5210, 5310, 5410, and 5510 Tractors

TECHNICAL MANUAL
5210, 5310, 5410, and 5510 Tractors

TM1716 26APR04 (ENGLISH)

For complete service information also see:

John Deere Augusta Works
LITHO IN U.S.A.

Introduction

Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

 This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

DX,TMIFC –19–29SEP98–1/1

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Continued on next page

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

Section 10
General Information

Contents

Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.

T81389 –UN–07DEC88

DX,ALERT –19–29SEP98–1/1

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

TS187 –19–30SEP88

DX,SIGNAL –19–03MAR93–1/1

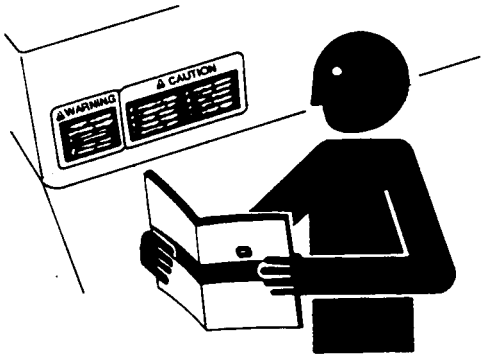
Follow Safety Instructions

Carefully read all safety messages in this manual and on your machine safety signs. Keep safety signs in good condition. Replace missing or damaged safety signs. Be sure new equipment components and repair parts include the current safety signs. Replacement safety signs are available from your John Deere dealer.

Learn how to operate the machine and how to use controls properly. Do not let anyone operate without instruction.

Keep your machine in proper working condition. Unauthorized modifications to the machine may impair the function and/or safety and affect machine life.

If you do not understand any part of this manual and need assistance, contact your John Deere dealer.



TS201 –UN–23AUG88

DX,READ –19–03MAR93–1/1

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Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.

TS227 –UN–23AUG88

DX,FLAME –19–29SEP98–1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

TS204 –UN–23AUG88

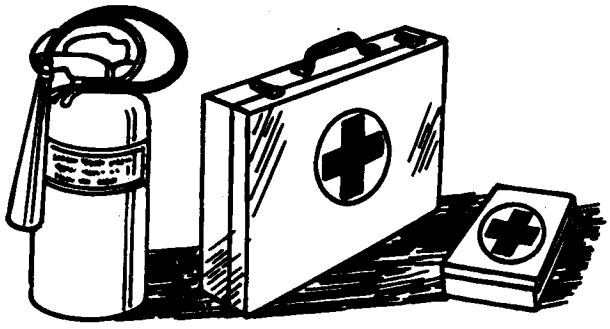
DX,SPARKS –19–03MAR93–1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 –UN–23AUG88

DX,FIRE2 –19–03MAR93–1/1

Prevent Acid Burns

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

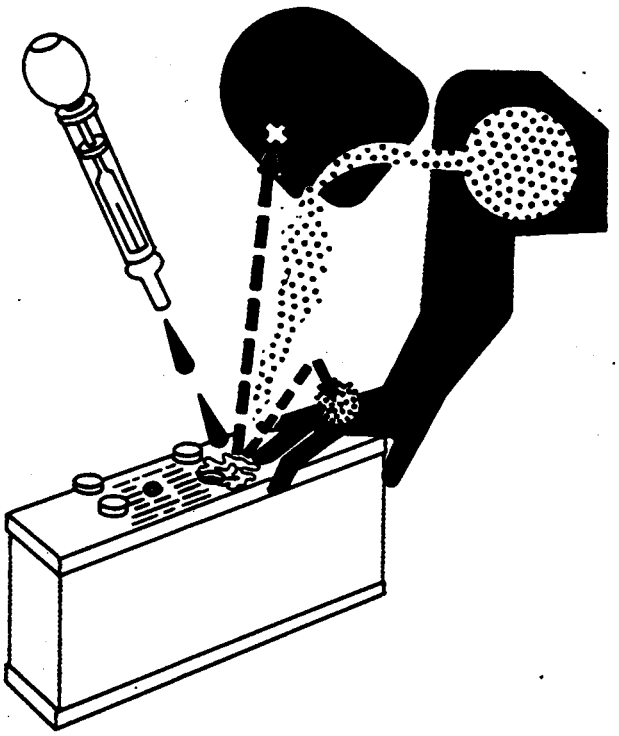
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 quarts).
3. Get medical attention immediately.



TS203 –UN–23AUG88

DX,POISON –19–21APR93–1/1

Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

TS281 –UN–23AUG88

DX,RCAP –19–04JUN90–1/1

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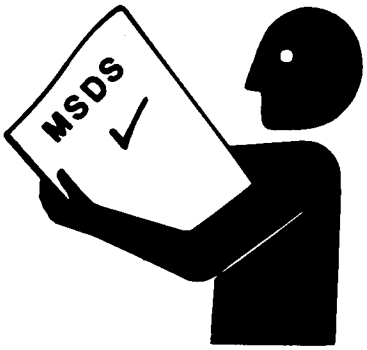
Handle Chemical Products Safely



TS1132 –UN–26NOV90

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

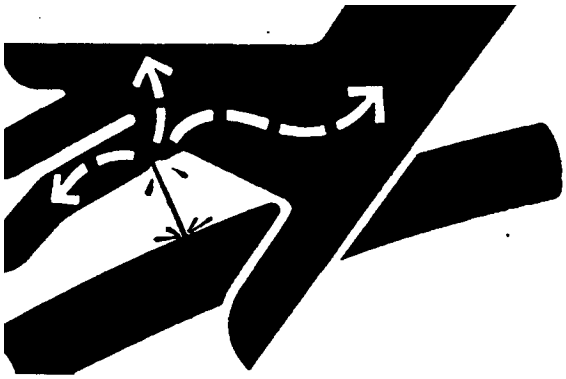
A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)

DX,MSDS,NA –19–03MAR93–1/1

Avoid High-Pressure Fluids



X9811 –UN–23AUG88

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

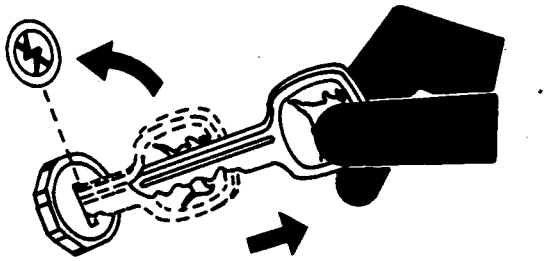
If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.

DX,FLUID –19–03MAR93–1/1

Park Machine Safely

Before working on the machine:

- Lower all equipment to the ground.
- Shift transmission to PARK.
- Engage park brake if equipped.
- Stop the engine and remove the key.
- Disconnect the battery ground strap.
- Hang a "DO NOT OPERATE" tag in operator station.



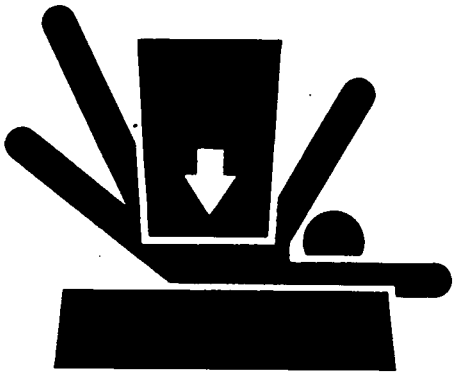
TS230 –UN–24MAY89

CED,OUO1085,7 –19–26JUL00–1/1

Support Machine Properly

Always lower the attachment or implement to the ground before you work on the machine. If you must work on a lifted machine or attachment, securely support the machine or attachment.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.



TS229 –UN–23AUG88

CED,OUO1085,8 –19–26JUL00–1/1

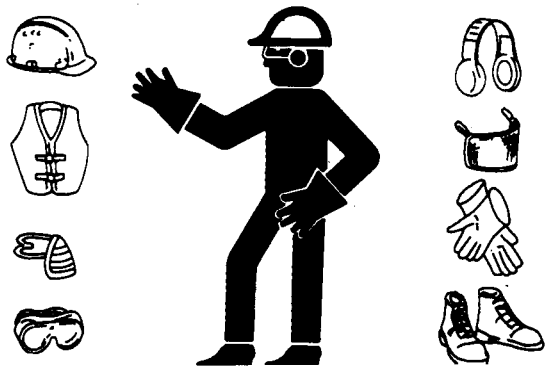
Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



TS206 –UN–23AUG88

DX,WEAR –19–10SEP90–1/1

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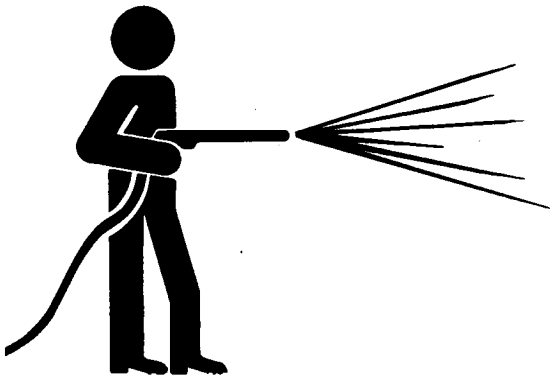
Work in Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



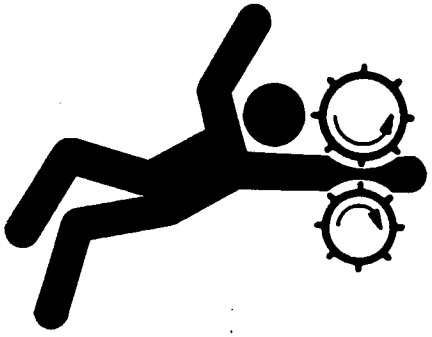
T6642EJ –UN–18OCT88

DX,CLEAN –19–04JUN90–1/1

Service Machines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



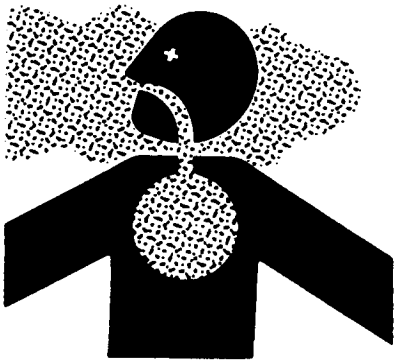
TS228 –UN–23AUG88

DX,LOOSE –19–04JUN90–1/1

Work in Ventilated Area

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area

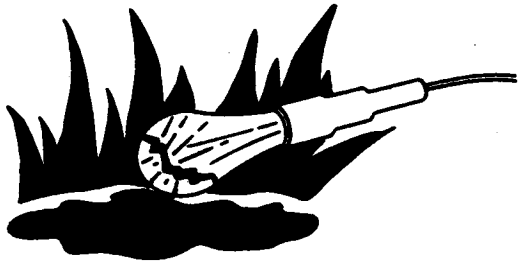


TS220 –UN–23AUG88

DX,AIR –19–17FEB99–1/1

Illuminate Work Area Safely

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

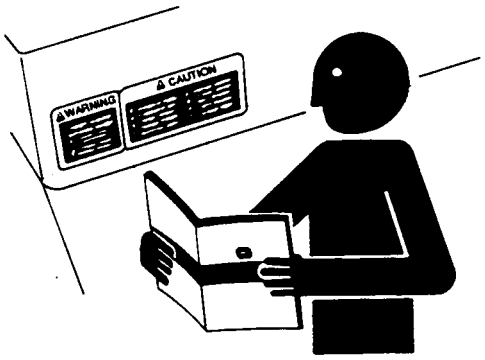


TS223 –UN–23AUG88

DX,LIGHT –19–04JUN90–1/1

Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



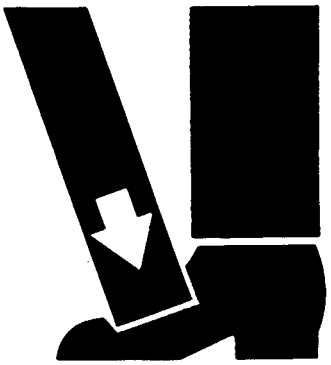
TS201 –UN–23AUG88

DX,SIGNS1 –19–04JUN90–1/1

Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



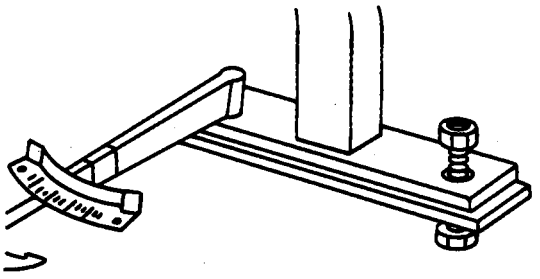
TS226 –UN–23AUG88

DX,LIFT –19–04JUN90–1/1

Keep ROPS Installed Properly

Make certain all parts are reinstalled correctly if the roll-over protective structure (ROPS) is loosened or removed for any reason. Tighten mounting bolts to proper torque.

The protection offered by ROPS will be impaired if ROPS is subjected to structural damage, is involved in an overturn incident, or is in any way altered by welding, bending, drilling, or cutting. A damaged ROPS should be replaced, not reused.



TS212 –UN–23AUG88

DX,ROPS3 –19–03MAR93–1/1

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Service Tires Safely

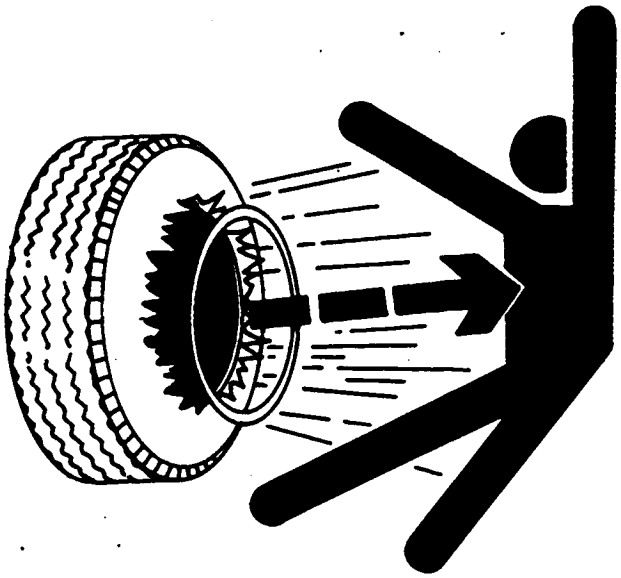
Explosive separation of a tire and rim parts can cause serious injury or death.

Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in air pressure resulting in a tire explosion. Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tire assembly. Use a safety cage if available.

Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.



TS211 –UN–23AUG88

DX,RIM –19–24AUG90–1/1

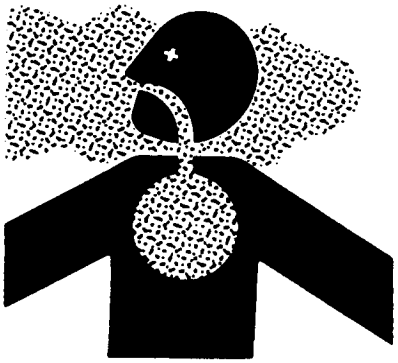
Avoid Harmful Asbestos Dust

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.

Keep bystanders away from the area.



TS220 –UN–23AUG88

DX,DUST –19–15MAR91–1/1

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area.

TS953 –UN–15MAY90

DX,TORCH –19–03MAR93–1/1

Remove Paint Before Welding or Heating

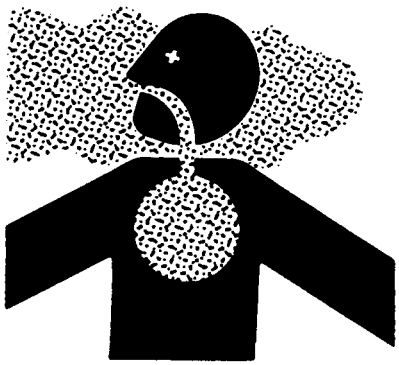
Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.



TS220 –UN–23AUG88

DX,PAINT –19–03MAR93–1/1

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Use Proper Tools

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

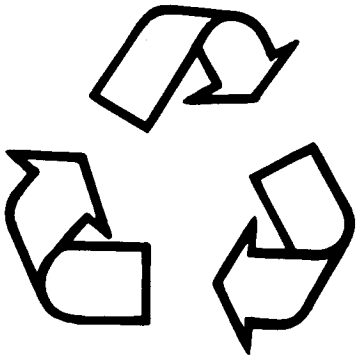
Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.

DX,REPAIR –19–17FEB99–1/1

Dispose of Waste Properly



Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.

DX,DRAIN –19–03MAR93–1/1

Live With Safety

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

TS231 –19–07OCT88

DX,LIVE –19–25SEP92–1/1

Machine Specifications—5210 and 5310

NOTE: Specifications and design subject to change without notice.

5210 Tractor

Item	Measurement	Specification
Engine	Make	John Deere
	Type	Diesel
	Model	CD3029DLV50
	Aspiration	Natural
	Horsepower	40 kW (53 hp)
	Rated Engine Speed	2400 rpm
	Operating Range	1600—2400 rpm
	Number of Cylinders	3
	Displacement	2.9 L (179 cu in.)
	Bore and Stroke	106 x 110 mm (4.19 x 4.33 in.)
	Compression Ratio	17.8:1
	Fast Idle	2625 ± 25 rpm
	Slow Idle	825 ± 25 rpm
	Start Aid	Air heater
	Firing Order	1-2-3
	Timing	18° BTDC
	Lubrication	Pressurized
	Cooling	Liquid cooled
	Air Cleaner	Dry type w/safety element
	Engine Shutoff	Key switch
Fuel System	Type	Direct injection
	Injection Pump Type	Rotary w/electric shutoff
Electrical System	Type	12 Volt
	Battery Size	700 cold cranking amps at -18° C
	Alternator Without Cab	40 amp
	Alternator With Cab	60 amp
Drive Train	Transmission Type	CollarShift (standard) SyncShuttle™ (optional) PowrReverser™ (optional)
	Number of Speeds	9 forward, 3 reverse (SyncShuttle™) 12 forward, 12 reverse (PowrReverser™)
	Final Drive	Planetary
	Clutch	Dual, dry Multi-disk, wet (PowrReverser™)

Continued on next page

Item	Measurement	Specification
Steering/Brakes	Steering	Hydrostatic power
	Brakes	Wet disk Self-equalizing Self-adjusting
Hydraulic System	Type	Open Center
	Working Pressure	18995—19700 kPa (190—197 bar) (2755—2855 psi)
	Pump Type	Tandem gear
	Capacity	(68.8 L/min 18.2 gpm)
	Hitch Lift Capacity at 610 mm (24 in.) Behind Hitch Balls	1530 kg (3374 lb)
	Lift Control Type	Position and depth
Rear PTO[1]	Type	Fully independent
	Horsepower (Standard Mode)	34 kW (45 hp)
	Speed (540 Standard Mode) @ 2400 rpm Engine Speed	540 rpm
	Speed (540E Economy Mode) @ 1700 rpm Engine Speed	540 rpm
Capacities	Fuel Tank (Open Station)	68 L (18 U.S. gal)
	Fuel Tank (Cab Tractors)	83 L (22 U.S. gal)
	Cooling System	9.5 L (10 U.S. qt)
	Engine Crankcase w/Filter	8.5 L (9 U.S. qt)
	Hydraulic System	38 L (10 U.S. gal)
	MFWD Wheel Hubs	0.6 L (0.63 U.S. qt)
	MFWD Differential Housing	5 L (5.3 U.S. qt)

[1]540E Economy Mode available only on SyncSuttle™ Transmission.

Continued on next page

CED,OUO1085,9 –19–03APR02–2/6

Item	Measurement	Specification
Tires (Standard Equipment)	2WD Front	6.50—16 6PR F2
	2WD Rear	13.6—28 4PR R1
	MFWD Front	8.3—24 4PR R1
	MFWD Rear	13.6—28 4PR R1
Overall Dimensions (Standard Equipment)[2]	Drawbar Ground Clearance	364 mm (14.3 in.)
	Front Axle Ground Clearance (2WD)	478 mm (19 in.)
	Front Axle Ground Clearance (MFWD)	430 mm (17 in.)
	Overall Length without Hitch and Drawbar	3150 mm (124 in.)
	Overall Width (Maximum)	2402 mm (94.6 in.)
	Height to Top of Steering Wheel	1600 mm (63 in.)
	Height to Top of ROPS (Add 4 Inches if Equipped with a Canopy)	2254 mm (88.7 in.) extended
		1948 mm (76.7 in.) folded
	Height to Top of Cab from Center Line of Rear Axle	1844 mm (72.6 in.)
	Approximate Weight (2WD)	1982 kg (4370 lb)
	Approximate Weight (MFWD)	2145 kg (4730 lb)

[2]Weights will vary slightly with optional tires. Add 1000 lbs. to weight of tractor if equipped with a cab.

Continued on next page

CED,OUO1085,9 –19–03APR02–3/6

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5310 Tractor

Item	Measurement	Specification
Engine	Make	John Deere
	Type	Diesel
	Model	CD3029TLV50
	Aspiration	Turbocharged
	Horsepower	48 kW (64 hp)
	Rated Engine Speed	2400 rpm
	Operating Range	1600—2400 rpm
	Number of Cylinders	3
	Displacement	2.9 L (179 cu in.)
	Bore and Stroke	106 x 110 mm (4.19 x 4.33 in.)
	Compression Ratio	17.8:1
	Fast Idle	2625 ± 25 rpm
	Slow Idle	825 ± 25 rpm
	Start Aid	Air heater
	Firing Order	1-2-3
	Timing	18° BTDC
	Lubrication	Pressurized
	Cooling	Liquid cooled
	Air Cleaner	Dry type w/safety element
	Engine Shutoff	Key switch
Fuel System	Type	Direct injection
	Injection Pump Type	Rotary w/electric shutoff
Electrical System	Type	12 volt
	Battery Size	700 cold cranking amps at -18° C
	Alternator Without Cab	40 amp
	Alternator With Cab	60 amp
Drive Train	Transmision Type	CollarShift (standard) SyncShuttle™ (optional) PowrReverser™ (optional)
	Number of Speeds	9 forward, 3 reverse (SyncShuttle™) 12 forward, 12 reverse (PowrReverser™)
	Final Drive	Planetary
	Clutch	Dual, dry Multi-disk, wet (PowrReverser™)
Steering/Brakes	Steering	Hydrostatic power
	Brakes	Wet disk Self-equalizing Self-adjusting

Continued on next page

CED,OUO1085,9 –19–03APR02–4/6

Item	Measurement	Specification
Hydraulic System	Type	Open center
	Working Pressure	18 995—19 700 kPa (190—197 bar) (2755—2855 psi)
	Pump Type	Tandem gear
	Capacity	68.8 L/min (18.2 gpm)
	Hitch Lift Capacity at 610 mm (24 in.) Behind Hitch Balls	1530 kg (3374 lb)
	Lift Control Type	Position and depth
Rear PTO[3]	Type	Fully independent
	Horsepower (Standard Mode)	41 kW (55 hp)
	Speed (540 Standard Mode) @ 2400 rpm Engine Speed	540 rpm
	Speed (540E Economy Mode) @ 1700 rpm Engine Speed	540 rpm
Capacities	Fuel Tank (Open Station)	68 L (18 U.S. gal)
	Fuel Tank (Cab Tractors)	83 L (22 U.S. gal)
	Cooling System	9.5 L (10 U.S. qt)
	Engine Crankcase w/Filter	8.5 L (9 U.S. qt)
	Hydraulic System	38 L (10 U.S. gal)
	MFWD Wheel Hubs	0.6 L (0.63 U.S. qt)
	MFWD Differential Housing	5 L (5.3 U.S. qt)

[3]540E Economy Mode available only on SyncShuttle™ Transmission.

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Item	Measurement	Specification
Tires (Standard Equipment)	2WD Front	7.50—16 6PR F2
	2WD Rear	14.9—28 6PR R1
	MFWD Front	9.5—24 4PR R1
	MFWD Rear	14.9—28 6PR R1
Overall Dimensions (Standard Equipment)[2]	Drawbar Ground Clearance	364 mm (14.3 in.)
	Front Axle Ground Clearance (2WD)	478 mm (19 in.)
	Front Axle Ground Clearance (MFWD)	430 mm (17 in.)
	Overall Length without Hitch and Drawbar	3150 mm (124 in.)
	Overall Width (Maximum)	2402 mm (94.6 in.)
	Height to Top of Steering Wheel	1625 mm (64 in.)
	Height to Top of ROPS (Add 4 Inches to Top of ROPS if Equipped with a Canopy)	2254 mm (88.7 in.) extended
		1973 mm (77.7 in.) folded
	Height to Top of Cab from Center Line of Rear Axle	1844 mm (72.6 in.)
	Approximate Weight (2WD)	2064 kg (4550 lb)
	Approximate Weight (MFWD)	2250 kg (4960 lb)

[2]Weights will vary slightly with optional tires. Add 1000 lbs. to weight of tractor if equipped with a cab.

CED,OUO1085,9 –19–03APR02–6/6

Travel Speeds—5210 and 5310

Item	Measurement	Specification
Travel Speeds for CollarShift or SyncShuttle™ Units at Full Engine RPM with 14.9—28 R1 Rear Tire Types[1]		
Creeper-1 Gear in Forward	Speed	0.3 km/h (0.2 mph)
Creeper-2 Gear in Forward	Speed	0.5 km/h (0.3 mph)
Creeper-3 Gear in Forward	Speed	0.7 km/h (0.4 mph)
A-1st Gear in Forward	Speed	2.0 km/h (1.2 mph)
A-2nd Gear in Forward	Speed	2.1 km/h (1.3 mph)
A-3rd Gear in Forward	Speed	4.0 km/h (2.5 mph)
B-1st Gear in Forward	Speed	4.7 km/h (2.9 mph)
B-2nd Gear in Forward	Speed	6.7 km/h (4.2 mph)
B-3rd Gear in Forward	Speed	9.2 km/h (5.7 mph)
C-1st Gear in Forward	Speed	12.8 km/h (7.9 mph)
C-2nd Gear in Forward	Speed	18.4 km/h (11.5 mph)
C-3rd Gear in Forward	Speed	25.1 km/h (15.6 mph)
Creeper-R Gear in Reverse	Speed	0.6 km/h (0.34 mph)
Reverse-1st Gear	Speed	3.4 km/h (2.1 mph)
Reverse-2nd Gear	Speed	7.8 km/h (4.8 mph)
Reverse-3rd Gear	Speed	21.3 km/h (13.2 mph)

[1]Travel speeds will vary with optional rear tires. Creeper assembly is optional.

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Item	Measurement	Specification
Travel Speeds for PowrReverser™ Units at Full Engine RPM with 16.9—30 R1 Rear Tire Types[1]		
Creeper-1 Gear in Forward	Speed	0.24 km/h (0.15 mph)
Creeper-2 Gear in Forward	Speed	0.31 km/h (0.19 mph)
Creeper-3 Gear in Forward	Speed	0.40 km/h (0.25 mph)
Creeper-4 Gear in Forward	Speed	0.54 km/h (0.34 mph)
A-1 Gear in Forward	Speed	1.49 km/h (0.93 mph)
A-2 Gear in Forward	Speed	1.87 km/h (1.16 mph)
A-3 Gear in Forward	Speed	2.42 km/h (1.50 mph)
A-4 Gear in Forward	Speed	2.87 km/h (1.79 mph)
B-1 Gear in Forward	Speed	4.33 km/h (2.69 mph)
B-2 Gear in Forward	Speed	5.42 km/h (3.37 mph)
B-3 Gear in Forward	Speed	7.00 km/h (4.34 mph)
B-4 Gear in Forward	Speed	9.56 km/h (5.94 mph)
C-1 Gear in Forward	Speed	12.2 km/h (7.61 mph)
C-2 Gear in Forward	Speed	15.3 km/h (9.51 mph)
C-3 Gear in Forward	Speed	19.8 km/h (12.3 mph)
C-4 Gear in Forward	Speed	27.0 km/h (16.8 mph)
Creeper-1 Gear in Reverse	Speed	0.28 km/h (0.18 mph)
Creeper-2 Gear in Reverse	Speed	0.35 km/h (0.22 mph)
Creeper-3 Gear in Reverse	Speed	0.46 km/h (0.28 mph)
Creeper-4 Gear in Reverse	Speed	0.62 km/h (0.39 mph)

[1]Travel speeds will vary with optional rear tires. Creeper assembly is optional.

Continued on next page

Item	Measurement	Specification
A-1 Gear in Reverse	Speed	1.72 km/h (1.07 mph)
A-2 Gear in Reverse	Speed	2.16 km/h (1.34 mph)
A-3 Gear in Reverse	Speed	2.79 km/h (1.74 mph)
A-4 Gear in Reverse	Speed	3.32 km/h (2.07 mph)
B-1 Gear in Reverse	Speed	5.01 km/h (3.11 mph)
B-2 Gear in Reverse	Speed	6.26 km/h (3.89 mph)
B-3 Gear in Reverse	Speed	8.10 km/h (5.04 mph)
B-4 Gear in Reverse	Speed	11.0 km/h (6.87 mph)
C-1 Gear in Reverse	Speed	14.2 km/h (8.80 mph)
C-2 Gear in Reverse	Speed	17.7 km/h (11.0 mph)
C-3 Gear in Reverse	Speed	22.9 km/h (14.2 mph)
C-4 Gear in Reverse	Speed	31.2 km/h (19.4 mph)

OUO1080,0000287 –19–23JUL02–3/3

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Machine Specifications—5410

5410 Tractor

Item	Measurement	Specification
Engine	Make	John Deere
	Type	Diesel
	Model	CD4045DLV50
	Aspiration	Natural
	Horsepower	48 kW (65 hp)
	Rated Engine Speed	2400 rpm
	Number of Cylinders	4
	Displacement	4.5 L (274 cu in.)
	Bore and Stroke	106 x 127 mm (4.19 x 5.00 in.)
	Compression Ratio	17.6:1
	Fast Idle	2625 ± 25 rpm
	Slow Idle	825 ± 25 rpm
	Start Aid	Air heater
	Firing Order	1-3-4-2
	Timing	17° BTDC
	Lubrication	Pressurized
	Cooling	Liquid cooled
	Air Cleaner	Dry type w/safety element
	Engine Shutoff	Key switch
Fuel System	Type	Direct injection
	Injection Pump Type	Rotary w/electric shutoff
Electrical System	Type	12 volt
	Battery Size	700 cold cranking amps at -18°C
	Alternator	40 amp without cab
		65 amp with cab
Drive Train	Transmission Type	CollarShift
		SyncShuttle™ (optional)
		PowrReverser™ (optional)
	Number of Speeds	9 Foward, 3 Reverse (SyncShuttle™)
		12 Forward, 12 Reverse (PowrReverser™)
	Final Drive	Planetary
	Clutch	Dual, dry
		Multi-disk, wet (PowrReverser™)

Continued on next page

Item	Measurement	Specification
Steering/Brakes	Steering	Hydrostatic power
	Brakes	Wet disk Self-equalizing Self-adjusting
Hydraulic System	Type	Open center
	Working Pressure	18995—19700 kPa (190—197 bar) (2755—2855 psi)
	Pump Type	Tandem gear
	Capacity	85 L/min (22.5 gpm)
	Hitch Lift Capacity at 610 mm (24 in.) Behind Hitch Balls	1530 kg (3374 lb)
	Lift Control Type	Position and depth
Rear PTO[1]	Type	Fully independent
	Horsepower	48 kW (65 hp)
	Speed (540 Standard Mode) @ 2400 rpm Engine Speed	540 rpm
	Speed (540E Economy Mode) @ 1700 rpm Engine Speed	540 rpm
Capacities	Fuel Tank (Open Station)	68 L (18 U.S. gal)
	Fuel Tank (Cab Tractors)	83 L (22 U.S. gal)
	Cooling System	10.8 L (11.4 U.S. qt)
	Engine Crankcase w/Filter	8.5 L (9 U.S. qt)
	Hydraulic System	38 L (10 U.S. gal)
	MFWD Wheel Hubs	0.6 L (0.63 U.S. qt)
	MFWD Axle Housing	5 L (5.3 U.S. qt)

[1]Economy Mode available only on SyncShuttle™ Transmission.

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Item	Measurement	Specification
Tires (Standard Equipment)	2WD Front	7.50—16 6PR F2
	2WD Rear	16.9—30 6PR R1
	MFWD Front	11.2—24 4PR R1
	MFWD Rear	16.9—30 6PR R1
Overall Dimensions (Standard Equipment)[2]	Drawbar Ground Clearance (2WD)	497.8 mm (19.6 in.)
	Drawbar Ground Clearance (MFWD)	477.5 mm (18.8 in.)
	Front Axle Ground Clearance (2WD)	464.8 mm (18.3 in.)
	Front Axle Ground Clearance (MFWD)	391.1 mm (15.4 in.)
	Overall Length without Hitch, Drawbar, and Weights (2WD)	3197.8 mm (125.9 in.)
	Overall Length without Hitch, Drawbar, and Weights (MFWD)	3309.6 mm (130.3 in.)
	Overall Width (2WD)	1744.9mm (68.7 in.) maximum
	Overall Width (MFWD)	1744.9 mm (68.7 in.) maximum
	Height to Top of Steering Wheel	1661 mm (65.4 in.)
	Height to Top of ROPS (Add 4 Inches to Top of ROPS if Equipped with a Canopy)	2316.4 mm (91.2 in.) extended
		1981 mm (78 in.) folded
	Height to Top of Cab from Center Line of Rear Axle	1844 mm (72.6 in.)
	Approximate Weight (2WD)	2390 kg (5270 lb)
	Approximate Weight (MFWD)	2581 kg (5690 lb)

[2]Weights will vary slightly with optional tires. Add 1000 lbs. to weight of tractor if equipped with a cab.

OUO1080,0000288 –19–23JUL02–3/3

Travel Speeds—5410

Item	Measurement	Specification
Travel Speeds for CollarShift or SyncShuttle™ Units at Full Engine RPM with 14.9—28 R1 Rear Tire Types[1]		
Creeper-1 Gear in Forward	Speed	0.3 km/h (0.2 mph)
Creeper-2 Gear in Forward	Speed	0.5 km/h
Creeper-3 Gear in Forward	Speed	0.7 km/h (0.4 mph)
A-1st Gear in Forward	Speed	2.0 km/h (1.2 mph)
A-2nd Gear in Forward	Speed	2.1 km/h (1.3 mph)
A-3rd Gear in Forward	Speed	4.0 km/h (2.5 mph)
B-1st Gear in Forward	Speed	4.7 km/h (2.9 mph)
B-2nd Gear in Forward	Speed	6.7 km/h (4.2 mph)
B-3rd Gear in Forward	Speed	9.2 km/h (5.7 mph)
C-1st Gear in Forward	Speed	12.8 km/h (7.9 mph)
C-2nd Gear in Forward	Speed	18.4 km/h (11.5 mph)
C-3rd Gear in Forward	Speed	25.1 km/h (15.6 mph)
Creeper-Reverse Gear	Speed	0.6 km/h (0.34 mph)
Reverse-1st Gear	Speed	3.4 km/h (2.1 mph)
Reverse-2nd Gear	Speed	7.8 km/h (4.8 mph)
Reverse-3rd Gear	Speed	21.3 km/h (13.2 mph)

[1]Travel speeds will vary with optional rear tires. Creeper assembly is optional.

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Item	Measurement	Specification
Travel Speeds for PowrReverser™ Units at Full Engine RPM with 16.9—30 R1 Rear Tire Types[1]		
Creeper-1 Gear in Forward	Speed	0.24 km/h (0.15 mph)
Creeper-2 Gear in Forward	Speed	0.31 km/h (0.19 mph)
Creeper-3 Gear in Forward	Speed	0.40 km/h (0.25 mph)
Creeper-4 Gear in Forward	Speed	0.54 km/h (0.34 mph)
A-1 Gear in Forward	Speed	1.49 km/h (0.93 mph)
A-2 Gear in Forward	Speed	1.87 km/h (1.16 mph)
A-3 Gear in Forward	Speed	2.42 km/h (1.50 mph)
A-4 Gear in Forward	Speed	2.87 km/h (1.79 mph)
B-1 Gear in Forward	Speed	4.33 km/h (2.69 mph)
B-2 Gear in Forward	Speed	5.42 km/h (3.37 mph)
B-3 Gear in Forward	Speed	7.00 km/h (4.34 mph)
B-4 Gear in Forward	Speed	9.56 km/h (5.94 mph)
C-1 Gear in Forward	Speed	12.2 km/h (7.61 mph)
C-2 Gear in Forward	Speed	15.3 km/h (9.51 mph)
C-3 Gear in Forward	Speed	19.8 km/h (12.3 mph)
C-4 Gear in Forward	Speed	27.0 km/h (16.8 mph)
Creeper-1 Gear in Reverse	Speed	0.28 km/h (0.18 mph)
Creeper-2 Gear in Reverse	Speed	0.35 km/h (0.22 mph)
Creeper-3 Gear in Reverse	Speed	0.46 km/h (0.28 mph)
Creeper-4 Gear in Reverse	Speed	0.62 km/h (0.39 mph)

[1]Travel speeds will vary with optional rear tires. Creeper assembly is optional.

Continued on next page

Item	Measurement	Specification
A-1 Gear in Reverse	Speed	1.72 km/h (1.07 mph)
A-2 Gear in Reverse	Speed	2.16 km/h (1.34 mph)
A-3 Gear in Reverse	Speed	2.79 km/h (1.74 mph)
A-4 Gear in Reverse	Speed	3.32 km/h (2.07 mph)
B-1 Gear in Reverse	Speed	5.01 km/h (3.11 mph)
B-2 Gear in Reverse	Speed	6.26 km/h (3.89 mph)
B-3 Gear in Reverse	Speed	8.10 km/h (5.04 mph)
B-4 Gear in Reverse	Speed	11.0 km/h (6.87 mph)
C-1 Gear in Reverse	Speed	14.2 km/h (8.80 mph)
C-2 Gear in Reverse	Speed	17.7 km/h (11.0 mph)
C-3 Gear in Reverse	Speed	22.9 km/h (14.2 mph)
C-4 Gear in Reverse	Speed	31.2 km/h (19.4 mph)

OUO1080,0000289 –19–23JUL02–3/3

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Machine Specifications—5510

5510 Tractor

Item	Measurement	Specification
Engine	Make	John Deere
	Type	Diesel
	Model	CD4045TLV50
	Aspiration	Turbocharged
	Horsepower	56 kW (75 hp)
	Rated Engine Speed	2400 rpm
	Number of Cylinders	4
	Displacement	4.5 L (274 cu in.)
	Bore and Stroke	106 x 127 mm (4.19 x 5.00 in.)
	Compression Ratio	17.0:1
	Fast Idle	2625 ± 25 rpm
	Slow Idle	825 ± 25 rpm
	Start Aid	Air heater
	Firing Order	1-3-4-2
	Timing	17° BTDC
	Lubrication	Pressurized
	Cooling	Liquid cooled
	Air Cleaner	Dry type w/safety element
	Engine Shutoff	Key switch
Fuel System	Type	Direct injection
	Battery Size	700 cold cranking amps at -18°C
	Alternator	40 amp without cab 65 amp with cab
Drive Train	Transmission Type	CollarShift (standard) SyncShuttle™ (optional) PowrReverser™ (optional)
	Number of Speeds	9 Forward, 3 Reverse (SyncShuttle™) 12 Forward, 12 Reverse (PowrReverser™)
	Final Drive	Planetary
	Clutch	Dual, dry Multi-disk, wet (PowrReverser™)
Steering/Brakes	Steering	Hydrostatic Power
	Brakes	Wet Disk Self-equalizing Self-adjusting

Continued on next page

Item	Measurement	Specification
Hydraulic System	Type	Open center
	Working Pressure	18995—19700 kPa (190—197 bar) (2755—2855 psi)
	Pump Type	Tandem gear
	Capacity	85 L/min (22.5 gpm)
	Hitch Lift Capacity at 610 mm (24 in.) Behind Hitch Balls	1530 kg (3374 lb)
	Lift Control Type	Position and depth
Rear PTO[1]	Type	Fully independent
	Horsepower	56 kW (75 hp)
	Speed (540 Standard Mode) @ 2400 rpm Engine Speed	540 rpm
	Speed (540E Economy Mode) @ 1700 rpm Engine Speed	540 rpm
Capacities	Fuel Tank (Open Station)	83 L (22 U.S. gal)
	Fuel Tank (Cab Tractors)	83 L (22 U.S. gal)
	Cooling System	10.8 L (11.4 U.S. qt)
	Engine Crankcase w/Filter	8.5 L (9 U.S. qt)
	Hydraulic System	41.8 L (11 U.S. gal)
	MFWD Wheel Hubs	0.6 L (0.63 U.S. qt)
	MFWD Axle Housing	5 L (5.3 U.S. qt)

[1]Economy Mode available only on SyncShuttle™ Transmission.

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Item	Measurement	Specification
Tires (Standard Equipment)	2WD Front	7.50—16 6PR F2
	2WD Rear	16.9—30 6PR R1
	MFWD Front	11.2—24 4PR R1
	MFWD Rear	16.9—30 6PR R1
Overall Dimensions (Standard Equipment)[2]	Drawbar Ground Clearance (2WD)	497.8 mm (19.6 in.) Drawbar Ground Clearance (MFWD) 3309.6 mm (130.3 in.)
	Front Axle Ground Clearance (2WD)	464.8 mm (18.3 in.)
	Front Axle Ground Clearance (MFWD)	391.1 mm (15.4 in.)
	Overall Length without Hitch, Drawbar and Weights (2WD)	3510.2 mm (138.2 in.)
	Overall Length without Hitch, Drawbar, and Weights (MFWD)	3510.2 mm (138.2 in.)
	Overall Width (2WD)	1744.9 mm (68.7 in.) maximum
	Overall Width (MFWD)	1744.9 mm (68.7 in.) maximum
	Height to Top of Steering Wheel	1696.7 mm (66.8 in.)
	Height to Top of ROPS (Add 4 Inches to Top of ROPS if Equipped with Canopy)	2481.5 mm (97.7 in.) extended 2024.3 mm (79.7 in.) folded
	Height to Top of Cab from Center Line of Rear Axle	1844 mm (72.6 in.)
	Approximate Weight (2WD)	2599 kg (5730 lb)
	Approximate Weight (MFWD)	2785.1 kg (6140 lb)

[2]Weights will vary slightly with optional tires. Add 1000 lbs. to weight of tractor if equipped with cab.

OUO1080,000028A –19–23JUL02–3/3

Travel Speeds—5510

Item	Measurement	Specification
Travel Speeds for CollarShift or SyncShuttle™ Units at Full Engine RPM with 16.9—30 R1 Rear Tire Types		
Creeper-1 Gear in Forward	Speed	13.7 km/h (8.5 mph)
Creeper-2 Gear in Forward	Speed	19.8 km/h (12.3 mph)
Creeper-3 Gear in Forward	Speed	27.0 mph (16.7 mph)
A-1st Gear in Forward	Speed	2.1 km/h (1.3 mph)
A-2nd Gear in Forward	Speed	3.1 km/h (1.9 mph)
A-3rd Gear in Forward	Speed	4.2 km/h (2.6 mph)
B-1st Gear in Forward	Speed	4.9 km/h (3.1 mph)
B-2nd Gear in Forward	Speed	7.2 km/h (4.4 mph)
B-3rd Gear in Forward	Speed	9.8 km/h (6.1 mph)
C-1st Gear in Forward	Speed	13.7 km/h (8.5 mph)
C-2nd Gear in Forward	Speed	19.8 km/h (12.3 mph)
C-3rd Gear in Forward	Speed	27.0 km/h (16.7 mph)
Creeper-Reverse Gear	Speed	0.59 km/h (0.37 mph)
Reverse-1st Gear	Speed	0.35 km/h (0.25 mph)
Reverse-2nd Gear	Speed	0.51 km/h (0.32 mph)
Reverse-3rd Gear	Speed	0.70 km/h (0.43 mph)

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Item	Measurement	Specification
Travel Speeds for PowrReverser™ Units at Full Engine RPM with 16.9—30 R1 Rear Tire Types[1]		
Creeper-1 Gear in Forward	Speed	0.24 km/h (0.15 mph)
Creeper-2 Gear in Forward	Speed	0.31 km/h (0.19 mph)
Creeper-3 Gear in Forward	Speed	0.40 km/h (0.25 mph)
Creeper-4 Gear in Forward	Speed	0.54 km/h (0.34 mph)
A-1 Gear in Forward	Speed	1.49 km/h (0.93 mph)
A-2 Gear in Forward	Speed	1.87 km/h (1.16 mph)
A-3 Gear in Forward	Speed	2.42 km/h (1.50 mph)
A-4 Gear in Forward	Speed	2.87 km/h (1.79 mph)
B-1 Gear in Forward	Speed	4.33 km/h (2.69 mph)
B-2 Gear in Forward	Speed	5.42 km/h (3.37 mph)
B-3 Gear in Forward	Speed	7.00 km/h (4.34 mph)
B-4 Gear in Forward	Speed	9.56 km/h (5.94 mph)
C-1 Gear in Forward	Speed	12.2 km/h (7.61 mph)
C-2 Gear in Forward	Speed	15.3 km/h (9.51 mph)
C-3 Gear in Forward	Speed	19.8 km/h (12.3 mph)
C-4 Gear in Forward	Speed	27.0 km/h (16.8 mph)
Creeper-1 Gear in Reverse	Speed	0.28 km/h (0.18 mph)
Creeper-2 Gear in Reverse	Speed	0.35 km/h (0.22 mph)
Creeper-3 Gear in Reverse	Speed	0.46 km/h (0.28 mph)
Creeper-4 Gear in Reverse	Speed	0.62 km/h (0.39 mph)

[1]Travel speeds will vary with optional rear tires. Creeper assembly is optional.

Continued on next page

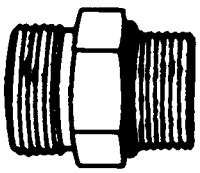
Item	Measurement	Specification
A-1 Gear in Reverse	Speed	1.72 km/h (1.07 mph)
A-2 Gear in Reverse	Speed	2.16 km/h (1.34 mph)
A-3 Gear in Reverse	Speed	2.79 km/h (1.74 mph)
A-4 Gear in Reverse	Speed	3.32 km/h (2.07 mph)
B-1 Gear in Reverse	Speed	5.01 km/h (3.11 mph)
B-2 Gear in Reverse	Speed	6.26 km/h (3.89 mph)
B-3 Gear in Reverse	Speed	8.10 km/h (5.04 mph)
B-4 Gear in Reverse	Speed	11.0 km/h (6.87 mph)
C-1 Gear in Reverse	Speed	14.2 km/h (8.80 mph)
C-2 Gear in Reverse	Speed	17.7 km/h (11.0 mph)
C-3 Gear in Reverse	Speed	22.9 km/h (14.2 mph)
C-4 Gear in Reverse	Speed	31.2 km/h (19.4 mph)

OUO1080,000028B –19–23JUL02–3/3

Service Recommendations for O-Ring Boss Fittings

Straight Fitting

1. Inspect O-ring boss seat for dirt or defects.
2. Lubricate O-ring with petroleum jelly. Place electrical tape over threads to protect O-ring. Slide O-ring over tape and into O-ring groove of fitting. Remove tape.
3. Tighten fitting to torque value shown on chart.



T6243AE –UN–18OCT88

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04T,90,K66 –19–19MAR96–1/2

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Angle Fitting

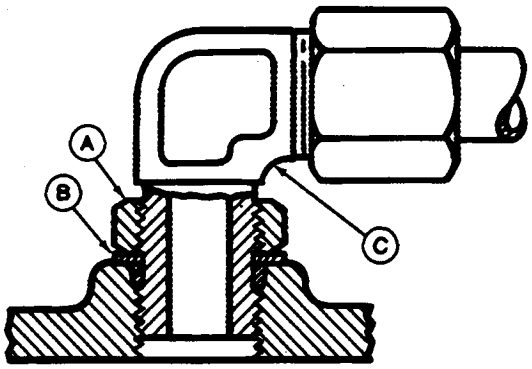
1. Back-off lock nut (A) and back-up washer (B) completely to head-end (C) of fitting.
2. Turn fitting into threaded boss until back-up washer contacts face of boss.
3. Turn fitting head-end counterclockwise to proper index (maximum of one turn).

NOTE: Do not allow hoses to twist when tightening fittings.

4. Hold fitting head-end with a wrench and tighten locknut and back-up washer to proper torque value.

STRAIGHT FITTING OR SPECIAL NUT TORQUE CHART		
Thread Size	**N•m**	**lb-ft**
3/8-24 UNF	8	6
7/16-20 UNF	12	9
1/2-20 UNF	16	12
9/16-18 UNF	24	18
3/4-16 UNF	46	34
7/8-14 UNF	62	46
1-1/16-12 UN	102	75
1-3/16-12 UN	122	90
1-5/16-12 UN	142	105
1-5/8-12 UN	190	140
1-7/8-12 UN	217	160

NOTE: Torque tolerance is ± 10%.

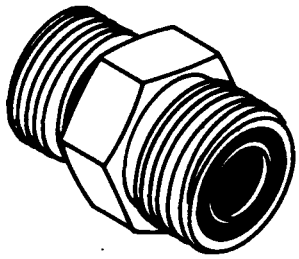


T6520AB –UN–18OCT88

A—Lock Nut
B—Washer
C—Fitting

04T,90,K66 –19–19MAR96–2/2

Service Recommendations for Flat Face O-Ring Seal Fittings



T6243AD –UN–18OCT88

1. Inspect the fitting sealing surfaces. They must be free of dirt or defects.
2. Inspect the O-ring. It must be free of damage or defects.
3. Lubricate O-rings and install into groove using petroleum jelly to hold in place.
4. Push O-ring into the groove with plenty of petroleum jelly so O-ring is not displaced during assembly.
5. Index angle fittings and tighten by hand pressing joint together to insure O-ring remains in place.
6. Tighten fitting or nut to torque value shown on the chart per dash size stamped on the fitting. Do not allow hoses to twist when tightening fittings.

FLAT FACE O-RING SEAL FITTING TORQUE

Nominal Tube O.D.		Dash Size	Thread Size in.	Swivel Nut Torque		Bulkhead Nut Torque	
mm	in.	N•m	lb-ft	N•m	lb-ft		
6.35	0.250	-4	9/16-18	16	12	5.0	3.5
9.52	0.375	-6	11/16-16	24	18	9.0	6.5
12.70	0.500	-8	13/16-16	50	37	17.0	12.5
15.88	0.625	-10	1-14	69	51	17.0	12.5
19.05	0.750	-12	1 3/16-12	102	75	17.0	12.5
22.22	0.875	-14	1 3/16-12	102	75	17.0	12.5
25.40	1.000	-16	1 7/16-12	142	105	17.0	12.5
31.75	1.250	-20	1 11/16-12	190	140	17.0	12.5
38.10	1.500	-24	2-12	217	160	17.0	12.5

NOTE: Torque tolerance is +15 -20%.

04T,90,K67 –19–01AUG94–1/1

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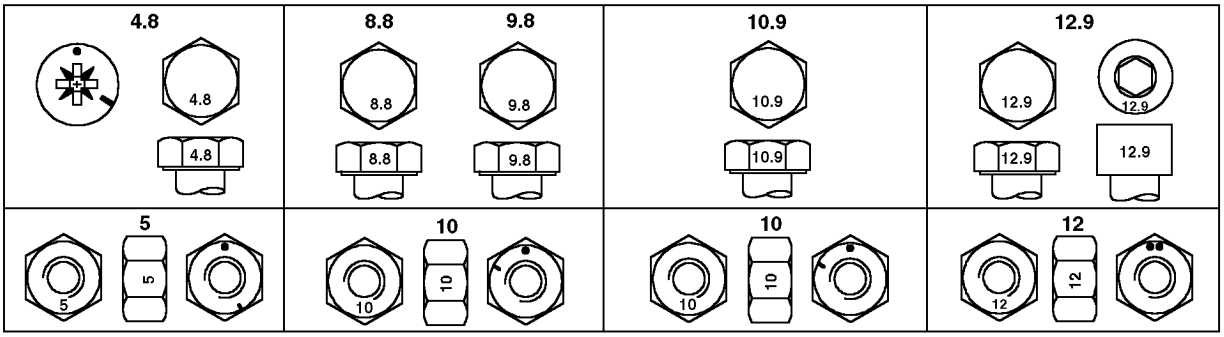
Metric Cap Screw Torque Values—Grade 7

NOTE: When bolting aluminum parts, tighten to 80% of torque specified in table.

Size	N•m	(lb-ft)
M6	9.5 - 12.2	(7-9)
M8	20.3 - 27.1	(15-20)
M10	47.5 - 54.2	(35-40)
M12	81.4 - 94.9	(60-70)
M14	128.8 - 146.4	(95-108)
M16	210.2 - 240	(155-177)

CED,OUO1085,12 –19–31JUL00–1/1

Metric Bolt and Cap Screw Torque Values



TORQ2 –UN–07SEP99

Top, Property Class and Head Markings; Bottom, Property Class and Nut Markings

	Class 4.8		Class 8.8 or 9.8		Class 10.9		Class 12.9	
Size	**Lubricated[a] N•m (lb-ft)**	**Dry[b] N•m (lb-ft)**	**Lubricated[a] N•m (lb-ft)**	**Dry[b] N•m (lb-ft)**	**Lubricated[a] N•m (lb-ft)**	**Dry[b] N•m (lb-ft)**	**Lubricated[a] N•m (lb-ft)**	**Dry[b] N•m (lb-ft)**
M6	4.7 (3.5)	6 (4.4)	9 (6.6)	11.5 (8.5)	13 (9.5)	16.5 (12.2)	15.5 (11.5)	19.5 (14.5)
M8	11.5 (8.5)	14.5 (10.7)	22 (16)	28 (20.5)	32 (23.5)	40 (29.5)	37 (27.5)	47 (35)
M10	23 (17)	29 (21)	43 (32)	55 (40)	63 (46)	80 (59)	75 (55)	95 (70)
M12	40 (29.5)	50 (37)	75 (55)	95 (70)	110 (80)	140 (105)	130 (95)	165 (120)
M14	63 (46)	80 (59)	120 (88)	150 (110)	175 (130)	220 (165)	205 (150)	260 (190)
M16	100 (74)	125 (92)	190 (140)	240 (175)	275 (200)	350 (255)	320 (235)	400 (300)
M18	135 (100)	170 (125)	265 (195)	330 (245)	375 (275)	475 (350)	440 (325)	560 (410)
M20	190 (140)	245 (180)	375 (275)	475 (350)	530 (390)	675 (500)	625 (460)	790 (580)
M22	265 (195)	330 (245)	510 (375)	650 (480)	725 (535)	920 (680)	850 (625)	1080 (800)
M24	330 (245)	425 (315)	650 (480)	820 (600)	920 (680)	1150 (850)	1080 (800)	1350 (1000)
M27	490 (360)	625 (460)	950 (700)	1200 (885)	1350 (1000)	1700 (1250)	1580 (1160)	2000 (1475)
M30	660 (490)	850 (625)	1290 (950)	1630 (1200)	1850 (1350)	2300 (1700)	2140 (1580)	2700 (2000)
M33	900 (665)	1150 (850)	1750 (1300)	2200 (1625)	2500 (1850)	3150 (2325)	2900 (2150)	3700 (2730)
M36	1150 (850)	1450 (1075)	2250 (1650)	2850 (2100)	3200 (2350)	4050 (3000)	3750 (2770)	4750 (3500)

[a] *"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.*

[b] *"Dry" means plain or zinc plated without any lubrication.*

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Fasteners should be replaced with the same or higher property class. If higher property class fasteners are used, these should only be tightened to the strength of the original.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class.

Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

DX,TORQ2 –19–01OCT99–1/1

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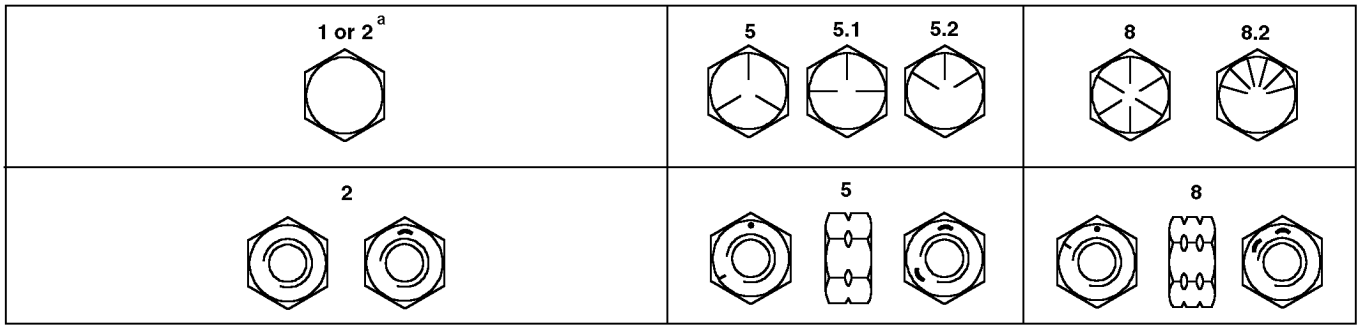
Unified Inch Bolt and Cap Screw Torque Values



TORQ1A –UN–27SEP99

Top, SAE Grade and Head Markings; Bottom, SAE Grade and Nut Markings

	Grade 1 (No Mark)		Grade 2[a] (No Mark)		Grade 5, 5.1 or 5.2		Grade 8 or 8.2	
Size	**Lubricated[b] N•m (lb-ft)**	**Dry[c] N•m (lb-ft)**	**Lubricated[b] N•m (lb-ft)**	**Dry[c] N•m (lb-ft)**	**Lubricated[b] N•m (lb-ft)**	**Dry[c] N•m (lb-ft)**	**Lubricated[b] N•m (lb-ft)**	**Dry[c] N•m (lb-ft)**
1/4	3.8 (2.8)	4.7 (3.5)	6 (4.4)	7.5 (5.5)	9.5 (7)	12 (9)	13.5 (10)	17 (12.5)
5/16	7.7 (5.7)	9.8 (7.2)	12 (9)	15.5 (11.5)	19.5 (14.5)	25 (18.5)	28 (20.5)	35 (26)
3/8	13.5 (10)	17.5 (13)	22 (16)	27.5 (20)	35 (26)	44 (32.5)	49 (36)	63 (46)
7/16	22 (16)	28 (20.5)	35 (26)	44 (32.5)	56 (41)	70 (52)	80 (59)	100 (74)
1/2	34 (25)	42 (31)	53 (39)	67 (49)	85 (63)	110 (80)	120 (88)	155 (115)
9/16	48 (35.5)	60 (45)	76 (56)	95 (70)	125 (92)	155 (115)	175 (130)	220 (165)
5/8	67 (49)	85 (63)	105 (77)	135 (100)	170 (125)	215 (160)	240 (175)	305 (225)
3/4	120 (88)	150 (110)	190 (140)	240 (175)	300 (220)	380 (280)	425 (315)	540 (400)
7/8	190 (140)	240 (175)	190 (140)	240 (175)	490 (360)	615 (455)	690 (510)	870 (640)
1	285 (210)	360 (265)	285 (210)	360 (265)	730 (540)	920 (680)	1030 (760)	1300 (960)
1-1/8	400 (300)	510 (375)	400 (300)	510 (375)	910 (670)	1150 (850)	1450 (1075)	1850 (1350)
1-1/4	570 (420)	725 (535)	570 (420)	725 (535)	1280 (945)	1630 (1200)	2050 (1500)	2600 (1920)
1-3/8	750 (550)	950 (700)	750 (550)	950 (700)	1700 (1250)	2140 (1580)	2700 (2000)	3400 (2500)
1-1/2	990 (730)	1250 (930)	990 (730)	1250 (930)	2250 (1650)	2850 (2100)	3600 (2650)	4550 (3350)

[a] Grade 2 applies for hex cap screws (not hex bolts) up to 6 in. (152 mm) long. Grade 1 applies for hex cap screws over 6 in. (152 mm) long, and for all other types of bolts and screws of any length.

[b] "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings.

[c] "Dry" means plain or zinc plated without any lubrication.

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

DX,TORQ1 –19–01OCT99–1/1

Abbreviations

NOTE: Abbreviations are used in place of some words.

- CTM—Component Technical Manual
- ID—Inside Diameter
- OD—Outside Diameter
- SCV—Selective Control Valve
- MFWD—Mechanical Front-Wheel Drive
- PTO—Power Take-Off
- SMV—Slow Moving Vehicle
- CS—CollarShift
- POW REV—PowrReverser™
- SS—SyncShuttle™

AG,OUO1085,13 –19–31JUL00–1/1

Diesel Fuel Specifications

Use either Grade No. 1-D or Grade No. 2-D fuel as defined by ASTM Designation D975 for diesel fuels. Find expected air temperature at time of start on thermometer scale in chart. Correct diesel fuel grade is shown to the right of scale.

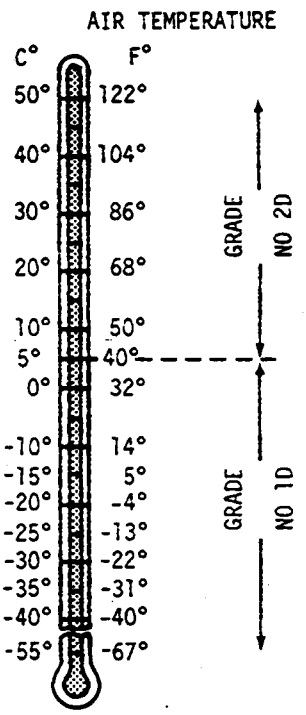
NOTE: At altitudes above 1500 m (5000 ft) use grade 1-D for all temperatures.

Fuel sulphur content should be less than 1.0 percent, preferably less than 0.5 percent. Diesel fuel having sulphur content higher than 1.0 percent may cause increase wear on metal engine parts because of acids produced by sulphur during combustion.

IMPORTANT: If fuel sulphur content exceeds 0.7 percent, the engine oil drain interval must be reduced by 50 percent to 125 hours.

Cetane number should be no less than 40 to assure satisfactory starting and overall performance.

Cloud point should be at least -12°C (10°F) below lowest expected air temperature at time of starting. Wax can separate from fuel when temperature decreases to cloud point and may plug filter.



AG,OUO1085,14 –19–31JUL00–1/1

Storing Fuel

If there is a very slow turnover of fuel in the fuel tank or supply tank, it may be necessary to add a fuel conditioner to prevent water condensation. Contact your John Deere dealer for proper service or maintenance recommendations.

DX,FUEL –19–03MAR93–1/1

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Do Not Use Galvanized Containers

IMPORTANT: Diesel fuel stored in galvanized containers reacts with zinc coating on the container to form zinc flakes. If fuel contains water, a zinc gel will also form. The gel and flakes will quickly plug fuel filters and damage fuel injectors and fuel pumps.

DO NOT USE a galvanized container to store diesel fuel.

Store fuel in:

- plastic containers.
- aluminum containers.
- specially coated steel containers made for diesel fuel.

DO NOT USE brass-coated containers: brass is an alloy of copper and zinc.

M21,FLQ,B1 –19–02AUG85–1/1

Fill Fuel Tank

CAUTION: Handle fuel carefully. Do not refuel the machine while smoking or when near open flame or sparks.

Always stop engine before refueling machine.

Fill fuel tank at end of each day's operation. Fill fuel tank only to bottom of filler neck.

Specification	
5210, 5310 and 5410 Fuel Tank—Capacity	68 L (18.0 U.S. gal)
5510 and All Tractors with Cab Fuel Tank—Capacity	83 L (22.0 U.S. gal)

IMPORTANT: The fuel tank uses a sealed filler cap. If a new filler cap is required, always replace it with a sealed cap.

TS202 –UN–23AUG88

LV095 –UN–21NOV91

OUO1043,0000E90 –19–24JUN02–1/1

Diesel Engine Oil

Use oil viscosity based on the expected air temperature range during the period between oil changes.

The following oil is preferred:

- John Deere PLUS-50®

The following oil is also recommended:

- John Deere TORQ-GARD SUPREME®

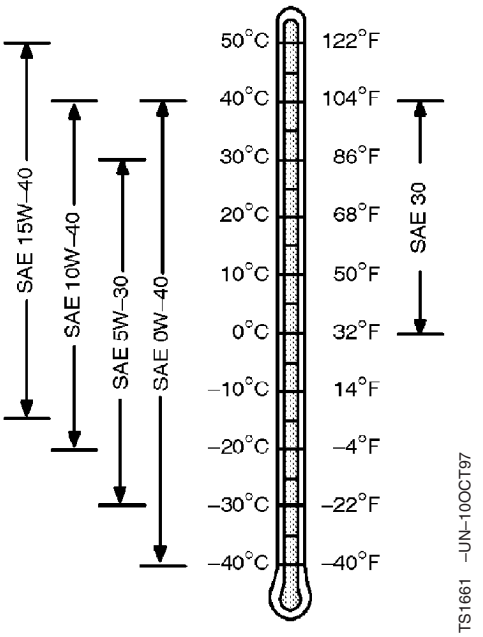
Other oils may be used if they meet one or more of the following:

- API Service Classification CH-4
- API Service Classification CG-4
- API Service Classification CF-4
- ACEA Specification E3
- ACEA Specification E2

Multi-viscosity diesel engine oils are preferred.

If diesel fuel with sulfur content greater than 0.5% is used, reduce the service interval by 50%.

Extended service intervals may apply when John Deere preferred engine oils are used. Consult your John Deere dealer for more information.



PLUS-50 is a registered trademark of Deere & Company.
TORQ-GARD SUPREME is a registered trademark of Deere & Company

DX,ENOIL –19–24JAN00–1/1

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Diesel Engine Coolant

The engine cooling system is filled to provide year-round protection against corrosion and cylinder liner pitting, and winter freeze protection to -37°C (-34°F).

John Deere COOL-GARD

The following engine coolant is preferred for service:

- John Deere COOL-GARD Prediluted Coolant

The following engine coolant is also recommended:

- John Deere COOL-GARD Coolant Concentrate in a 40 to 60% mixture of concentrate with quality water.

John Deere COOL-GARD coolants do not require use of supplemental coolant additives, except for periodic replenishment of additives during the drain interval.

Ethylene glycol base coolants

Other fully formulated low silicate ethylene or propylene glycol base coolants for heavy-duty engines may be used if they meet one of the following specifications:

- ASTM D6210 prediluted coolant
- ASTM D6210 coolant concentrate in a 40 to 60% mixture of concentrate with quality water

Coolants meeting ASTM D6210 do not require use of supplemental coolant additives, except for periodic replenishment of additives during the drain interval.

Other low silicate ethylene glycol base coolants for heavy-duty engines may also be used if they meet one of the following specifications:

- ASTM D5345 prediluted coolant
- ASTM D4985 coolant concentrate in a 40 to 60% mixture of concentrate with quality water

Coolants meeting ASTM D5345 or ASTM D4985 require an initial charge of supplemental coolant additives, formulated for protection of heavy duty diesel engines against corrosion and cylinder liner erosion and pitting. They also require periodic replenishment of additives during the drain interval.

Propylene glycol base coolants

Fully formulated low silicate propylene glycol base coolants for heavy-duty engines may be used if they meet one of the following specifications:

- ASTM D6211 prediluted coolant
- ASTM D6211 coolant concentrate in a 40 to 60% mixture of concentrate with quality water

Coolants meeting ASTM D6211 do not require use of supplemental coolant additives, except for periodic replenishment during the drain interval.

Freeze protection

A 50% mixture of ethylene glycol engine coolant in water provides freeze protection to -37°C (-34°F).

A 50% mixture of propylene glycol engine coolant in water provides freeze protection to -33°C (-27°F).

If protection at lower temperatures is required, consult your John Deere dealer for recommendations.

Water quality

Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

IMPORTANT: Do not use cooling system sealing additives or antifreeze that contains sealing additives.

IMPORTANT: Do not mix ethylene glycol and propylene glycol base coolants.

DX,COOL3 –19–18OCT01–1/1

Liquid Coolant Conditioner

John Deere Liquid Coolant Conditioner is recommended for wet-sleeve diesel engines not having a coolant filter option. Other conditioners may be used if it contains non-chromate inhibitors.

IMPORTANT: If engine is equipped with a John Deere Coolant Filter Conditioner, the correct inhibitors are contained in the filter. If both are used, a gel-type deposit is created which could inhibit heat transfer and block coolant flow. John Deere Liquid Coolant Conditioner does not protect against freezing.

Various sizes of coolant conditioners are available from your John Deere dealer.

RG4690 –UN–14DEC88

DX,COOL1 –19–04JUN90–1/1

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Transmission and Hydraulic Oil

Use oil viscosity based on the expected air temperature range during the period between oil changes.

The following oils are preferred:

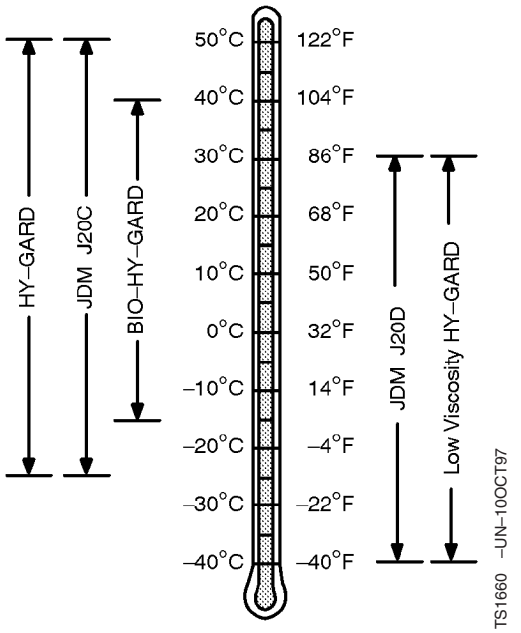
- John Deere HY-GARDHY-GARD®
- John Deere Low Viscosity HY-GARDHY-GARD®

Other oils may be used if they meet one of the following:

- John Deere Standard JDM J20C
- John Deere Standard JDM J20D

Use the following oil when a biodegradable fluid is required:

- John Deere BIO-HY-GARD™[1]



HY-GARD is a registered trademark of Deere & Company.
BIO-HY-GARD is a trademark of Deere & Company.

[1]BIO-HY-GARD meets or exceeds the minimum biodegradability of 80% within 21 days according to CEC-L-33-T-82 test method. BIO-HY-GARD should not be mixed with mineral oils because this reduces the biodegradability and makes proper oil recycling impossible.

DX,ANTI –19–10OCT97–1/1

MFWD Gear Oil

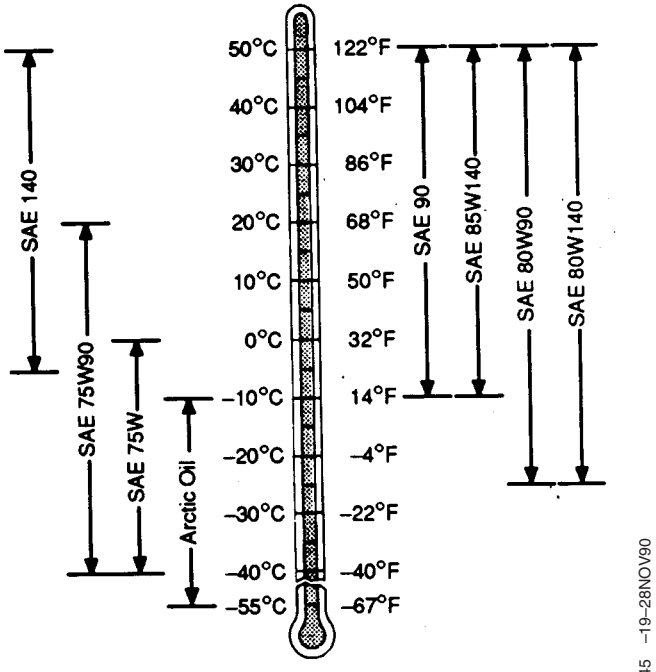
Use oil viscosity based on the expected air temperature range during the period between oil changes.

John Deere GL-5 Gear Lubricant is recommended.

Other oils may be used if they meet one or more of the following:

- API Service Classification GL-5
- Military Specification MIL-L-2105D
- Military Specification MIL-L-2105C
- Military Specification MIL-L-2105B

Oils meeting Military Specification MIL-L-10324A may be used as arctic oils.



LV,1020HA,A3 –19–19JAN95–1/1

Grease (Specific Application)

Lithium Grease with Molybdenum Disulphide is recommended for use on internal components of transmission.

TY6333 or TY6347 John Deere Moly High Temperature EP Grease is recommended for use on the traction clutch and PTO clutch splines.

LV,1020HA,A4 –19–27JUN94–1/1

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Grease

Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

The following greases are preferred:

- John Deere SD POLYUREA GREASE

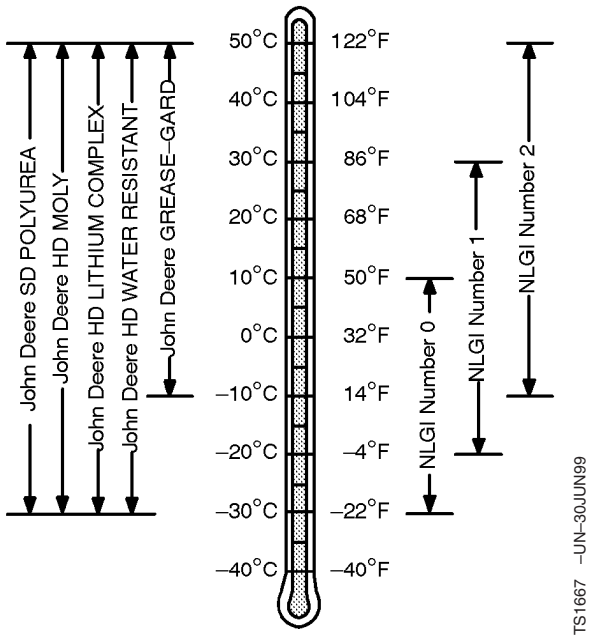
The following greases are also recommended:

- John Deere HD MOLY GREASE
- John Deere HD LITHIUM COMPLEX GREASE
- John Deere HD WATER RESISTANT GREASE
- John Deere GREASE-GARD

Other greases may be used if they meet the following:

- NLGI Performance Classification GC-LB

IMPORTANT: Some types of grease thickener are not compatible with others. Consult your grease supplier before mixing different types of grease.



DX,GREA1 –19–24JAN00–1/1

Alternative and Synthetic Lubricants

Conditions in certain geographical areas may require lubricant recommendations different from those printed in this manual.

Some John Deere brand coolants and lubricants may not be available in your location.

Consult your John Deere dealer to obtain information and recommendations.

Synthetic lubricants may be used if they meet the performance requirements as shown in this manual.

The temperature limits and service intervals shown in this manual apply to both conventional and synthetic oils.

Re-refined base stock products may be used if the finished lubricant meets the performance requirements.

DX,ALTER –19–15JUN00–1/1

Lubricant Storage

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Whenever possible, store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

DX,LUBST –19–18MAR96–1/1

Serial Numbers

When working on machines or components that are covered by warranty, it is IMPORTANT that you include the machine's Product Identification Number and the component serial number on the warranty claim form.

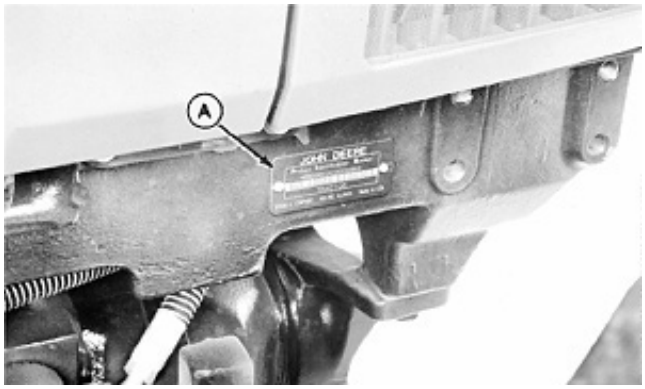
The location of component serial number plates are shown below.

MX,1025FT,A4 –19–15JAN91–1/1

Product Identification Number Location

The machine's product identification number plate (A) is located on the right-hand side of the front support.

A—Product Identification Number Plate



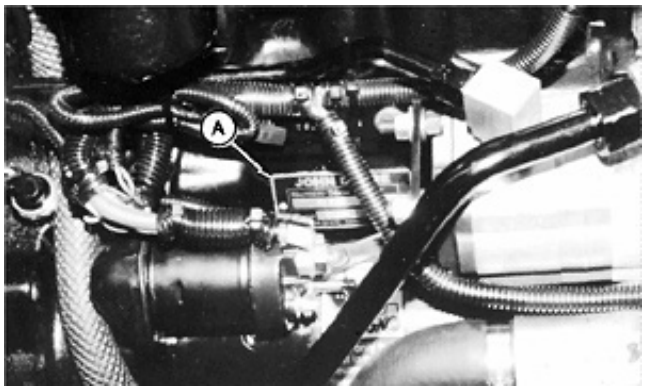
LV093 –UN–21NOV91

AG,OUO1085,16 –19–31JUL00–1/1

Engine Serial Number Location

The engine serial number plate (A) is located on the right-hand side of the engine block, between the starter and the hydraulic pump.

A—Engine Serial Number Plate



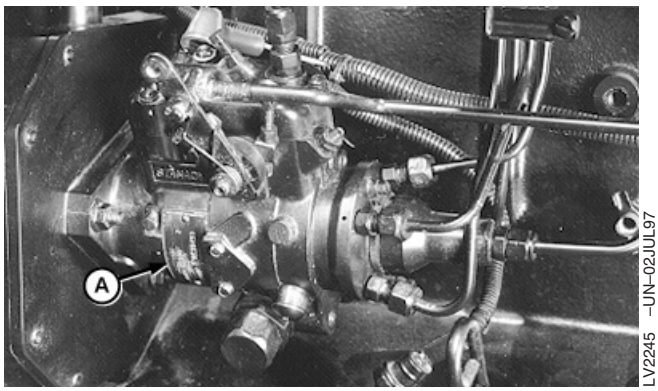
LV094 –UN–21NOV91

OUO1043,0000E91 –19–24JUN02–1/1

Fuel Injection Pump Serial Number Location

The fuel injection pump serial number plate (A) is located on the side of the pump.

A—Fuel Injection Serial Number Plate



LV2245 –UN–02JUL97

AG,OUO1085,18 –19–31JUL00–1/1

Alternator Serial Number Location

The alternator serial number plate (A) is located on the side of the housing.

A—Alternator Serial Number Plate

LV097 –UN–21NOV91

AG,OUO1085,19 –19–31JUL00–1/1

Power Steering Valve Serial Number Location

The power steering valve serial number plate (A) is located on the bottom of the valve.

A—Power Steering Valve Serial Number Plate

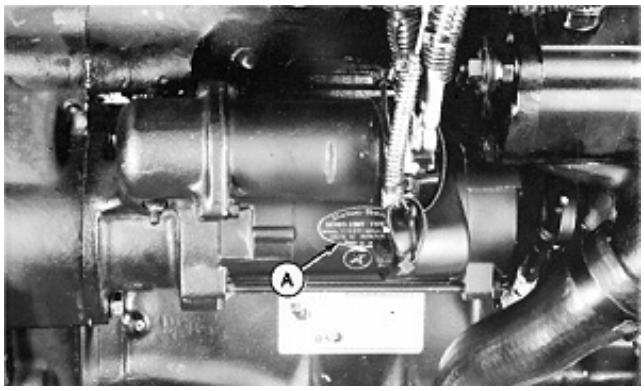
LV098 –UN–21NOV91

AG,OUO1032,2849 –19–18JAN00–1/1

Starter Serial Number Location

The starter serial number plate (A) is located on the side of the starter housing.

A—Starter Serial Number Location



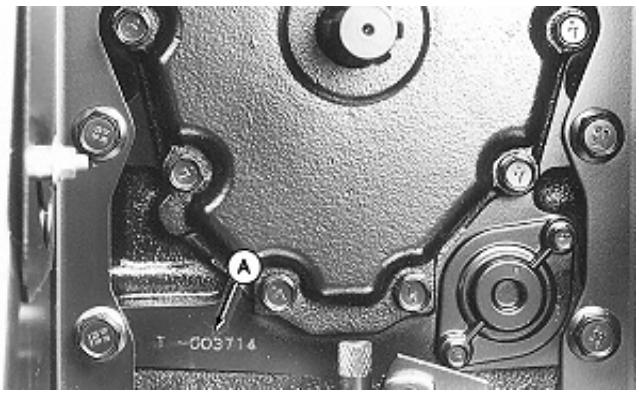
LV472 –UN–25FEB92

OUO1043,0000E92 –19–24JUN02–1/1

Transmission Serial Number Location

The transmission (drive train) serial number (A) is located at the rear of the machine on the bottom left-hand corner of the differential housing.

A—Transmission Serial Number



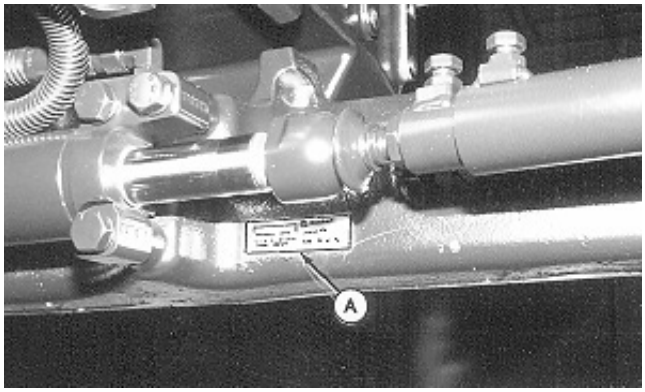
LV629 –UN–17JUN94

AG,OUO1085,21 –19–31JUL00–1/1

Front Axle (2WD) Serial Number Location

The 2WD front axle serial number plate (A) is located on the rear right-hand side of the axle.

A—Front Axle Serial Number Plate

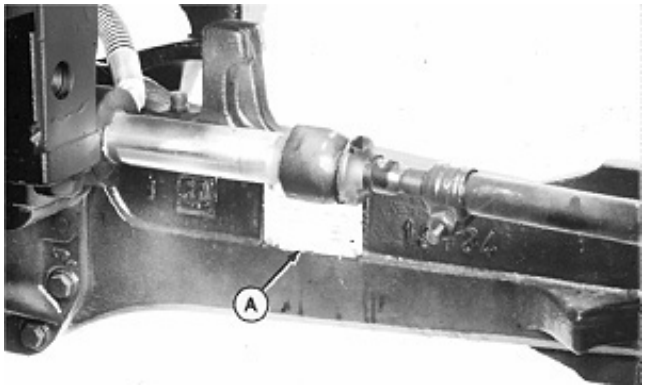


AG,OUO1085,22 –19–31JUL00–1/1

Mechanical Front Wheel Drive (MFWD) Serial Number Location

The MFWD serial number plate (A) is located on the rear side of the right-hand axle housing.

A—MFWD Serial Number Plate

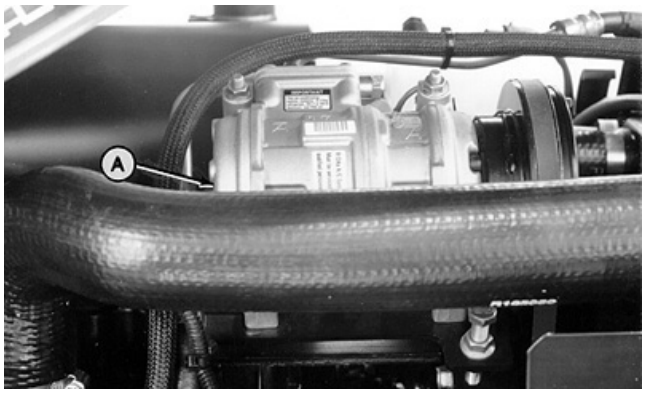


AG,OUO1085,23 –19–31JUL00–1/1

Air Conditioning Compressor Serial Number Location

The air conditioning compressor serial number plate (A) is located on the rear of the housing.

A—Air Conditioning Compressor Serial Number Plate



AG,OUO1085,24 –19–31JUL00–1/1

Features and Accessories

The information covered in this group pertains to the features of the machines covered in this Technical Manual. It can be used in addition to the normal advertising literature or may help in determining which specific feature requires service. A list of all the available accessories and kits is also included.

LV,1030HA,A2 –19–07MAY96–1/1

Standard Features—5210 and 5310

- John Deere 3000 Series Engine
  - 5210 CD3029DLV50 40 kw (53 hp)
  - 5310 CD3029TLV50 47 kw (63 hp)
  - 3-cylinder diesel engine
  - Wet sleeved
  - Direct injection
  - Intake air heater starting aid
  - Key switch controlled fuel shut-off
  - 5210 is naturally aspirated
  - 5310 is turbocharged
- CollarShift Transmission
  - Nine speeds forward, three reverse
  - Inboard planetary final drives
  - Differential lock
- Dual Clutch
  - Provides continuous live PTO
  - Stops tractor without disengaging PTO
- PTO
  - Rear, 540 rpm
  - 540/540E PTO available on SyncShuttle™ transmission only
  - Fully independent clutch
- Hydrostatic Power Steering
  - Power is supplied by a tandem gear hydraulic pump mounted to the engine
- Hydraulic Brakes
  - Wet disc
  - Individually hydraulic controlled
  - Self-adjusting
  - Self-equalizing
- Open-Center Hydraulic System
  - Tandem gear hydraulic pumps
  - Pumps are driven directly off engine timing gears

The rear pump supplies oil to the power steering, provides brake valve make-up oil and lubricates top shaft of the transmission.

The front pump supplies oil to the rockshaft and the selective control valves, if equipped.

LV1886

Model 5210

LV1886 –UN–01JUL97

LV1887

Model 5310

LV1887 –UN–01JUL97

AG,OUO1085,25 –19–31JUL00–1/1

Standard Features—5410 and 5510

- John Deere 4000 Series Engine
  - 5410 CD4045DLV50 56 kw (75 hp)
  - 5510 CD4045TLV50 63 kw (85 hp)
  - 4-cylinder diesel engine
  - Wet sleeved
  - Direct injection
  - Intake air heater starting aid
  - Key switch controlled fuel shut-off
  - 5410 is naturally aspirated
  - 5510 is turbocharged
- CollarShift Transmission
  - Nine speeds forward, three reverse
  - Inboard planetary final drives
  - Differential lock
- Dual Clutch
  - Provides continuous live PTO
  - Stops tractor without disengaging PTO
- PTO
  - Rear, 540 rpm
  - 540/540E PTO available on SyncShuttle™ transmission only
  - Fully independent clutch
- Hydrostatic Power Steering
  - Power is supplied by a tandem gear hydraulic pump mounted to the engine
- Tilt Steering Wheel
- Hydraulic Brakes
  - Wet disc
  - Individually hydraulic controlled
  - Self-adjusting
  - Self-equalizing
- Open-Center Hydraulic System
  - Tandem gear hydraulic pumps
  - Pumps are driven directly off engine timing gears

The rear pump supplies oil to the power steering, provides brake valve make-up oil and lubricates top shaft of the transmission.

The front pump supplies oil to the rockshaft and the selective control valves, if equipped.

LV1888 –UN–01JUL97

LV1888

Model 5410

LV1890 –UN–01JUL97

LV1890

Model 5510

LV1891 –UN–09JUN97

Tilt Steering Wheel

AG,OUO1085,26 –19–31JUL00–1/1

10
30
4

Standard Features—5210 through 5510

- Standard Adjustable Front Axle
- Hitch
  - – Category II, convertible to category I
  - – Position and draft control levers
- PTO Warning System
  - – Warning horn sounds for 8—10 seconds when operator leaves seat with PTO engaged. Engine and PTO continue to run.
- Two-Post Foldable ROPS with Seat Belt
  - – Protects operator in the event of a tip-over

LV1892 –UN–09JUN97

Adjustable Front Axle

LV1893 –UN–09JUN97

Foldable ROPS

AG,OUO1085,27 –19–31JUL00–1/1

Factory Installed Optional Equipment (5210—5510)

- Mechanical Front Wheel Drive (MFWD) Axle
  - – Center line design
  - – Limited slip differential
  - – High pivot point for better ground clearance and axle oscillation
- SyncShuttle™ Transmision
  - – Nine speeds forward, three reverse
  - – Synchronized forward to reverse shift
- PowrReverser™ Transmission
  - – 12 speeds forward, 12 reverse
  - – Hydraulic forward to reverse shift
- Telescopic Draft Links
- Dual Selective Control Valve (SCV)
  - – One lever “joystick” control
  - – Float and regenerative spool values
- Weather Enclosure (Cab)
  - – Left-hand exterior mirror
  - – Sun visor
  - – Cup holder
- Rear Work Light
- Cold Weather Package
  - – 900 CCA Battery
  - – Engine Coolant Heater
  - – Heavy-Duty Intake Heater

LV1894 –UN–09JUN97

Mechanical Front Wheel Drive

LV1895 –UN–01JUL97

MFWD Front Fender

LV2219 –UN–08AUG97

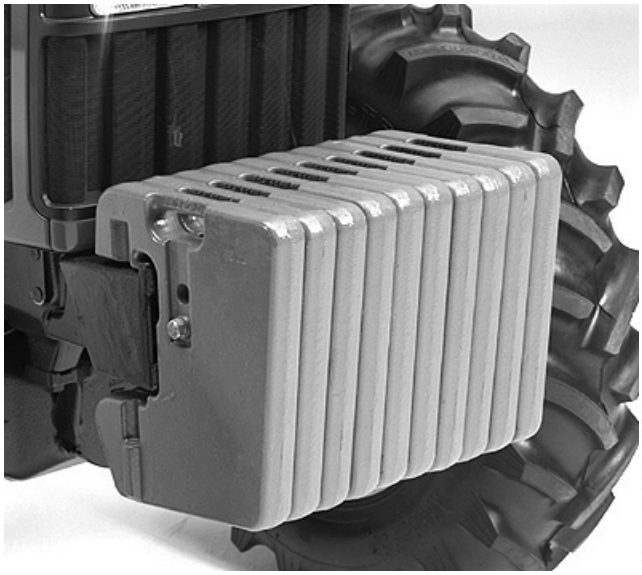
Cab Tractor

AG,OUO1085,28 –19–31JUL00–1/1

10
30
6

Field Installed Optional Kits and Accessories—5210 Through 5510

- Dual selective control valve (SCV)
  - – One lever “joystick” control
  - – Float and regenerative spool values
- Single (third) selective control valve
  - – Single lever operation
- Creeper gear kit
- Front drive shaft coupler
- Horizontal rear exhaust extension
- Seat arm rests
- Single horn
- 7-pin electrical outlet socket
- Soft weather enclosure
- Front weight bracket and weights
- FOPS canopy
- Deluxe canopy
- Narrow front axle kit (2WD only)
- Interchangeable, category 2-to-category 1 hitch balls
- Work lights for tractors without fender mounted lights
- Larger tool box
- Available for factory installed cab
  - – Right-hand exterior mirror
  - – Rear wiper and windshield washer
  - – Sun visor
  - – AM and FM radio with speakers and antenna
- Cold Weather Package
  - – 900 CCA Battery
  - – Engine Coolant Heater
  - – Heavy-Duty Intake Heater



LV1896 –UN–09JUN97

Front Weight Bracket and Weights

LV1897 –UN–01JUL97

LV1897

Deluxe Canopy

AG,OUO1085,29 –19–02AUG00–1/1

Section 20
Engine Repair

Contents

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

OUO1089,0000244 –19–25JUN02–1/3

Lifting Bracket JDG19

Used to remove and install engine.

OUO1089,0000244 –19–25JUN02–2/3

Lifting Bracket JT01748

Used to remove and install engine.

OUO1089,0000244 –19–25JUN02–3/3

Specifications

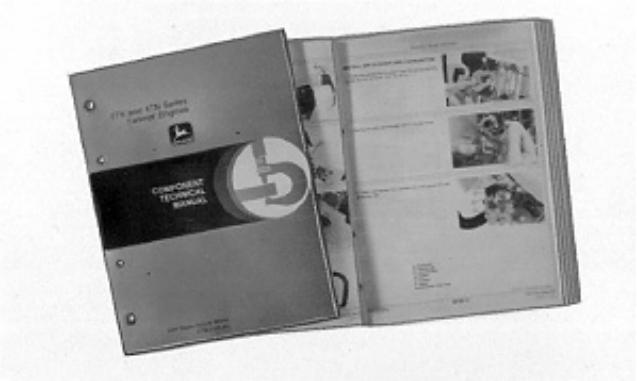
Item	Measurement	Specification
3-Cylinder Engine (Tractors without Cab)		
Engine-to-Clutch Housing Cap Screws	Torque	300 N•m (225 lb-ft)
Engine-to-Clutch Housing Nuts	Torque	300 N•m (225 lb-ft)
4-Cylinder Engine (Tractors without Cab)		
Engine-to-Clutch Housing Cap Screws	Torque	350 N•m (255 lb-ft)
Engine-to-Clutch Housing Nuts	Torque	350 N•m (255 lb-ft)
3- and 4-Cylinder Engines (Tractors with Cab)		
Engine-to-Clutch Housing Cap Screws	Torque	318 N•m (235 lb-ft)
Engine-to-Clutch Housing Nuts	Torque	318 N•m (235 lb-ft)
Front End Support-to-Engine Upper Cap Screws and Nuts	Torque	305 N•m (225 lb-ft)
Front End Support-to-Engine Lower Cap Screws	Torque	176 N•m (130 lb-ft)

OUO1089,0000247 –19–25JUN02–1/1

John Deere Engine Repair—Use CTM104 or CTM125

For complete repair information the component technical manual (CTM) is also required. Use the component technical manual in conjunction with this machine manual.

- 3-cylinder 2.9 L engines—Use CTM125
- 4-cylinder 4.5 L engines—Use CTM104



TS225 –UN–17JAN89

AG,OUO1085,30 –19–02AUG00–1/1

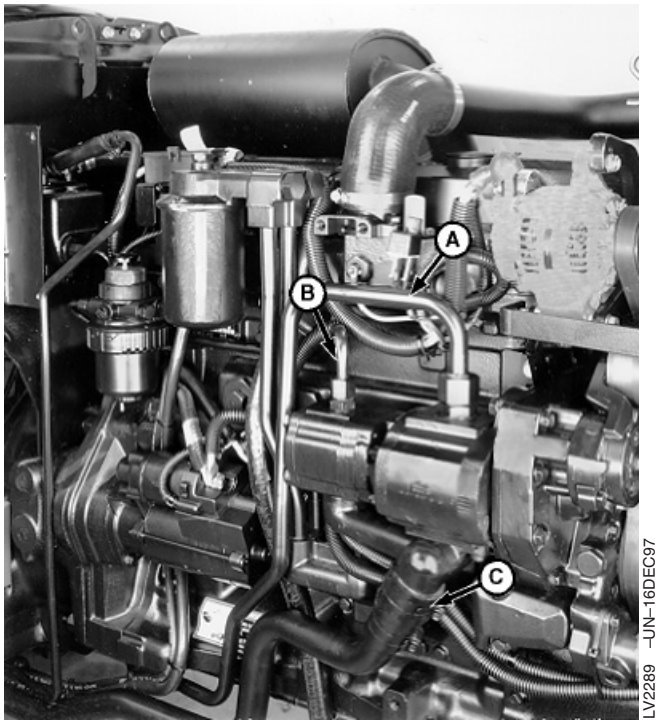
Remove Engine—Tractors without Cab

1. Remove hood from tractor.
2. Remove radiator. (See Remove and Inspect Radiator in Group 10.)
3. Remove battery. (See Remove and Install Battery—Tractors Without Cab in Section 40, Group 05.)
4. Remove fuel filter/primer pump. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05.)
5. Remove MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Section 50, Group 35.)

NOTE: Close all openings using caps and plugs.

Support suction line (C). Transmission/hydraulic oil will spill out of hose if line drops below transmission/reservoir oil level.

6. Disconnect hydraulic lines (A, B, and C) from pump.
7. Loosen hydraulic lines retaining clamp under right-side floor and step plate and move lines away from engine.



LV2289 –UN–16DEC97

A—Hydraulic Pump-to-Inlet Housing Line
B—Hydraulic Pump-to-Steering Valve Line
C—Suction Line

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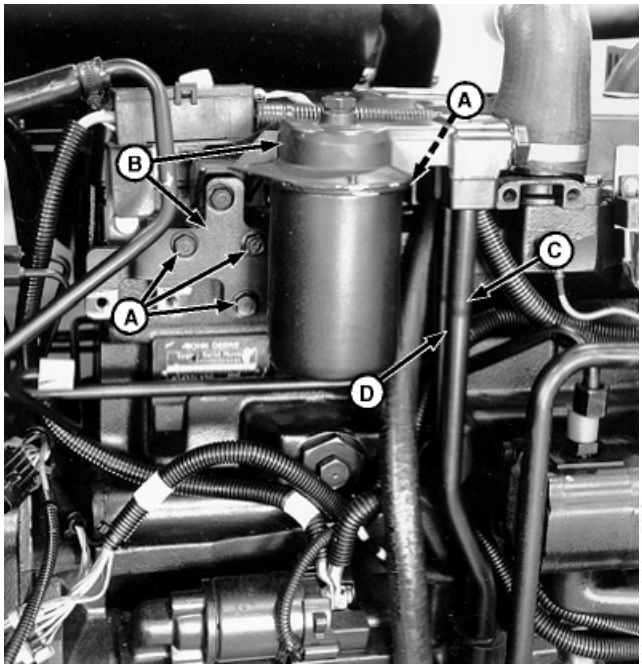
8. Tractors equipped with 4-cylinder engines, remove four cap screws (A).

9. Remove oil filter and bracket (B).

10. Remove oil tubes (C and D) from engine oil cooler manifold.

A—Cap Screw (4 used)
B—Oil Filter and Bracket
C—Oil Tube
D—Oil Tube



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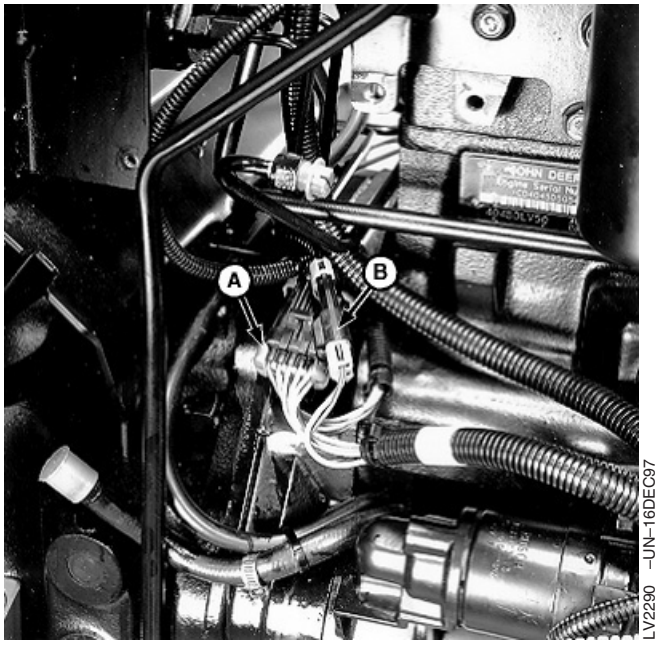
NOTE: Cut all tie straps as necessary.

11. Disconnect two main harness wiring connectors (A and B).

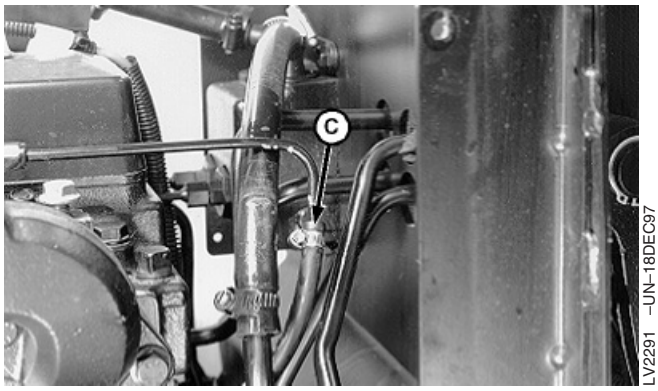
12. Disconnect fuel return hose (C).

13. Disconnect red wire lead #002C from right-side post (D) of fuse link junction block.

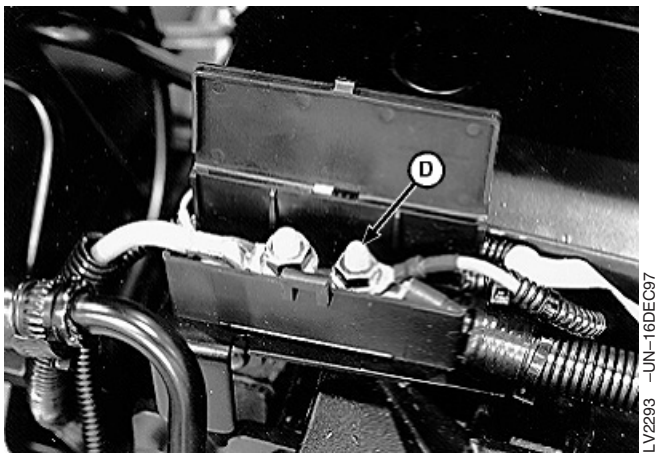
A—Wiring Connector
B—Wiring Connector
C—Fuel Return Line
D—Right-Side Post (At Fuse Link Junction Block)



LV2290 –UN–16DEC97



LV2291 –UN–18DEC97



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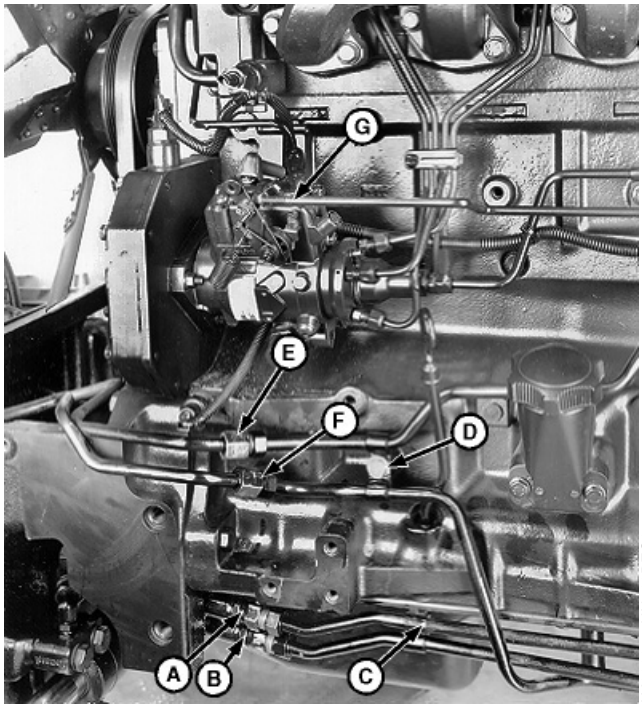
14. Disconnect hydraulic steering lines (A and B).
15. Remove clamps (C and D).
16. Disconnect hydraulic oil cooler lines (E and F).
17. Remove throttle control rod (G).

A—Hydraulic Steering Line
B—Hydraulic Steering Line
C—Clamp
D—Clamp
E—Hydraulic Oil Cooler Line
F—Hydraulic Oil Cooler Line
G—Throttle Control Rod



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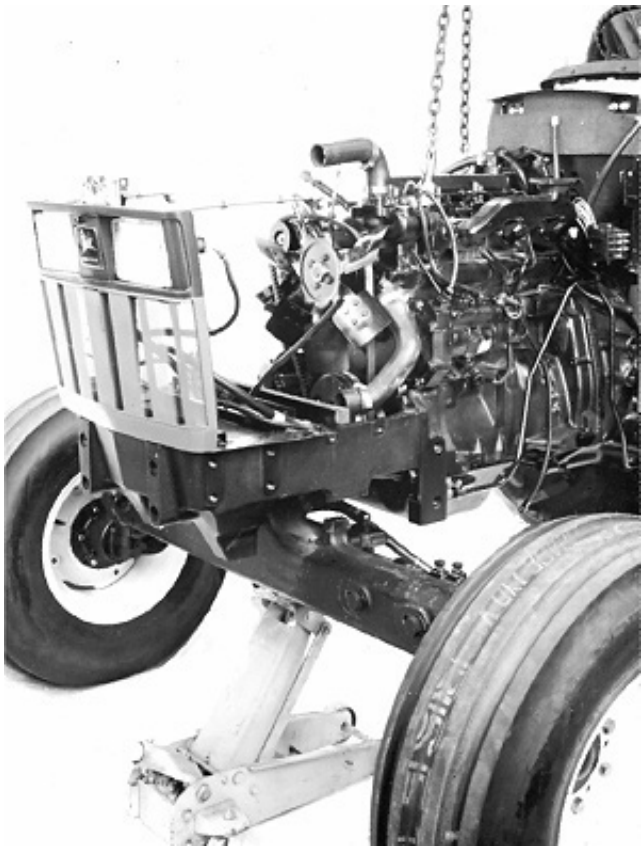
CAUTION: Front weights and bracket must be removed from tractor before removing any frame-to-engine mounting hardware.

18. Remove front weights and bracket, if equipped.
19. Install lifting brackets such as JDG19 or JT01748 Lifting Brackets.
20. Install a support stand under clutch housing.
21. Attach a hoist to engine.
22. Install a floor jack under front axle.
23. Install a wood block between front axle and frame on both sides.


LV213 –UN–25FEB92

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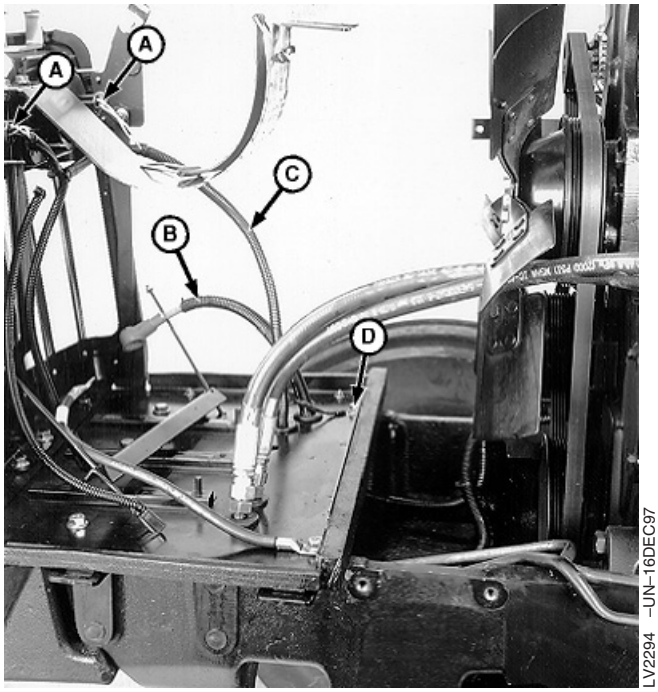
AG,OUO1085,31 –19–25JUN02–5/8

24. Pull battery cable (B) through grommet.
25. Disconnect ground cable (D).
26. Disconnect wiring connectors (A) at headlights.
27. Pull wiring harness (C) through grommet.

A—Headlight Wiring Connectors
B—Positive (+) Battery Cable
C—Wiring Harness
D—Ground Cable



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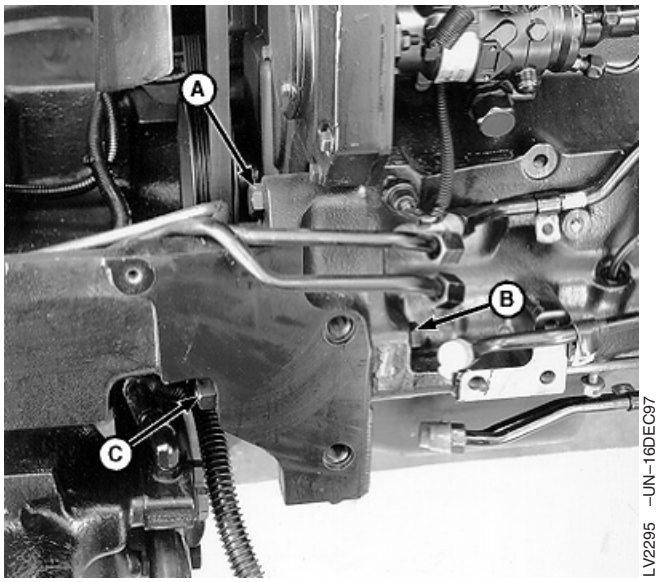
AG,OUO1085,31 –19–25JUN02–6/8

28. Remove front end support-to-engine cap screws (A and B) and nut (C) from each side of frame.
29. Roll front end away from tractor.

A—Cap Screw
B—Cap Screw
C—Nut



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30. Remove engine-to-clutch housing cap screws (A) and nuts and washers (B).

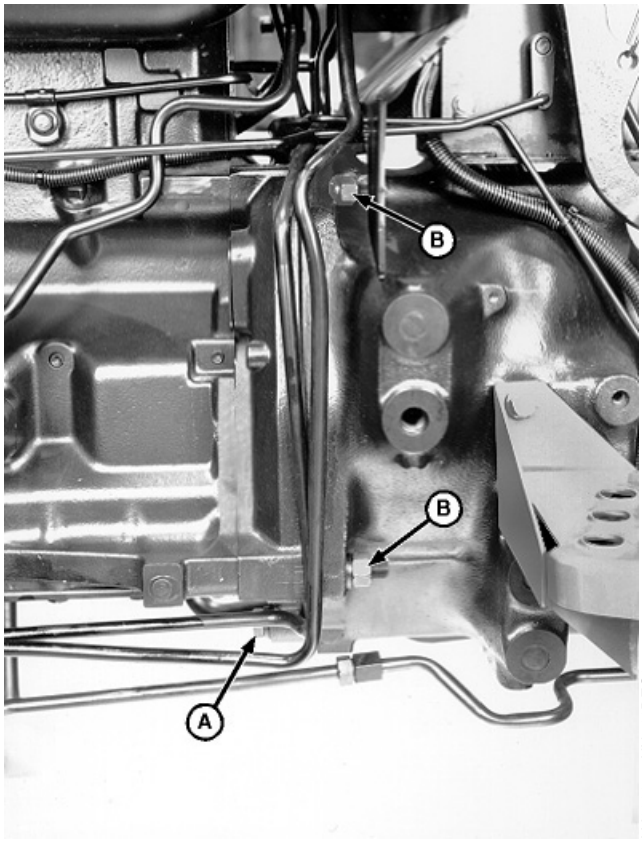
31. Remove engine.

20
05
8

32. Remove clutch. (See Remove and Install Clutch Assembly in Section 50, Group 10 for CollarShift/SyncShuttle™ Transmission or Remove and Install Clutch Assembly in Section 50, Group 11 for PowrReverser™ Transmission.)

33. Make repairs as necessary. (See CTM104 or CTM125.)

A—Cap Screw
B—Nut and Washer



AG,OUO1085,31 –19–25JUN02–8/8

Install Engine—Tractors without Cab

1. Install clutch. (See Remove and Install Clutch Assembly in Section 50, Group 10 for CollarShift/SyncShuttle™ Transmission or Remove and Install Clutch Assembly in Section 50, Group 11 for PowrReverser™ Transmission.)

NOTE: Turning PTO shaft at rear of tractor during engine installation will aid in alignment of PTO clutch and shaft.

2. Put transmission shift levers in neutral to ease clutch shaft alignment with engine.

3. Apply multipurpose grease to end of PTO clutch shaft.

4. Install engine to clutch housing.

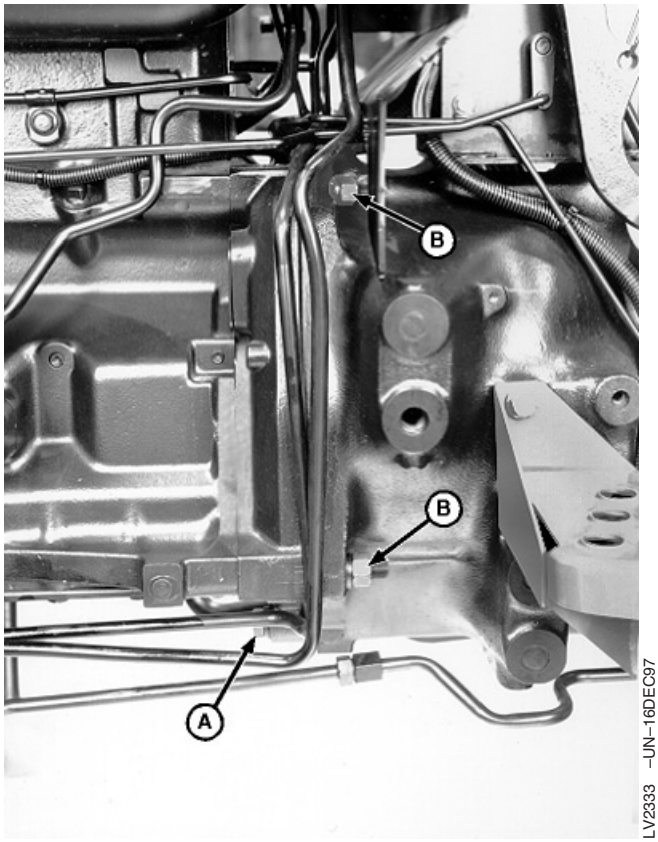
5. Install engine-to-clutch housing cap screws (A) and nuts and washers (B). Tighten to specifications below.

3-Cylinder Engine—Specification

Engine-to-Clutch Housing Cap Screws—Torque	300 N•m (225 lb-ft)
Engine-to-Clutch Housing Nuts—Torque	300 N•m (225 lb-ft)

4-Cylinder Engine—Specification

Engine-to-Clutch Housing Cap Screws—Torque	350 N•m (255 lb-ft)
Engine-to-Clutch Housing Nuts—Torque	350 N•m (255 lb-ft)



A—Cap Screw
B—Nut and Washer

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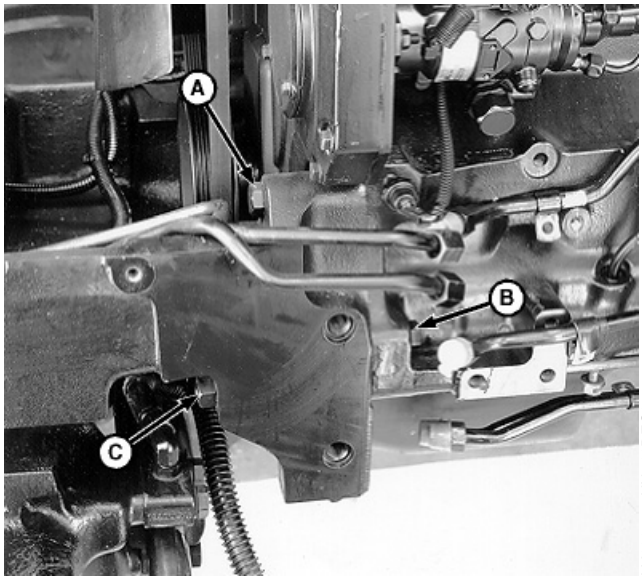
NOTE: Hollow dowels are installed in bores of cap screws (B).

6. Align studs in engine with front end. Install front end to tractor. Tighten front end support-to-engine cap screws (A and B) and nuts (C) to specifications.

Specification	
Front End Support-to-Engine Upper Cap Screws and Nuts—Torque	305 N•m (225 lb-ft)
Front End Support-to-Engine Lower Cap Screws—Torque	176 N•m (130 lb-ft)

A—Cap Screw
B—Cap Screw
C—Nut



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AG,OUO1085,32 –19–25JUN02–2/7

7. Pull wiring harness (C) and cable (B) through grommets.

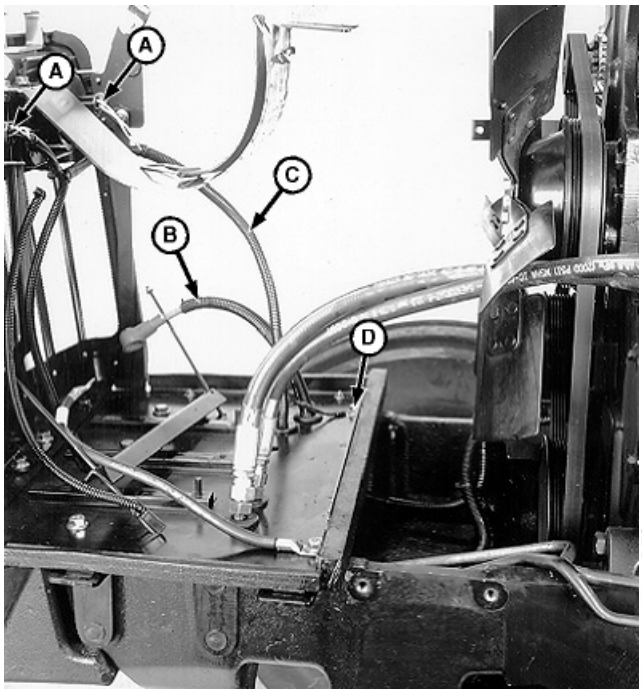
8. Connect wiring connectors (A).

9. Connect ground cable (D).

10. Remove wood blocks, floor jack, support stands, and lifting brackets.

11. Install muffler and exhaust pipe.

A—Headlight Wiring Connector
B—Positive (+) Battery Cable
C—Wiring Harness
D—Ground Cable



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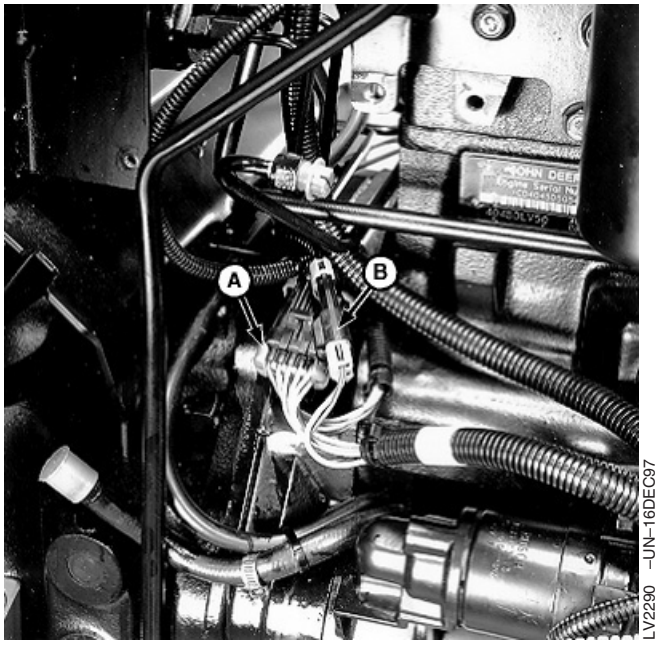
AG,OUO1085,32 –19–25JUN02–3/7

12. Connect wiring connectors (A and B).
13. Connect fuel return hose (C).
14. Connect red wire lead #002C on right-side post (D) of fuse link junction block.

A—Wiring Connector
B—Wiring Connector
C—Fuel Return Hose
D—Right-Side Post



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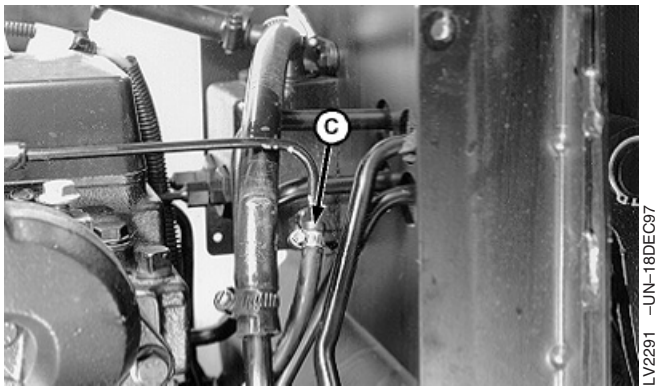

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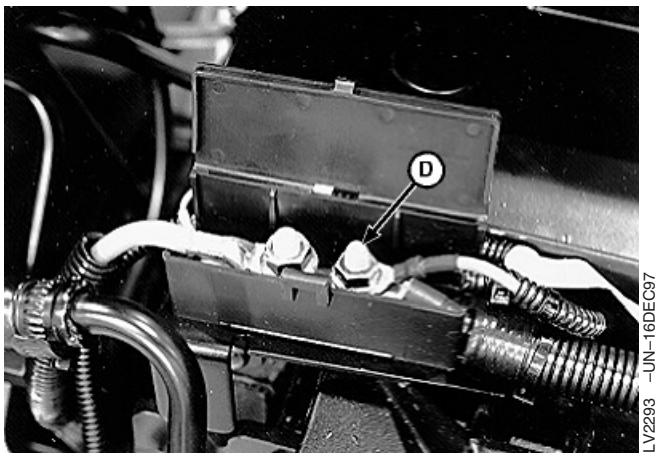

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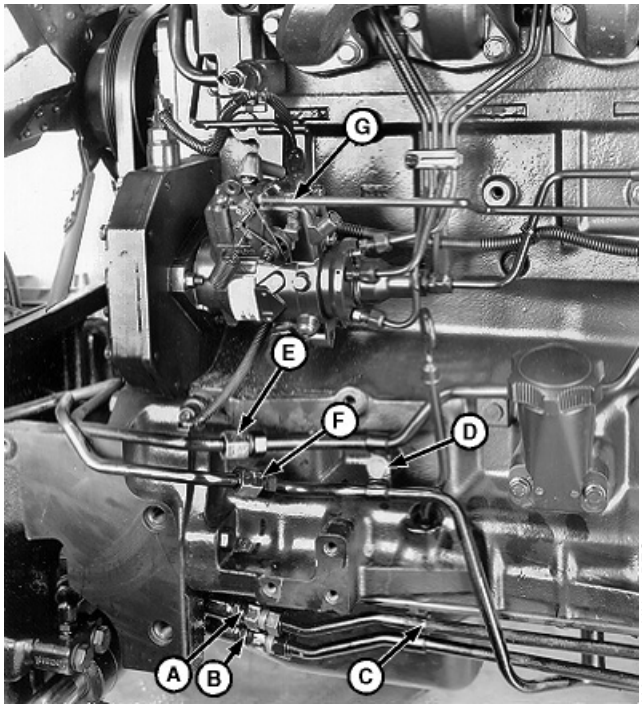
15. Connect hydraulic steering lines (A and B).
16. Connect oil cooler lines (E and F).
17. Install clamps (C and D).
18. Install throttle control rod (G).

A—Hydraulic Steering Line
B—Hydraulic Steering Line
C—Clamp
D—Clamp
E—Oil Cooler Line
F—Oil Cooler Line
G—Throttle Control Rod



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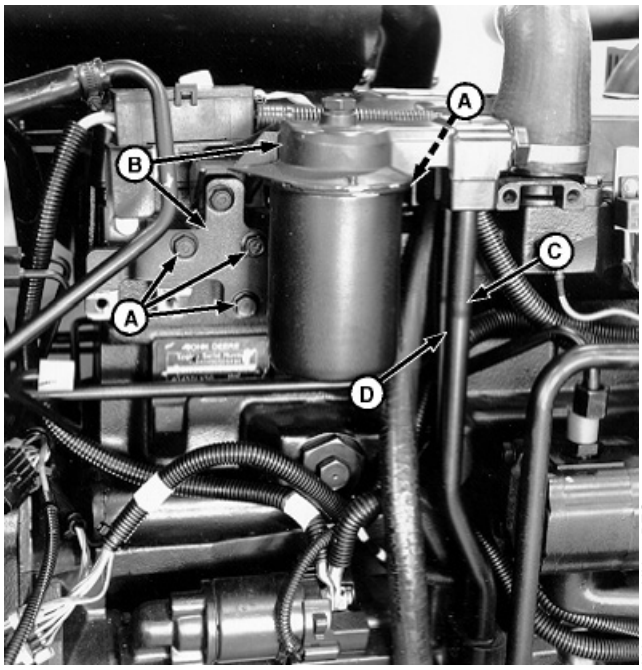
AG,OUO1085,32 –19–25JUN02–5/7

NOTE: Install high mount oil filter, if equipped.

19. Install oil tubes (C and D) into engine oil cooler manifold.
20. Install oil filter and bracket (B).
21. Install four cap screws (A).

A—Cap Screw (4 used)
B—Oil Filter and Bracket
C—Oil Tube
D—Oil Tube



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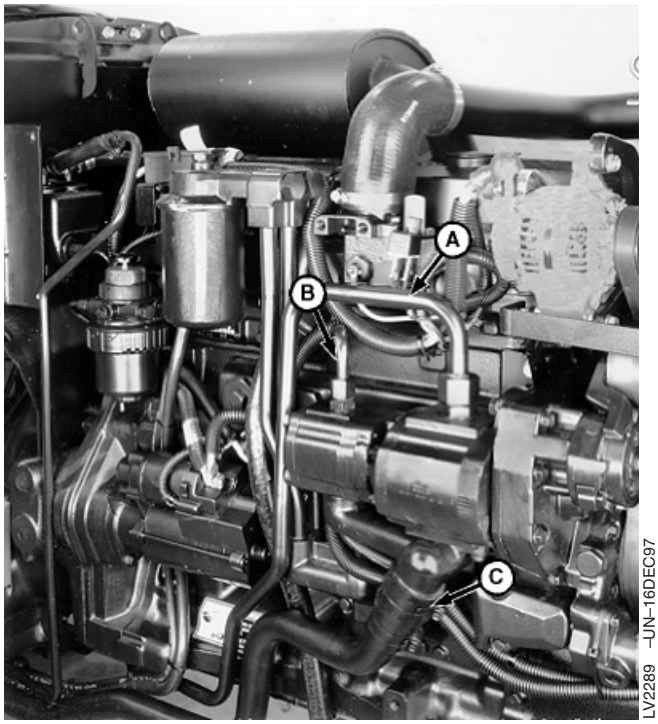
22. Install lines (A and B).
23. Connect suction line (C).
24. Install hydraulic line support clamp under right-side floor plate.
25. Install MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Section 50, Group 35.)
26. Install fuel filter/primer pump. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05).
27. Install battery. (See Remove and Install Battery—Tractors Without Cab in Section 40, Group 05.)
28. Install radiator. (See Install Radiator in Group 10.)
29. Adjust fast idle. (See Fast Idle Adjustment in Section 220, Group 15.)
30. Install hood.



A—Line
B—Line
C—Suction Line

AG,OUO1085,32 –19–25JUN02–7/7

Remove Engine—Tractors with Cab

NOTE: 4-cylinder cab tractor shown, 3-cylinder cab tractors are similar.

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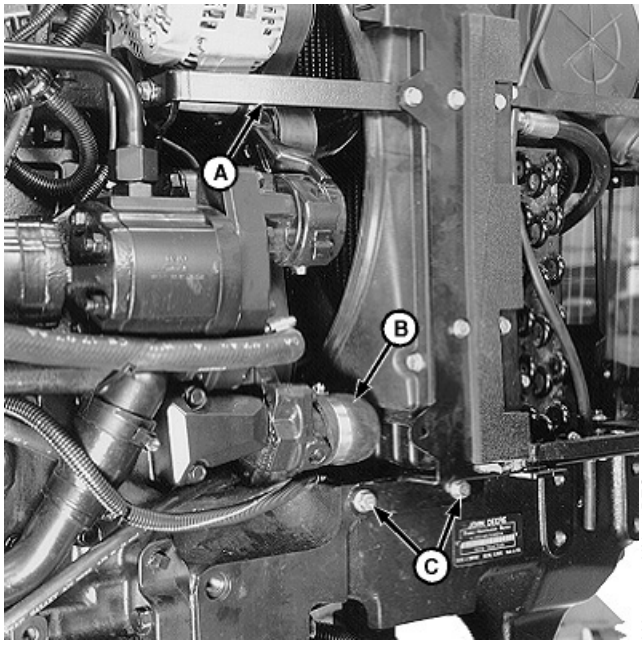
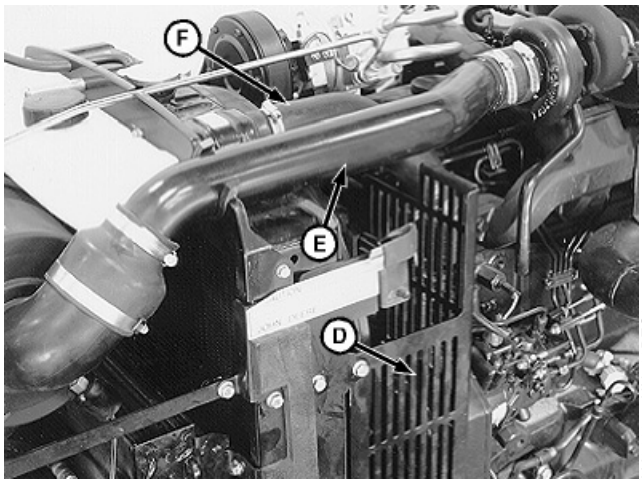
1. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in Section 90, Group 20).
2. Remove hood and side grille panels.
3. Disconnect battery, negative (—) cable first.
4. Remove fuel filter/primer pump assembly. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05.)
5. Remove MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Section 50, Group 35.)
6. Remove brace (A) and disconnect lower radiator hose (B) from water pump.
7. Remove cap screws (C) on both sides of tractor.
8. Remove finger guard (D), intake pipe (E), and disconnect upper radiator hose (F) from radiator.
9. Remove four cap screws (G) and five grommets (H).
10. Disconnect air filter restriction indicator wire connector (I).

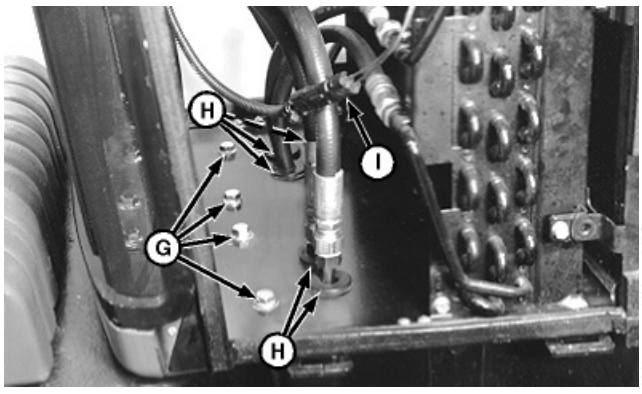
A—Brace
B—Lower Radiator Hose
C—Cap Screw (2 used)
D—Finger Guard
E—Intake Pipe
F—Upper Radiator Hose
G—Cap Screw (4 used)
H—Grommet (5 used)
I—Wire Connector



LV2411 –UN–16DEC97



LV2412 –UN–16DEC97



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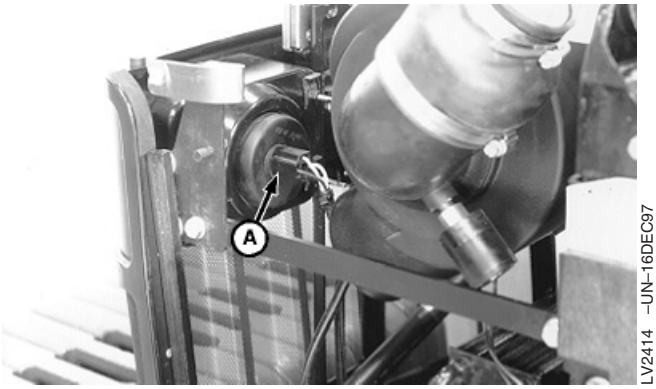
11. Disconnect two headlight connectors (A).

NOTE: Close all openings using caps and plugs to prevent contamination.

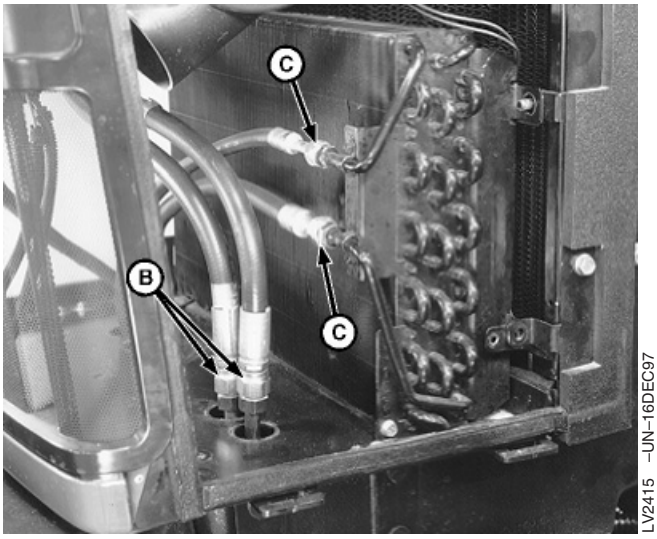
12. Disconnect oil cooler lines (B) and condenser lines (C). Close all openings using caps and plugs.

13. Remove cap screw and lock nut (D) and nut (E) on both sides of oil cooler and condenser.

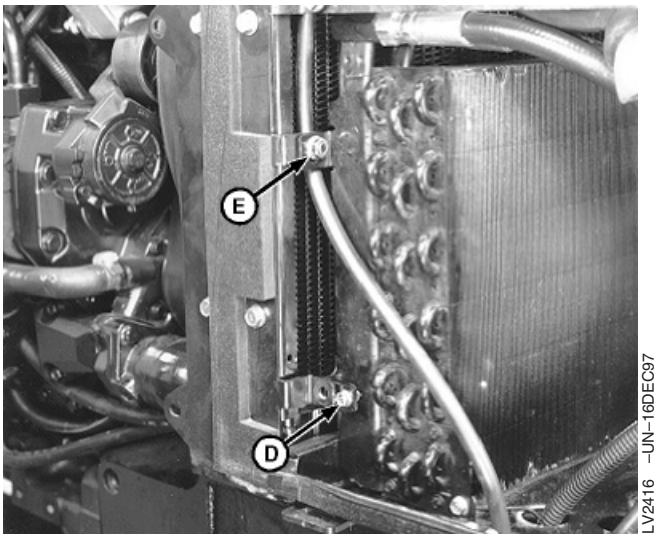
A—Headlight Connector (2 used)
B—Oil Cooler Line (2 used)
C—Condenser Line (2 used)
D—Cap Screw and Lock Nut
E—Nut



LV2414 –UN–16DEC97



LV2415 –UN–16DEC97



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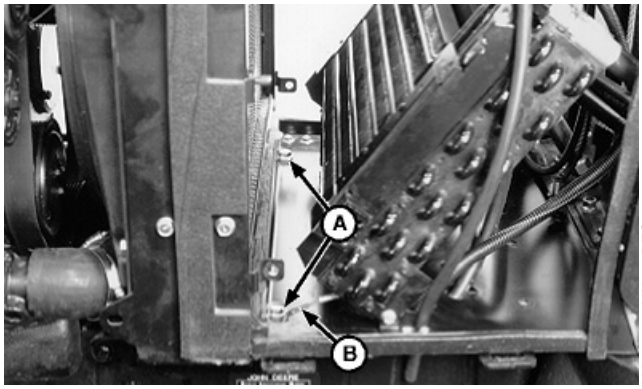
14. Tilt condenser and oil cooler forward. Remove cap screws (A) and ground wire (B).

NOTE: Make sure to route oil lines, condenser lines, and headlight harness through holes where grommets were removed.

15. Tilt condenser and oil cooler back and lift out front grille/radiator assembly. Route oil lines, condenser lines, and headlight harness through holes where grommets were removed.



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A—Cap Screw
B—Ground Wire

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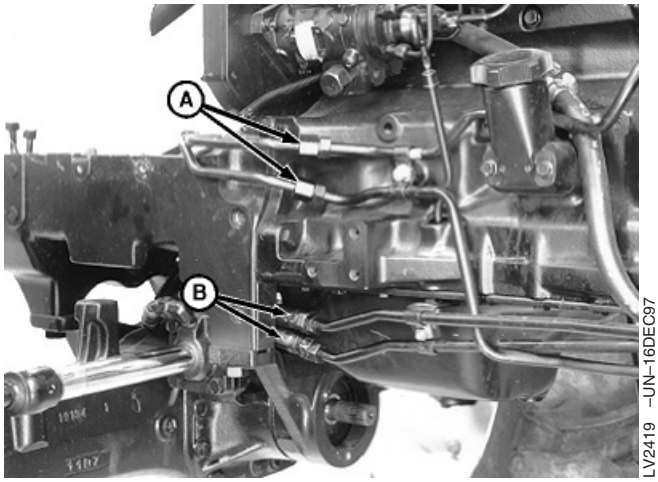
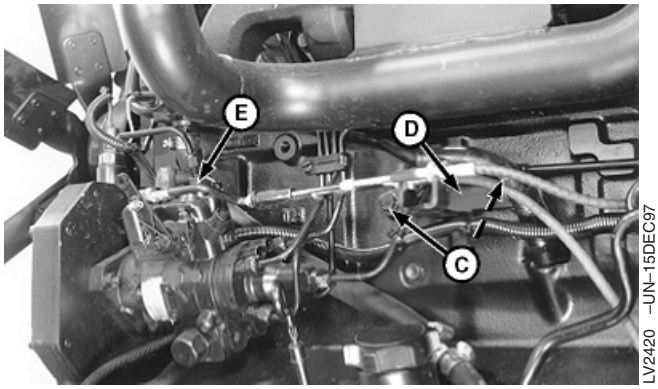
AG,OUO1085,33 –19–25JUN02–3/10

16. Disconnect and remove oil cooler lines (A).
17. Disconnect hydraulic steering lines (B).
18. Remove cap screws (C) and remove bracket (D) from engine.
19. Remove rod (E) from injection pump.
20. Disconnect hydraulic lines (F).

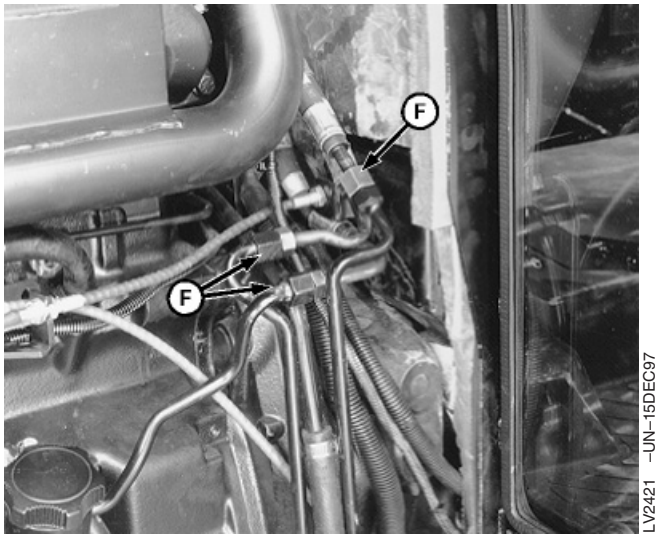
A—Oil Cooler Line (2 used)
B—Hydraulic Steering Line (2 used)
C—Cap Screw
D—Bracket
E—Rod
F—Hydraulic Line (3 used)



LV2419 –UN–16DEC97



LV2420 –UN–15DEC97



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AG,OUO1085,33 –19–25JUN02–4/10

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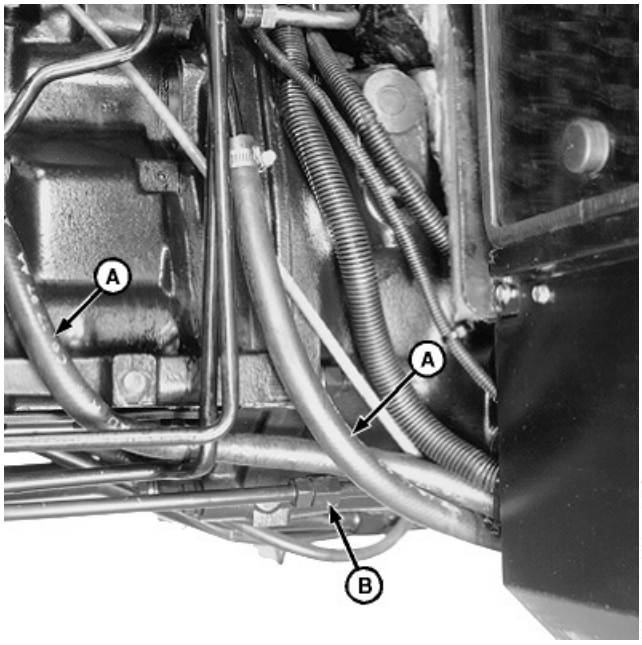
21. Disconnect coolant lines (A) from engine.
22. Disconnect hydraulic line (B).
23. Remove exhaust pipe.
24. Disconnect low pressure line (C), ground wire (D), and compressor clutch wire connector (E).

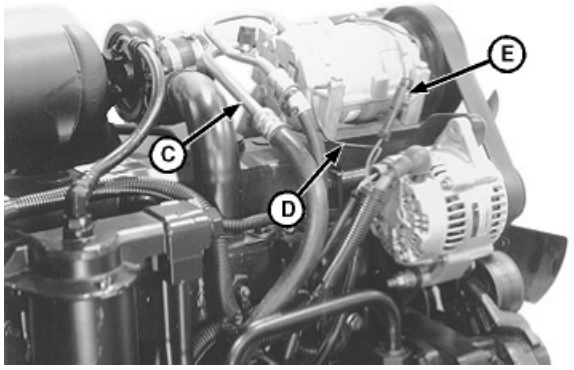
NOTE: Muffler removed for clarity of photo.

25. Remove fuel return line (F).

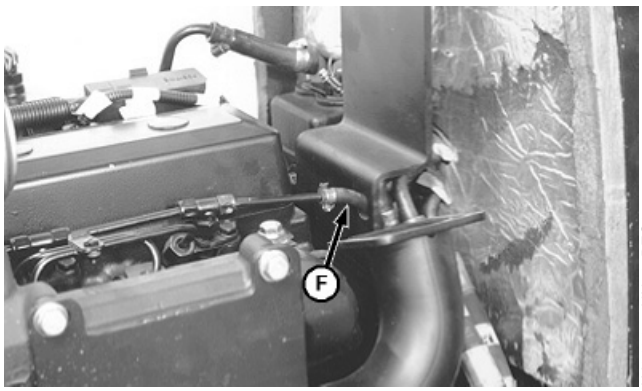
A—Coolant Line (2 used)
B—Hydraulic Line
C—Low Pressure Line
D—Ground Wire
E—Clutch Wire Connector
F—Fuel Line



LV2422 –UN–15DEC97



LV2423 –UN–15DEC97



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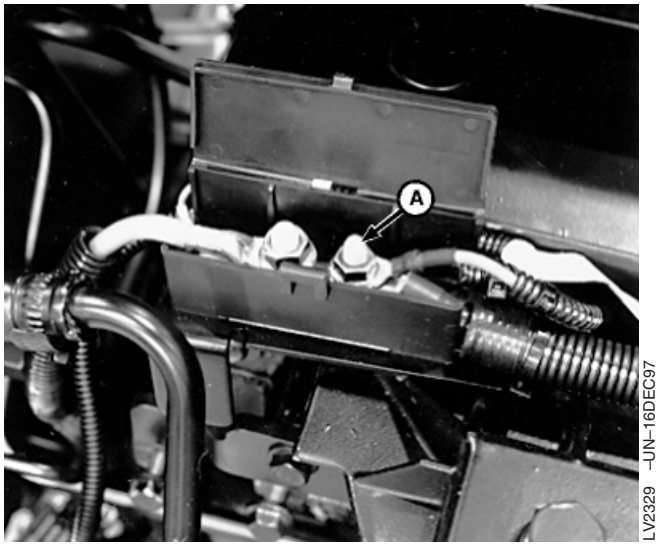
26. Disconnect red wires #002C and #002D/E from right post (A) of fuse link junction block.

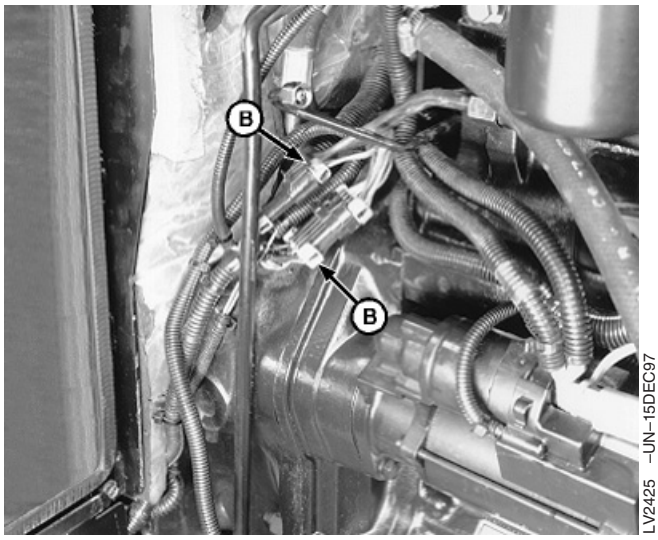
27. Disconnect two main harness wiring connectors (B).

28. Disconnect hydraulic line (C).

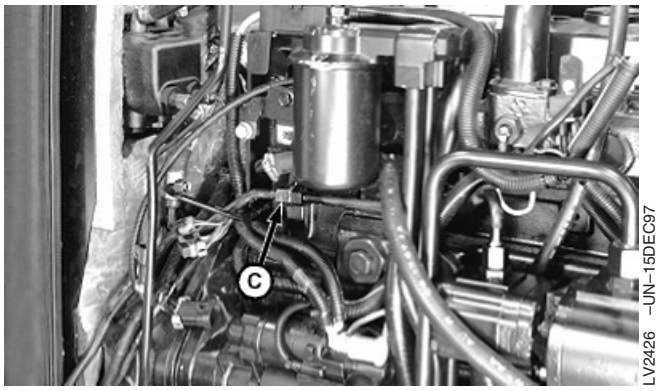
A—Fuse Link Post
B—Wire Connector
C—Hydraulic Line



LV2329 –UN–16DEC97



LV2425 –UN–15DEC97



LV2426 –UN–15DEC97

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AG,OUO1085,33 –19–25JUN02–6/10

29. Disconnect hydraulic line (A) from hydraulic pump.

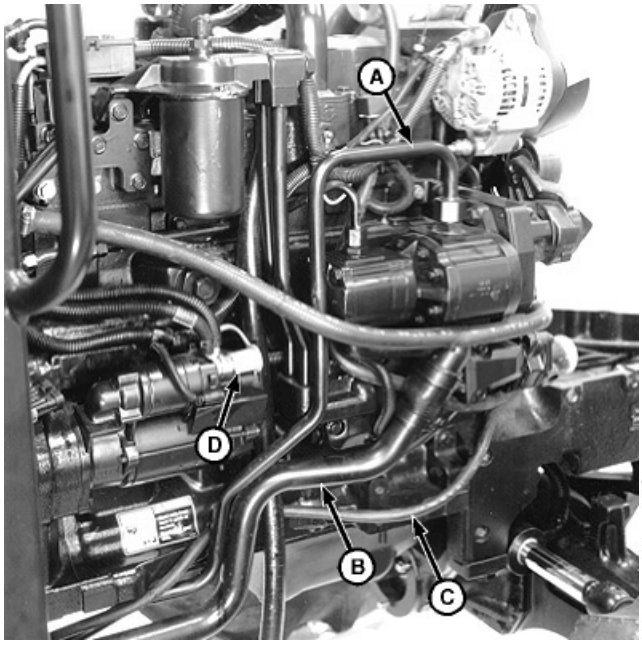
NOTE: Support suction line (B). Transmission/hydraulic oil will spill out of hose if line drops below transmission/reservoir oil level.

30. Disconnect suction line (B).

31. Move hose (C) away from engine.

32. Disconnect battery positive (+) cable from starter terminal (D).

A—Hydraulic Line
B—Suction Line
C—Hose
D—Starter Terminal



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CAUTION: Front weights and bracket must be removed from tractor before removing any frame to engine mounting hardware.

33. Remove front weights and bracket, if equipped.

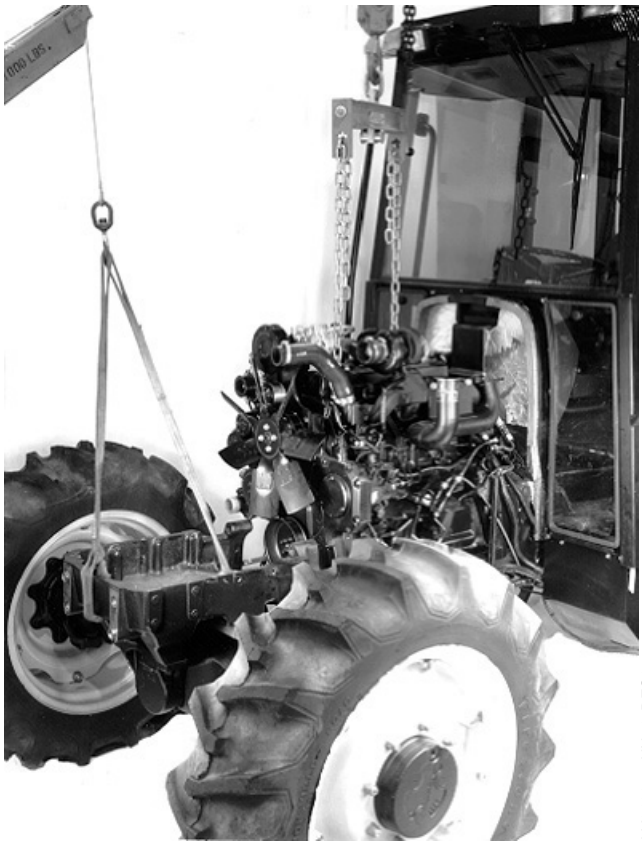
34. Install lifting brackets such as JDG19 or JT01748 to engine.

35. Remove engine fan belt.

36. Remove muffler, if necessary.

37. Use a hoist and appropriate straps to prevent the front axle from tipping to the front or the back.

38. Install a wood block between front axle and frame on both sides.



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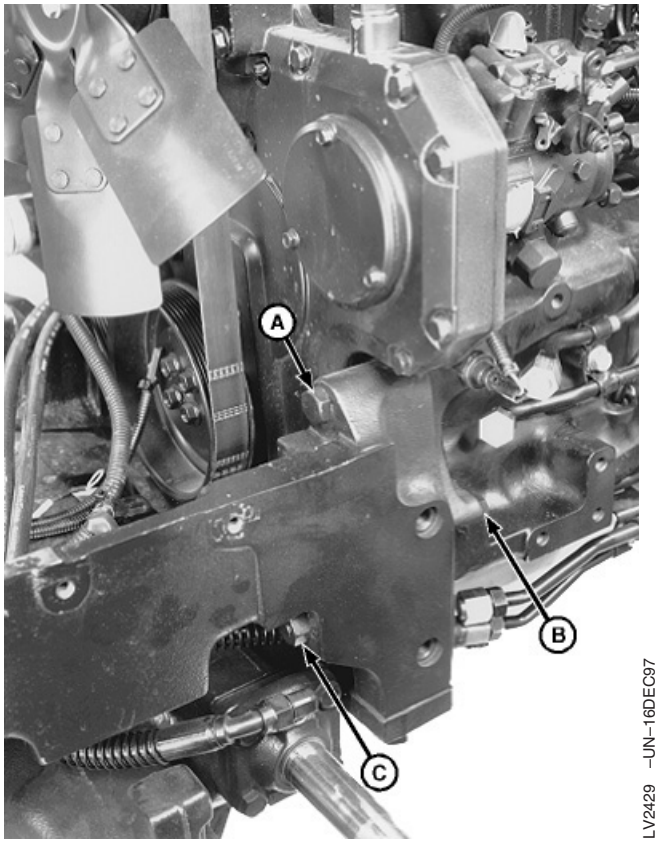
AG,OUO1085,33 –19–25JUN02–8/10

39. Remove front end support-to-engine cap screws (A and B) and nut (C) from both sides of frame.

A—Cap Screw (2 used)
B—Cap Screw (2 used)
C—Nut (2 used)



AG,OUO1085,33 –19–25JUN02–9/10

40. Roll front end away from tractor.

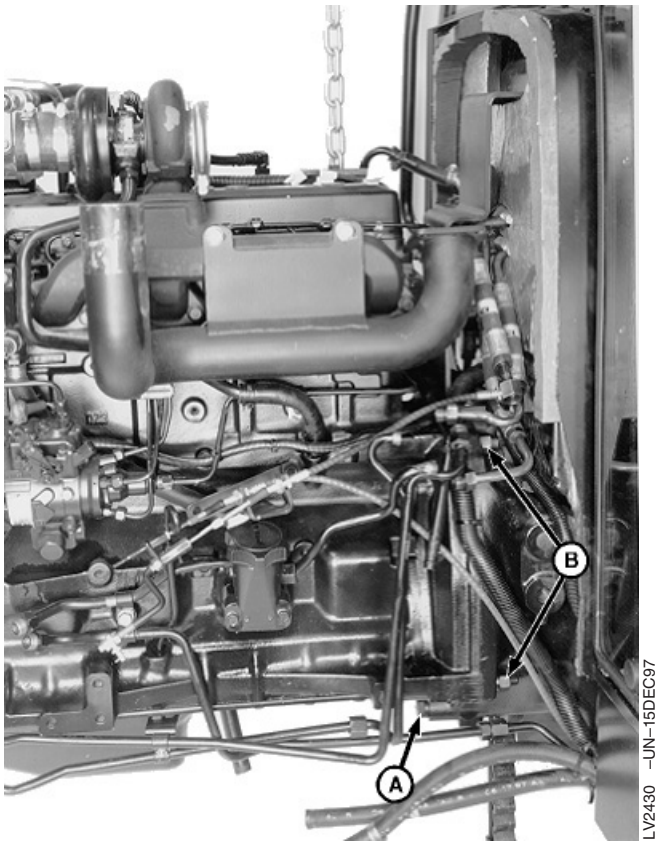
41. Remove engine-to-clutch housing cap screw (A) and nuts (B) from both sides.

42. Remove engine.

43. Remove clutch. (See Remove and Install Clutch Assembly in Section 50, Group 10 for CollarShift/SyncShuttle™ Transmission or Remove and Install Clutch Assembly in Section 50, Group 11 for PowrReverser™ Transmission.)

44. Make repairs as necessary. (See CTM104 or CTM125.)

A—Cap Screw
B—Nut



AG,OUO1085,33 –19–25JUN02–10/10

Install Engine—Tractors with Cab

1. Install clutch. (SeeRemove and Install Clutch Assembly in Section 50, Group 10 for CollarShift/SyncShuttle™ Transmission or Remove and Install Clutch Assembly in Section 50, Group 11 for PowrReverser™ Transmission.)

NOTE: Turning PTO shaft at rear of tractor during engine installation will aid in alignment of PTO clutch and shaft.

2. Put transmission shift levers in neutral to ease clutch shaft alignment with engine.

3. Apply multipurpose grease to end of PTO clutch shaft.

4. Install engine.

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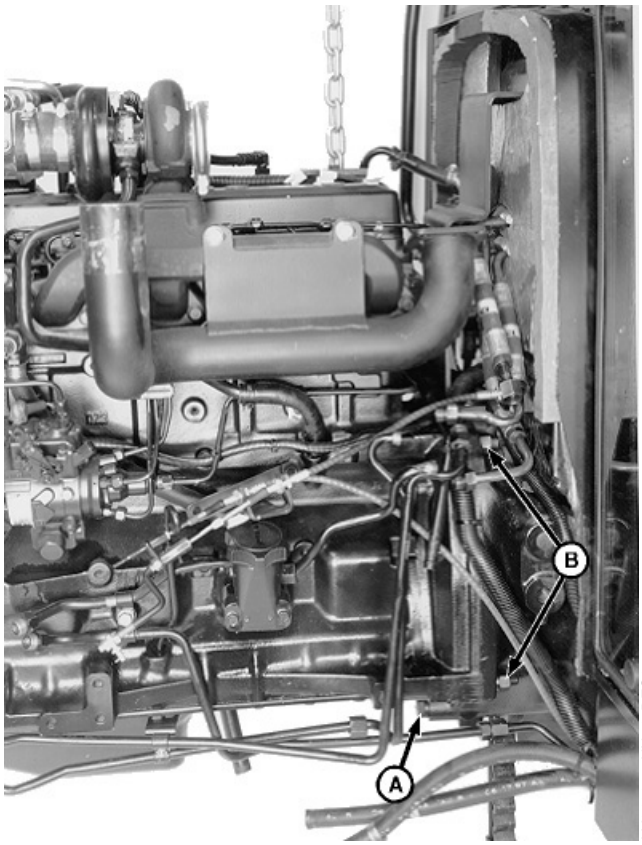
5. Install engine-to-clutch housing cap screws (A) and nuts (B). Tighten to specifications.

Specification	
Engine-to-Clutch Housing Cap Screws—Torque	318 N•m (235 lb-ft)
Engine-to-Clutch Housing Nuts—Torque	318 N•m (235 lb-ft)

A—Cap Screw
B—Nut



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AG,OUO1085,34 –19–25JUN02–2/10

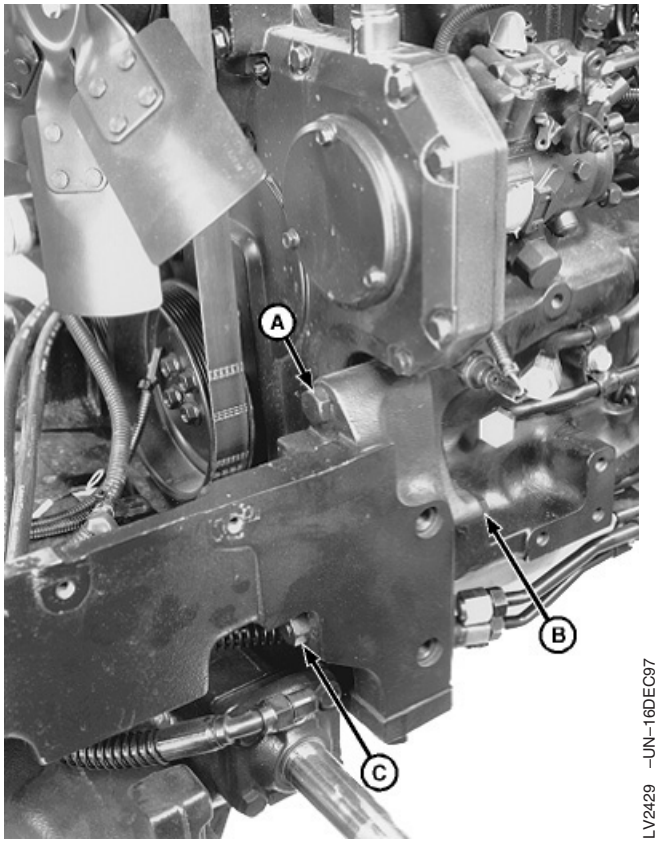
NOTE: Hollow dowels are installed in bores of cap screws (B).

6. Align studs in engine with front end. Install front end to tractor. Tighten front end support-to-engine cap screws (A and B) and nuts (C) to specifications.

Specification	
Front End Support-to-Engine Upper Cap Screws and Nuts—Torque	305 N•m (225 lb-ft)
Front End Support-to-Engine Lower Cap Screws—Torque	176 N•m (130 lb-ft)

7. Install engine fan belt.

A—Cap Screw (2 used)
B—Cap Screw (2 used)
C—Nut (2 used)



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AG,OUO1085,34 –19–25JUN02–3/10

8. Connect battery positive (+) cable to starter terminal (D).

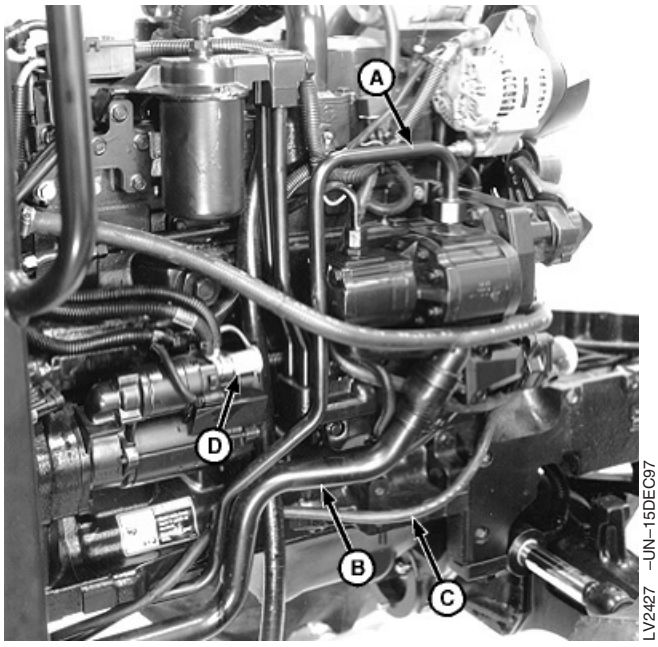
9. Route hose (C) along engine towards front.

10. Connect suction line (B).

NOTE: Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

11. Connect hydraulic line (A) to hydraulic pump.

A—Hydraulic Line
B—Suction Line
C—Hose
D—Starter Terminal



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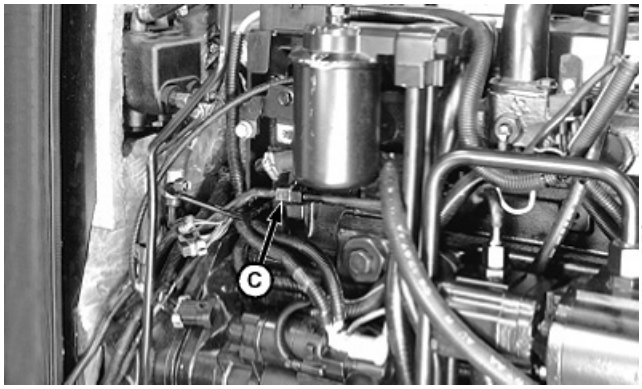
AG,OUO1085,34 –19–25JUN02–4/10

12. Connect hydraulic line (C).

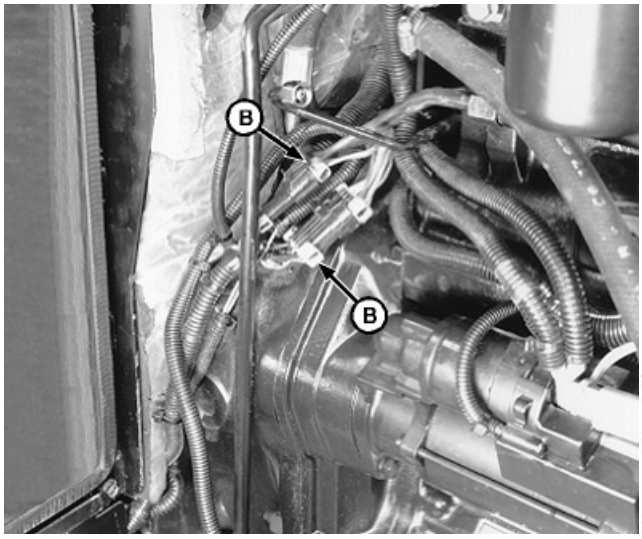
13. Connect two main wiring harness connectors. (B).

14. Connect red wires #002C and #002D/E to right post (A) of fuse link junction block.

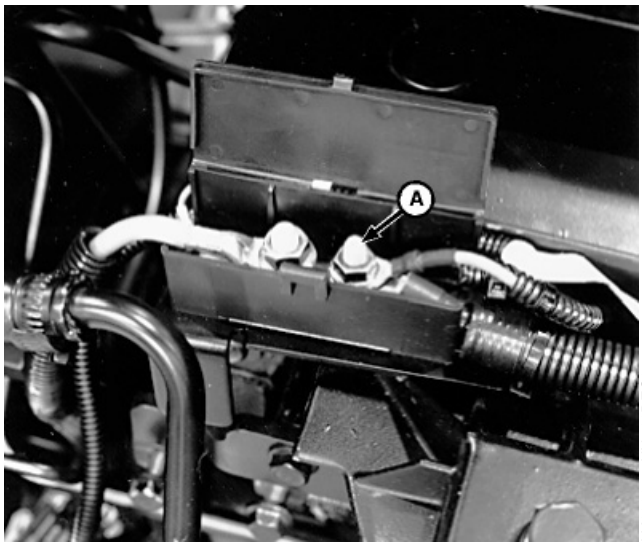
A—Fuse Link Post
B—Wire Connector
C—Hydraulic Line



LV2426 –UN–15DEC97



LV2425 –UN–15DEC97



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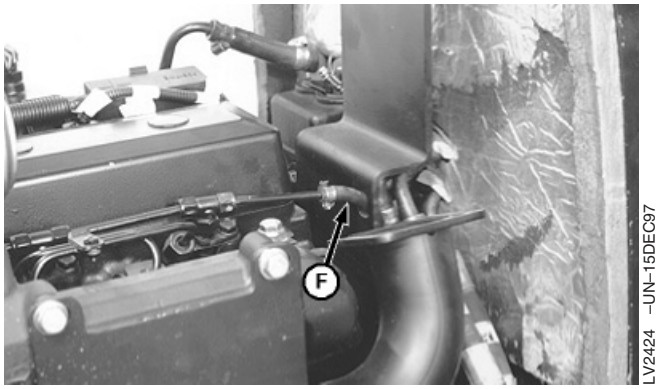
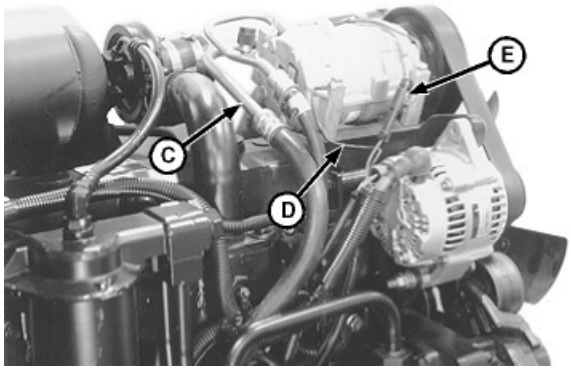
AG,OUO1085,34 –19–25JUN02–5/10

15. Connect fuel return line (F).
16. Connect low pressure line (C), ground wire (D), and compressor clutch wire connector (E).
17. Install exhaust pipe.
18. Connect hydraulic line (B).
19. Connect coolant lines (A).

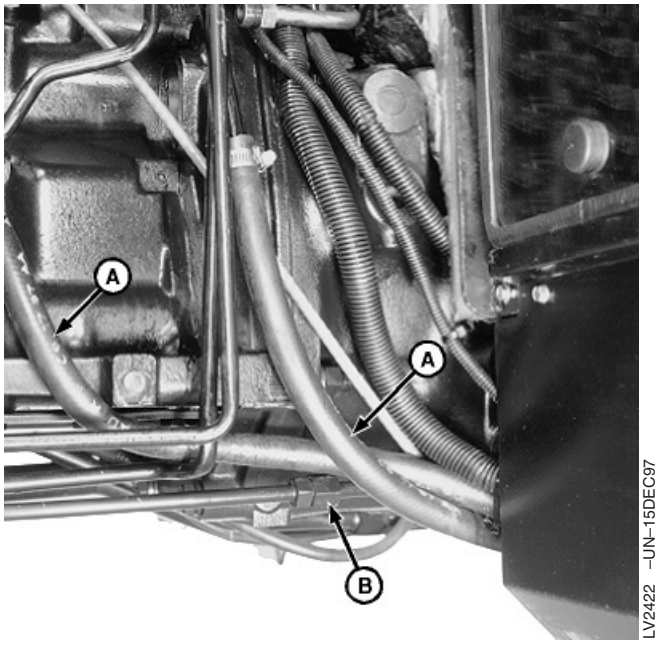
A—Coolant Line (2 used)
B—Hydraulic Line
C—Low Pressure Line
D—Ground Wire
E—Clutch Wire Connector
F—Fuel Line



LV2424 –UN–15DEC97



LV2423 –UN–15DEC97



LV2422 –UN–15DEC97

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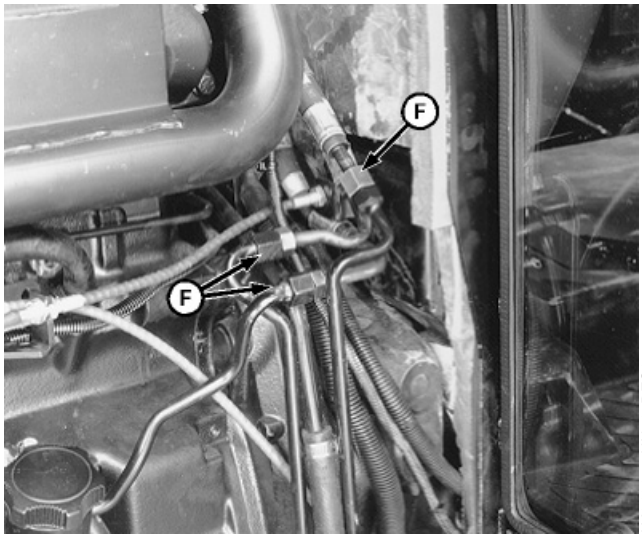
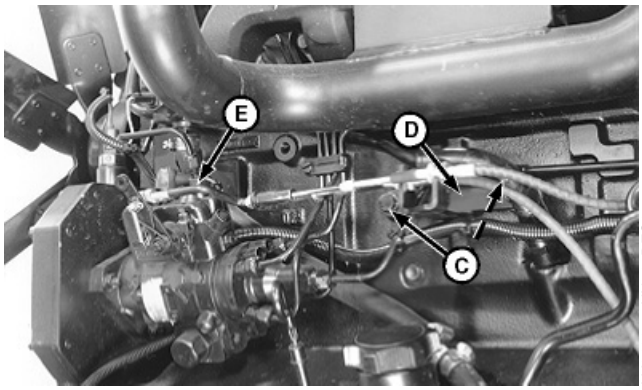
AG,OUO1085,34 –19–25JUN02–6/10

20. Connect hydraulic lines (F).
21. Install rod (E) to injection pump.
22. Install cap screws (C) through bracket (D) to engine.
23. Connect hydraulic steering lines (B).
24. Install oil cooler lines (A).

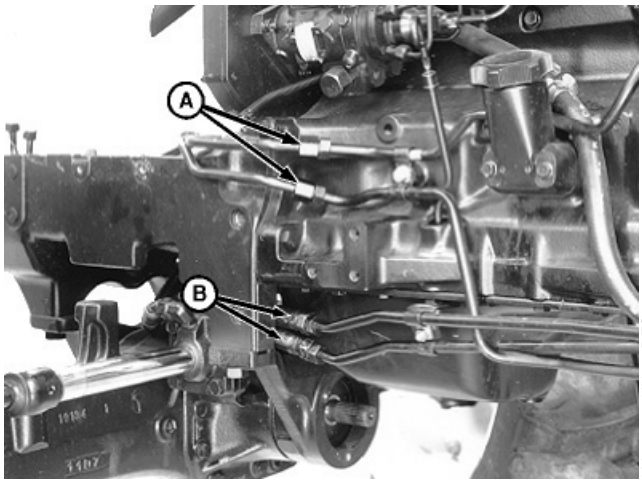
A—Oil Cooler Line (2 used)
B—Hydraulic Steering Line (2 used)
C—Cap Screw
D—Bracket
E—Rod
F—Hydraulic Line (3 used)



LV2421 –UN–15DEC97



LV2420 –UN–15DEC97



LV2419 –UN–16DEC97

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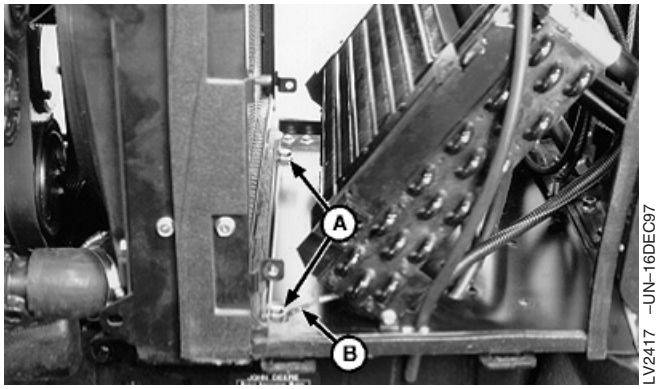
AG,OUO1085,34 –19–25JUN02–7/10

NOTE: Make sure to route oil lines, condenser lines, and headlight harness through holes where grommets were removed.

25. Install front grille/radiator assembly, being sure to route hoses, lines, and wire harness through holes.

26. Tilt condenser and oil cooler forward. Install cap screws (A) and ground wire (B).

A—Cap Screw
B—Ground Wire



LV2417 –UN–16DEC97

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27

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AG,OUO1085,34 –19–25JUN02–8/10

27. Install cap screws and lock nuts (D) and nuts (E) to both sides.

28. Connect oil cooler lines (B) and condenser lines (C).

29. Connect two headlight connectors (A).

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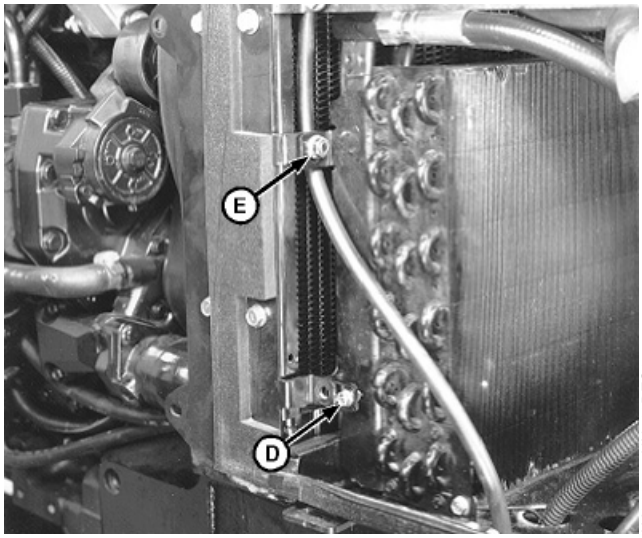
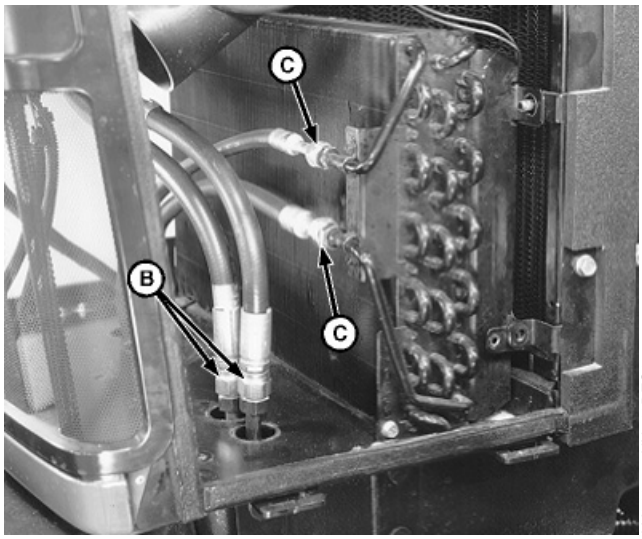
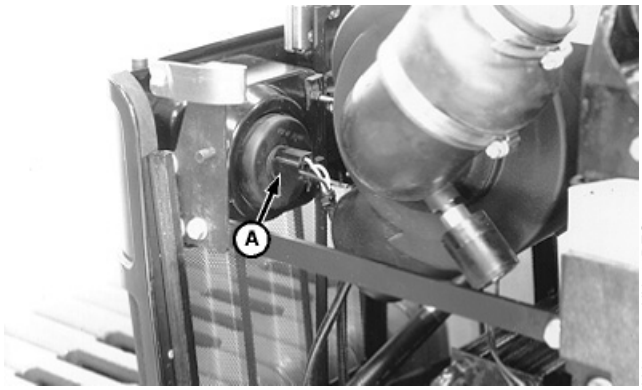
A—Headlight Connector (2 used)
B—Oil Cooler Line (2 used)
C—Condenser Line (2 used)
D—Cap Screw and Lock Nut
E—Nut



LV2416 –UN–16DEC97



LV2415 –UN–16DEC97



LV2414 –UN–16DEC97

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AG,OUO1085,34 –19–25JUN02–9/10

30. Connect air filter restriction indicator wire connector (I).

31. Install four cap screws (G) and five grommets (H).

32. Install finger guard (D), intake pipe (E) and connect upper radiator hose (F).

33. Install cap screws (C) to both sides.

34. Install brace (A) and lower radiator hose (B).

35. Install MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Section 50, Group 35.)

36. Install fuel filter/primer pump assembly. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 in Section 30, Group 05.)

37. Connect battery, positive (+) cable first.

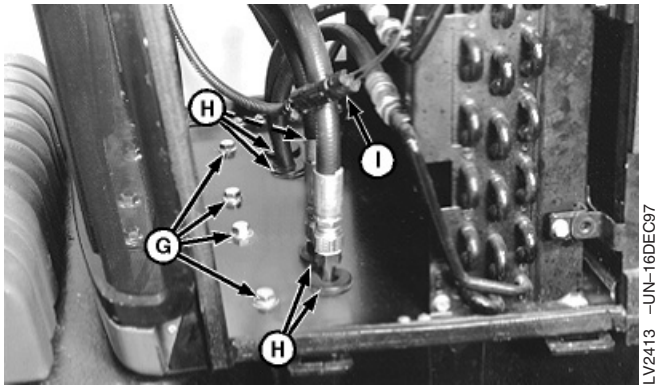
38. Install hood and side grille panels.

39. Fill cooling system with proper coolant. Run engine to circulate coolant. Check coolant level and replenish as necessary.

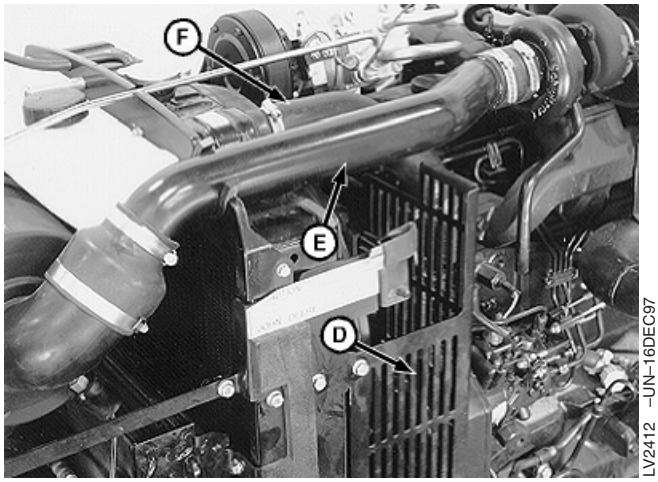
40. Adjust fast idle. (See Fast Idle Adjustment in Section 220, Group 15.)

41. Flush, evacuate, and charge air conditioning system. (See Flush Air Conditioning System, Evacuate Air Conditioning System and Charge Air Conditioning System in Section 90, Group 20.)

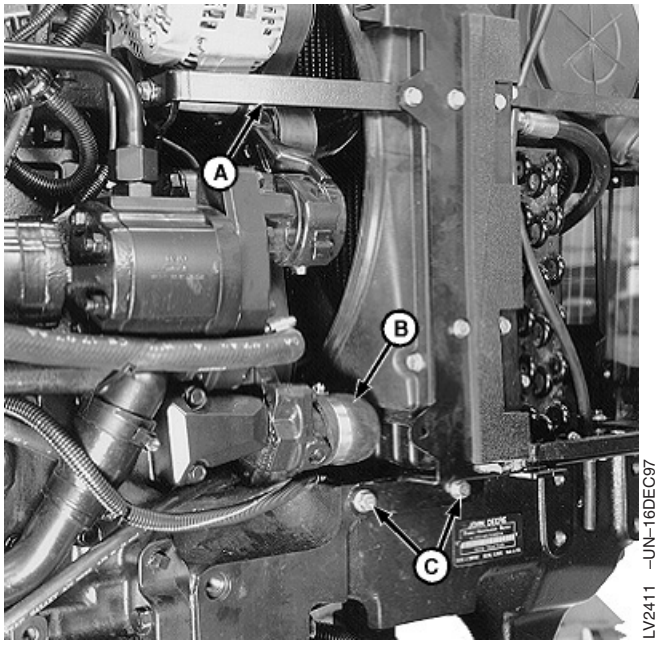
A—Brace
B—Lower Radiator Hose
C—Cap Screw (2 used)
D—Finger Guard
E—Intake Pipe
F—Upper Radiator Hose
G—Cap Screw (4 used)
H—Grommet
I—Wire Connector



LV2413 –UN–16DEC97



LV2412 –UN–16DEC97



LV2411 –UN–16DEC97

AG,OUO1085,34 –19–25JUN02–10/10

Specifications

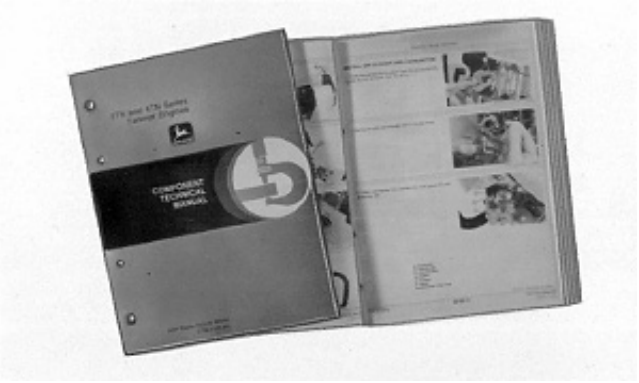
Item	Measurement	Specification
Belt Tensioner Spring	Tension	18—22 N•m (13—16 lb-ft)

OUO1089,000024B –19–25JUN02–1/1

Engine Water Pump Repair—Use CTM104 or CTM125

For complete repair information the component technical manual (CTM) is also required. Use the component technical manual in conjunction with this machine manual.

- 3-cylinder 2.9 L engines—Use CTM125
- 4-cylinder 4.5 L engines—Use CTM104



TS225 –UN–17JAN89

AG,OUO1085,35 –19–04AUG00–1/1

Remove and Inspect Radiator

TS281 –UN–23AUG88

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

NOTE: 4-cylinder cab tractor shown; 3-cylinder tractors without cabs are similar.

1. Remove left- and right-side grille panels.
2. In tractors equipped with cab, remove air conditioning condenser. (See Remove, Inspect, and Install Air Conditioning Condenser in Section 90, Group 20.)
3. Remove hydraulic oil cooler, if equipped. (See Remove, Inspect, and Install Hydraulic Oil Cooler in Section 70, Group 06.)

NOTE: Cooling system capacity is approximately 10.8 L (11.5 qt).

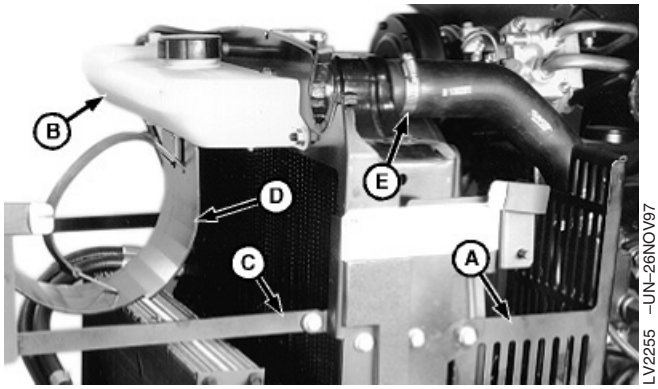
4. Drain coolant.
5. Remove air cleaner.

Continued on next page

AG,OUO1085,36 –19–25JUN02–1/4

6. Remove finger guard (A) and recovery tank (B).
7. Disconnect bracket (C) from radiator support.
8. Remove air cleaner support bracket (D).
9. Disconnect upper radiator hose (E) from radiator.

A—Finger Guard
B—Recovery Tank
C—Bracket
D—Air Cleaner Support
E—Upper Radiator Hose

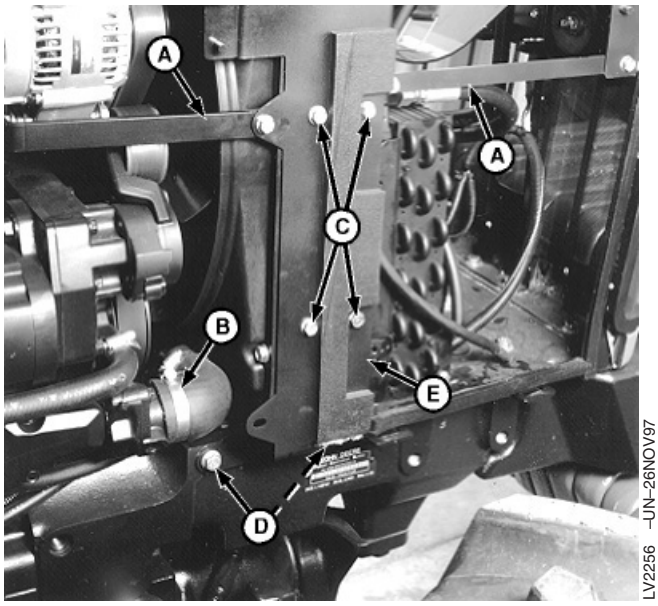


LV2255 –UN–26NOV97

AG,OUO1085,36 –19–25JUN02–2/4

10. Remove brackets (A) from radiator support.
11. Disconnect lower radiator hose (B) from water pump. Close all openings using caps and plugs.
12. Remove four cap screws (C), two cap screws (D), and radiator support (E) to both sides.

A—Radiator Support Bracket
B—Lower Radiator Hose
C—Cap Screw (8 used)
D—Cap Screw (4 used)
E—Radiator Support



LV2256 –UN–26NOV97

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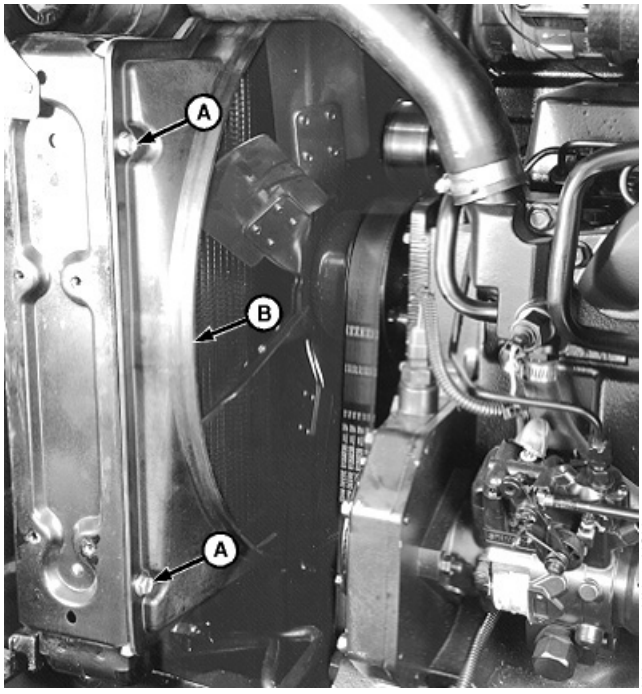
AG,OUO1085,36 –19–25JUN02–3/4

NOTE: Move fan shroud (B) rearward over fan to aid during removal of radiator.

13. Remove four cap screws (A) and separate fan shroud (B) from radiator.
14. Remove radiator.
15. Remove hose clamp (C) and hose (D).

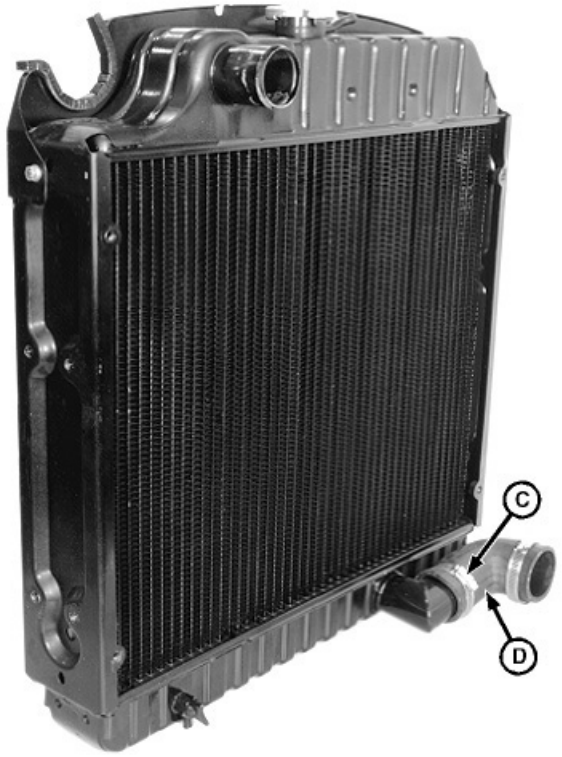
CAUTION: Reduce compressed air to less than 210 kPa (2 bar) (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear personal protection equipment, including eye protection.

16. Check radiator for debris lodged in fins. Clean radiator using compressed air or pressure washer.
17. Inspect radiator for bent fins, cracks, and damaged seams. Repair as necessary.



LV2257 –UN–26NOV97

A—Cap Screw (4 used)
B—Fan Shroud
C—Hose Clamp
D—Lower Radiator Hose



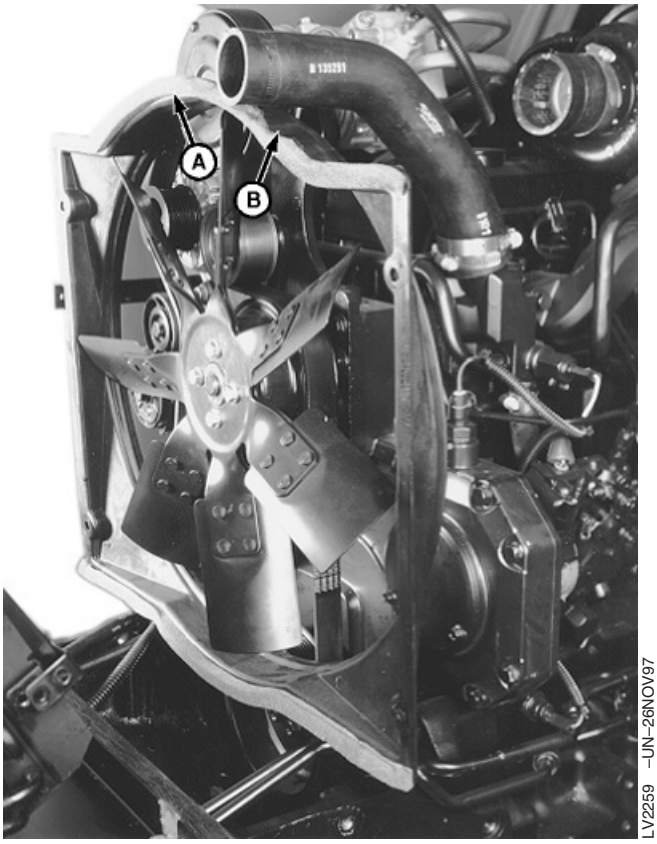
LV2258 –UN–26NOV97

AG,OUO1085,36 –19–25JUN02–4/4

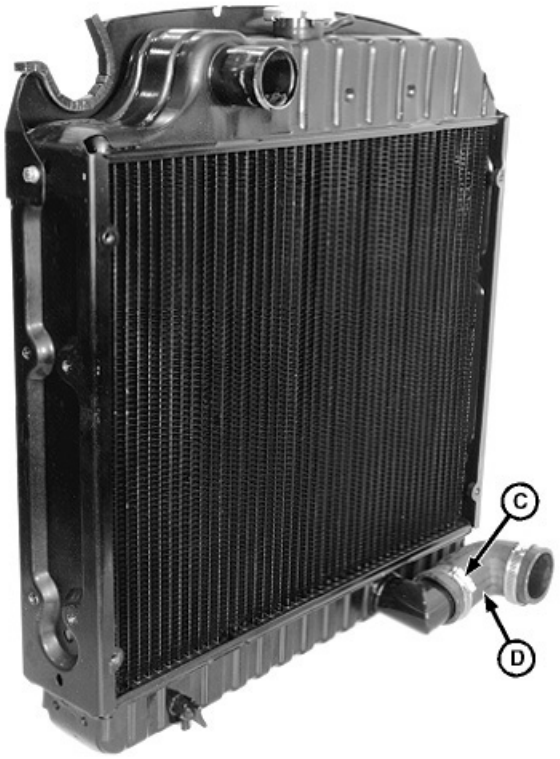
Install Radiator

1. Place fan shroud (A) over cooling fan, with hose notch (B) at top.
2. Install lower radiator hose (D) and hose clamp (C). Tighten clamp.

A—Fan Shroud
B—Hose Notch
C—Clamp
D—Lower Radiator Hose



LV2259 –UN–26NOV97



LV2258 –UN–26NOV97

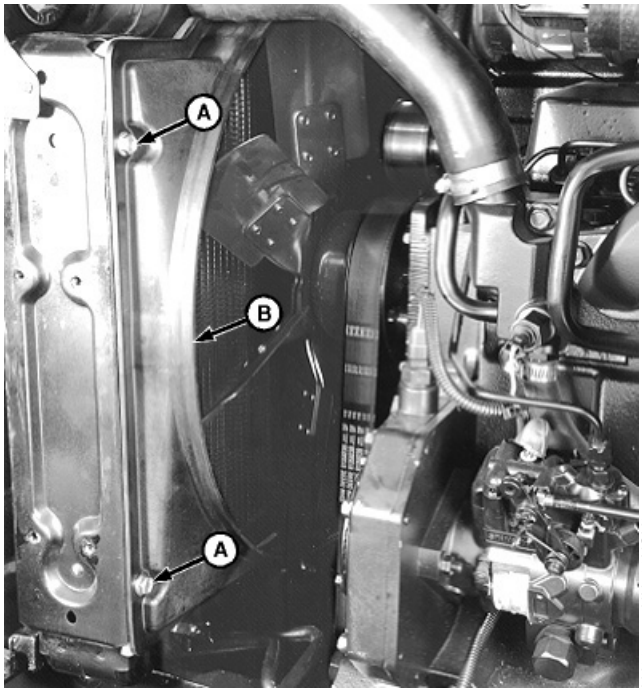
Continued on next page

AG,OUO1085,37 –19–25JUN02–1/4

3. Install radiator on front of tractor.

4. Install fan shroud (B) and four cap screws (A). Adjust shroud for fan clearance.

A—Cap Screw (4 used)
B—Fan Shroud



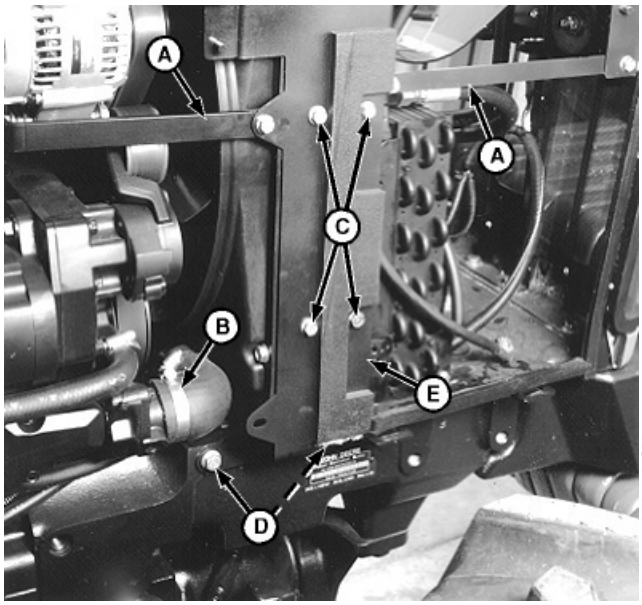
LV2257 –UN–26NOV97

AG,OUO1085,37 –19–25JUN02–2/4

5. Install radiator support (E), four cap screws (C), and two cap screws (D) to both sides.

6. Install lower radiator hose (B) and brackets (A).

A—Radiator Support Bracket
B—Lower Radiator Hose
C—Cap Screw (8 used)
D—Cap Screw (4 used)
E—Radiator Support



LV2256 –UN–26NOV97

Continued on next page

AG,OUO1085,37 –19–25JUN02–3/4

7. Install upper radiator hose (E) and bracket (C).

8. Install finger guard (A) and air cleaner support bracket (D).

9. Install recovery tank (B).

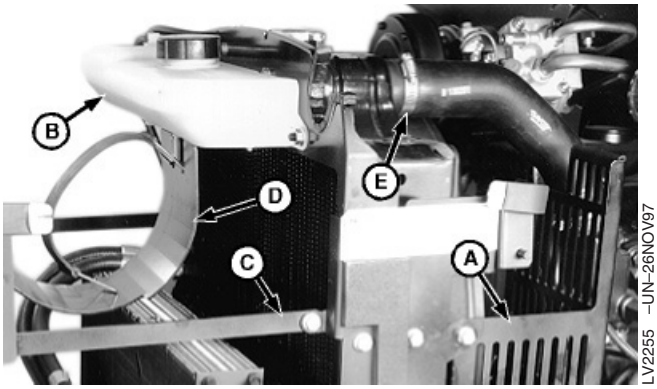
10. Install hydraulic oil cooler if equipped. (See Remove, Inspect, and Install Hydraulic Oil Cooler in Section 70, Group 06.)

11. Tractors with cab: Install air conditioning condenser. (See Remove, Inspect, and Install Air Conditioning Condenser in Section 90, Group 20.)

12. Close drain valve and fill radiator with proper coolant to top of filler neck. (See Diesel Engine Coolant in Section 10, Group 20.)

13. Start engine and allow it to reach proper operating temperature. Check radiator, hoses, and connections for leaks. Adjust coolant level in recovery tank.

14. Install side grille panels.



LV2255 –UN–26NOV97

A—Finger Guard
B—Recovery Tank
C—Bracket
D—Air Cleaner Support Bracket
E—Upper Radiator Hose

AG,OUO1085,37 –19–25JUN02–4/4

Replace Thermostat

TS281 –UN–23AUG88

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

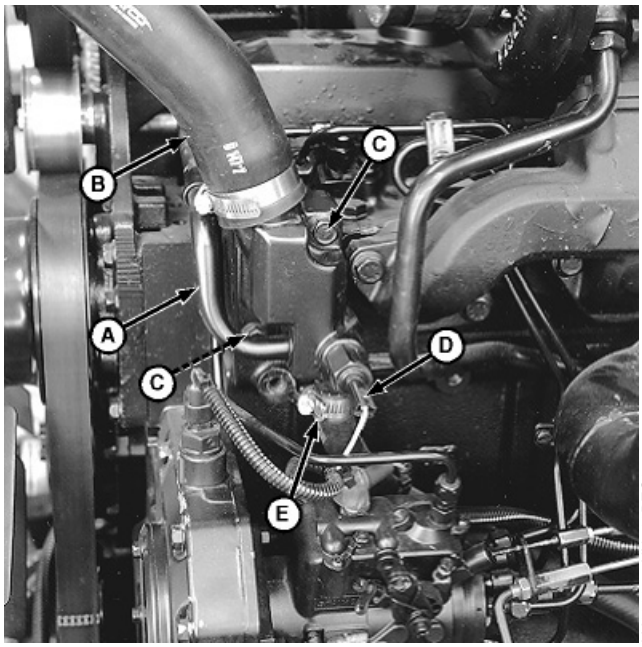
Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

1. Partially drain radiator.

NOTE: Tractor with cab shown; procedure for tractors without cabs is similar.

Finger guard removed for clarity of photo only.

2. Remove left-side grille panel.
3. Disconnect bypass tube (A) from thermostat housing.
4. Remove upper radiator hose (B) and two cap screws (C).
5. Disconnect temperature sender wire connector (D).
6. Tractors with cab: Disconnect heater hose (E).



LV2200 –UN–16DEC97

A—Bypass Tube
B—Upper Radiator Hose
C—Cap Screw (2 used)
D—Wire Connector
E—Heater Hose (Cab Tractors Only)

Continued on next page

AG,OUO1085,38 –19–25JUN02–1/3

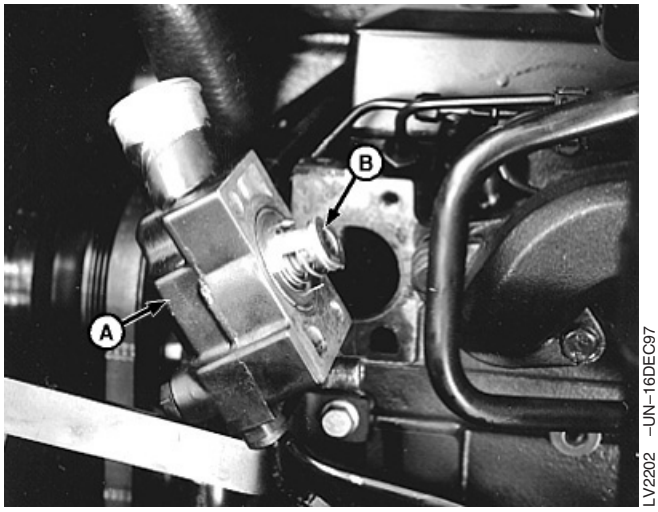
7. Remove housing (A) and replace thermostat (B).

8. Clean mating surfaces of thermostat housing and engine block.

NOTE: Install new thermostat with jiggle pin at top to improve de-aeration of coolant.

9. Replace thermostat (B) and install new gasket.

A—Housing
B—Thermostat



LV2202 –UN–16DEC97

AG,OUO1085,38 –19–25JUN02–2/3

10. Install thermostat housing and cap screws (C).

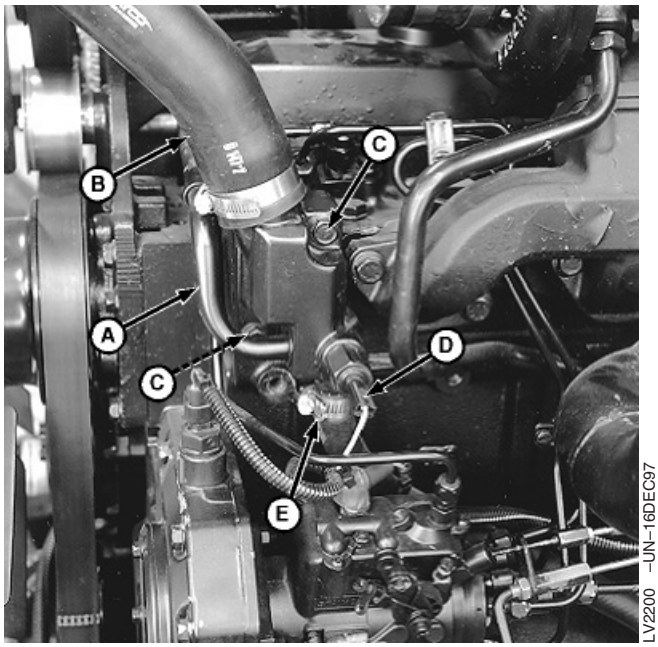
11. Connect bypass tube (A) and upper radiator hose (B).

12. Connect wire connector (D) and cab heater hose (E), if equipped.

13. Fill radiator with proper coolant to top of filler neck. (See Diesel Engine Coolant in Section 10, Group 20.)

14. Install left-side grille panel.

A—Bypass Tube
B—Upper Radiator Hose
C—Cap Screw (2 used)
D—Wire Connector
E—Heater Hose (Cab Tractors Only)



LV2200 –UN–16DEC97

AG,OUO1085,38 –19–25JUN02–3/3

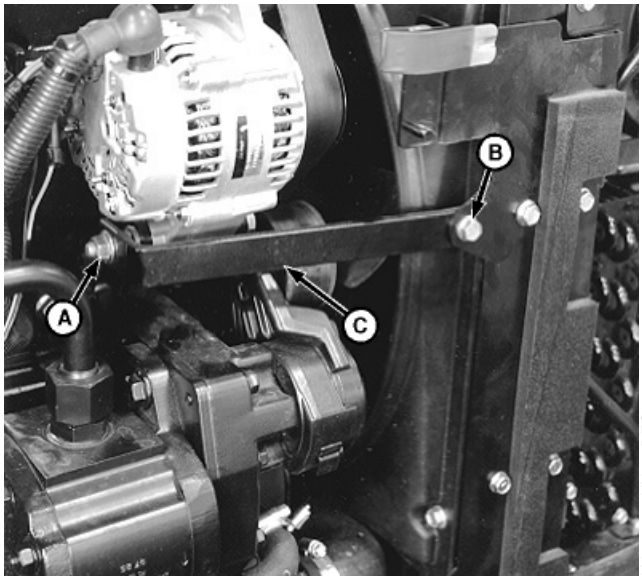
Inspect and Replace Belt Tensioner—Models 5410 and 5510

NOTE: Pulley and spring tensioner are not serviceable.

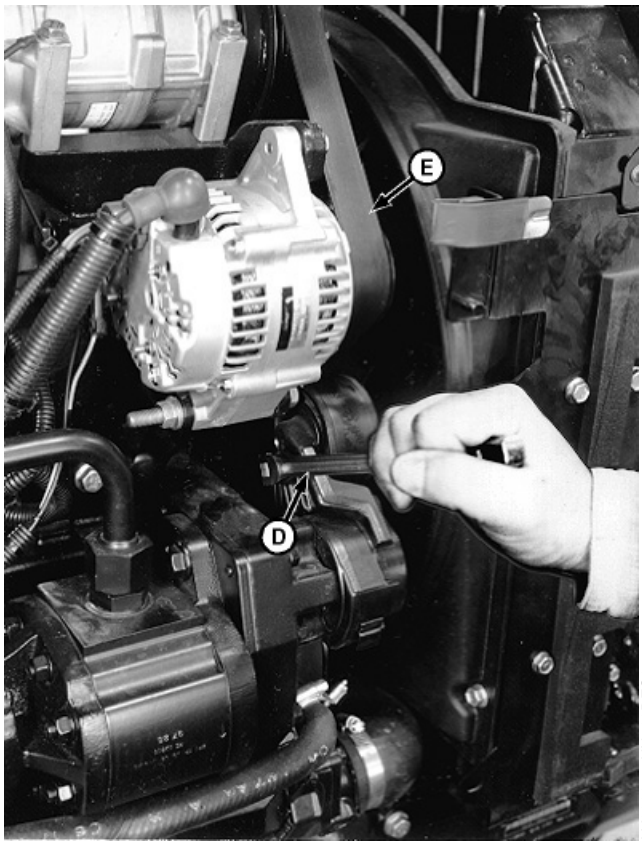
20
10
10

1. Remove right-side grille panel.
2. Remove nut (A), cap screw (B), and right-side radiator support bracket (C).
3. Release tension on belt using a 3/8” drive long handle breaker bar (D). Remove belt (E) from alternator pulley.
4. Release tension on tensioner arm and remove tool.

A—Nut
B—Cap Screw
C—Radiator Support Bracket
D—3/8” Drive Breaker Bar
E—Belt



LV2398 –UN–16DEC97



LV2399 –UN–18DEC97

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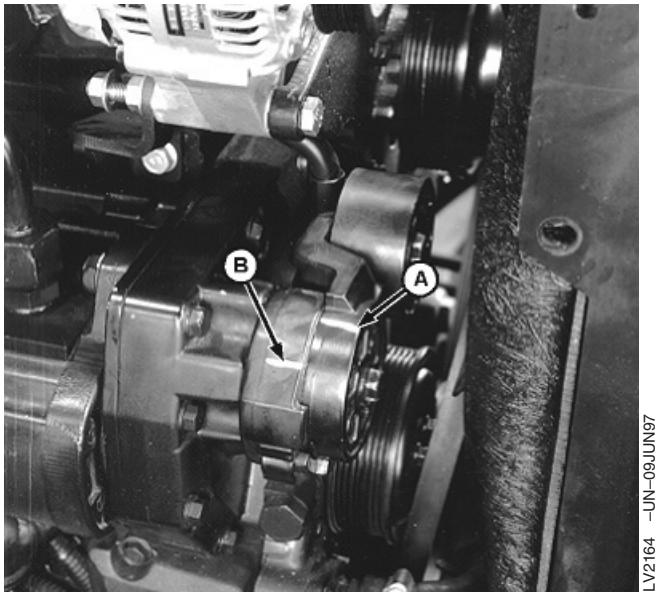
AG,OUO1085,40 –19–04AUG00–1/3

NOTE: A belt tension gauge will not give an accurate measurement of the belt tension when automatic belt tensioner is used. Measure tensioner spring tension using a torque wrench and procedure outlined below.

5. Put a mark (A) on swing arm of tensioner as shown.

6. Measure 21 mm (0.83 in.) from (A) and put a mark (B) on tensioner mounting base.

A—Mark—Swing Arm
B—Mark—Tensioner Mounting Base



LV2164 –UN–09JUN97

AG,OUO1085,40 –19–04AUG00–2/3

7. Rotate the swing arm using a torque wrench until marks (A and B) are aligned.

8. Record torque wrench measurement and compare with specification below. Replace belt tensioner assembly if recorded measurement is under specification.

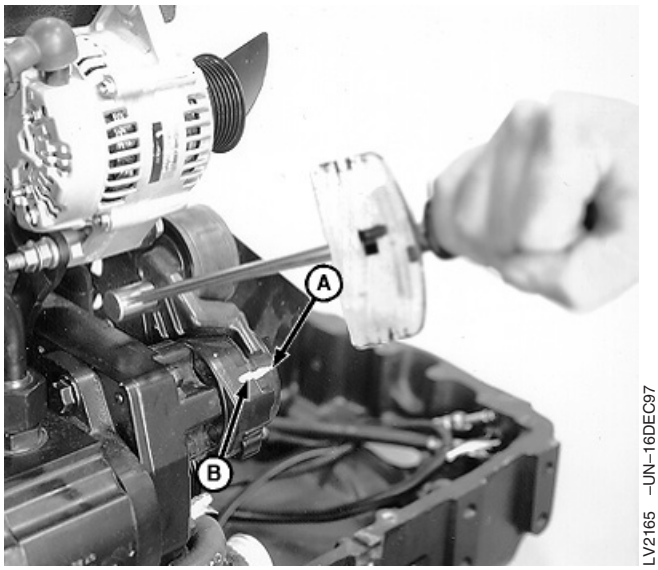
Specification

Belt Tensioner Spring—Tension ..... 18—22 N•m (13—16 lb-ft)

9. Make sure belt is in place and release tension on tensioner arm.

10. Install right-side grille panel.

A—Mark
B—Mark



LV2165 –UN–16DEC97

AG,OUO1085,40 –19–04AUG00–3/3

Section 30
Fuel and Air Repair

Contents

Specifications

Item	Measurement	Specification
Fuel Tank-to-Bracket Screws	Torque	35 N•m (26 lb-ft)
Rear Cab Mounting Nuts	Torque	203 N•m (150 lb-ft)

OUO1080,000023E –19–24JUN02–1/1

Injection Pump, Nozzle and Governor Repair—Use CTM104 or CTM125

For complete repair information the component technical manual (CTM) is also required. Use the component manual in conjunction with this machine manual.

- 3-cylinder 2.9 L engines—Use CTM125
- 4-cylinder 4.5 L engines—Use CTM104

TS225 –UN–17JAN89

AG,OUO1085,43 –19–04AUG00–1/1

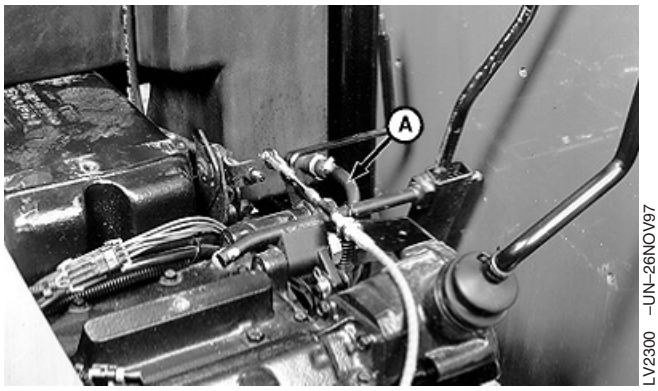
Remove, Inspect and Install Fuel Tank—Without Cab

NOTE: Fuel tank capacity for model series tractors 5210 through 5410 is approximately 68 L (18 U.S. gal). The 5510 series tractor fuel tank capacity is approximately 83 L (22 U.S. gal).

1. Drain fuel tank.
2. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab in Section 90, Group 05.)
3. Remove left-side control console and panel. (See Remove and Install Left-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)

NOTE: Close all openings using caps and plugs to prevent contamination of fuel system.

4. Disconnect fuel supply hose (A). Close all openings using caps and plugs.



LV2300 –UN–26NOV97

A—Fuel Supply Hose

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AG,OUO1085,44 –19–04AUG00–1/5

5. Loosen clamps (A).

6. Disconnect fuel hose (B). Close all openings using caps and plugs.

NOTE: Tag or label wiring leads to aid during installation.

7. Disconnect wiring leads (C).

A—Clamp (2 used)
B—Fuel Hose
C—Wiring Lead (2 used)

LV1903 –UN–19MAY97

AG,OUO1085,44 –19–04AUG00–2/5

30
05
2

8. Remove two screws and nuts (A).

9. Remove two cap screws (B) and nuts (C).

10. Lift retaining strap away from tank and remove fuel tank.

11. Inspect fuel tank for damage. Replace if necessary.

12. Wash tank out with a small amount of fuel to remove any debris.

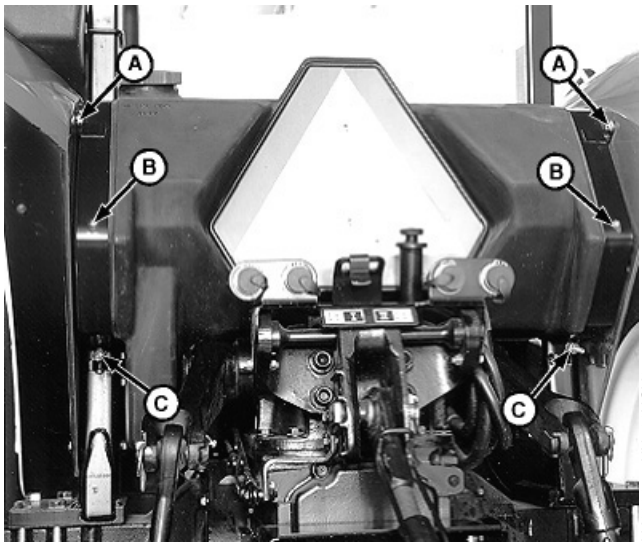
13. Inspect rubber isolator, located between bottom of tank and rockshaft case, for excessive wear or damage. Replace if necessary.

14. Install fuel tank, cap screws, and nuts (A).

15. Install two screws (B) and nuts (C). Tighten to specification.

Specification

Fuel Tank-to-Bracket Screws—
Torque ..... 35 N•m (26 lb-ft)



LV2301 –UN–26NOV97

A—Screw and Nut (2 used)
B—Screw (2 used)
C—Nut (2 used)

Continued on next page

AG,OUO1085,44 –19–04AUG00–3/5

16. Connect wiring leads (C).

17. Connect fuel hose (B) and tighten clamps (A).

A—Clamp (2 used)
B—Fuel Hose
C—Wiring Lead (2 used)

LV1903 –UN–19MAY97

AG,OUO1085,44 –19–04AUG00–4/5

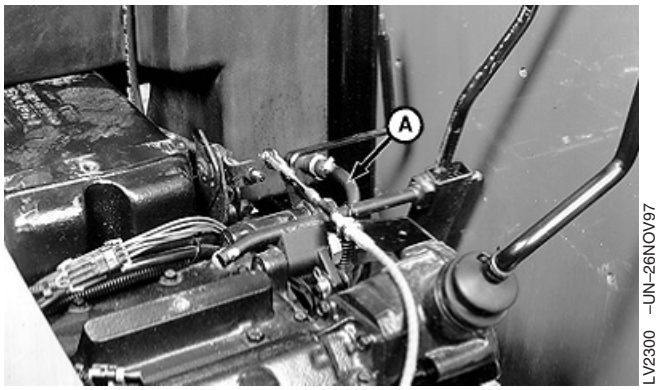
18. Connect fuel supply hose (A).

19. Install left-side control console and panel. (See Remove and Install Left-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)

20. Install seat and support. (See Remove and Install Seat and Support—Tractors Without Cab in Section 90, Group 05.)

21. Fill fuel tank with proper fuel. (See Diesel Fuel Specifications in Section 10, Group 20.)

22. Bleed the fuel system. (See Bleed Fuel System in Section 220, Group 15.)



LV2300 –UN–26NOV97

A—Fuel Supply Hose

AG,OUO1085,44 –19–04AUG00–5/5

Remove, Inspect and Install Fuel Tank—With Cab

NOTE: Fuel tank capacity is approximately 83 L (22 U.S. gal).

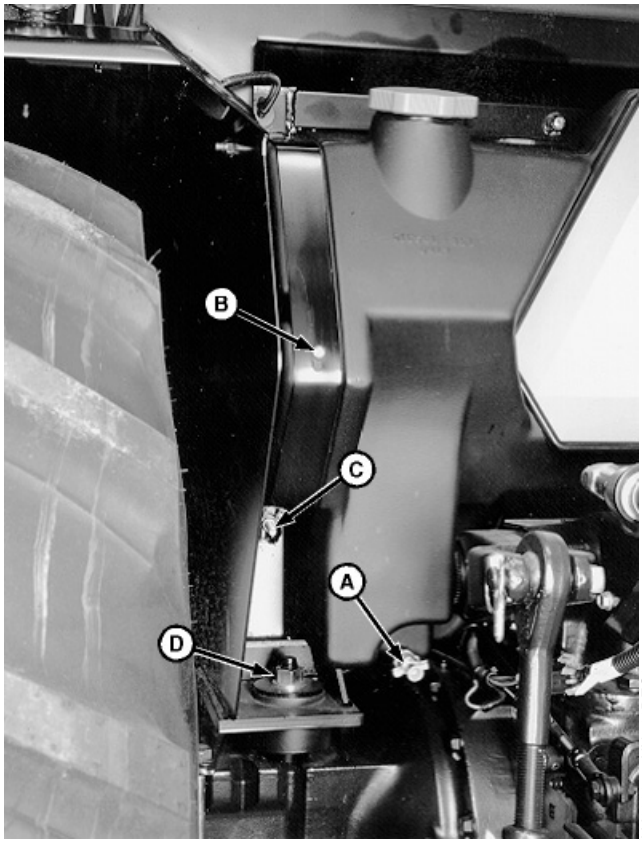
1. Open drain valve (A) and drain fuel tank into proper container. (See Do Not Use Galvanized Containers in Section 10, Group 20.)

2. Remove screw (B) and nut (C) on both sides of fuel tank.

NOTE: Rear of cab must be lifted upward approximately 25.4 mm (1.000 in.) for clearance of fuel tank during removal.

3. Remove rear cab mounting nuts (D) on both sides of cab.

A—Fuel Tank Drain
B—Screw (2 used)
C—Nut (2 used)
D—Nut (2 used)



LV2262 –UN–16DEC97

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AG,OUO1085,45 –19–07AUG00–1/3

4. Remove slow moving vehicle (SMV) emblem (A) and hydraulic oil dipstick (B) to aid during removal and installation of fuel tank.

5. Lower lifting arms (C) and center link (D) to aid during removal and installation of fuel tank.

6. At location in front of left rear axle:

   - Disconnect fuel supply line and fuel return line going to fuel tank. Cap or plug all openings.
   - Cut all tie straps as necessary.

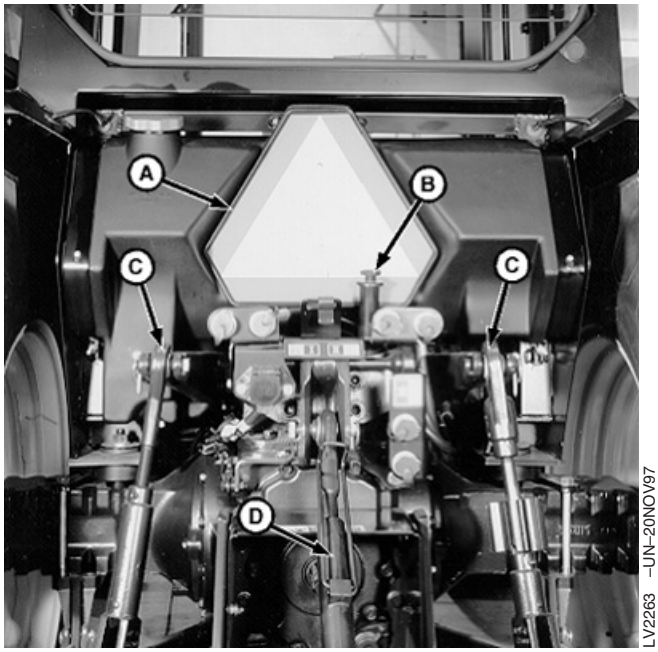
7. At location in front of right rear axle:

   - Disconnect fuel level sender wiring connector.
   - Cut all tie straps as necessary.

8. Using a suitable hoist, raise rear of cab. Remove fuel tank.

9. Inspect fuel tank for damage. Replace if necessary.

10. Wash tank out with a small amount of fuel to remove any debris.



LV2263 –UN–20NOV97

A—SMV Emblem
B—Dipstick
C—Lifting Arm
D—Center Link

Continued on next page

AG,OUO1085,45 –19–07AUG00–2/3

11. Install fuel tank and lower cab.

12. Install nuts (C) and screws (B) on both sides of fuel tank. Tighten screws (B) to specification.

Specification

Fuel Tank-to-Bracket Screws—
Torque ..... 35 N•m (26 lb-ft)

Make sure drain valve (A) is fully closed.

13. Install rear cab mounting nuts (D). Tighten nuts to specification.

Specification

Rear Cab Mounting Nuts—
Torque ..... 203 N•m (150 lb-ft)

14. Install hydraulic oil dipstick and SMV emblem.

15. At location in front of left rear axle:

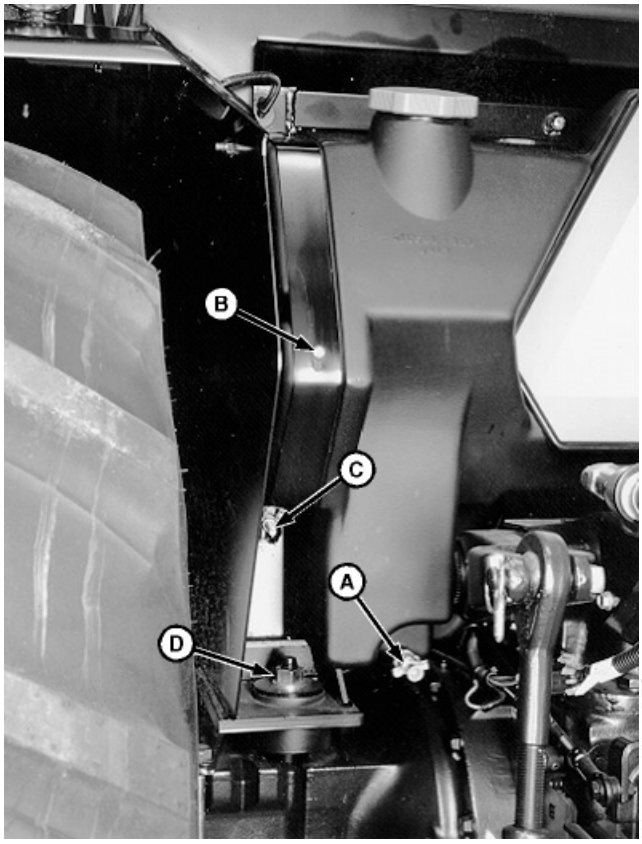
    - Connect fuel supply line and fuel return line going to fuel tank.
    - Install tie straps as necessary.

16. At location in front of right rear axle:

    - Connect fuel level sender wiring connector.
    - Install tie straps as necessary.

17. Fill fuel tank with proper fuel. (See Diesel Fuel Specifications in Section 10, Group 20.)

18. Bleed the fuel system. (See Bleed Fuel System in Section 220, Group 15.)



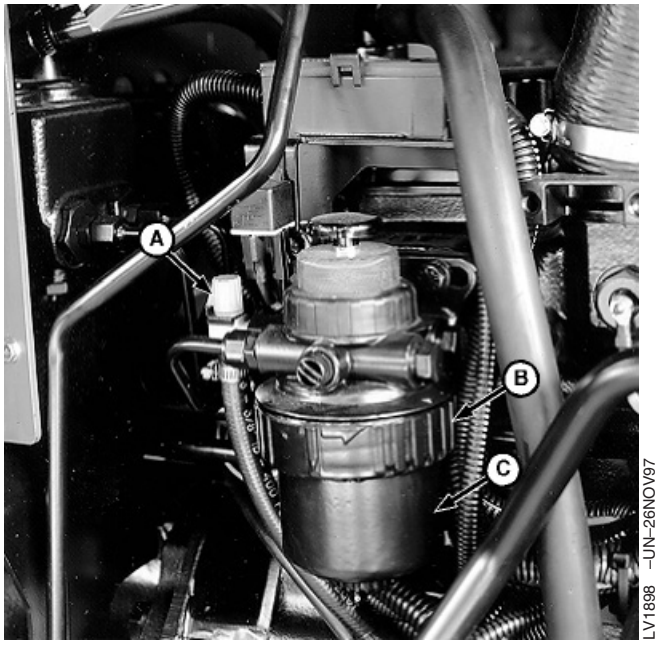
A—Fuel Tank Drain
B—Screw (2 used)
C—Nut (2 used)
D—Nut (2 used)

AG,OUO1085,45 –19–07AUG00–3/3

Replace Fuel Filter—5210 and 5310

1. Turn shut-off valve (A) to off position.
2. Loosen retaining ring (B).
3. Replace filter (C).
4. Tighten retaining ring.
5. Open shut-off valve.
6. Bleed the fuel system. (See Bleed Fuel System in Section 220, Group 15.)

A—Shut-Off Valve
B—Retaining Ring
C—Filter

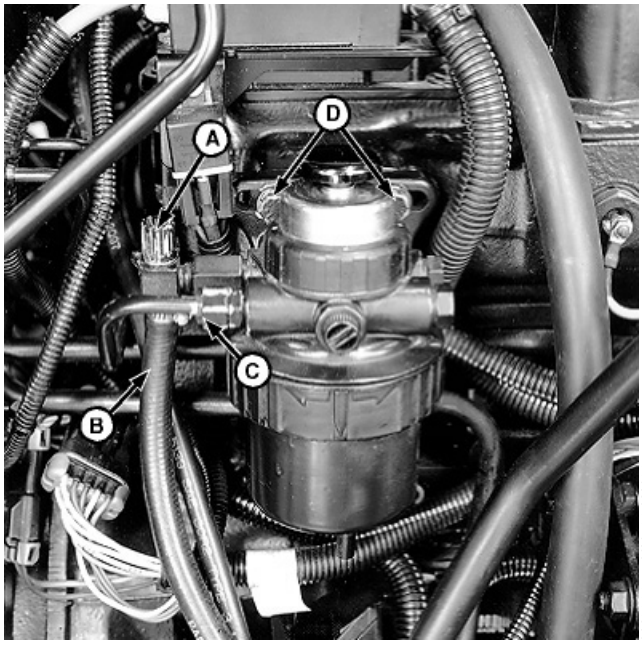


LV1898 –UN–26NOV97

AG,OUO1085,46 –19–07AUG00–1/1

Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310

1. Close fuel shut-off valve (A).
2. Disconnect fuel lines (B and C). Close all openings using caps and plugs.
3. Remove cap screws, lock washers, and flat washers (D). Remove fuel filter/primer pump assembly.
4. Install fuel filter/primer pump assembly, washers and cap screws.
5. Connect fuel lines (B and C).
6. Open fuel shut-off valve (A).
7. Bleed fuel system. (See Bleed Fuel System in Section 220, Group 15.)



LV2361 –UN–28JAN98

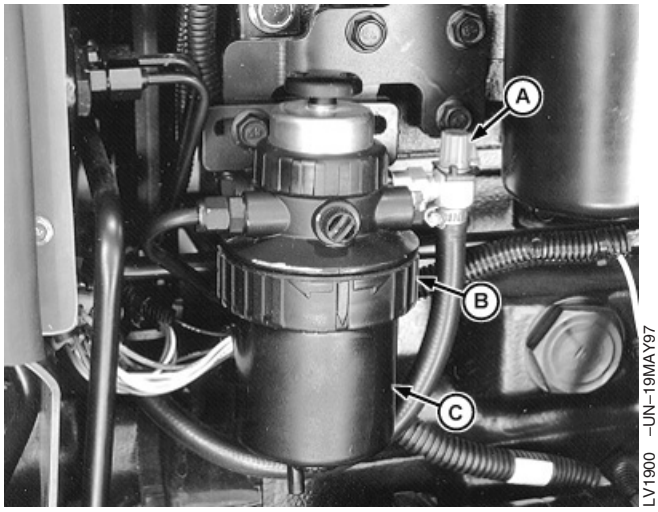
A—Fuel Filter Shut-Off Valve
B—Fuel Line
C—Fuel Line
D—Cap Screw, Lock Washer, and Flat Washer (2 used)

AG,OUO1085,47 –19–07AUG00–1/1

Replace Fuel Filter—5410 and 5510

1. Turn shut-off valve (A) to off position.
2. Loosen retaining ring (B).
3. Replace filter (C).
4. Tighten retaining ring.
5. Open shut-off valve.
6. Bleed the fuel system. (See Bleed Fuel System in Section 220, Group 15.)

A—Shut-Off Valve
B—Retaining Ring
C—Filter

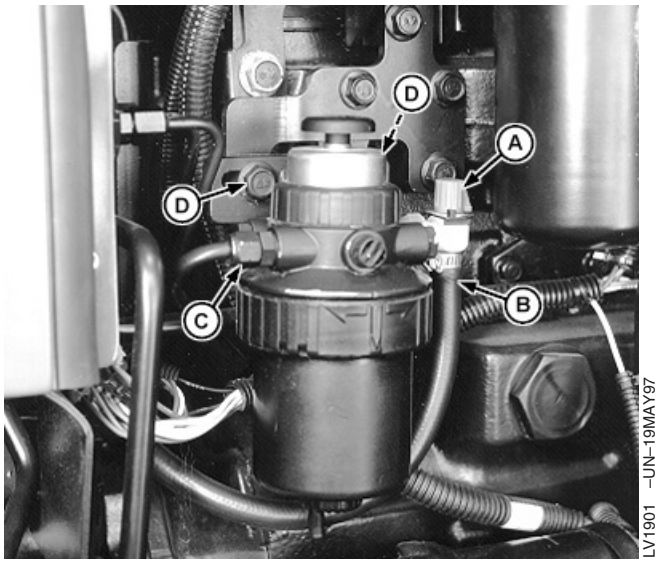


LV1900 –UN–19MAY97

AG,OUO1085,48 –19–07AUG00–1/1

Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510

1. Close fuel shut-off valve (A).
2. Disconnect fuel lines (B and C). Close all openings using caps and plugs.
3. Remove cap screws (D). Remove fuel filter/primer pump assembly.
4. Install fuel filter/primer pump assembly and cap screws.
5. Connect fuel lines.
6. Open fuel shut-off valve.
7. Bleed fuel system. (See Bleed Fuel System in Section 220, Group 15.)



LV1901 –UN–19MAY97

A—Fuel Filter Shut-Off Valve
B—Fuel Line
C—Fuel Line
D—Cap Screw (2 used)

AG,OUO1085,49 –19–07AUG00–1/1

Other Material

Number	Name	Use
R36757 (U.S.)	John Deere Filter Element Cleaner	Cleans filter element

OUO1080,0000241 –19–24JUN02–1/1

Specifications

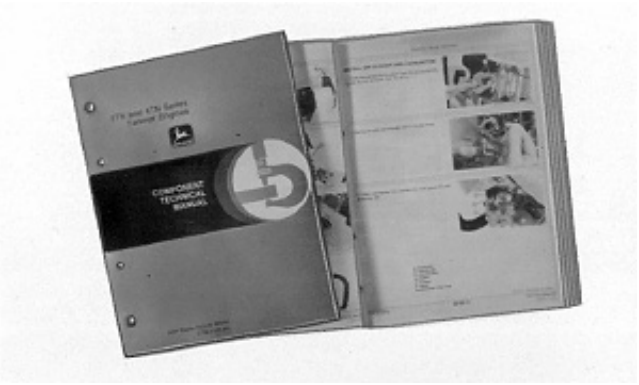
Item	Measurement	Specification
Turbocharger Oil Drain Line	Torque	27 N•m (20 lb-ft)
Turbocharger Oil Inlet Line	Torque	27 N•m (20 lb-ft)
Turbocharger-to-Intake Manifold Cap Screws	Torque	47 N•m (35 lb-ft)
Muffler-to-Turbocharger Clamp	Torque	47 N•m (35 lb-ft)

OUO1080,0000245 –19–24JUN02–1/1

Turbocharger Repair—Use CTM104 or CTM125

For complete repair information the component technical manual (CTM) is also required. Use the component manual in conjunction with this machine manual.

- 3-cylinder 2.9 L engines—Use CTM125
- 4-cylinder 4.5 L engines—Use CTM104



TS225 –UN–17JAN89

AG,OUO1085,50 –19–07AUG00–1/1

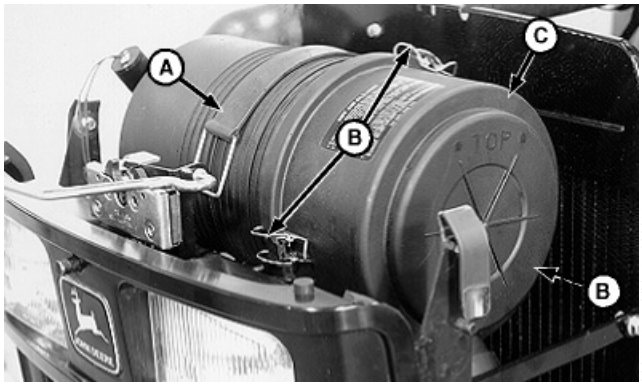
Remove, Inspect, and Install Air Cleaner Elements—5210 and 5310

1. Open hood and remove left-side grille panel.
2. Remove strap (A).
3. Disconnect three retaining clips (B) and remove air cleaner cover (C).
4. Remove primary element (D).

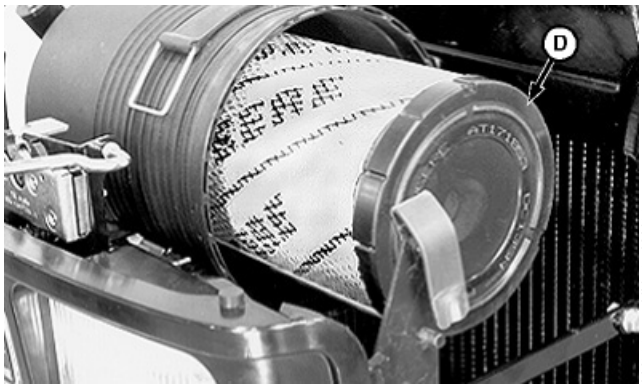
IMPORTANT: Remove secondary safety element (E) ONLY if it is to be replaced. Do not attempt to clean secondary element. Install new element immediately to prevent dust from entering air intake system. Dust can damage internal engine components and turbocharger, if equipped.

5. Replace secondary safety element (E), if dirty or damaged.

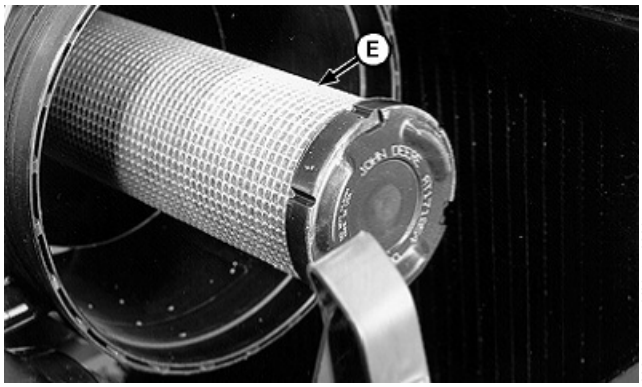
A—Retaining Strap
B—Cover Retaining Clip (3 used)
C—Air Cleaner Cover
D—Primary Element
E—Secondary Element



LV2281 –UN–05JAN98



LV2282 –UN–05JAN98



LV2283 –UN–05JAN98

Continued on next page
AG,OUO1008,230 –19–13OCT99–1/2

6. Pat primary element with your hand, NOT ON HARD SURFACE.

7. If this does not remove dust, use compressed air under 690 kPa (6.9 bar) (100 psi). Direct air up and down the pleats, blowing from inside to outside. Be careful not to make a break in the element.

8. After you clean the primary element, put a lighted bulb inside it. Inspect the element and seal (A) for damage. Throw away an element that has the smallest break. If the seal is broken or cracked install a new element.

IMPORTANT: DO NOT wash element in fuel oil, oil, gasoline, or solvent. DO NOT use compressed air to remove water from an element.

9. Add John Deere R36757 Filter Element Cleaner or an equivalent non-sudsing detergent to water. Move the element up and down in this solution to loosen dirt.

10. Flush with clean water. Use water pressure under 280 kPa (2.80 bar) (40 psi).

IMPORTANT: Air dry element for 24 to 36 hours before installing.

11. Shake the element to remove water. Do not install element in the machine until it is completely dry.

12. Before you install primary element, clean the inside of air cleaner housing and unloader valve with a damp cloth.

13. Install primary element.

14. Install air cleaner cover and retaining strap.

LV2108 –UN–19MAY97

A—Seal (2 used)

AG,OUO1008,230 –19–13OCT99–2/2

Remove, Inspect, and Install Air Cleaner Elements—5410 and 5510

1. Open hood and remove right-side grill panel.
2. Remove air cleaner retaining strap (A).

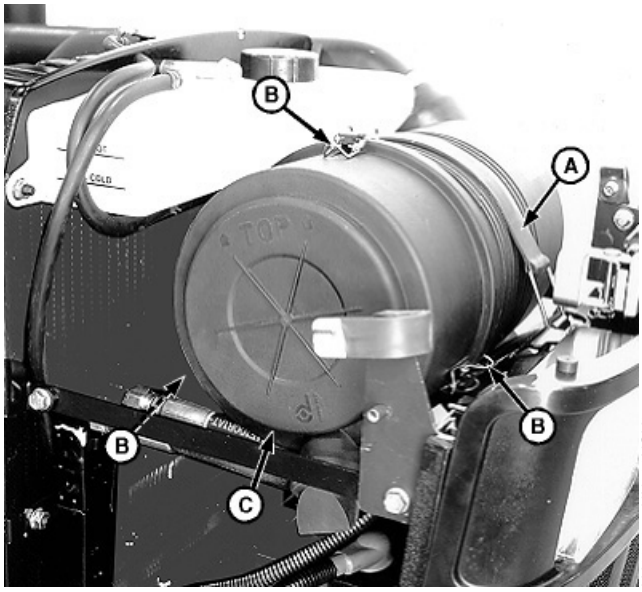
NOTE: Lift up on cover end of air cleaner to aid during release of retaining clips (B) and removal of cover (C).

3. Release three air cleaner cover retaining clips (B) and remove air cleaner cover (C).
4. Remove primary element (D).

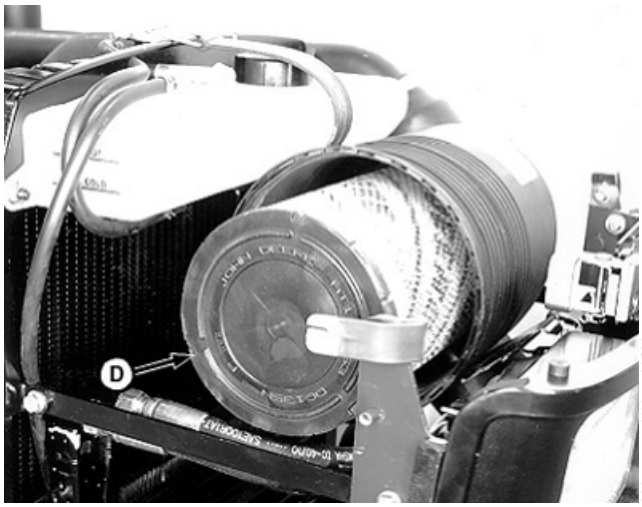
IMPORTANT: Remove secondary safety element (E) ONLY if replacement is necessary. Do not attempt to clean secondary element. Install new element immediately to prevent dust from entering air intake system. Dust can damage internal engine components and turbocharger, if equipped.

5. Replace secondary safety element (E), if dirty or damaged.

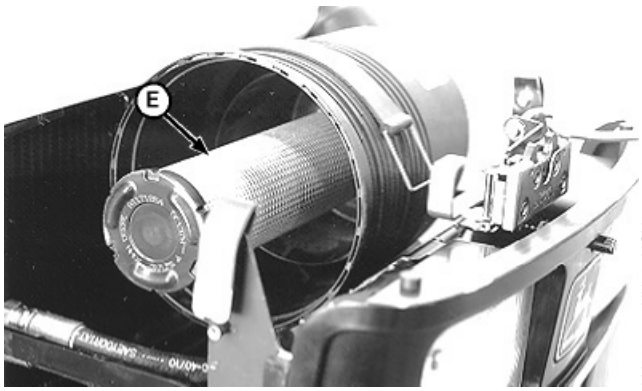
A—Retaining Strap
B—Cover Retaining Clip (3 used)
C—Air Cleaner Cover
D—Primary Element
E—Secondary Element



LV1904 –UN–26NOV97



LV2106 –UN–28NOV97



LV2305 –UN–26NOV97

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AG,OUO1085,51 –19–07AUG00–1/2

6. Pat primary element with the palm of your hand, NOT ON HARD SURFACE.

7. If this does not remove dust, use compressed air under 690 kPa (6.9 bar) (100 psi). Direct air up and down the pleats, blowing from inside to outside. Be careful not to make a break in the element.

8. After you clean the primary element, put a lighted bulb inside it. Inspect the element and seal (A) for damage. Throw away an element that has the smallest break. If the seal is broken or cracked install a new element.

IMPORTANT: DO NOT wash element in fuel oil, oil, gasoline, or solvent. DO NOT use compressed air to remove water from an element.

9. Add John Deere R36757 Filter Element Cleaner or an equivalent non-sudsing detergent to water. Move the element up and down in this solution to loosen dirt.

10. Flush with clean water. Use water pressure under 280 kPa (2.80 bar) (40 psi).

IMPORTANT: Air dry element for 24 to 36 hours before installing.

11. Shake the element to remove water. Do not install element in the machine until it is completely dry.

12. Before you install primary element, clean the inside of air cleaner housing and unloader valve with a damp cloth.

13. Install primary element.

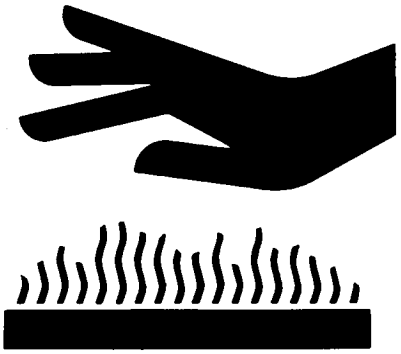
14. Install air cleaner cover and retaining strap.

LV2108 –UN–19MAY97

A—Seal (2 used)

AG,OUO1085,51 –19–07AUG00–2/2

Remove Turbocharger—5310



TS271 –UN–23AUG88

CAUTION: Turbocharger may be hot. Allow turbocharger to cool before removal. Hot turbocharger can cause serious burns.

IMPORTANT: Do not clean exterior of turbocharger if inspection is required. Cleaning can remove evidence for failure analysis.

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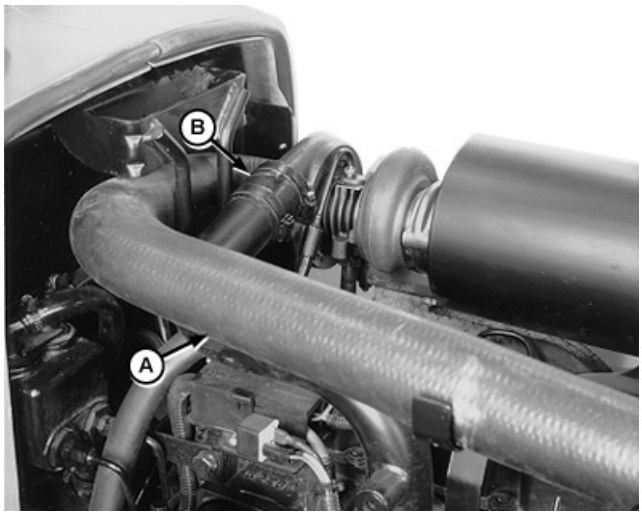
10
6

NOTE: Hood removed for clarity of photo.

1. Disconnect air intake hose (A) from turbocharger.
2. Disconnect air intake pipe (B). Close all openings using caps and plugs.

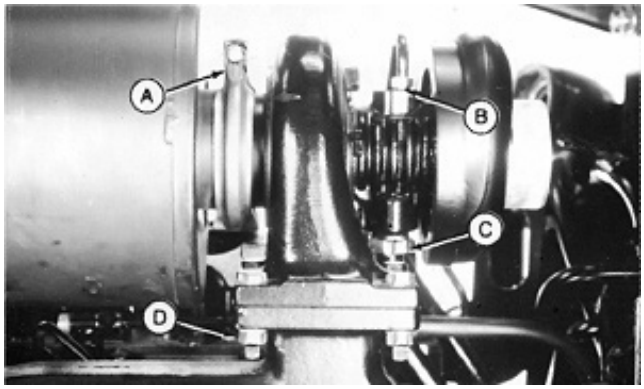
A—Air Intake Hose
B—Air Intake Pipe



LV2109 –UN–19MAY97

AG,OUO1085,52 –19–07AUG00–1/2

3. Remove cap screw from clamp (A).
4. Disconnect lines (B and C). Close all openings using caps and plugs.
5. Remove four cap screws, lock washers, and nuts (D).
6. Remove turbocharger and gasket. Close all openings using caps and plugs.
7. Make repairs as necessary. (See CTM104 or CTM125.)



LV384 –UN–25FEB92

A—Muffler Clamp
B—Oil Inlet Line
C—Oil Drain Line
D—Cap Screw, Lock Washer, and Nut (4 used)

AG,OUO1085,52 –19–07AUG00–2/2

Install Turbocharger—5310

1. Install clamp (A) on muffler flange.
2. Install new gasket between manifold and turbocharger.
3. Install four cap screws, lock washers, and nuts (D). Leave nuts loose.
4. Connect oil drain line (C). Tighten to specification.

Specification

Turbocharger Oil Drain Line—
Torque ..... 27 N•m (20 lb-ft)

5. Fill oil line inlet port (B) with clean engine oil. Rotate turbine wheel by hand to lubricate bearings.
6. Connect oil inlet line (B). Tighten to specification.

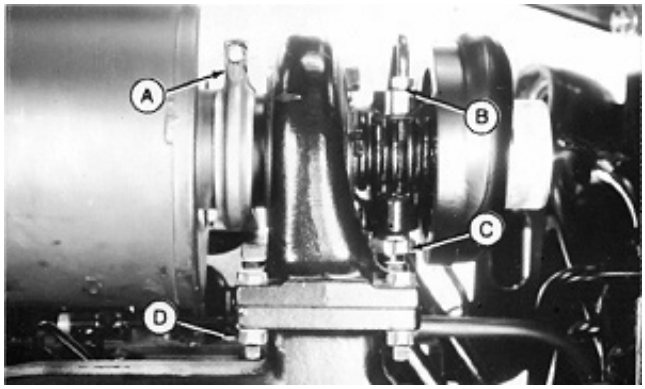
Specification

Turbocharger Oil Inlet Line—
Torque ..... 27 N•m (20 lb-ft)

7. Tighten cap screw in clamp (A).
8. Tighten cap screws (D) to specification.

Specification

Turbocharger-to-Intake Manifold
Cap Screws—Torque ..... 47 N•m (35 lb-ft)



LV384 –UN–25FEB92

A—Muffler Clamp
B—Oil Inlet Line
C—Oil Drain Line
D—Cap Screw, Lock Washer, and Nut (4 used)

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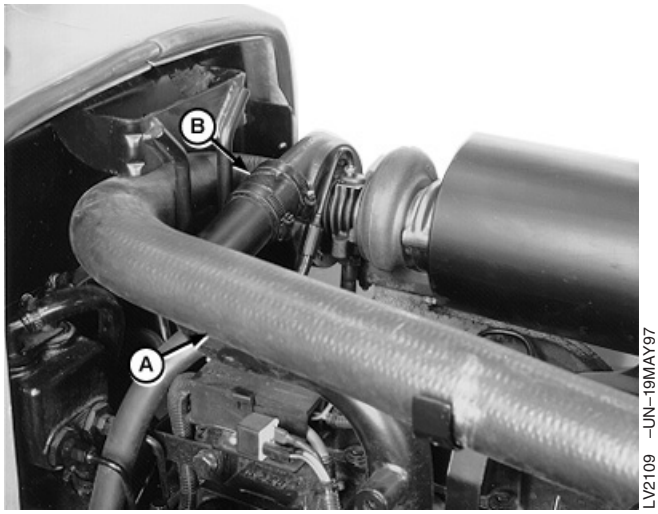
7

AG,OUO1085,55 –19–07AUG00–1/2

IMPORTANT: With the greatest suction force occurring between air cleaner and turbocharger, ensure that hose connections are tight to prevent entry of dirt into the system.

9. Connect air intake pipe (B).
10. Connect air intake hose (A).
11. Perform turbocharger break-in. (See Turbocharger Break-In in this group.)

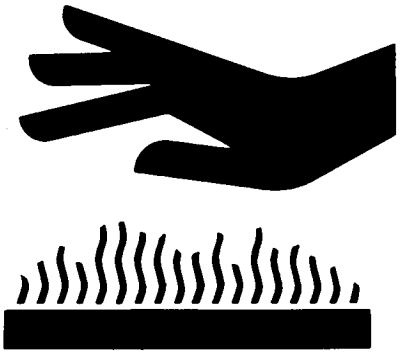
A—Air Intake Hose
B—Air Intake Pipe



LV2109 –UN–19MAY97

AG,OUO1085,55 –19–07AUG00–2/2

Remove Turbocharger—5510



TS271 –UN–23AUG88

CAUTION: Turbocharger may be hot. Allow turbocharger to cool before removal. Hot turbocharger can cause serious burns.

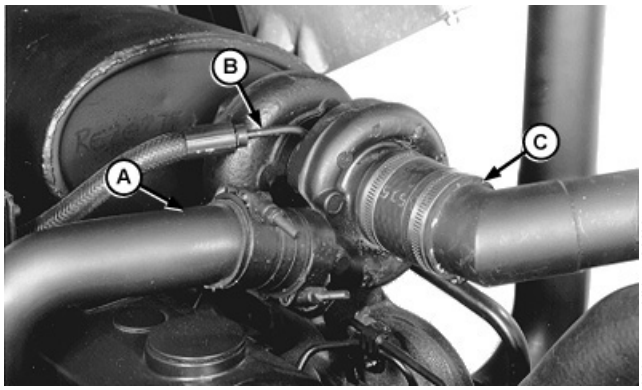
IMPORTANT: Do not clean exterior of turbocharger if inspection is required. Cleaning can remove evidence for failure analysis.

NOTE: Tractor without cab shown. Procedure with cab is the same.

1. Raise hood and remove left-hand hood side shield.

NOTE: Close all openings using caps and plugs to prevent contamination.

2. Remove air intake tube (A).
3. Disconnect oil inlet line (B).
4. Remove air intake tube (C).



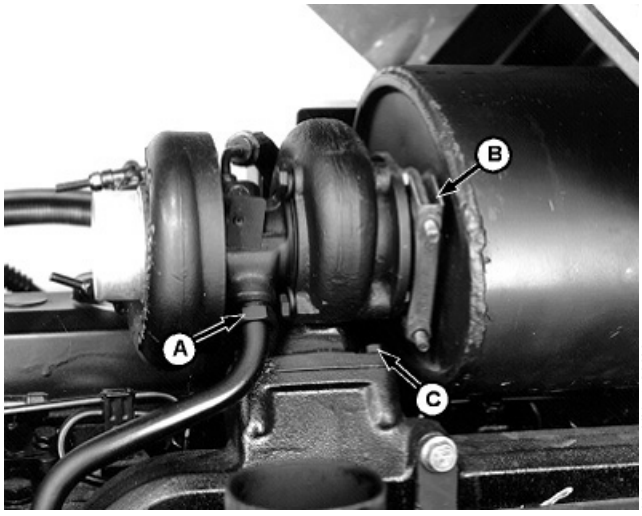
LV2110 –UN–19MAY97

A—Air Intake Tube
B—Oil Inlet Line
C—Air intake Tube

AG,OUO1085,56 –19–07AUG00–1/2

NOTE: Exhaust stack removed for clarity of photo.

5. Remove oil drain line (A), muffler clamp (B), and four cap screws (C).
6. Remove turbocharger from intake manifold. Remove and discard gasket. Seal intake manifold opening to prevent entry of dirt.
7. Make repairs as necessary. (See CTM104 or CTM125.)



LV2111 –UN–14MAY97

A—Oil Drain Line
B—Muffler Clamp
C—Cap Screw (4 used)

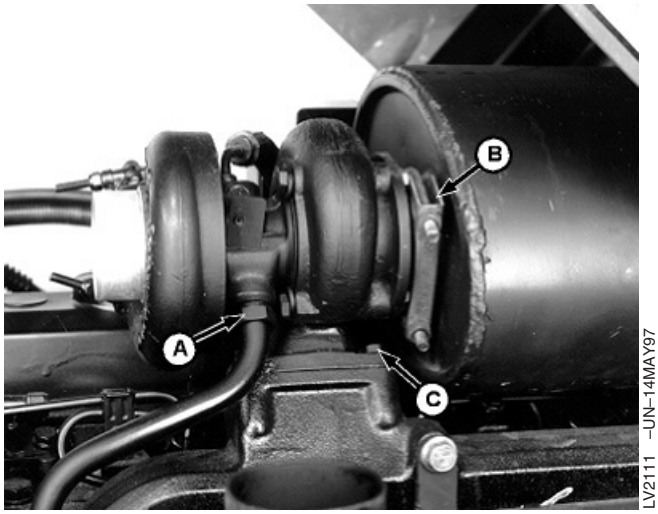
AG,OUO1085,56 –19–07AUG00–2/2

Install Turbocharger—5510

NOTE: Exhaust stack removed for clarity of photo.

1. Install new gasket and turbocharger on intake manifold.
2. Install four cap screws (C), muffler clamp (B), and oil drain line (A). Tighten to specifications.

Specification	
Turbocharger Oil Drain Line—Torque	27 N•m (20 lb-ft)
Muffler Clamp—Torque	47 N•m (35 lb-ft)
Turbocharger-to-Intake Manifold Cap Screws—Torque	47 N•m (35 lb-ft)



LV2111 –UN–14MAY97

A—Oil Drain Line
B—Muffler Clamp
C—Cap Screw (4 used)

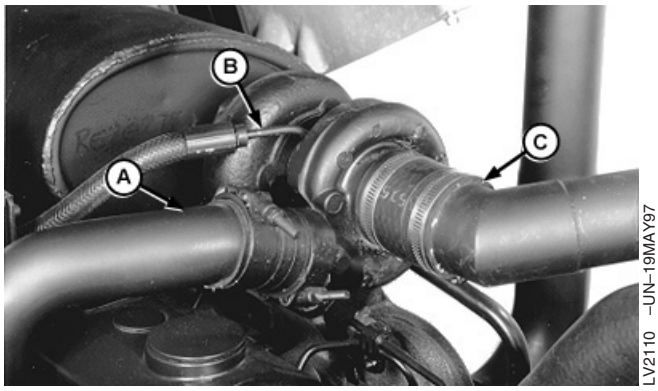
AG,OUO1085,57 –19–07AUG00–1/2

3. Fill turbocharger with clean engine oil through opening in top of turbocharger. Rotate turbine wheel by hand to lubricate bearings.
4. Connect oil inlet line (B). Tighten to specification.

Specification	
Turbocharger Oil Inlet Line—Torque	27 N•m (20 lb-ft)

IMPORTANT: With the greatest suction force occurring between air cleaner and turbocharger, ensure that hose connections are tight to prevent entry of dirt into the system.

5. Connect air intake tubes (A and C). Tighten securely.
6. Install left-hand hood side shield.
7. Perform turbocharger break-in. (See Turbocharger Break-In in this group.)



LV2110 –UN–19MAY97

A—Air Intake Tube
B—Oil Inlet Line
C—Air Intake Tube

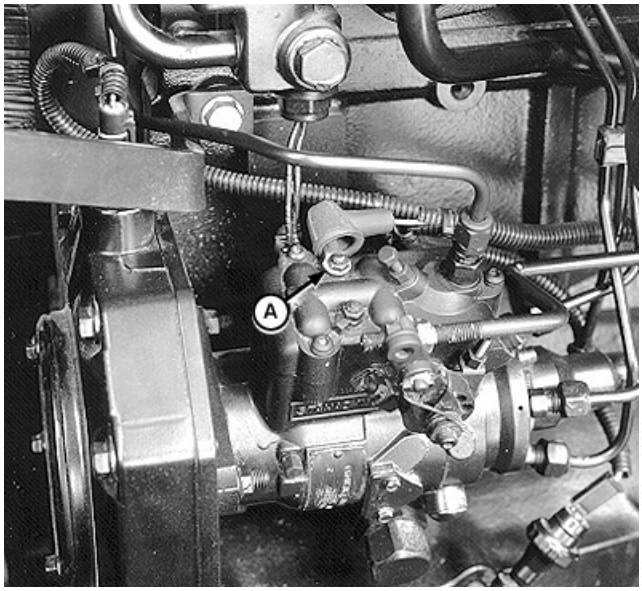
AG,OUO1085,57 –19–07AUG00–2/2

Turbocharger Break-In

IMPORTANT: A new or repaired turbocharger does not have an adequate oil supply for initial start-up of engine. Perform the steps below to prevent damage to turbocharger bearings.

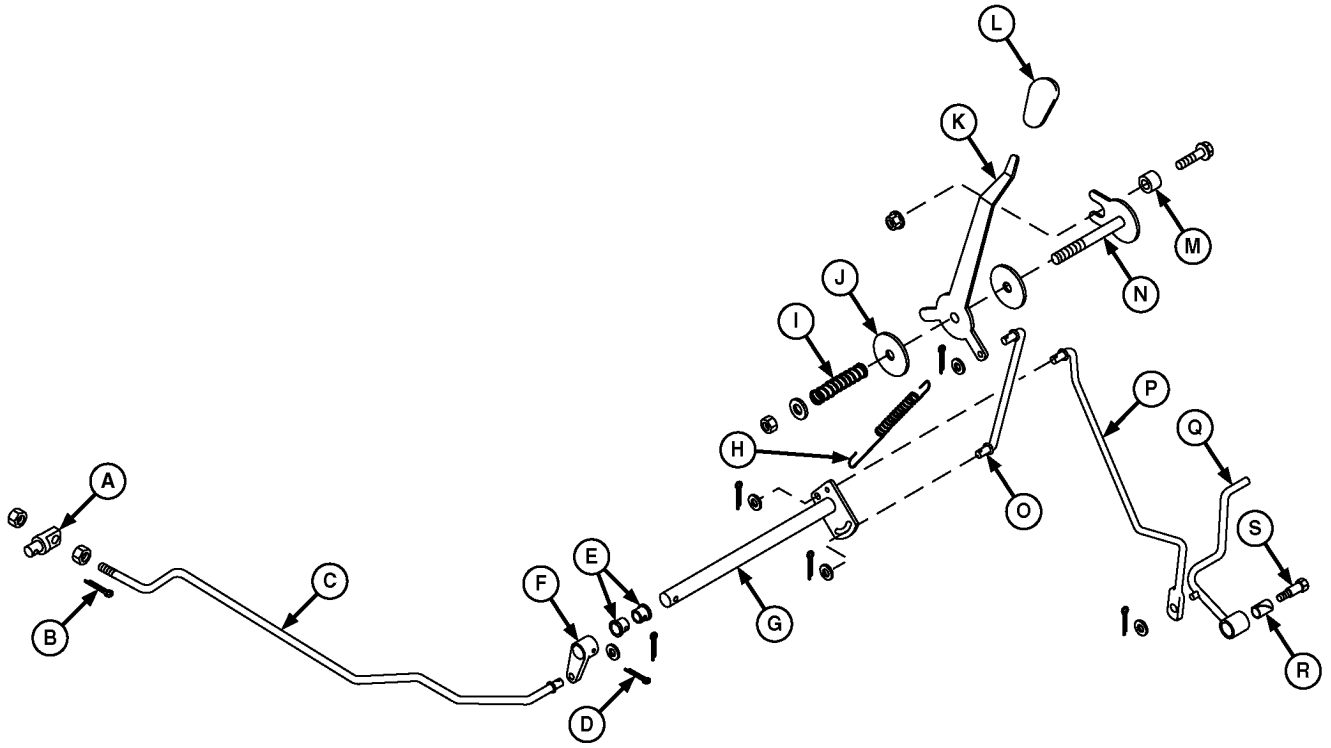
1. Disconnect wire lead (A) from fuel shut-off solenoid at injection pump.
2. Crank engine over with starting motor for 10 seconds. DO NOT crank engine longer than 30 seconds at a time to avoid damage to starting motor.

A—Wire Lead



AG,OUO1085,58 –19–07AUG00–1/1

Inspect and Repair Speed Control Linkage—Without 540/540E PTO



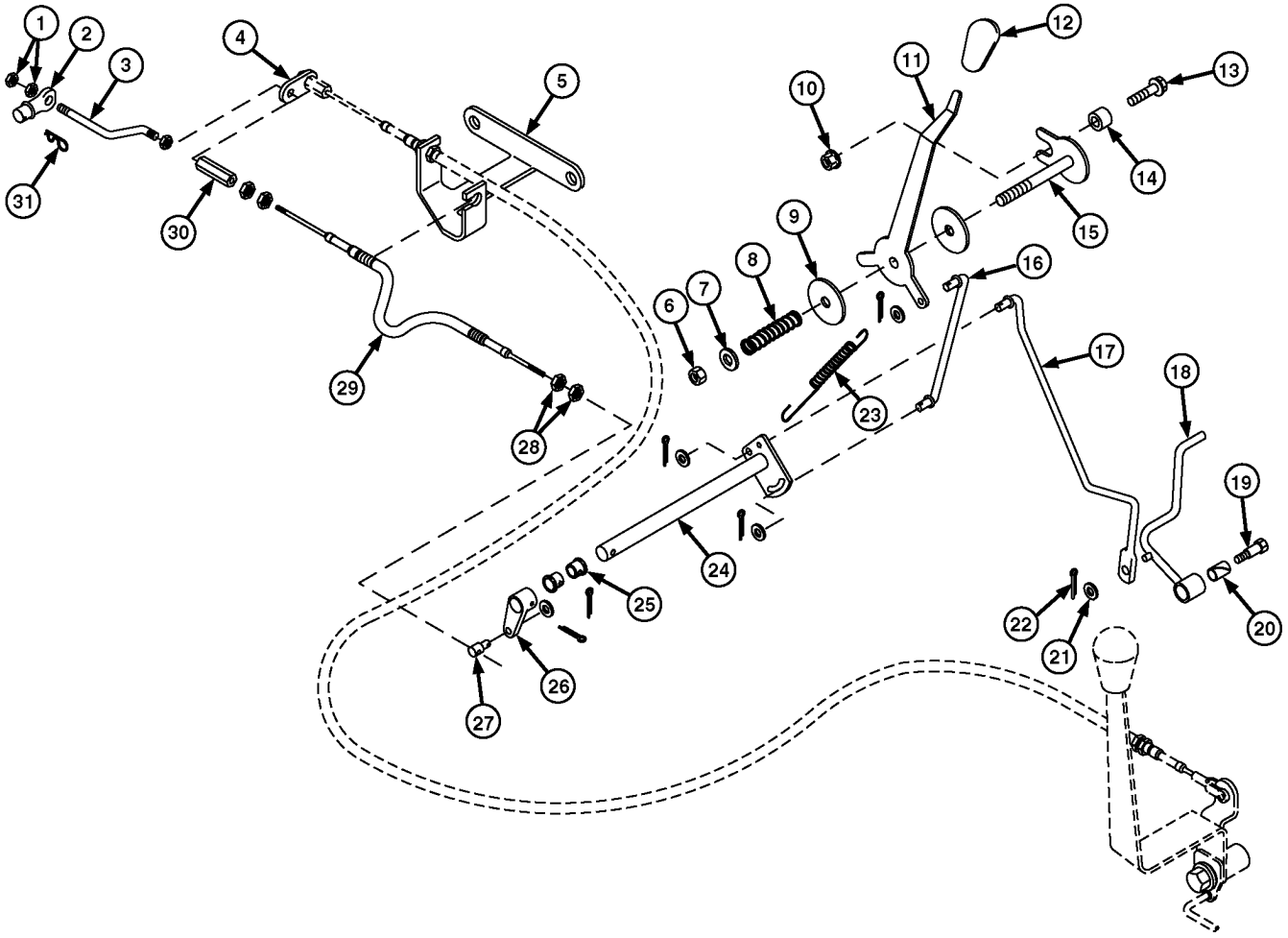
LV2113 –UN–09JUN97

A—Swivel
B—Cotter Pin (6 used)
C—Linkage Rod
D—Spring Pin
E—Nylon Split Bushing
F—Lever
G—Rod
H—Extension Spring
I—Adjustment Spring
J—Washer (2 used)
K—Throttle Lever
L—Knob
M—Bushing
N—Plate
O—Linkage Rod
P—Linkage Rod
Q—Foot Pedal
R—Nylon Split Bushing
S—Shoulder Bolt

1. Remove dash side panels.
2. Remove right-hand step plate on tractors without cab.
3. Inspect parts for wear or damage. Replace as necessary.
4. Adjust throttle lever. (See Throttle Lever Adjustment in Section 220, Group 15.)
5. Install step plate, if removed.
6. Install dash side panels.
7. Adjust fast and slow idle. (See Slow Idle Adjustment and Fast Idle Adjustment in Section 220, Group 15.)

AG,OUO1085,59 –19–07AUG00–1/1

Inspect and Repair Speed Control Linkage—With 540/540E PTO



1—Nut (3 used)
2—Swivel
3—Linkage Rod
4—Adjustment Stop
5—Control Bracket
6—Tension Nut
7—Washer
8—Tension Spring
9—Washer (2 used)
10—Nut
11—Throttle Lever
12—Knob
13—Cap Screw
14—Bushing
15—Plate
16—Linkage Rod
17—Linkage Rod
18—Foot Pedal
19—Shoulder Bolt
20—Nylon Split Bushing
21—Washer (5 used)
22—Cotter Pin (6 used)
23—Extension Spring
24—Lever
25—Nylon Split Bushing
26—Lever
27—Swivel
28—Nut (4 used)
29—Control Cable
30—Adjustment Nut
31—Locking Pin

1. Remove dash side panels.
2. Remove right-hand step plate on tractors without cab.
3. Inspect parts for wear or damage. Replace as necessary.
4. Adjust throttle lever. (See Throttle Lever Adjustment in Section 220, Group 15.)
5. Install step plate, if removed.
6. Install dash side panels.

Continued on next page

AG,OUO1085,60 –19–07AUG00–1/2

7. Adjust fast and slow idle. (See Slow Idle Adjustment and Fast Idle Adjustment in Section 220, Group 15.)

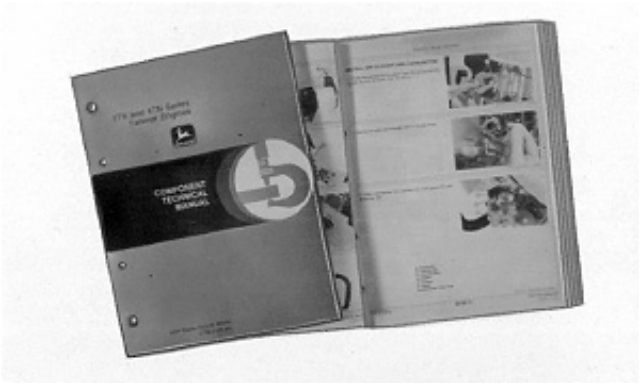
AG,OUO1085,60 –19–07AUG00–2/2

Section 40
Electrical Repair

Contents

Starter Repair—Use CTM77

For complete repair information the component technical manual (CTM) is also required. Use the component technical manual in conjunction with this machine manual.



TS225 –UN–17JAN89

LV,4005HA,A1 –19–08JUN94–1/1

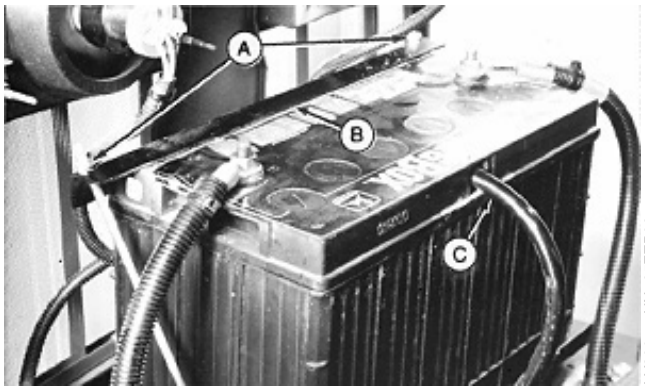
Remove and Install Battery—Tractors Without Cab

TS204 –UN–23AUG88

CAUTION: Keep all sparks and flames away from batteries, as gas given off by electrolyte is explosive. To avoid sparks, connect ground cable last and disconnect it first.

To avoid shocks and burns, disconnect battery ground cable before servicing any part of electrical system.

NOTE: Air cleaner removed for illustration purposes only.



LV390 –UN–25FEB92

A—Nut
B—Hold-Down Bracket
C—Vent Tube

1. Remove side grille panels.
2. Disconnect negative (–) first, then positive (+), battery cables.
3. Loosen nuts (A) and rotate hold-down bracket (B) away from battery.
4. Disconnect vent tube (C).
5. Remove battery. Clean and service as necessary.
6. Install battery.
7. Connect vent tube.
8. Install hold-down bracket and tighten nuts.
9. Connect positive (+) then negative (–) cables.
10. Apply petroleum jelly on battery terminals.
11. Install grille panels.

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05
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AG,OUO1085,61 –19–07AUG00–1/1

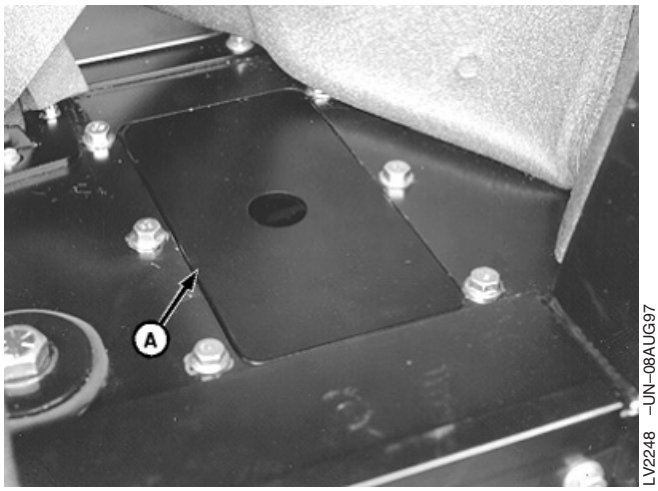
Remove and Install Battery—Tractors With Cab

TS204 –UN–23AUG88

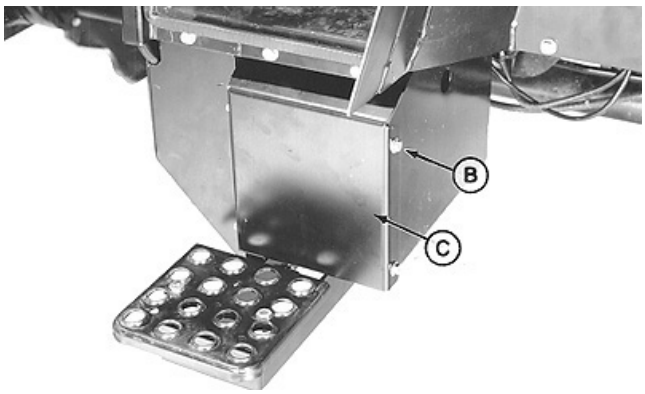
CAUTION: Keep all sparks and flames away from batteries, as gas given off by electrolyte is explosive. To avoid sparks, connect ground cable last and disconnect it first.

To avoid shocks and burns, disconnect battery ground cable before servicing any part of electrical system.

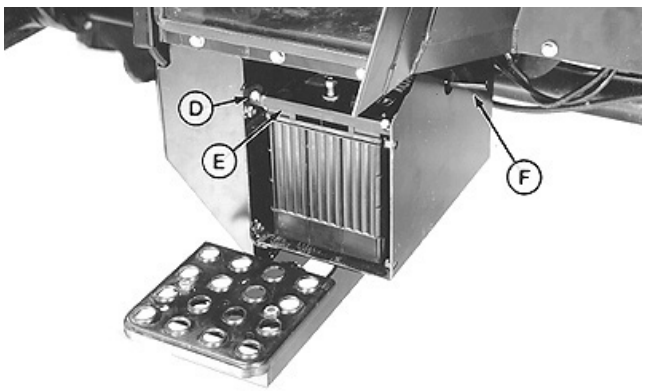
1. Remove one screw between clutch pedal and center floor cover. Pull back left side floor mat to expose battery access floor plate (A).
2. Remove floor plate (A).
3. Disconnect negative (–) first, then positive (+), battery cables.
4. Remove four cap screws (B) and cover (C).
5. Remove two nuts (D) and hold-down bracket (E).
6. Disconnect vent tube (F).
7. Remove battery. Clean and service as necessary.
8. Install battery.
9. Connect vent tube.
10. Install hold-down bracket and tighten nuts.
11. Connect positive (+) then negative (–) cables.
12. Apply petroleum jelly on battery terminals.
13. Install battery box cover and floor access plate.



LV2248 –UN–08AUG97



LV1386 –UN–05DEC95



LV1387 –UN–05DEC95

A—Floor Plate
B—Cap Screw (4 used)
C—Battery Box Cover
D—Nut (2 used)
E—Bracket
F—Vent Tube

Continued on next page

AG,OUO1085,62 –19–07AUG00–1/2

14. Position floor mat and install screw in center floor panel.

AG,OUO1085,62 –19–07AUG00–2/2

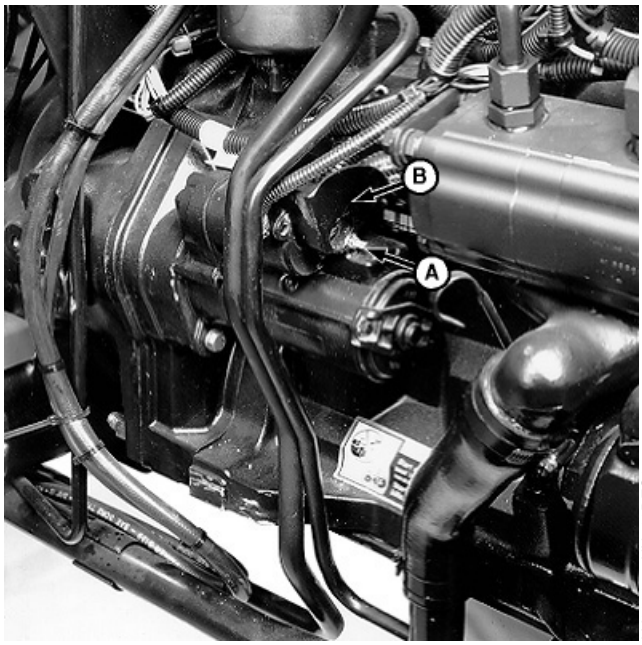
Remove and Install Starter—5210 and 5310

NOTE: Tractor without cab air conditioning shown.

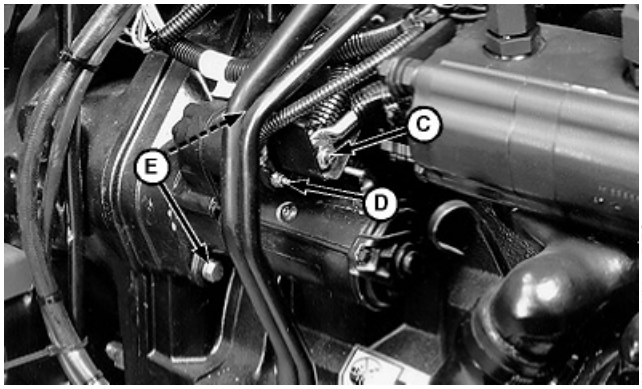
1. Remove right front grille panel.
2. Disconnect negative (–) battery cable.

NOTE: If equipped with air conditioning, cut all tie straps as necessary and move air conditioning lines away from starter.

3. Remove nut (A) and cover (B).
4. Disconnect cables at stud (C).
5. Disconnect wire lead at stud.
6. Remove cap screws and lock washers (E).
7. Remove starter.
8. Make repairs as necessary. (See CTM77.)
9. Install starter using cap screws and lock washers (E).
10. Connect wire lead to stud (D).
11. Install cover.
12. Connect cables at stud (C). Install cover (B) and nut (A).
13. Connect negative (–) battery cable and install front grille panel.



LV2320 –UN–16DEC97



LV2321 –UN–16DEC97

A—Nut
B—Cover
C—Starter Solenoid "B" Stud
D—Starter Solenoid "S" Stud
E—Cap Screws and Lock Washers

AG,OUO1085,63 –19–08AUG00–1/1

Remove and Install Starter—5410 and 5510

NOTE: Tractor with cab air conditioning shown.

1. Remove right front grille panel.
2. Disconnect battery negative (–) cable.

NOTE: Close all openings using caps and plugs to prevent contamination.

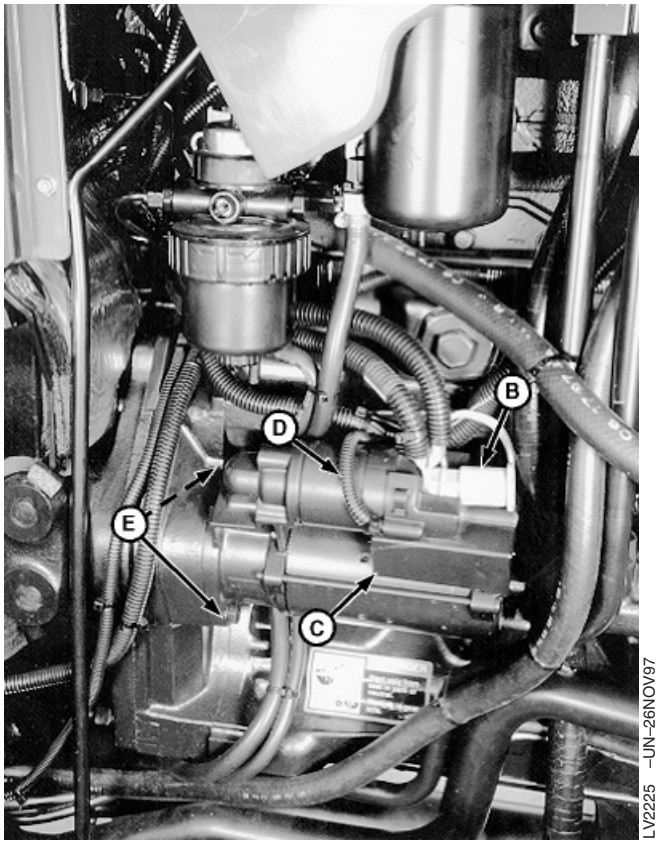
3. Disconnect line (A) at hydraulic pump. Move line away from starter.

NOTE: If equipped with air conditioning, cut all tie straps as necessary and move air conditioning lines away from starter.

4. Disconnect cables at stud (B).
5. Remove cover (C).
6. Disconnect wiring lead (D).
7. Remove cap screws and lock washer (E).
8. Remove starter.
9. Make repairs as necessary. (See CTM77.)
10. Install starter using cap screws and lock washers (E).
11. Connect wiring lead (D).
12. Install cover (C).
13. Connect cables at stud (B).
14. Connect hydraulic line (A).
15. Install new wire ties as necessary.
16. Connect battery negative (–) cable and install grille panel.

A—Hydraulic Pump-to-Inlet Housing Supply Line
B—Starter Solenoid "B" Stud
C—Cover
D—Wire Lead
E—Cap Screws and Lock Washers

LV2224 –UN–26NOV97

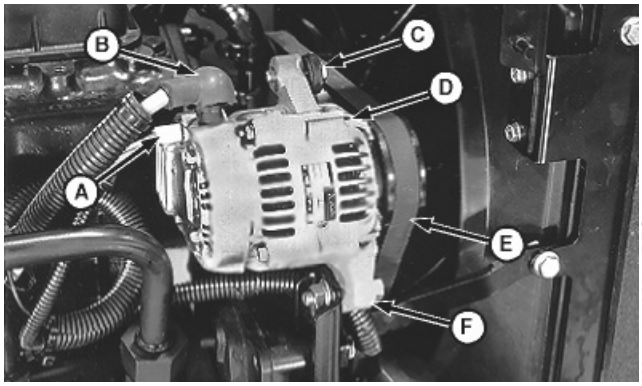


LV2225 –UN–26NOV97

AG,OUO1085,64 –19–08AUG00–1/1

Replace Alternator/Regulator—40 Amp Without Cab

1. Remove right grille panel.
2. Disconnect negative (–) cable at battery.
3. Disconnect wiring connector (A) and cable (B).
4. Loosen cap screws (C and F).
5. Move alternator/regulator (D) towards engine. Lift belt (E) off pulley.
6. Remove adjustment and pivot cap screws.
7. Replace alternator/regulator.
8. Install cap screws.
9. Adjust belt tension. (See Fan/Alternator V-Belt Adjustment (5210 and 5310) in Section 220, Group 15.)
10. Connect wiring connector and cable.
11. Connect negative (–) cable at battery.
12. Install right grille panel.



LV2322 –UN–16DEC97

A—Wiring Connector
B—Cable
C—Adjustment Cap Screw
D—Alternator/Regulator
E—Belt
F—Pivot Cap Screw

AG,OUO1085,67 –19–08AUG00–1/1

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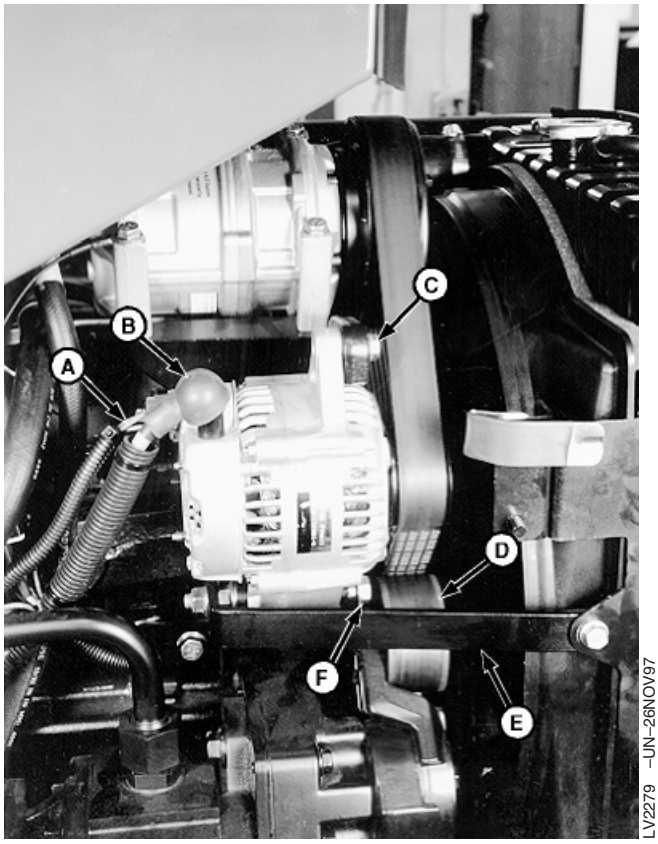
05
6

Replace Alternator/Regulator—60 and 65 Amp with Cab

1. Remove right grille panel.
2. Disconnect negative (–) cable at battery.
3. Disconnect wiring connector (A) and cable (B).
4. Remove bracket (E).
5. Put a wrench on upper pulley of belt tensioner (D) and turn tensioner counterclockwise to relieve belt tension. Remove belt from alternator/regulator pulley.
6. Remove cap screws (C and F).
7. Replace alternator/regulator.
8. Install cap screws (C and F).
9. Install belt on alternator pulley.
10. Connect wiring connector (A) and cable (B).
11. Install bracket (E).
12. Connect negative (–) cable at battery.
13. Install right grille panel.



A—Wiring Connector
B—Cable
C—Cap Screw
D—Upper Tensioner Pulley
E—Bracket
F—Cap Screw

AG,OUO1085,68 –19–08AUG00–1/1

Specifications

Item	Measurement	Specification
Fuel Tank Retaining Strap Nut	Torque	35 N•m (26 lb-ft)
Rear Cab Mounting Nuts	Torque	203 N•m (150 lb-ft)

OUO1010,0000561 –19–24JUL02–1/1

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

OUO1010,0000564 –19–24JUL02–1/2

Special Socket JDG465

Engine Oil Pressure Switch

OUO1010,0000564 –19–24JUL02–2/2

Other Material

Number	Name	Use
TY9375 (U.S.) TY9480 (Canadian) 592 (LOCTITE®)	Pipe Sealant	Apply to threads of air restriction switch. Apply to threads of coolant temperature sender.
T43512 (U.S.) TY9473 (Canadian) 242 LOCTITE® (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to threads of engine oil pressure switch.

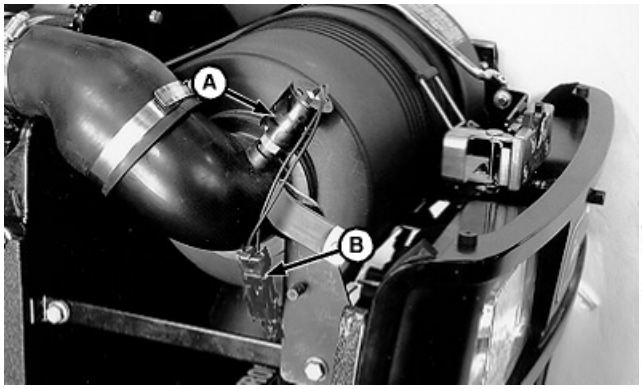
LOCTITE is a registerd trademark of Loctite Corp.

OUO1010,0000565 –19–24JUL02–1/1

Replace Air Filter Restriction Switch—5210 and 5310

NOTE: Right grille panel removed for illustration purposes only.

1. Disconnect wiring connector (B) and remove switch (A).
2. Apply pipe sealant with TEFLON® tape to threads of switch before installation.
3. Install air filter restriction switch.
4. Connect wiring connector.



A—Air Filter Restriction Switch

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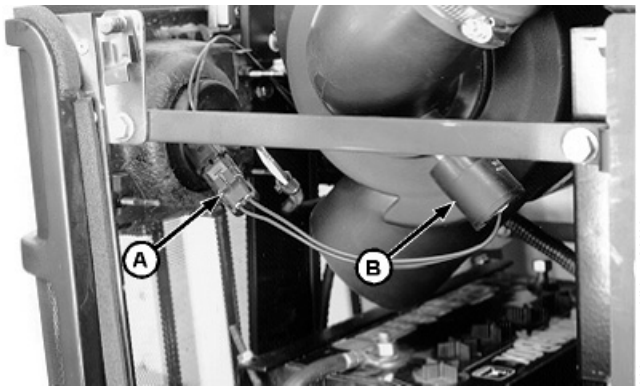
10
2

TEFLON is a registered trademark of Du Pont Co.

AG,OUO1085,70 –19–08AUG00–1/1

Replace Air Filter Restriction Switch—5410 and 5510

1. Remove left grille panel.
2. Disconnect wiring connector (A) and remove switch (B).
3. Apply pipe sealant with TEFLON® tape to threads of switch before installation.
4. Install air filter restriction switch.
5. Connect wiring connector.



A—Wiring Connector
B—Air Filter Restriction Switch

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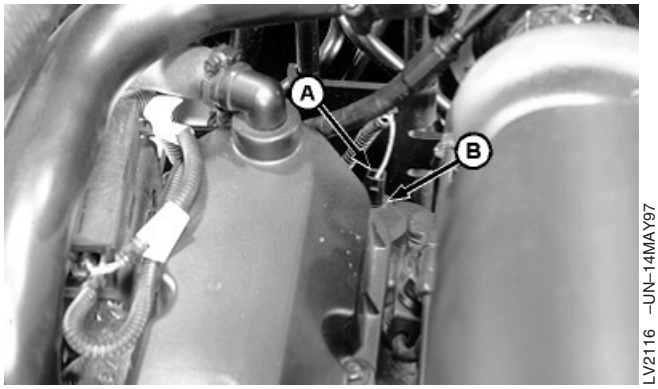
AG,OUO1085,71 –19–08AUG00–1/1

Replace Coolant Temperature Sender—5210 and 5310

NOTE: In 5210 and 5310 model tractors the coolant temperature sender is located at the left hand rear corner on top of cylinder head.

1. Disconnect wiring connector (A).
2. Remove and discard coolant temperature sender (B).
3. Apply John Deere Pipe Sealant with TEFLON®, or an equivalent, to threads of new temperature sender.
4. Install new temperature sender.
5. Connect wiring connector.



LV2116 –UN–14MAY97

A—Wiring Connector
B—Coolant Temperature Sender

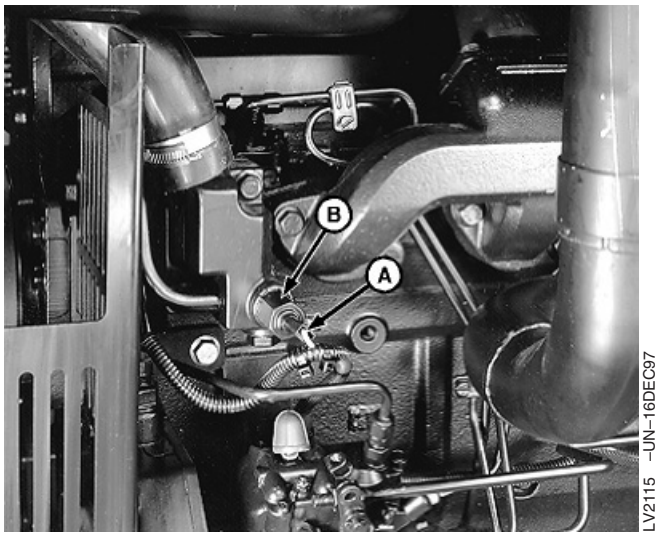
TEFLON is a registered trademark of the Du Pont Co.

AG,OUO1085,72 –19–08AUG00–1/1

Replace Coolant Temperature Sender—5410 and 5510

NOTE: In 5410 and 5510 model tractors the coolant temperature sender is located on the thermostat housing.

1. Disconnect wiring connector (A).
2. Remove and discard coolant temperature sender (B).
3. Apply John Deere Pipe Sealant with TEFLON®, or an equivalent, to threads of new temperature sender.
4. Install new temperature sender.
5. Connect wiring connector.



LV2115 –UN–16DEC97

A—Wiring Connector
B—Coolant Temperature Sender

TEFLON is a registered trademark of Du Pont Co.

AG,OUO1085,73 –19–08AUG00–1/1

Replace Engine Speed Sensor

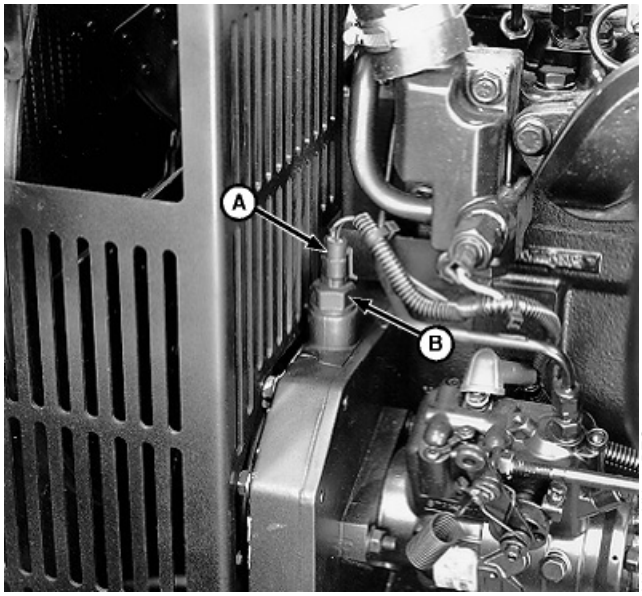
NOTE: 4-cylinder engine shown. 3-cylinder engines are similar.

1. Disconnect wiring connector (A).

IMPORTANT: Speed sensor is plastic. Do not overtighten or sensor will be damaged.

2. Replace speed sensor and O-ring (B).
3. Connect wiring connector.

A—Wiring Connector
B—Engine Speed Sensor and O-Ring



AG,OUO1023,258 –19–06OCT99–1/1

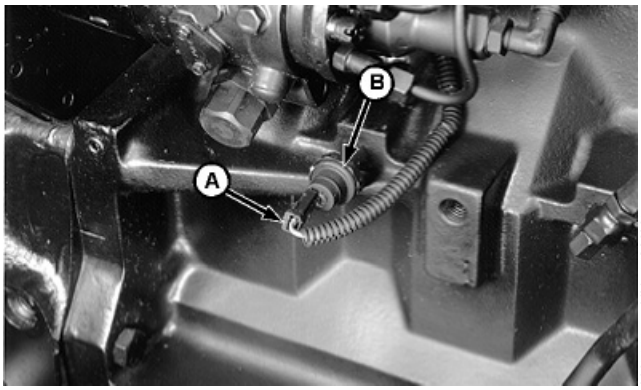
Replace Engine Oil Pressure Switch

NOTE: 5210/5310 tractor shown, 5410/5510 is similar.

1. Disconnect wiring connector (A).

NOTE: JDG465 special socket may be used to replace switch.

2. Remove and discard oil pressure switch (B).
3. Apply thread lock and sealer (medium strength) to threads of new oil pressure switch.
4. Install switch.
5. Connect wiring connector.



A—Wiring Connector
B—Engine Oil Pressure Switch

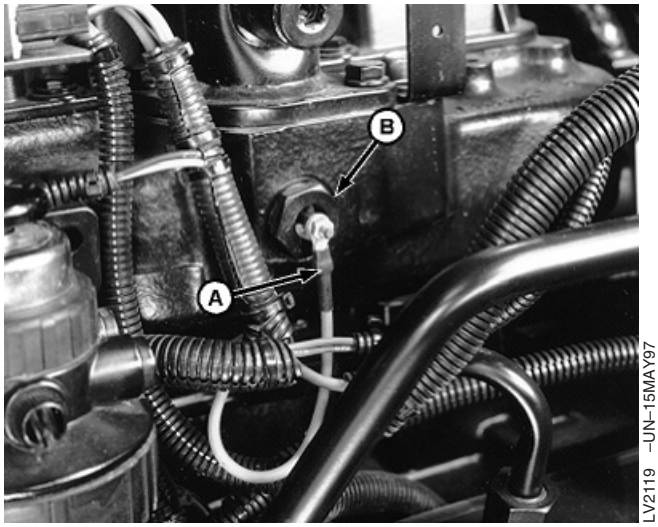
AG,OUO1085,74 –19–08AUG00–1/1

Replace Air Intake Heater

NOTE: 5210/5310 tractor shown; 5410/5510 is similar.

1. Disconnect wiring lead (A).
2. Replace air intake heater (B).
3. Connect wiring lead.

A—Wiring Lead
B—Air Intake Heater



LV2119 –UN–15MAY97

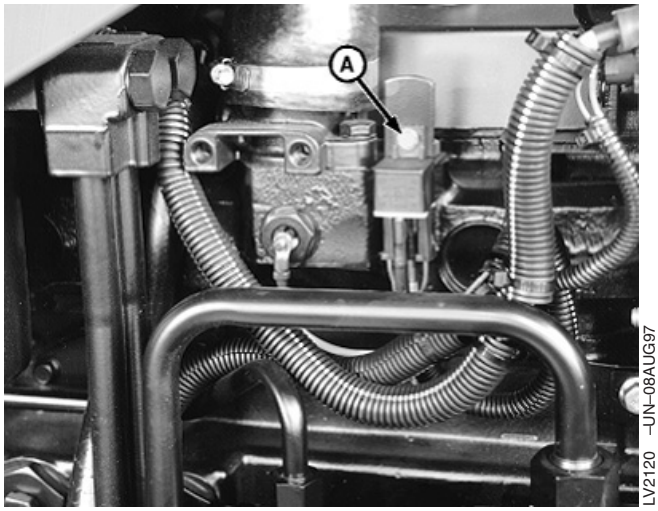
OUO1023,0000011 –19–07APR04–1/1

Replace Air Intake Heater Relay

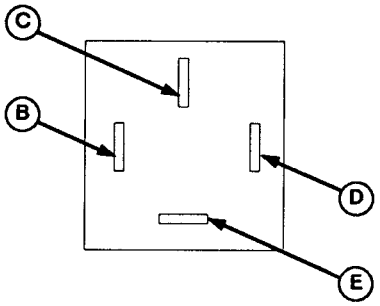
NOTE: Model 5410/5510 tractor shown. 5210/5310 is similar and is located next to the fuel filter primer pump.

1. Disconnect battery negative (–) cable.
2. Disconnect wiring connectors.
3. Remove cap screw (A) and relay.
4. Install new relay and cap screw.
5. Connect wiring leads (B—E).
6. Connect battery negative (–) cable.

A—Cap Screw
B—385 Green Wiring Lead
C—002 Red Wiring Lead
D—010 Black Wiring Lead
E—383 Orange Wiring Lead



LV2120 –UN–08AUG97



LV566AE –UN–09MAR92

Blades (Terminals) on End of Relay

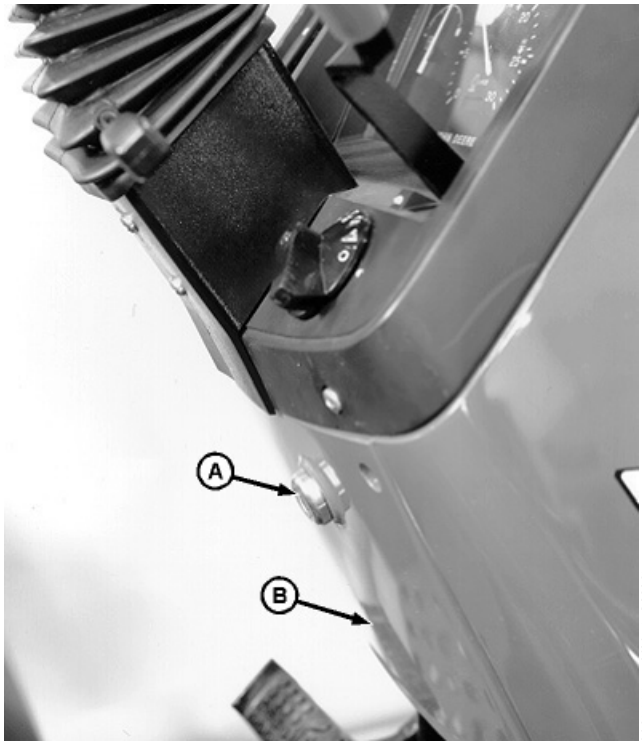
OUO1023,0000012 –19–07APR04–1/1

Replace Key Switch

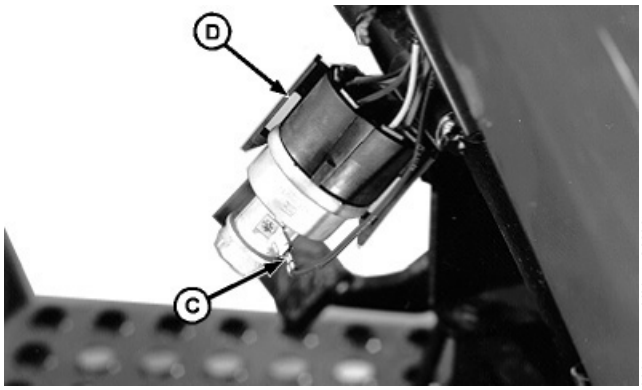
NOTE: Tractor equipped with tilt steering wheel shown. Tractors without tilt steering are similar.

1. Disconnect battery negative (–) cable.
2. Remove key switch nut (A).
3. Remove key switch panel (B).
4. Disconnect wiring lead (C).
5. Disconnect wiring connector (D) and replace key switch.
6. Connect wiring connector (D) and wire lead (C).
7. Install key switch panel.
8. Install nut.
9. Connect battery negative (–) cable.

A—Nut
B—Key Switch Panel
C—010 Black Wire Lead
D—Wiring Connector



LV2121 –UN–15MAY97

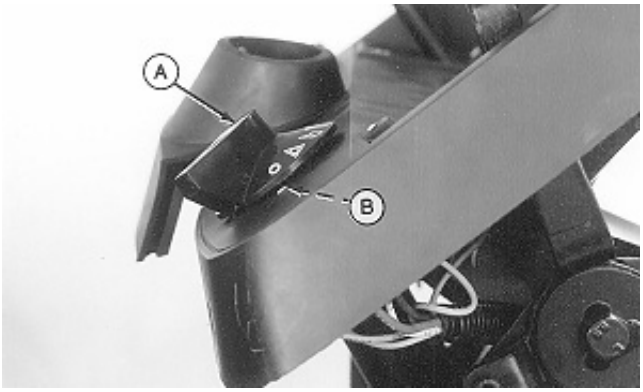


LV2122 –UN–15MAY97

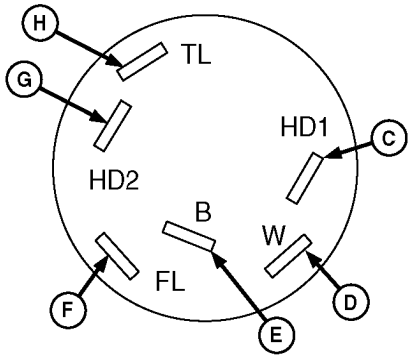
AG,OUO1085,77 –19–08AUG00–1/1

Replace Tractor Light Switch

1. Disconnect battery negative (–) cable.
2. Remove mounting hardware from left dash panel but do not remove panel.
3. Remove right dash panel.
4. Disconnect wiring connectors.
5. Remove cap screw and knob (A).
6. Remove nut and lock washer (B) under knob.
7. Replace light switch.
8. Install lock washer and nut.
9. Install knob and cap screw.
10. Connect wiring leads (C—H).
11. Install right dash panel.
12. Install mounting hardware for left dash panel.
13. Connect battery negative (–) cable.



LV684 –UN–21SEP94



LV2123 –UN–09JUN97

Blades (Terminals) on End of Switch

A—Light Switch Knob
B—Nut and Lock Washer
C—113 Orange Wire Lead
D—102 Red Wire Lead
E—122 Red Wire Lead
F—137 Purple Wire Lead
G—134 Yellow Wire Lead
H—103 Orange Wire Lead

AG,OUO1085,78 –19–08AUG00–1/1

Replace Radio

1. Insert two radio removal tools (A) into small holes on the left and right side of radio (B).
2. Push inward on tools (A) to remove radio from mounting bracket.
3. Pull radio out of control panel. Disconnect wiring connector and antenna cable on back of radio.

NOTE: Push inward until radio locks in place into mounting bracket.

4. Replace radio. Connect wiring connector and antenna cable.

LV1610 –UN–02FEB96

A—Radio Removal Tool (2 used)
B—Radio

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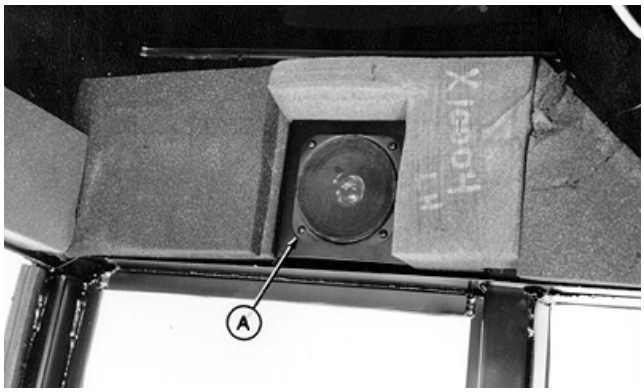
8

AG,OUO1085,79 –19–08AUG00–1/1

Replace Speakers

NOTE: Speakers are located above side windows on each side of cab.

1. Remove rear headliner. (See Remove and Install Rear Headliner in Section 90, Group 15.)
2. Remove four screws (A) securing speaker to cab panel.
3. Tag and disconnect wires from speaker.
4. Connect wires to new speaker using tags for identification.
5. Install speaker with four screws (A).
6. Install rear headliner. (See Remove and Install Rear Headliner in Section 90, Group 15.)



LV1440 –UN–10NOV95

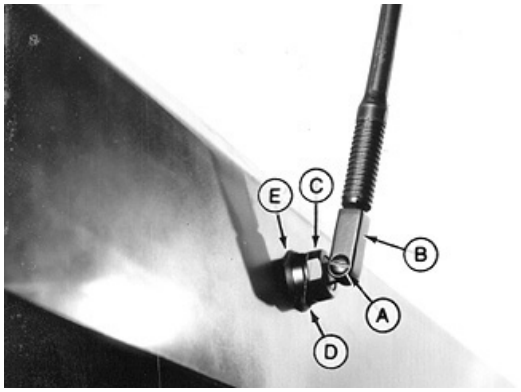
A—Screw (4 used)

AG,OUO1085,80 –19–08AUG00–1/1

Replace Antenna

1. Remove nut, washer, and screw (A), and antenna mast (B).
2. Remove nut (C), ferrule (D), and washer (E).

A—Nut, Washer, and Screw
B—Antenna Mast
C—Nut
D—Ferrule
E—Washer

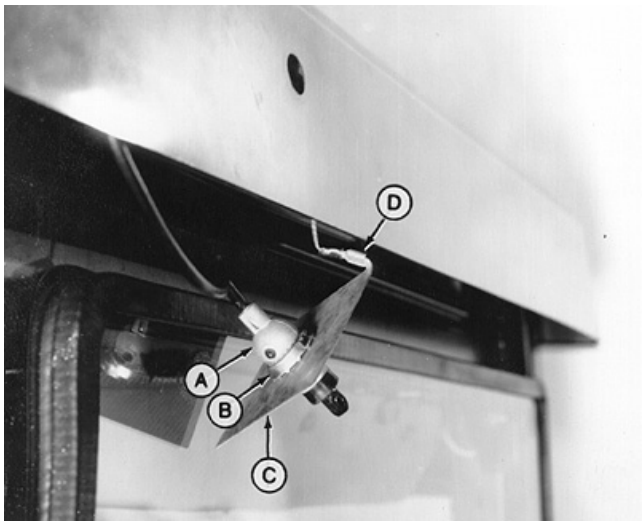


LV1441 –UN–10NOV95

AG,OUO1085,81 –19–08AUG00–1/3

3. Remove antenna mount (A) and locking ring from plate (C).
4. If necessary, remove ground wire (D) from plate.
5. To remove antenna cable, unplug cable from back of radio. (See Replace Radio in this group.)
6. Connect ground wire (D) to plate (C).
7. Install locking ring (B) and antenna mount (A) on plate and push through hole in roof.

A—Antenna Mount
B—Locking Ring
C—Plate
D—Ground Wire



LV1442 –UN–10NOV95

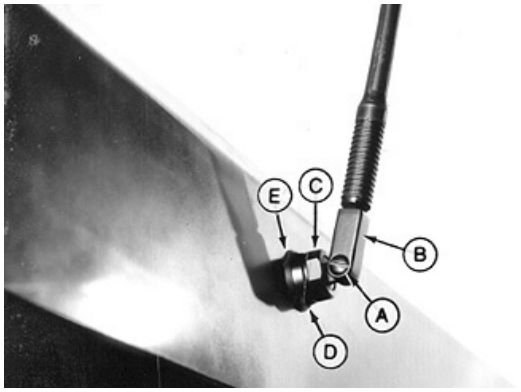
Continued on next page

AG,OUO1085,81 –19–08AUG00–2/3

8. Fasten the antenna mount to cab roof using washer (E), ferrule (D), and nut (C).

9. Fasten antenna mast (B) to the antenna mount using nut, washer, and screw (A).

A—Nut, Washer, and Screw
B—Antenna Mast
C—Nut
D—Ferrule
E—Washer

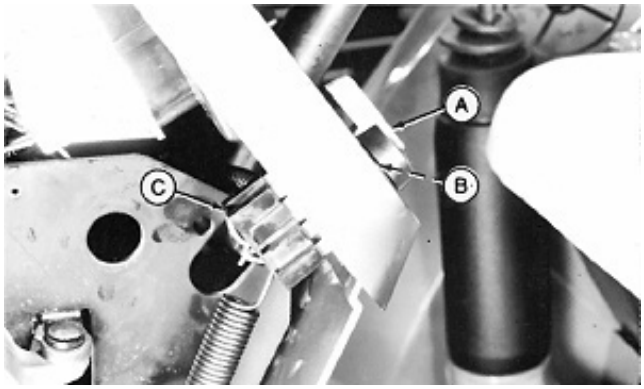


LV1441 –UN–10NOV95

AG,OUO1085,81 –19–08AUG00–3/3

Replace Turn Signal Controller

1. Disconnect battery negative (–) cable.
2. Remove left dash panel.
3. Disconnect wiring connector (C).
4. Remove screw, lock washer and lever (A).
5. Remove nut (B) and controller.
6. Install new controller and nut.
7. Install lever, lock washer and screw.
8. Connect wiring connector.
9. Install dash panel.
10. Connect battery negative (–) cable.



LV559 –UN–09MAR92

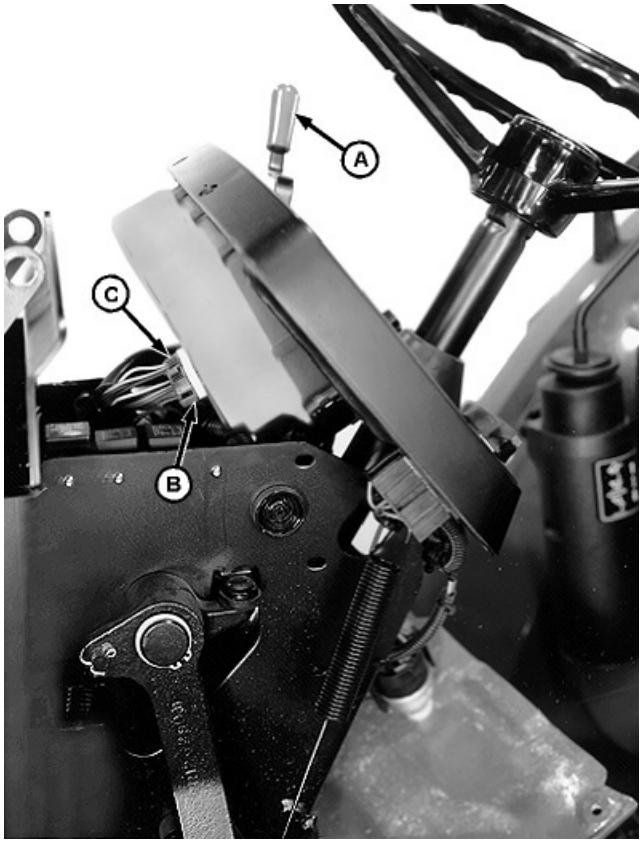
A—Lever
B—Nut
C—Wiring Connector

AG,OUO1023,261 –19–06OCT99–1/1

Replace Instrument Panel—CollarShift/SyncShuttle™ Transmission

1. Remove right and left dash panels.
2. Remove turn signal controller. (See Replace Turn Signal Controller in this group.)
3. Remove light switch. (See Replace Tractor Light Switch in this group.)
4. Remove throttle lever knob (A).
5. Disconnect wiring connectors (B and C).
6. Remove instrument panel assembly.

A—Throttle Lever Knob
B—Wiring Connector
C—Wiring Connector



LV2133 –UN–14MAY97

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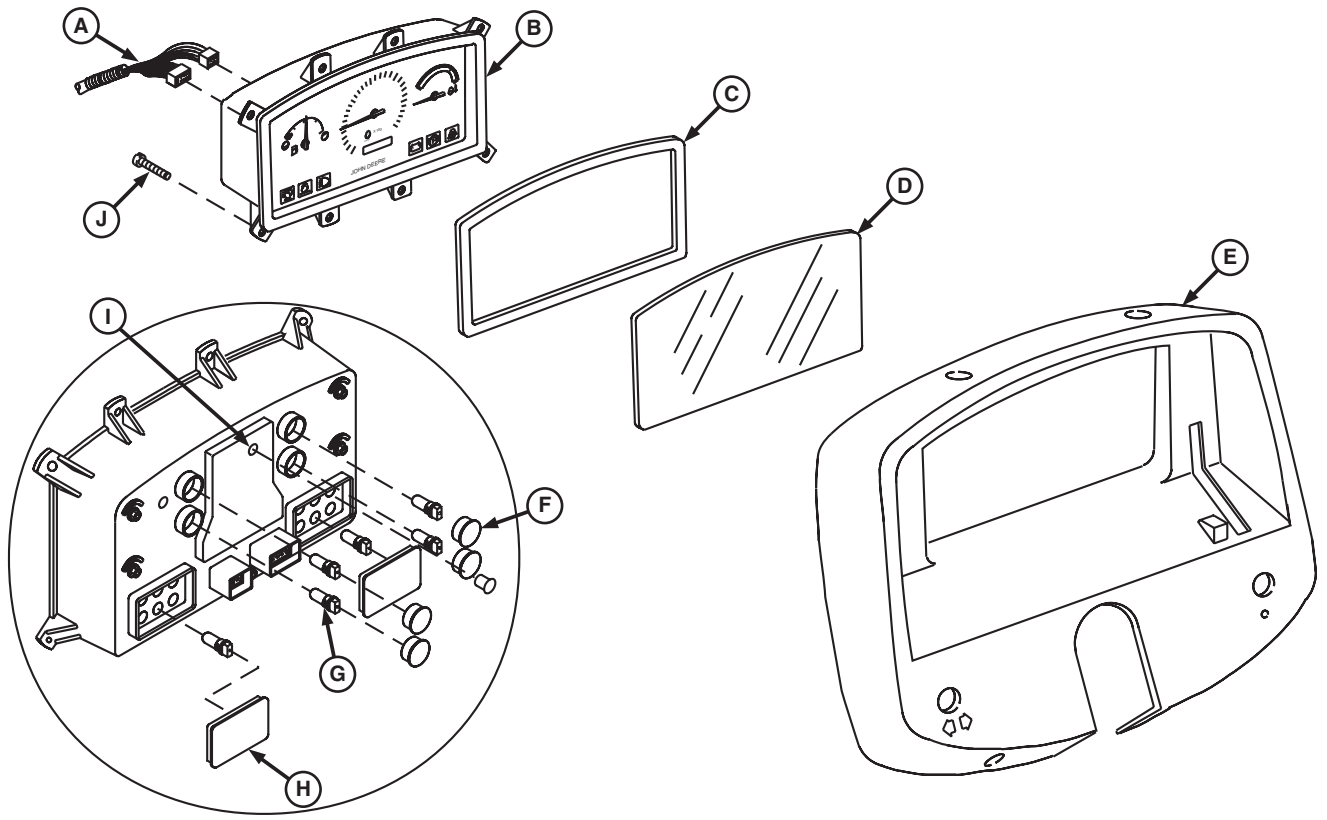
AG,OUO1085,82 –19–27JUN02–1/2



Exploded View of Instrument Panel

A—Wiring Harness
B—Instrument Cluster
C—Gasket
D—Glass
E—Instrument Panel
F—Bulb Dust Cover (round)
G—Bulb (10 used)
H—Bulb Dust Cover (rectangular)
I—Tach Switch
J—Phillips Head Cap Screw (8 used)

7. Inspect and replace parts (A—J) as necessary.

NOTE: The tach switch (I) is located underneath the small rubber dust cap.

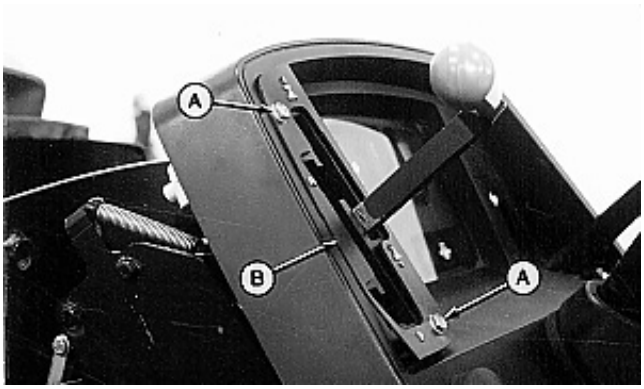
8. Make sure 2-position tach switch (I) is in the correct position for 3-cylinder or 4-cylinder engines.
   - 3-Cylinder: Tab on tach switch must be in the UP position. (24 pulse/engine revolution)
   - 4-Cylinder: Tab on tach switch must be in the DOWN position. (30 pulse/engine revolution)
9. Install instrument panel assembly.
10. Connect wiring connectors.
11. Install throttle lever knob.
12. Install light switch.
13. Install turn signal controller.
14. Install right and left dash panels.

AG,OUO1085,82 –19–27JUN02–2/2

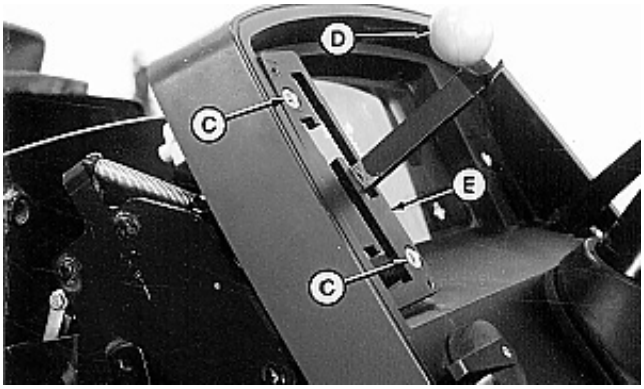
Replace Instrument Panel—PowrReverser™ Transmission

1. Remove right and left dash panels.
2. Remove two cap screws (A) and plate (B).
3. Remove two screws (C), knob (D), and bracket (E).
4. Remove light switch. (See Replace Tractor Light Switch in this group.)
5. Remove throttle lever knob.

A—Cap Screw (2 used)
B—Plate
C—Screw (2 used)
D—Knob
E—Bracket



LV1373 –UN–15SEP95

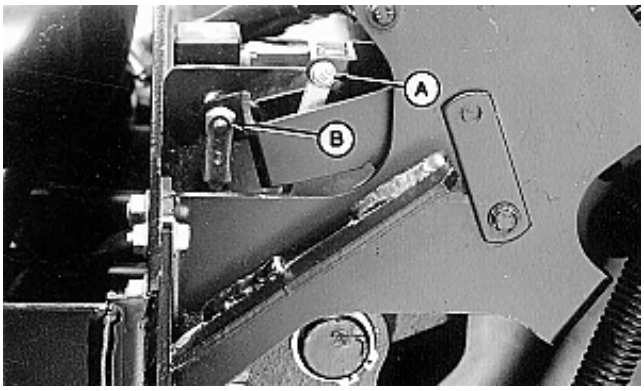


LV1374 –UN–15SEP95

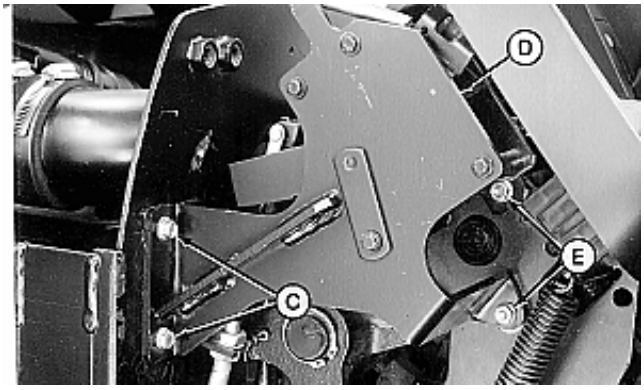
AG,OUO1085,83 –19–27JUN02–1/4

6. Disconnect F-N-R linkage (A) and park brake linkage (B).
7. Remove two cap screws and nuts (C).
8. Remove two cap screws, washers, and nuts (E).
9. Remove F-N-R lever assembly.

A—F-N-R Linkage
B—Park Brake Linkage
C—Cap Screw and Nut (2 used)
D—F-N-R Lever Assembly
E—Cap Screw, Washer, and Nut (2 used)



LV1375 –UN–15SEP95



LV1376 –UN–15SEP95

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AG,OUO1085,83 –19–27JUN02–2/4

10. Disconnect turn signal connector (A) on back of instrument panel.

11. In tractors equipped with a tilt steering wheel, remove plastic covers (B) around tilt mechanism.

12. Disconnect instrument panel main harness connectors (C) on back of instrument panel and remove panel.

A—Turn Signal Connector
B—Plastic Cover
C—Main Harness Connector

LV2134 –UN–14MAY97

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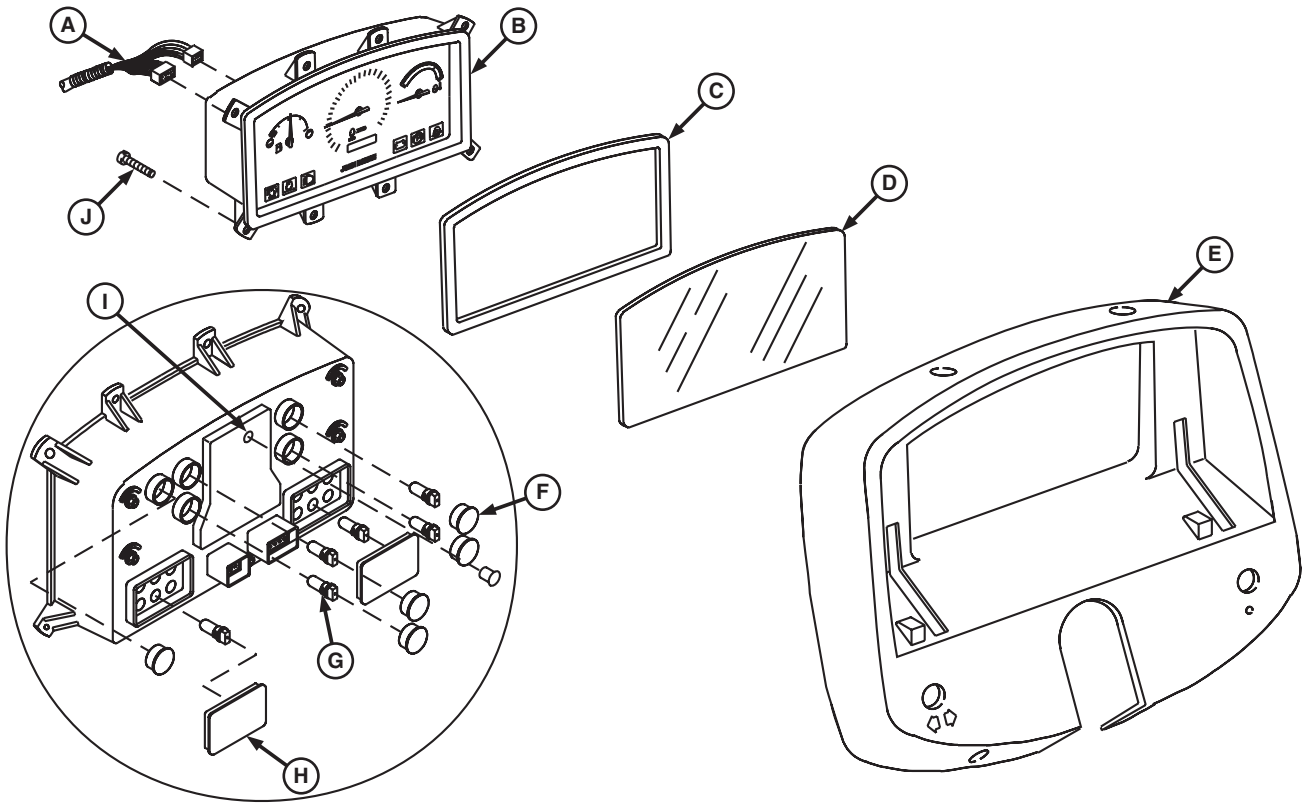
AG,OUO1085,83 –19–27JUN02–3/4



LV2124 –UN–28JUN02

A—Wiring Harness
B—Instrument Cluster
C—Gasket
D—Glass
E—Instrument Panel
F—Bulb Dust Cover (round)
G—Bulb (10 used)
H—Bulb Dust Cover (rectangular)
I—Tach Switch
J—Phillips Head Cap Screw (8 used)

13. Inspect and replace parts (A—J) as necessary.

NOTE: The tach switch (I) is located underneath the small rubber dust cap.

14. Make sure 2-position tach switch (I) is in the correct position for 3-cylinder or 4-cylinder engines.

    - 3-Cylinder: Tab on tach switch must be in the UP position. (24 pulse/engine revolution)
    - 4-Cylinder: Tab on tach switch must be in the DOWN position. (30 pulse/engine revolution)

15. Install instrument panel assembly.

16. Connect wiring connectors.

17. Install throttle lever knob.

18. Install light switch.

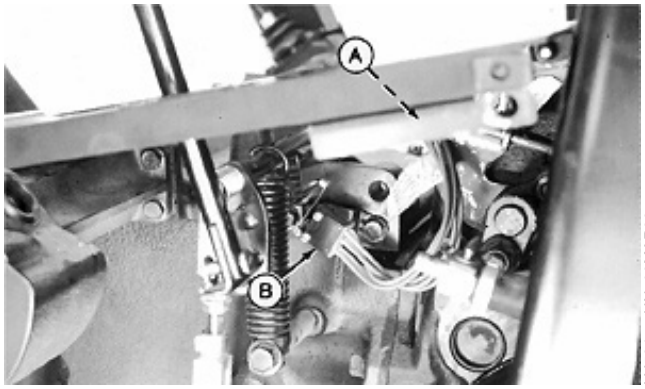
19. Install F-N-R lever assembly and connect linkage.

AG,OUO1085,83 –19–27JUN02–4/4

Replace Rear PTO Switch—Tractors Without Cab

NOTE: Left wheel, fender, and fuel line removed for illustration purposes only.

1. Disconnect wiring connector (A).
2. Replace rear PTO switch (B).
3. Connect wiring connector.



A—Wiring Connector
B—Rear PTO Switch

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16

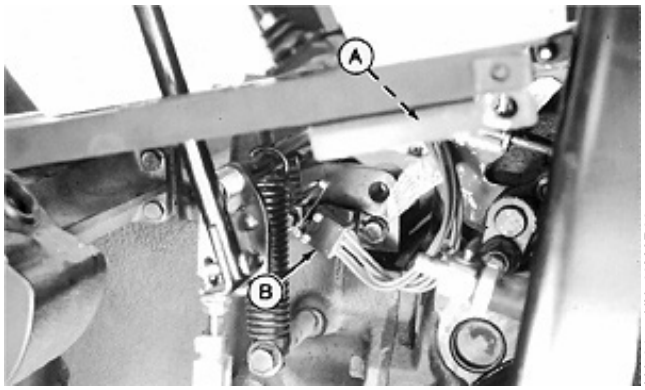
AG,OUO1085,85 –19–08AUG00–1/1

Replace Rear PTO Switch—Tractors With Cab

NOTE: Tractor without cab shown for illustration purposes only.

If necessary remove cab seat, support, and left control console and panel.

1. Remove seat and support plate. (See Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
2. Remove left control console and panel. (See Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)
3. Disconnect wiring connector (A).
4. Replace rear PTO switch (B).
5. Connect wiring connector.
6. If removed, install console support plate, base plate, and seat.



A—Wiring Connector
B—Rear PTO Switch

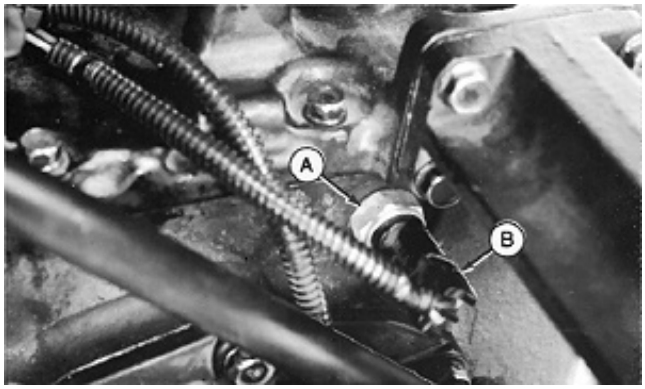
AG,OUO1085,86 –19–08AUG00–1/1

Replace Neutral Start Switch

NOTE: Right fender removed for illustration purposes only.

If equipped with PowrReverser™ transmission, neutral start switch is located on the PowrReverser™ control valve.

1. Remove seat and support plate. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
2. Remove right control console. (See Remove and Install Right-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06 or Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)
3. Disconnect wiring connector (B).
4. Replace neutral start switch and O-ring (A).
5. Connect wiring connector.
6. Install control console.
7. Install seat and support plate.



LV521 –UN–09MAR92

Right Side of Transmission Housing Shown

A—Neutral Start Switch and O-Ring
B—Wiring Connector

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17

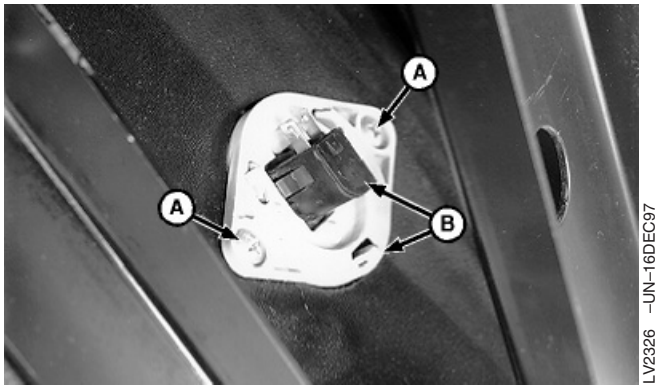
AG,OUO1085,88 –19–27JUN02–1/1

Replace Seat Switch

NOTE: Seat switch is located under seat cushion.

1. Disconnect wiring connector at seat switch.
2. Remove two screws (A) and remove switch assembly (B) from bottom of cushion.

A—Screw (2 used)
B—Seat Switch Assembly



LV2326 –UN–16DEC97

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AG,OUO1085,89 –19–08AUG00–1/3

3. Remove switch plunger (A) and replace switch (B).
4. Install switch plunger (A).

A—Seat Switch Plunger
B—Seat Switch

LV2327 –UN–26NOV97

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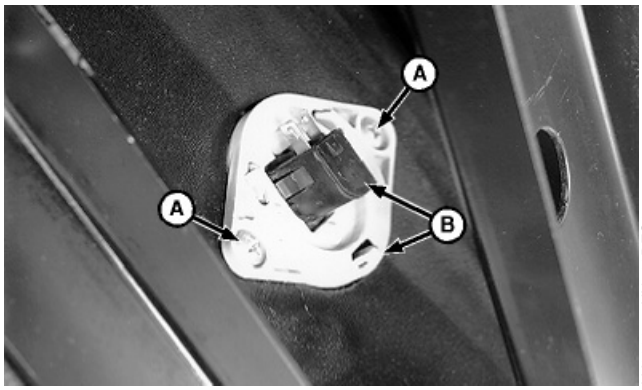
18

AG,OUO1085,89 –19–08AUG00–2/3

5. Install seat switch assembly (B) and screws (A) in bottom of seat cushion.
6. Connect wiring connector.

A—Screw (2 used)
B—Seat Switch Assembly

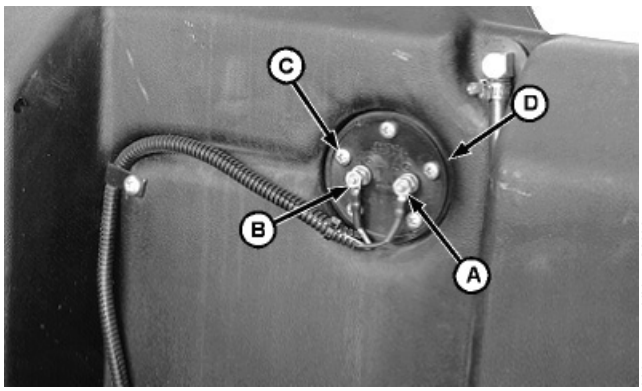


LV2326 –UN–16DEC97

AG,OUO1085,89 –19–08AUG00–3/3

Replace Fuel Level Sender—Tractors Without Cab

1. Disconnect wiring lead (A and B).
2. Remove screws (C).
3. Replace fuel level sender and gasket (D).
4. Install screws.
5. Connect wiring leads.



LV2125 –UN–15MAY97

A—010 Black Wire Lead
B—353 Orange Wire Lead
C—Screw (5 used)
D—Fuel Level Sender and Gasket

AG,OUO1085,90 –19–08AUG00–1/1

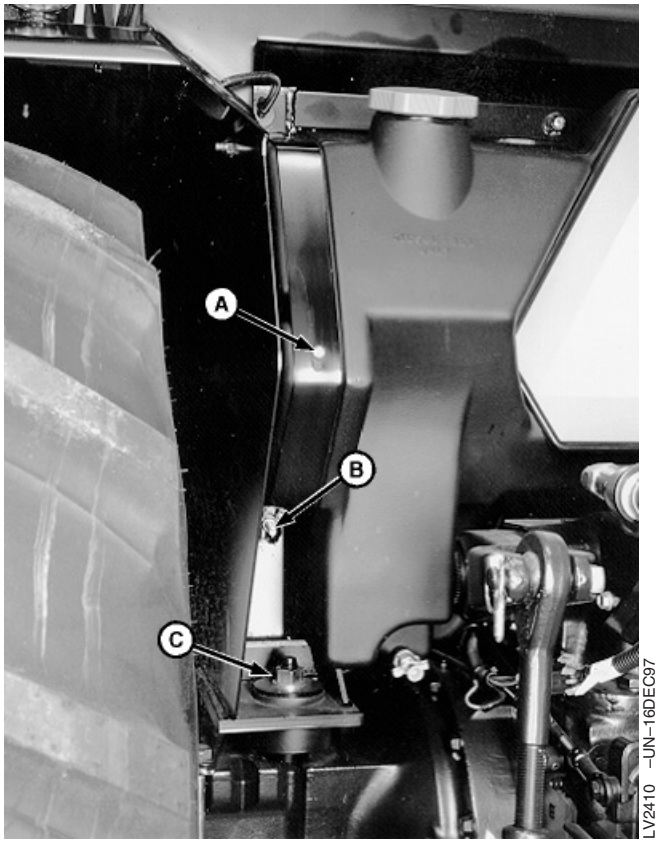
Replace Fuel Level Sender—Tractors With Cab

1. Remove fuel tank retaining strap nut (B) and screw (A) on both sides of fuel tank.

NOTE: Rear of cab must be lifted upward approximately 25.4 mm (1.000 in.) for clearance to tilt fuel tank back.

2. Remove rear cab mounting nuts (C) on both sides of cab.

A—Screw
B—Fuel Tank Retaining Strap Nuts
C—Rear Cab Mounting Nut



AG,OUO1085,91 –19–08AUG00–1/4

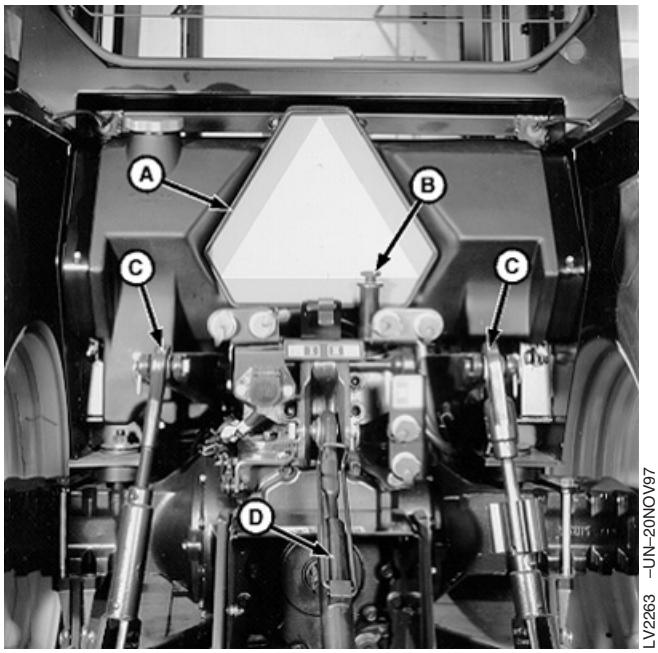
3. Remove slow moving vehicle (SMV) emblem (A) and hydraulic oil dipstick (B) to aid during removal and installation of fuel level sender.

4. Lower lifting arms (C) and center link (D).

5. At location in front of right rear axle:

   - Disconnect fuel level sender wiring connector.
   - Cut all tie straps as necessary.

A—SMV Emblem
B—Dipstick
C—Lifting Arms
D—Center Link



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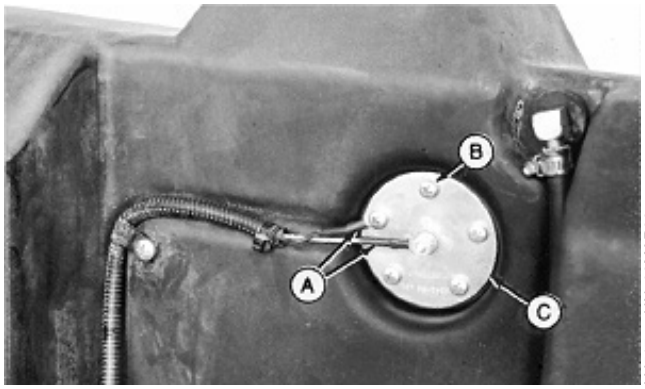
AG,OUO1085,91 –19–08AUG00–2/4

6. Using a hoist, raise rear of cab off rear cab mounts approximately 25.4 mm (1.000 in.). Tilt top of fuel tank back to access fuel level sender.
7. Disconnect wiring leads (A).
8. Remove retaining screws (B).
9. Replace fuel level sender and gasket (C).
10. Install screws.

NOTE: Connect orange wiring lead to the center terminal.

11. Connect wiring leads.



LV517 –UN–09MAR92

A—Wiring Leads
B—Retaining Screws
C—Fuel Level Sender and Gasket

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20

AG,OUO1085,91 –19–08AUG00–3/4

12. Tilt fuel tank forward and lower cab.
13. Install fuel tank retaining strap nuts (B) and screws (A) on both sides of fuel tank. Tighten nuts (B) to specification.

Specification

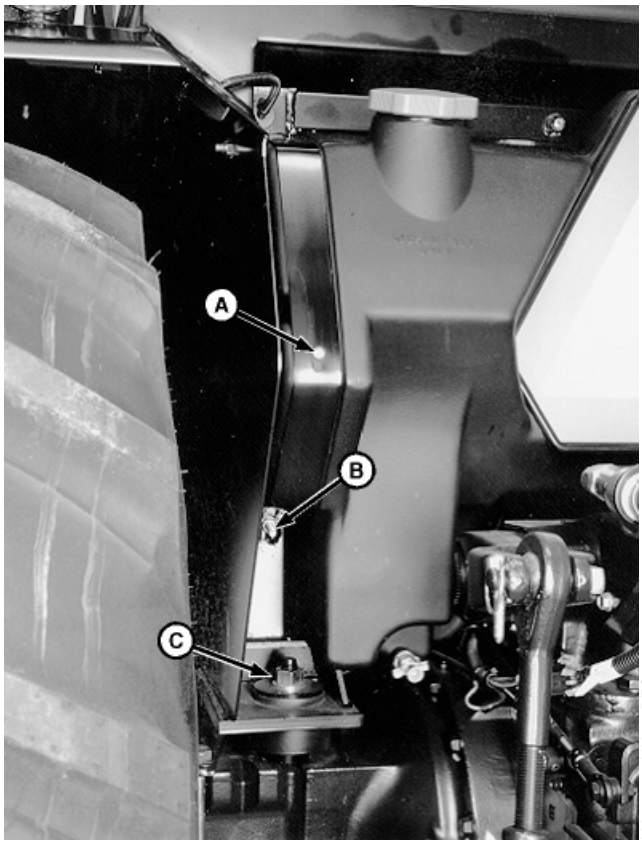
Fuel Tank Retaining Strap Nut—
Torque ..... 35 N•m (26 lb-ft)

14. Install rear cab mounting nuts (C). Tighten nuts to 203 N•m (150 lb-ft).

Specification

Rear Cab Mounting Nuts—
Torque ..... 203 N•m (150 lb-ft)

15. Install hydraulic oil dipstick and SMV emblem.
16. At location in front of right rear axle:
    - Connect fuel level sender wiring connector.
    - Install tie straps as necessary.



LV2410 –UN–16DEC97

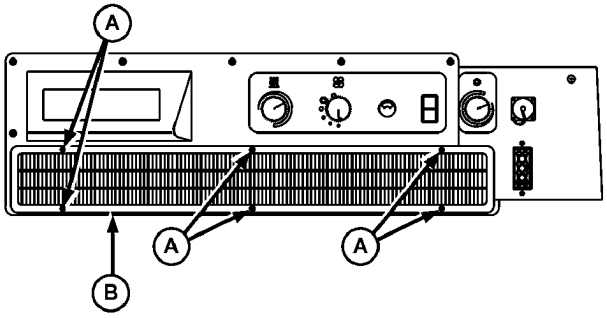
A—Screws
B—Fuel Tank Retaining Strap Nuts
C—Rear Cab Mounting Nuts

AG,OUO1085,91 –19–08AUG00–4/4

Replace Wiper Control Switch

1. Disconnect battery negative (–) cable.
2. Loosen six screws (A) and remove air recirculating intake cover and filter (B).

A—Screw (6 used)
B—Filter



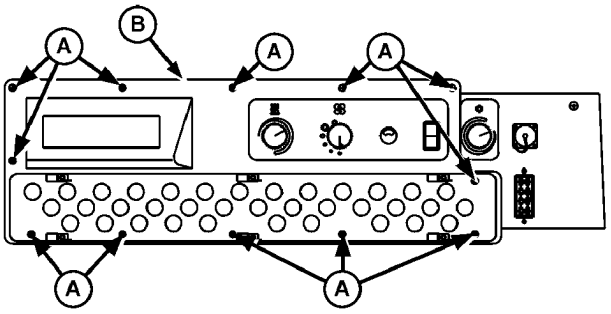
LV1398 –UN–08AUG97

AG,OUO1085,92 –19–08AUG00–1/3

NOTE: Support control panel (B) using wire or rope to prevent weight of panel from pulling on wires during removal of wiper control switch.

3. Remove twelve screws (A) and control panel (B). Support weight of control panel using wire or rope.

A—Screw (12 used)
B—Control Panel

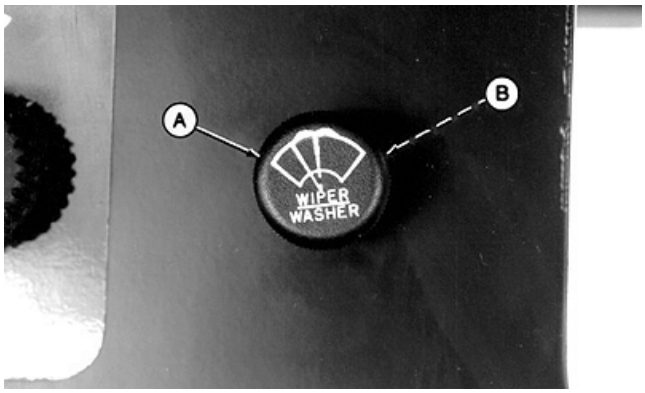


LV1401 –UN–08AUG97

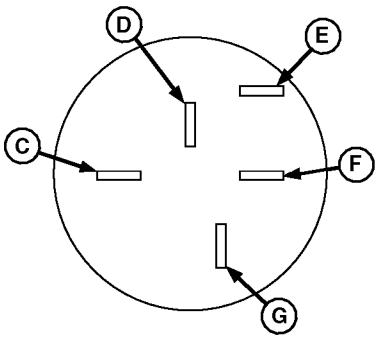
AG,OUO1085,92 –19–08AUG00–2/3

4. Remove knob (A) and nut (B).
5. Disconnect wiring leads (C—G).
6. Replace wiper control switch.
7. Connect wiring leads (C—G).
8. Install nut (B) and knob (A).
9. Install control panel and recirculating air intake cover and filter.
10. Connect battery negative (–) cable.

A—Knob
B—Nut
C—229 White Wire Lead
D—262 Red Wire Lead
E—238 Grey Wire Lead
F—224 Yellow Wire Lead
G—234 Yellow Wire Lead



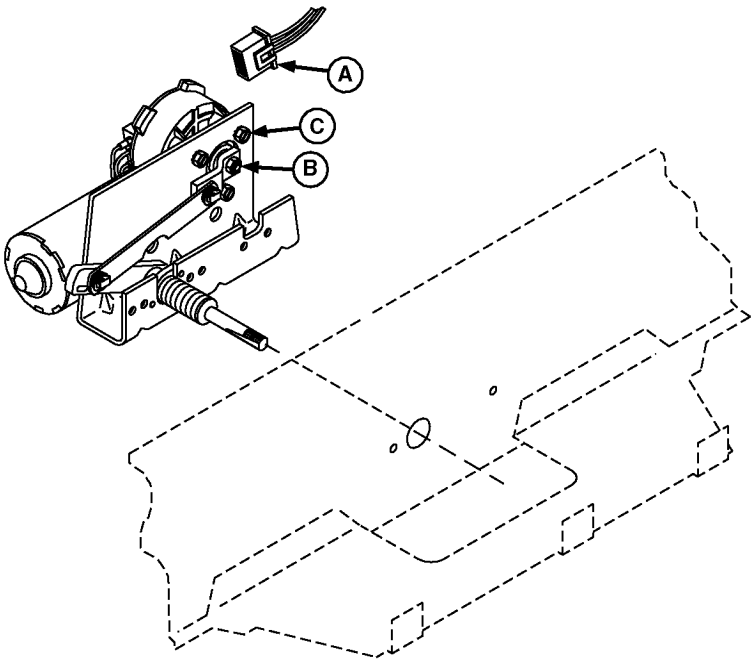
LV1413 –UN–10NOV95



LV1414 –UN–05DEC95

AG,OUO1085,92 –19–08AUG00–3/3

Replace Wiper Motor



LV1444 –UN–05DEC95

A—Electrical Connector **B—Nut** **C—Screw (3 used)**

1. Remove cab roof. (See Remove and Install Cab Roof in Section 90, Group 15.)
2. Disconnect electrical connector (A) from motor.
3. Remove nut (B) from motor shaft.
4. Remove three screws (C) and lock washers.

NOTE: Wiper motor is not repairable.

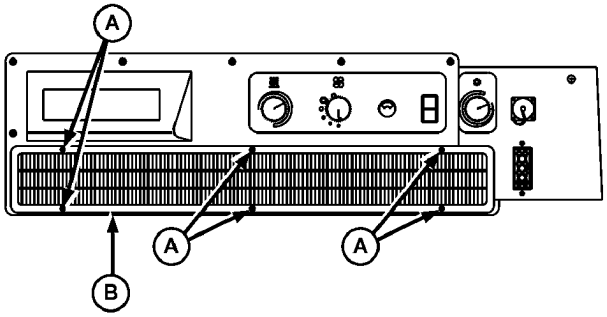
5. Replace front wiper motor.
6. Install cab roof.

AG,OUO1085,93 –19–08AUG00–1/1

Replace Blower Control Switch

1. Disconnect battery negative (–) cable.
2. Loosen six screws (A) and remove air recirculating intake cover and filter (B).

A—Screw (6 used)
B—Filter



LV1398 –UN–08AUG97

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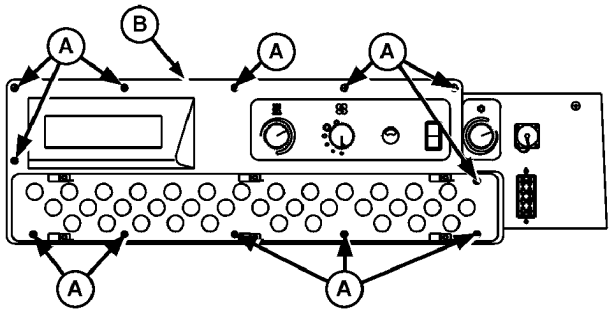
AG,OUO1085,94 –19–08AUG00–1/3

NOTE: Support control panel (B) using wire or rope to prevent weight of panel from pulling on wires during removal of blower control switch.

3. Remove twelve screws (A) and control panel (B). Support weight of control panel using wire or rope.

A—Screw (12 used)
B—Control Panel

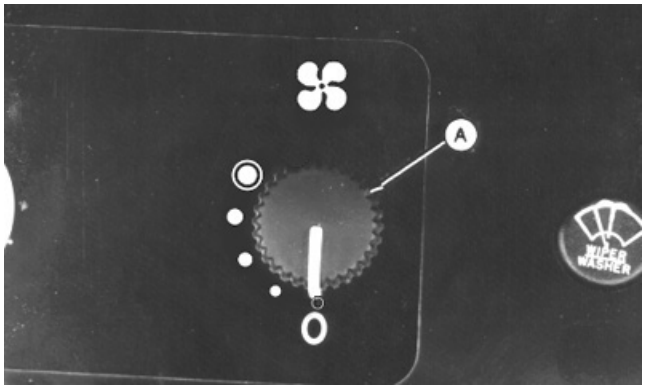


LV1401 –UN–08AUG97

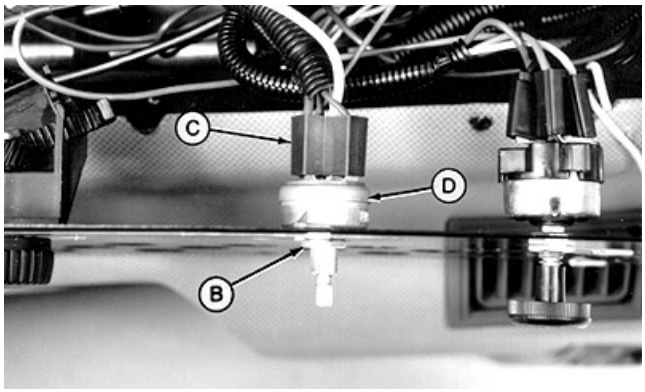
AG,OUO1085,94 –19–08AUG00–2/3

4. Remove Knob (A) and nut (B).
5. Disconnect wiring connector (C).
6. Replace blower switch (D).
7. Install nut (B) and knob (A).
8. Connect wiring connector (C).
9. Install control panel, recirculating intake cover, and filter.
10. Connect battery negative (–) cable.

A—Knob
B—Nut
C—Wiring Connector
D—Blower Switch



LV1411 –UN–12JAN96



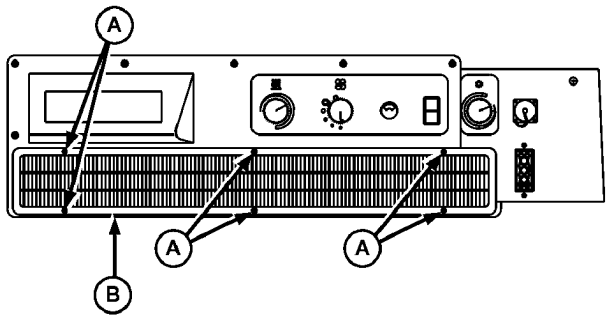
LV1412 –UN–10NOV95

AG,OUO1085,94 –19–08AUG00–3/3

Replace Air Conditioning Temperature Control Switch

1. Disconnect battery negative (–) cable.
2. Loosen six screws (A) and remove air recirculating intake cover and filter (B).

A—Screw (6 used)
B—Filter



LV1398 –UN–08AUG97

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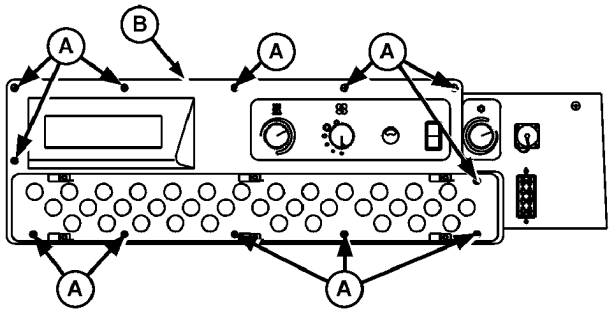
AG,OUO1085,95 –19–08AUG00–1/3

NOTE: Support control panel (B) using wire or rope to prevent weight of panel from pulling on wires during removal of control switch.

3. Remove twelve screws (A) and control panel (B). Support weight of control panel using wire or rope.

A—Screw (12 used)
B—Control Panel



LV1401 –UN–08AUG97

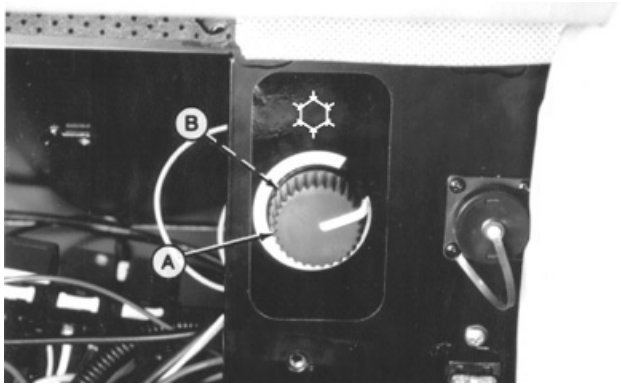
AG,OUO1085,95 –19–08AUG00–2/3

40
10
24

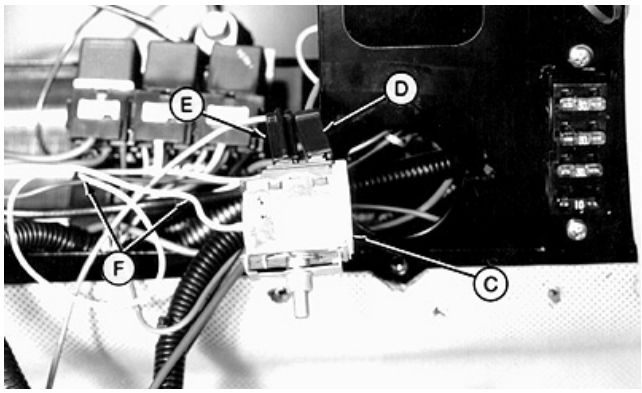
4. Remove knob (A) and nut (B).
5. Remove control switch (C), from overhead panel.
6. Disconnect wiring leads (D and E).
7. Pull capillary sensing line (F) out of evaporator core.
8. Replace air conditioning control switch.

IMPORTANT: Insert end of capillary sensing line into the core of the evaporator, near the right side.

9. Connect wiring leads (D and E).
10. Install control switch (C) into panel.
11. Install nut (B) and knob (A).
12. Install control panel and recirculating intake cover and filter.
13. Connect battery negative (–) cable.



LV1415 –UN–05DEC95



LV1416 –UN–10NOV95

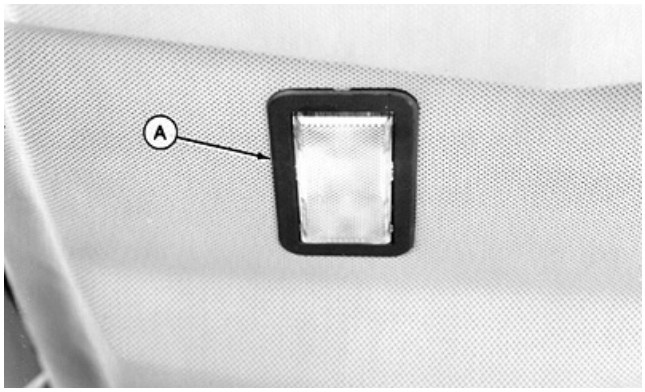
A—Knob
B—Nut
C—Control Switch
D—228 Gray Wiring Lead
E—227 Purple Wiring Lead
F—Capillary Sensing Line

AG,OUO1085,95 –19–08AUG00–3/3

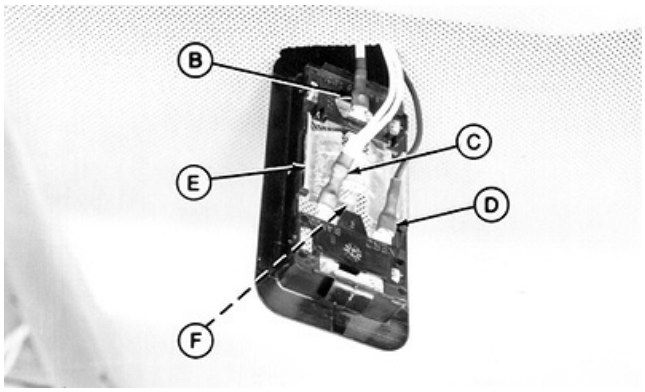
Replace Dome Light

1. Disconnect battery negative (–) cable.
2. Remove dome light (A), from headliner.
3. Disconnect wiring leads (B—D)
4. Remove cover (E) and replace bulb (F).
5. Install cover (E) and connect wiring leads (B—D).
6. Install dome light (A).
7. Connect battery negative (–) cable.

A—Dome Light
B—262 Red Wiring Lead
C—255 Grn Wiring Lead
D—010 Blk Wiring Lead
E—Cover
F—Bulb



LV1417 –UN–10NOV95



LV1418 –UN–10NOV95

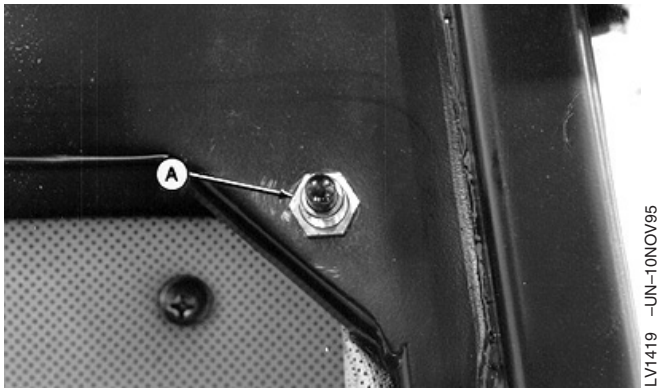
AG,OUO1085,96 –19–08AUG00–1/1

Replace Dome Light Switch

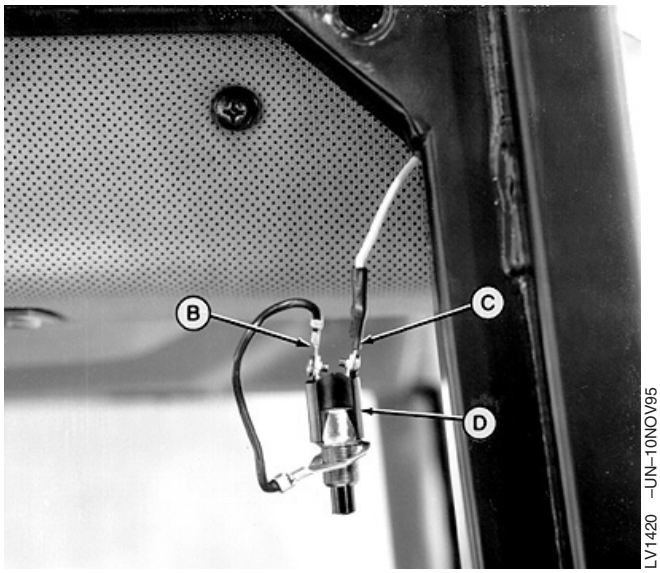
NOTE: Dome light switches are located in upper front corner of cab door frame on both sides of cab.

1. Disconnect battery negative (–) cable.
2. Remove the side trim cover along cab door frame.
3. Remove nut (A).
4. Disconnect wiring leads (B and C).
5. Replace light switch (D).
6. Connect wiring leads to new light switch.
7. Install switch in cab door frame.
8. Install nut and side trim cover.
9. Connect battery negative (–) cable.

A—Nut
B—Wiring Lead
C—Wiring Lead
D—Light Switch



Right Side Light Switch Shown



AG,OUO1085,97 –19–08AUG00–1/1

Special or Essential Tools

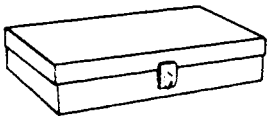
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

SERVICEGARD is a trademark of Deere & Company.

DX,JDG155 –19–05JUN90–1/2

TS446 –UN–22JUN89

Electrical Repair Tool Kit. JDG155



For repair and installation of wires into electrical connectors.

DX,JDG155 –19–05JUN90–2/2

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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AG,OUO1085,263 –19–28AUG00–1/3

Extraction Tool JDG364

Pulls wire from connector body.

AG,OUO1085,263 –19–28AUG00–2/3

Terminal Applicator JDG783

Applies contact to terminal wire.

AG,OUO1085,263 –19–28AUG00–3/3

Service Parts Kits

The following kits are available through your parts catalog:

- RE11154 Electrical Connector and Wire Service Kit.

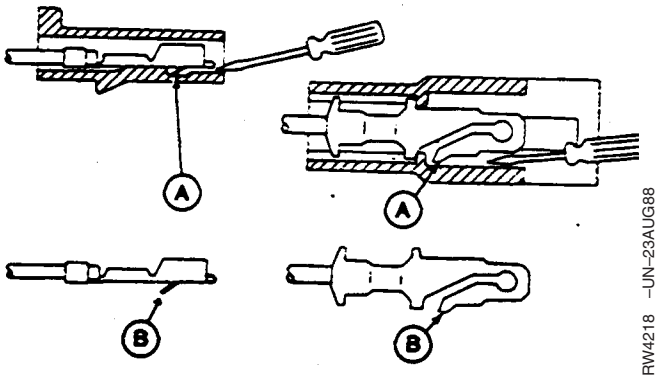
DX,ECONN,AE –19–09AUG00–1/1

Replace Connector Body—Blade Terminals

40
15
2

1. Use a small screwdriver to depress locking tang (A) on terminal. Slide connector body off.
2. Be sure to bend locking tang back to its original position (B) before installing connector body.

A—Locking Tang
B—Locking Tang—Original Position



RW4218 –UN–23AUG88

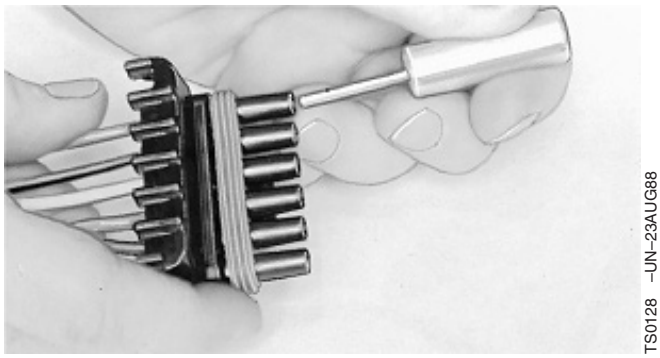
AG,OUO1085,98 –19–09AUG00–1/1

Replace WEATHER PACK™ Connector

IMPORTANT: Identify wire color locations with connector terminal letters.

1. Open connector body.
2. Insert JDG364 Extraction Tool over terminal contact in connector body.
3. Hold extractor tool fully seated and pull wire from connector body.

NOTE: If terminal cannot be removed, insert wire or nail through extractor tool handle and push terminal contact from connector.



TS0128 –UN–23AUG88

WEATHER PACK is a trademark of Packard Electric.

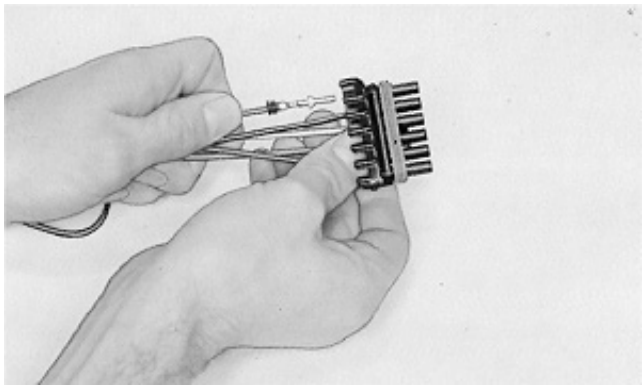
Continued on next page

DX,ECONN,R –19–04JUN90–1/2

IMPORTANT: Carefully spread contact lances to assure good seating on connector body.

NOTE: Connector bodies are "keyed" for proper contact mating. Be sure contacts are in proper alignment.

4. Push contact into new connector body until fully seated.
5. Pull on wire slightly to be certain contact is locked in place.
6. Transfer remaining wires to correct terminal in new connector.
7. Close connector body.



TS0130 –UN–23AUG88

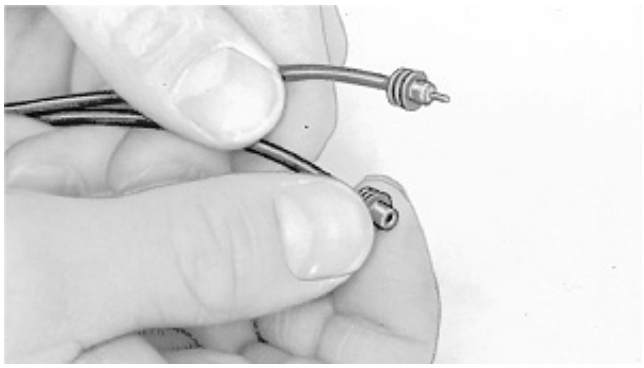
DX,ECONN,R –19–04JUN90–2/2

Install WEATHER PACK™ Contact

NOTE: Cable seals are color coded for three sizes of wire:

- *Green - 18 to 20 gauge wire*
- *Gray - 14 to 16 gauge wire*
- *Blue - 10 to 12 gauge wire*

1. Slip correct size cable seal on wire.
2. Strip insulation from wire to expose 6 mm (1/4 in.) and align cable seal with edge of insulation.



TS0136 –UN–23AUG88

WEATHER PACK is a trademark of Packard Electric.

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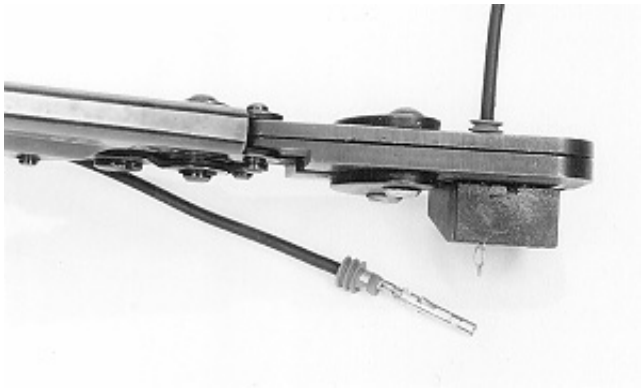
DX,ECONN,AD –19–04JUN90–1/3

NOTE: Contacts have numbered identification for two sizes of wire:

- *#15 for 14 to 16 gauge wire*
- *#19 for 18 to 20 gauge wire*

3. Put proper size contact on wire and crimp in place with a “W” type crimp, using JDG783 Terminal Applicator.

4. Fasten cable seal to contact as shown, using JDG783 Terminal Applicator.

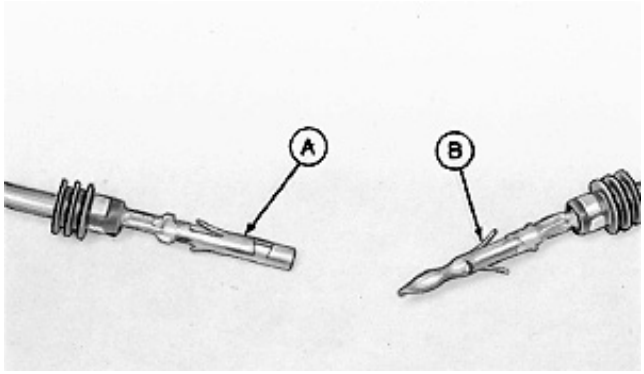


TS1623 –UN–02NOV94

DX,ECONN,AD –19–04JUN90–2/3

IMPORTANT: Proper contact installation for “sleeve” (A) and “pin” (B) is shown.

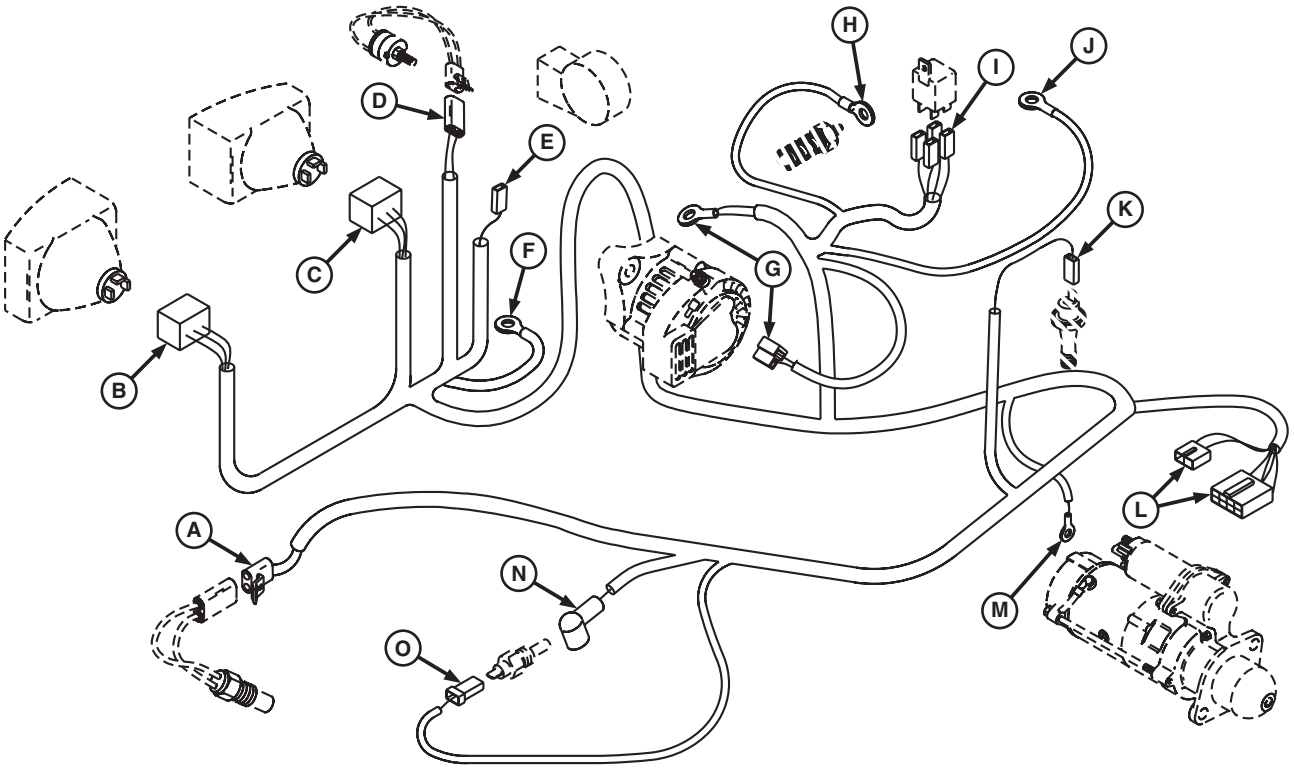
A—Sleeve
B—Pin



TS0139 –UN–02DEC88

DX,ECONN,AD –19–04JUN90–3/3

Replace Front Wiring Harness—3 Cylinder



LV2126 –UN–13JUN01

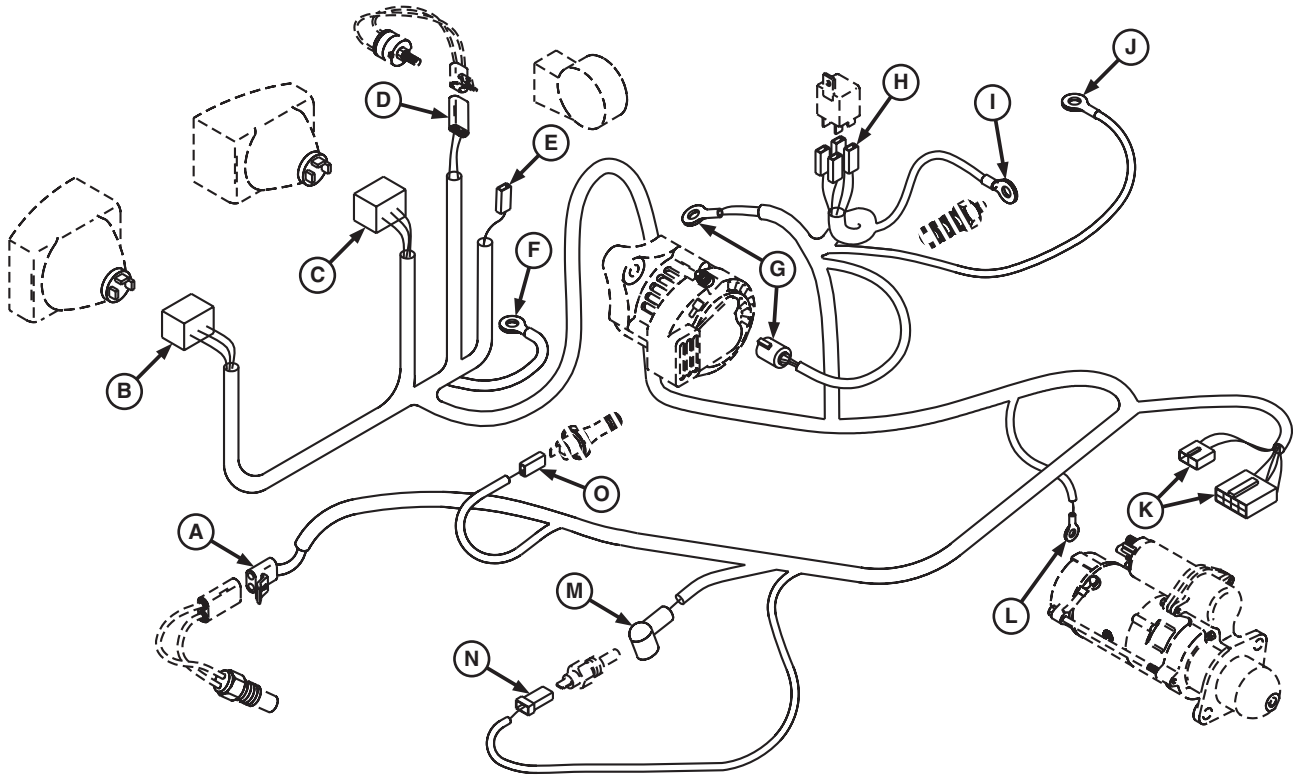
FRONT WIRING HARNESS—3-CYLINDER

A—Engine Speed Sensor
B—Left Headlight
C—Right Headlight
D—Air Filter Restriction Indicator
E—Horn (Optional)
F—Ground
G—Alternator/Regulator
H—Manifold Heater
I—Manifold Heater Relay
J—To Fuse Link Junction Box
K—Coolant Temperature Sender
L—Rear Wiring Harness
M—Starter
N—Fuel Shut-Off Solenoid
O—Oil Pressure Switch

1. Remove front grille panels and cooling fan finger guard.
2. Remove battery. (See Remove and Install Battery—Tractors Without Cab or Remove and Install Battery—Tractors With Cab in Group 05.)
3. Cut all tie straps.
4. Remove all hold-down clamps.
5. Disconnect wiring connectors and leads (A—O).
6. Replace wiring harness.
7. Connect wiring connectors and leads.
8. Install hold-down clamps.
9. Install tie straps as necessary.
10. Install battery.
11. Install fan finger guard and front grille panels.

AG,OUO1085,100 –19–09AUG00–1/1

Replace Front Wiring Harness—4 Cylinder



LV2250 –UN–13JUN01

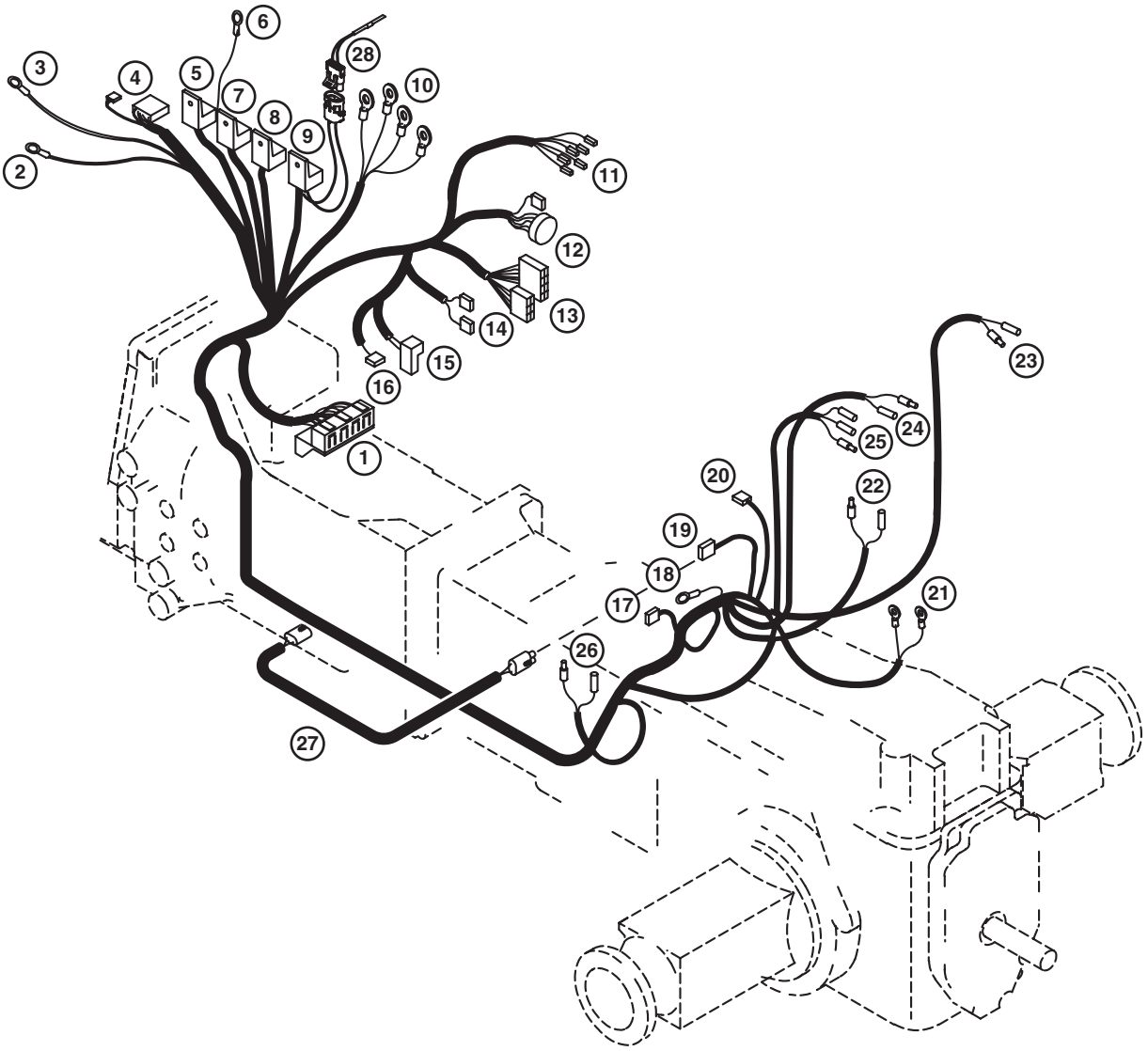
FRONT WIRING HARNESS—4-CYLINDER

A—Engine Speed Sensor
B—Left Headlight
C—Right Headlight
D—Air Filter Restriction Indicator
E—Horn (Optional)
F—Ground
G—Alternator/Regulator
H—Manifold Heater Relay
I—Manifold Heater
J—To Fuse Link Junction Box
K—Rear Wiring Harness
L—Starter
M—Fuel Shut-Off Solenoid
N—Oil Pressure Switch
O—Coolant Temperature Sender

1. Remove front grille panels and fan finger guard.
2. Remove battery. (See Remove and Install Battery—Tractors Without Cab or Remove and Install Battery—Tractors With Cab in Group 05.)
3. Cut all tie straps.
4. Remove all hold-down clamps.
5. Disconnect wiring connectors and leads (A—O).
6. Replace wiring harness.
7. Connect wiring connectors and leads.
8. Install hold-down clamps.
9. Install tie straps as necessary.
10. Install battery.
11. Install fan finger guard and front grille panels.

AG,OUO1085,102 –19–09AUG00–1/1

Replace Rear Wiring Harness—Tractors Without Cab



LV2217 –UN–01JUL02

Rear Wiring Harness—Tractors Without Cab

1—Fuse Block
2—Starter Motor Battery Terminal
3—To Fuse Link Junction Box
4—To Front Wiring Harness
5—Diode Pack
6—Ground
7—Accessory Relay
8—Bypass Start Relay #2
9—Bypass Start Relay #1
10—Start Relay
11—Light Switch
12—Key Switch
13—Instrument Panel
14—Optional Horn Switch
15—Turn Signal Controller
16—Horn/Timer
17—Rear PTO Switch
18—Ground
19—Neutral Start Switch (CollarShift/SyncShuttle™ Transmission)
20—Seat Switch
21—Fuel Level Sender
22—Right Front Fender Floodlight (Model 5510 Tractor Only)
23—Right Warn/Turn Light
24—Rear Work Light
25—Left Warn/Turn Light
26—Left Front Fender Floodlight (Model 5510 Tractor Only)
27—Neutral Start Switch (PowrReverser™ Transmission)
28—Start Resistor (4-cyl only)

Continued on next page

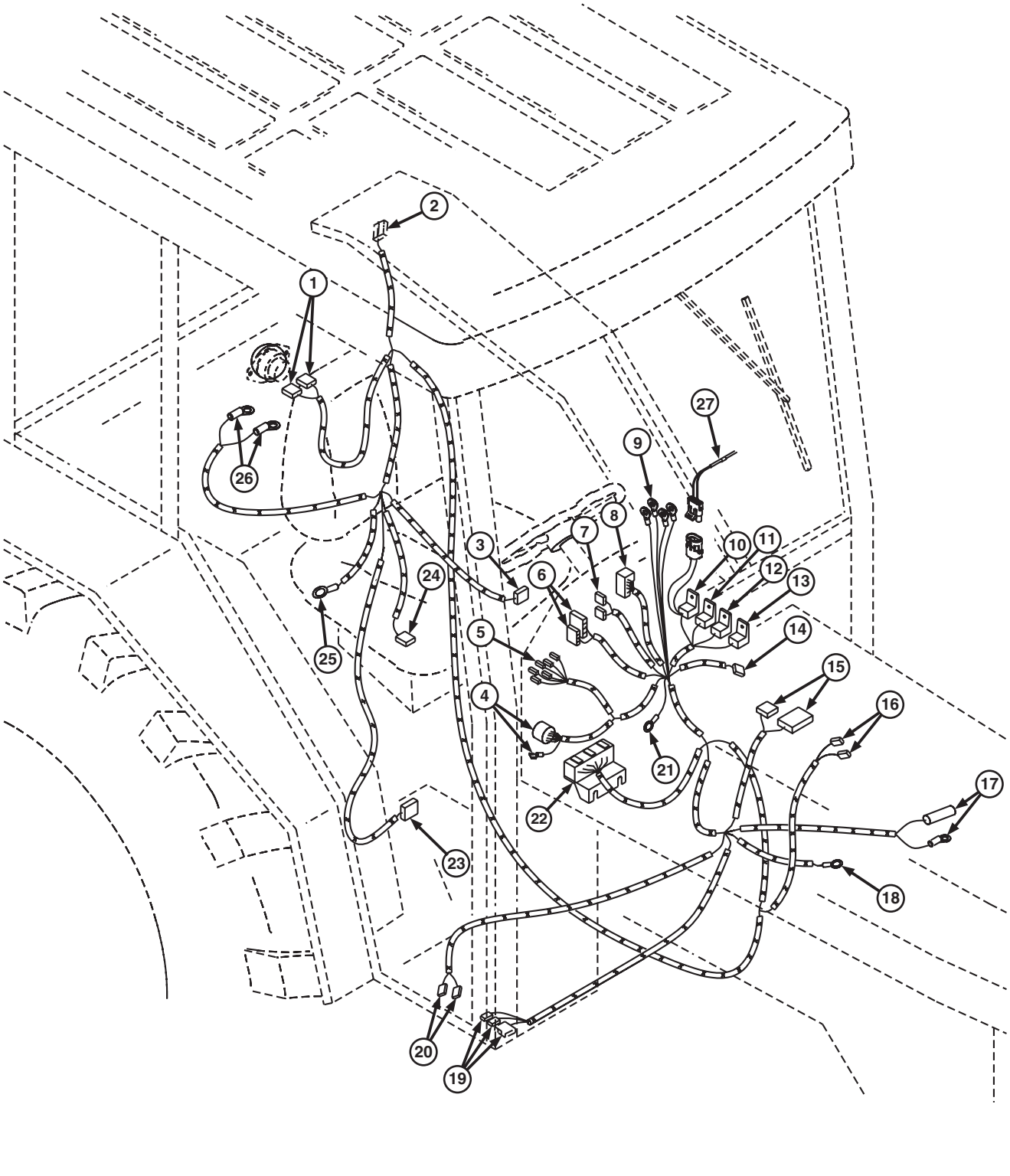
AG,OUO1085,104 –19–27JUN02–1/2

NOTE: Model 5510 tractors are equipped with left and right fender mounted floodlights.

1. Remove instrument panel. (See Replace Instrument Panel—CollarShift/SyncShuttle™ Transmission or Replace Instrument Panel—PowrReverser™ Transmission in Group 10.)
2. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab in Section 90, Group 05.)
3. Cut all tie straps.
4. Remove fuse block (1) under instrument panel console.
5. Disconnect diode pack (5) and relay sockets (7—9) from support bracket.
6. Disconnect all wiring connectors and leads.
7. Remove wiring harness.
8. Install new harness and connect all wiring connectors and leads.
9. Install fuse block and relay sockets.
10. Install tie straps as necessary.
11. Install seat and support.
12. Install instrument panel and dash covers.

AG,OUO1085,104 –19–27JUN02–2/2

Replace Rear Wiring Harness—Tractors With Cab



Rear Wiring Harness—Tractors With Cab

Continued on next page

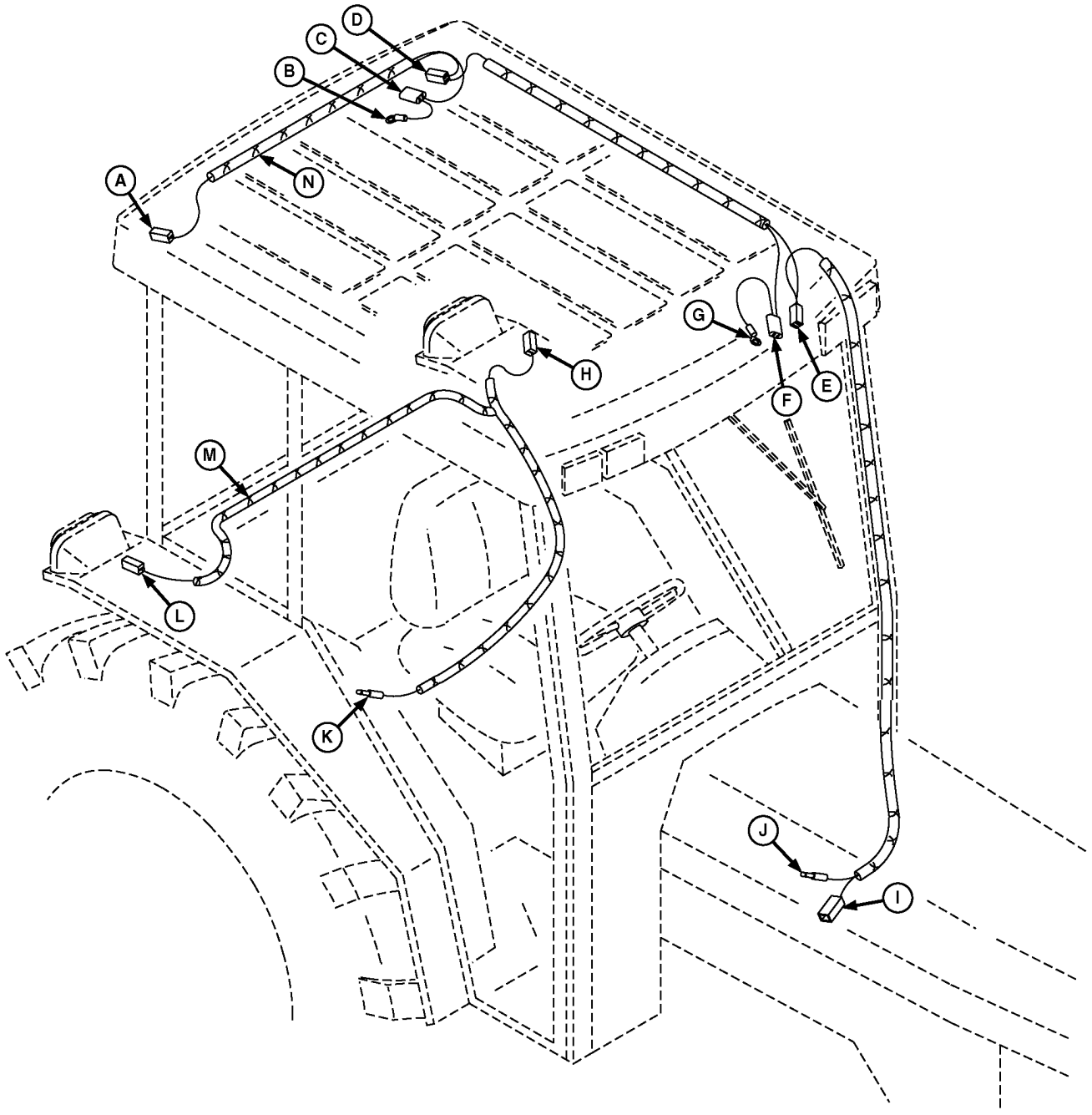
AG,OUO1085,106 –19–27JUN02–1/2

1—To Trailer Connector
2—To Left Rear Taillight
3—Rear PTO Switch
4—Key Switch
5—Light Switch
6—Instrument Panel
7—Optional Horn Switch
8—Turn Signal Controller
9—Start Relay
10—Bypass Starter Relay #1
11—Bypass Starter Relay #2
12—Accessory Relay
13—Diode Pack
14—Horn/Timer
15—To Tractor Front Wiring Harness
16—To Cab Harness at Left Cab Post
17—Air Conditioning Compressor
18—To Fuse Link Junction Block
19—To Cab Harness at Right Hand Cab Post
20—High and Low Pressure Switch at Receiver Dryer
21—Ground
22—Fuse Block
23—Neutral Start Switch
24—Seat Switch
25—Ground
26—Fuel Level Sender
27—Start Resistor (4-cyl only)

1. Remove dash panels.
2. Remove instrument panel. (See Replace Instrument Panel—CollarShift/SyncShuttle™ Transmission or Replace Instrument Panel—PowrReverser™ Transmission in Group 10.)
3. Remove seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
4. Remove fuse block (22) from instrument panel console.
5. Disconnect relay sockets (10, 11, 12, and 13) from support bracket.
6. Disconnect remaining wiring connectors and leads.
7. Cut all tie straps.
8. Remove wiring harness.
9. Install new harness and connect all wiring connectors and leads.
10. Install fuse block and relay sockets.
11. Install tie straps as necessary.
12. Install seat and support.
13. Install dash covers.
14. Install instrument panel.

AG,OUO1085,106 –19–27JUN02–2/2

Replace Cab Wiring Harness—Lights



Cab Lights Wiring Harness

A—Right Rear Floodlight
B—Ground
C—Left Rear Floodlight
D—Left Rear Flasher
E—Rear Floodlight Power Jumper
F—Left Front Flasher
G—Ground
H—Left Taillight
I—Rear Tractor Harness Connector
J—Rear Tractor Harness Connector
K—Rear Tractor Harness Connector
L—Right Taillight
M—Taillight Power Jumper Harness
N—Cab Lights Wiring Harness

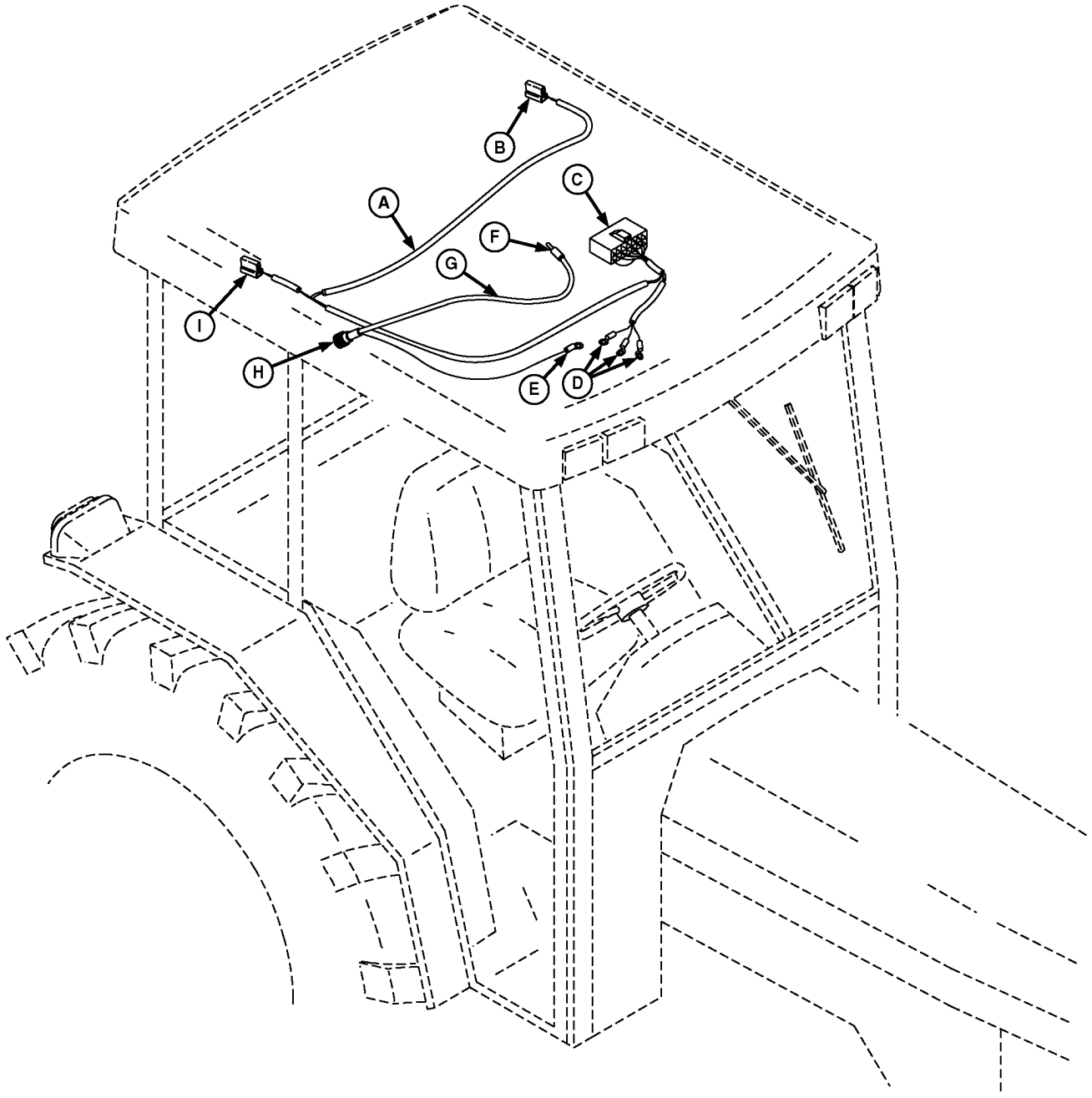
1. Disconnect battery negative (–) cable.
2. Remove cab roof and rear cab liner behind seat.

Continued on next page

3. Remove both taillights from housings.
4. Cut all tie straps.
5. Remove all hold-down clamps.
6. Disconnect wiring connectors and leads (A—L).
7. Replace wiring harnesses (M and N) and connect all wiring connectors and leads.
8. Fasten wiring harnesses using hold-down clamps and tie straps.

AG,OUO1085,108 –19–27JUN02–2/2

Replace Cab Wiring Harness—Radio/Antenna



Radio/Antenna Wiring Harness

A—Radio/Speaker Wiring Harness
B—Left Speaker Connector
C—Radio Connector
D—Junction Block Leads
E—Ground
F—Radio/Antenna Connector
G—Antenna Cable
H—Antenna Connector
I—Right Speaker Connector

1. Disconnect battery negative (–) cable.

Continued on next page

AG,OUO1085,110 –19–27JUN02–1/2

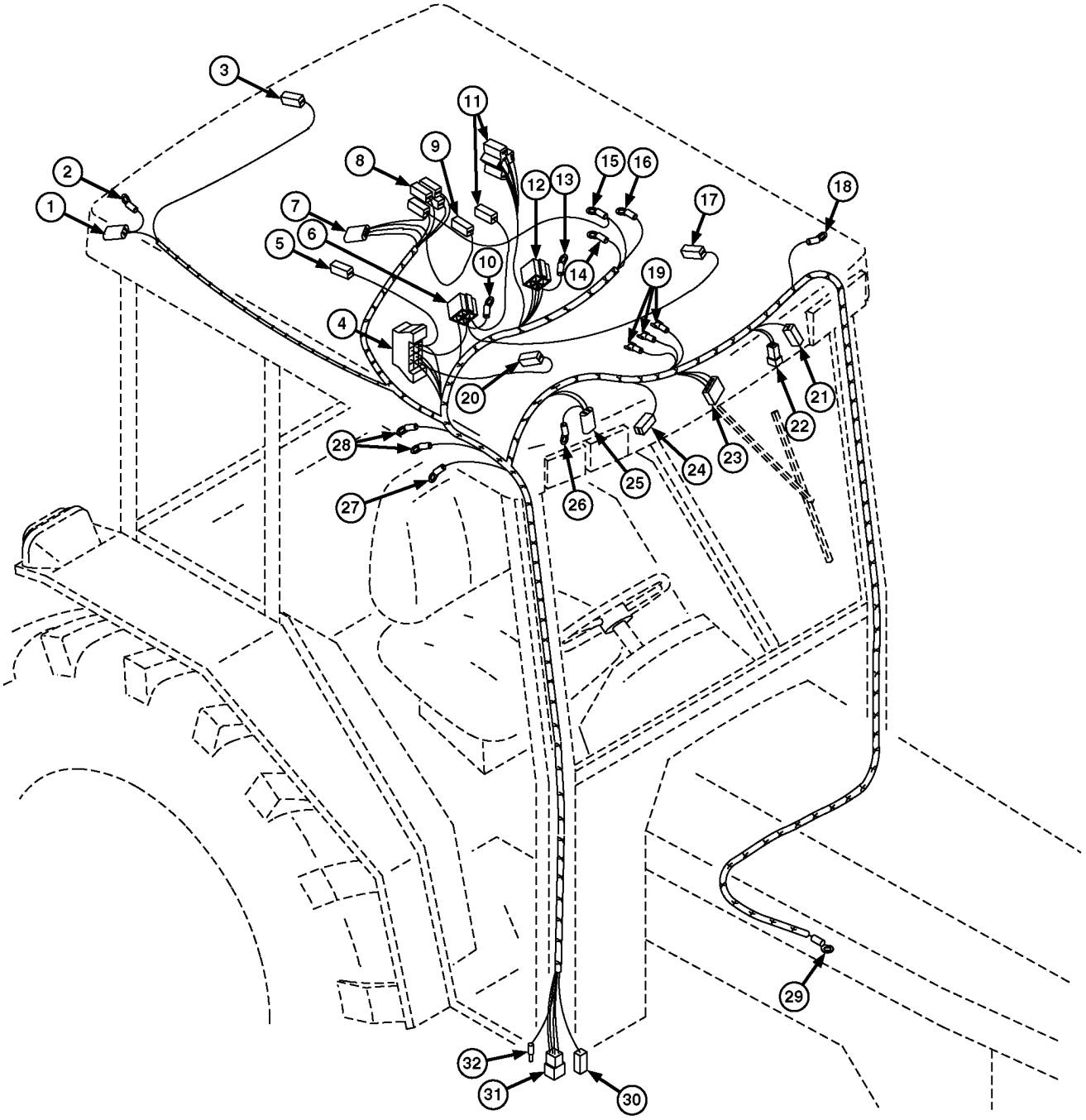
2. Remove rear headliner. (See Remove and Install Rear Headliner in Section 90, Group 15.)
3. Remove foam filler panels around left and right speakers to access connectors.
4. Disconnect wiring connectors (B and I).

NOTE: Support control panel using wire or rope to prevent weight of panel from pulling on wiring during disconnection of harness.

5. Remove overhead control panel.
6. Disconnect wiring connector (C) and leads (D).
7. Remove wiring harness (A).
8. Install new wiring harness and connect all connectors and leads.
9. Remove cab roof and disconnect wiring connectors and leads (E, F, and H).
10. Remove antenna cable (G).
11. Install new wiring harness and antenna cable and connect all leads and connectors.
12. Install cab roof. (See Remove and Install Cab Roof in Section 90, Group 15.)
13. Install foam filler panels around speakers and install rear headliner.
14. Install overhead control panel.
15. Connect battery negative (–) cable.

AG,OUO1085,110 –19–27JUN02–2/2

Replace Cab Wiring Harness—Main



Main Cab Wiring Harness

Continued on next page

AG,OUO1085,113 –19–27JUN02–1/2

1—Right Rear Flasher
2—Ground
3—Rear Wiper
4—Cab Fuse Block
5—Air Conditioning Control Switch
6—Main Cab Relay
7—Rear Wiper Switch
8—Front Wiper Switch
9—Front Wiper Switch
10—Ground
11—Blower Switch Connector
12—Flood Light Relay
13—Ground
14—Cab Junction Block (10-24 Stud)
15—Cab Junction Block (10-24 Stud)
16—Cab Junction Block (1/4-20 Stud)
17—Left Blower Motor
18—Doorjamb Switch—Left Side
19—Dome Light
20—Right Blower Motor
21—Front Floodlight—Left Side
22—Floodlight Relay Jumper
23—Front Wiper Motor
24—Front Floodlight—Right Side
25—Front Flasher—Right Side
26—Ground
27—Doorjamb Switch—Right Side
28—Ground
29—Fuse Link Junction Box
30—Tractor Rear Harness Connector
31—Tractor Rear Harness Connector
32—Tractor Rear Harness Connector

1. Disconnect battery negative (–) cable.
2. Remove cab roof. (See Remove and Install Cab Roof in Section 90, Group 15.)
3. Remove left and right cab post trim strips.
4. Remove air circulating intake cover and filter.

NOTE: Support cab control panel using wire or rope to prevent weight of panel from pulling on wiring during disconnection of harness.

5. Remove cab control panel.
6. Cut all tie straps.
7. Remove all hold-down clamps.
8. Disconnect wiring connectors and leads (1—30).
9. Replace wiring harness.
10. Connect all wiring connectors and leads.
11. Install hold-down clamps.
12. Install new tie straps as necessary.
13. Install cab control panel and air recirculating intake cover and filter.
14. Install left and right cab post trim strips.
15. Install cab roof. (See Remove and Install Cab Roof in Section 90, Group 15.)
16. Connect battery negative (–) cable.

AG,OUO1085,113 –19–27JUN02–2/2

Section 50
Power Train Repair

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Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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OUO1043,0000E94 –19–28JUN02–1/4

Lifting Brackets JDG19

Remove and install engine.

OUO1043,0000E94 –19–28JUN02–2/4

Lifting Brackets JT01748

Remove and install engine.

OUO1043,0000E94 –19–28JUN02–3/4

Flywheel Turning Tool JDE83

Rotates flywheel.

OUO1043,0000E94 –19–28JUN02–4/4

Specifications

Item	Measurement	Specification
Engine-to-Clutch Housing Cap Screws and Nuts—3 Cylinder Tractors without Cab	Torque	300 N•m (225 lb-ft)
Engine-to-Clutch Housing Cap Screws adn Nuts—4 Cylinder Tractors without Cab	Torque	350 N•m (255 lb-ft)
Engine-to-Clutch Housing Cap Screws and Nuts—Tractors with Cab	Torque	318 N•m (235 lb-ft)

OUO1043,0000EC0 –19–28JUN02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

- Clutch Housing Seal Kit

AG,OUO1085,116 –19–09AUG00–1/1

Separate Engine from Clutch Housing— Tractors Without Cab

NOTE: 4-cylinder engine shown, 3-cylinder engines are similar.

1. Remove MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)
2. Remove left and right grille panels.
3. Remove left and right dash panels.
4. Remove hood and disconnect battery negative (—) cable from battery.

Continued on next page

AG,OUO1085,117 –19–28JUN02–1/6

NOTE: Close all openings using caps and plugs.

5. Remove fuel filter/primer pump assembly. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05.) Close all openings using caps and plugs.

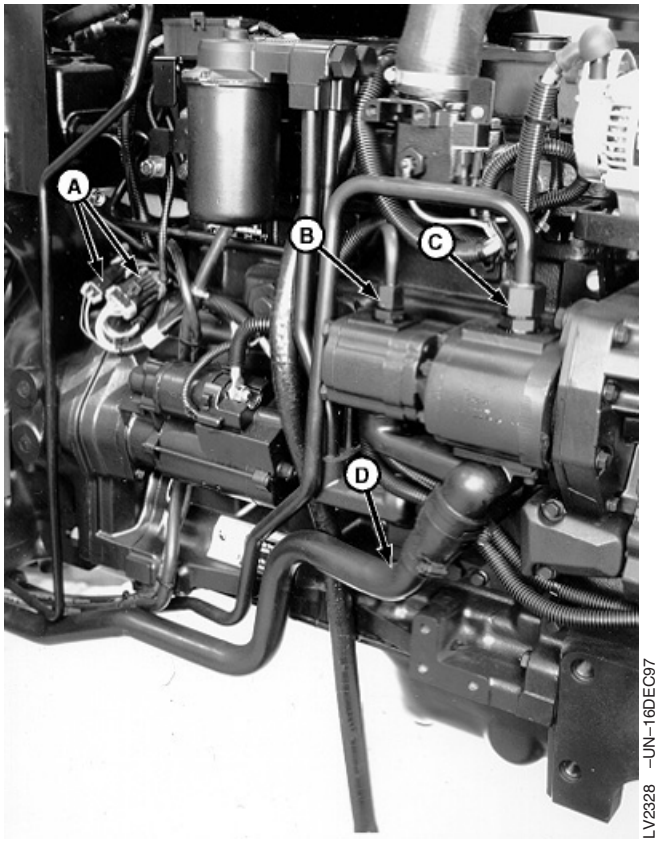
6. Disconnect main wiring harness connectors (A) located at rear of engine.

7. Disconnect hydraulic lines (B and C) from hydraulic pump.

NOTE: Support suction line (D). Transmission/hydraulic oil will spill out of hose if line drops below transmission/reservoir oil level.

8. Disconnect suction line (D) and support line to prevent oil from spilling out.

9. Remove clamp under right step plate that retains lines (C and D).



Right Side Shown

A—Main Wiring Harness Connector
B—Hydraulic Line
C—Hydraulic Line
D—Hydraulic Suction Line

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AG,OUO1085,117 –19–28JUN02–2/6

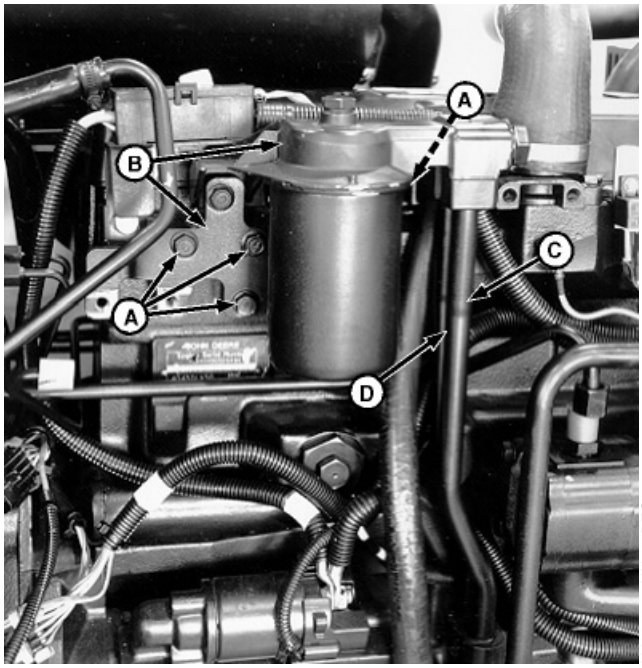
NOTE: Remove high mount oil filter if equipped. See procedures below.

10. Remove four cap screws (A) and remove filter assembly and mounting bracket (B).

NOTE: During removal of oil tubes (C and D) a small amount of engine oil will spill out. Close all openings using caps and plugs.

11. Remove oil tubes (C and D). Close all openings using caps and plugs.

A—Cap Screw (4 used)
B—Oil Filter Assembly and Bracket
C—Oil Tube
D—Oil Tube



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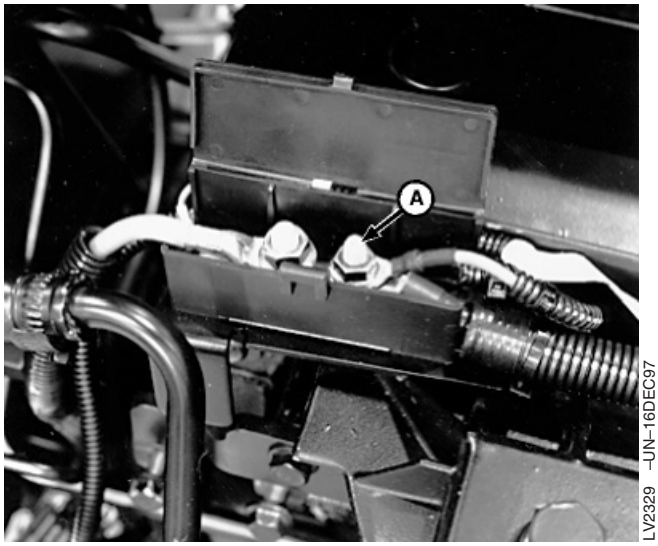
12. Disconnect red wire lead No. 002C from right post (A) of fuse link junction block.

13. Disconnect fuel return hose (B) from injection nozzles.

14. Cut all tie straps as necessary and move wire leads and fuel hoses away from engine.

A—Right Post
B—Fuel Return Hose



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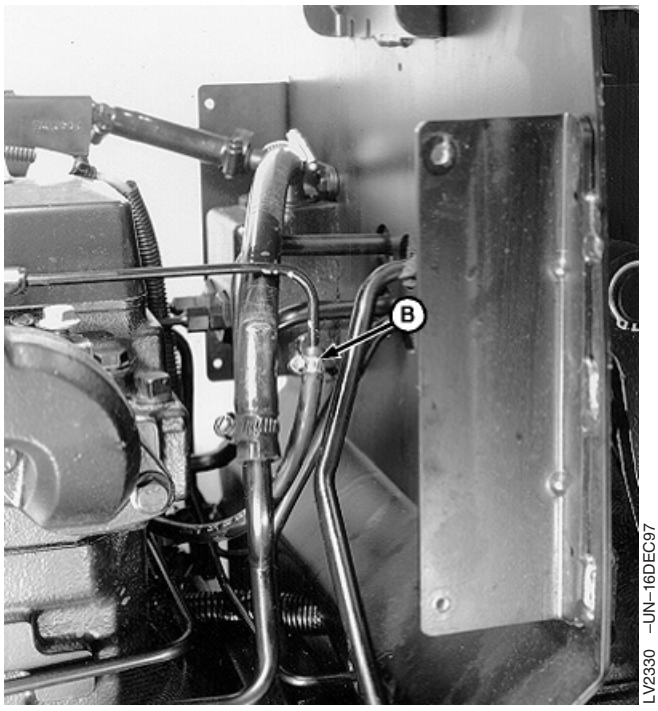

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AG,OUO1085,117 –19–28JUN02–4/6

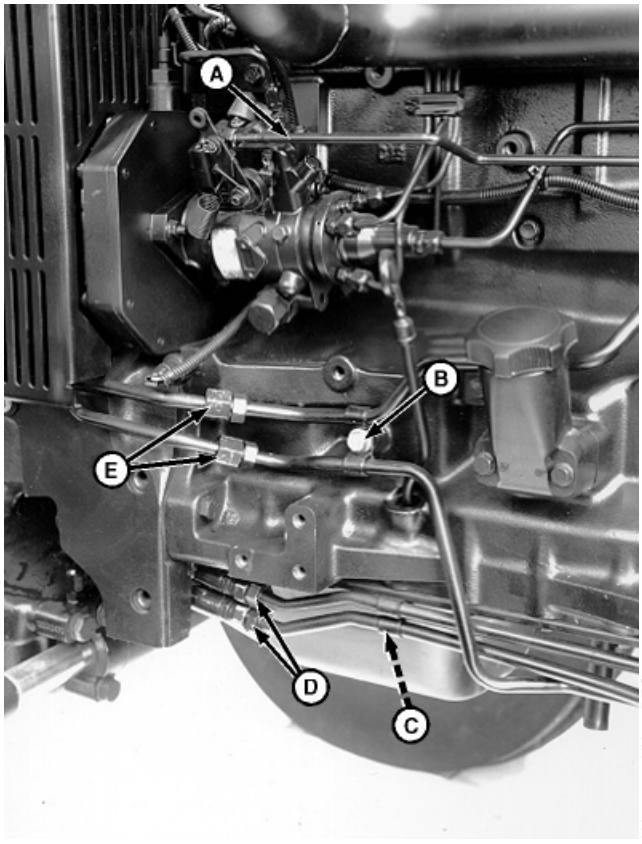
15. Remove throttle linkage rod (A). If equipped with 540/540E shiftable PTO, remove throttle cable bracket located on left side of engine block.

16. Remove cap screw and clamp (B) and nut and clamp (C).

NOTE: Close all openings using caps and plugs.

17. Disconnect hydraulic lines (D). If equipped with hydraulic oil cooler, disconnect lines (E). Close all openings using caps and plugs.

A—Throttle Linkage Rod
B—Cap Screw and Clamp
C—Nut and Clamp
D—Hydraulic Line (2 used)
E—Oil Cooler Line (2 used)



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AG,OUO1085,117 –19–28JUN02–5/6

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18. Remove exhaust pipe and muffler.

19. Install lifting brackets such as JDG19 or JT01748 Lifting Brackets to the rear section of the engine cylinder head.

20. Install lifting eye or bracket in location of removed fuel filter/primer pump and muffler.

21. Attach a hoist to engine.

22. Install a floor jack under clutch housing.

23. Install wood blocks between front axle pivot stops and frame.

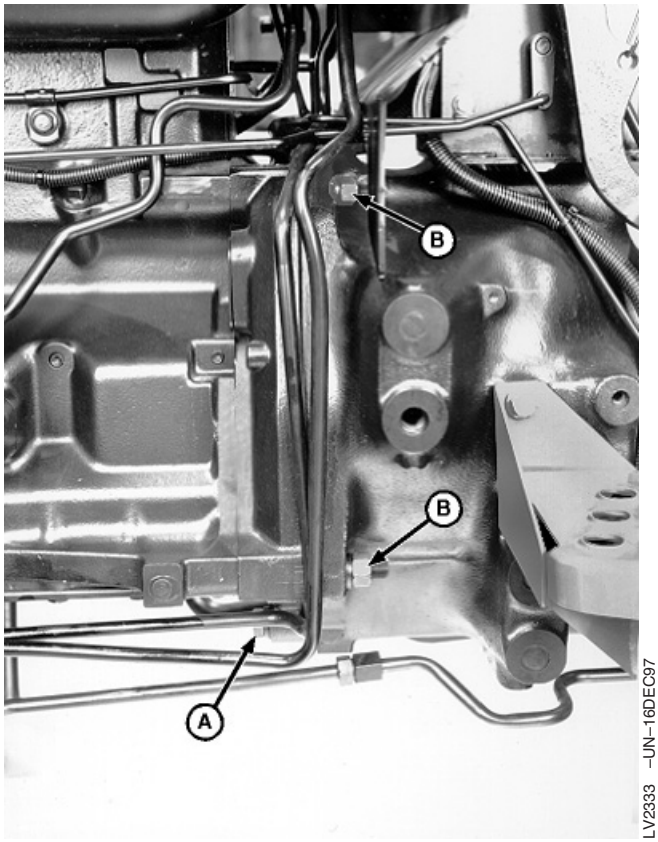
NOTE: Ensure disconnected hydraulic lines do not entangle with engine components or electrical wiring during engine/clutch housing separation.

24. Remove cap screws (A) and two nuts and washers (B). Repeat this procedure for opposite side of tractor.

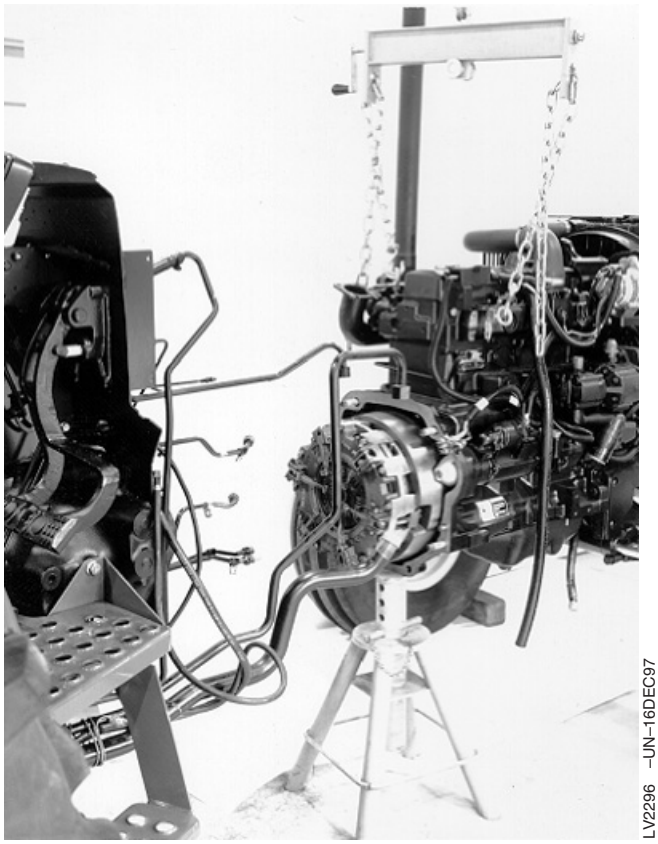
25. Roll front section (engine/front axle assembly) away from tractor rear section.

26. Install a support stand under the flywheel housing of engine.

A—Cap Screw
B—Nut and Washer (2 used)



LV2333 –UN–16DEC97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AG,OUO1085,117 –19–28JUN02–6/6

Install Engine to Clutch Housing—Tractors Without Cab

1. Clean mating surfaces of clutch housing and engine.

NOTE: Ensure disconnected hydraulic lines do not entangle with engine components or electrical wiring during engine/clutch housing installation.

It may be necessary to rotate the PTO shaft and/or engine flywheel so the clutch shafts mesh with the clutch discs. Rotate the PTO shaft by manually turning the PTO at rear of tractor.

Rotate the engine flywheel using Flywheel Turning Tool JDE83.

2. Apply Moly High Temperature EP Grease to traction and PTO clutch shafts.

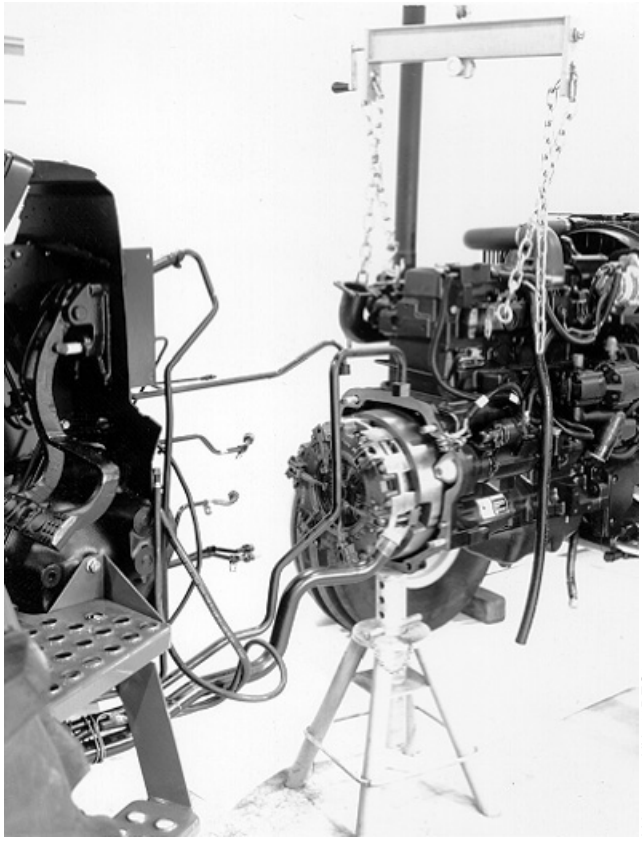
3. Install engine to clutch housing. Tighten cap screws and nuts to specifications.

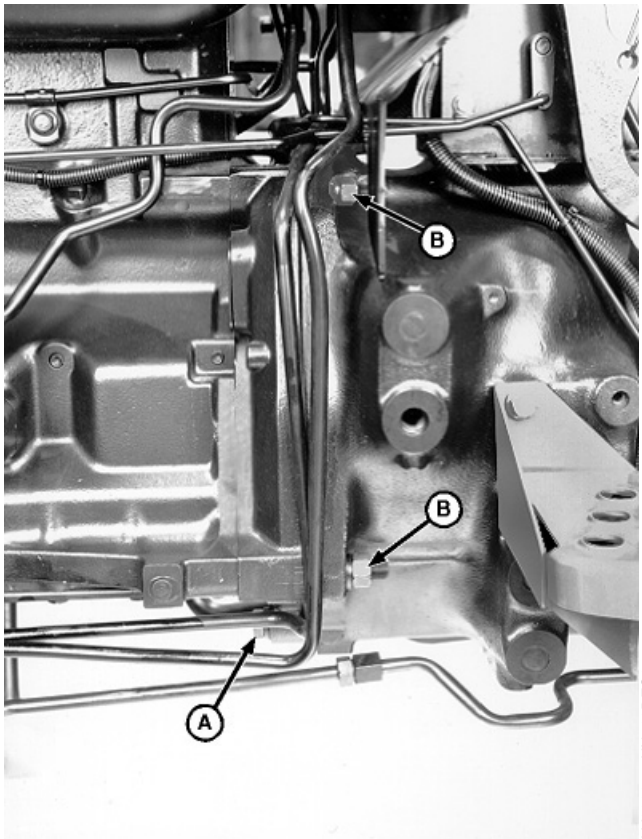
Specification	
Engine-to-Clutch Housing Cap Screws and Nuts—3 Cylinder Tractors without Cab—Torque	300 N•m (225 lb-ft)
Engine-to-Clutch Housing Cap Screws adn Nuts—4 Cylinder Tractors without Cab—Torque	350 N•m (255 lb-ft)

4. Remove wood blocks and floor jack.

5. Remove lifting brackets.

A—Cap Screw
B—Nut





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IMPORTANT: Make sure all O-rings are in place and in good condition before making any hydraulic line connections. Damaged or missing O-rings and seals will leak.

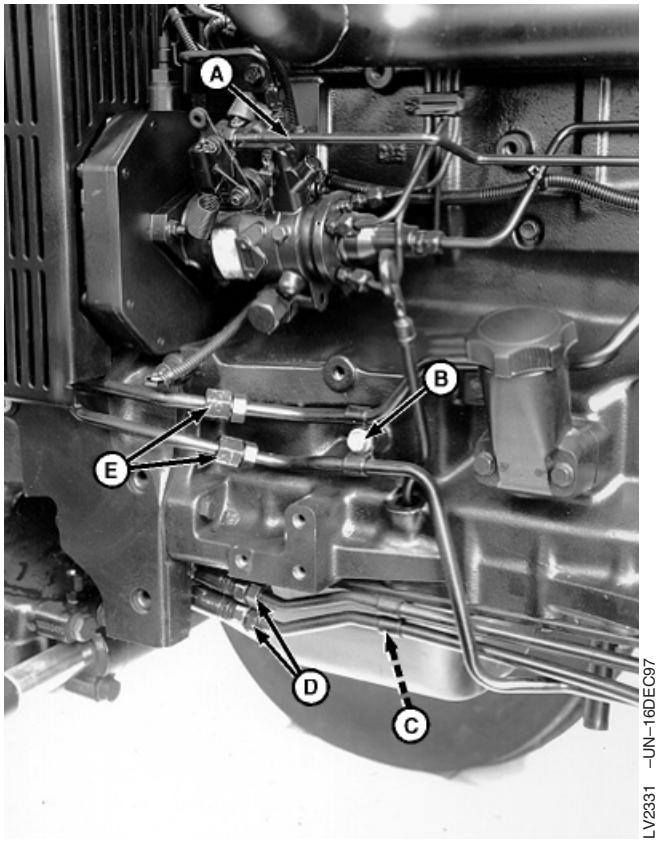
6. Connect hydraulic line (D). If equipped with hydraulic oil cooler, connect lines (E).

7. Install nut and clamp (C).

8. Install cap screw and clamp (B).

9. Install throttle linkage rod (A). If equipped with 540/540E shiftable PTO, install throttle cable bracket on left side of engine block.

A—Throttle Linkage Rod
B—Cap Screw and Clamp
C—Nut and Clamp
D—Hydraulic Line (2 used)
E—Oil Cooler Line (2 used)



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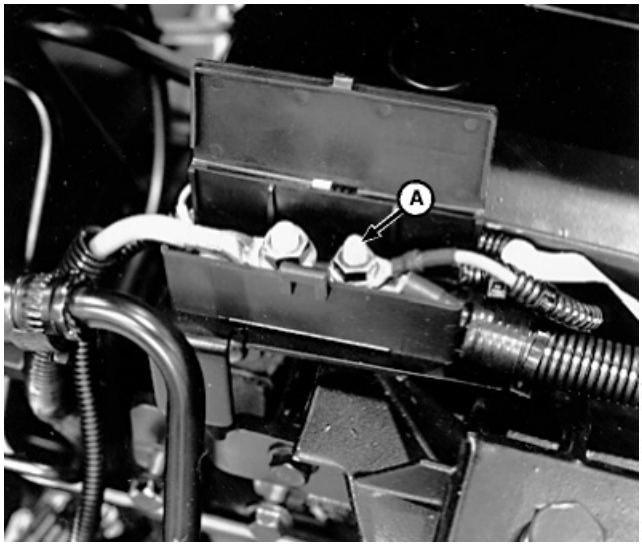
AG,OUO1085,118 –19–28JUN02–2/5

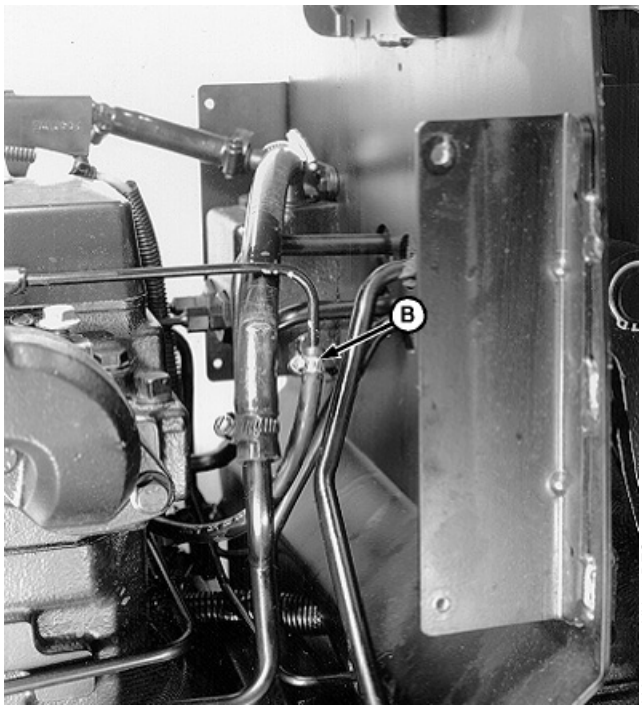
10. Connect red wiring lead at right post (A) of fuse link junction block.

11. Connect fuel hose (B).

A—Right Post
B—Fuel Hose



LV2329 –UN–16DEC97



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AG,OUO1085,118 –19–28JUN02–3/5

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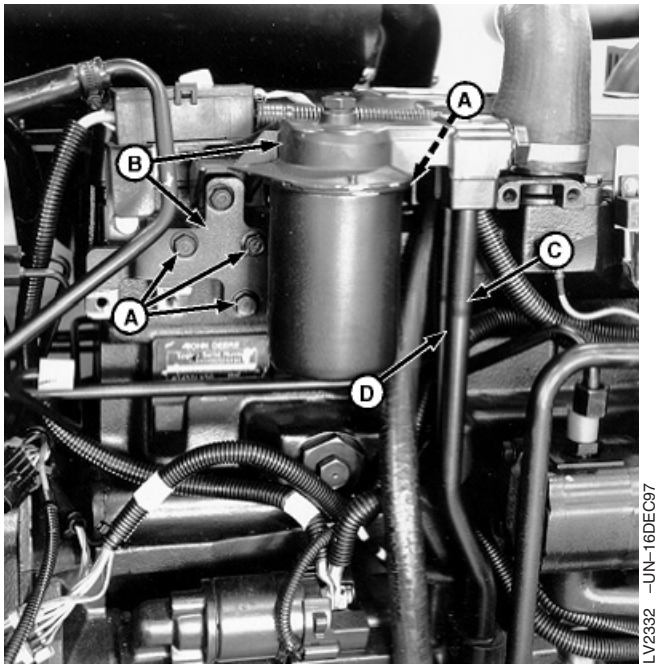
12. Install tubes (C and D).

13. Install filter assembly and bracket (B) using cap screws (A).

A—Cap Screw (4 used)
B—Filter Assembly and Bracket
C—Oil Tube
D—Oil Tube



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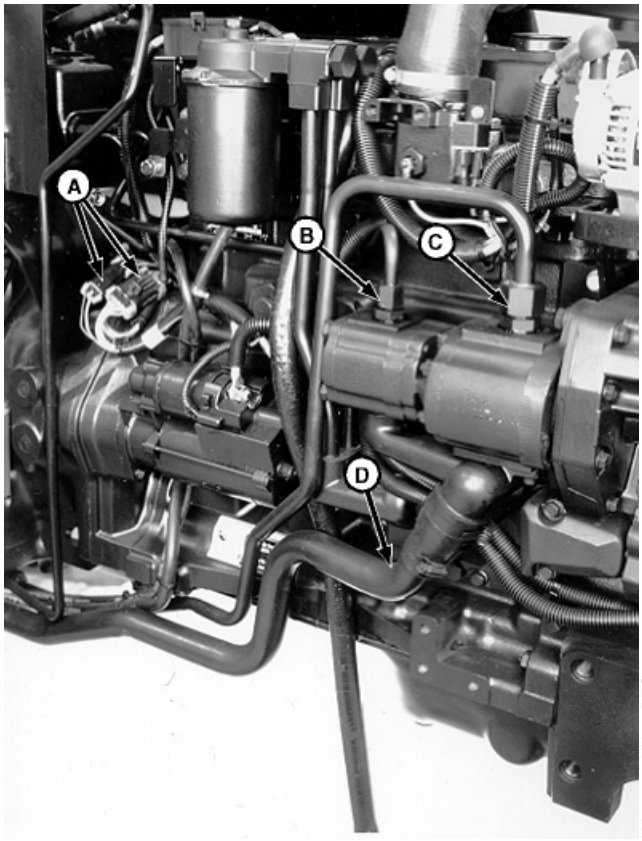
AG,OUO1085,118 –19–28JUN02–4/5

14. Connect hydraulic lines (B and C).
15. Connect suction line (D).
16. Install clamp under right step plate that supports and retains lines (C and D).
17. Connect wiring connectors (A).
18. Install tie straps as necessary.
19. Install fuel filter/primer pump assembly. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05.)
20. Install muffler and exhaust pipe.
21. Connect battery negative (—) cable to battery.
22. Install hood.
23. Install left and right dash panels.
24. Install left and right grille panels.
25. Install MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)
26. Adjust throttle control rod. (See Slow Idle Adjustment and Fast Idle Adjustment in Section 220, Group 15.)



Right Side Shown

A—Wiring Connector
B—Hydraulic Line
C—Hydraulic Line
D—Suction Line

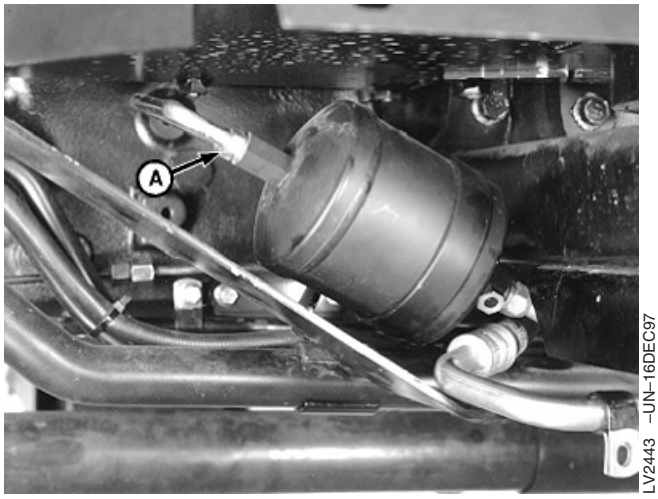
AG,OUO1085,118 –19–28JUN02–5/5

Separate Engine from Clutch Housing—Tractors With Cab

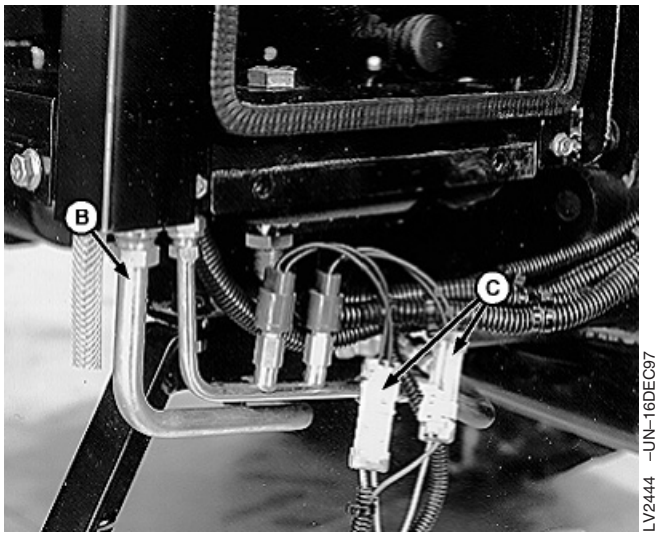
1. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in Section 90, Group 20.)
2. Remove hood and side grille panels.
3. Disconnect battery, negative (—) cable first.
4. Remove fuel filter/primer pump assembly. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05.)
5. Remove MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)
6. Remove right crop guard.

NOTE: Close all openings using caps and plugs.

7. Disconnect air conditioning line (A) from receiver/dryer. Close all openings using caps and plugs.
8. Disconnect air conditioning line (B).
9. Disconnect two wiring connectors (C). Cut wire ties as necessary.



LV2443 –UN–16DEC97



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A—Air Conditioning Line
B—Air Conditioning Line
C—Wire Connector

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AG,OUO1085,119 –19–28JUN02–1/6

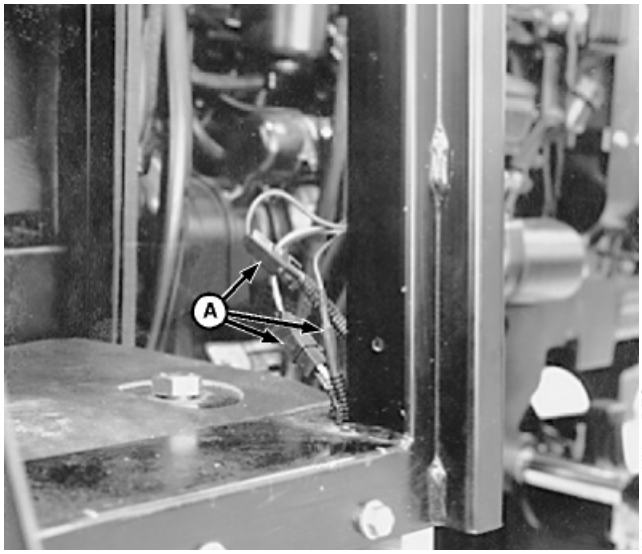
10. Remove trim strip from inside right cab post and disconnect three wire connectors (A).

NOTE: Close all openings using caps and plugs.

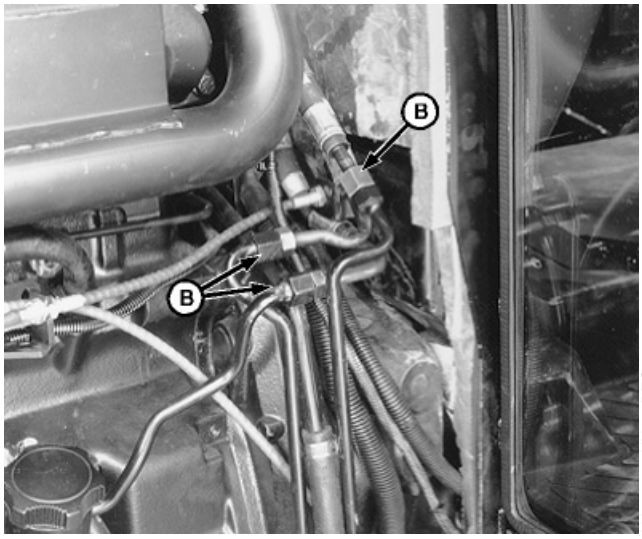
11. Disconnect three hydraulic lines (B). Close all openings using caps and plugs.

12. Remove two cap screws (C) and remove bracket (D) from engine block.

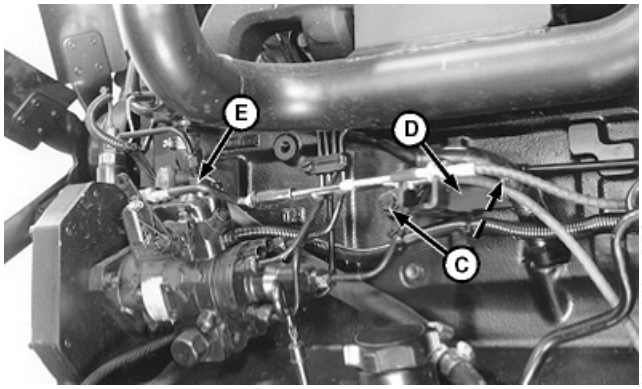
A—Wire Connector (3 used)
B—Hydraulic Line (3 used)
C—Cap Screw (2 used)
D—Bracket
E—Injection Pump Rod



LV2339 –UN–16DEC97



LV2454 –UN–16DEC97



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AG,OUO1085,119 –19–28JUN02–2/6

13. Disconnect two coolant lines (A) from engine.

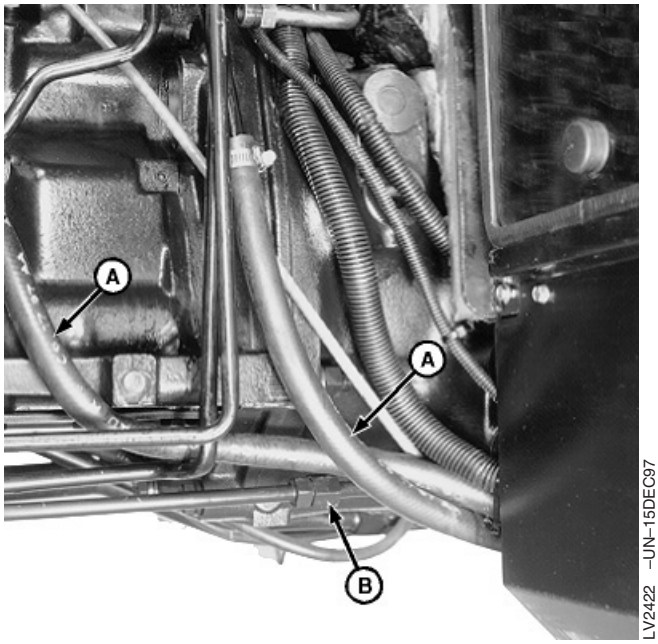
14. Disconnect hydraulic line (B).

15. Remove exhaust pipe.

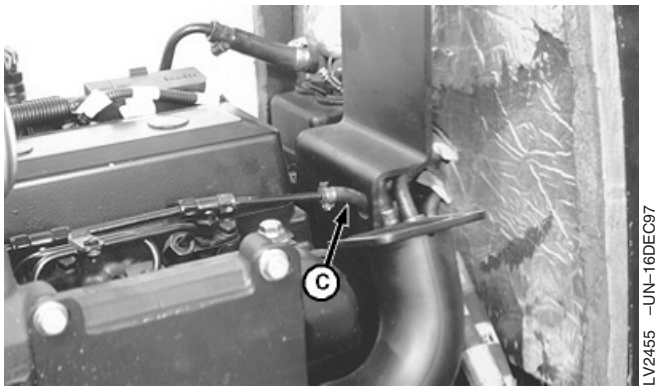
NOTE: Muffler removed for illustration purposes.

16. Remove fuel return line (C).

A—Coolant Line (2 used)
B—Hydraulic Line
C—Fuel Return Line



LV2422 –UN–15DEC97



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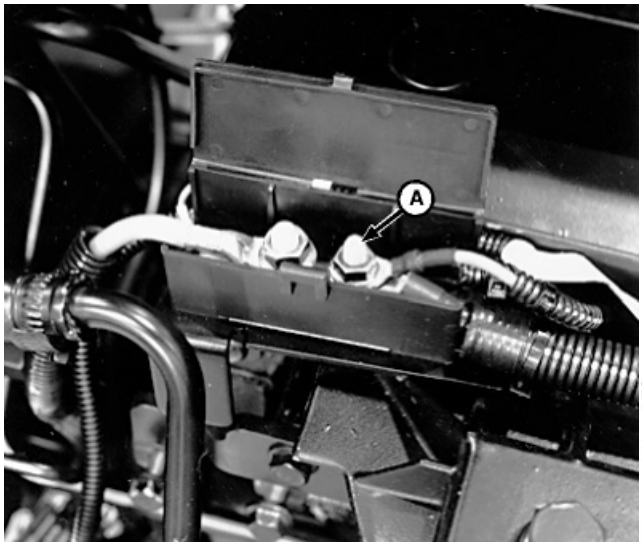
AG,OUO1085,119 –19–28JUN02–3/6

17. Disconnect red wires Nos. 002C and 002D/E from right post of fuse link (A).

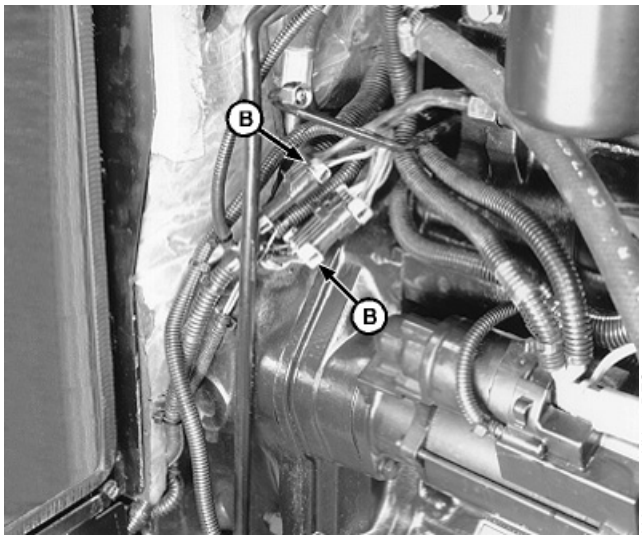
18. Disconnect two main harness wiring connectors (B).

19. Disconnect hydraulic line (C).

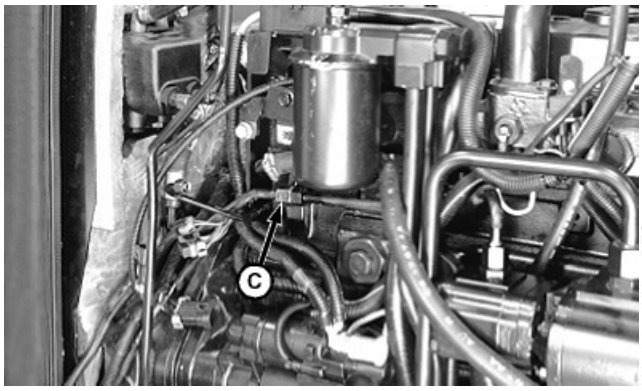
A—Fuse Link
B—Wire Connector (2 used)
C—Hydraulic Line



LV2329 –UN–16DEC97



LV2425 –UN–15DEC97



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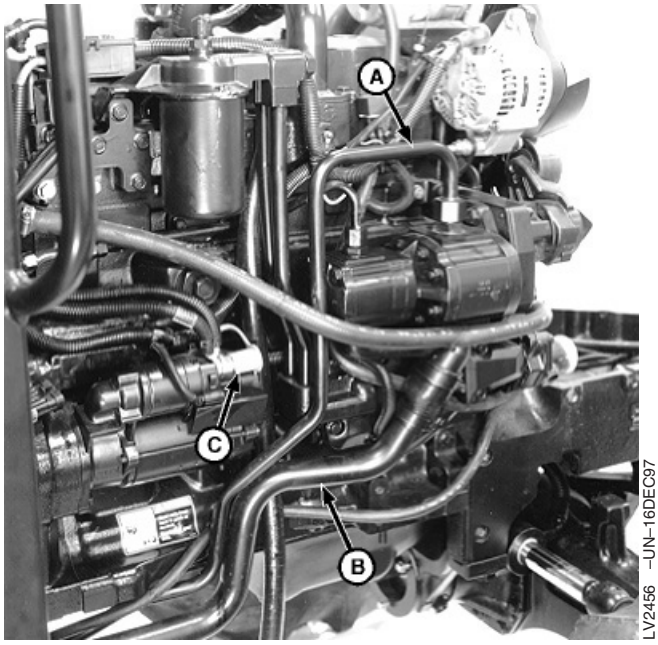
20. Disconnect hydraulic line (A) from hydraulic pump.

NOTE: Support suction line (B). Transmission/hydraulic oil will spill out of hose if line drops below transmission/reservoir oil level.

21. Disconnect suction line (B).

22. Disconnect battery positive (+) cable from starter terminal (C).

A—Hydraulic Line
B—Suction Line
C—Battery Positive Cable



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AG,OUO1085,119 –19–28JUN02–5/6

23. Remove muffler if necessary.

24. Install lifting brackets such as JDG19 or JT01748 to engine in the areas where muffler and fuel filter primer pump were removed.

25. Attach a hoist to engine.

NOTE: If tractor is equipped with optional front weights, remove weights from weight bracket before removing any engine to clutch housing mounting hardware.

26. Install a floor jack under clutch housing.

27. Install wood blocks between front axle pivot stops and frame.

NOTE: Ensure disconnected hydraulic lines do not entangle with engine components or electrical wiring during engine/clutch housing separation.

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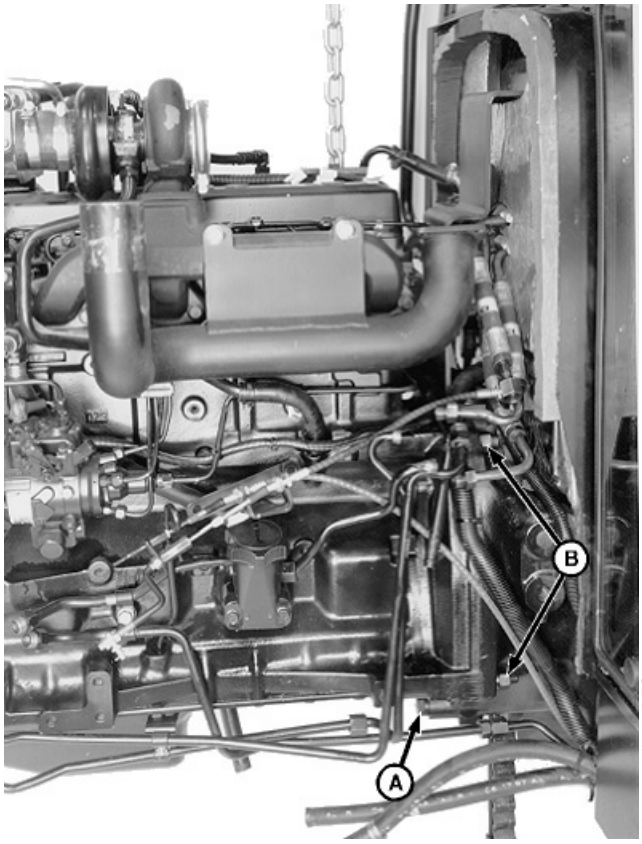
28. Remove two cap screws (A) and four nuts (B). Roll front section (engine/front axle assembly) away from tractor rear section.

29. Install a support stand under the flywheel housing of engine.



A—Cap Screw (2 used)
B—Nut (4 used)

AG,OUO1085,119 –19–28JUN02–6/6

Install Engine to Clutch Housing—Tractors With Cab

1. Clean mating surfaces of clutch housing and engine.

NOTE: Ensure disconnected hydraulic lines do not entangle with engine components or electrical wiring during engine/clutch housing installation.

It may be necessary to rotate the PTO shaft and/or engine flywheel so the clutch shafts mesh with the clutch discs. Rotate the PTO shaft by manually turning the PTO at rear of tractor.

Rotate the engine flywheel using Flywheel Turning Tool JDE83.

2. Apply Moly High Temperature EP Grease to traction and PTO clutch shafts.

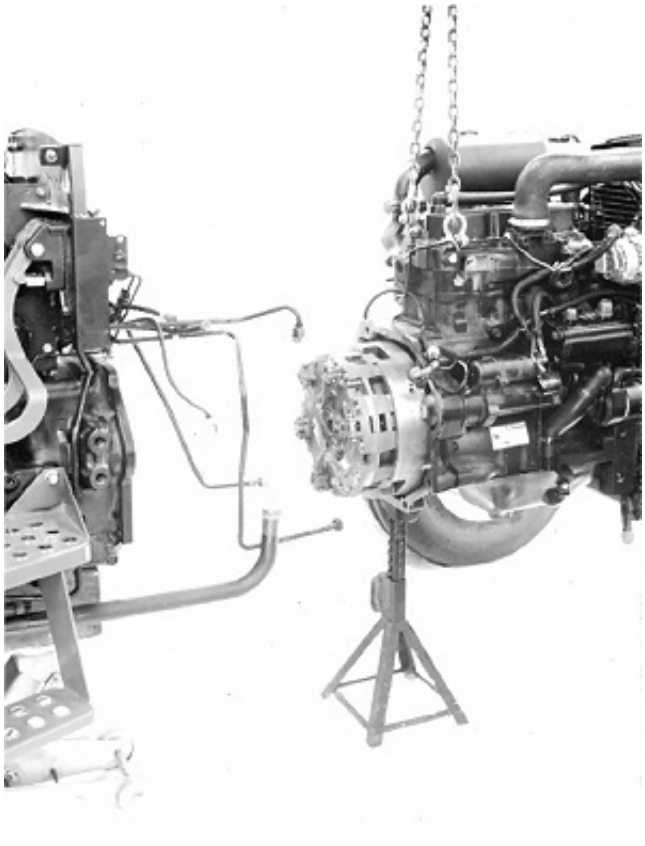
3. Install engine to clutch housing. Tighten cap screws (A) and nuts (B) to specification.

Specification	
Clutch Housing Cap Screws and Nuts—Tractors with Cab—Torque	318 N•m (235 lb-ft)

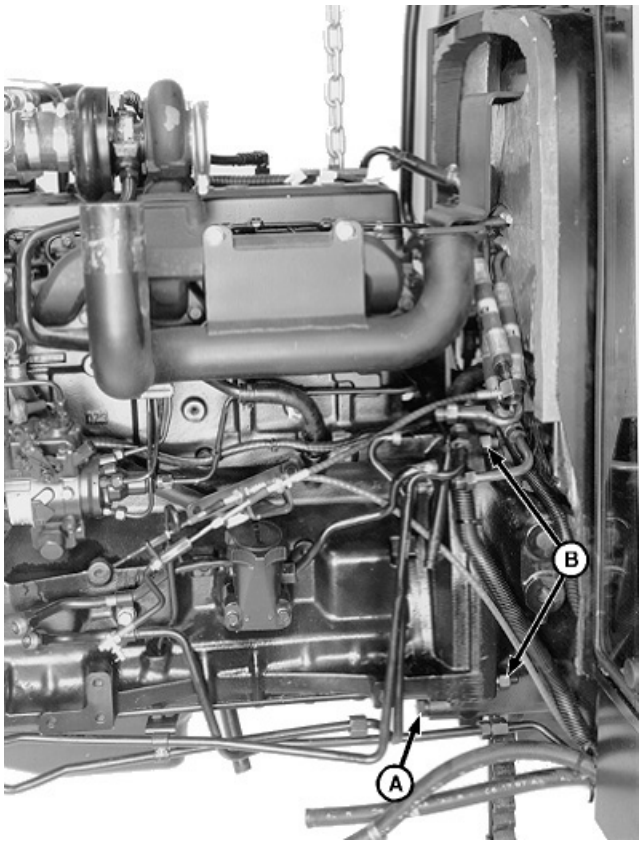
4. Remove wood blocks and floor jack.

5. Remove lifting brackets.

A—Cap Screw
B—Nut



LV525 –UN–03MAR92



LV2430 –UN–15DEC97

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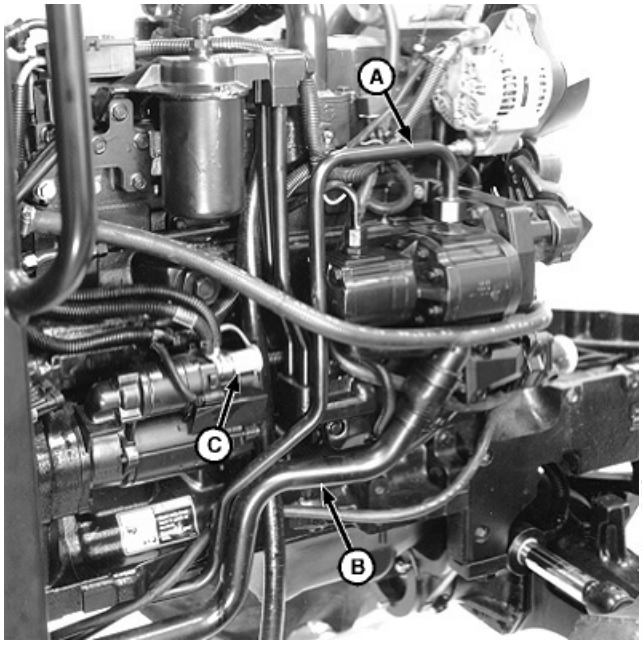
6. Connect battery positive (+) cable to starter terminal (C).

7. Connect suction line (B).

IMPORTANT: Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

8. Connect hydraulic line (A) to hydraulic pump.

A—Hydraulic Line
B—Suction Line
C—Battery Positive Cable



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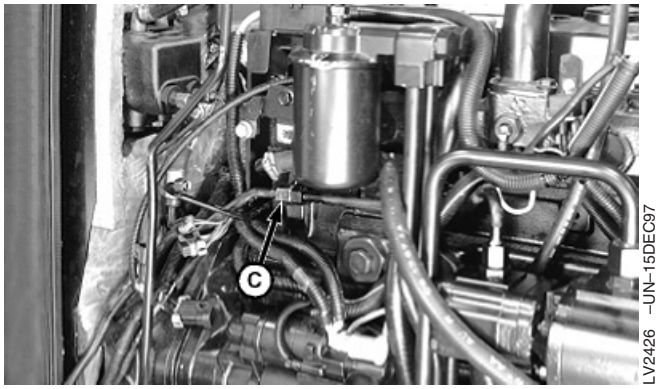
AG,OUO1085,120 –19–28JUN02–2/6

9. Connect hydraulic line (C).

10. Connect two main harness wiring connectors (B).

11. Connect red wires Nos. 002C and 002D/E to right post of fuse link (A).

A—Fuse Link
B—Wiring Connector (2 used)
C—Hydraulic Line



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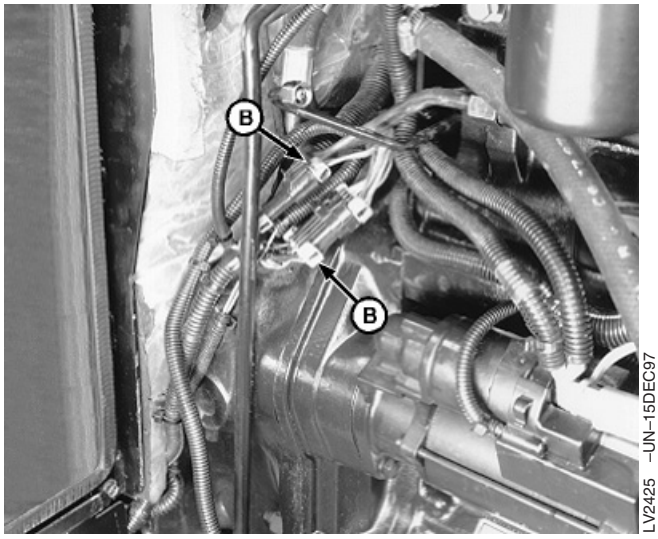

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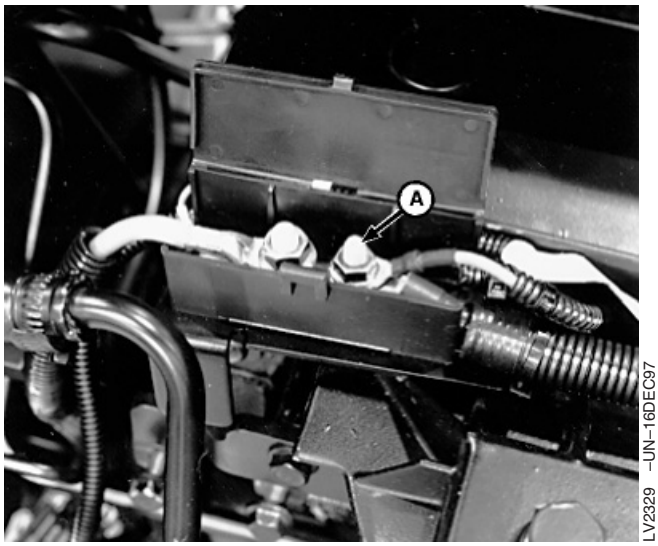

LV2329 –UN–16DEC97

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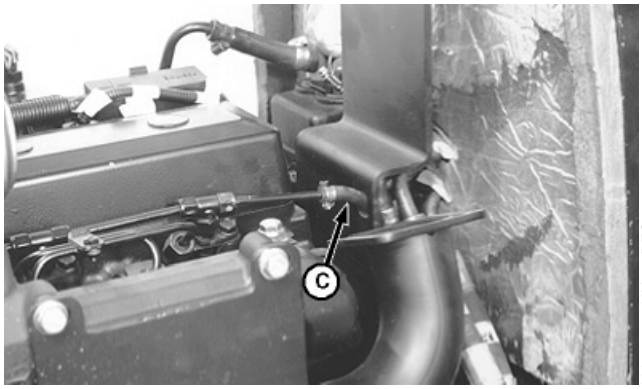
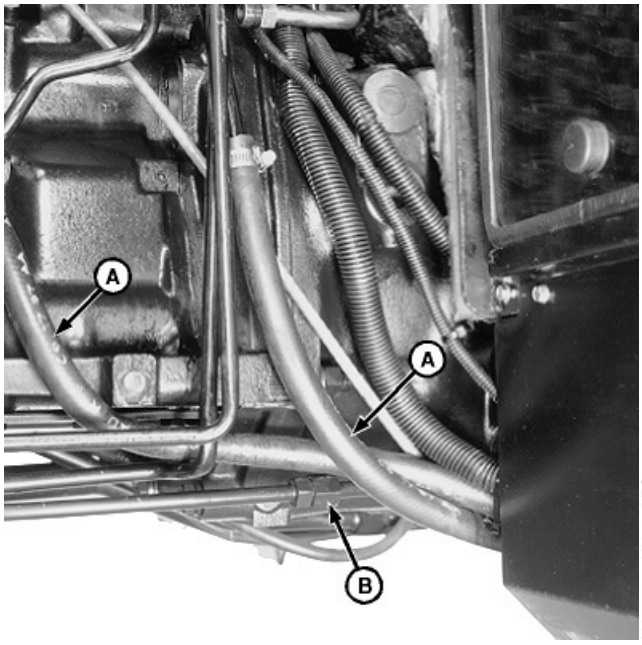
AG,OUO1085,120 –19–28JUN02–3/6

12. Connect fuel line (C).
13. Install exhaust pipe.
14. Connect hydraulic line (B).
15. Connect coolant supply and return lines (A) from engine.

A—Coolant Lines
B—Hydraulic Line
C—Fuel Line



LV2455 –UN–16DEC97



LV2422 –UN–15DEC97

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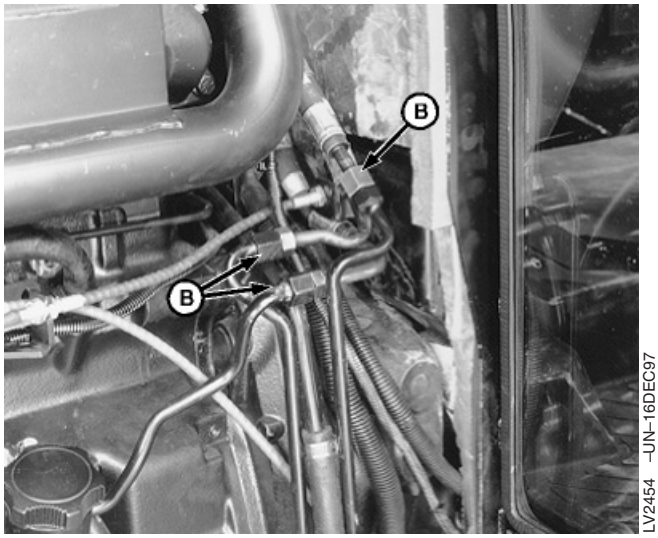
AG,OUO1085,120 –19–28JUN02–4/6

16. Connect hydraulic lines (B).
17. Install rod (E) to injection pump.
18. Install cap screws (C) through bracket (D) to engine.
19. Connect three wire connectors (A). Install trim strip inside right front cab post.

A—Wire Connector (3 used)
B—Hydraulic Line (2 used)
C—Cap Screw (2 used)
D—Bracket
E—Injection Pump Rod



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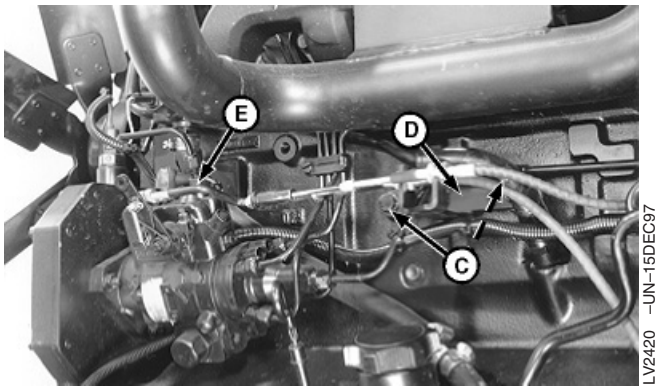

LV2420 –UN–15DEC97

LV2339 –UN–16DEC97

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AG,OUO1085,120 –19–28JUN02–5/6

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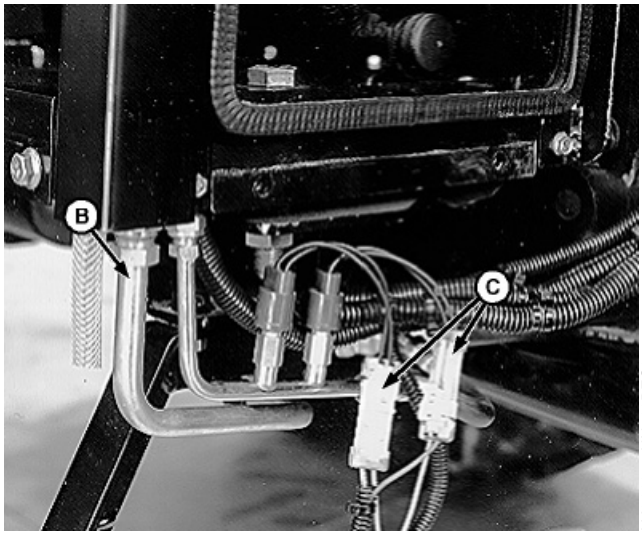
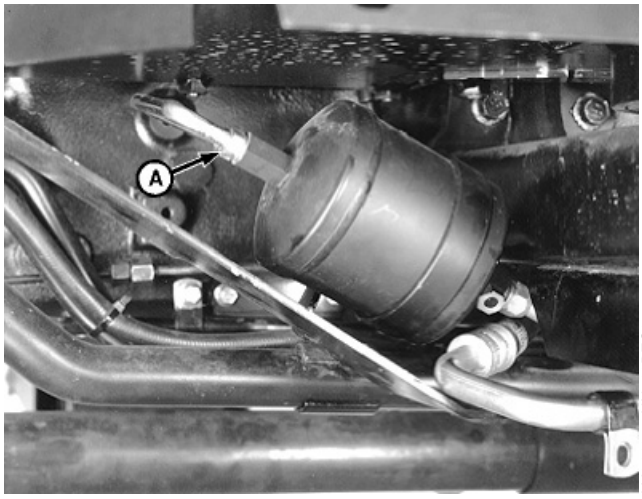
20. Connect air conditioning line (B) and connect two wire connectors (C).
21. Connect air conditioning line (A) to receiver/dryer.
22. Install right crop guard.
23. Install MFWD drive shaft. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)
24. Install fuel filter/primer pump assembly. (See Remove and Install Fuel Filter/Primer Pump Assembly—5210 and 5310 or Remove and Install Fuel Filter/Primer Pump Assembly—5410 and 5510 in Section 30, Group 05.)
25. Connect battery, positive (+) cable first.
26. Fill cooling system with proper coolant. Run engine to circulate coolant. Check coolant level and replenish as necessary.
27. Adjust fast idle. (See Fast Idle Adjustment in Section 220, Group 15.)
28. Flush, evacuate, and charge air conditioning system. (See Flush Air Conditioning System, Evacuate Air Conditioning System and Charge Air Conditioning System in Section 90, Group 20.)

A—Air Conditioning Line
B—Air Conditioning Line
C—Wire Connector (2 used)



LV2444 –UN–16DEC97



LV2443 –UN–16DEC97

AG,OUO1085,120 –19–28JUN02–6/6

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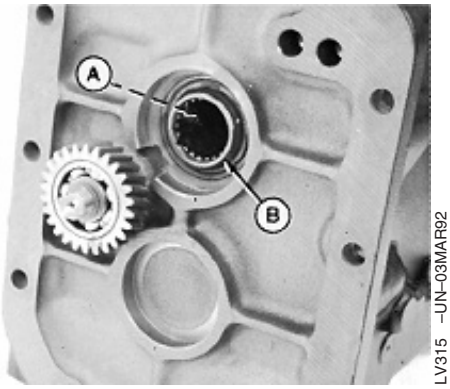
Replace Clutch Housing Seal

1. Separate clutch housing from transmission. (See Separate Clutch Housing from Transmission in Group 15 for CollarShift/SyncShuttle™ Transmission or Separate Clutch Housing from Transmission in Group 16 for PowrReverser™ Transmission.)

2. Remove PTO clutch shaft coupler (A).

NOTE: Traction clutch shaft will only pull out part way. When removing traction clutch shaft, the PTO clutch shaft may slide out with the traction clutch shaft.

3. Remove traction clutch shaft (B) using an inside puller and slide hammer.



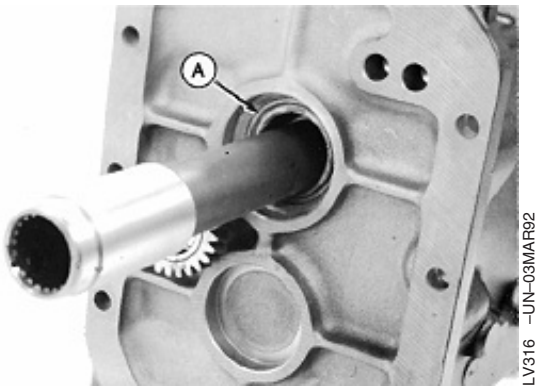
LV315 –UN–03MAR92

A—PTO Clutch Shaft Coupler
B—Traction Clutch Shaft

AG,OUO1085,121 –19–28JUN02–1/3

4. Pry out seal (A).

A—Clutch Housing Seal



LV316 –UN–03MAR92

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AG,OUO1085,121 –19–28JUN02–2/3

IMPORTANT: When installing clutch shafts, make sure splines on opposite end of shafts are in alignment with clutch disk splines before striking ends of shaft with a hammer. Damage to clutch disks and shaft splines can occur.

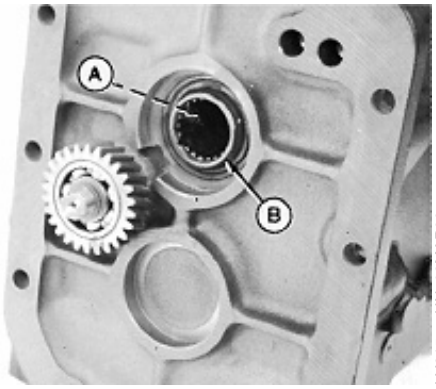
5. Install clutch shaft (B). Align opposite ends of each shaft with clutch disks. Rotate shaft in either direction if necessary. Tap on the end of each shaft using a brass drift and hammer to fully seat each shaft in its respective bore.

6. Apply multipurpose grease to the lips of new seal.

7. Install seal with lips facing away from clutch housing using a brass drift and hammer. Install seal until it stops.

8. Install PTO clutch shaft coupler (A).

9. Install clutch housing to transmission. (See Install Clutch Housing to Transmission in Group 15 for CollarShift/SyncShuttle™ Transmission or Install Clutch Housing to Transmission in Group 16 for PowrReverser™ Transmission.)

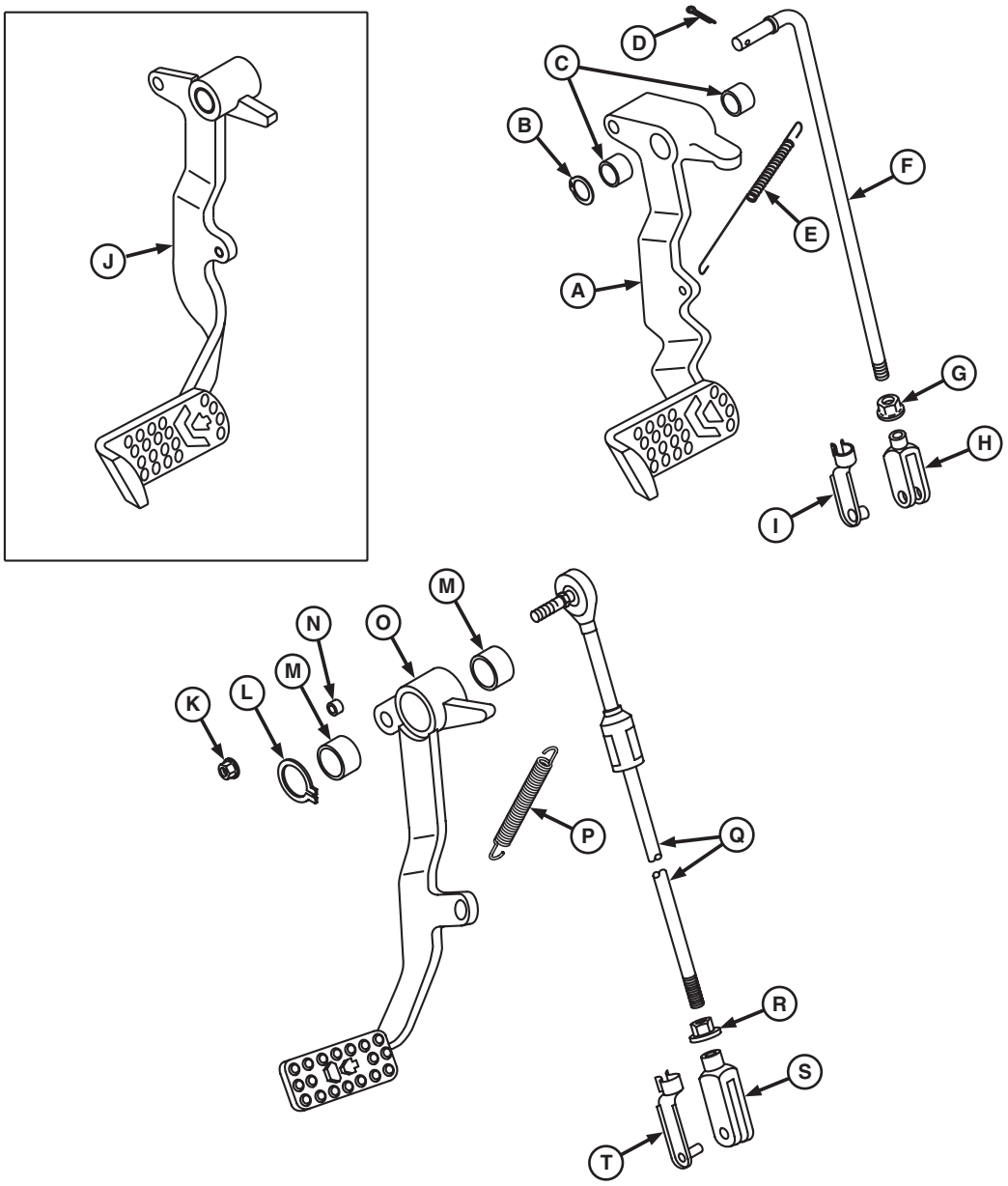


LV315 –UN–03MAR92

A—PTO Clutch Shaft Coupler
B—Clutch Shaft

AG,OUO1085,121 –19–28JUN02–3/3

Inspect and Repair Clutch Pedal and Linkage—CollarShift/SyncShuttle™



LV353AE –UN–18APR01

A—Clutch Pedal (Early)
B—Snap Ring (Early)
C—Bushing (2 used) (Early)
D—Cotter Pin (Early)
E—Extension Spring (Early)
F—Rod (Early)
G—Flange Nut (Early)
H—Yoke (Early)
I—Spring Locking Pin (Early)
J—Clutch Pedal (Cab Tractor Only)
K—Flange Nut (Later)
L—Snap Ring (Later)
M—Bushing (2 used) (Later)
N—Bushing (Later)
O—Clutch Pedal (Later)
P—Extension Spring (Later)
Q—Rod (Later)
R—Flange Nut (Later)
S—Yoke (Later)
T—Spring Locking Pin (Later)

Continued on next page

AG,OUO1085,122 –19–11NOV02–1/2

NOTE: If equipped with cab, lower front windows must be removed before removing dash covers. (See Remove and Install Lower Front Windows in Section 90, Group 15.)

Early and later exploded view shown. Inspect and repair procedures are the same for both.

1. Remove left and right dash panels.

NOTE: Cab tractors are equipped with clutch pedal (J) in place of clutch pedal (A or O).

2. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Remove bushings only if replacement is necessary.

3. Inspect bushings (C or M) for wear or damage. Replace if necessary.

   Replace bushings using a bearing, bushing, and seal driver set. Install bushings flush with pedal surface.

4. Apply Moly High Temperature EP Grease to I.D. of bushings.

5. Install left and right dash panels.

6. Adjust clutch pedal free-play. (See Clutch Pedal Free Play Adjustment in Section 250, Group 15.)

7. Adjust throttle control rod. (See Slow Idle Adjustment and Fast Idle Adjustment in Section 220, Group 15.)

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AG,OUO1085,122 –19–11NOV02–2/2

Inspect and Repair Clutch Pedal and Linkage—PowrReverser™

1. Remove left and right dash panels.

NOTE: Cab tractors are equipped with clutch pedal (J) in place of clutch pedal (A).

2. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Remove bushings (C) only if replacement is necessary.

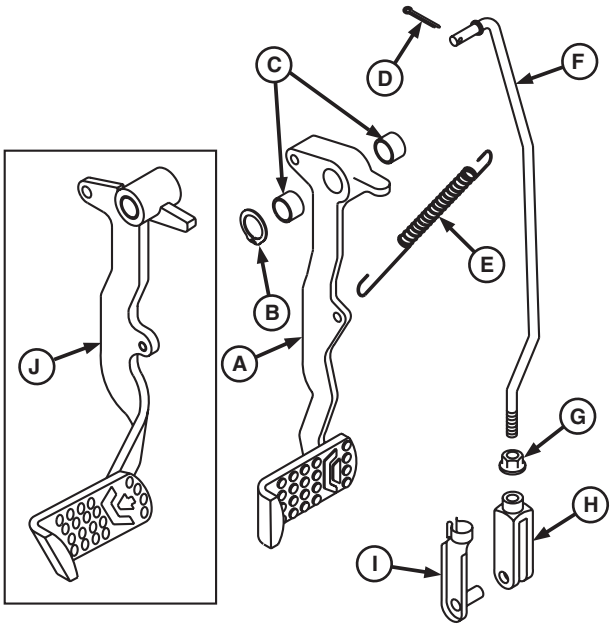
3. Inspect bushings (C) for wear or damage. Replace if necessary.

   Replace bushings using a bearing, bushing, and seal driver set. Install bushings flush with pedal surface.

4. Apply Moly High Temperature EP Grease to I.D. of bushings.

5. Install left and right dash panels.

6. Adjust clutch pedal free-play. (See Clutch Pedal Linkage Adjustment in Section 250, Group 16.)



LV1045AE –UN–09MAY02

A—Clutch Pedal
B—Snap Ring
C—Bushing (2)
D—Cotter Pin
E—Extension Spring
F—Rod
G—Flange Nut
H—Yoke
I—Pin
J—Clutch Pedal (Cab Tractor)

AG,OUO1085,123 –19–28JUN02–1/1

Essential Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

SERVICEGARD is a trademark of Deere & Company

OUO1043,0000E97 –19–28JUN02–1/5

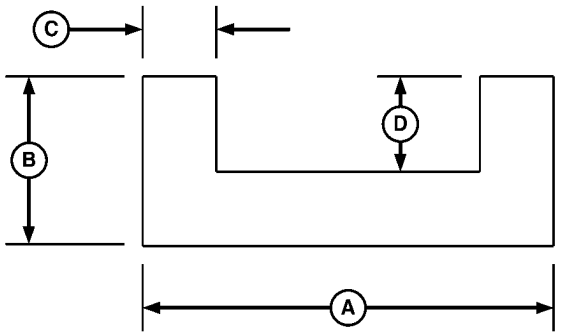
Universal Clutch Alignment Tool. JDG689

Aligns PTO and traction clutch disks.

OUO1043,0000E97 –19–28JUN02–2/5

Traction Clutch Finger Height Gauge. JDG827

Measure traction clutch finger height on tractors without PowrReverser™. See Dealer Fabricated Tools in Section 299, Group 10 for dimensions.



JDG827 –UN–01JUL97

PowrReverser is a trademark of Deere & Company

OUO1043,0000E97 –19–28JUN02–3/5

JDG828 –UN–24FEB98

Traction Clutch Finger Height Adjustment Tool . . JDG828

Adjust traction clutch finger height on tractors without PowrReverser™. See Dealer Fabricated Tools in Section 299, Group 10 for dimensions.

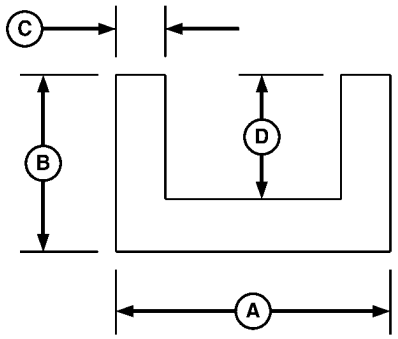
PowrReverser is a trademark of Deere & Company

Continued on next page

OUO1043,0000E97 –19–28JUN02–4/5

PTO Clutch Finger Height Gauge JDG826

Measure PTO clutch finger height on tractors without PowrReverser™. See Dealer Fabricated Tools in Section 299, Group 10 for dimensions.



JDG826 –UN–01JUL97

PowrReverser is a trademark of Deere & Company

OUO1043,0000E97 –19–28JUN02–5/5

Other Material

Number	Name	Use
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to PTO and traction clutch yoke-to-armshaft cap screw threads.

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LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000E99 –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Clutch Assembly Cap Screws	Torque	36 N•m (27 lb-ft)
Traction Clutch Disk	Minimum Thickness	6.50 mm (0.260 in.)
PTO Clutch Disk	Minimum Thickness	5.50 mm (0.220 in.)
PTO Clutch Front Pressure Plate	Minimum Thickness	17.30 mm (0.680 in.)
PTO Clutch Rear Pressure Plate	Minimum Thickness	18.80 mm (0.740 in.)
Traction Clutch Front Pressure Plate	Minimum Thickness	30.00 mm (1.181 in.)
Traction Clutch Rear Pressure Plate	Minimum Thickness	17.00 mm (0.669 in.)
Clutch Assembly Spring Washer	Height	13.3 mm (0.523 in.) minimum
Clutch Release Mechanism Cap Screws	Torque	65 N•m (48 lb-ft)

OUO1043,0000E9A –19–28JUN02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

Traction Clutch Shaft Seal Kit

PTO Clutch Lever Kit

Traction Clutch Lever Kit

AG,OUO1085,125 –19–11AUG00–1/1

Remove and Install Clutch Assembly

NOTE: Clutch assembly can be removed and installed without any alignment or finger adjustment procedures.

If clutch assembly has been disassembled for inspection or repair, see PTO Clutch Finger Adjustment and Traction Clutch Finger Adjustment in this group.

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)

CAUTION: Clutch assembly is heavy. Support clutch before removing cap screws to prevent personal injury.

2. Remove twelve cap screws (A) and clutch assembly.

3. Make repairs as necessary. (See Disassemble and Inspect Clutch Assembly in this group.)

4. Install clutch assembly and cap screws. Evenly tighten cap screws in a criss-cross pattern to specification.

Specification

Clutch Assembly Cap Screws—
Torque ..... 36 N•m (27 lb-ft)

5. Install engine to clutch housing. (See Install Engine to Clutch Housing—Tractors Without Cab or Install Engine to Clutch Housing—Tractors With Cab in Group 05.)

LV387 –UN–03MAR92

A—Cap Screw (12 used)

AG,OUO1085,126 –19–28JUN02–1/1

Disassemble and Inspect Clutch Assembly

1. Put index marks (A) on pressure plates to aid in assembly.

A—Index Marks (4 used)

LV029 –UN–03MAR92

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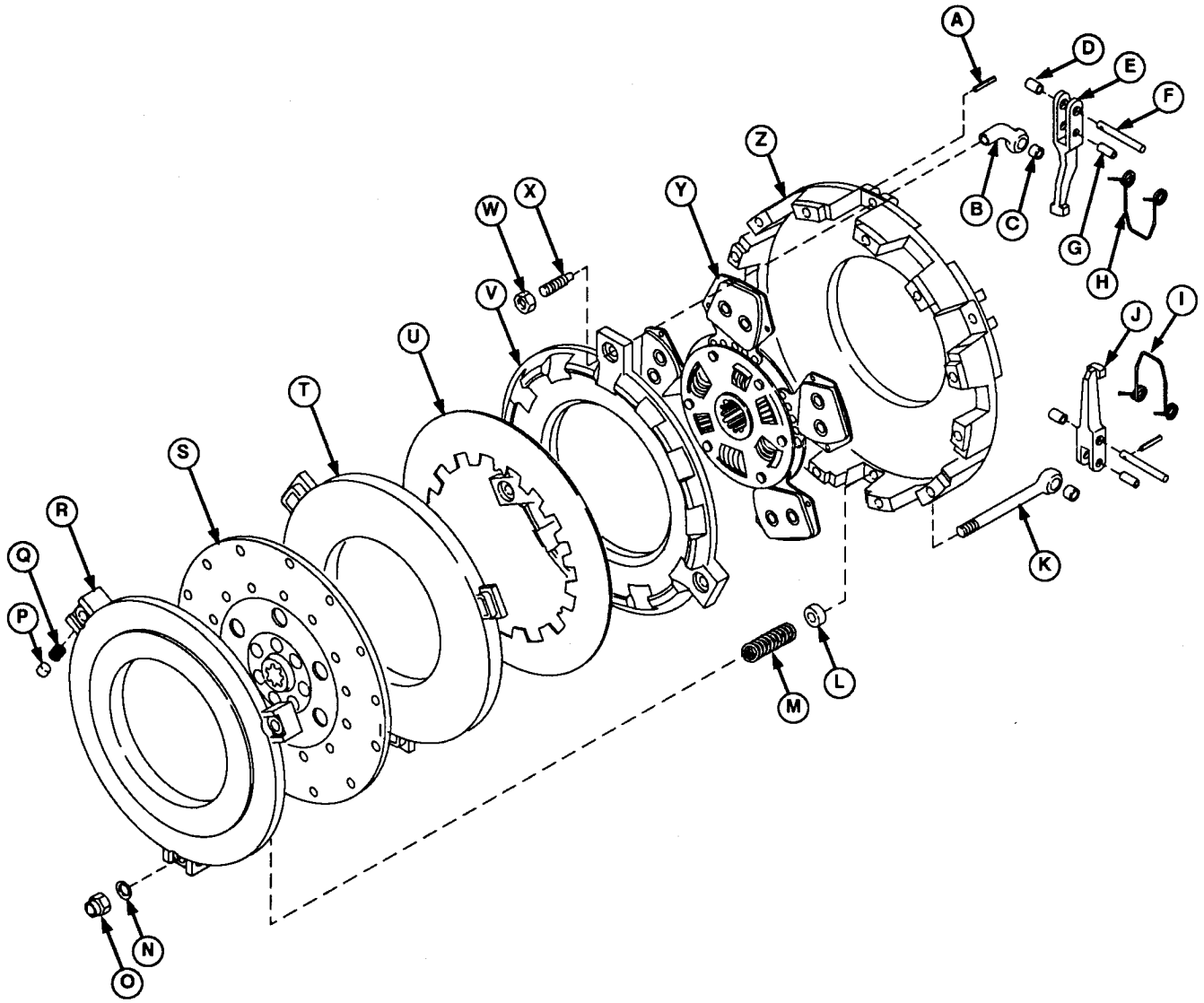
AG,OUO1085,127 –19–28JUN02–1/5



LV030AE –UN–03MAR92

Clutch Assembly

A—Spring Pin (6 used)
B—Adjuster Cap (3 used)
C—Bushing (6 used)
D—Bushing (6 used)
E—Traction Clutch Finger (3 used)
F—Pin (6 used)
G—Pin (6 used)
H—Spring (3 used)
I—Spring (3 used)
J—PTO Clutch Finger (3 used)
K—Adjuster (3 used)
L—Spacer (3 used)
M—Spring (3 used)
N—Conical Washer (3 used)
O—Lock Nut (3 used)
P —Pad (3 used)
Q—Spring (3 used)
R—PTO Clutch Front Pressure Plate
S—PTO Clutch Disk
T—PTO Clutch Rear Pressure Plate
U—Spring Washer
V—Traction Clutch Front Pressure Plate
W—Nut
X—Adjuster Stud
Y—Traction Clutch Disk
Z—Traction Clutch Rear Pressure Plate

NOTE: Spring pins (A) must be pulled from bore to remove.

PTO clutch and traction clutch finger assemblies are serviced as separate kits. Kits are available through the parts catalog.

2. Disassemble parts (A—Z).
3. Inspect all parts for wear or damage. Replace as necessary.
4. Replace lock nuts (O).

Continued on next page

5. Clean any rust or oil from drive surfaces of plates (R, T, V, and Z). Inspect drive surfaces for distortion, checking cracks and heat damage.

6. Replace clutch disks if friction surfaces are contaminated with grease or oil or if thickness of disk is not within specifications.

Specification	
Traction Clutch Disk—Minimum Thickness	6.50 mm (0.260 in.)
PTO Clutch Disk—Minimum Thickness	5.50 mm (0.220 in.)

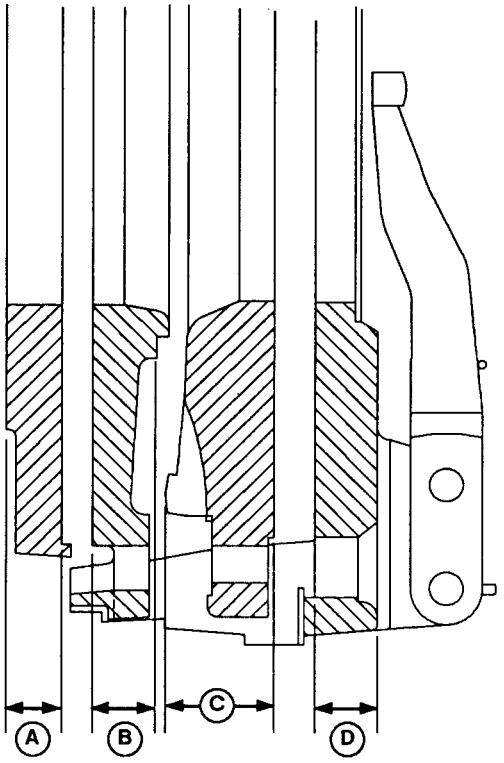
AG,OUO1085,127 –19–28JUN02–3/5

7. Machine drive surfaces of pressure plates and cover, if necessary, until surface is free of scores, cracks, and heat discoloration.

8. Measure thickness of pressure plates at dimensions (A—D). Replace parts that are not within specifications.

Pressure Plates—Specification	
PTO Clutch Front Pressure Plate—Minimum Thickness	17.30 mm (0.680 in.)
PTO Clutch Rear Pressure Plate—Minimum Thickness	18.80 mm (0.740 in.)
Traction Clutch Front Pressure Plate—Minimum Thickness	30.00 mm (1.181 in.)
Traction Clutch Rear Pressure Plate—Minimum Thickness	17.00 mm (0.669 in.)

A—PTO Clutch Front Pressure Plate
B—PTO Clutch Rear Pressure Plate
C—Traction Clutch Front Pressure Plate
D—Traction Clutch Rear Pressure Plate

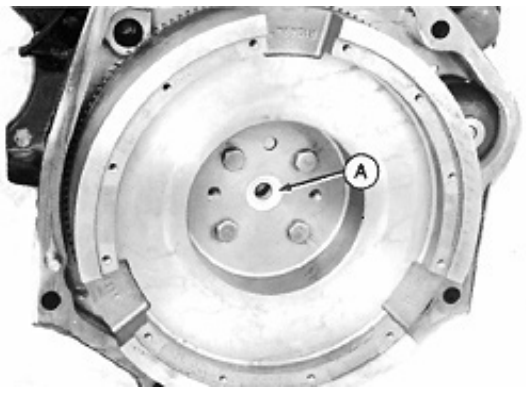


LV025AE –UN–03MAR92

AG,OUO1085,127 –19–28JUN02–4/5

9. Inspect pilot bearing (A) for wear or damage. Replace if necessary. (See procedure in CTM104 for 4-cylinder engines or CTM125 for 3-cylinder engines.)

A—Pilot Bearing



LV385 –UN–03MAR92

AG,OUO1085,127 –19–28JUN02–5/5

Assemble Clutch Assembly

1. Install adjusters in PTO clutch fingers (B) and traction clutch fingers (C). Install pins (A) using a press. Adjusters should pivot freely.

A—Pin (2 used)
B—PTO Clutch Finger
C—Traction Clutch Finger

LV031 –UN–03MAR92

AG,OUO1085,128 –19–28JUN02–1/8

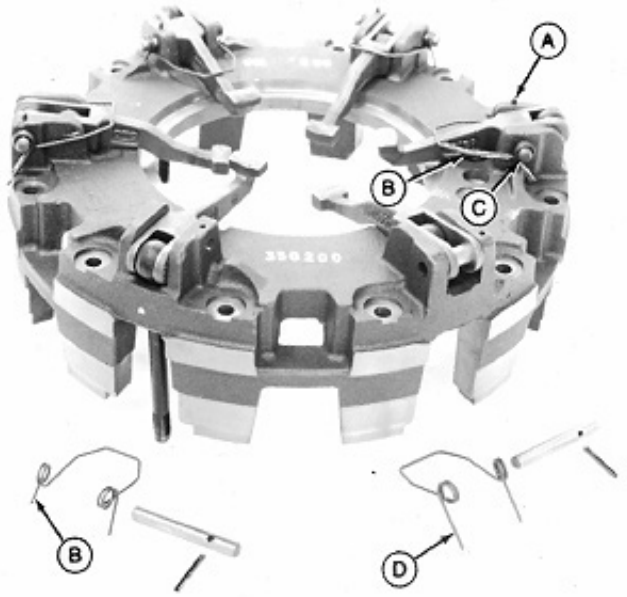
2. Install clutch finger assemblies in traction clutch rear pressure plate.

NOTE: PTO finger spring has shorter tang (B) than traction finger spring (D).

3. Install springs (B and D) and pins (C).

4. Install spring pins (A) until seated.

A—Spring Pin (6 used)
B—PTO Clutch Finger Spring (3 used)
C—Pin (6 used)
D—Traction Clutch Finger Spring (3 used)



LV032 –UN–03MAR92

AG,OUO1085,128 –19–28JUN02–2/8

IMPORTANT: Wide edge (B) of pad must face clockwise direction.

5. Install traction clutch disk (A) in pressure plate with wide edge (B) of pads facing clockwise direction.

A—Traction Clutch Disk
B—Wide Edge of Pad

LV033 –UN–03MAR92

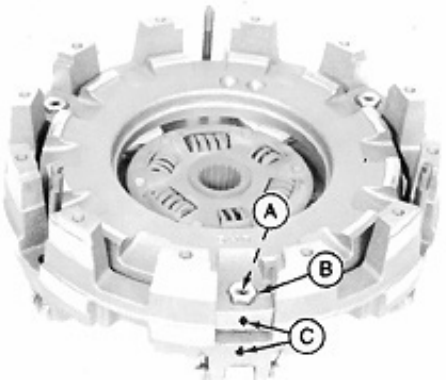
Continued on next page

AG,OUO1085,128 –19–28JUN02–3/8

6. Install traction clutch front pressure plate with index marks (C) aligned.

7. Install adjuster studs (A) and lock nuts (B). Check that adjuster studs are seated in adjusters.

A—Adjuster Stud
B—Lock Nut
C—Index Mark (2)



LV034 –UN–03MAR92

AG,OUO1085,128 –19–28JUN02–4/8

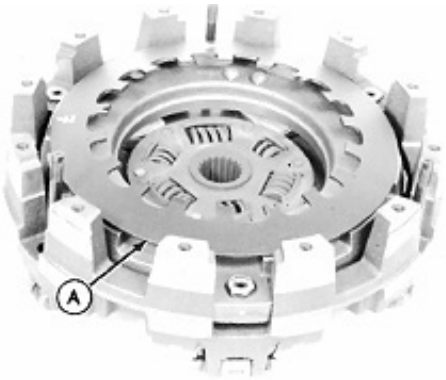
8. Place spring washer (A) on a work bench or any flat surface and measure free height dimension (B). If less than specification, replace spring washer.

Specification

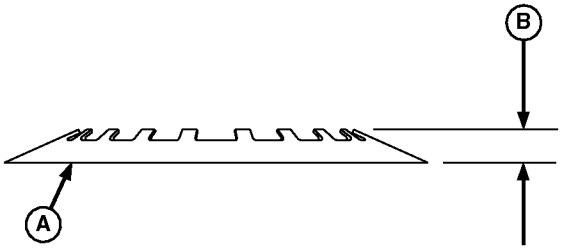
Clutch Assembly Spring Washer—Height ..... 13.3 mm (0.523 in.) minimum

9. Install spring washer (A) with concave side toward traction clutch pressure plate. Center spring washer on traction clutch pressure plate.

A—Spring Washer
B—Free Height Dimension



LV035 –UN–03MAR92

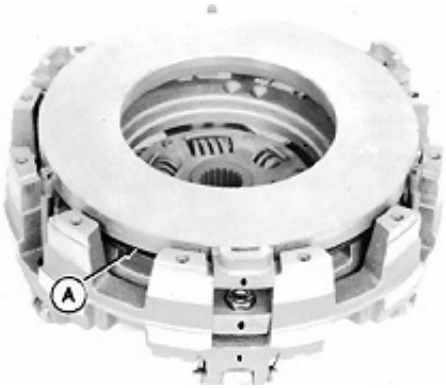


LV1611 –UN–07FEB96

AG,OUO1085,128 –19–28JUN02–5/8

10. Install PTO clutch rear pressure plate (A) with index marks aligned. Check that spring washer remains centered on traction clutch pressure plate and is seated in recess of PTO clutch rear pressure plate.

A—Rear Pressure Plate



LV036 –UN–03MAR92

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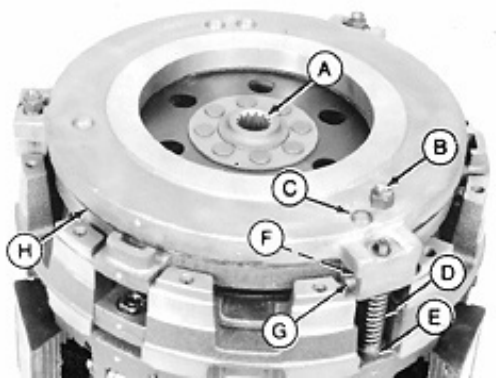
AG,OUO1085,128 –19–28JUN02–6/8

11. Install PTO clutch disk with short hub (A) facing out.
12. Install spacers (E) and springs (D) on adjusters.
13. Install pressure plate (H) with index marks aligned.
14. Install spring (F) and button (G) in pressure plate.

NOTE: Raise clutch assembly on blocks and pull PTO lever down to install special nuts.

15. Install washer (C) and new special nuts (B) loosely.
16. Align clutch discs using JDG689 Universal Clutch Alignment Tool.



LV037 –UN–03MAR92

A—Short Hub of Clutch Disk
B—Special Nut (3 used)
C—Conical Washer (3 used)
D—Spring (3 used)
E—Spacer (3 used)
F—Spring (3 used)
G—Button (3 used)
H—PTO Clutch Pressure Plate

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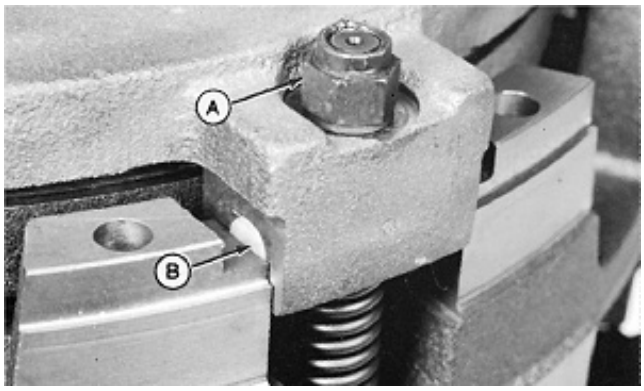
AG,OUO1085,128 –19–28JUN02–7/8

NOTE: Conical washer must be seated in special nut before tightening.

17. Tighten special nut (A) while depressing button (B) until button is in channel.

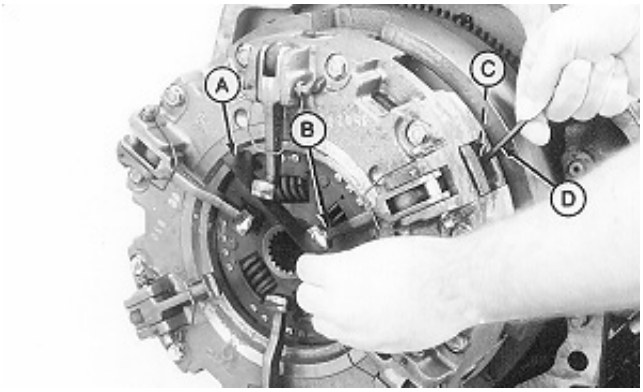
A—Special Nut
B—Button



LV038 –UN–03MAR92

AG,OUO1085,128 –19–28JUN02–8/8

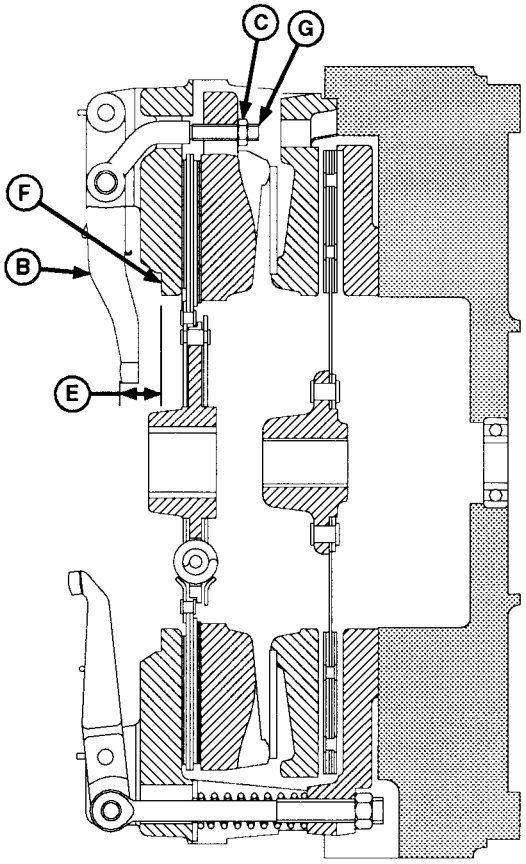
Traction Clutch Finger Adjustment



LV550 –UN–09JAN95

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)
2. Check finger height (E) from pressure plate (F) to traction clutch finger (B) using JDG827 Traction Clutch Finger Height Gauge (A).
3. Loosen jam nut (C). Turn adjuster (G) in or out until clutch finger touches gauge, using JDG828 Traction Clutch Finger Height Adjustment Tool (D).
4. Tighten jam nut.
5. Repeat procedures for two remaining fingers.

A—JDG827 Traction Clutch Finger Height Gauge
B—Traction Clutch Finger
C—Jam Nut
D—JDG828 Traction Clutch Finger Height Adjustment Tool
E—Distance
F—Pressure Plate
G—Adjuster

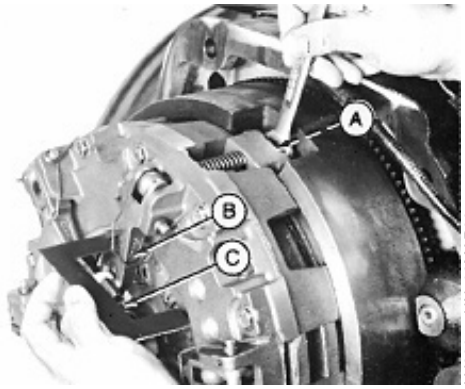


LV635AE –UN–09JAN95

AG,OUO1085,129 –19–11AUG00–1/1

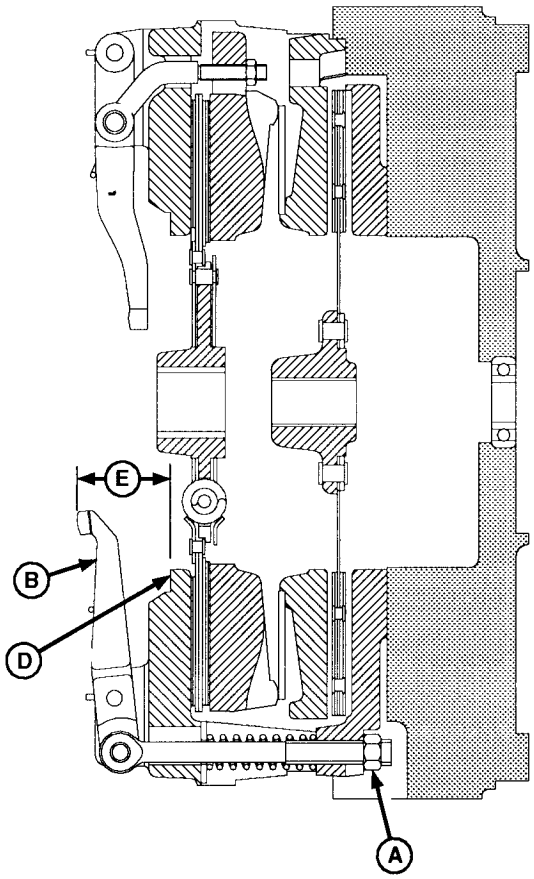
PTO Clutch Finger Adjustment

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)
2. Check finger height (E) from pressure plate (D) to PTO clutch finger (B) using JDG826 PTO Clutch Finger Height Gauge (C).
3. Turn special nut (A) in or out until clutch finger touches gauge.
4. Using pliers, crimp the top of special nut to flats on finger adjusting rod.
5. Repeat procedure for two remaining fingers.



LV386 –UN–03MAR92

A—Special Nut
B—PTO Clutch Finger
C—JDG826 PTO Clutch Finger Height Gauge
D—Pressure Plate
E—Distance



LV636AE –UN–09JAN95

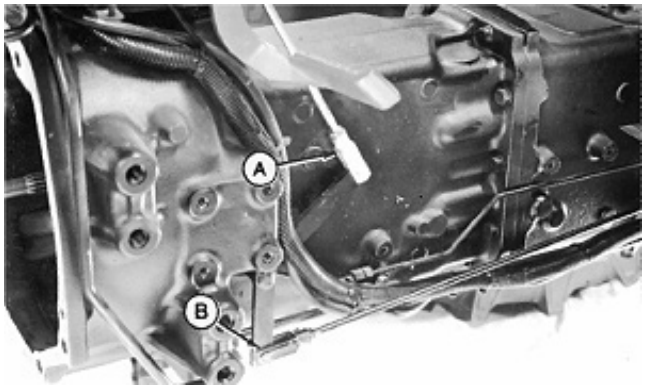
AG,OUO1085,130 –19–11AUG00–1/1

Remove and Inspect Clutch Release Mechanism and Shafts

NOTE: Tractor without cab shown.

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)
2. Disconnect traction clutch rod (A) and PTO clutch rod (B).

A—Traction Clutch Rod
B—PTO Clutch Rod

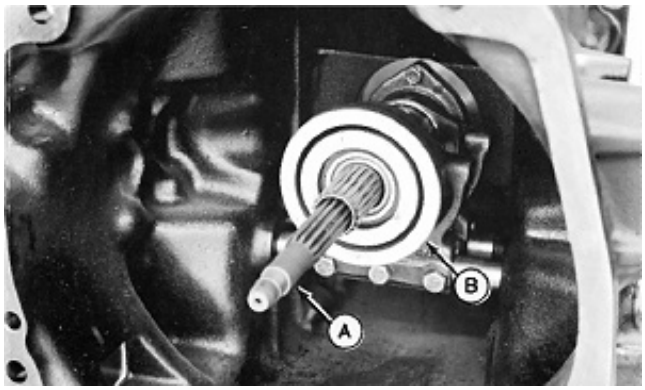


LV319 –UN–03MAR92

AG,OUO1085,131 –19–16AUG00–1/5

3. Remove PTO clutch shaft (A).
4. Remove clutch release bearing assembly (B).

A—PTO Clutch Shaft
B—Clutch Release Bearing Assembly



LV307 –UN–03MAR92

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AG,OUO1085,131 –19–16AUG00–2/5

5. Inspect parts (A—F) for wear or damage. Replace as necessary.

NOTE: Collars (A and C) and bearings (B and D) are press fit.

Remove collars and bearings only if replacement is necessary.

Disassemble parts (A—F) using a knife edged puller and a press.

Assemble parts using a press.

6. Tractors without cab: remove left platform.

7. Tractors with cab: remove battery. (See Remove and Install Battery—Tractors With Cab in Section 40, Group 05.)

8. Tractors with cab: remove battery box and crop guard.

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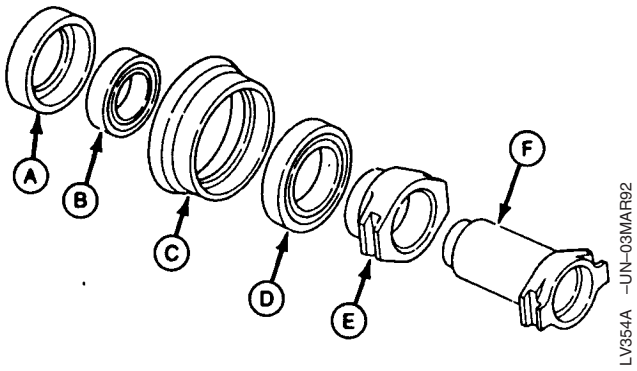
NOTE: Tractors with cab: place a floor jack under left side of cab door to support cab during removal of left cab mounting bracket.

9. Install floor jack and remove left cab mounting bracket.

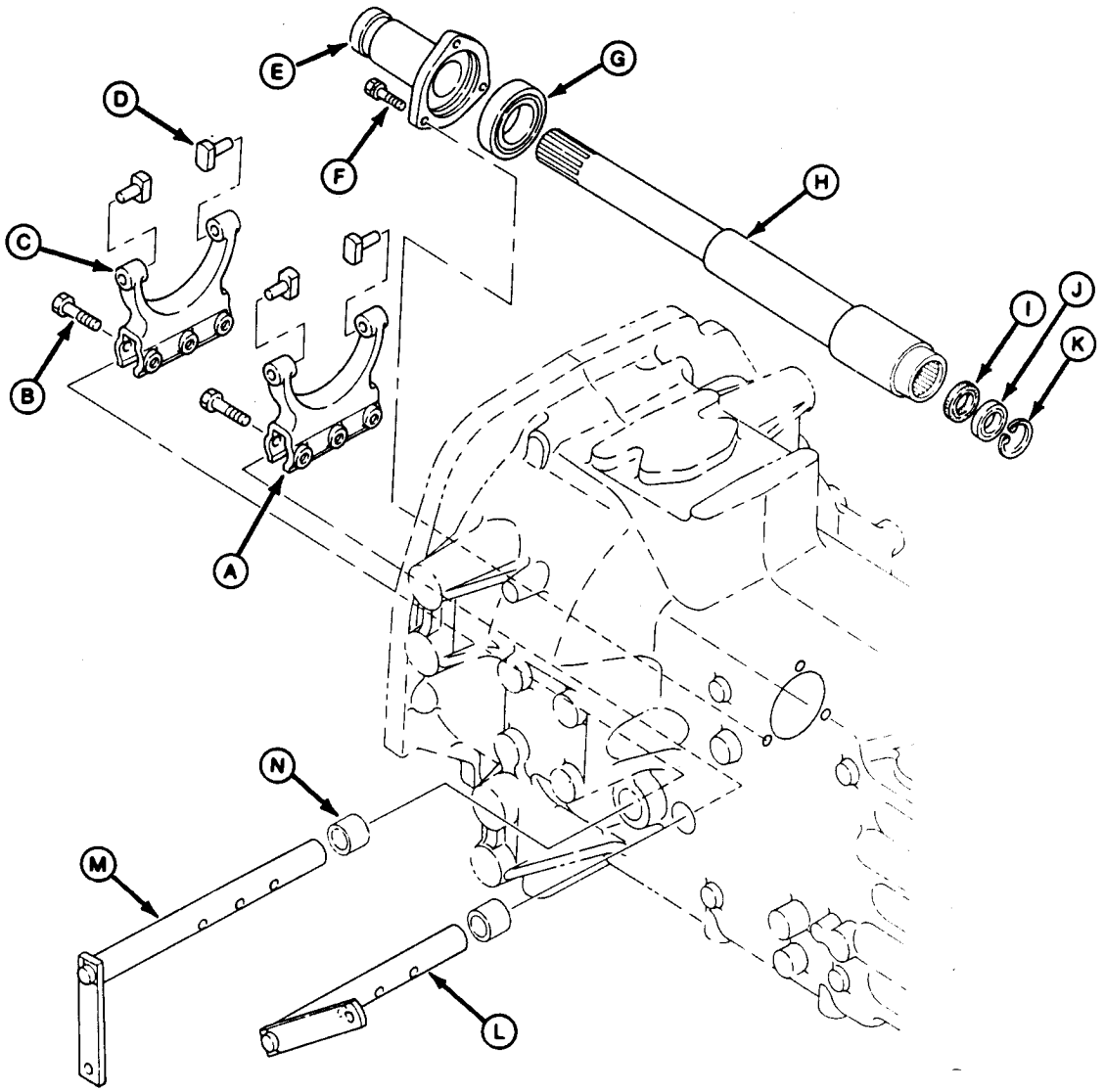


Clutch Release Bearing Assembly

A—Traction Clutch Collar
B—Bearing
C—PTO Clutch Collar
D—Bearing
E—PTO Clutch Sleeve
F—Traction Clutch Sleeve

Continued on next page

AG,OUO1085,131 –19–16AUG00–3/5



LV306A –UN–03MAR92

A—Traction Clutch Yoke
B—Cap Screw (6 used)
C—PTO Clutch Yoke
D—Shoe (4 used)
E—Guide
F—Cap Screw (3 used)
G—Bearing
H—Traction Clutch Shaft
I—Seal
J—Bearing
K—Snap Ring
L—Traction Clutch Armshaft
M—PTO Clutch Armshaft
N—Bushing (4 used)

10. Remove parts (A—M).

NOTE: Bearing (G) and bushings (N) are press fit. Remove only if replacement is necessary. Bearing (J) is slip fit.

Replace bearing (G) using a press.

Replace bushings (N) using a bushing, bearing, and seal driver set. Install bushings flush with clutch housing.

11. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

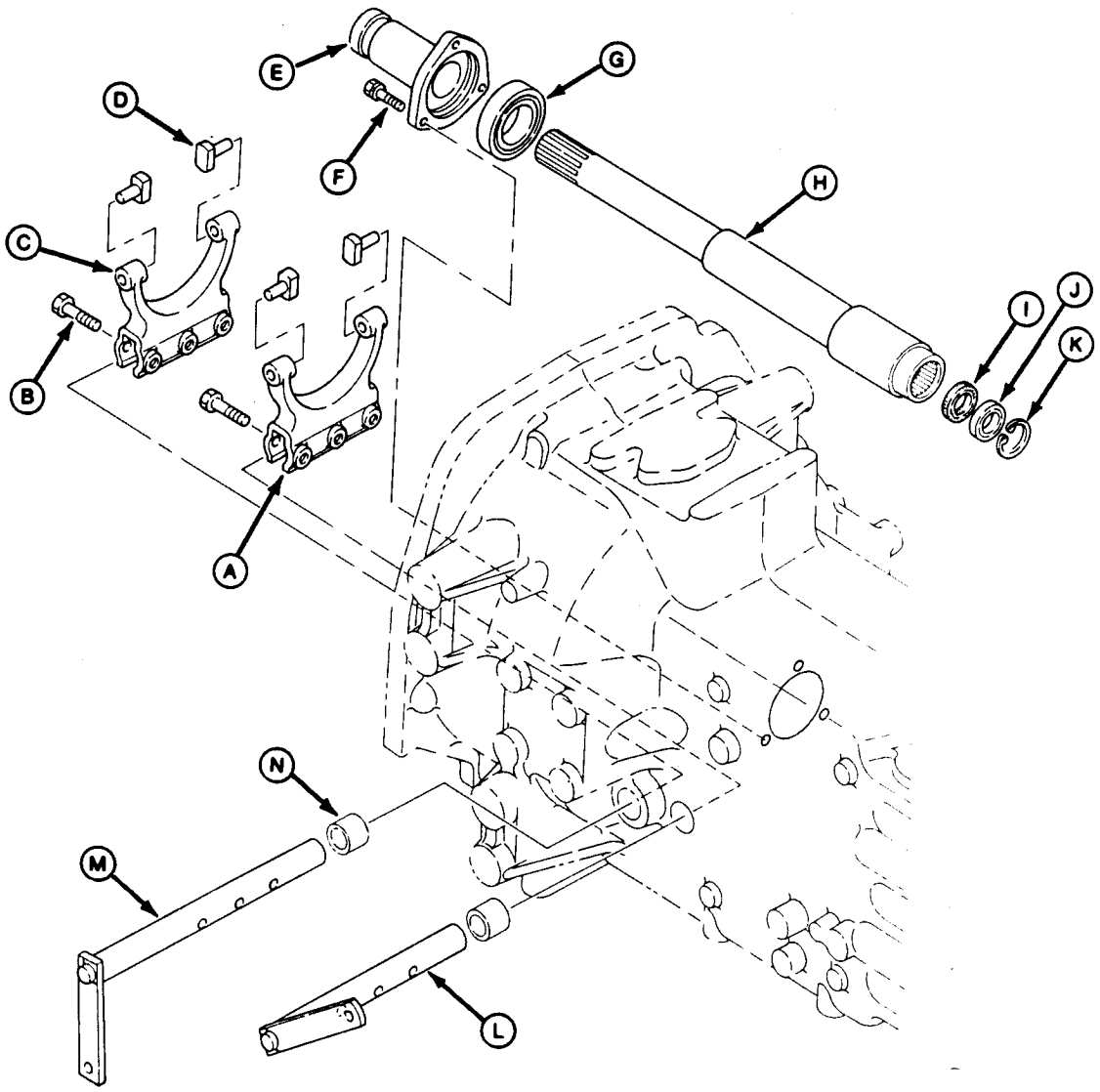
AG,OUO1085,131 –19–16AUG00–4/5

IMPORTANT: Replace all seals. Damaged or used seals will leak.

12. Pry out seal (I). Install seal into shaft bore with lips facing toward the rear of clutch housing, until it stops, using a bushing, bearing, and seal driver set.

AG,OUO1085,131 –19–16AUG00–5/5

Install Clutch Release Mechanism and Shafts



LV306A –UN–03MAR92

A—Traction Clutch Yoke
B—Cap Screw (6 used)
C—PTO Clutch Yoke
D—Shoe (4 used)
E—Guide
F—Cap Screw (3 used)
G—Bearing
H—Traction Clutch Shaft
I—Seal
J—Bearing
K—Snap Ring
L—Traction Clutch Armshaft
M—PTO Clutch Armshaft
N—Bushing (4 used)

1. Apply multipurpose grease to inside lips of seal (I).
2. Apply Moly High Temperature EP Grease to armshafts (L and M), shoes (D), shaft end of guide (E), and splined ends of shaft (H).
3. Clean cap screws (B) and yoke threads (A and C) thoroughly with Clean and Cure Primer. Apply thread lock and sealer (medium strength) to cap screw threads.
4. Install parts (A—N).

Continued on next page

AG,OUO1085,132 –19–28JUN02–1/4

5. Tighten cap screws (B) to specification.

Specification

Clutch Release Mechanism
Cap Screws—Torque ..... 65 N•m (48 lb-ft)

6. Tractors without cab: install left platform.

AG,OUO1085,132 –19–28JUN02–2/4

7. Apply Moly High Temperature EP Grease to sliding surfaces of clutch release bearing assembly (B).

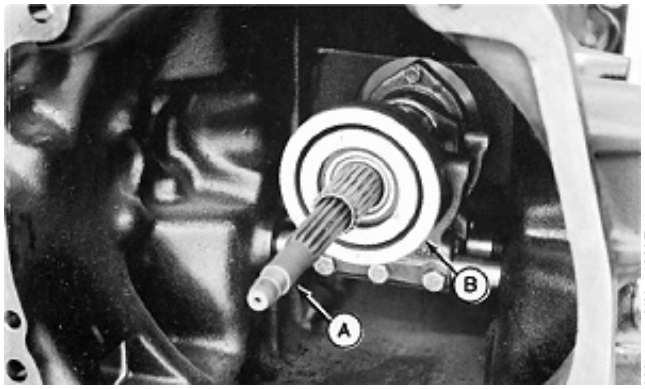
8. Install clutch release bearing assembly.

9. Install PTO clutch shaft; rotate shaft as necessary until splines align.

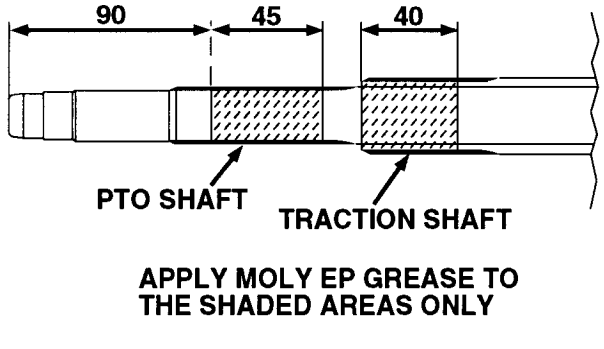
NOTE: Opposite end of PTO shaft must align with a coupler.

10. Apply Moly High Temperature EP Grease to splined ends of PTO and traction clutch shafts as shown in illustrations.

A—PTO Shaft
B—Clutch Release Bearing Assembly



LV307 –UN–03MAR92



LV1188AE –19–25JAN95

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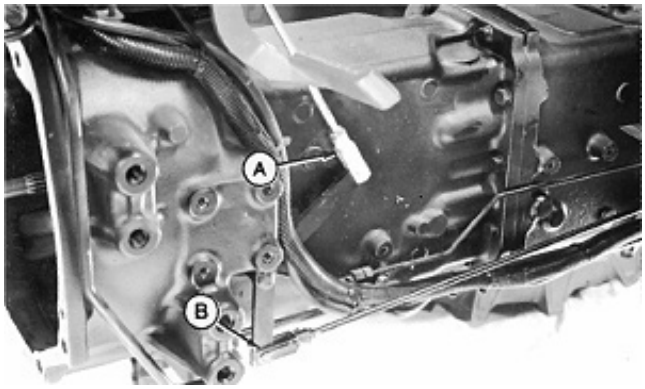
AG,OUO1085,132 –19–28JUN02–3/4

11. Connect PTO Clutch Rod (B) and traction clutch rod (A).

12. Install engine to clutch housing. (See Install Engine to Clutch Housing—Tractors Without Cab or Install Engine to Clutch Housing—Tractors With Cab in Group 05.)

13. Adjust clutch pedal free-play. (See Clutch Pedal Free Play Adjustment in Section 250, Group 15.)

14. Tractors with cab: install left cab mounting bracket, crop guard, battery box, and battery.



A—Traction Clutch Rod
B—PTO Clutch Rod

AG,OUO1085,132 –19–28JUN02–4/4

Essential Tools

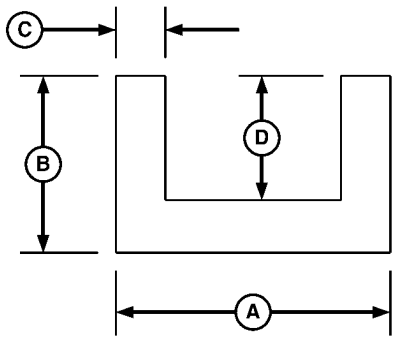
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

SERVICEGARD is a trademark of Deere & Company

OUO1043,0000E9B –19–28JUN02–1/2

Clutch Finger Height Gauge JDG919

Measures PTO clutch finger height. See Dealer Fabricated Tools in Section 299, Group 10 for dimensions.



JDG826 –UN–01JUL97

OUO1043,0000E9B –19–28JUN02–2/2

Other Material

Number	Name	Use
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans parts and speeds cure of sealant.
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to PTO clutch yoke-to-armshaft cap screw threads.

LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000E9D –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Clutch Assembly Cap Screws	Torque	36 N•m (27 lb-ft)
PTO Clutch Disk	Thickness	5.50 mm (0.220 in.) Minimum
Front Pressure Plate Dimension	Thickness	17.00 mm (0.669 in.) Minimum
Rear Pressure Plate Dimension	Thickness	18.80 mm (0.740 in.) Minimum
Spring Washer	Height	13.3 mm (0.523 in.) Minimum
Clutch Release Mechanism Cap Screws	Torque	26 N•m (20 lb-ft)
Traction Clutch Shaft Cap Screws	Torque	65 N•m (48 lb-ft)
Transmission Pump Cap Screws	Torque	26 N•m (20 lb-ft)

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OUO1020,000120C –19–18JUL02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

PTO Clutch Lever Kit

Traction Clutch Lever Kit

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Remove and Install Clutch Assembly

NOTE: Clutch assembly can be removed and installed without any alignment or finger adjustment procedures.

If clutch assembly has been disassembled for inspection or repair, see PTO Clutch Finger Adjustment in this group.

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)

CAUTION: Clutch assembly is heavy. Support clutch before removing cap screws to prevent personal injury.

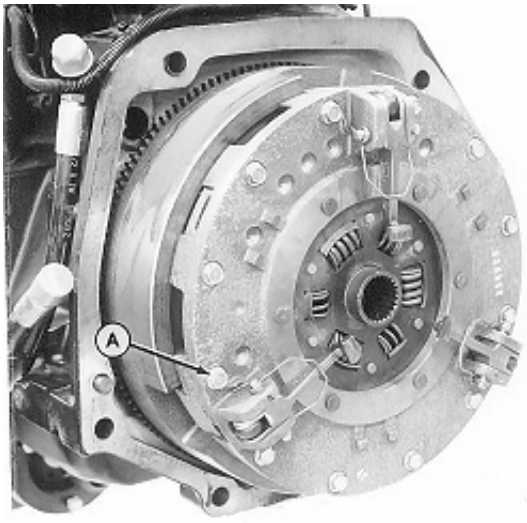
2. Remove twelve cap screws (A) and clutch assembly.

3. Make repairs as necessary. (See Disassemble and Inspect Clutch Assembly in this group.)

4. Install clutch assembly and cap screws. Evenly tighten cap screws in a criss-cross pattern to specification.

Specification	
Clutch Assembly Cap Screws— Torque	36 N•m (27 lb-ft)

5. Install engine to clutch housing.



LV1044 –UN–15DEC94

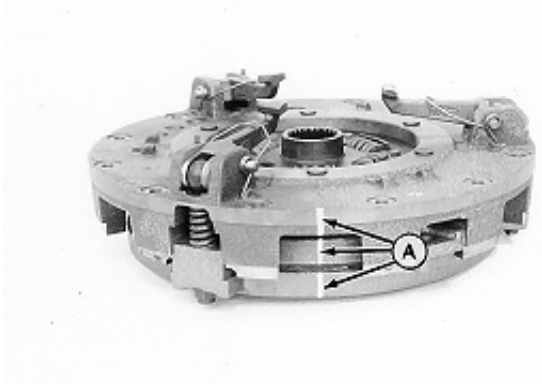
A—Cap Screw (12 used)

AG,OUO1085,135 –19–16AUG00–1/1

Disassemble and Inspect Clutch Assembly

1. Put index marks (A) on pressure plates to aid in assembly.

A—Index Mark (4 used)



LV1046 –UN–15DEC94

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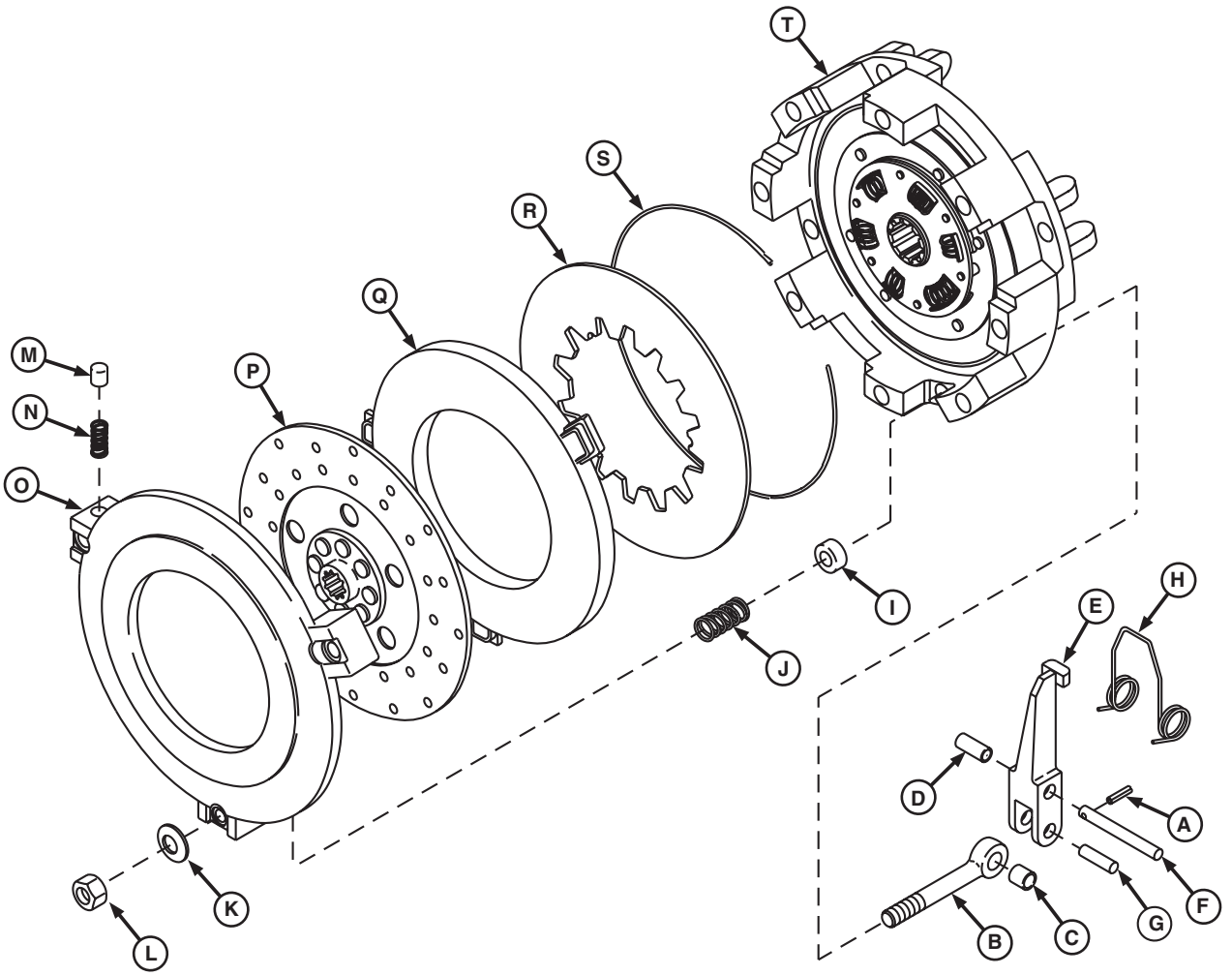
AG,OUO1085,136 –19–28JUN02–1/5



LV1067AE –UN–12APR01

Clutch Assembly

A—Spring Pin (3 used)
B—Adjuster (3 used)
C—Bushing (3 used)
D—Bushing (3 used)
E—PTO Clutch Finger
F—Pin (3 used)
G—Pin (3 used)
H—Spring (3 used)
I—Washer (3 used)
J—Spring (3 used)
K—Conical Washer (3 used)
L—Lock Nut (3 used)
M—Pad (3 used)
N—Spring (3 used)
O—PTO Clutch Front Pressure Plate
P—PTO Clutch Disk
Q—PTO Clutch Rear Pressure Plate
R—Spring Washer
S—Ring
T—Torsional Drive Plate

NOTE: Spring pins (A) must be pulled from bore to remove.

PTO clutch finger assemblies are serviced as separate kits. Kits are available through the parts catalog.

2. Disassemble parts (A—T).
3. Inspect all parts for wear or damage. Replace as necessary.
4. Replace lock nuts (L).
5. Clean any rust or oil from drive surfaces of plates (O and Q). Inspect drive surfaces for distortion, checking cracks and heat damage.

Continued on next page

AG,OUO1085,136 –19–28JUN02–2/5

6. Replace clutch disk if friction surfaces are contaminated with grease or oil or if thickness of disk is not within specifications.

Specification

PTO Clutch Disk—Thickness ..... 5.50 mm (0.220 in.) Minimum

AG,OUO1085,136 –19–28JUN02–3/5

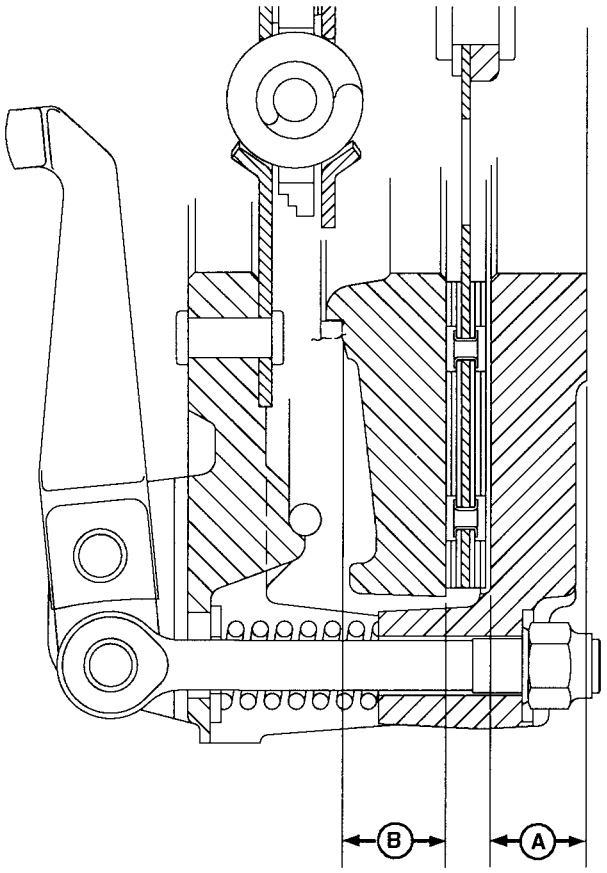
7. Machine drive surfaces of pressure plates if necessary, until surface is free of scores, cracks, and heat discoloration.

8. Measure thickness of pressure plates at dimensions (A and B). Replace parts that are not within specifications.

Specification

Front Pressure Plate
Dimension—Thickness ..... 17.00 mm (0.669 in.) Minimum
Rear Pressure Plate Dimension—
Thickness..... 18.80 mm (0.740 in.) Minimum

A—PTO Clutch Front Pressure Plate
B—PTO Clutch Rear Pressure Plate



LV1225AE –UN–15DEC94

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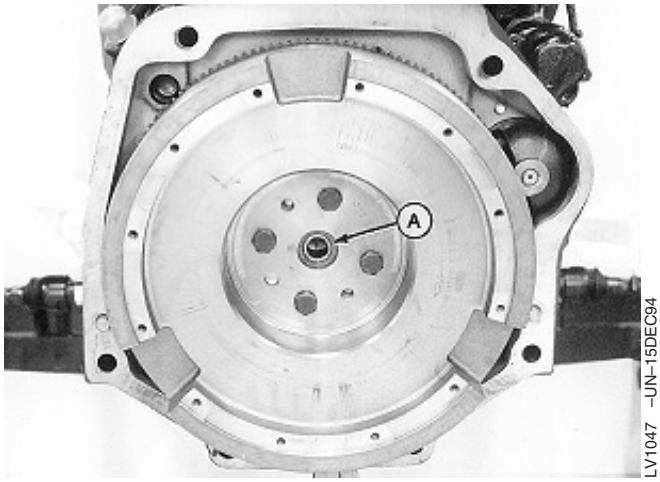
AG,OUO1085,136 –19–28JUN02–4/5

9. Inspect pilot bearing (A) for wear or damage. Replace if necessary. (See procedure in CTM104 for 4 cylinder engines or CTM125 for 3 cylinder engines.)

A—Pilot Bearing



LV1047 –UN–15DEC94

AG,OUO1085,136 –19–28JUN02–5/5

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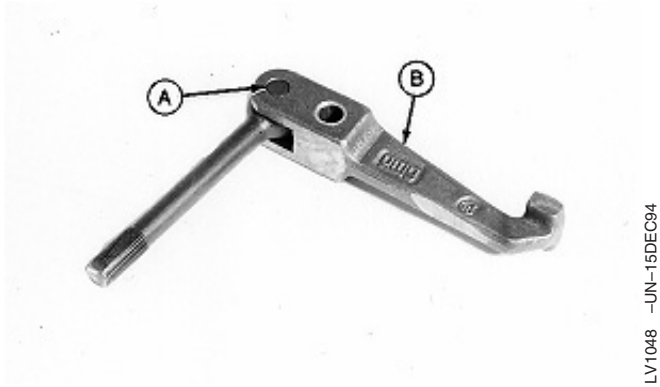
Assemble Clutch Assembly

1. Install adjusters in PTO clutch fingers (B). Install pin (A) using a press. Adjusters should pivot freely.

A—Pin
B—PTO Clutch Finger

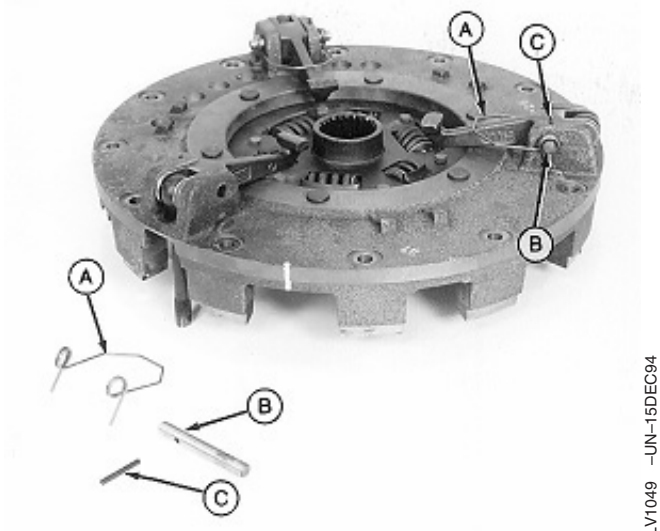


LV1048 –UN–15DEC94

AG,OUO1085,137 –19–28JUN02–1/7

2. Install clutch finger assemblies in PTO clutch rear pressure plate.
3. Install springs (A) and pins (B).
4. Install spring pins (C) until seated.

A—PTO Clutch Finger Spring (3 used)
B—Pin (3 used)
C—Spring Pin (3 used)



LV1049 –UN–15DEC94

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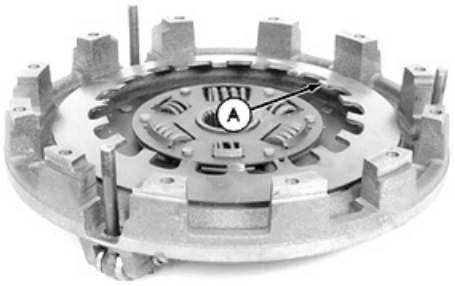
AG,OUO1085,137 –19–28JUN02–2/7

5. Place spring washer (A) on a work bench or any flat surface and measure free height dimension (B). If less than specification, replace spring washer.

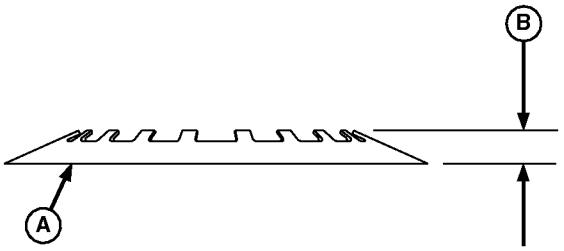
Specification

Spring Washer—Height..... 13.3 mm (0.523 in.) Minimum

A—Spring Washer
B—Free Height Dimension



LV1612 –UN–02FEB96



LV1611 –UN–07FEB96

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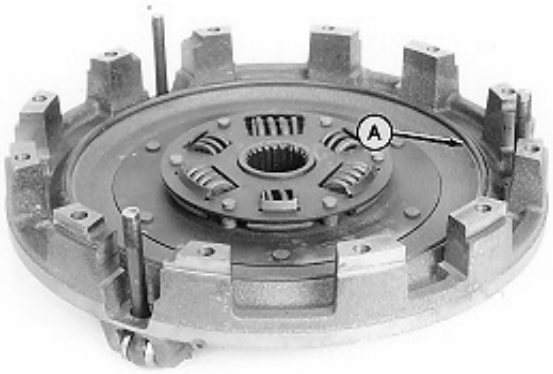
AG,OUO1085,137 –19–28JUN02–3/7

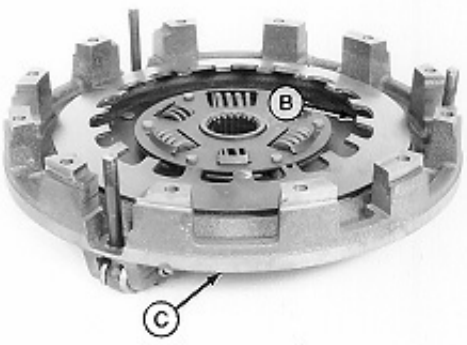
IMPORTANT: Ensure that spacer ring (A) is installed and seated.

6. Install spring washer (B) with concave side toward rear torsion plate (C).

A—Spacer Ring
B—Spring Washer
C—Rear Torsion Plate



LV1050 –UN–15DEC94



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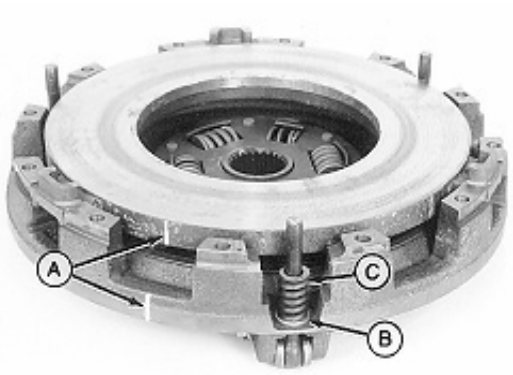
AG,OUO1085,137 –19–28JUN02–4/7

NOTE: Ensure that rear pressure plate is centered and seated on spring washer.

7. Install clutch rear pressure plate with index marks (A) aligned.

8. Install adjuster stud washer (B) and springs (C).

A—Index Mark (2 used)
B—Adjuster Stud Washer
C—Spring



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AG,OUO1085,137 –19–28JUN02–5/7

9. Install PTO clutch disk with long hub (A) facing out or to engine when clutch assembly is installed.

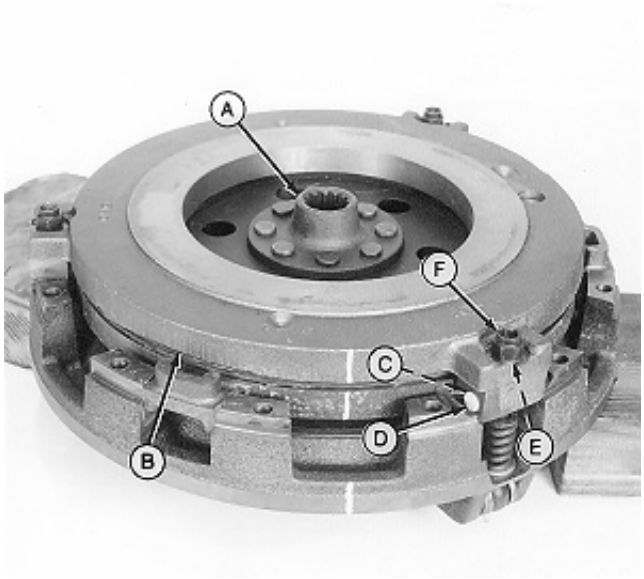
10. Install pressure plate (B) with index marks aligned.

11. Install spring (C) and button (D) in pressure plate.

NOTE: Raise clutch assembly on blocks and pull PTO fingers down to install special nuts.

12. Install washer (E) and new special nuts (F) loosely.

A—Long Hub of Clutch Disk
B—PTO Clutch Pressure Plate
C—Spring (3 used)
D—Button (3 used)
E—Conical Washer (3 used)
F—Special Nut (3 used)



LV1053 –UN–15DEC94

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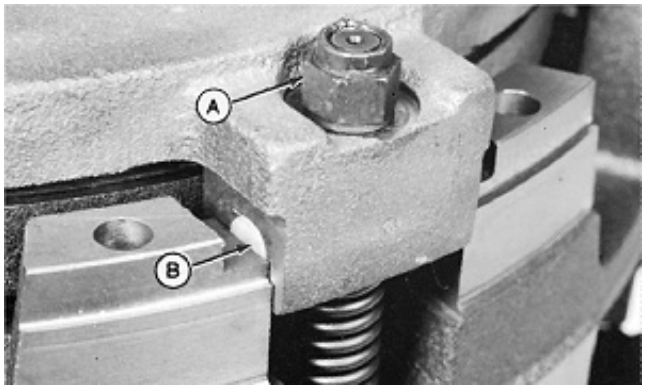
AG,OUO1085,137 –19–28JUN02–6/7

NOTE: Conical washer must be sealed in special nut before tightening.

13. Tighten special nut (A) while depressing button (B), until button is in channel.

A—Special Nut
B—Button

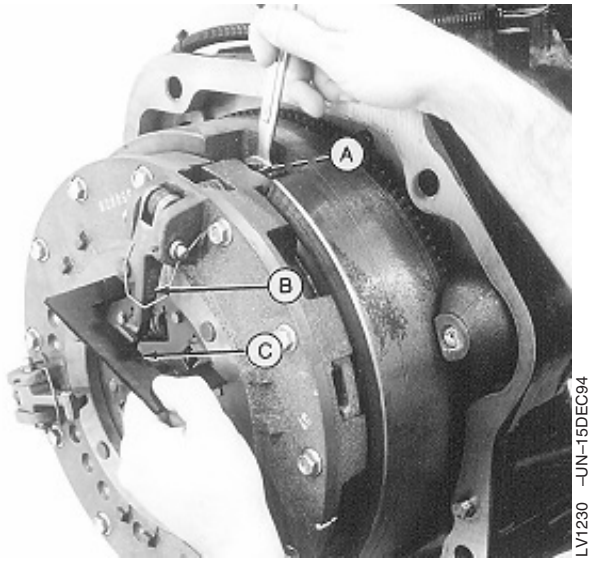


LV038 –UN–03MAR92

AG,OUO1085,137 –19–28JUN02–7/7

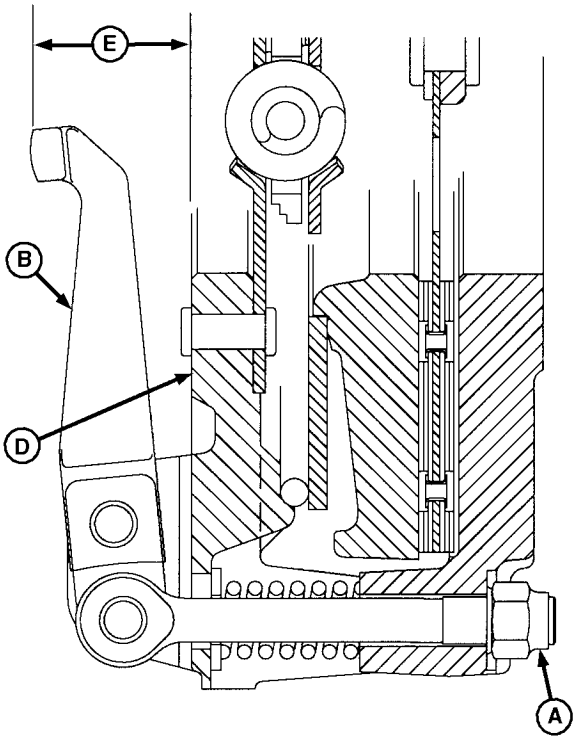
PTO Clutch Finger Adjustment

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)
2. Check distance (height) (E) from pressure plate (D) to PTO clutch finger (B) using JDG919 Clutch Finger Height Gauge (C).
3. Turn special nut (A) in or out until clutch finger touches gauge.
4. Using pliers, crimp the top of special nut to flats on finger adjusting rod.
5. Repeat procedures for two remaining fingers.



LV1230 –UN–15DEC94

A—Special Nut
B—PTO Clutch Finger
C—JDG919 Clutch Finger Height Gauge
D—Pressure Plate
E—Distance



LV1229AE –UN–15DEC94

AG,OUO1085,138 –19–16AUG00–1/1

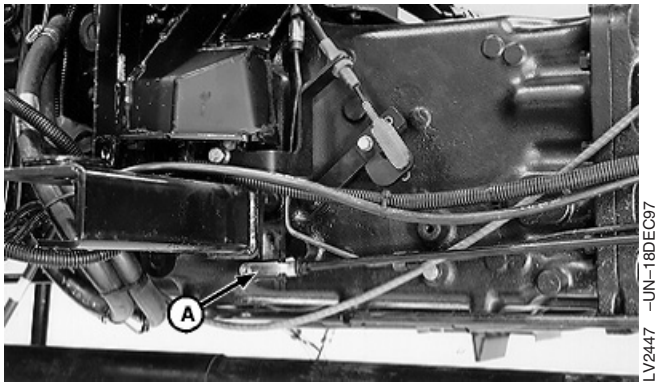
Remove and Inspect Clutch Release Mechanism and Shafts

NOTE: Floor plate removed for illustration purposes.

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)
2. Disconnect PTO clutch rod (A) at both ends and remove.

NOTE: Tractor without cab shown.

3. Tractors without cab: remove left platform.



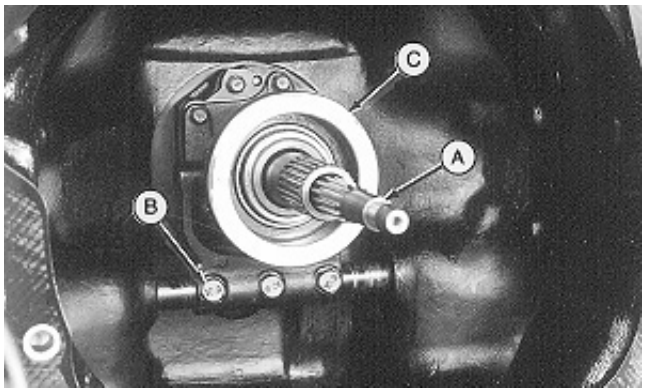
LV2447 –UN–18DEC97

A—PTO Clutch Rod

AG,OUO1085,139 –19–16AUG00–1/5

4. Remove PTO clutch shaft (A).
5. Remove cap screw (B).
6. Remove clutch release bearing assembly (C).

A—PTO Clutch Shaft
B—Cap Screw
C—Clutch Release Bearing Assembly



LV1054 –UN–15DEC94

AG,OUO1085,139 –19–16AUG00–2/5

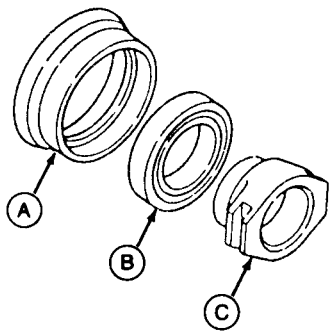
7. Inspect parts (A—C) for wear or damage. Replace as necessary.

NOTE: Collars (A) and bearings (B) are press fit.

Remove collar and bearing only if replacement is necessary.

Disassemble parts (A—C) using a knife edged puller and a press.

Assemble parts using a press.



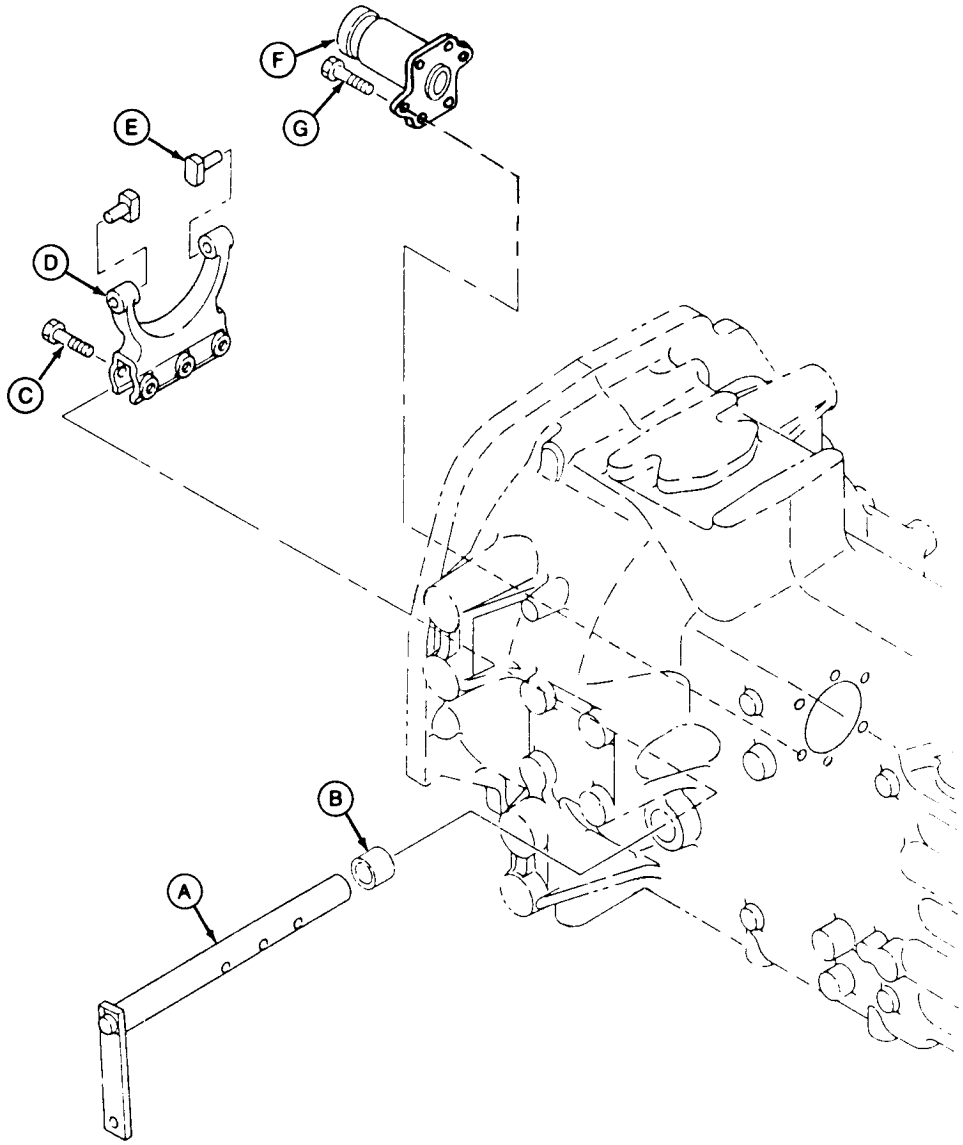
LV1057A –UN–15DEC94

Clutch Release Bearing Assembly

A—PTO Clutch Collar
B—Bearing
C—PTO Clutch Sleeve

Continued on next page

AG,OUO1085,139 –19–16AUG00–3/5



LV1062A –UN–15DEC94

A—PTO Clutch Armshaft
B—Bushing (2 used)
C—Cap Screw (3 used)
D—PTO Clutch Yoke
E—Shoe (2 used)
F—Guide
G—Cap Screw (6 used)

8. Tractors with cab: remove battery. (See Remove and Install Battery—Tractors With Cab in Section 40, Group 05.)
9. Tractors with cab: remove battery box and crop guard.

NOTE: Tractors with cab: place a floor jack under left side of cab door to support cab during removal of left cab mounting bracket.

10. Tractors with cab: install floor jack and remove left cab mounting bracket.
11. Remove parts (A—G).

Continued on next page

AG,OUO1085,139 –19–16AUG00–4/5

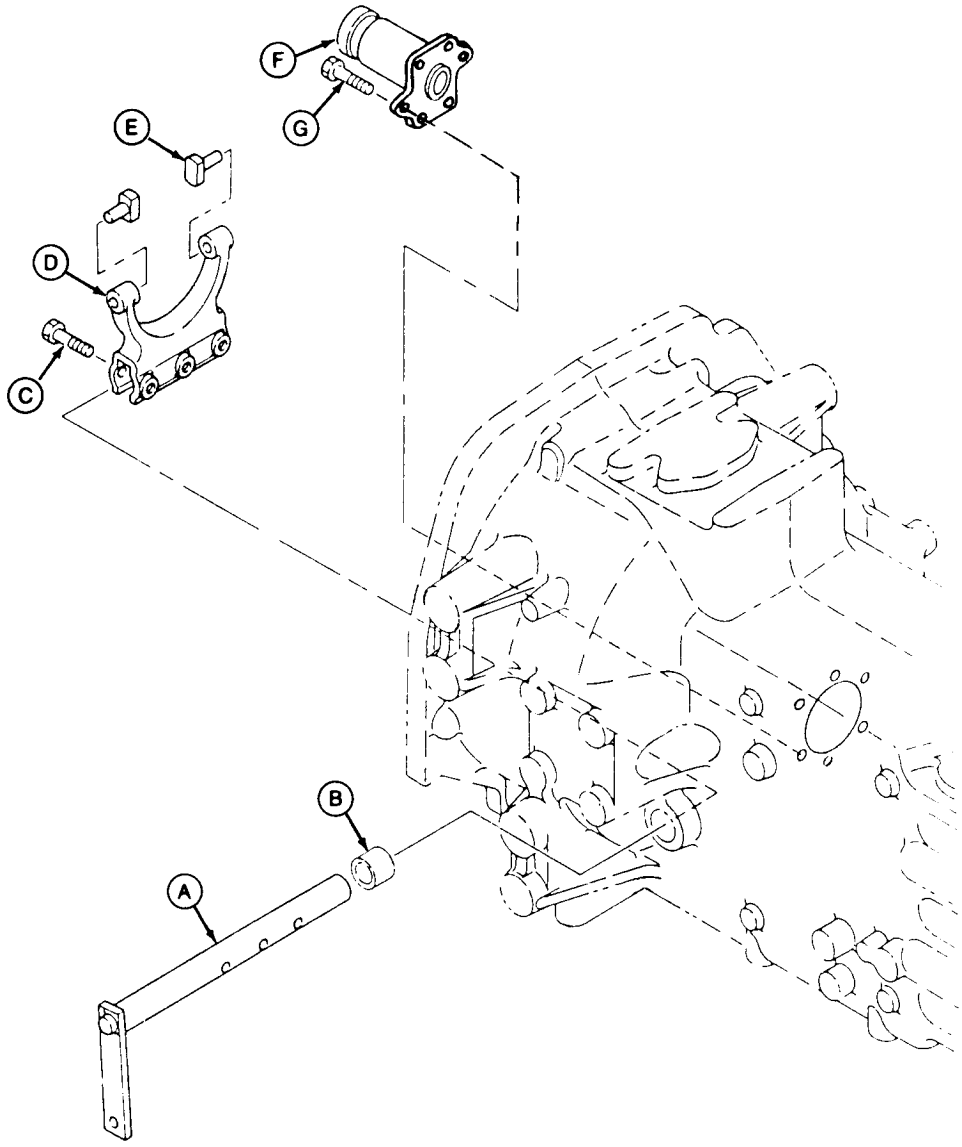
NOTE: Bushings (B) are press fit. Remove only if replacement is necessary.

Replace bushings (B) using a bushing, bearing, and seal driver set. Install bushings flush with clutch housing.

12. Inspect parts for wear or damage. Replace as necessary.

AG,OUO1085,139 –19–16AUG00–5/5

Install Clutch Release Mechanism and Shafts



LV1062A –UN–15DEC94

A—PTO Clutch Armshaft
B—Bushing (2 used)
C—Cap Screw (3 used)
D—PTO Clutch Yoke
E—Shoe (2 used)
F—Guide
G—Cap Screw (6 used)

1. Apply Moly High Temperature EP Grease to armshafts (A), shoes (E), and shaft end of guide (F).
2. Install parts (A—G). Tighten cap screws (G) to specification.

Specification	
Clutch Release Mechanism	
Cap Screws—Torque	26 N•m (20 lb-ft)

Continued on next page

AG,OUO1085,140 –19–28JUN02–1/3

3. Apply Moly High Temperature EP Grease to sliding surfaces of PTO clutch bearing assembly (C).

4. Install clutch release bearing assembly.

5. Clean cap screws (B) and yoke threads thoroughly with Clean and Cure Primer. Apply thread lock and sealer (medium strength) to cap screw threads.

6. Tighten cap screws (B) to specification.

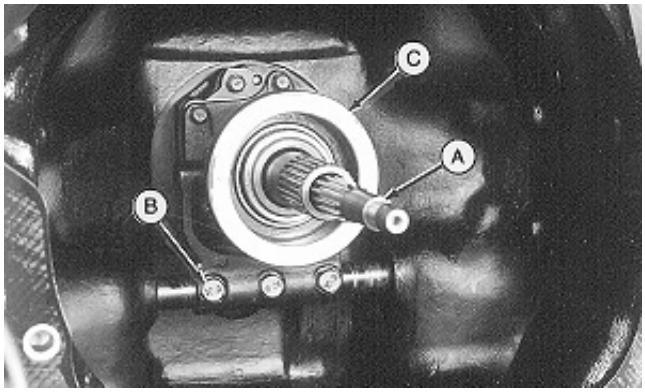
Specification

Traction Clutch Shaft Cap Screws—Torque ..... 65 N•m (48 lb-ft)

7. Apply Moly High Temperature EP Grease to splined ends of PTO and traction clutch shafts (A).

NOTE: Opposite end of clutch shaft must align with a coupler.

8. Install PTO clutch shaft using a soft-faced hammer. Rotate shaft as necessary until fully seated.



LV1054 –UN–15DEC94

A—Traction Clutch Shaft
B—Cap Screw
C—PTO Clutch Release Bearing Assembly

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AG,OUO1085,140 –19–28JUN02–2/3

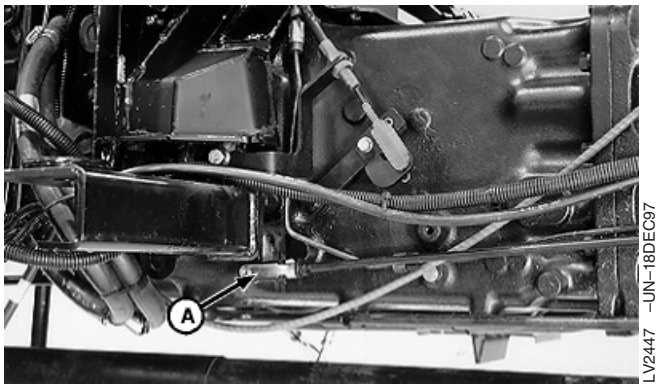
9. Connect PTO clutch rod (A).

10. Install engine to clutch housing. (See Install Engine to Clutch Housing—Tractors Without Cab or Install Engine to Clutch Housing—Tractors With Cab in Group 05.)

11. Adjust PTO clutch lever linkage. (See PTO Clutch Lever Adjustment in Section 250, Group 15.)

12. Tractors without cab: install left platform.

13. Tractors with cab: install left cab mounting bracket, crop guard, battery box, and battery.

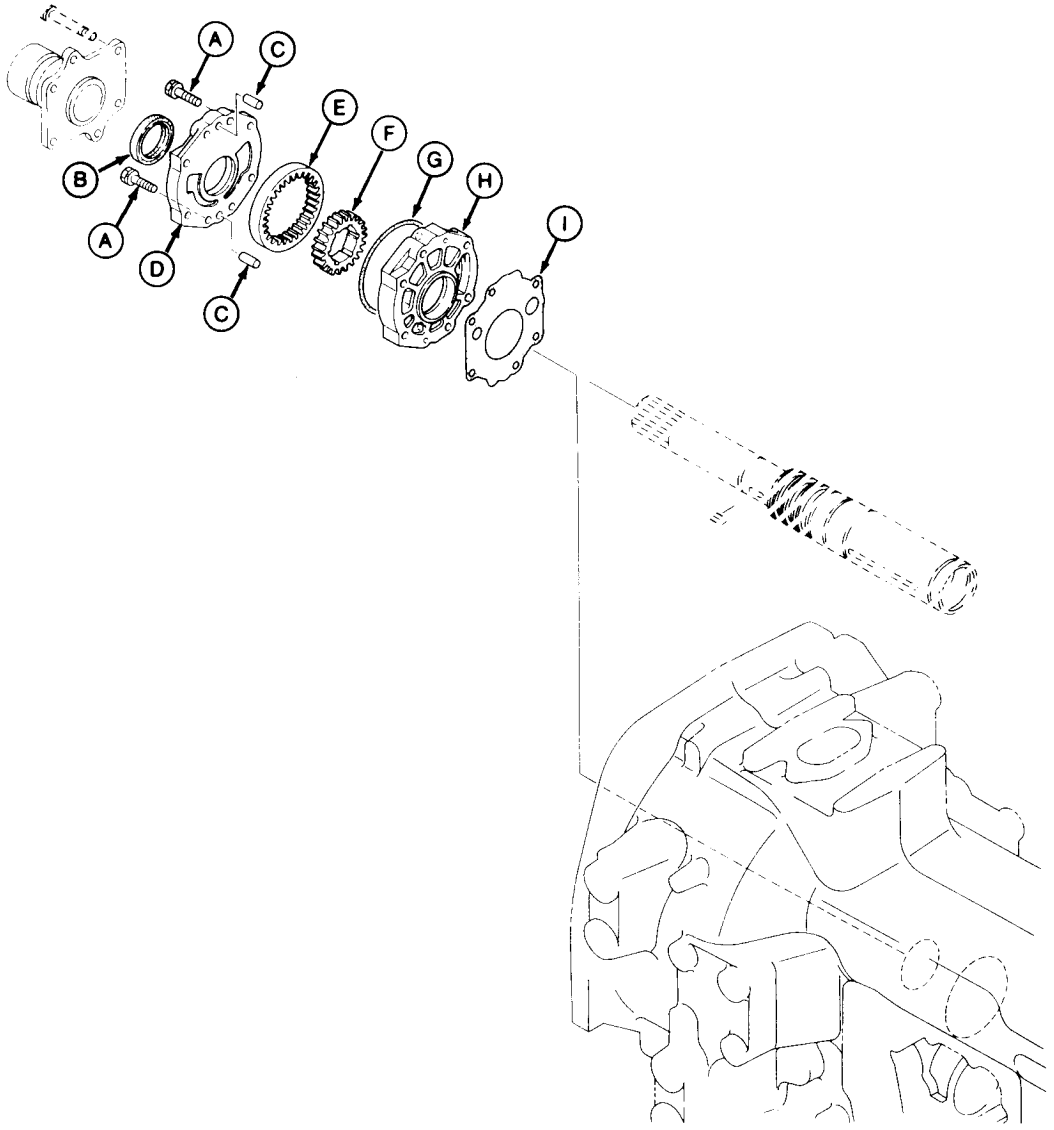


LV2447 –UN–18DEC97

A—PTO Clutch Rod

AG,OUO1085,140 –19–28JUN02–3/3

Remove, Inspect, and Repair Transmission Pump



LV1063A –UN–15DEC94

A—Cap Screw (2 used)
B—Seal
C—Pin (2 used)
D—Pump Cover
E—Drive Gear
F—Pump Gear
G—O-Ring
H—Pump Housing
I—Gasket

1. Separate engine from clutch housing. (See Separate Engine from Clutch Housing—Tractors Without Cab or Separate Engine from Clutch Housing—Tractors With Cab in Group 05.)
2. Remove clutch release mechanism and shafts. (See Remove and Inspect Clutch Release Mechanism and Shafts in this group.)
3. Remove parts (A—I).
4. Inspect all parts for wear or damage. Replace as necessary.

Continued on next page

AG,OUO1085,141 –19–28JUN02–1/2

NOTE: Remove seal (B) only if replacement is necessary.

5. Inspect seal (B) for wear or damage. Replace if necessary.
6. Pry out seal (B).
7. Replace seal (B) using a bearing, bushing, and seal drive set. Install until seated.

IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

8. Install parts (A—I) and tighten cap screws (A) to specification.

Specification	
Transmission Pump Cap Screws—Torque	26 N•m (20 lb-ft)

9. Install clutch release mechanism and shafts.
10. Install engine to clutch housing. (See Install Engine to Clutch Housing—Tractors Without Cab or Install Engine to Clutch Housing—Tractors With Cab in Group 05.)

AG,OUO1085,141 –19–28JUN02–2/2

Essential Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

SERVICEGARD is a trademark of Deere & Company

OUO1043,0000E9F –19–28JUN02–1/2

Special Tool. JDT24B

Disassembles clutch piston.

OUO1043,0000E9F –19–28JUN02–2/2

Specifications

Item	Measurement	Specification
Control Valve Cap Screws	Torque	26 N•m (20 lb-ft)
Detent Plug	Torque	19 N•m (14 lb-ft.)
Valve Spool Cover Screws	Torque	26 N•m (20 lb-ft.)
PowrReverser™ Control Valve Filter Plug	Torque	29 N•m (21 lb-ft.)
Valve Spool Retaining Plate Screws	Torque	26 N•m (19 lb-ft.)
Valve Body Screws	Torque	10 N•m (7 lb-in.)
PowrReverser™ Valve Plate Screws	Torque	10 N•m (7 lb-in.)
PowrReverser™ Clutch Pack Plate Cap Screw	Torque	26 N•m (20 lb-ft)
Outer Clutch Plate (21)	Thickness	5.85 mm (0.230 in.) Minimum
Clutch Disk (22)	Thickness	2.7 mm (0.106 in.) Minimum
Outer Clutch Plate (23)	Thickness	3.85 mm (0.151 in.) Minimum
PowrReverser™ Spring (No Load)	Length	58 mm (2.283 in.) Minimum

OUO1020,000120D –19–18JUL02–1/1

Remove and Install PowrReverser™ Control Valve

NOTE: Tractor without cab shown.

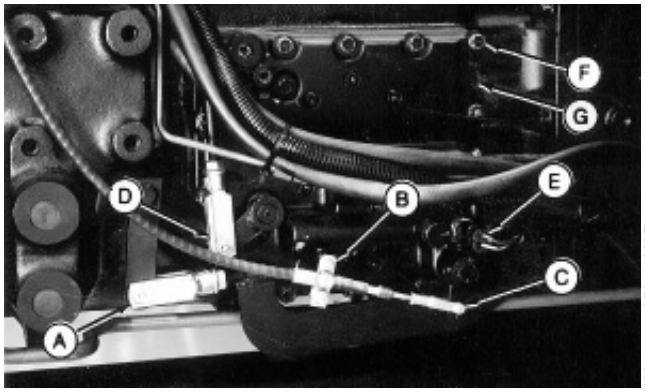
Left step removed for illustration purposes.

1. Disconnect long PTO rod assembly (A) at both ends and remove.
2. Tractors without cab: remove left step.
3. Tractors with cab: remove floor plate covering clutch housing.
4. Remove cable clamp with shims (B) and clevis pin (C), and disconnect F-N-R cable.
5. Disconnect clutch pedal linkage (D).
6. Disconnect neutral safety wiring connector (E).
7. Remove cap screws (F) and control valve (G).
8. Make repairs as necessary. (See Disassemble, Inspect, and Repair PowrReverser™ Control Valve in this group.)
9. Clean mating surfaces of control valve and clutch housing.
10. Install new gasket.
11. Install control valve (G) and cap screws (F). Tighten cap screws to specification.

Specification

Control Valve Cap Screws—
Torque ..... 26 N•m (20 lb-ft)

12. Connect neutral safety switch wiring connector.
13. Connect clutch pedal linkage and adjust. (See Clutch Pedal Linkage Adjustment in Section 250, Group 16.)
14. Connect F-N-R lever cable and make adjustments. (See Forward-Neutral-Reverse Control Cable Adjustment in Section 250, Group 16.)



LV1056 –UN–08MAR95

A—Long PTO Rod Assembly
B—F-N-R Cable Clamp with Shims
C—Clevis Pin
D—Traction Clutch Linkage
E—Wire Connector
F—Cap Screw (15 used)
G—Control Valve

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Continued on next page

AG,OUO1085,142 –19–11NOV02–1/2

15. Install new tie straps as necessary.

16. Tractors without cab: install left step.

17. Tractors with cab: install clutch housing floor plate.

18. Install long PTO rod assembly and make adjustments. (See PTO Clutch Lever Adjustment in Section 250, Group 15 for adjustment procedures.)

19. Test control valve for proper function. (See PowrReverser™ Control Valve Tests in Section 250, Group 16.)

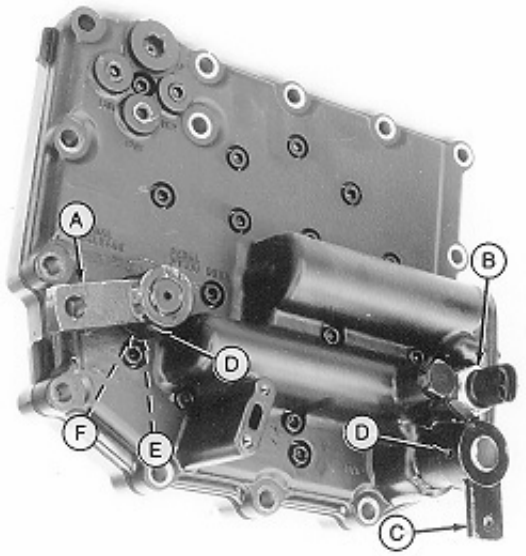
AG,OUO1085,142 –19–11NOV02–2/2

Disassemble, Inspect, and Repair PowrReverser™ Control Valve

1. Remove PowrReverser™ valve. (See Remove and Install PowrReverser™ Control Valve in this group.)

2. Remove parts (A—F).

A—Clutch Lever
B—Neutral Safety Switch
C—F-N-R Lever
D—Spring Pin
E—Snap Ring
F—Washer



LV1226 –UN–06JAN95

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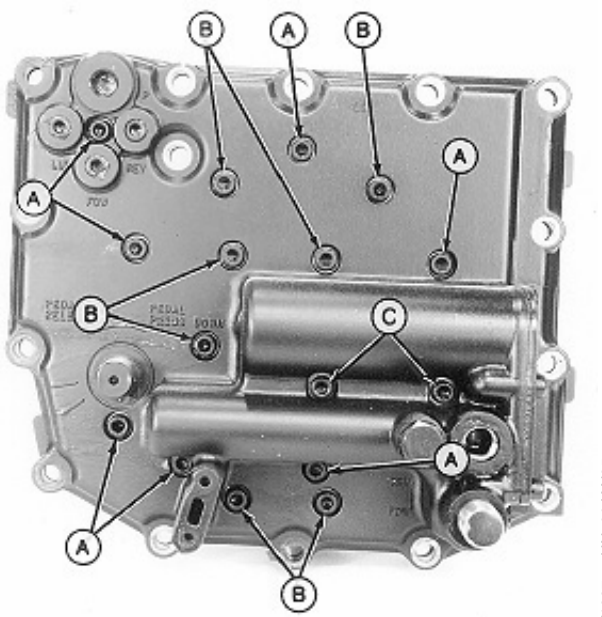
AG,OUO1085,143 –19–28JUN02–1/10

3. Remove socket head screws and sealing washers (A, B, and C).

NOTE: Inspect sealing washers on screws for wear or damage. Replace if necessary.

A—Screw and Sealing Washer 25 mm (0.984 in.) Long
B—Screw and Sealing Washer 45 mm (1.771 in.) Long
C—Screw and Sealing Washer 55 mm (2.165 in.) Long



LV1227 –UN–06JAN95

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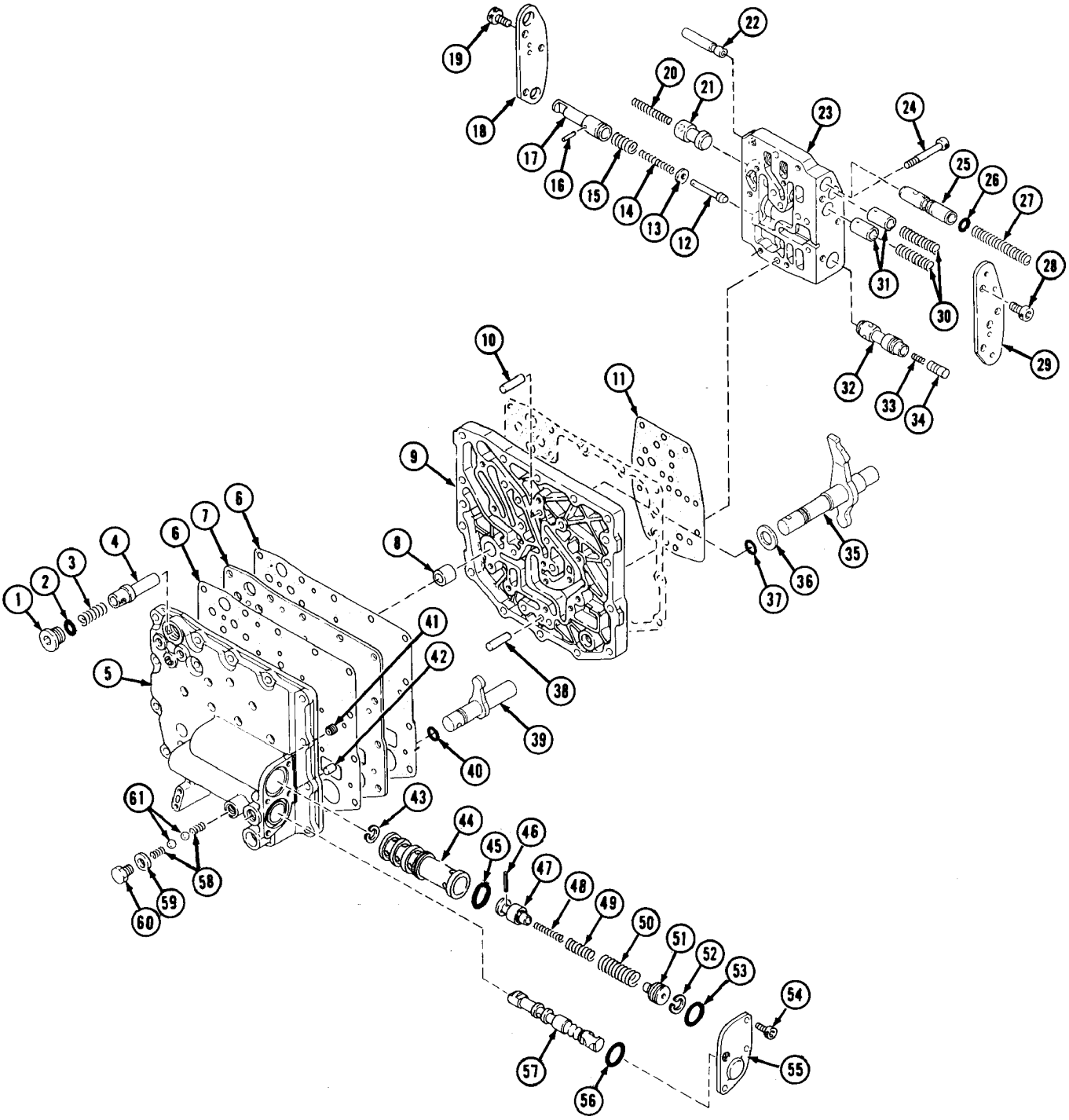
AG,OUO1085,143 –19–28JUN02–2/10



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AG,OUO1085,143 –19–28JUN02–3/10

1—Plug
2—Seal
3—Filter Spring
4—Filter
5—Valve Body
6—Gasket (2 used)
7—Plate
8—Bearing
9—Valve Plate
10—Pin
11—Gasket
12—Guide Pin
13—Washer
14—Spring
15—Spring
16—Spring Pin
17—Piston
18—Plate
19—Socket Head Screw (3 used)
20—Spring
21—Spool
22—Spool
23—Valve Body
24—Socket Head Screw (3 used)
25—Spool
26—Seal
27—Spring
28—Socket Head Screw (3 used)
29—Plate
30—Spring
31—Spool
32—Spool
33—Spring
34—Pin
35—Clutch Arm
36—Washer
37—Seal
38—Pin
39—Shift Arm
40—Seal
41—Orifice
42—Pin
43—Snap Ring
44—Valve Sleeve
45—Seal
46—Spring Pin
47—Spool
48—Spring
49—Spring
50—Spring
51—Spool
52—Snap Ring
53—Seal
54—Socket Head Screw (4 used)
55—Cover
56—Seal
57—Spool
58—Spring
59—Gasket
60—Plug
61—Ball

NOTE: Clutch arm (35) is press fit in plate (9).

4. Remove parts (35, 36, and 37) using a bushing, bearing, and seal driver set.

5. Separate back valve plate (9) from front valve body (5).

6. Remove gaskets (6) and plate (7).

7. Remove plug (60), gasket (59), springs (58), and balls (61).

8. Remove screws (24) and valve body (23).

IMPORTANT: Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

9. Remove parts (11—34) from valve body (23). Inspect for wear or damage. Replace as necessary.

10. Disassemble piston (17) containing parts (12—16). Place piston assembly (17) in a soft-jawed vise. Place a socket or pipe over the head of pin (12) and compress washer (13) and springs (14 and 15). Remove pin (16) using a small punch and hammer.

11. Remove parts (12—15) from piston (17). Inspect all parts for wear or damage. Replace as necessary.

NOTE: Bearing (8) is press fit in plate (9). Inspect for wear or damage. Replace only if necessary.

12. Replace bearing (8) using a bushing, bearing, and seal driver set. Install new bearing until centered in bore.

13. Remove shift arm (39) and seal (40) using a punch and soft-faced hammer.

14. Remove orifice (41). Inspect for debris or damage in orifice hole. Clean or replace if necessary.

15. Remove plug (1), seal (2), spring (3), and filter (4). Inspect parts for wear or damage. Replace as necessary.

16. Remove screws (54), cover (55), and seals (53 and 56).

17. Remove spool (57).

18. Remove sleeve (44) containing parts (43 and 45—53) from front valve body (5).

NOTE: Spring pin (46) is press fit in spool (47). Remove spring pin only if replacement of spool is necessary.

19. Disassemble sleeve (44) by compressing spool (51) and remove snap ring (52).

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Continued on next page

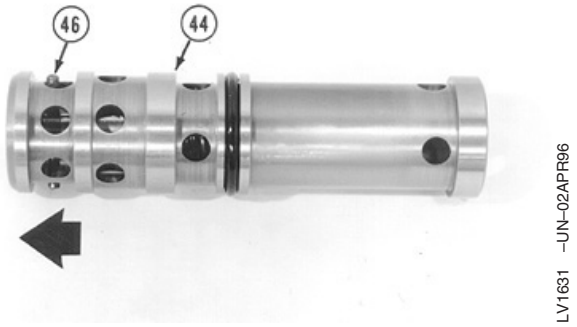
20. Remove spool (51) and springs (48, 49, and 50).

21. Remove spring pin (46), snap ring (43), and spool (47).

AG,OUO1085,143 –19–28JUN02–5/10

22. Inspect all parts for wear or damage. Replace as necessary.

44—Valve Sleeve
46—Spring Pin



LV1631 –UN–02APR96

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AG,OUO1085,143 –19–28JUN02–6/10

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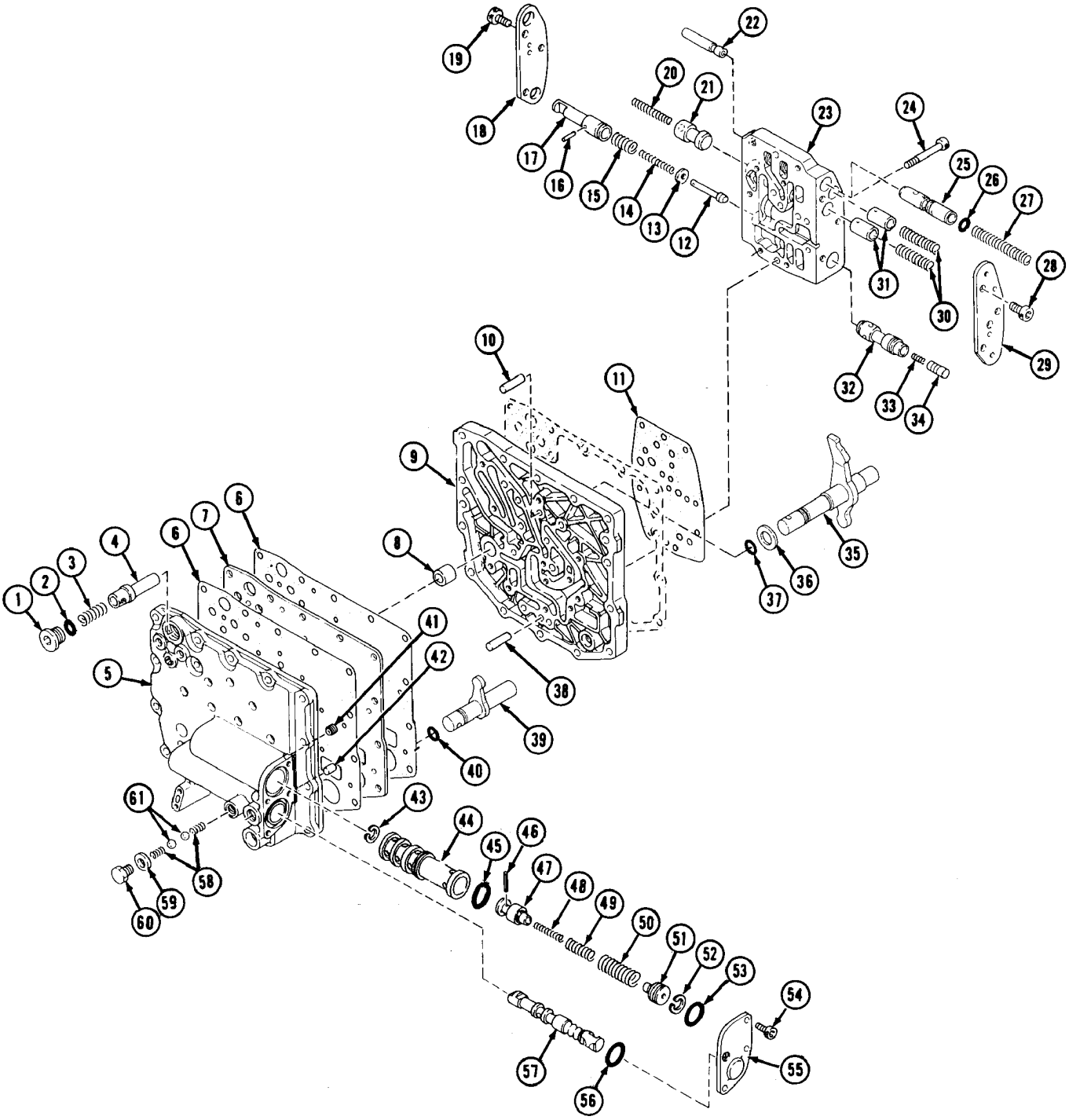

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AG,OUO1085,143 –19–28JUN02–7/10

1—Plug
2—Seal
3—Filter Spring
4—Filter
5—Valve Body
6—Gasket (2 used)
7—Plate
8—Bearing
9—Valve Plate
10—Pin
11—Gasket
12—Guide Pin
13—Washer
14—Spring
15—Spring
16—Spring Pin
17—Piston
18—Plate
19—Socket Head Screw (3 used)
20—Spring
21—Spool
22—Spool
23—Valve Body
24—Socket Head Screw (3 used)
25—Spool
26—Seal
27—Spring
28—Socket Head Screw (3 used)
29—Plate
30—Spring
31—Spool
32—Spool
33—Spring
34—Pin
35—Clutch Arm
36—Washer
37—Seal
38—Pin
39—Shift Arm
40—Seal
41—Orifice
42—Pin
43—Snap Ring
44—Valve Sleeve
45—Seal
46—Spring Pin
47—Spool
48—Spring
49—Spring
50—Spring
51—Spool
52—Snap Ring
53—Seal
54—Socket Head Screw (4 used)
55—Cover
56—Seal
57—Spool
58—Spring
59—Gasket
60—Plug
61—Ball

IMPORTANT: Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

23. Assemble parts (43—53).

24. Install parts (38—61). Tighten detent plug (60) and valve spool cover screws (54) to specification.

Specification

Detent Plug—Torque ..... 19 N•m (14 lb-ft.)
Valve Spool Cover Screws—Torque ..... 26 N•m (20 lb-ft.)

25. Install filter (4), spring (3), seal (2), and plug (1). Tighten socket head plug (1) to specification.

Specification

PowrReverser™ Control Valve Filter Plug—Torque ..... 29 N•m (21 lb-ft.)

26. Reassemble parts (12—17). Install pin (16) until centered.

27. Install parts (12—22) and parts (25—34) on valve body (23). Tighten screws (19 and 28) to specification.

Specification

Valve Spool Retaining Plate Screws—Torque ..... 26 N•m (19 lb-ft.)

28. Install gasket (11), valve body (23), and screws (24). Tighten screws to specification.

Specification

Valve Body Screws—Torque ..... 10 N•m (7 lb-in.)

29. Install valve case (5), gaskets (6), plate (7), and valve plate (9).

50 12 11

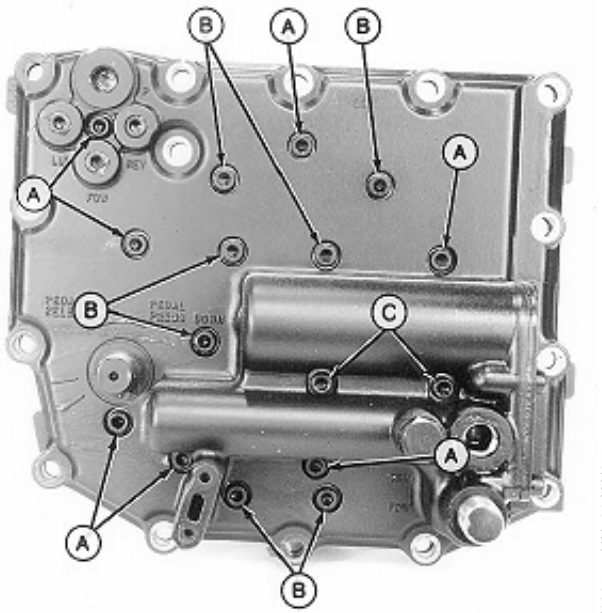
Continued on next page

30. Install screws and sealing washers (A, B, and C). Tighten screws to specification.

Specification

PowrReverser™ Valve Plate
Screws—Torque ..... 10 N•m (7 lb-in.)

A—Screw and Sealing Washer 25 mm (0.984 in.) Long
B—Screw and Sealing Washer 45 mm (1.771 in.) Long
C—Screw and Sealing Washer 55 mm (2.165 in.) Long



LV1227 –UN–06JAN95

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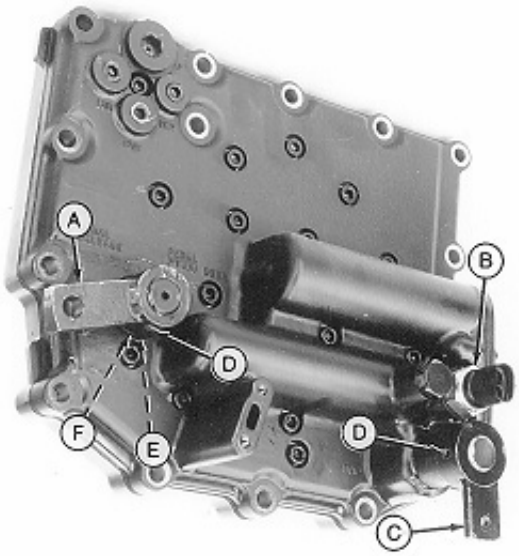
AG,OUO1085,143 –19–28JUN02–9/10

31. Install parts (A—F).

32. Install PowrReverser™ control valve. (See Remove and Install PowrReverser™ Control valve in this group.)

A—Clutch Lever
B—Neutral Safety Switch
C—F-N-R Lever
D—Spring Pin
E—Snap Ring
F—Washer



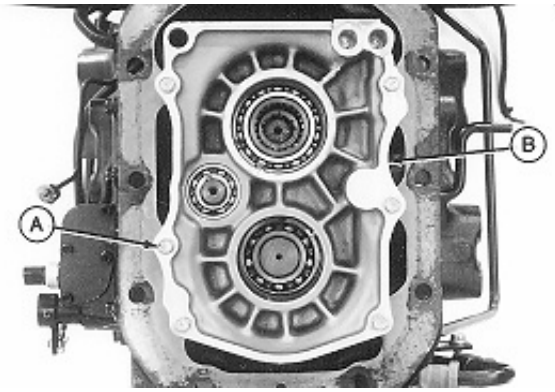
LV1226 –UN–06JAN95

AG,OUO1085,143 –19–28JUN02–10/10

Remove and Install PowrReverser™

1. Separate clutch housing from transmission. (See Separate Clutch Housing from Transmission in Group 16.)
2. Remove cap screws (A) and clutch pack plate (B).
3. Disassemble and inspect plate (B). Replace parts as necessary. (See Disassemble, Inspect, and Repair Reverse Idle Gear in this group.)

A—Cap Screw
B—Plate

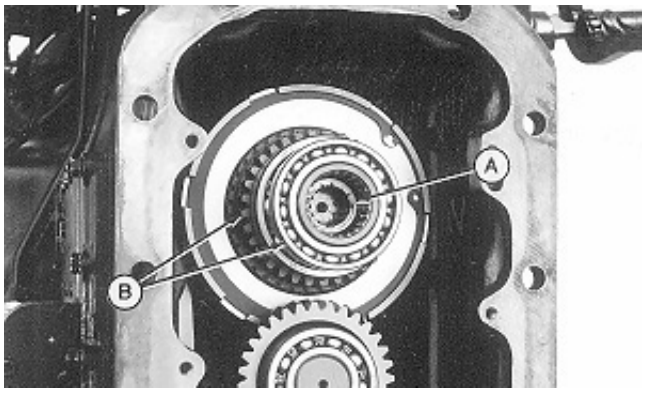


LV1069 –UN–15DEC94

AG,OUO1085,144 –19–28JUN02–1/8

4. Remove splined coupling (A).
5. Remove clutch gear (B).
6. Disassemble and inspect clutch gear (B). Replace parts as necessary. (See Disassemble, Inspect, and Repair Clutch Gear in this group.)

A—Splined Coupling
B—Clutch Gear



LV1070 –UN–15DEC94

LV1071 –UN–15DEC94

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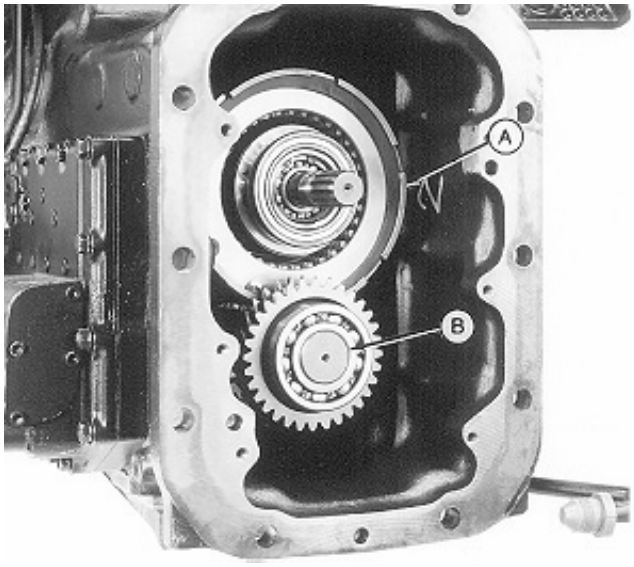
AG,OUO1085,144 –19–28JUN02–2/8

NOTE: Place a mark on the end of driven shaft (B) to aid during installation.

7. Slide PowrReverser™ (A) and driven shaft (B) rearward until driven shaft (B) can be removed.

8. Disassemble and inspect driven shaft (B). Replace parts as necessary. (See Disassemble, Inspect, and Repair Driven Shaft in this group.)

A—PowrReverser™
B—Driven Shaft



LV1072 –UN–15DEC94

LV1073 –UN–15DEC94

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AG,OUO1085,144 –19–28JUN02–3/8

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12
14

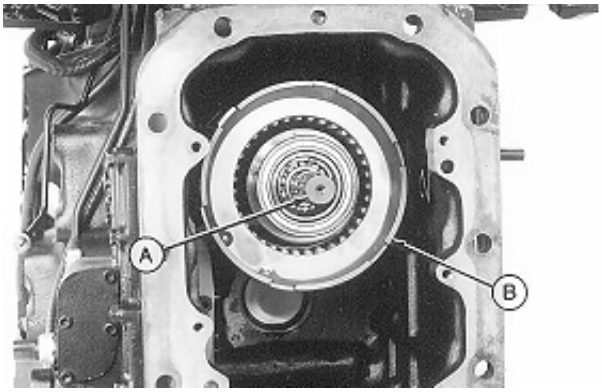
CAUTION: Approximate weight of PowrReverser™ (B) is 20 kg (45 lbs).

9. Remove PTO shaft (A).

10. Remove hydraulic reverser (B).

11. Disassemble and inspect PowrReverser™ (B). Replace parts as necessary. (See Disassemble, Inspect, and Repair PowrReverser™ in this group.)

A—PTO Shaft
B—Hydraulic Reverser



LV1074 –UN–15DEC94

LV1075 –UN–15DEC94

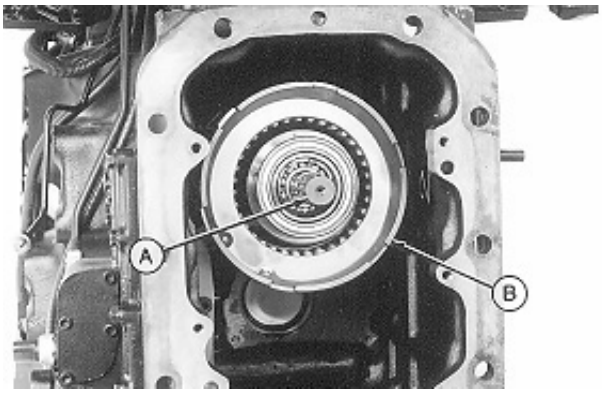
AG,OUO1085,144 –19–28JUN02–4/8

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

IMPORTANT: Use new seals and O-rings during assembly. Damaged or used seals or O-rings will leak.

12. Apply Moly High Temperature EP Grease to splined ends of PTO and clutch shafts.

13. Install PowrReverser™ (B) and PTO shaft (A). It may be necessary to rotate PowrReverser™ during installation.



LV1074 –UN–15DEC94

A—PTO Shaft
B—PowrReverser™

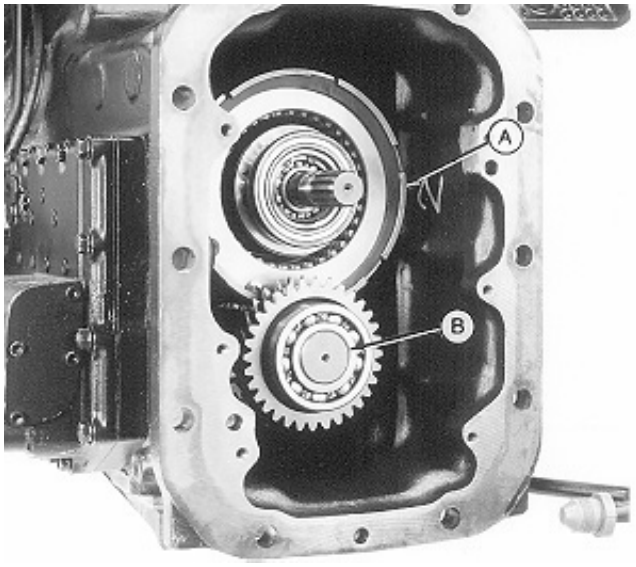
Continued on next page

AG,OUO1085,144 –19–28JUN02–5/8

NOTE: To aid in installation of driven shaft (B), do not seat PowrReverser™ (A) completely into case bore.

14. Install driven shaft (B) and fully seat both shafts (A and B) into case bore.

A—PowrReverser™
B—Driven Shaft



LV1072 –UN–15DEC94

AG,OUO1085,144 –19–28JUN02–6/8

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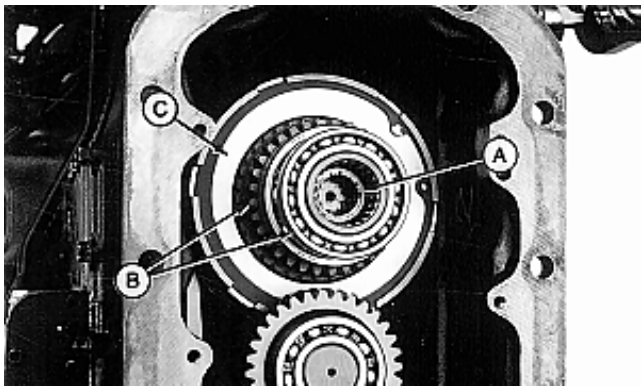
NOTE: During installation of clutch gear (B), rotate clutch gear to align disks onto splined ends of clutch gear. Make sure clutch gear (B) is completely seated inside PowrReverser™.

15. Install clutch gear (B) until large seal on clutch gear is completely under plate (C).

16. Apply Moly High Temperature EP Grease to inside splines of coupling (A).

17. Install splined coupling (A).



LV1368 –UN–15SEP95

A—Splined Coupling
B—Clutch Gear
C—Plate

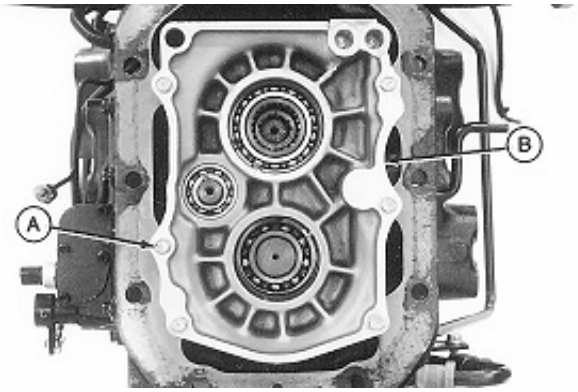
AG,OUO1085,144 –19–28JUN02–7/8

18. Install clutch pack plate (B) and cap screws (A). Tighten cap screws to specification.

Specification

PowrReverser™ Clutch Pack
Plate Cap Screw—Torque..... 26 N•m (20 lb-ft)

A—Cap Screw
B—Clutch Pack Plate



LV1069 –UN–15DEC94

AG,OUO1085,144 –19–28JUN02–8/8

Disassemble, Inspect, and Repair Reverse Idle Gear

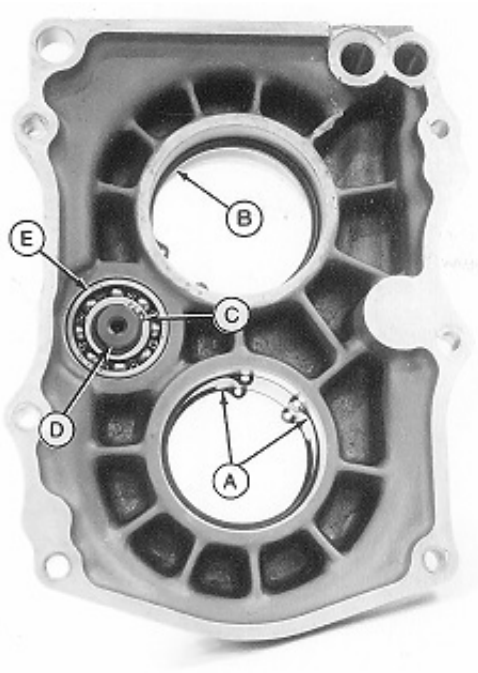
1. Remove retaining ring (A and B).

2. Remove retaining ring (C).

NOTE: Reverse idle gear (D) is press fit. Remove reverse idle gear (D) using a bushing, bearing, and seal driver set.

3. Remove idle gear (D) and bearing (E).

A—Retaining Ring (2 used)
B—Retaining Ring
C—Retaining Ring
D—Reverse Idle Gear
E—Bearing



LV1076 –UN–15DEC94

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AG,OUO1085,145 –19–16AUG00–1/2

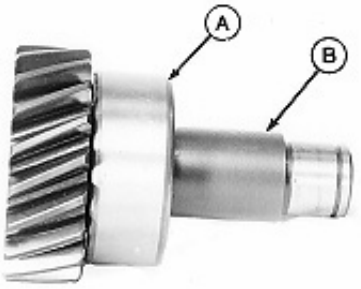
NOTE: Bearing (A) is press fit on shaft (B). Remove bearing only if replacement is necessary.

Remove bearing (A) using a knife-edged puller and press. Install new bearing until seated.

4. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all bearings with clean transmission/hydraulic oil during assembly.

5. Install all parts.



LV1077 –UN–15DEC94

A—Bearing
B—Shaft

AG,OUO1085,145 –19–16AUG00–2/2

Disassemble, Inspect, and Repair Clutch Gear

NOTE: Bearings (C and E) are press fit on clutch gear (B).

1. Remove bearings (C and E) using a knife-edged puller and a press.

IMPORTANT: Replace seal. Damaged or used seal will leak.

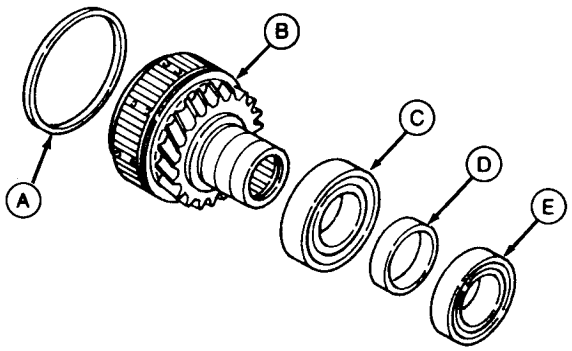
2. Remove all parts.

3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Install all parts.

   Install bearings (C and E) using a bearing, bushing, and seal drive set and a press.



LV1220A –UN–15DEC94

LV1078 –UN–15DEC94

A—Seal
B—Clutch Gear
C—Ball Bearing
D—Collar
E—Bearing

AG,OUO1085,146 –19–16AUG00–1/1

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Disassemble, Inspect, and Repair Driven Shaft

NOTE: Bearings (A and H) are press fit on shaft (E).

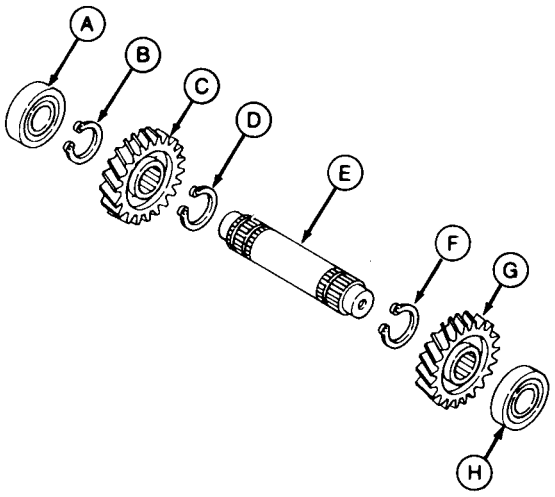
1. Remove bearings (A and H) using a knife-edged puller and a press.
2. Remove all parts.
3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Install all parts.

   Install bearings (A and H) using a bearing, bushing, and seal driver set and a press.

A—Ball Bearing
B—Snap Ring
C—Drive Gear
D—Snap Ring
E—Driven Shaft
F—Snap Ring
G—Drive Gear
H—Ball Bearing



LV1222A –UN–15DEC94

LV1221 –UN–15DEC94

AG,OUO1085,147 –19–16AUG00–1/1

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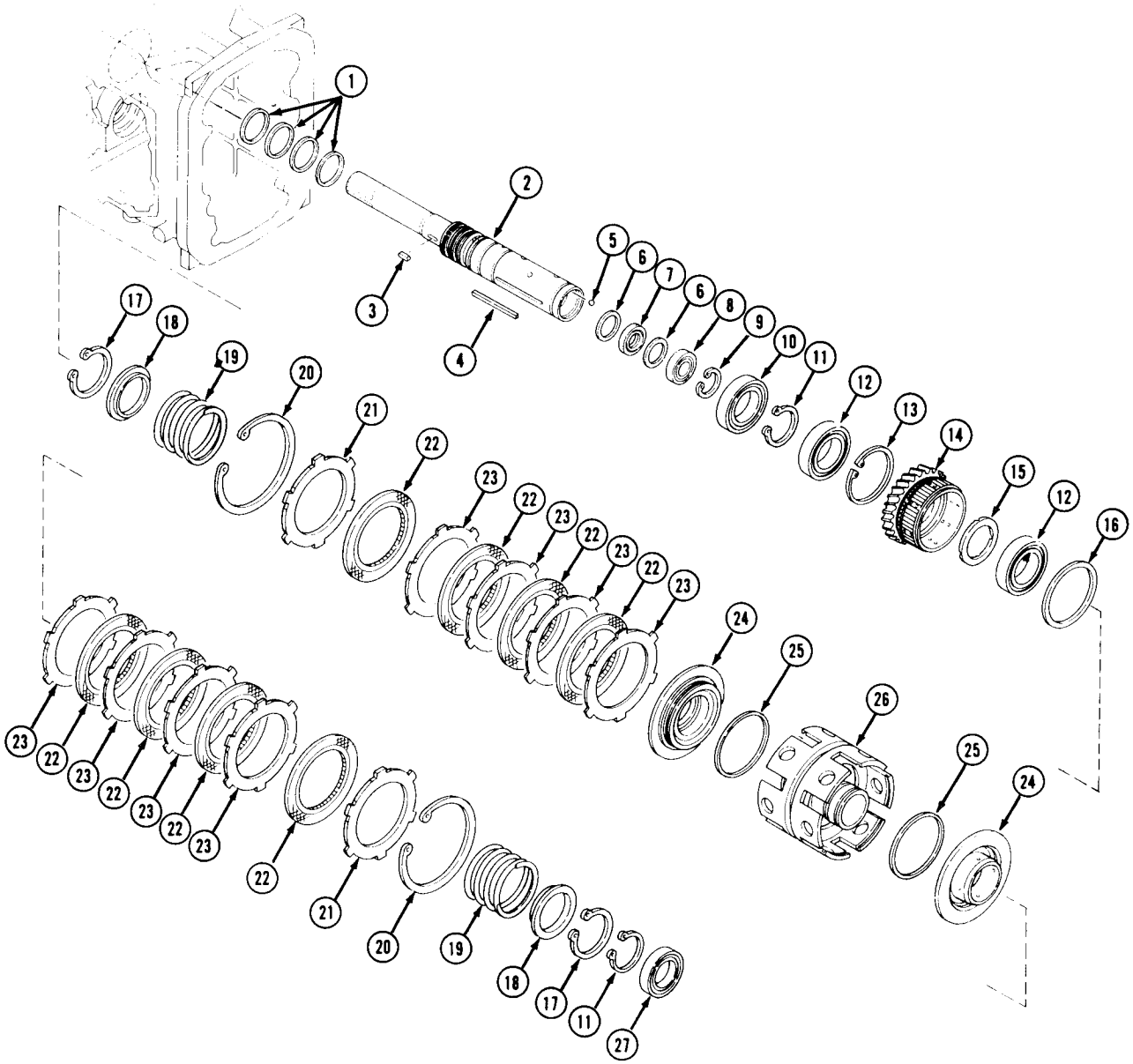
Disassemble, Inspect, and Repair PowrReverser™



1—Ring Seal (4 used)
2—Shaft
3—Key
4—Key
5—Ball (4 used)
6—Washer (2 used)
7—Seal
8—Bearing
9—Snap Ring
10—Ball Bearing
11—Snap Ring (3 used)
12—Bearing (2 used)
13—Snap Ring
14—Clutch Gear
15—Washer
16—Seal
17—Snap Ring (2 used)
18—Support (2 used)
19—Spring (2 used)
20—Retaining Ring (2 used)
21—Plate (2 used)
22—Disk (8 used)
23—Plate (8 used)
24—Piston (2 used)
25—Seal (2 used)
26—Clutch Cylinder
27—Ball Bearing

IMPORTANT: Replace all seals and O-rings. Damaged or used seals and O-rings will leak.

1. Remove seals (1) and key (3).

Continued on next page

AG,OUO1085,148 –19–28JUN02–1/5

NOTE: Bearing (27) is press fit on shaft (2).

2. Remove bearing (27) using a knife-edged puller.

3. Remove retaining ring (20) and parts (21—23) on both sides of clutch cylinder (26).

4. Inspect disks (22) and plates (21 and 23) for cracks or damage. Replace if necessary. Measure disk and plate thickness. Replace if less than specifications.

Specification

Outer Clutch Plate (21)—Thickness	5.85 mm (0.230 in.) Minimum
Clutch Disk (22)—Thickness	2.7 mm (0.106 in.) Minimum
Outer Clutch Plate (23)—Thickness	3.85 mm (0.151 in.) Minimum

5. Remove snap ring (11) from transmission end of shaft (2).

6. Remove clutch cylinder (26) containing parts (17—19), piston (24), and seal (25).

AG,OUO1085,148 –19–28JUN02–2/5

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NOTE: Dealers with JDT24A need only purchase new center tee JDT24-3 to make special tool JDT24B.

7. Disassemble clutch piston by placing clutch cylinder (A) and special tool JDT24B (B) on a press or flat-jawed vise.

8. Compress spring (C) and support (D). Remove snap ring (E).

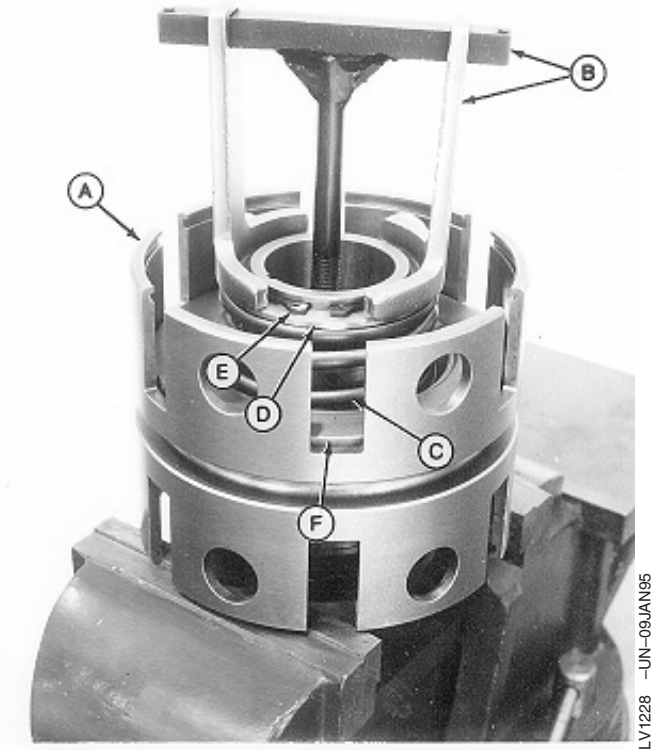
9. Slowly release pressure of special tool and remove parts (B—E) and piston (F).

10. Measure spring (C) under no load. Replace spring if not within specification.

Specification

PowrReverser™ Spring (No Load)—Length	58 mm (2.283 in.) Minimum

11. Repeat procedure for other side of clutch cylinder.



LV1228 –UN–09JAN95

A—Clutch Cylinder
B—Special Tool JDT24B
C—Spring
D—Support
E—Snap Ring
F—Piston

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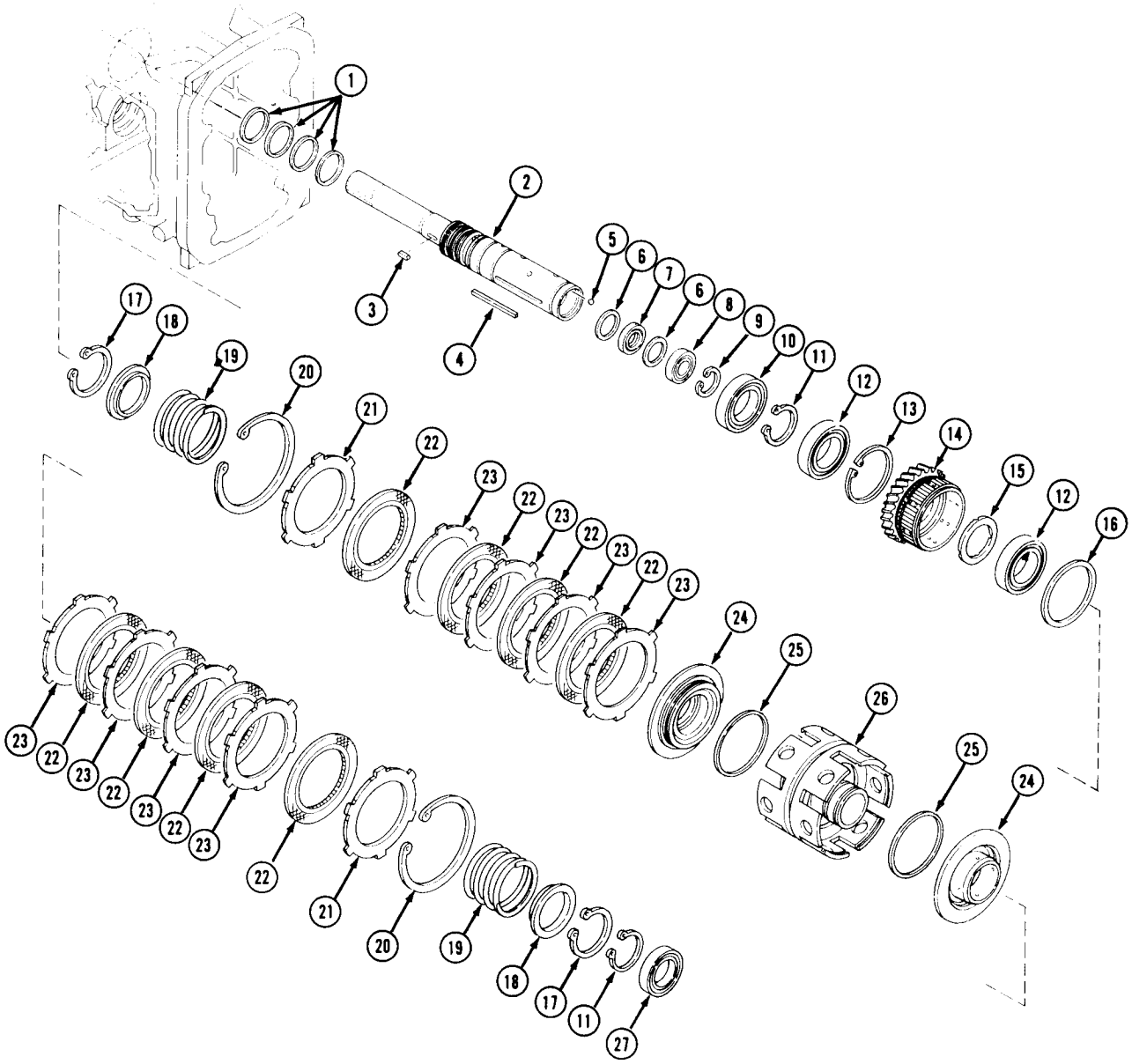
AG,OUO1085,148 –19–28JUN02–3/5



LV1223A –UN–15SEP95

1—Ring Seal (4 used)
2—Shaft
3—Key
4—Key
5—Ball (4 used)
6—Washer (2 used)
7—Seal
8—Bearing
9—Snap Ring
10—Ball Bearing
11—Snap Ring (3 used)
12—Bearing (2 used)
13—Snap Ring
14—Clutch Gear
15—Washer
16—Seal
17—Snap Ring (2 used)
18—Support (2 used)
19—Spring (2 used)
20—Retaining Ring (2 used)
21—Plate (2 used)
22—Disk (8 used)
23—Plate (8 used)
24—Piston (2 used)
25—Seal (2 used)
26—Clutch Cylinder
27—Ball Bearing

IMPORTANT: Replace all seals and O-rings. Damaged or used seals and O-rings will leak.

12. Remove seals (25) from piston (24).

13. Remove parts (11—16) and key (4) from shaft (2).

Continued on next page

AG,OUO1085,148 –19–28JUN02–4/5

NOTE: Bearing (10) is press fit on shaft (2). Inspect bearing (10) for wear or damage. Replace only if necessary.

14. Remove bearing (10) from charge pump end of shaft (2) using a knife-edged puller and a press.

NOTE: Seal (7) is press fit inside shaft (2). Inspect seal (7) for wear or damage. Replace only if necessary.

15. Remove snap ring (9), bearing (8), and washer (6).

16. Pry out seal (7) and remove washer (6) behind seal.

NOTE: Balls (5) are press fit and are not replaceable.

17. Inspect shaft (2) for wear or damage. Replace if necessary.

18. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

19. Install washer (6) inside transmission end of shaft (2).

20. Install seal (7) using a bushing, bearing, and seal driver set and a press.

21. Install washer (6), bearing (8), and snap ring (9).

22. Install snap ring (11).

23. Install bearing (10) from the PTO clutch end of shaft (2) using a bushing, bearing, and seal driver set. Install bearing (10) until seated against snap ring (11).

24. Install parts (12—16) on shaft (2).

25. Reassemble parts (17, 18, 19, 24, and 25) on both sides of clutch cylinder (26) using special tool JDT24A.

26. Install key (4).

NOTE: Make sure the radius on plate (21) is toward the large retaining ring (20).

27. Install parts (21—23) on clutch gear (14).

NOTE: When installing large retaining rings (20), make sure open end of retaining ring aligns with solid wall of clutch cylinder (26).

28. Install clutch cylinder (26) and back retaining ring (20).

NOTE: Make sure the radius on plate (21) is toward the large retaining ring (20).

29. Install parts (21—23) and front retaining ring (20).

NOTE: When installing large retaining rings (20), make sure open end of retaining ring aligns with solid wall of clutch cylinder (26).

30. Install snap ring (11) and seals (1).

31. Install bearing (27) using a bushing, bearing, and seal driver set.

32. Install key (3) in shaft (2).

33. Install clutch housing to transmission. (See Install Clutch Housing to Transmission in Group 16.)

34. Test function of PowrReverser™. (See PowrReverser™ Control Valve Tests in Section 250, Group 16.)

AG,OUO1085,148 –19–28JUN02–5/5

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

OUO1043,0000EA4 –19–28JUN02–1/2

Flywheel Turning Tool JDE83

Rotates flywheel.

OUO1043,0000EA4 –19–28JUN02–2/2

Other Material

Number	Name	Use
TY15130 (U.S.)	John Deere Sealer	Seals shift lever housings.
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to PTO and traction clutch yoke-to-armshaft cap screw threads. Apply to shift fork-to-shaft cap screw threads.

LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000EA5 –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Clutch Housing-to-Transmission Cap Screws	Torque	118—147 N•m (87—108 lb-ft)
Wheel Cap Screws	Torque	175 N•m (130 lb-ft)
Transmission-to-Differential Case Cap Screws	Torque	140 N•m (105 lb-ft)
Reverse Idler Shaft	Torque	132 N•m (97 lb-ft)

OUO1043,0000EA6 –19–28JUN02–1/1

Separate Clutch Housing from Transmission

NOTE: The approximate capacity of transmission is 38 L (10 U.S. gal).

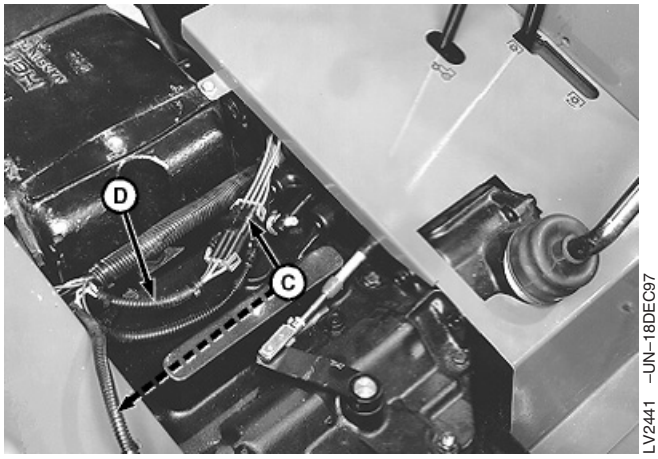
1. Drain transmission.

NOTE: Remove cab and floor plate if equipped. (See Cab Remove and Install and Cab Floor Plates Remove and Install—Early Model Tractors or Cab Floor Plate Remove and Install—Later Model Tractors in Section 90, Group 15.)

2. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
3. Remove clamp (A).
4. Disconnect wiring leads (B).
5. Disconnect ground wire lead (D), located on transmission cover.
6. Disconnect wiring connectors (C).

A—Clamp
B—Fuel Level Sender Wiring Leads
C—Wiring Connector
D—Ground Wiring Lead

LV2440 –UN–16DEC97

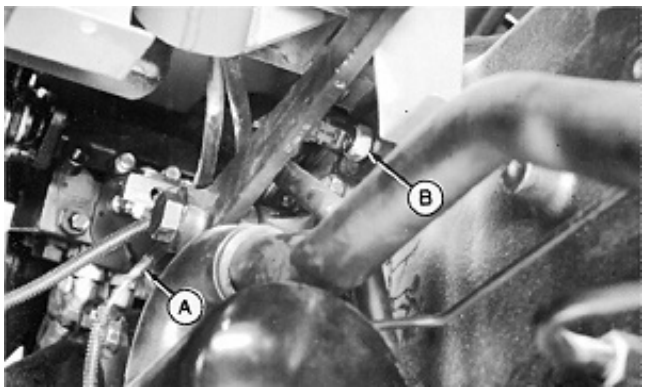


LV2441 –UN–18DEC97

AG,OUO1085,150 –19–17AUG00–1/6

7. Tractors without cab: remove right step plate.
8. Disconnect turn signal wiring connector (A).
9. Disconnect neutral safety switch wiring connector (B).

A—Turn Signal Wiring Connector
B—Neutral Safety Switch Wiring Connector



LV516 –UN–03MAR92

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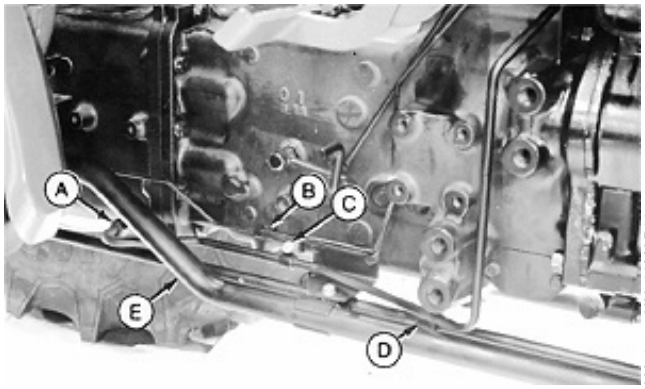
AG,OUO1085,150 –19–17AUG00–2/6

NOTE: Close all openings using caps and plugs.

10. Remove suction line (E).
11. Remove cap screw (C).
12. Disconnect hydraulic lines (A and D).
13. Disconnect brake line (B).

A—Brake Valve Return Line
B—Brake Pressure Line
C—Cap Screw
D—Hydraulic Pump-to-Inlet Housing Supply Line
E—Suction Line



LV515 –UN–03MAR92

Right Side Shown

AG,OUO1085,150 –19–17AUG00–3/6

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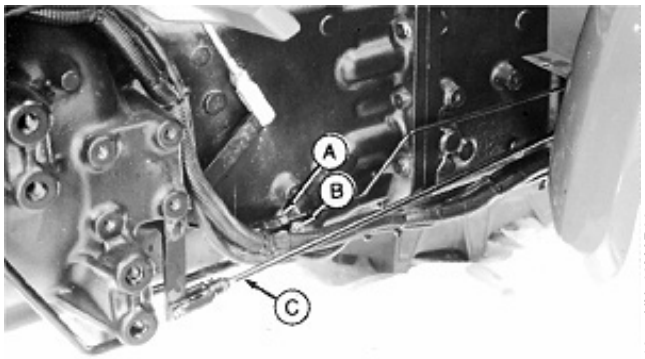
14. Tractors without cab: remove left step plate.
15. Disconnect brake line (A).
16. Remove cap screw (B).
17. Remove PTO clutch linkage rod (C).

A—Brake Line
B—Cap Screw
C—Linkage Rod



LV518 –UN–03MAR92

Left Side Shown

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AG,OUO1085,150 –19–17AUG00–4/6

NOTE: Fuel tank capacity for 5210, 5310, and 5410 tractors is 68 L (18.0 U.S. gal).

Fuel tank capacity for 5510 and tractors with cab is 83 L (22.0 U.S. gal).

18. Drain fuel tank.

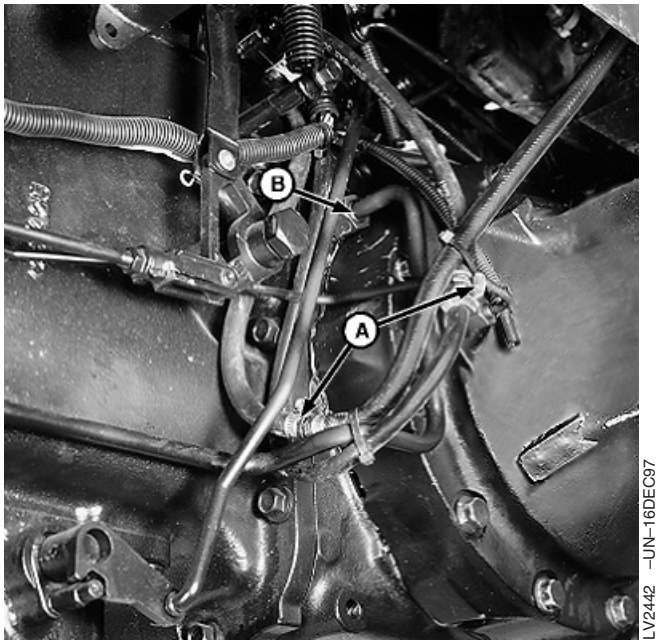
NOTE: Fuel lines are located on left side of tractor by axle final drive housing.

19. Disconnect fuel lines (A). Cut tie straps as necessary.

20. Disconnect hydraulic line (B).

21. Remove wire harness from rear of tractor. Cut tie straps as necessary.

A—Fuel Line (2 used)
B—Hydraulic Line



LV2442 –UN–16DEC97

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AG,OUO1085,150 –19–17AUG00–5/6

22. Remove MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)

23. Install wood blocks between the front axle pivot stops and tractor frame. Check front and back of rear wheels.

24. Position a floor jack under the transmission and a support stand under end of drawbar.

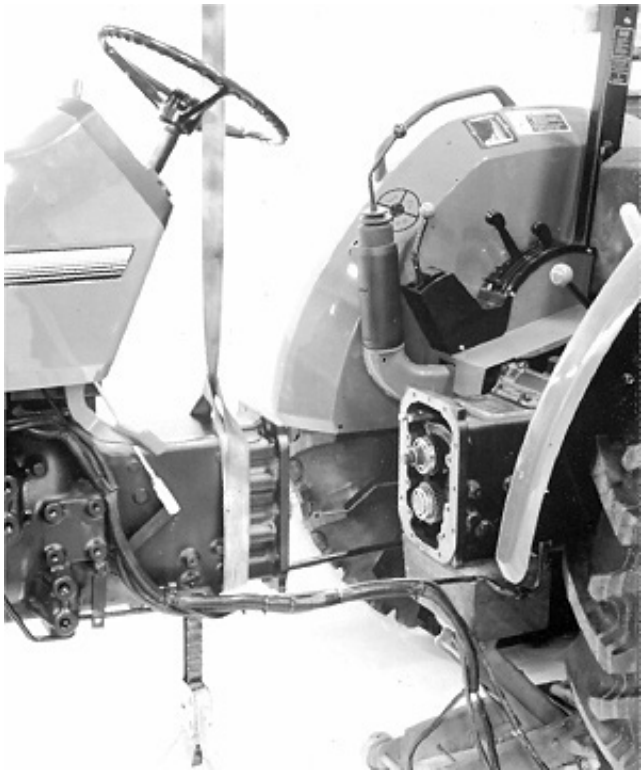
25. Attach a hoist and lifting chains or strap around clutch housing.

26. Place range shift lever in neutral and move gear shift lever fully left to neutral position between 2nd and reverse gears. Use wire or rope to hold gear shift lever in this position.

NOTE: When separating, the main outer shaft, gear fork shaft, and driven shaft assemblies must remain in transmission case.

27. Remove ten cap screws. Roll front section of tractor (clutch housing) away from rear section (transmission).

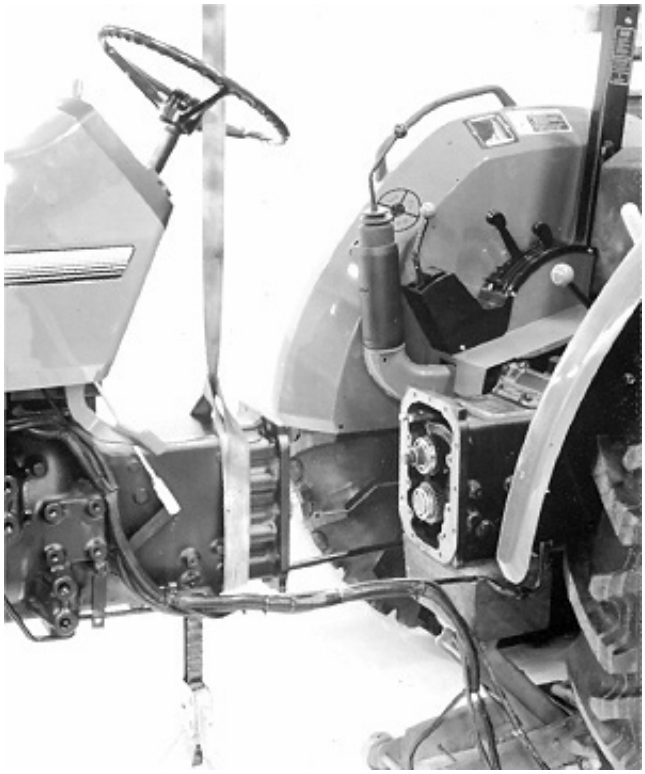
28. Install a support stand under clutch housing.



LV522 –UN–03MAR92

AG,OUO1085,150 –19–17AUG00–6/6

Install Clutch Housing to Transmission


LV522 –UN–03MAR92

1. Clean mating surfaces of transmission and clutch housings. Install new gasket.

2. Place range shift lever in neutral and gear shift lever in reverse.

NOTE: It may be necessary to rotate the clutch shafts and reverse gears during installation so that the clutch and transmission shafts mesh.

Rotate the PTO shaft by manually turning the PTO at rear of tractor.

Rotate the traction shaft by turning the flywheel using JDE83 Flywheel Turning Tool.

Verify that the two bearings and two fork shafts enter holes of clutch housing at the same time.

Verify that the two pins enter the holes in transmission housing.

3. Install clutch housing to transmission. Tighten cap screws to specification.

Specification	
Clutch Housing-to-Transmission Cap Screws—Torque	118—147 N•m (87—108 lb-ft)

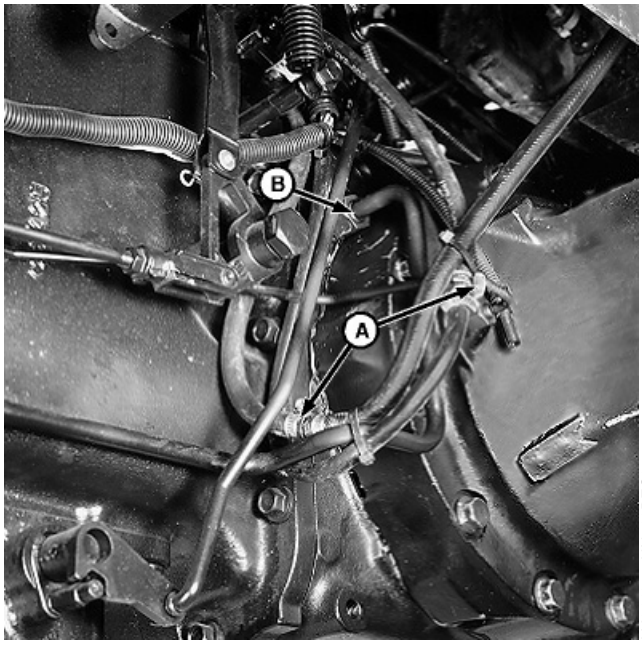
4. Install MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)

Continued on next page

AG,OUO1085,151 –19–28JUN02–1/6

5. Connect hydraulic line (B).
6. Connect fuel hoses (A).

A—Fuel Hose (2 used)
B—Hydraulic Line

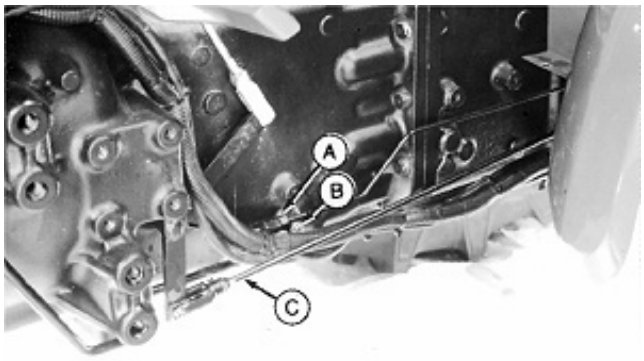


LV2442 –UN–16DEC97

AG,OUO1085,151 –19–28JUN02–2/6

7. Install PTO clutch linkage rod (C).
8. Install cap screw (B).
9. Connect brake line (A).
10. Install left step plate if removed.

A—Brake Line
B—Cap Screw
C—Clutch Linkage Rod



LV518 –UN–03MAR92

Left Side Shown

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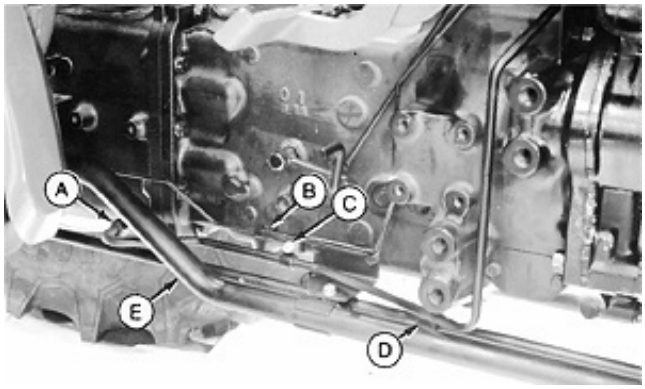
AG,OUO1085,151 –19–28JUN02–3/6

11. Connect brake line (B).
12. Connect hydraulic lines (A and D).
13. Install cap screw (C).
14. Install suction line (E).

A—Brake Valve Return Line
B—Brake Pressure Line
C—Cap Screw
D—Hydraulic Pump-to-Inlet Housing Supply Line
E—Suction Line



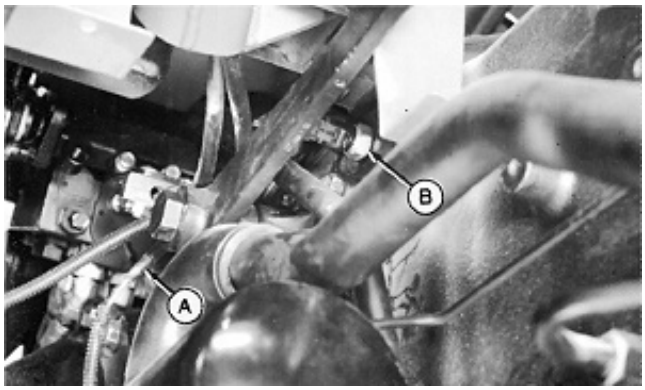
LV515 –UN–03MAR92

Right Side Shown

AG,OUO1085,151 –19–28JUN02–4/6

15. Connect wiring connector to neutral safety switch (B).
16. Connect wiring connector (A). Install new tie straps as necessary.
17. Install right step plate if removed.
18. Install cab and floor plates if equipped. (See Cab Remove and Install and Cab Floor Plates Remove and Install—Early Model Tractors or Cab Floor Plate Remove and Install—Later Model Tractors in Section 90, Group 15.)

A—Wiring Connector
B—Neutral Safety Switch



LV516 –UN–03MAR92

Right Side Shown

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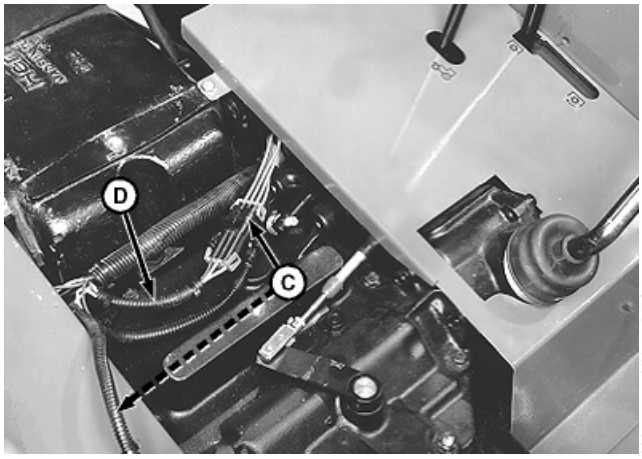
AG,OUO1085,151 –19–28JUN02–5/6

19. Connect wiring connectors (C).
20. Connect wire lead (D).
21. Connect wiring leads (B).
22. Install clamp (A).
23. Fill fuel tank with proper fuel. (See Diesel Fuel Specifications in Section 10, Group 20.)
24. Install seal and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
25. Fill transmission with clean transmission/hydraulic oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)
26. Bleed brake system. (See Bleed Brake System in Section 260, Group 15.)

A—Clamp
B—Fuel Level Sender Wiring Lead
C—Wiring Connectors
D—Ground Wire Lead

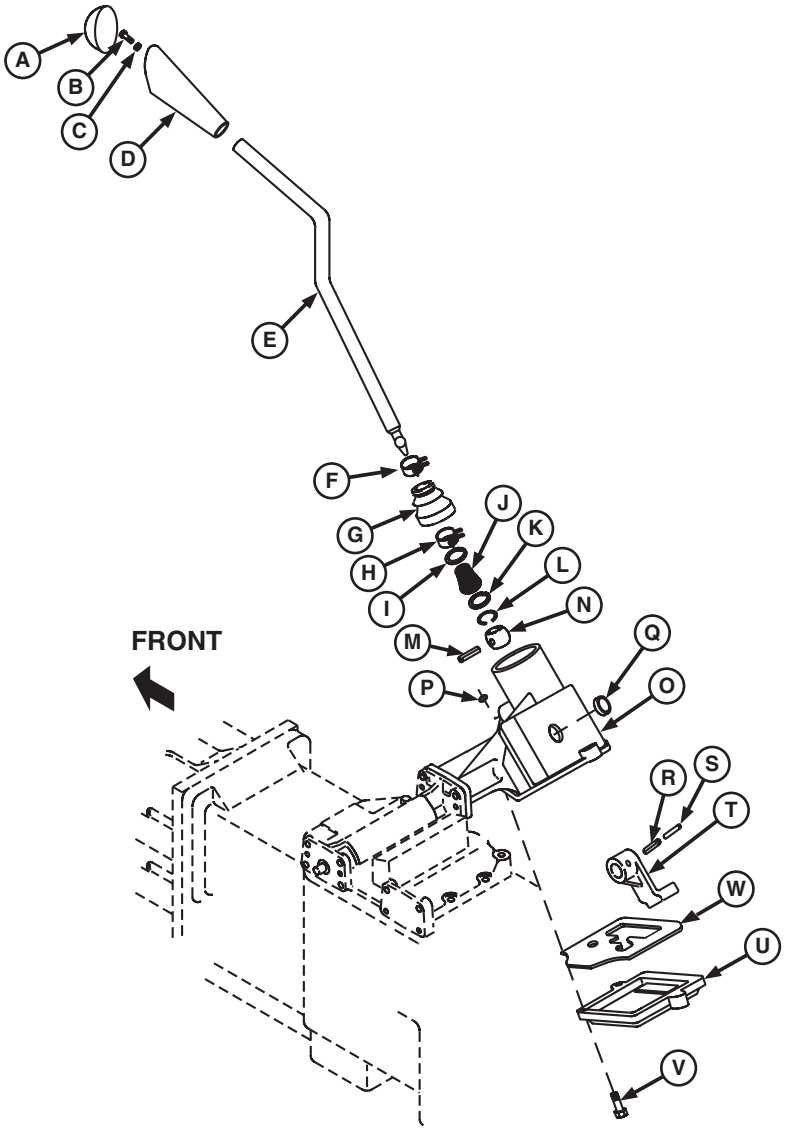
LV2440 –UN–16DEC97



LV2441 –UN–18DEC97

AG,OUO1085,151 –19–28JUN02–6/6

Inspect and Repair Gear Shift Lever



Gear Shift Lever

A—Knob Cover
B—Screw
C—Washer
D—Knob
E—Gear Shift Lever
F—Clamp
G—Boot
H—Clamp
I—Retaining Ring
J—Spring
K—Retaining Ring
L—Ring
M—Pin
N—Ball
O—Case
P—Plug
Q—Plug
R—Spring Pin
S—Spring Pin
T—Arm
U—Case Cover
V—Screw
W—Plate

NOTE: Tractor without cab shown. Tractor with cab is similar.

1. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)

Continued on next page

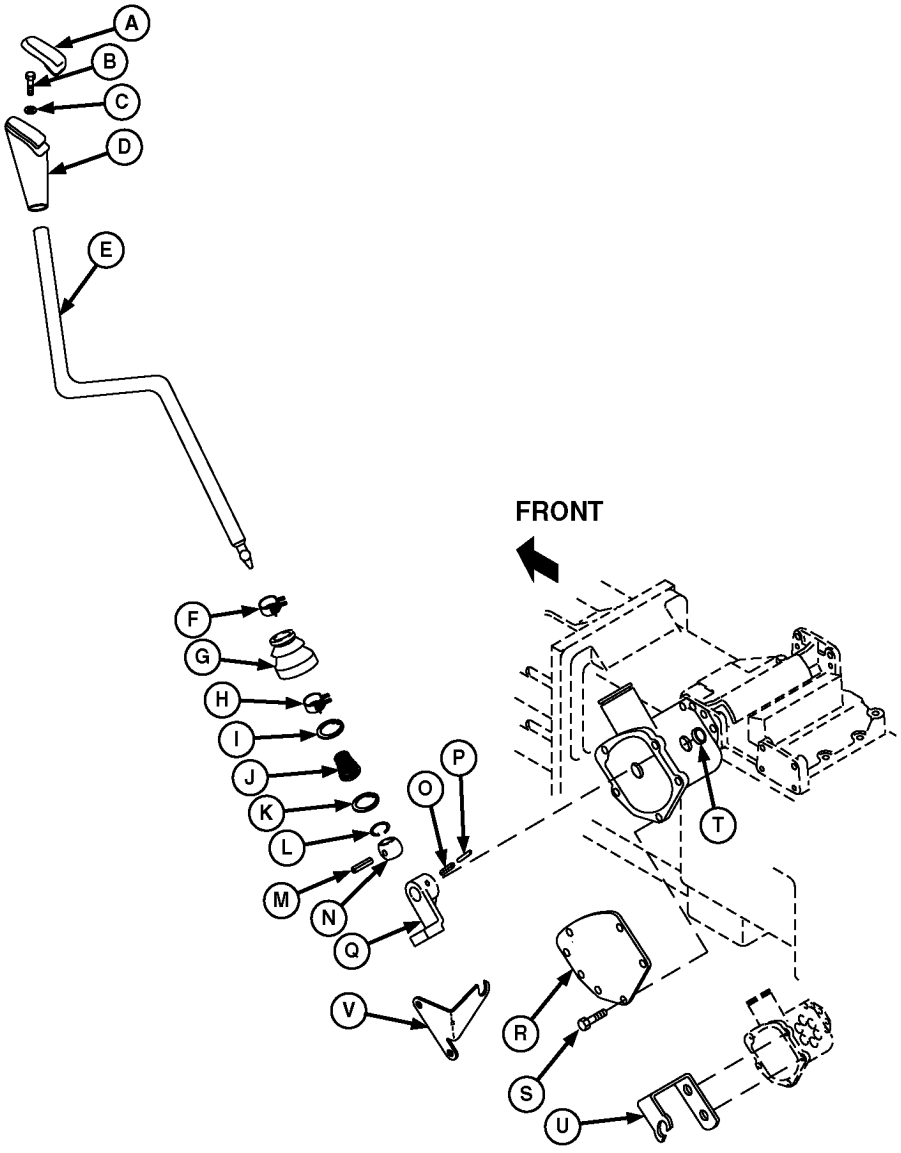
2. Remove right control console and panel. See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15 or Remove and Install Right-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)
3. Tractors without cab: remove right rear wheel and fender.
4. Remove case cover (U) and plate (W).
5. Remove plugs (P and Q).
6. Remove spring pins (R and S).
7. Remove parts (A—N).
8. Inspect all parts for wear or damage. Replace as necessary.
9. Apply multipurpose grease to ball (N).
10. Install all parts.
11. Install right control console and panel.
12. Install seat and support.
13. Tractors without cab: install fender and wheel. Tighten wheel cap screws to specification.

Specification

Wheel Cap Screws—Torque ..... 175 N•m (130 lb-ft)

AG,OUO1085,152 –19–28JUN02–2/2

Inspect and Repair Range Shift Lever



Range Shift Lever

A—Knob Cover
B—Screw
C—Washer
D—Knob
E—Range Shift Lever
F—Clamp
G—Boot
H—Clamp
I—Retaining Ring
J—Spring
K—Retaining Ring
L—Ring
M—Spring Pin
N—Ball
O—Spring Pin
P—Spring Pin
Q—Arm
R—Cover
S—Screw
T—Plug
U—Park Brake Cable Bracket
V—Shiftable PTO Cable Bracket

NOTE: Tractor without cab shown. Tractor with cab is similar.

1. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)

Continued on next page

LV2448 –UN–05JAN98

2. Remove left control console and panel. (See Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15 or Remove and Install Left-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)
3. Tractors without cab: remove left rear wheel and fender.
4. Remove screws (S) and bracket (U or V) if equipped.
5. Remove cover (R) and plugs (T) on both sides of range shift housing.
6. Remove spring pin (O and P).
7. Remove parts (A—Q).
8. Inspect all parts for wear or damage. Replace as necessary.
9. Apply multipurpose grease to ball (O).
10. Install all parts.
11. Install seat and support.
12. Install control console.
13. Tractors without cab: install fender and wheel. Tighten wheel cap screws to specification.

Specification

Wheel Cap Screws—Torque ..... 175 N•m (130 lb-ft)

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14

AG,OUO1085,153 –19–28JUN02–2/2

Remove Transmission


LV526 –UN–03MAR92

NOTE: Tractor without cab shown. Tractor with cab is similar.

1. Separate clutch housing from transmission. (See Separate Clutch Housing from Transmission in this group.)
2. In tractor with cab, remove both control consoles and support plate. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)
3. Raise and support rear axles.
4. In tractor without cab, remove rear wheels and fenders.
5. Remove rockshaft control levers.
6. Remove right control console. (See Remove and Install Right-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)
7. Remove SCV joystick and cable assembly, if equipped. (See Inspect and Repair Joystick and Linkage—Without Cab or Inspect and Repair Joystick and Linkage—With Cab in Section 70, Group 15.)

NOTE: Close all openings using caps and plugs.

8. Remove right brake line. Close all openings using caps and plugs.

Continued on next page

AG,OUO1085,154 –19–17AUG00–1/4

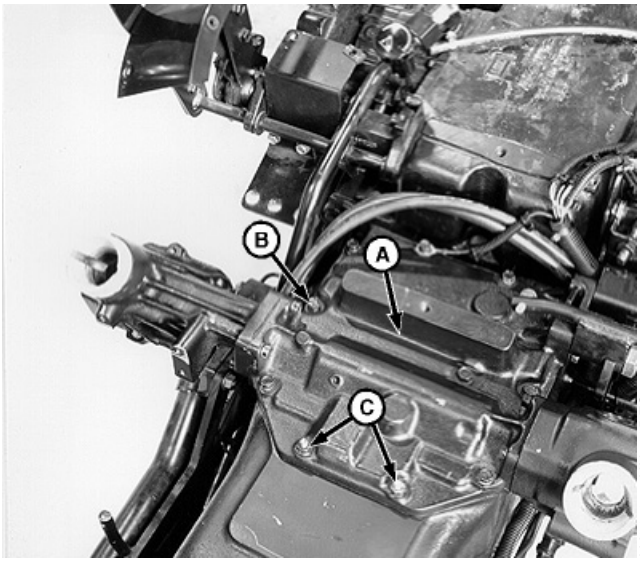
9. Remove MFWD lever and linkage, if equipped. (See Inspect and Repair MFWD Lever and Linkage in Group 35.)

10. Remove PTO lever and linkage. (See Remove, Inspect and Install Rear PTO Lever and Linkage in Group 20.)

11. Remove left control console.

12. Remove gear shift lever and range shift lever. (See Inspect and Repair Gear Shift Lever and Inspect and Repair Range Shift Lever in this group.)

13. Remove 8 cap screws (B) and nuts (C) to remove cover and shifter housings (A). Repair if necessary. (See Disassemble and Inspect Transmission in this group.)



Left Side Shown

A—Shifter Housing
B—Cap Screw (8 used)
C—Nut (8 used)

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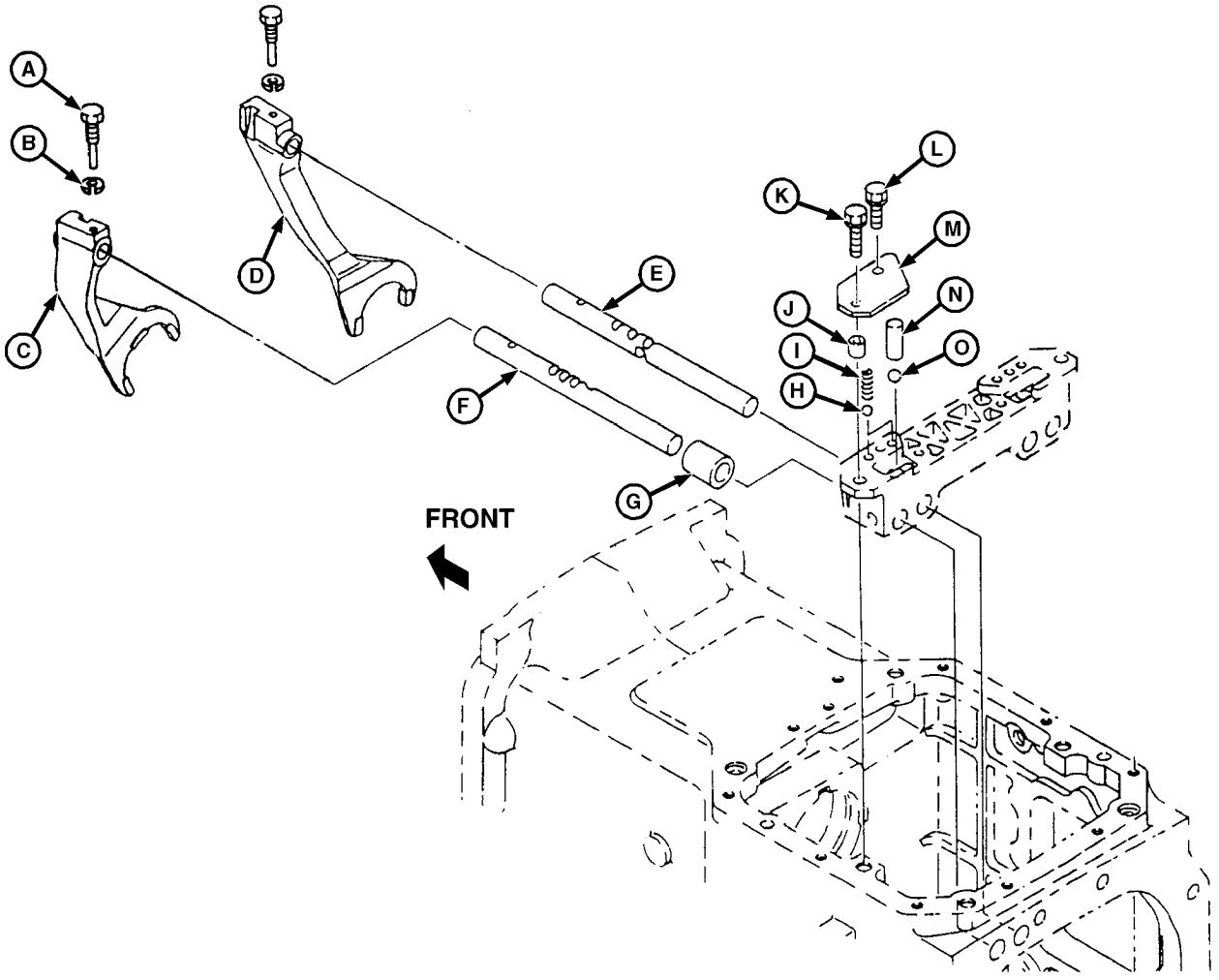
AG,OUO1085,154 –19–17AUG00–2/4



Range Shift Shaft Assembly

A—Cap Screw (2 used)
B—Lock Washer (2 used)
C—B and C Range Shift Fork
D—A Range and Creeper Shift Fork
E—A Range and Creeper Shift Shaft
F—B and C Range Shift Shaft
G—Sleeve
H—Ball (2 used)
I—Spring (2 used)
J—Bushing
K—Cap Screw
L—Cap Screw
M—Plate
N—Pin
O—Ball

14. Remove parts (H—O).

15. Remove cap screws (A) and lock washers (B). Slide shift shafts (F and E) forward into transmission housing to obtain necessary clearance to remove shift forks.

16. Remove shift fork (C).

17. Remove shift fork (D).

18. Install bushing (J) and cap screw (K) to aid in disassembly.

Continued on next page

AG,OUO1085,154 –19–17AUG00–3/4

19. Remove hydraulic oil filter assembly. (See Remove and Install Hydraulic Filter/Manifold—Early Model or Remove and Install Hydraulic Filter/Manifold—Later Model in Section 70, Group 05.)

20. Remove side cover or creeper assembly, if equipped. (See Remove and Install Creeper Assembly in Group 40.)

21. Remove lower cover or MFWD drop gearbox, if equipped. (See Remove and Install MFWD Drop Gearbox in Group 35.)

22. Position a jackstand under drawbar assembly.

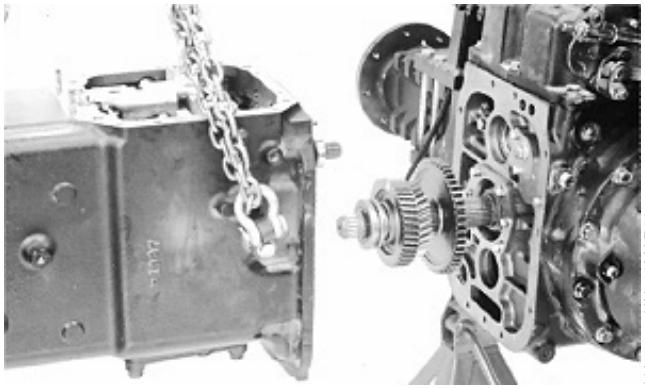
23. Attach hoist and chains to transmission housing.

IMPORTANT: Before separating the transmission from rear differential housing, rotate park pawl until it rests against the inside of transmission housing. If park pawl is not rotated, damage to gears may result when transmission is separated from the rear differential housing.

NOTE: Differential drive shaft and gear cluster assembly will stay with the differential during transmission removal.

24. Remove ten cap screws. Remove transmission.

25. Make repairs as necessary. (See Disassemble and Inspect Transmission in this group.)



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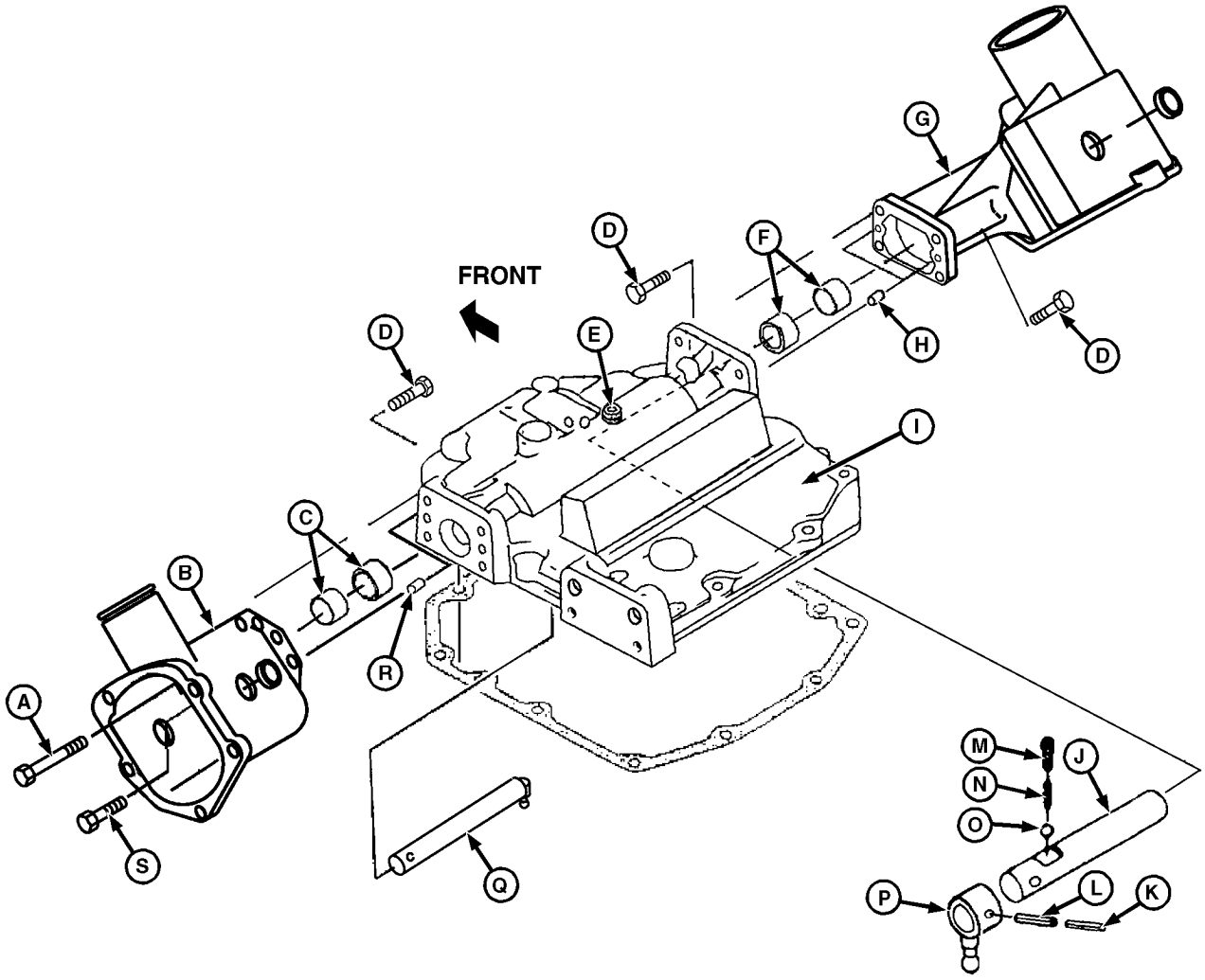
AG,OUO1085,154 –19–17AUG00–4/4

Disassemble and Inspect Transmission



A—Cap Screw
B—Range Shift Lever Housing
C—Bushing (2 used)
D—Cap Screw (6 used)
E—Plug
F—Bushing (2 used)
G—Gear Shift Lever Housing
H—Pin
I—Cover
J—Gear Shift Shaft
K—Spring Pin
L—Spring Pin
M—Spring
N—Spring
O—Ball
P—Gear Shift Arm
Q—Range Shift Arm
R—Pin
S—Cap Screw

1. Remove cap screws (A, D, and S).
2. Remove range shift lever housing (B) and gear shift lever housing (G).
3. Remove plug (E) and remove pins (K and L) through plug hole.
4. Remove gear shift arm (J), being careful not to lose detent ball (O) and springs (M and N).
5. Remove range shift arm (Q).
6. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

NOTE: Bushings (C and F) are a press fit in case (I) and housing (B and G). Remove bushings only if replacement is necessary.

7. Replace bushings (C and F) using a bushing, bearing, and seal driver set.

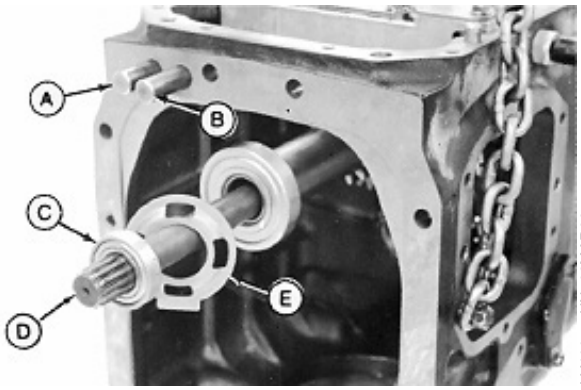
AG,OUO1023,510 –19–28JAN00–2/9

8. Remove range shift shafts (A and B).

9. Remove PTO shaft (D), washer (E), and bearing (C).

10. Inspect parts for wear or damage. Replace if necessary.

A—B and C Range Shift Shaft
B—A Range and Creeper Shift Shaft
C—Bearing
D—PTO Shaft
E—Washer



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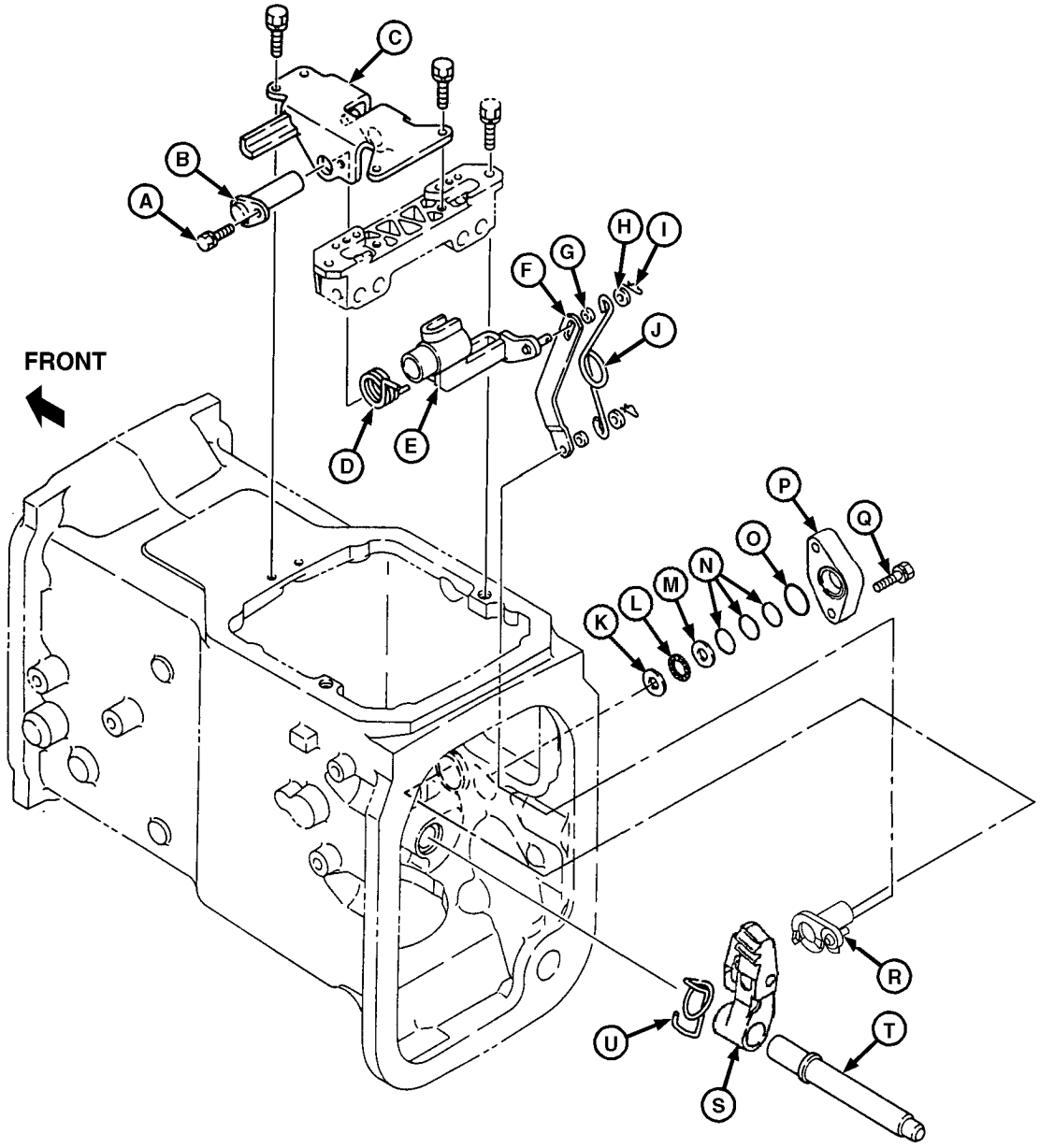
AG,OUO1023,510 –19–28JAN00–3/9



LV8126 –UN–13NOV02

Park Pawl Assembly

A—Cap Screw (5 used)
B—Shaft
C—Guide
D—Spring
E—Arm
F—Link
G—Bushing
H—Washer (2 used)
I—Spring Locking Pin (2 used)
J—Spring
K—Bearing Race
L—Thrust Bearing
M—Bearing Race
N—Shim (as required)
O—O-Ring
P—Cover Plate
Q—Cap Screw
R—Cam
S—Pawl
T—Shaft
U—Spring

11. Remove parts (A—U).

12. Inspect parts for wear or damage. Replace as necessary.

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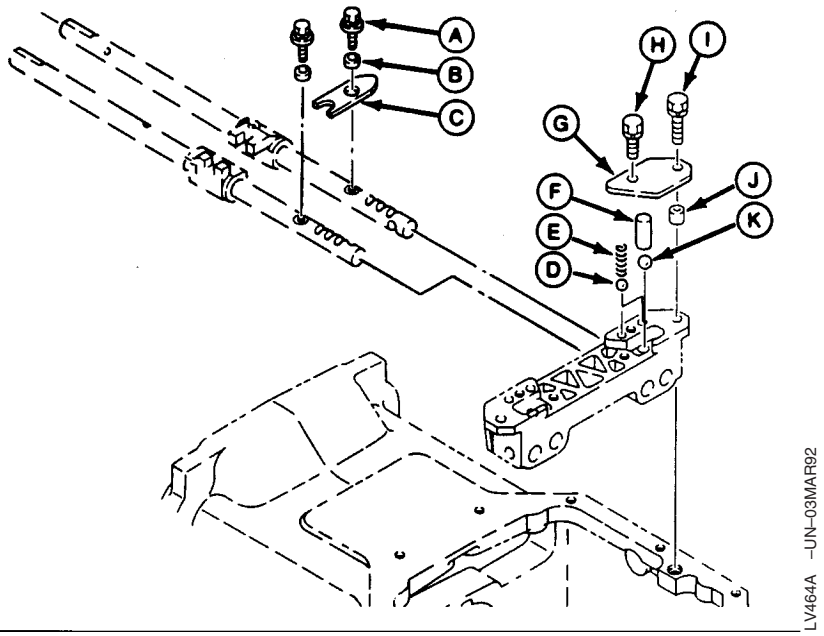

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A—Cap Screw (2 used)
B—Bushing (2 used)
C—Arm
D—Ball (2 used)
E—Spring (2 used)
F—Pin
G—Plate
H—Cap Screw
I—Cap Screw
J—Bushing
K—Ball

13. Remove parts (A—K).

NOTE: Reinstall bushing (J) and cap screw (I) to ease removal of gear shift/shaft assembly.

14. Install bushing (J) and cap screw (I).

15. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

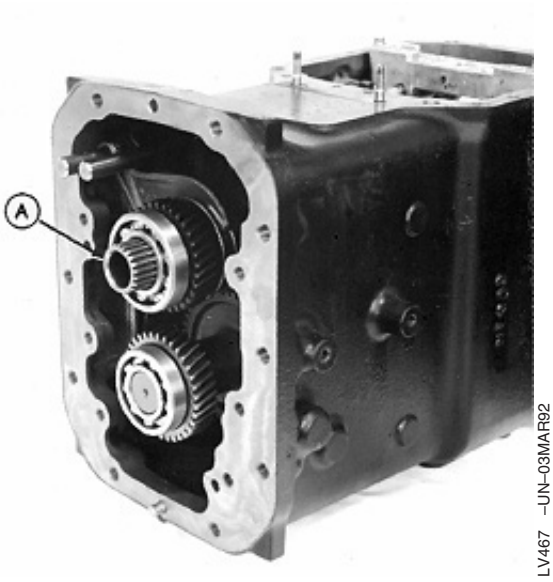
AG,OUO1023,510 –19–28JAN00–5/9

NOTE: To aid in removal, secure shifter shafts to transmission top shaft with wire.

16. Remove transmission top shaft (A) with reverse and 2nd gear shift shaft assembly (B) and 1st and 3rd gear shift shaft assembly (C).

17. Disassemble and inspect parts as necessary. (See Disassemble, Inspect, and Assemble Transmission Top Shaft—CollarShift Transmission or Disassemble, Inspect, and Assemble Transmission Top Shaft—SyncShuttle™ Transmission in this group.)

A—Transmission Top Shaft
B—Reverse and 2nd Gear Shift Shaft Assembly
C—1st and 3rd Gear Shift Shaft Assembly



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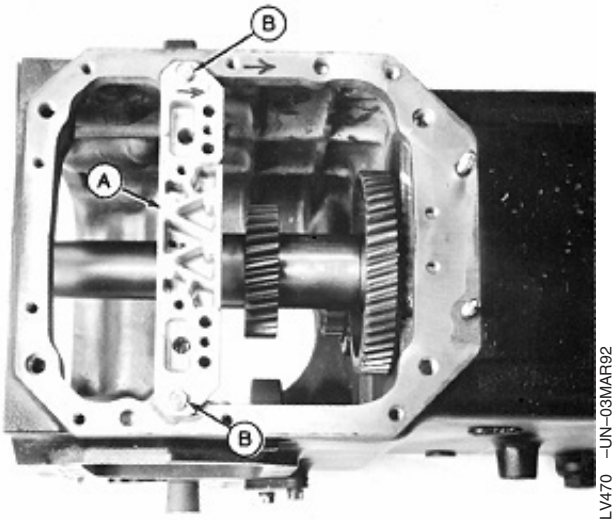
AG,OUO1023,510 –19–28JAN00–6/9

18. Mark support (A) and transmission case to aid in installation.

19. Remove cap screws and bushings (B), and support (A).

20. Inspect parts for wear or damage. Replace as necessary.

A—Support
B—Bushing



LV470 –UN–03MAR92

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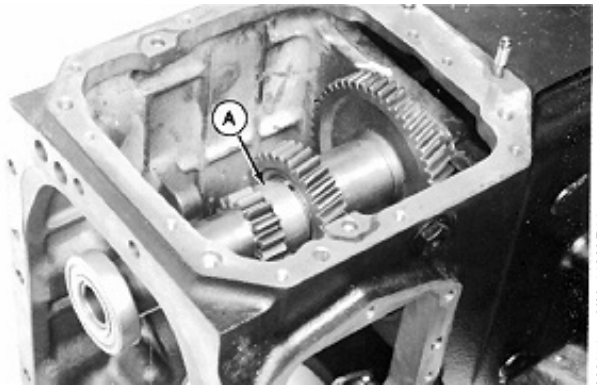
AG,OUO1023,510 –19–28JAN00–7/9

21. Remove range reduction shaft (A).

22. Disassemble and inspect parts as necessary. (See Disassemble, Inspect, and Assemble Range Reduction Shaft in this group.)

A—Range Reduction Shaft



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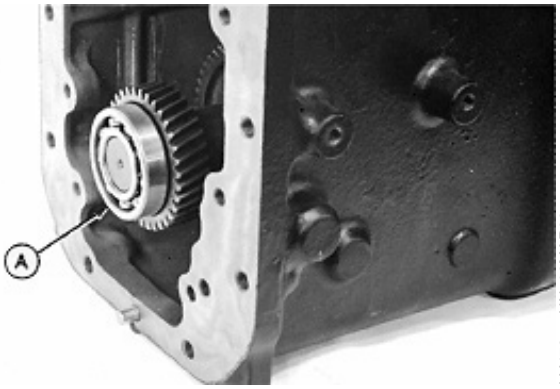
AG,OUO1023,510 –19–28JAN00–8/9

23. Remove driven shaft (A).

24. Disassemble and inspect parts as necessary. (See Disassemble, Inspect and Assemble Driven Shaft in this group.)

25. Inspect transmission case for cracks or damage. Replace if necessary.

A—Driven Shaft



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AG,OUO1023,510 –19–28JAN00–9/9

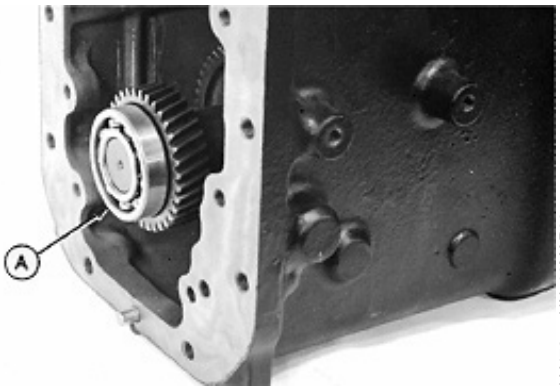
Assemble Transmission

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

IMPORTANT: Use new seals and O-rings during assembly. Damaged or used seals or O-rings will leak.

1. Install driven shaft (A). Tap on end of shaft with a soft-faced hammer to fully seat shaft in case bore.

A—Driven Shaft



LV473 –UN–03MAR92

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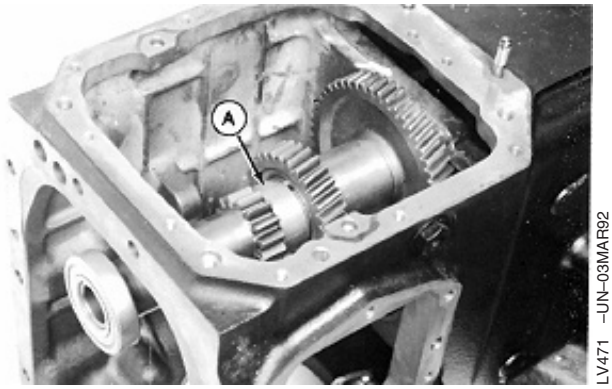
AG,OUO1085,155 –19–17AUG00–1/10

2. Install range reduction shaft (A).

A—Range Reduction Shaft



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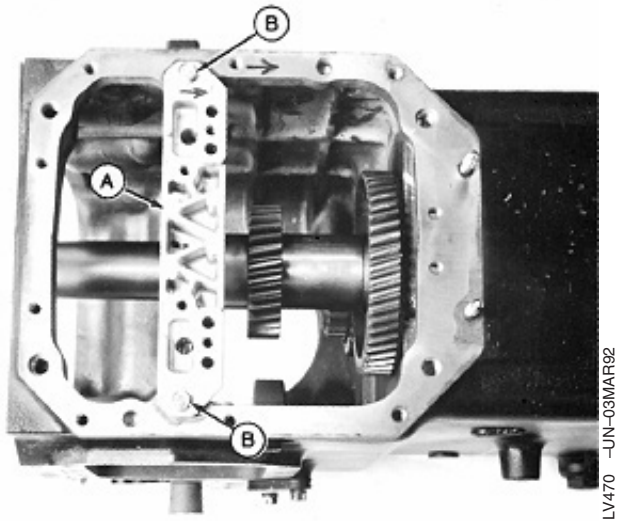
AG,OUO1085,155 –19–17AUG00–2/10

3. Align support (A) with transmission case with marks inside during disassembly.

4. Install bushings and cap screws (B).

A—Support
B—Cap Screw



LV470 –UN–03MAR92

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AG,OUO1085,155 –19–17AUG00–3/10

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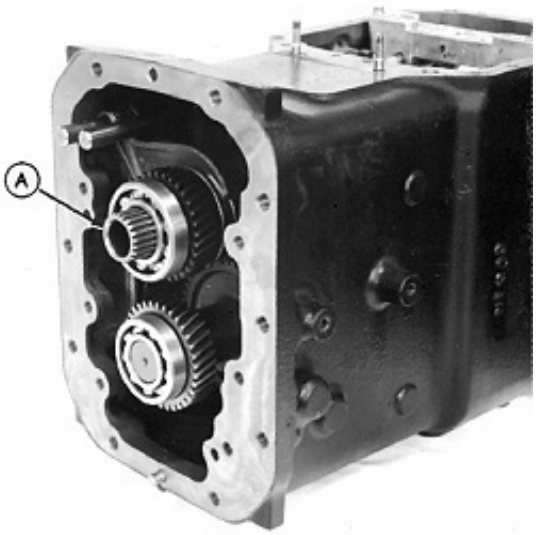
NOTE: To aid in installation, secure shifter shafts to transmission top shaft with wire.

5. Install transmission top shaft (A) with reverse and 2nd gear shaft assembly (B) and 1st and 3rd gear shaft assembly (C).

A—Transmission Top Shaft
B—Reverse and 2nd Gear Shift Shaft Assembly
C—1st and 3rd Gear Shift Shaft Assembly

LV468 –UN–03MAR92

CollarShift Shown



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AG,OUO1085,155 –19–17AUG00–4/10

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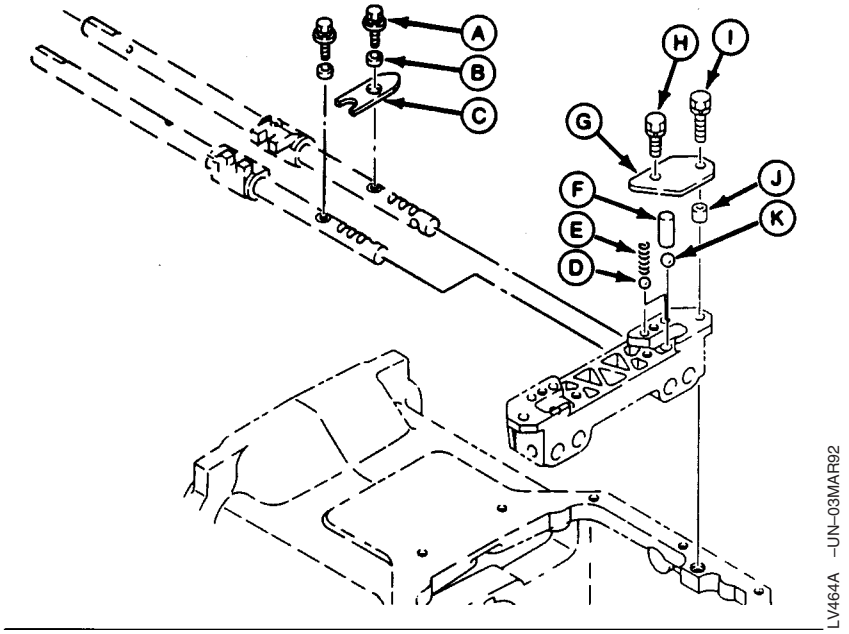


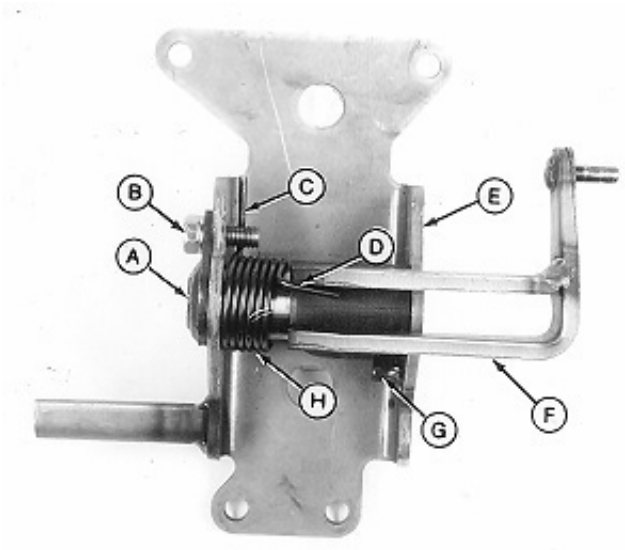
A—Cap Screw (2 used)
B—Bushing (2 used)
C—Arm
D—Ball (2 used)
E—Spring (2 used)
F—Pin
G—Plate
H—Cap Screw
I—Cap Screw
J—Bushing
K—Ball

6. Remove cap screw (I).
7. Install parts (A—H and K).
8. Install cap screw (I).

AG,OUO1085,155 –19–17AUG00–5/10

9. Assemble parts (A, B, E, F, and H). Spring tangs (C and D) and stop peg (G) should be positioned as shown.

A—Shaft
B—Cap Screw
C—Spring Tang
D—Spring Tang
E—Guide
F—Arm
G—Stop Peg
H—Spring



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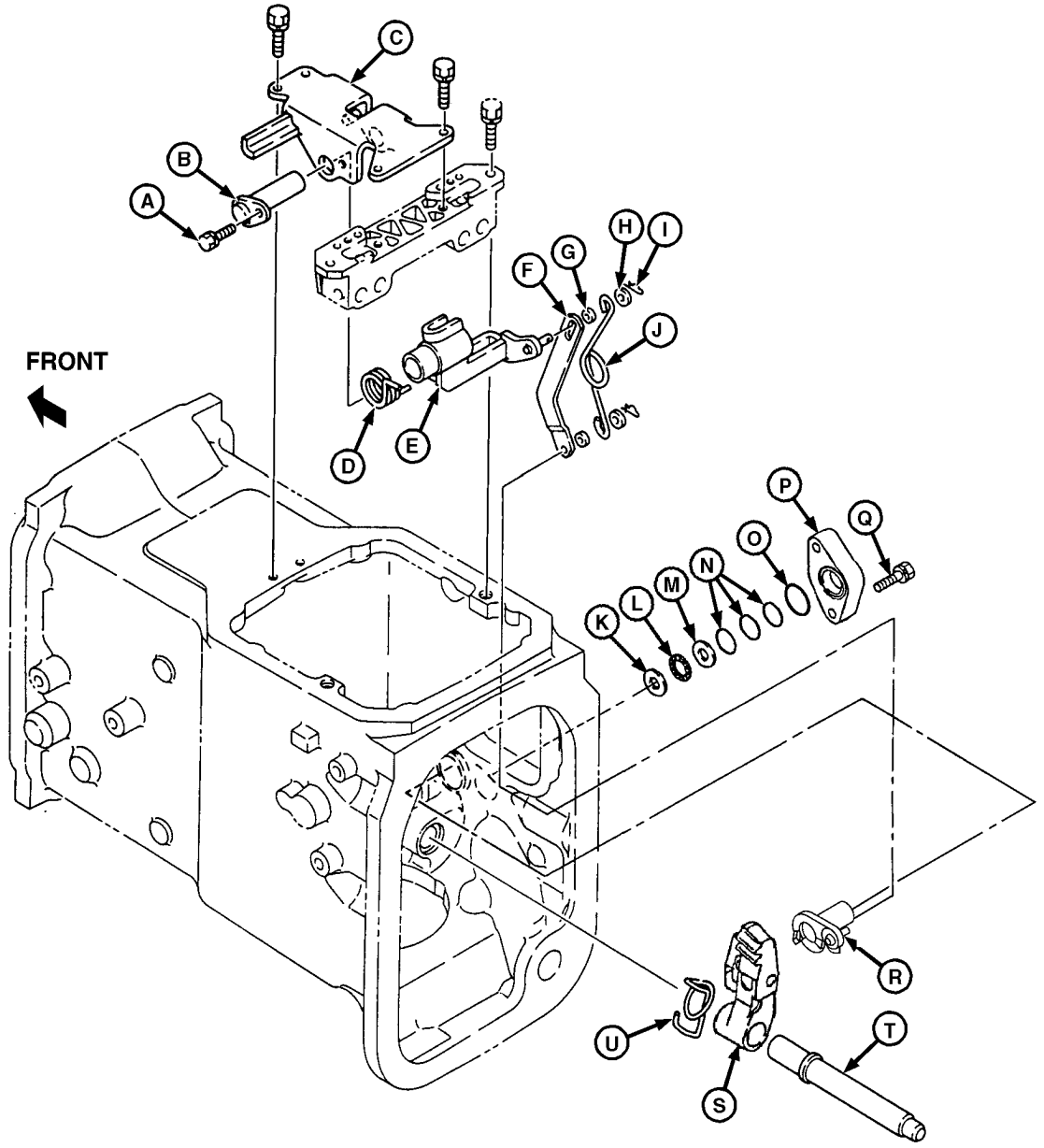

LV8126 –UN–13NOV02

Park Pawl Assembly

A—Cap Screw (5 used)	**G—Bushing**	**L—Thrust Bearing**	**Q—Cap Screw**
B—Shaft	**H—Washer (2 used)**	**M—Bearing Race**	**R—Cam**
C—Guide	**I—Spring Locking Pin (2 used)**	**N—Shim (as required)**	**S—Pawl**
D—Spring	**J—Spring**	**O—O-Ring**	**T—Shaft**
E—Arm	**K—Bearing Race**	**P—Cover Plate**	**U—Spring**
F—Link			

NOTE: Parts (K—Q) will be installed later.

10. Install parts (A—J) and (R—U).

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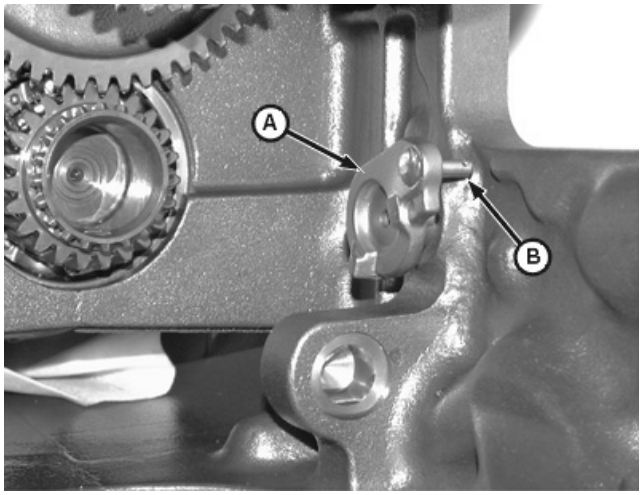
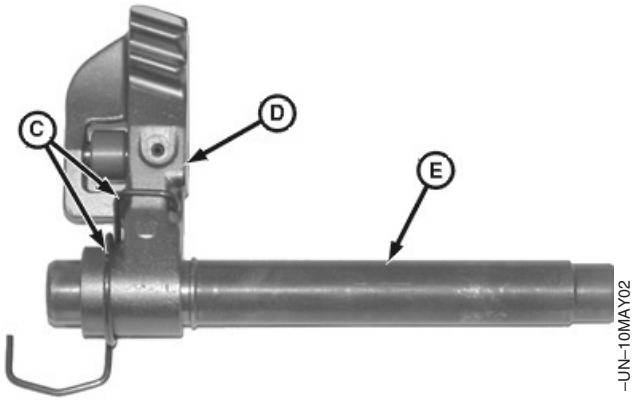


LV7921 –UN–10MAY02



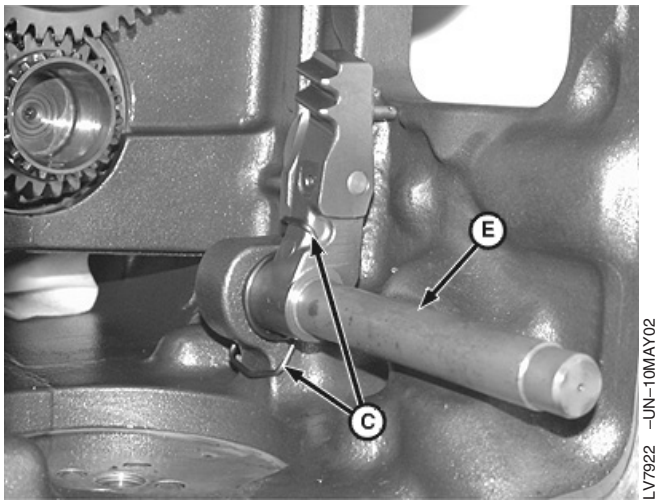
LV6636 –UN–10MAY02

11. Install park cam (A) into bore with pin (B) positioned as shown in photo.

12. Install park pawl (D) and spring (C) on park shaft (E).

13. Install park shaft (E) in shaft bore. Make sure spring (C) loops around and engages casting and park pawl as shown.

A—Park Cam
B—Pin
C—Spring
D—Park Pawl
E—Park Shaft



LV7922 –UN–10MAY02

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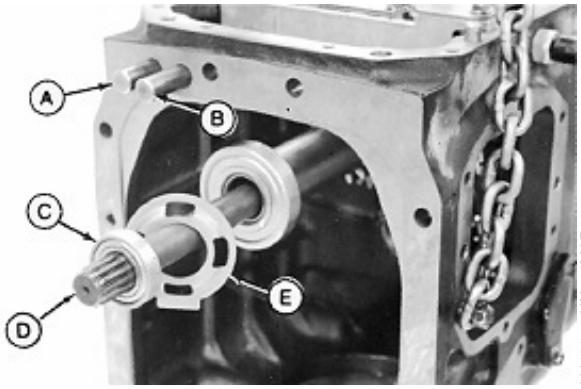
AG,OUO1085,155 –19–17AUG00–8/10

14. Install washer (E) and PTO shaft (D) with bearing (C).

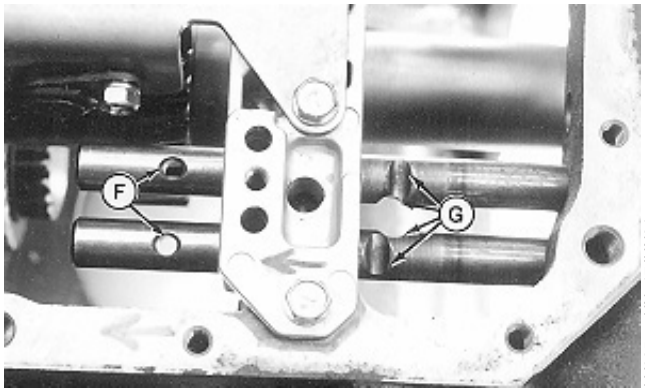
15. Apply Moly High Temperature EP Grease to splines on both ends of PTO shaft.

16. Install range shift shafts (A and B), with holes (F) and notches (G) positioned as shown.

A—B and C Range Shift Shaft
B—A Range and Creeper Shift Shaft
C—Beating
D—PTO Shaft
E—Washer
F—Shift Fork Hole
G—Detent Notch



LV466 –UN–03MAR92



LV625 –UN–17JUN94

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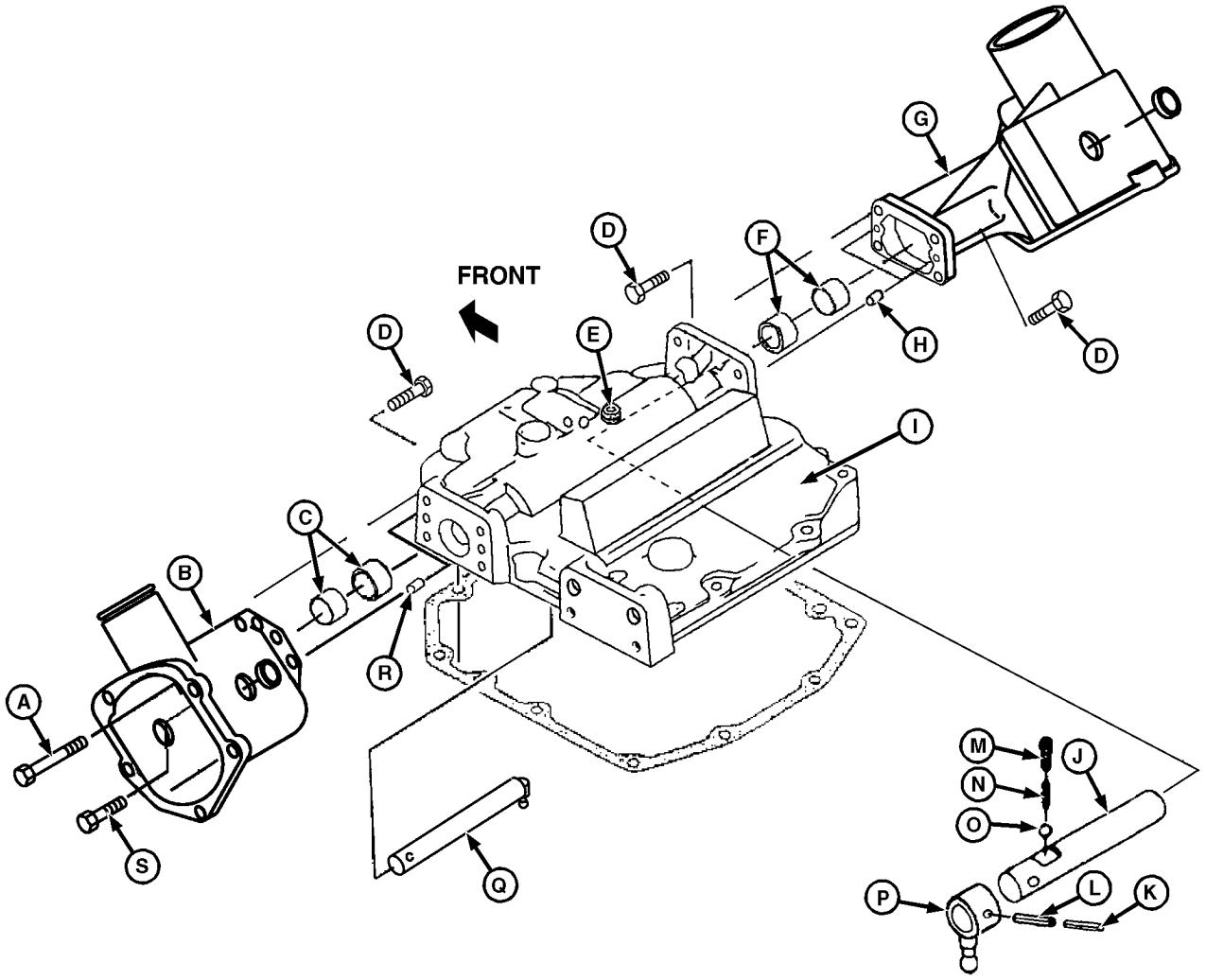
AG,OUO1085,155 –19–17AUG00–9/10



Top Cover

A—Cap Screw
B—Range Shift Lever Housing
C—Bushing (2 used)
D—Cap Screw (6 used)
E—Plug
F—Bushing (2 used)
G—Gear Shift Lever Housing
H—Pin
I—Cover
J—Gear Shift Shaft
K—Spring Pin
L—Spring Pin
M—Spring
N—Spring
O—Ball
P—Gear Shift Arm
Q—Range Shift Arm
R—Pin
S—Cap Screw

17. Install range shift arm (Q).

18. Install gear shift shaft (J) into cover (I). Use a punch through plug hole to depress detent ball (O) against springs (M and N). Slide shaft through, making sure detent ball stays under shaft.

19. Install pins (L and K) through shift arm (P) and into shaft (J).

20. Install plug (E) into cover (I).

21. Clean mating surfaces of cover (I) and lever housings (B and G).

22. Apply John Deere TY15130 or equivalent sealer to shift lever housings (B and G) and install housings to cover (I). Be sure that alignment pins (H and R) are in place.

AG,OUO1085,155 –19–17AUG00–10/10

Install Transmission

NOTE: Tractor without cab shown. Tractor with cab is similar.

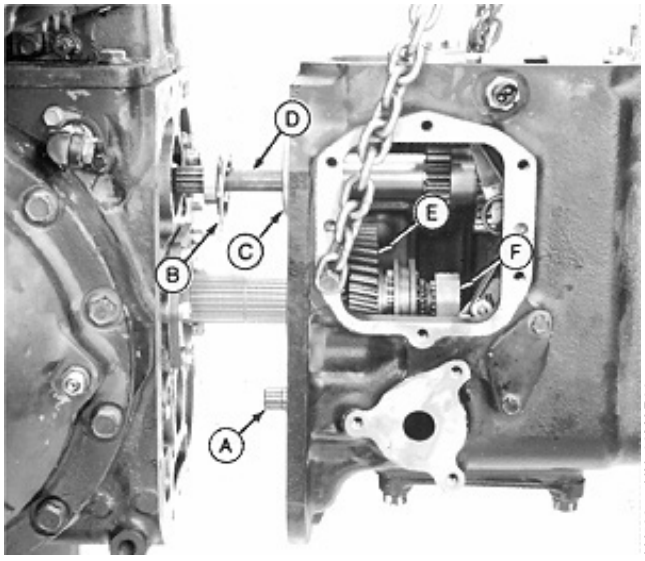
1. Clean mating surfaces of differential and transmission housings.
2. Install new gasket.
3. Position transmission approximately 127 mm (5 in.) from the differential case so bearing (C) is just past sliding gear (H).
4. Insert PTO shaft (D) into coupler (G).
5. Insert washer (B) into differential case.

NOTE: It may be necessary to rotate the transmission shafts during installation of transmission.

50 15 32

6. Install transmission. Ensure park pawl shaft (A) aligns with bore in differential case. Push park pawl (F) inward after clearing gear (E).

A—Park Pawl Shaft
B—Washer
C—Bearing
D—PTO Shaft
E—B Range Driven Gear
F—Park Pawl
G—PTO Shaft Coupler
H—A Range and Creeper Shift Sliding Gear



LV533 –UN–03MAR92

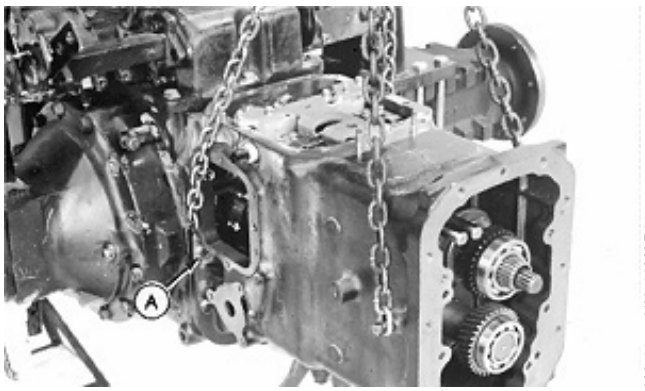
LV534 –UN–03MAR92

AG,OUO1085,156 –19–28JUN02–1/11

7. Install ten cap screws (A). Tighten to specification.

Specification

Transmission-to-Differential Case Cap Screws—Torque	140 N•m (105 lb-ft)



LV530 –UN–03MAR92

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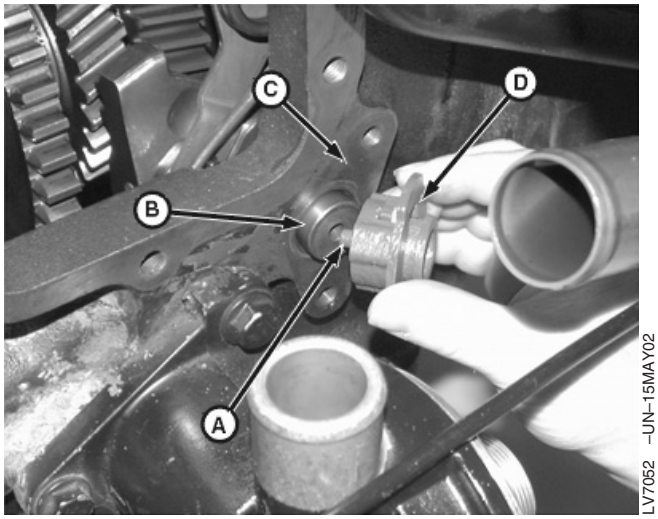
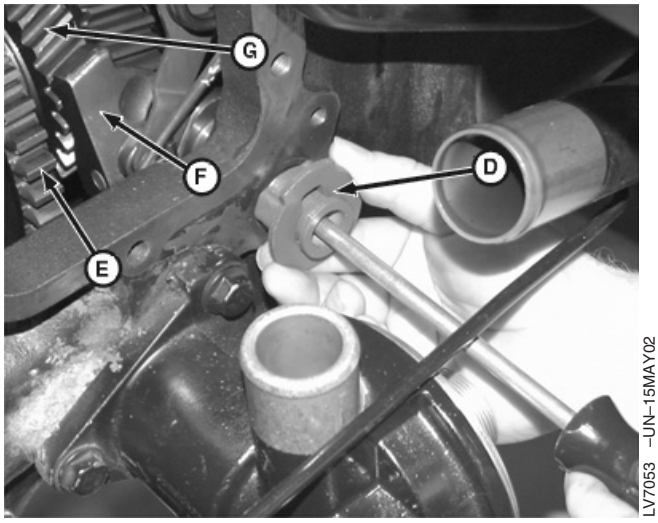
AG,OUO1085,156 –19–28JUN02–2/11



LV7052 –UN–15MAY02



LV7053 –UN–15MAY02

8. Position gear shift lever in park.

9. Make sure machined surface (C) is clean to achieve proper measurement.

10. Position shim gauge (D) over camshaft (B) with pin (A) inserted in center hole of camshaft.

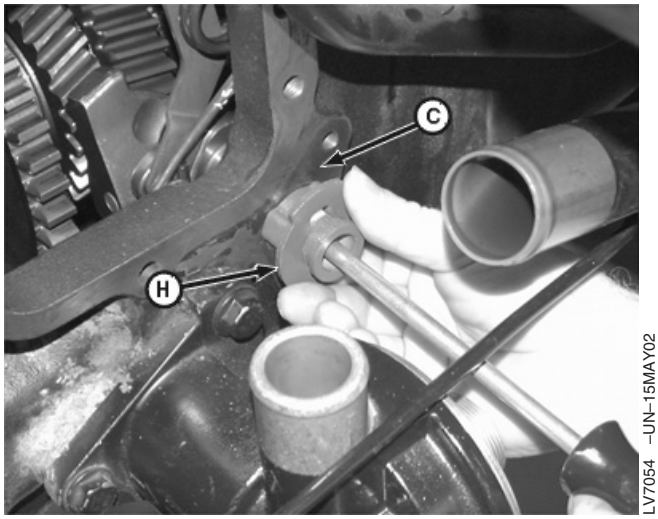
11. Hold shim gauge (D) in position and apply inward force in center of shim gauge, using a tool with a flat or blunt end, as shown in photo.

12. Make sure park pawl (F) is fully engaged in gear (G) by rotating the “A” range gear (E).

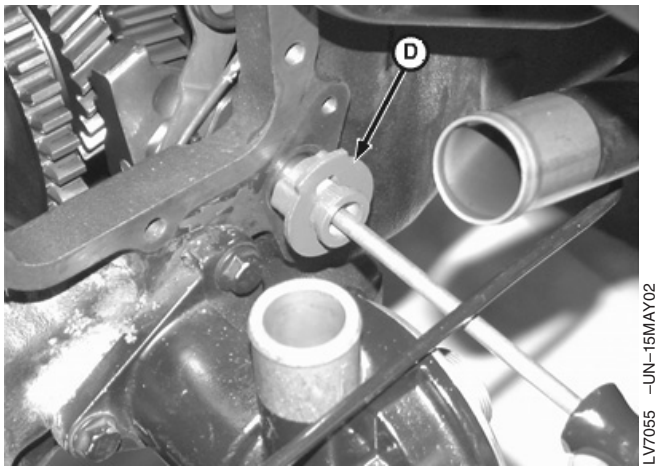
13. While applying inward force, slide outer collar (H) of shim gauge forward until seated against machined surface (C) of transmission housing.

14. Remove fingers from shim gauge (D). Slowly and evenly remove the inward force applied to center of shim gauge by the tool with flat or blunt end.

A—Pin
B—Camshaft
C—Machined Surface
D—Shim Gauge (RE188114)
E—A Range Gear
F—Park Pawl
G—Gear
H—Outer Collar



LV7054 –UN–15MAY02



LV7055 –UN–15MAY02

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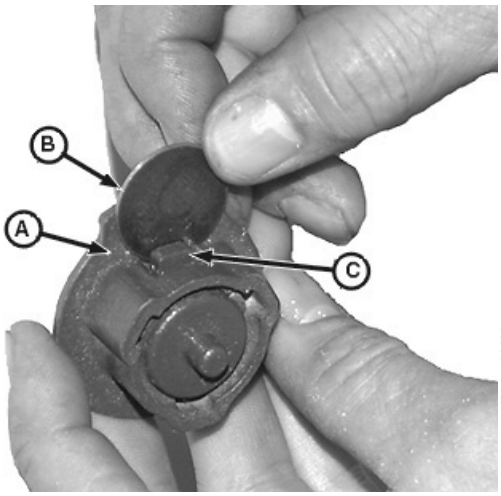
AG,OUO1085,156 –19–28JUN02–3/11

15. Carefully remove shim gauge from cam shaft. Make sure not to move the shim gauge during removal; this could affect the shim gauge setting.

AG,OUO1085,156 –19–28JUN02–4/11

16. Install shims (B) one at a time, as necessary, between tab (C) and collar flange (A) on shim gauge. Do not force shims in gauge. Retain shims for installation into park cam cover.

A—Collar Flange
B—Shims (as required)
C—Tab



LV7056 –UN–13MAY02

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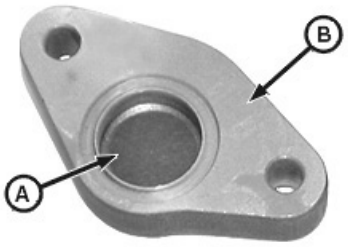
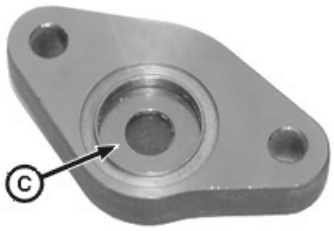
AG,OUO1085,156 –19–28JUN02–5/11



LV7002 –UN–15MAY02



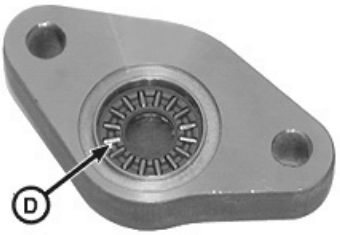
LV7003 –UN–15MAY02

17. Install shims (A) from shim gauge setting in park cam cover (B).
18. Install one thrust washer (C) on top of shims.
19. Apply multi-purpose grease to both sides of needle bearing (D).
20. Install needle bearing (D) on top of thrust washer.
21. Install remaining thrust washer (C) on top of bearing.

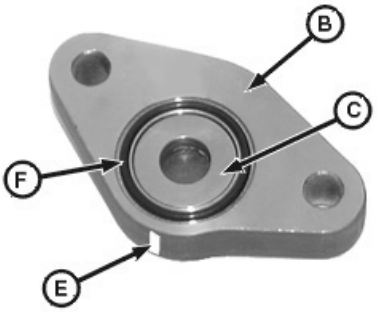
IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

22. Apply multi-purpose grease to O-ring groove.
23. Install O-ring (F) in park cam cover (B).
24. Place a mark (E) on side edge of cover (B) closest to O-ring as, shown in photo, to aid during installation.
25. Position gear shift lever in neutral.
26. Install park cam cover (B) with mark (E) made earlier facing rear of tractor. Make sure O-ring stays in position during installation.

A—Shim (as required)
B—Park Cam Cover
C—Thrust Washer (2 used)
D—Needle Bearing
E—Mark
F—O-Ring
G—Cap Screw (2 used)



LV7004 –UN–15MAY02



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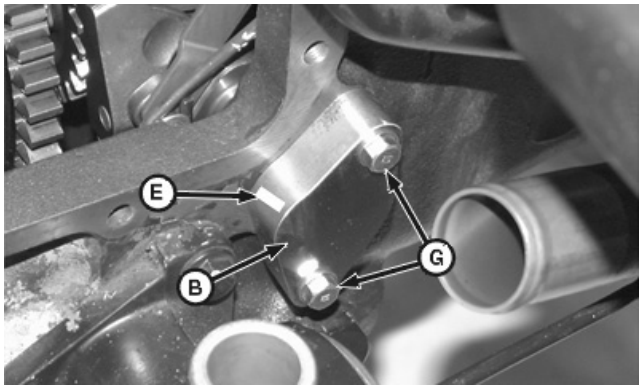

LV7057 –UN–15MAY02

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27. Install cap screws (G). Tighten cap screws to specification.

Specification	
Park Cam Cover Cap Screws— Torque	27 N•m (20 lb-ft)

28. Install MFWD drop gearbox, if equipped. (See Remove and Install MFWD Drop Gearbox in Group 35.)

29. Install side cover, or, if equipped, the creeper assembly. (See Remove and Install Creeper Assembly in Group 40.)

30. Install hydraulic oil filter assembly. See Remove and Install Hydraulic Filter/Manifold—Early Model or Remove and Install Hydraulic Filter/Manifold—Later Model in Section 70, Group 05.)

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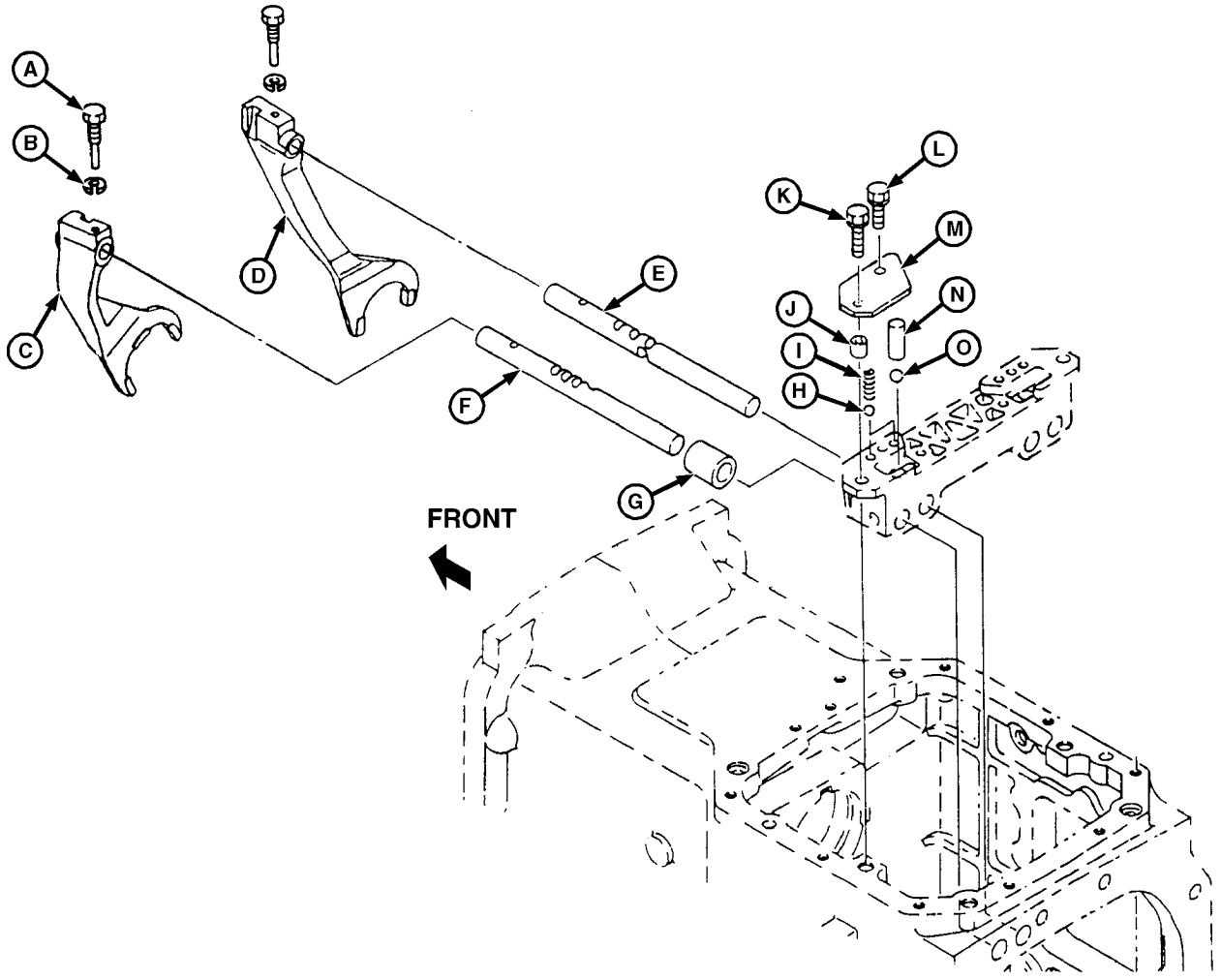

Range Shift Shaft Assembly

A—Cap Screw (2 used)
B—Lock Washer (2 used)
C—B and C Range Shift Fork
D—A Range and Creeper Shift Fork
E—A Range and Creeper Shift Shaft
F—B and C Range Shift Shaft
G—Sleeve
H—Ball (2 used)
I—Spring (2 used)
J—Bushing
K—Cap Screw
L—Cap Screw
M—Plate
N—Pin
O—Ball

31. Remove cap screw (K), if installed.
32. Install shift fork (D).
33. Install sleeve (G) and shift fork (C).
34. Slide shift shafts (F and E) into position.
35. Clean cap screws (A) with Clean and Cure Primer. Apply thread lock and sealer (medium strength) to threads of cap screws. Install lock washers (B) and cap screws (A).
36. Install parts (H—O).

Continued on next page

AG,OUO1085,156 –19–28JUN02–8/11

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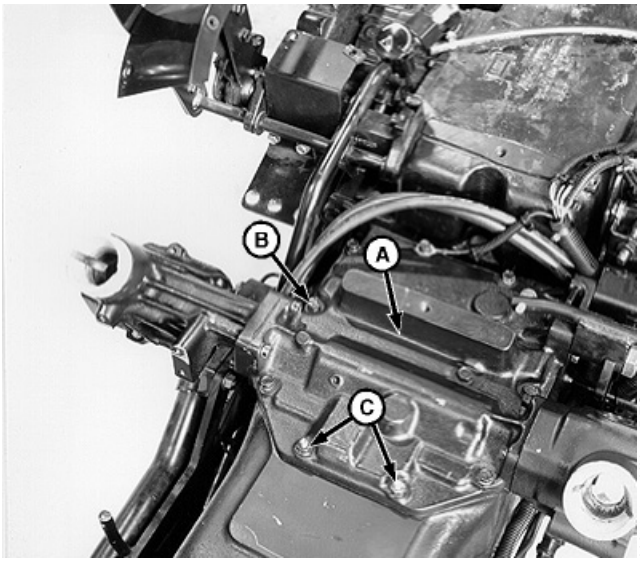
37. Install cover and shifter housings (A). Install eight cap screws (B) and nuts (C).

38. Install gear shift and range shift levers in housings. (See Inspect and Repair Gear Shift Lever and Inspect and Repair Range Shift Lever in his group.)

A—Shifter Housing
B—Cap Screw (8 used)
C—Nut (8 used)



LV2452 –UN–19DEC97

AG,OUO1085,156 –19–28JUN02–9/11

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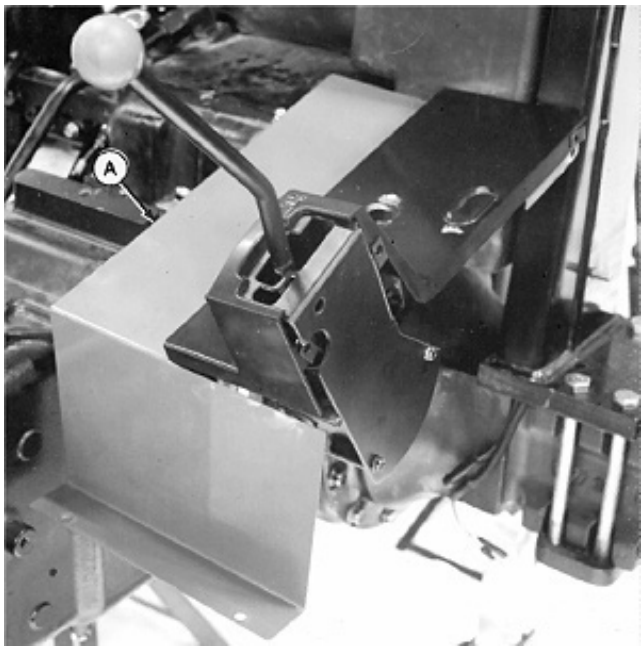
39. Tractors without cab: install left control console (A).

40. Install PTO lever and linkage. (See Remove, Inspect and Install Rear PTO Lever and Linkage in Group 20.)

41. Install MFWD lever and linkage, if equipped. (See Inspect and Repair MFWD Lever and Linkage in Group 35.)

A—Left Control Console



LV528 –UN–03MAR92

Left Side Shown

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AG,OUO1085,156 –19–28JUN02–10/11

42. Install right brake line.

43. Tractors with cab: install left and right control consoles and support plate. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)

44. Install SCV joystick and cable assembly if equipped. (See Inspect and Repair Joystick and Linkage—Without Cab or Inspect and Repair Joystick and Linkage—With Cab in Section 70, Group 15.)

45. Tractors without cab: install right control console. (See Remove and Install Right-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)

46. Install rockshaft control lever (A).

47. Install cab if equipped. (See Cab Remove and Install in Section 90, Group 15.)

48. Install fenders and rear wheels.

49. Install clutch housing to transmission. (See Install Clutch Housing to Transmission in this group.)

LV526 –UN–03MAR92

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AG,OUO1085,156 –19–28JUN02–11/11

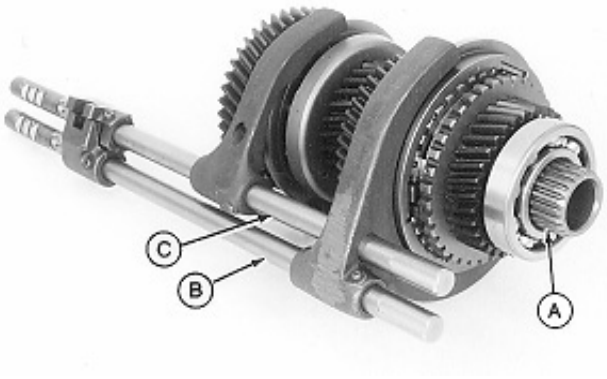
Disassemble, Inspect and Assemble Gear Shift Shaft Assemblies

1. Remove shift shaft assemblies (B and C) from transmission top shaft (A).

A—Transmission Top Shaft
B—Shift Shaft Assembly
C—Shift Shaft Assembly

LV468 –UN–03MAR92

CollarShift



LV626 –UN–17JUN94

SyncShuttle™

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AG,OUO1085,158 –19–18AUG00–1/2

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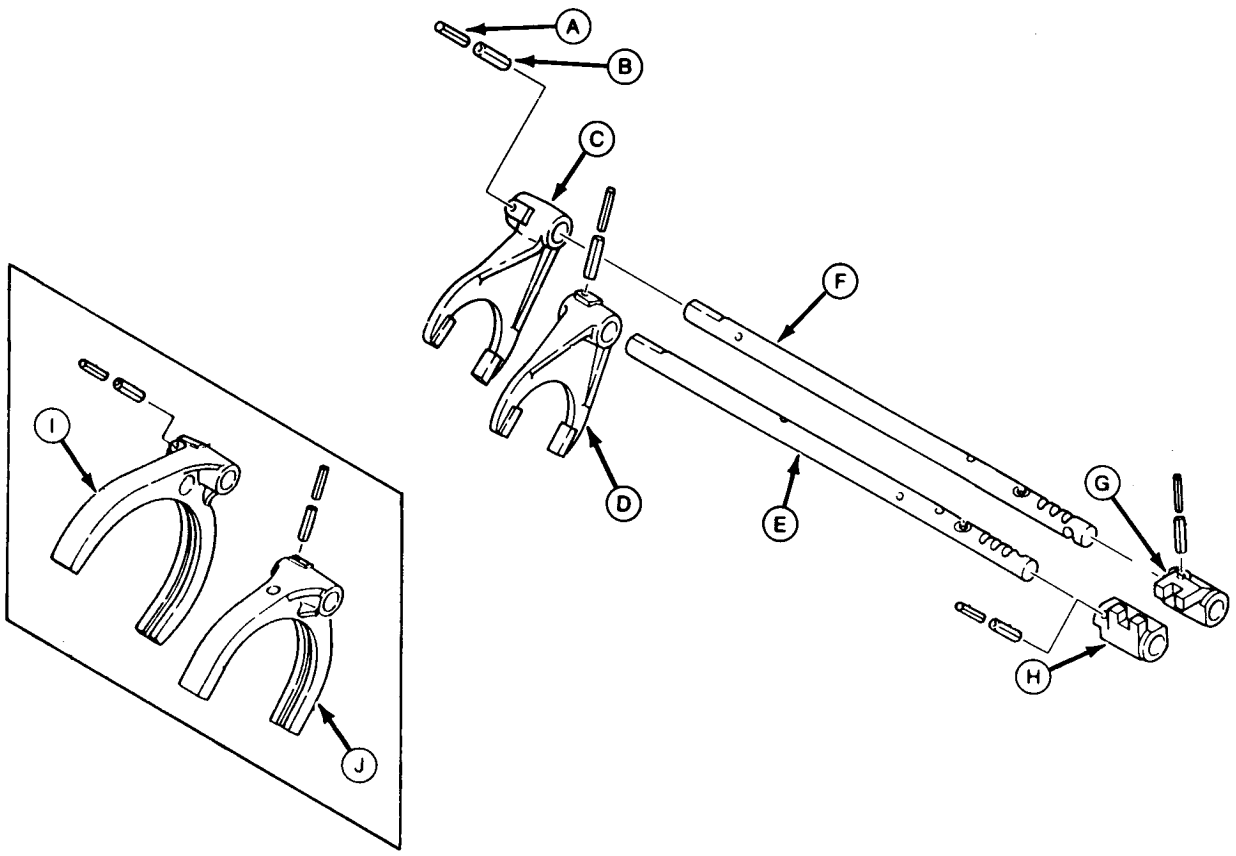

LV469A –UN–17JUN94

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A—Small Spring Pin (4 used)
B—Large Spring Pin (4 used)
C—Reverse and 2nd Gear Shift Fork (CollarShift)
D—1st and 3rd Gear Shift Fork (CollarShift)
E—1st and 3rd Gear Shift Shaft
F—Reverse and 2nd Gear Shift Shaft
G—Reverse and 2nd Gear Shift Yoke
H—1st and 3rd Gear Shift Yoke
I—Reverse and 2nd Gear Shift Fork SyncShuttle™ (SS)
J—1st and 3rd Gear Shift Fork SyncShuttle™ (SS)

NOTE: The SyncShuttle™ transmission is equipped with forks (I and J) in place of forks (C and D).

2. Mark position and location of yokes (G and H) and forks (C and D) or (I and J) on shafts to aid in assembly.

3. Drive out spring pins (A and B).

4. Disassemble parts.

5. Inspect parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

IMPORTANT: Install pins (A) inside pins (B) with splits facing 180° from each other.

6. Assemble all parts.

7. Install shift shaft assemblies to transmission top shaft.

AG,OUO1085,158 –19–18AUG00–2/2

Disassemble, Inspect, and Assemble Transmission Top Shaft—CollarShift Transmission

1. Remove reverse and 2nd gear shift shaft assembly (B) and 1st and 3rd gear shift shaft assembly (C) from transmission top shaft (A).

A—Transmission Top Shaft
B—Reverse and 2nd Gear Shift Shaft Assembly
C—1st and 3rd Gear Shift Shaft Assembly

LV468 –UN–03MAR92

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AG,OUO1085,159 –19–18AUG00–1/3

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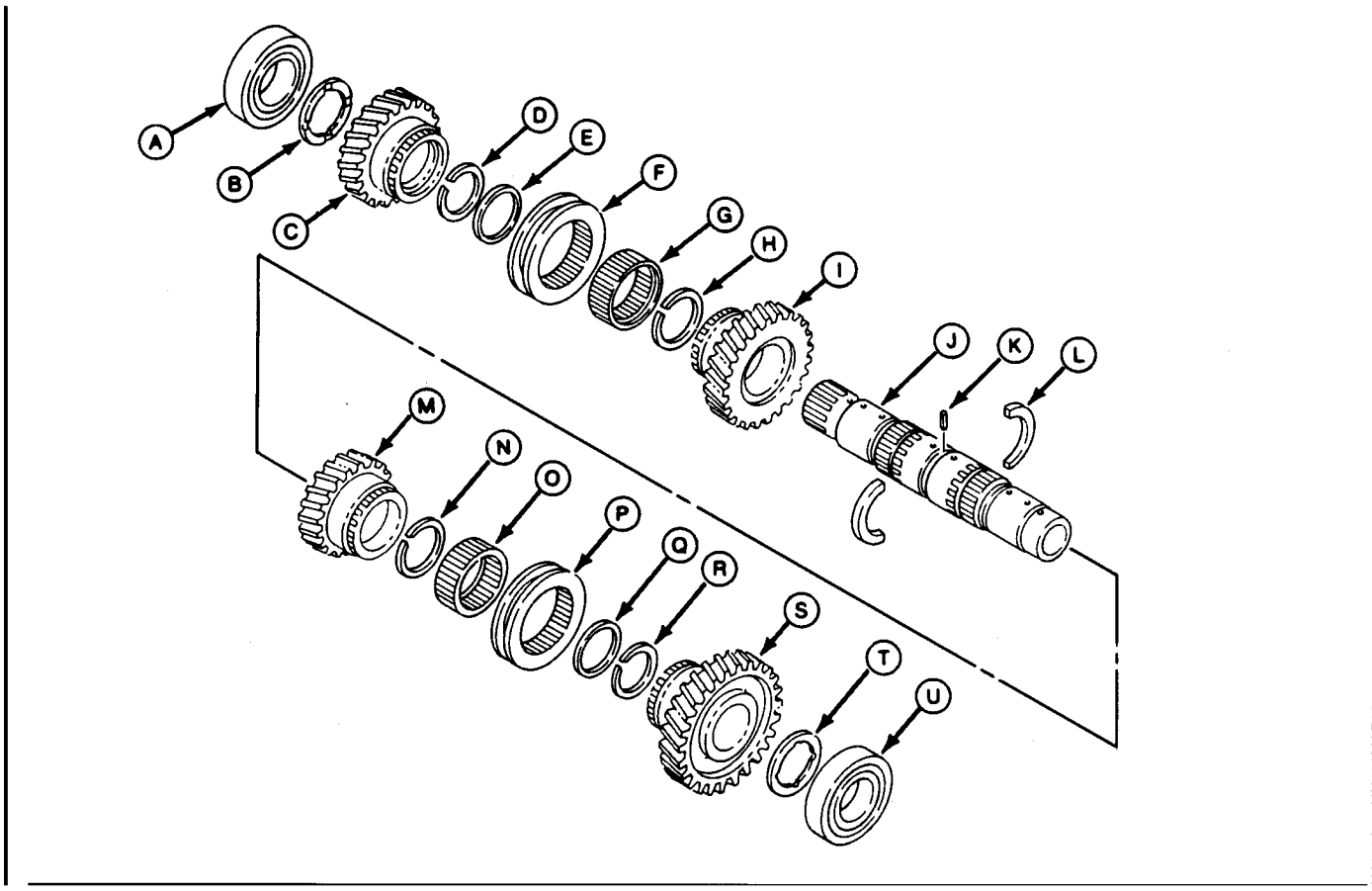

LV476A –UN–03MAR92

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A—Bearing
B—Washer
C—Reverse Drive Gear
D—Snap Ring
E—Washer
F—Reverse and 2nd Gear Shift Collar
G—Collar
H—Snap Ring
I—2nd Speed Drive Gear
J—Transmission Top Shaft
K—Spring Pin
L—Spacer (2 used)
M—1st Speed Drive Gear
N—Snap Ring
O—Collar
P—1st and 3rd Gear Shift Collar
Q—Washer
R—Snap Ring
S—3rd Speed Drive Gear
T—Washer
U—Bearing

NOTE: Bearings (A and U) are press fit on shaft (J).

2. Remove bearing (A) using a knife-edged puller and a press.

Continued on next page

AG,OUO1085,159 –19–18AUG00–2/3

3. Remove parts (B—I).
4. Remove bearing (U) using a knife-edged puller and a press.
5. Remove parts (K—T).
6. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

7. Apply Moly High Temperature EP Grease to ID of gears (C, I, M, and S).

IMPORTANT: Install washers (B and T) with grooves toward gears.

8. Install all parts.

   Install bearings (U and A) using a bearing, bushing, and seal driver set and a press.

9. Install shift shaft assemblies to transmission top shaft.

LV475 –UN–03MAR92

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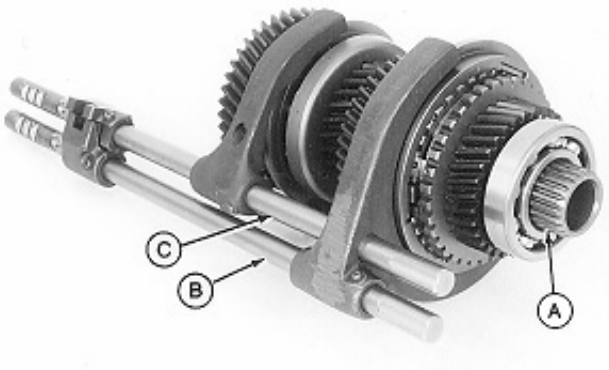
AG,OUO1085,159 –19–18AUG00–3/3

Disassemble, Inspect, and Assemble Transmission Top Shaft—SyncShuttle™ Transmission

1. Remove reverse and 2nd gear shift shaft assembly (B) and 1st and 3rd gear shift shaft assembly (C) from transmission top shaft (A).

A—Transmission Top Shaft
B—Reverse and 2nd Gear Shift Shaft Assembly
C—1st and 3rd Gear Shift Shaft Assembly



LV626 –UN–17JUN94

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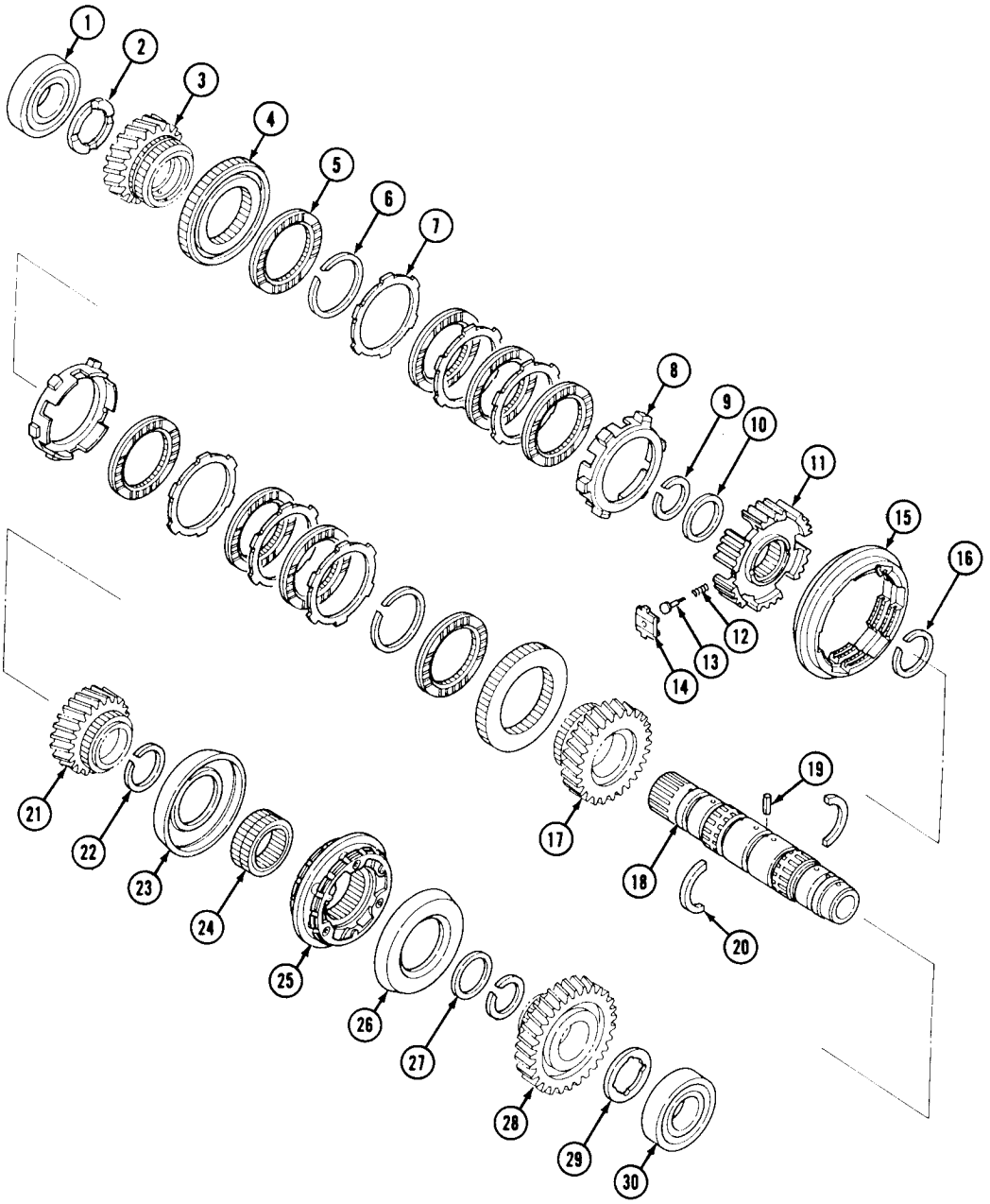
AG,OUO1085,160 –19–28JUN02–1/4



LV628A –UN–22NOV94

1—Front Bearing (Non-Sealed)
2—Grooved Washer
3—Reverse Drive Gear
4—Splined Coupler (2 used)
5—Disk (8 used)
6—Snap Ring (2 used)
7—Separator Plate (6 used)
8—Drum (2 used)
9—Snap Ring
10—Washer
11—Hub
12—Spring (3 used)
13—Detent (3 used)
14—Insert (3 used)
15—Shift Collar
16—Snap Ring (2 used)
17—2nd Speed Drive Gear
18—Transmission Top Shaft
19—Spring Pin
20—Spacer (2 used)
21—1st Speed Drive Gear
22—Snap Ring
23—Outer Stop Ring (2 used)
24—Splined Coupler
25—Stop Ring and Pin Assembly
26—Washer
27—Snap Ring
28—3rd Speed Drive Gear
29—Grooved Washer
30—Rear Bearing (Sealed)

Continued on next page

AG,OUO1085,160 –19–28JUN02–2/4

NOTE: Bearings (1 and 30) are press fit on shaft (18). Use a knife-edged puller and a press to remove bearings.

To aid in assembly, keep parts together and in proper sequence as the gear cluster is disassembled.

2. Remove parts (1—30).

AG,OUO1085,160 –19–28JUN02–3/4

3. Inspect all parts for wear or damage. Replace as necessary.

IMPORTANT: Washers (2 and 29) must be installed with grooves toward adjacent gears.

Lubricate all parts with clean transmission/hydraulic oil during assembly.

LV627 –UN–17JUN94

4. Install all parts using the following instructions:

- Insert spring pin (19) into shaft (18) until a maximum of 5 mm (0.20 in.) extends from shaft surface. Install spring pin with the slit facing 90° away from (perpendicular to) the length of the shaft.
- Apply Moly High Temperature EP Grease to ID of gears (3, 17, 21, and 28).
- Install the two splined couplers (4) with the smooth side toward gears (3 and 17).
- Install splined coupler (24) with grooved side toward gear (21).
- Install washer (2) with grooved side toward gear (3).
- Install washer (29) with grooved side toward gear (28).

NOTE: Ensure that sealed bearing is installed to the rear and non-sealed bearing is installed at the front.

- Install bearings (1 and 30) using a press.

5. Install shift shaft assemblies to the transmission top shaft.

AG,OUO1085,160 –19–28JUN02–4/4

Disassemble, Inspect, and Assemble Range Reduction Shaft

NOTE: Bearings (A and G) are press fit on shaft.

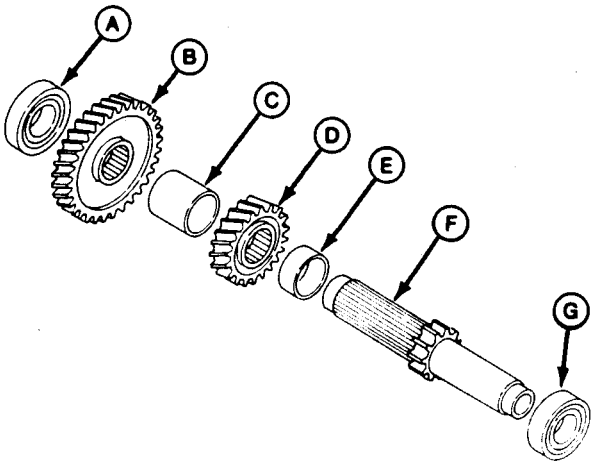
1. Remove bearings (A and G) using a knife-edged puller and a press.
2. Remove all parts.
3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Install all parts.

   Install bearings (A and G) using a bearing, bushing, and seal driver set and a press.

A—Bearing
B—Range Reduction Drive Gear
C—Collar
D—B Range Drive Gear
E—Collar
F—Range Reduction Shaft
G—Bearing



LV478A –UN–03MAR92

LV477 –UN–03MAR92

AG,OUO1085,161 –19–18AUG00–1/1

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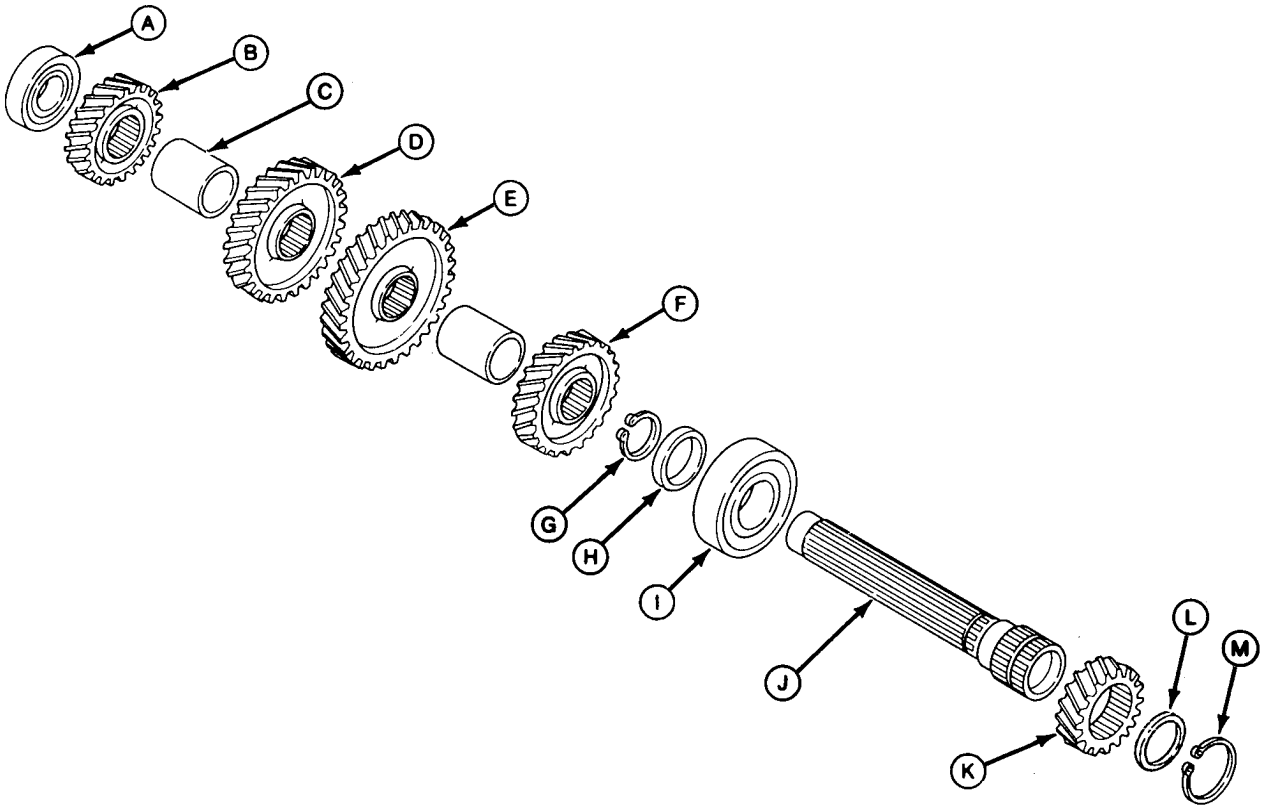
Disassemble, Inspect and Assemble Driven Shaft



LV482A –UN–18APR96

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48

NOTE: Bearings (A and I) are press fit on shaft (J).

1. Remove bearing (A) using a knife-edged puller and a press.
2. Remove parts (B—H).
3. Remove parts (L, M, and K).

LV481 –UN–03MAR92

A—Bearing
B—Reverse Driven Gear
C—Collar (2 used)
D—2nd Speed Driven Gear
E—1st Speed Driven Gear
F—3rd Speed Driven Gear
G—Snap Ring
H—Spacer
I—Bearing
J—Driven Shaft
K—C Range Driven Gear
L—Washer
M—Snap Ring

Continued on next page

4. Remove bearing (I) using a knife-edged puller and a press.

5. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

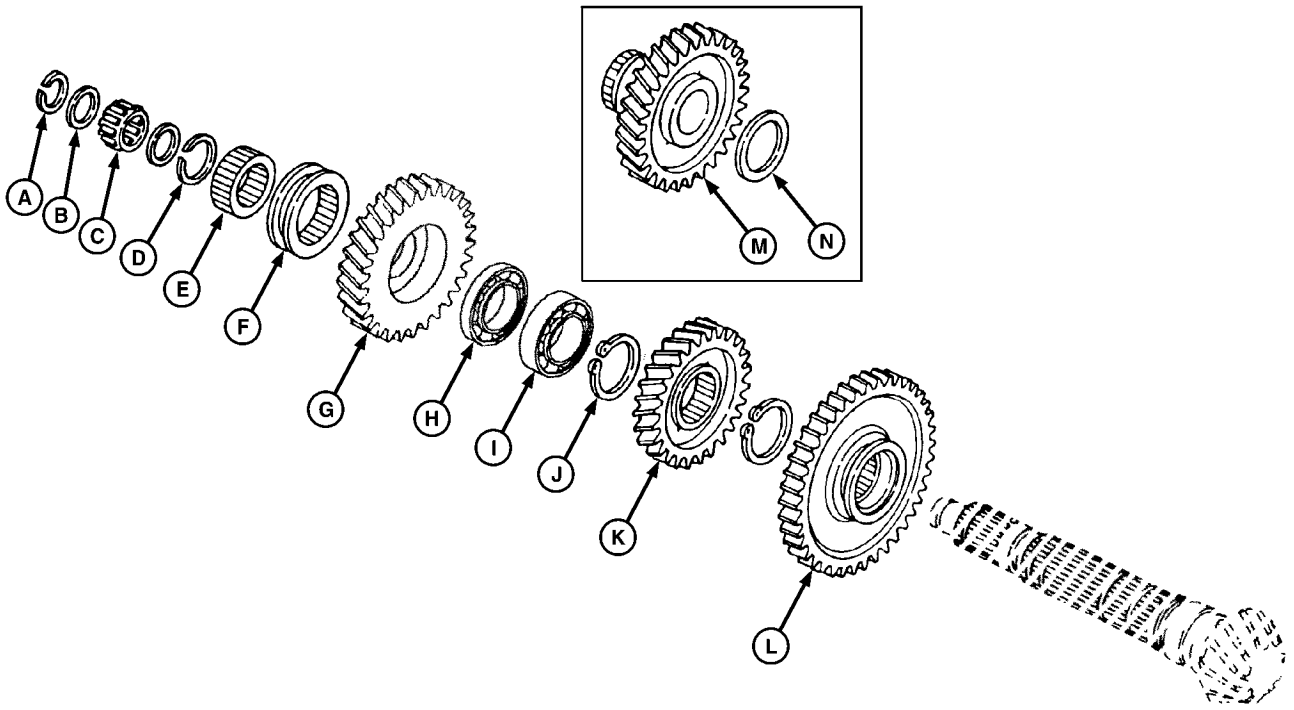
6. Install bearing (I) using a piece of pipe and a press.

7. Install all parts.

   Install bearing (A) using a bearing, bushing, and seal driver set and a press.

AG,OUO1085,162 –19–18AUG00–2/2

Remove, Inspect, and Install MFWD and Range Gears



LV480A –UN–09MAY02

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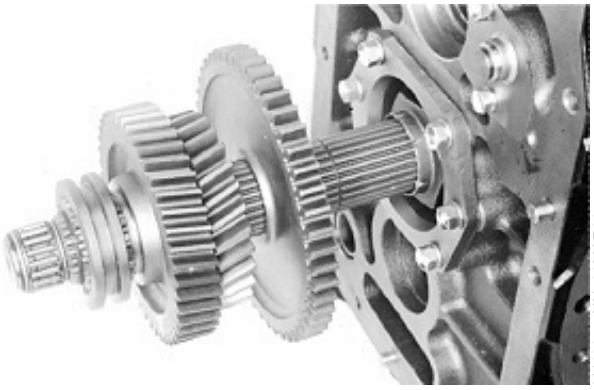
NOTE: If it is necessary to remove the entire shaft, see Remove and Inspect Differential Drive Shaft in Group 25.

1. Remove transmission. (See Remove Transmission in this group.)
2. Remove parts (A—N).
3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Apply Moly High Temperature EP Grease to ID of gear (G).
5. Install all parts.
6. Install transmission.



LV498 –UN–03MAR92

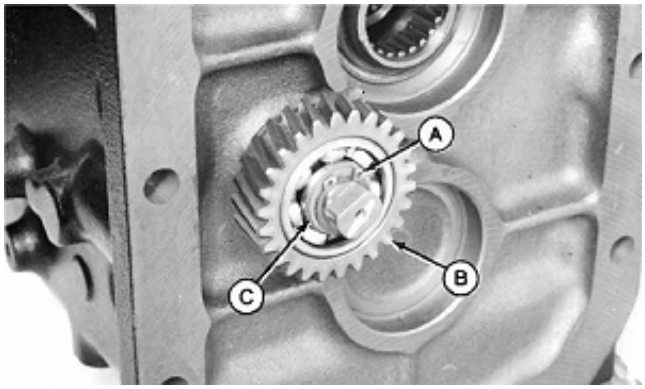
A—Snap Ring
B—Washer (2 used)
C—Bearing
D—Snap Ring
E—Collar
F—B and C Range Shift Collar
G—B Range Driven Gear (Later Models)
H—Bearing (Later Models)
I—Bearing (Later Models)
J—Snap Ring (2 used)
K—MFWD Gear
L—A Range and Creeper Shift Sliding Gear
M—B Range Driven Gear (Early Models)
N—Washer (Early Models)

AG,OUO1085,163 –19–28JUN02–1/1

Remove, Inspect, and Install Reverse Idler Shaft

NOTE: Reverse idler shaft is mounted to rear of clutch housing.

1. Separate clutch housing from transmission. (See Separate Clutch Housing from Transmission in this group.)
2. Remove snap ring (A) and washer (C).
3. Remove reverse idler gear assembly (B).



LV486 –UN–03MAR92

A—Snap Ring
B—Reverse Idler Gear Assembly
C—Washer

AG,OUO1085,164 –19–28JUN02–1/2

4. Remove threaded shaft (A).

NOTE: Bearings (B and F) are press fit in gear (D).

5. Remove bearings (B and F) using a bearing, bushing, and seal driver set and a press.
6. Inspect all parts for wear or damage. Replace as necessary.

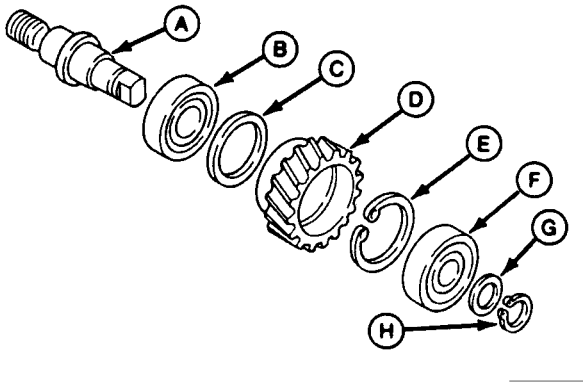
NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

7. Assembly parts (B—F). Install bearings using a bearing, bushing, and seal driver set and a press.
8. Apply thread lock and sealer (medium strength) to threads of shaft (A).
9. Install shaft and tighten to specification.

Specification

Reverse Idler Shaft—Torque..... 132 N•m (97 lb-ft)

10. Install idler gear assembly, washer (G), and snap ring (H).
11. Install clutch housing to transmission. (See Install Clutch Housing to Transmission in this group.)



LV487A –UN–03MAR92

A—Reverse Idler Shaft
B—Bearing
C—Spacer
D—Reverse Idler Gear
E—Snap Ring
F—Bearing
G—Washer
H—Snap Ring

AG,OUO1085,164 –19–28JUN02–2/2

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

OUO1043,0000EA8 –19–28JUN02–1/2

Flywheel Turning Tool JDE83

Rotates flywheel.

OUO1043,0000EA8 –19–28JUN02–2/2

Other Material

Number	Name	Use
TY15130 (U.S.)	John Deere Sealer	Apply to shift lever housings.
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to PTO and traction clutch yoke-to-armshaft cap screw threads.

LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000EA9 –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Clutch Housing-to-Transmission Cap Screws	Torque	118—147 N•m (87—108 lb-ft)
Transmission Cap Screws	Torque	140 N•m (105 lb-ft)

OUO1043,0000EAA –19–28JUN02–1/1

Separate Clutch Housing From Transmission

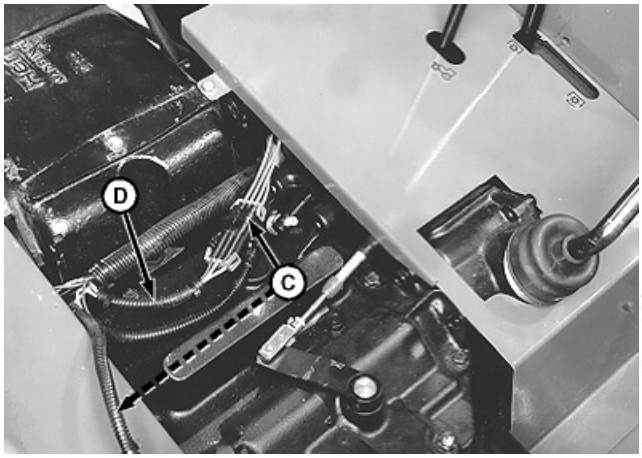
NOTE: The approximate capacity of transmission is 42.5 L (11 U.S. gal).

1. Drain transmission.

NOTE: Remove cab and floor plates if equipped. (See Cab Remove and Install and Cab Floor Plates Remove and Install—Early Model Tractors or Cab Floor Plate Remove and Install—Later Model Tractors in Section 90, Group 15.)

2. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
3. Remove clamp.
4. Disconnect wiring leads (B).
5. Disconnect wiring lead (D).
6. Disconnect wiring connectors (C).
7. Disconnect turn signal wiring connector. Cut all wire tie straps as necessary.
8. Disconnect park pawl cable.

LV2440 –UN–16DEC97



LV2441 –UN–18DEC97

A—Clamp
B—Fuel Level Sender Wiring Lead
C—Wiring Connector
D—Ground Wiring Lead

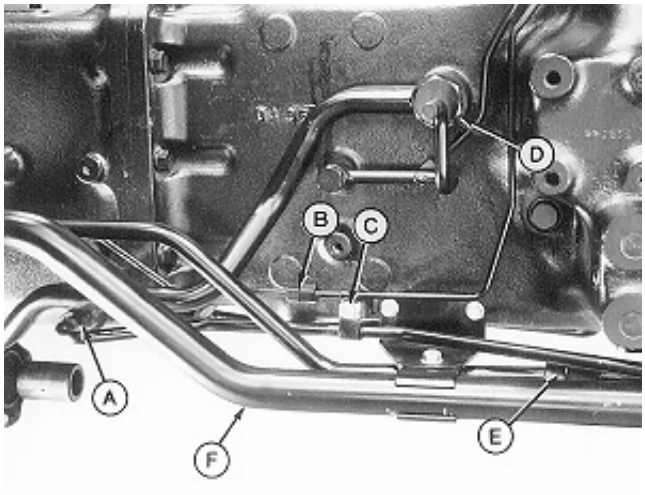
Continued on next page

AG,OUO1085,166 –19–18AUG00–1/5

NOTE: Close all openings using caps and plugs.

9. Tractors without cab: remove right step plate and fender.
10. Remove suction line (F).
11. Remove cap screw (C).
12. Disconnect hydraulic lines (A and E).
13. Disconnect brake line (B).
14. Disconnect hydraulic supply line (D).

A—Brake Valve Return Line
B—Brake Pressure Line
C—Cap Screw
D—PowrReverser™ Supply Line
E—Hydraulic Pump-to-Inlet Housing Supply Line
F—Hydraulic Suction Line



LV1065 –UN–15DEC94

Right Side Shown

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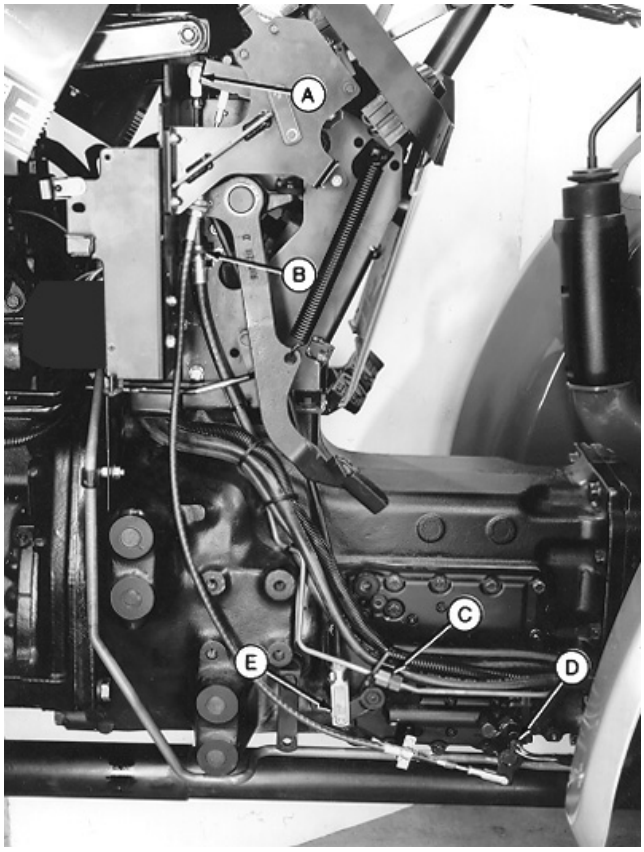
AG,OUO1085,166 –19–18AUG00–2/5

15. Disconnect long PTO rod assembly at both ends and remove.
16. Tractors without cab: remove left step.
17. Remove left dash panel.
18. Remove spring clip (B) and disconnect park brake linkage (A). Cut all tie straps as necessary.
19. Disconnect brake line (C).
20. Disconnect safety neutral switch wiring connector (D).
21. Disconnect clutch pedal linkage (E).

A—Park Brake Linkage
B—Spring Clip
C—Hydraulic Brake Line
D—Wiring Connector
E—Clutch Pedal Linkage



LV1066 –UN–05JAN98

Left Side Shown

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AG,OUO1085,166 –19–18AUG00–3/5

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NOTE: Fuel tank capacity for 5210, 5310, and 5410 tractors is 68 L (18.0 U.S. gal).

Fuel tank capacity for 5510 and tractors with cab is 83 L (22.0 U.S. gal).

22. Drain fuel tank.

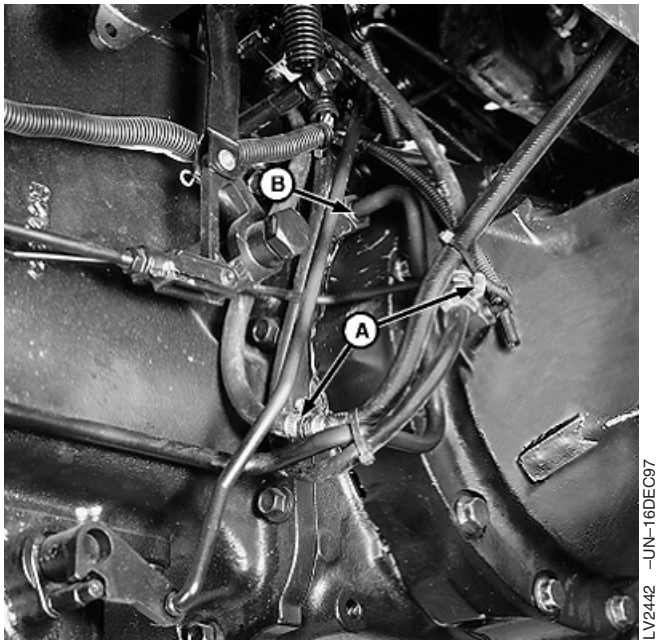
NOTE: Fuel lines are located on left side of tractor by axle final drive housing.

23. Disconnect fuel lines (A). Cut tie straps as necessary.

24. Disconnect hydraulic line (B).

25. Remove wire harness from rear of tractor. Cut tie straps as necessary.

A—Fuel Line (2 used)
B—Hydraulic Line



LV2442 –UN–16DEC97

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AG,OUO1085,166 –19–18AUG00–4/5

26. Remove MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)

27. Install wood blocks between the front axle pivot stops and tractor frame. Chock front and back of rear wheels.

28. Position a floor jack under the transmission and a support stand under end of drawbar.

29. Attach a hoist and lifting chains or strap around clutch housing.

30. Place range shift lever in neutral and move gear shift lever fully left to neutral position between 1st and 2nd gears. Use wire or rope to hold gear shift lever in this position.

NOTE: When separating, the main outer shaft, gear fork shaft, and driven shaft assemblies must remain in transmission case.

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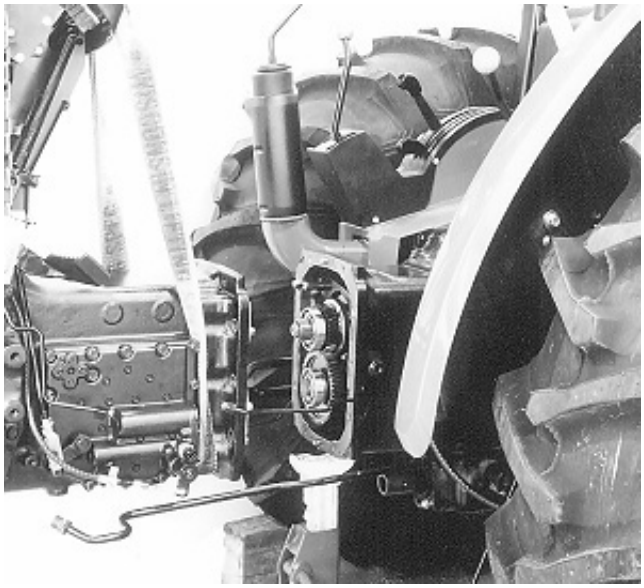
31. Remove ten cap screws. Roll front section of tractor (clutch housing) away from rear section (transmission).

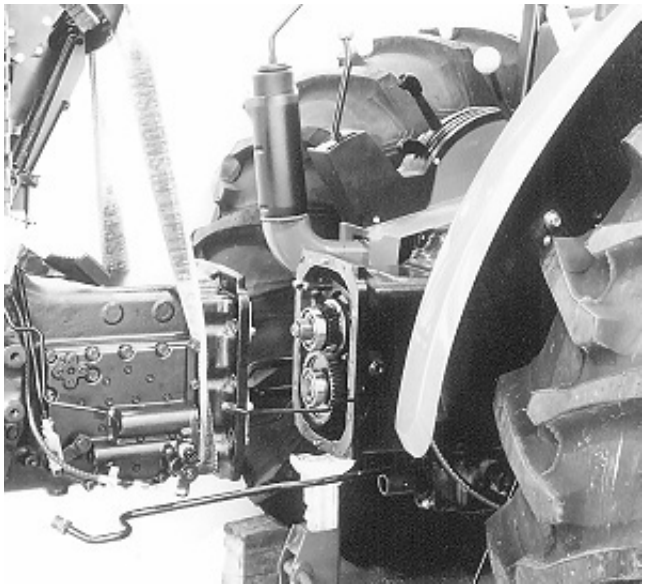
32. Install a support stand under clutch housing.



LV1231 –UN–15DEC94

AG,OUO1085,166 –19–18AUG00–5/5

Install Clutch Housing to Transmission


LV1231 –UN–15DEC94

1. Clean mating surfaces of transmission and clutch housings. Install new gasket.

2. Place range shift lever in neutral and gear shift lever in 2nd gear.

NOTE: It may be necessary to rotate the clutch shafts and reverse gears during installation so that the clutch and transmission shafts mesh.

Rotate the PTO shaft by manually turning the PTO at rear of tractor.

Rotate the traction shaft by turning the flywheel using JDE83 Flywheel Turning Tool.

Verify that the two bearings and two fork shafts enter holes of clutch housing at the same time.

Verify that the two pins enter the holes in transmission housing.

3. Install clutch housing to transmission. Tighten cap screws to specification.

Specification

Clutch Housing-to-Transmission
Cap Screws—Torque ..... 118—147 N•m (87—108 lb-ft)

4. Install MFWD drive shaft, if equipped. (See Remove, Inspect and Install MFWD Drive Shaft in Group 35.)

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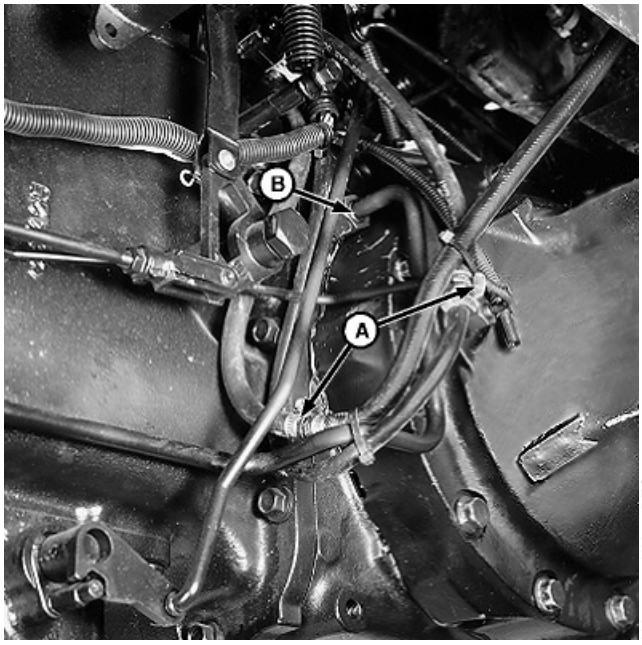
Continued on next page

AG,OUO1085,167 –19–28JUN02–1/5

5. Connect hydraulic line (B).

6. Connect fuel hoses (A).

A—Fuel Hose (2 used)
B—Hydraulic Line



LV2442 –UN–16DEC97

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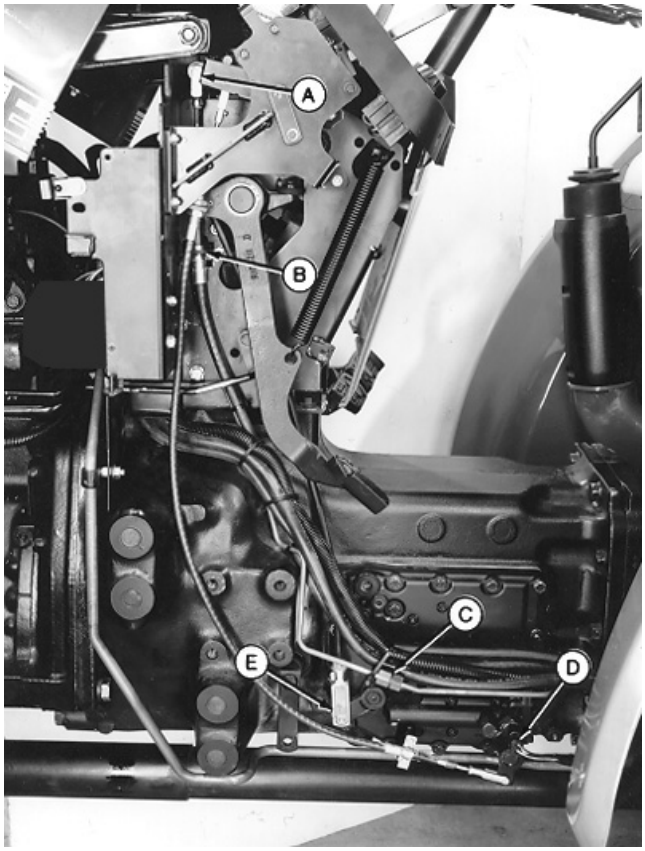
AG,OUO1085,167 –19–28JUN02–2/5

7. Connect clutch pedal linkage (E).
8. Connect neutral safety switch wiring connector (D).
9. Connect brake line (C).
10. Connect park brake linkage (A) and install spring clip (B).
11. Adjust park brake cable. (See Park Brake Cable Adjustment in Section 250, Group 16.)
12. Install new tie straps as necessary.
13. Install dash panel.
14. Tractors without cab: install left step.
15. Install long PTO rod assembly. (See PTO Clutch Lever Adjustment in Section 250, Group 15 for adjustment procedures.)

A—Park Brake Linkage
B—Spring Clip
C—Hydraulic Brake Line
D—Wiring Connector
E—Clutch Pedal Linkage



LV1066 –UN–05JAN98

Left Side Shown

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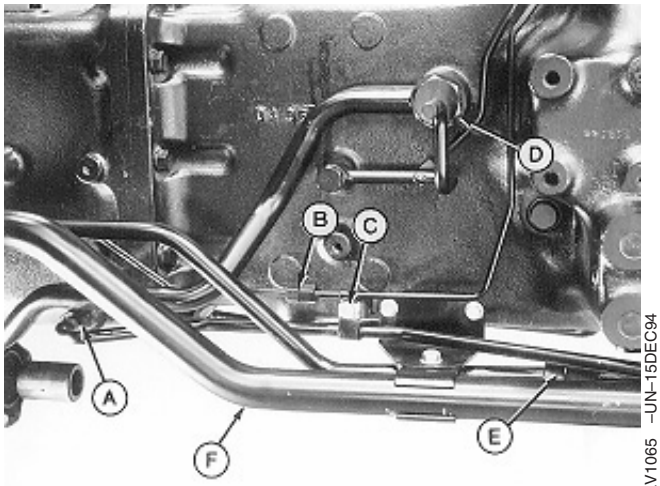
AG,OUO1085,167 –19–28JUN02–3/5

16. Connect brake line (B).
17. Connect hydraulic lines (A and E).
18. Install cap screw (C).
19. Install suction line (F).
20. Connect hydraulic supply line (D).
21. Tractors without cab: install right step and fender.

A—Brake Valve Return Line
B—Brake Pressure Line
C—Cap Screw
D—PowrReverser™ Supply Line
E—Hydraulic Pump-to-Inlet Housing Supply Line
F—Suction Line



LV1065 –UN–15DEC94

Right Side Shown

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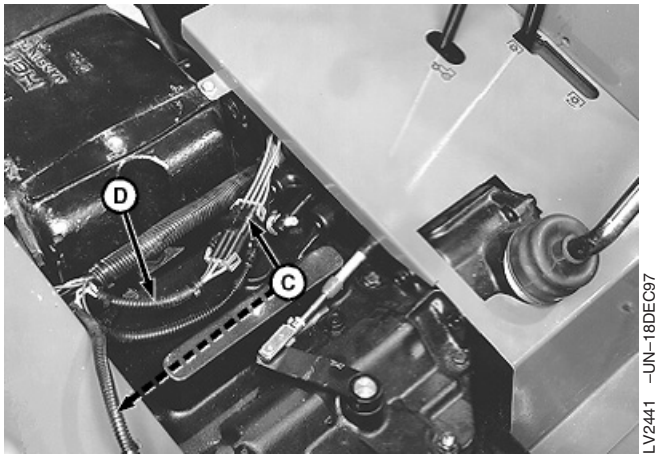
AG,OUO1085,167 –19–28JUN02–4/5

22. Connect wiring connectors (C).
23. Connect ground wiring lead (D).
24. Connect turn signal wiring connector.
25. Install cab if equipped. (See Cab Remove and Install in Section 90, Group 15.)
26. Connect wiring leads (B).
27. Install clamp (A).
28. Connect park pawl cable.
29. Fill fuel tank with proper fuel. (See Diesel Fuel Specifications in Section 10, Group 20.)
30. Install seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
31. Fill transmission with clean transmission/hydraulic oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)
32. Bleed brake system. (See Bleed Brake System in Section 260, Group 15.)

A—Clamp
B—Fuel Level Sender Wiring Leads
C—Wiring Connectors
D—Ground Wiring Lead

LV2440 –UN–16DEC97



LV2441 –UN–18DEC97

AG,OUO1085,167 –19–28JUN02–5/5

Remove Transmission

NOTE: Tractor without cab shown, tractor with cab is similar.

1. Separate clutch housing from transmission. (See Separate Clutch Housing from Transmission in this group.)
2. Tractor with cab: remove both control consoles and support plate. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)
3. Raise and support rear axles.
4. Tractors without cab: remove rear wheels and fenders.

LV1256 –UN–21DEC94

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LV,5016HA,B22 –19–21NOV02–1/10

5. Remove rockshaft control levers (A).

6. Tractors without cab: remove right-hand control console (B).

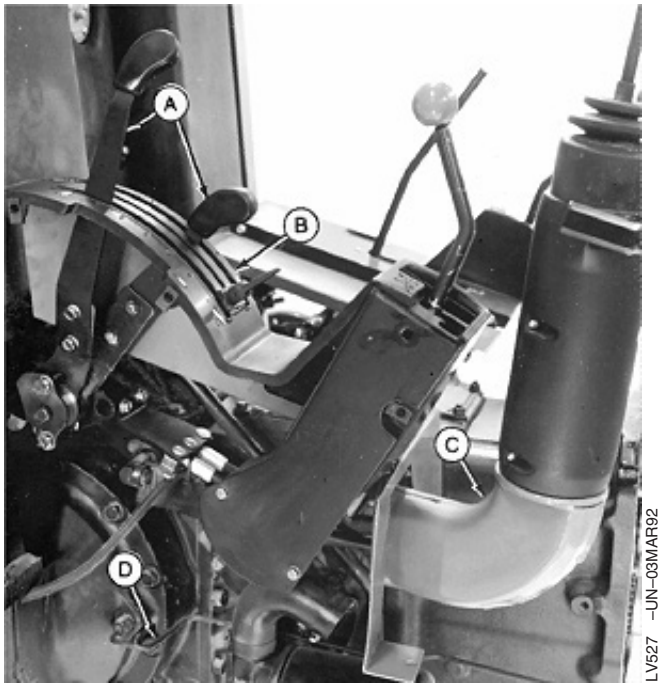
7. Remove SCV joystick and cable assembly (C), if equipped. (See Inspect and Repair Joystick and Linkage—Without Cab or Inspect and Repair Joystick and Linkage—With Cab in Section 70, Group 15.)

NOTE: Close all openings using caps and plugs.

8. Remove brake line (D).

9. Remove MFWD lever and linkage, if equipped. (See Inspect and Repair MFWD Lever and Linkage in Group 35.)

10. Remove PTO lever and linkage. (See Remove, Inspect and Install Rear PTO Lever and Linkage in Group 20.)



LV527 –UN–03MAR92

Right-Hand Side

A—Rockshaft Levers
B—Right-Hand Control Console
C—SCV Joystick and Cable Assembly
D—Brake Line

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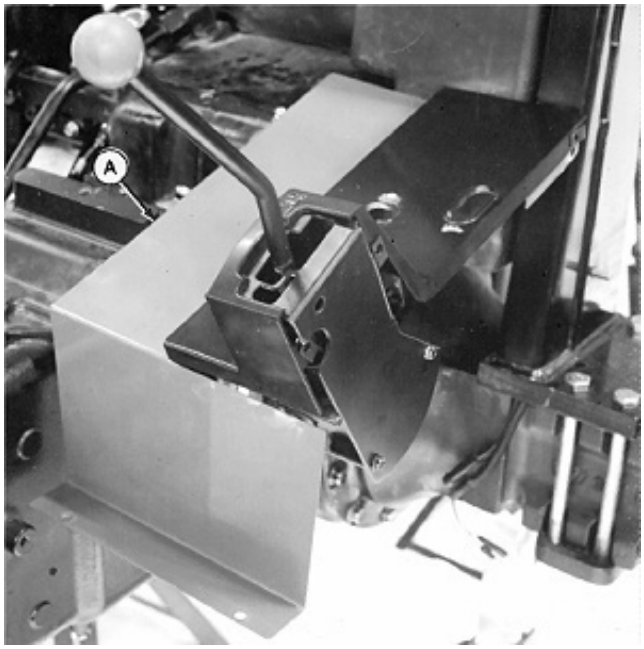
LV,5016HA,B22 –19–21NOV02–2/10

11. Tractors without cab: remove left-hand control console (A).

A—Left-Hand Control Console



Left-Hand Side

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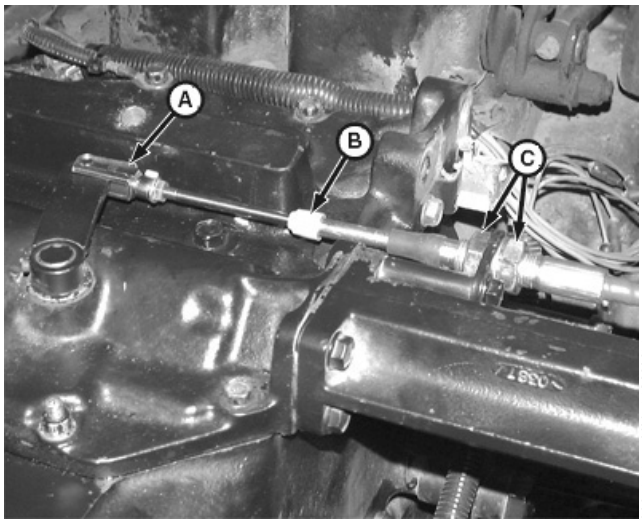
LV,5016HA,B22 –19–21NOV02–3/10

12. Remove bulkhead nuts (C).
13. Remove spring locking pin (A).
14. Remove park brake cable (B).

A—Spring Locking Pin
B—Park Brake Cable
C—Bulkhead Nut (2 used)



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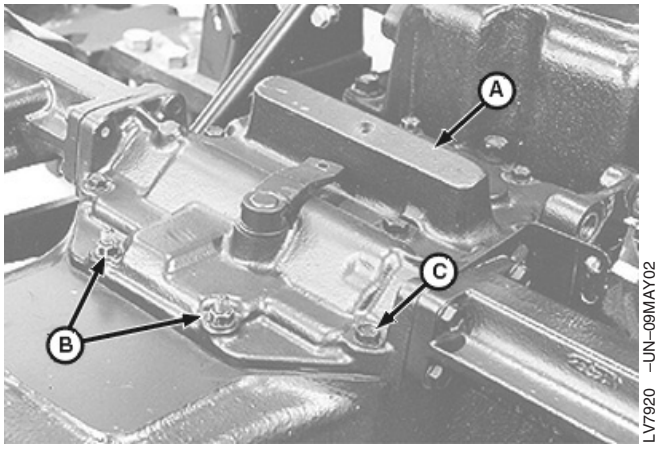
LV,5016HA,B22 –19–21NOV02–4/10

15. Remove eight cap screws (C) and nuts (B) to remove transmission top cover (A).

16. Remove hydraulic filter and manifold. (See Remove and Install Hydraulic Filter/Manifold—Early Model or Remove and Install Hydraulic Filter/Manifold—Later Model in Section 70, Group 05.)

17. Remove creeper assembly. (See Remove and Install Creeper Assembly in Group 40.)

A—Transmission Top Cover
B—Nut
C—Cap Screw



LV7920 –UN–09MAY02

LV,5016HA,B22 –19–21NOV02–5/10

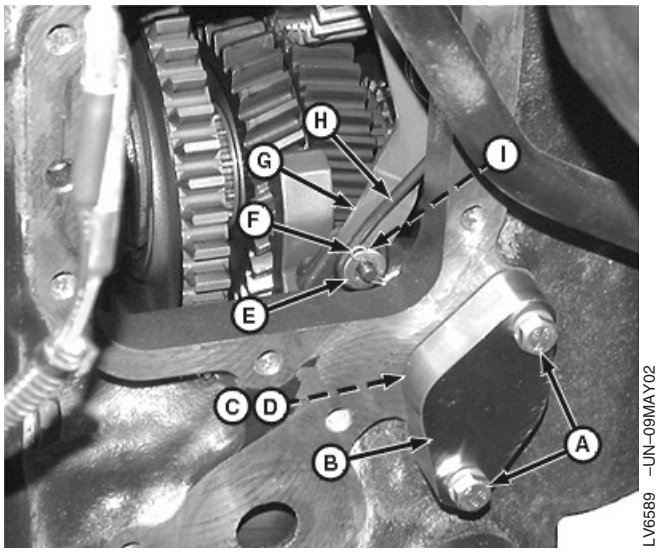
18. Remove cap screws (A), cover (B), shims (C), washers and bearing (D).

19. Remove spring clip (F) and washer (E).

20. Disconnect tension spring (H) and remove bushing (I).

21. Disconnect arm (G) from cam.

A—Cap Screw (2 used)
B—Cover
C—Shims
D—Washer (2 used) and Bearing
E—Washer
F—Spring Clip
G—Arm
H—Tension Spring
I—Bushing



LV6589 –UN–09MAY02

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LV,5016HA,B22 –19–21NOV02–6/10

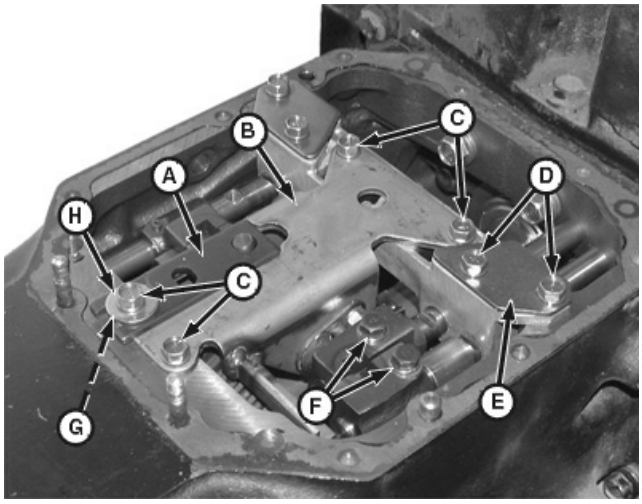
22. Remove four cap screws (C).

23. Remove washer (H), collar (G) and link plate (A).

24. Remove park guide assembly (B).

25. Remove screws (D), plate (E) and cap screws (F).

A—Link Plate
B—Park Guide Assembly
C—Cap Screw (4 used)
D—Cap Screw (2 used)
E—Plate
F—Cap Screw (2 used)
G—Collar
H—Washer



LV6629 –UN–09MAY02

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LV,5016HA,B22 –19–21NOV02–7/10

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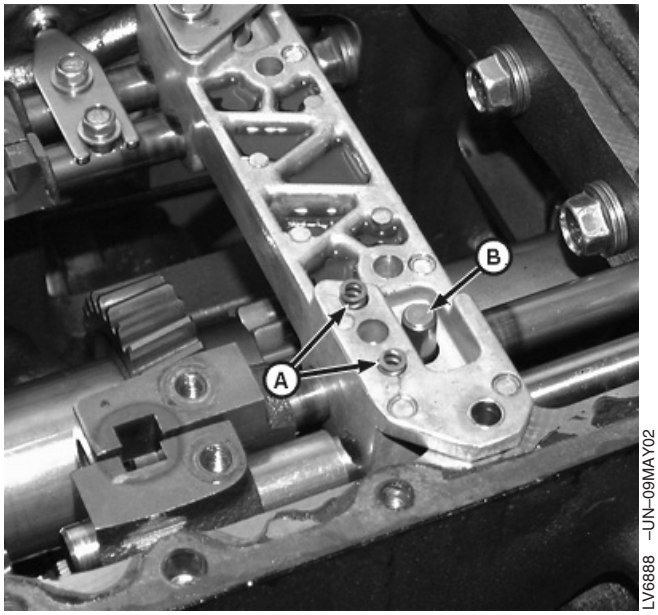
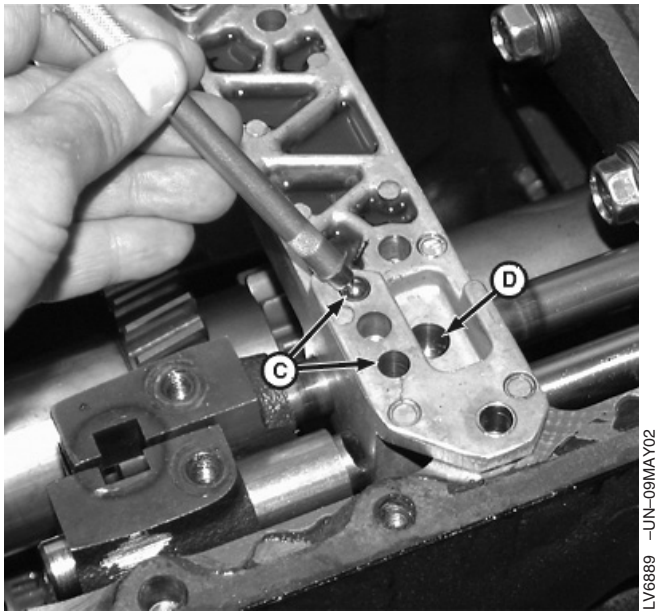


LV6888 –UN–09MAY02



LV6889 –UN–09MAY02

26. Remove two springs (A) and dowel pin (B).

27. Remove two small detent balls (C) and one large detent ball (D) using a pen magnet.

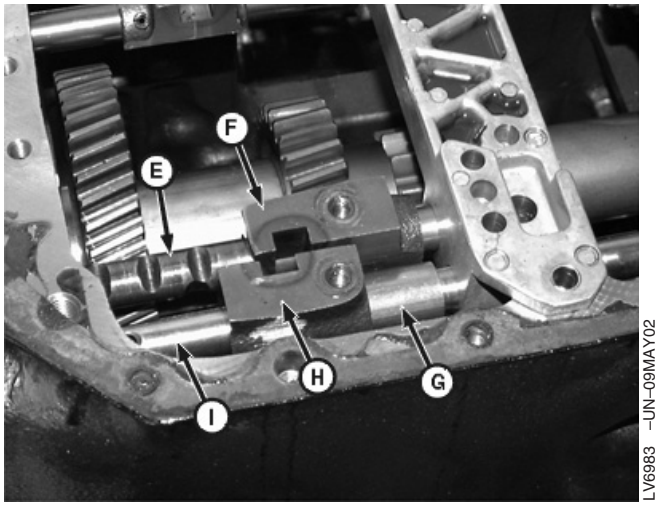
28. Slide outer shift shaft (I) forward into transmission housing until spacer (G) can be removed. Remove spacer (G).

29. Remove outer shift shaft (I).

30. Slide inner shift shaft (E) forward into transmission housing and remove shift shaft.

31. Remove outer shift fork (H) first, then remove inner shift fork (F).

32. Inspect all parts for wear or damage. Replace as necessary.



LV6983 –UN–09MAY02

A—Spring (2 used)
B—Dowel Pin
C—Small Detent Ball (2 used)
D—Large Detent Ball
E—Inner Shift Shaft
F—Inner Shift Fork
G—Spacer
H—Outer Shift Fork
I—Outer Shift Shaft

Continued on next page

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33. Remove cap screws (A) and hydraulic reverser supply line (B).

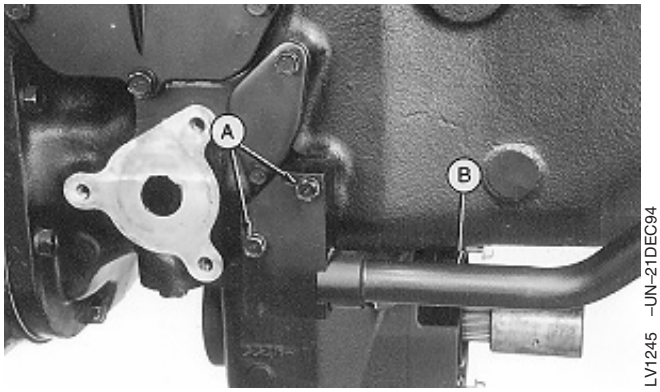
34. Remove lower cover or MFWD drop gearbox, if equipped. (See Remove and Install MFWD Drop Gearbox in Group 35.)

IMPORTANT: Before separating the transmission from rear differential housing, rotate park pawl until it rests against the park arm inside of transmission housing. If park pawl is not rotated, damage to gears may result when transmission is separated from the rear differential housing.

35. Rotate park pawl fully outward to side of transmission case.

36. Position a jackstand under drawbar assembly.

37. Attach hoist and chains to transmission housing.



A—Cap Screw
B—Hydraulic Reverser Supply Line

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LV,5016HA,B22 –19–21NOV02–9/10

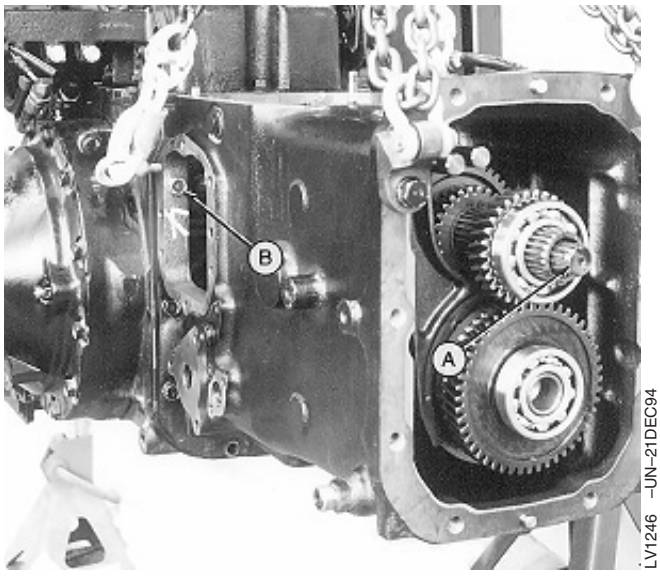
38. Remove PTO shaft (A)

NOTE: Differential drive shaft and gear cluster assembly will stay with the differential during transmission removal.

IMPORTANT: Early model tractors use 8.8 grade transmission mounting cap screws (B). Replace the 8.8 grade with 10.9 grade (see your parts catalog).

39. Remove ten cap screws (B).

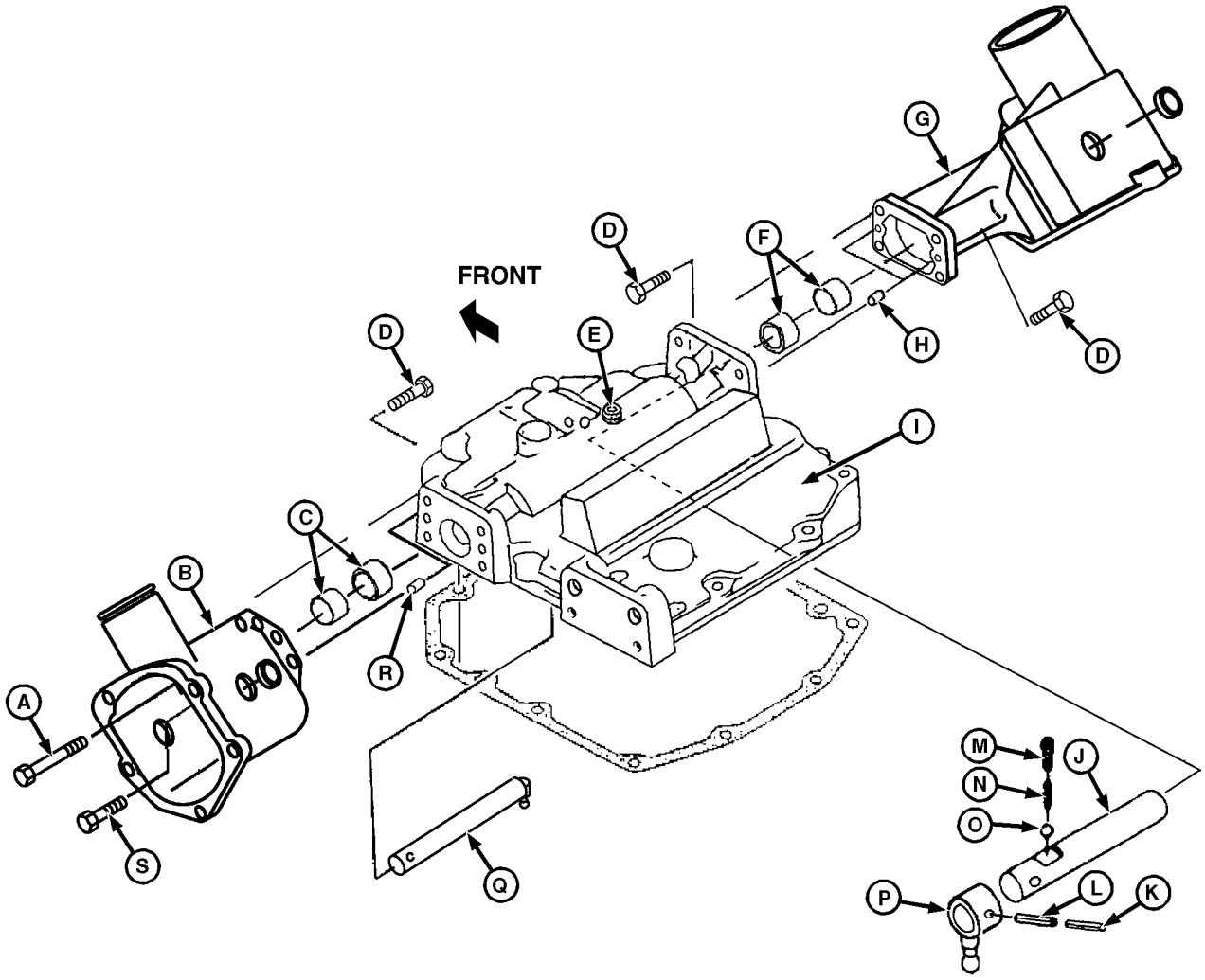
40. Remove transmission and make repairs as necessary. (See Disassemble and Inspect Transmission in this group.)



A—PTO Shaft
B—Cap Screw

LV,5016HA,B22 –19–21NOV02–10/10

Disassemble and Inspect Transmission



Top Cover

A—Cap Screw
B—Range Shift Lever Housing
C—Bushing (2 used)
D—Cap Screw (6 used)
E—Plug
F—Bushing (2 used)
G—Gear Shift Lever Housing
H—Pin
I—Cover
J—Gear Shift Shaft
K—Spring Pin
L—Spring Pin
M—Spring
N—Spring
O—Ball
P—Gear Shift Arm
Q—Range Shift Arm
R—Pin
S—Cap Screw

1. Remove cap screws (A, D, and S).
2. Remove range shift lever housing (B) and gear shift lever housing (G).
3. Remove plug (E) and remove pins (K and L) through plug hole.
4. Remove gear shift arm (J), being careful not to lose detent ball (O) and springs (M and N).
5. Remove range shift arm (Q).
6. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

NOTE: Bushings (C and F) are a press fit in case (I) and housing (B and G). Remove bushings only if replacement is necessary.

7. Replace bushings (C and F) using a bushing, bearing, and seal driver set.

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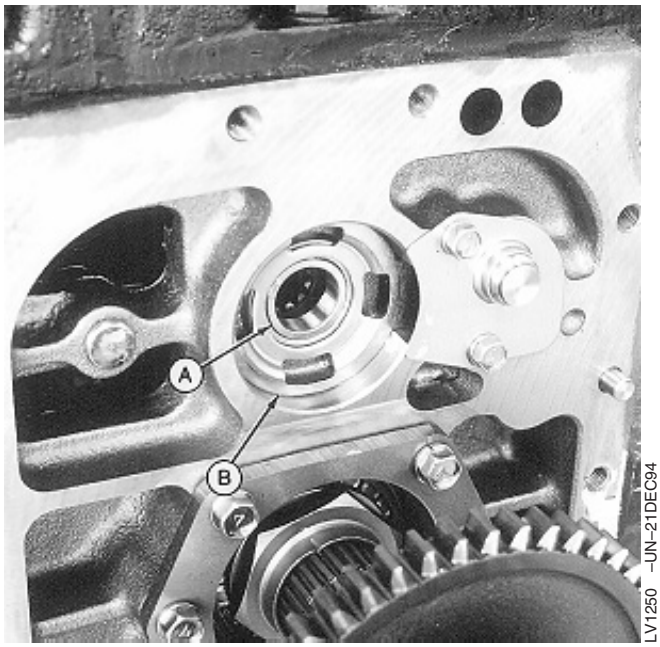
8. Remove washer (B) and bearing (A) from differential housing.

9. Inspect parts for wear or damage. Replace if necessary.

A—Bearing
B—Washer



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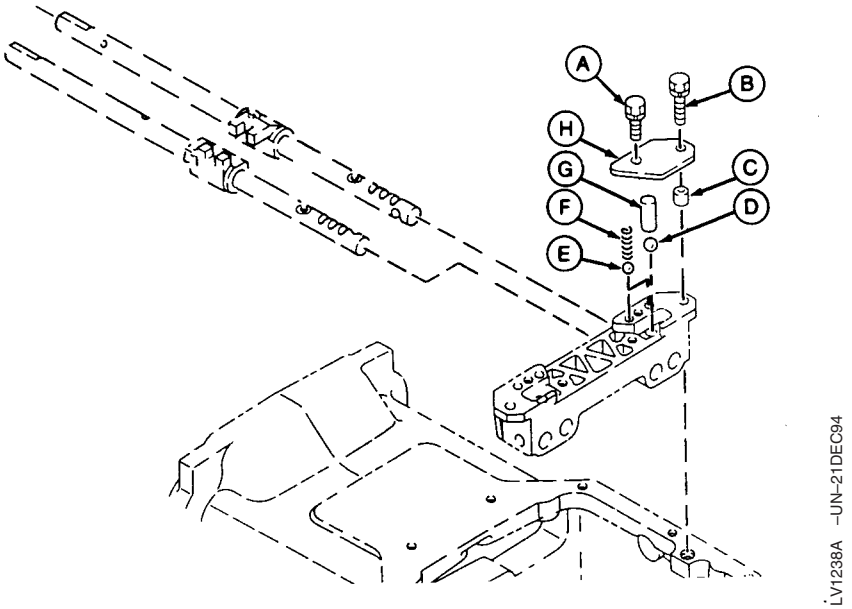
AG,OUO1085,170 –19–21AUG00–3/8



A—Cap Screw
B—Cap Screw
C—Bushing
D—Ball
E—Ball (2 used)
F—Spring (2 used)
G—Pin
H—Plate

10. Remove parts (A—H).

NOTE: Reinstall bushing (C) and cap screw (B) to ease removal of gear shift shaft assembly.

11. Install bushing (C) and cap screw (B).

12. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

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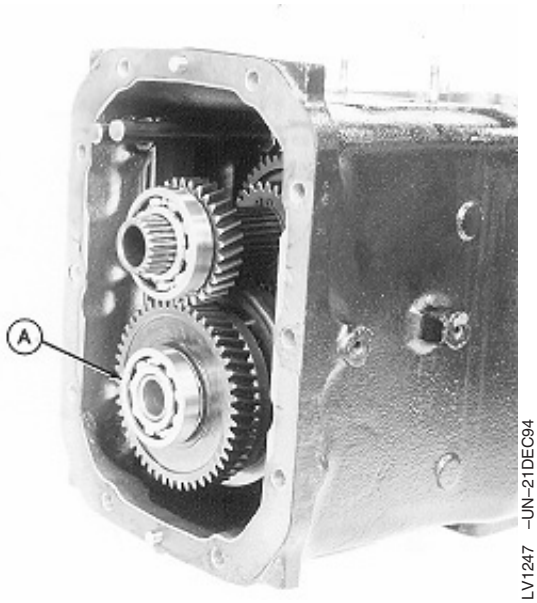
13. Remove transmission bottom shaft (A) with 1st and 2nd gear shift shaft assembly (B) and 3rd and 4th gear shift shaft assembly (C).

14. Disassemble and inspect parts as necessary. (See Disassemble, Inspect, and Assemble Transmission Bottom Shaft in this group.)

A—Transmission Bottom Shaft
B—1st and 2nd Gear Shift Shaft Assembly
C—3rd and 4th Gear Shift Shaft Assembly



LV1247 –UN–21DEC94

LV1248 –UN–21DEC94

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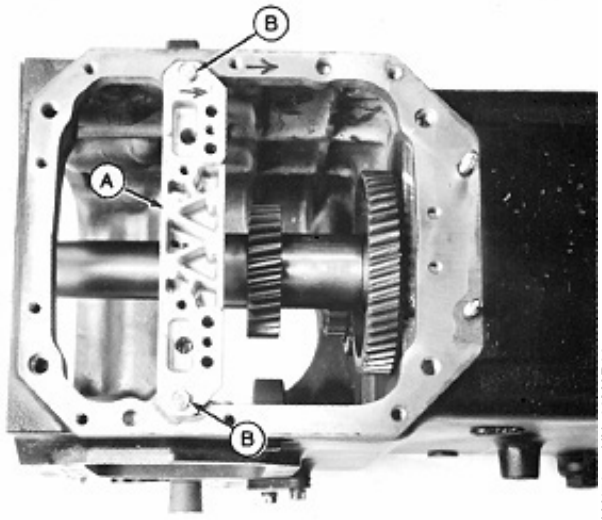
AG,OUO1085,170 –19–21AUG00–5/8

15. Mark support (A) and transmission case to aid in installation.

16. Remove cap screws and bushings (B) and support (A).

17. Inspect parts for wear or damage. Replace as necessary.

A—Support
B—Cap Screw and Bushing (2 used)



LV470 –UN–03MAR92

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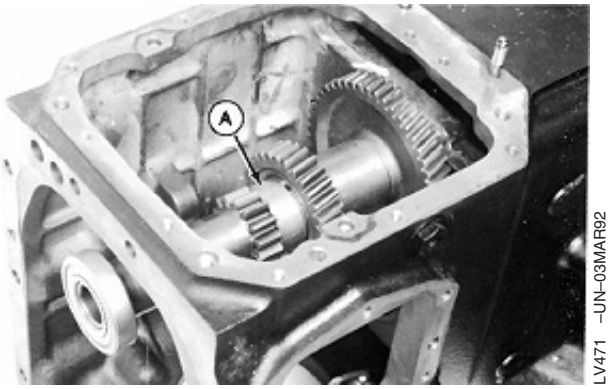
AG,OUO1085,170 –19–21AUG00–6/8

18. Remove range reduction shaft (A).

19. Disassemble and inspect parts as necessary. (See Disassemble, Inspect, and Assemble Range Reduction Shaft in this group.)

A—Range Reduction Shaft



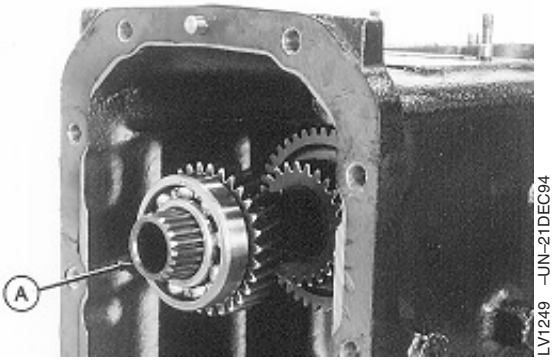
AG,OUO1085,170 –19–21AUG00–7/8

20. Remove driven shaft (A).

21. Disassemble and inspect parts as necessary. (See Disassemble, Inspect, and Repair Driven Shaft in Group 12.)

22. Inspect transmission case for cracks or damage. Replace if necessary.

A—Driven Shaft



AG,OUO1085,170 –19–21AUG00–8/8

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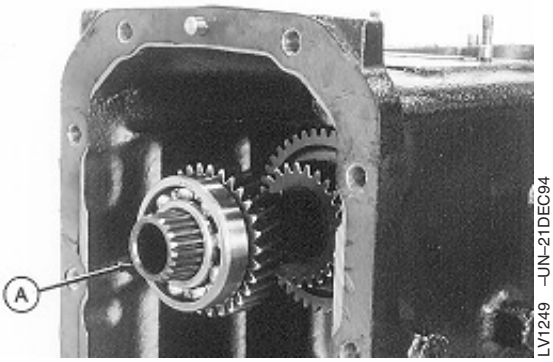
Assemble Transmission

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

IMPORTANT: Use new seals and O-rings during assembly. Damaged or used seals or O-rings will leak.

1. Install driven shaft (A). Tap on end of shaft with a soft-faced hammer to fully seat shaft in case bore.

A—Driven Shaft



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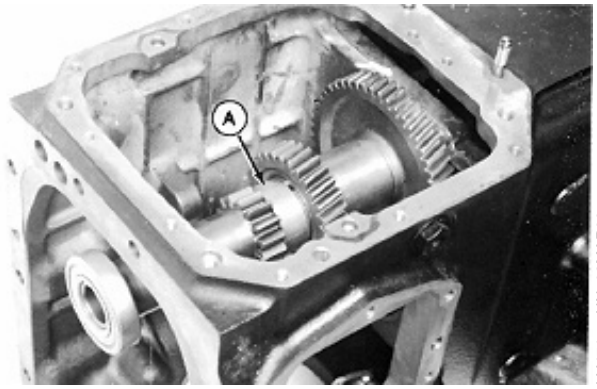
AG,OUO1085,171 –19–21AUG00–1/8

2. Install range reduction shaft (A).

A—Range Reduction Shaft



LV471 –UN–03MAR92

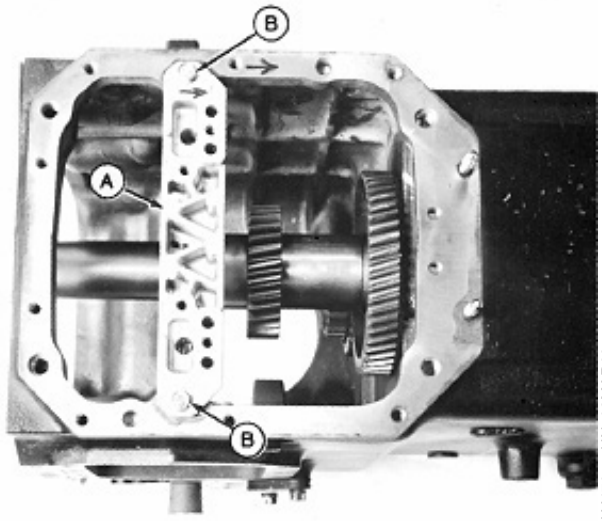
AG,OUO1085,171 –19–21AUG00–2/8

NOTE: Support plate (A) installed to support transmission bottom shaft during installation.

3. Align support plate (A) with transmission case with marks made during disassembly.

4. Install bushings and cap screws (B).

A—Support Plate
B—Bushing and Cap Screw (2 used)



LV470 –UN–03MAR92

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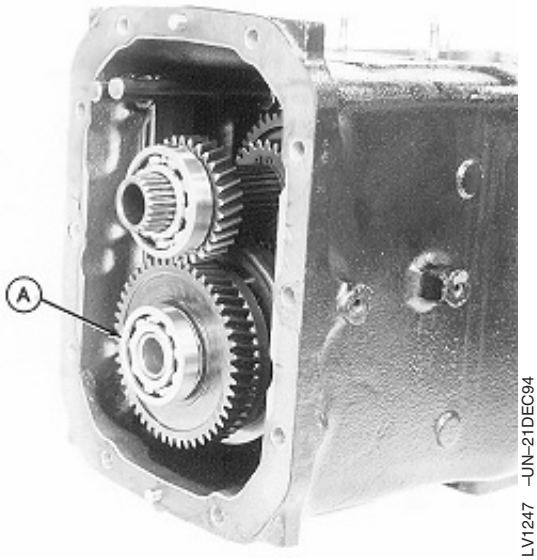
AG,OUO1085,171 –19–21AUG00–3/8

5. Install transmission bottom shaft (A) with 1st and 2nd gear shift shaft assembly (B) and 3rd and 4th gear shift shaft assembly (C).

A—Transmission Bottom Shaft
B—1st and 2nd Gear Shift Shaft Assembly
C—3rd and 4th Gear Shift Shaft Assembly

LV1248 –UN–21DEC94



LV1247 –UN–21DEC94

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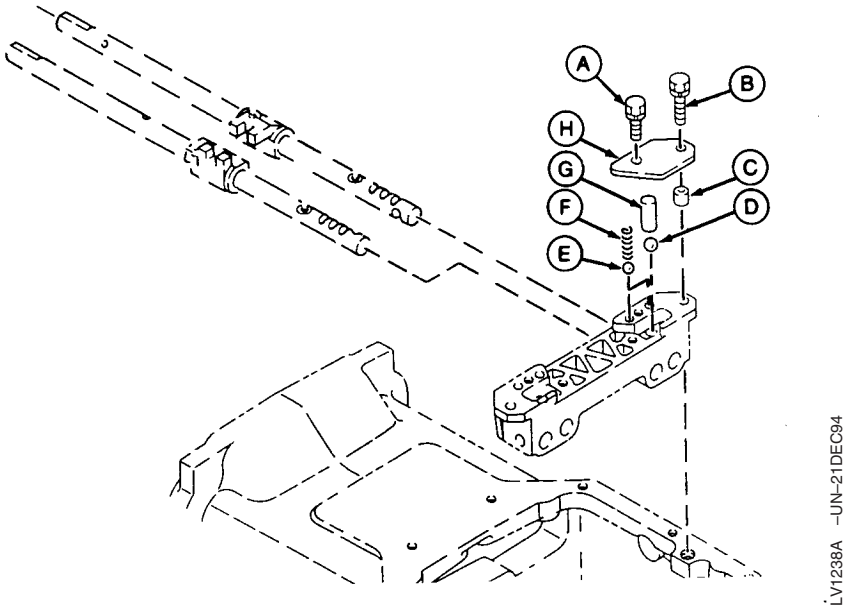

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A—Cap Screw **C—Bushing** **E—Ball (2 used)** **G—Pin**
B—Cap Screw **D—Ball** **F—Spring (2 used)** **H—Plate**

6. Remove cap screw (B).
7. Install parts (A and C—H).
8. Install cap screw (B).

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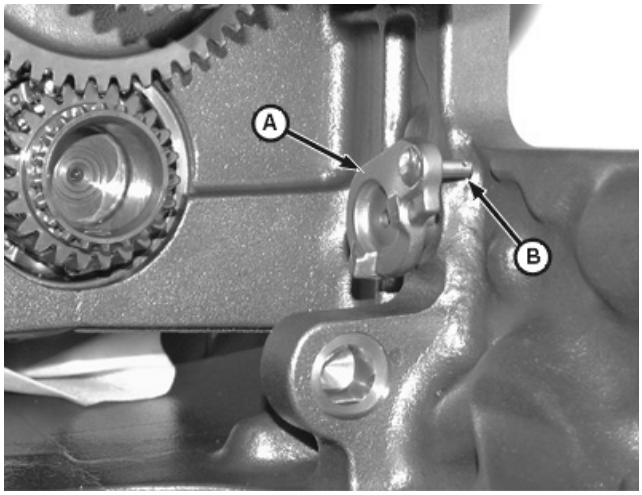
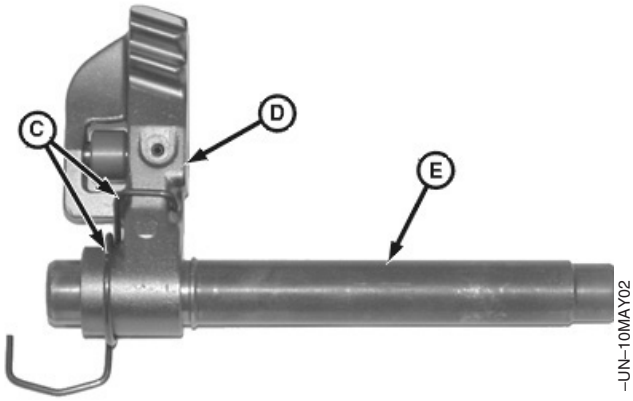
AG,OUO1085,171 –19–21AUG00–5/8



LV7921 –UN–10MAY02



LV6636 –UN–10MAY02

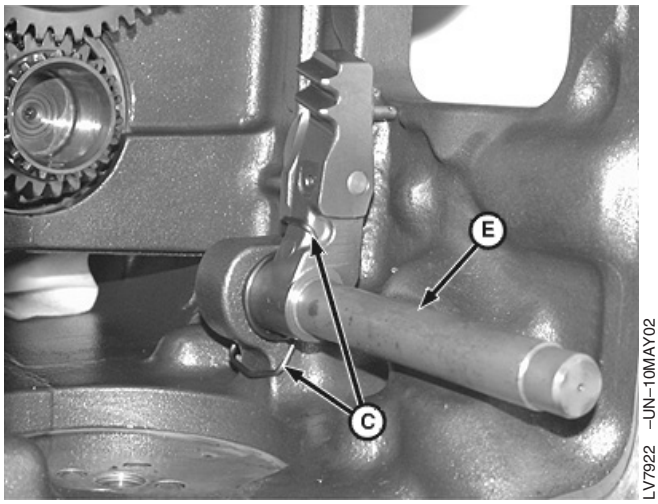
NOTE: Apply clean transmission/hydraulic oil to all internal transmission parts before installing.

9. Install park cam (A) into bore with pin (B) positioned as shown in photo.

10. Install park pawl (D) and spring (C) on park shaft (E).

11. Install park shaft (E) in shaft bore. Make sure spring (C) loops around and engages casting and park pawl as shown.

A—Park Cam
B—Pin
C—Spring
D—Park Pawl
E—Park Shaft



LV7922 –UN–10MAY02

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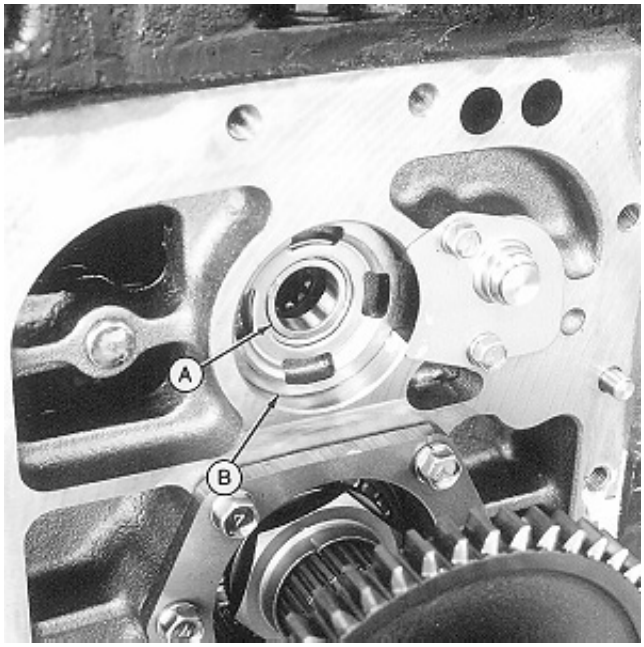
AG,OUO1085,171 –19–21AUG00–6/8

12. Install bearing (A) and washer (B) into differential housing.

A—Bearing
B—Washer



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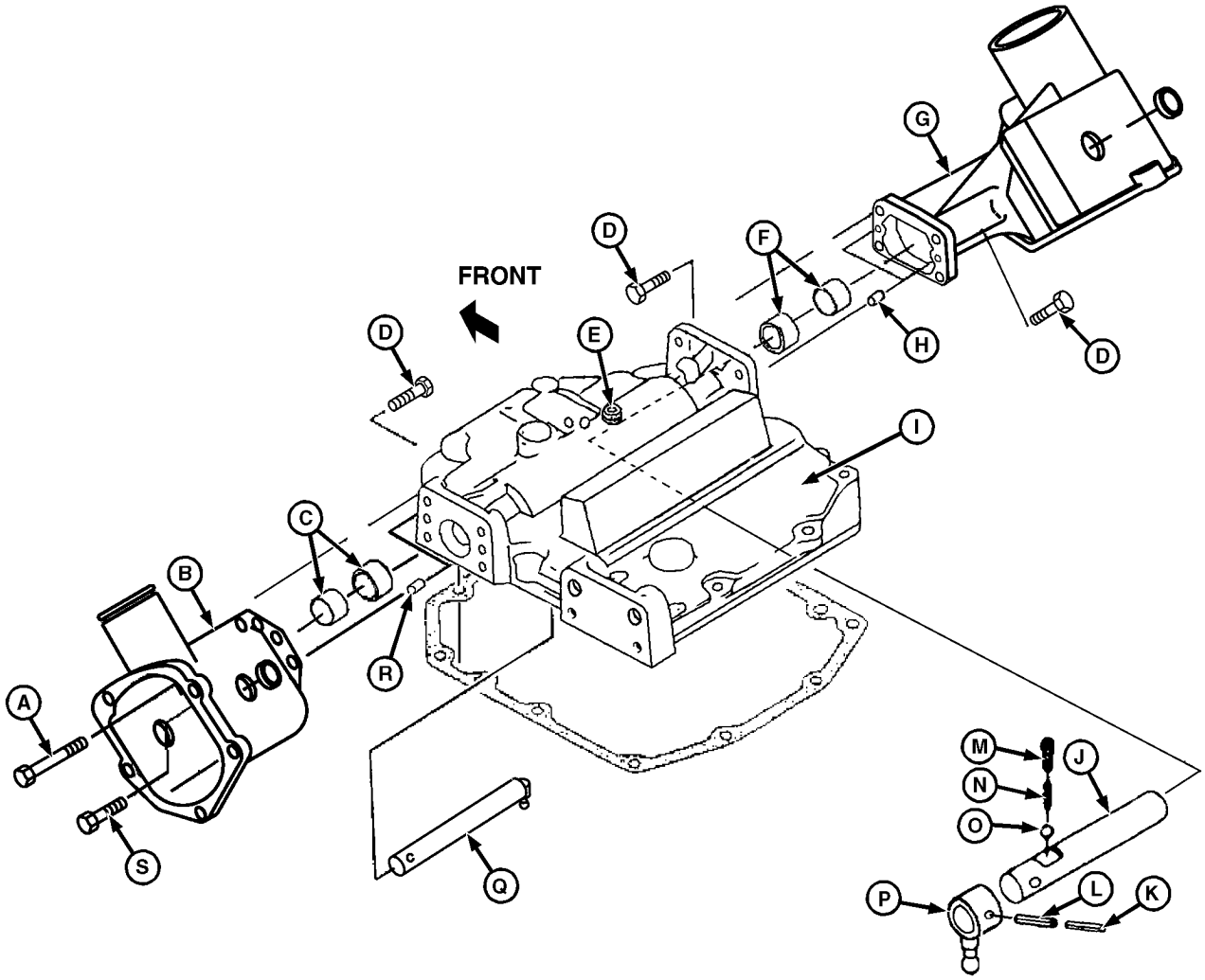
AG,OUO1085,171 –19–21AUG00–7/8



Top Cover

A—Cap Screw
B—Range Shift Lever Housing
C—Bushing (2 used)
D—Cap Screw (6 used)
E—Plug
F—Bushing (2 used)
G—Gear Shift Lever Housing
H—Pin
I—Cover
J—Gear Shift Shaft
K—Spring Pin
L—Spring Pin
M—Spring
N—Spring
O—Ball
P—Gear Shift Arm
Q—Range Shift Arm
R—Pin
S—Cap Screw

13. Install range shift arm (Q).

14. Install gear shift shaft (J) into cover (I). Use a punch through plug hole to depress detent ball (O) against springs (M and N). Slide shaft through, making sure detent ball stays under shaft.

15. Install pins (L and K) through shift arm (P) and into shaft (J).

16. Install plug (E) into cover I).

17. Clean mating surfaces of cover (I) and lever housings (B and G).

18. Apply John Deere TY15130 or equivalent sealer to shift lever housings (B and G) and install housings to cover (I). Be sure that alignment pins (H and R) are in place.

AG,OUO1085,171 –19–21AUG00–8/8

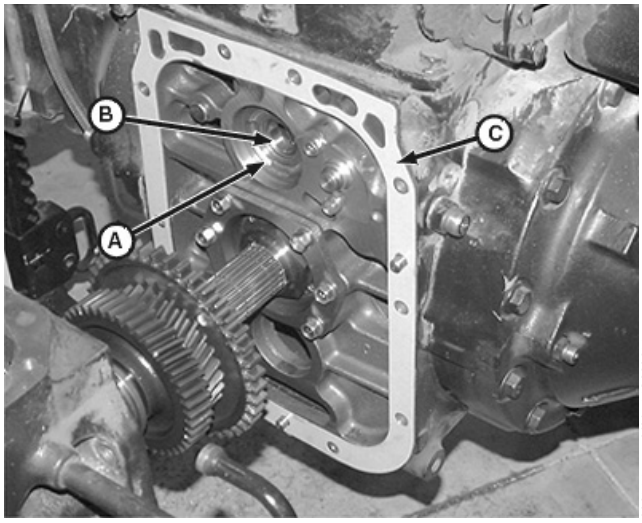
Install Transmission

1. Install new transmission-to-differential case gasket (C).

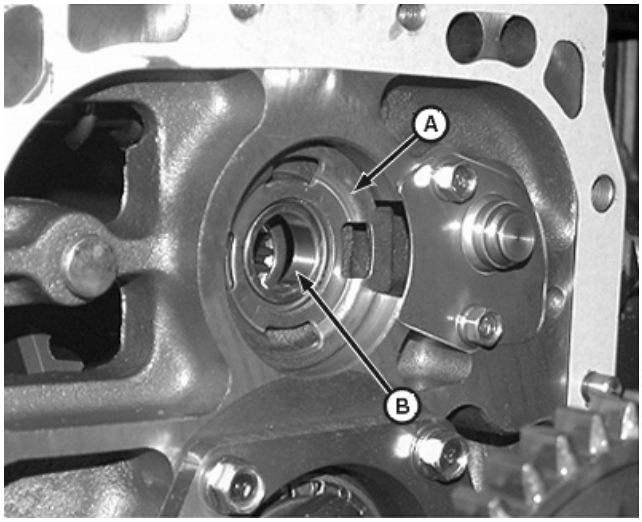
IMPORTANT: If bearing (B) and oil deflector (A) were removed or fell from bore during transmission separation, make sure bearing (B) and oil deflector (A) are installed as shown in photo.

2. Install bearing (B) and oil deflector (A), if removed as shown.

A—Oil Deflector
B—Bearing
C—Transmission-to-Differential Case Gasket



LV6987 –UN–10MAY02



LV6988 –UN–10MAY02

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NOTE: Make sure the transmission and differential housings are level and square when joining both sections to aid during assembly.

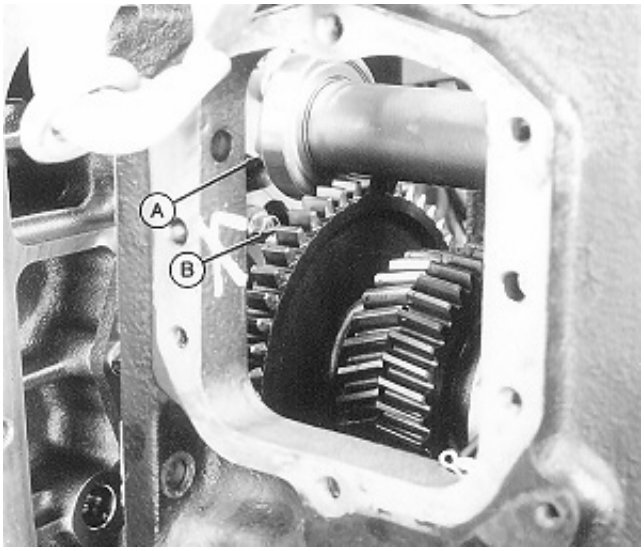
IMPORTANT: Do not force alignment or join both sections by tightening cap screw. Damage to components will result if force is used. If encountering difficulty during alignment, separate and check the level of transmission and differential housings.

3. Position transmission approximately 127 mm (5 in.) from the differential case so bearing (A) is just past sliding gear (B).

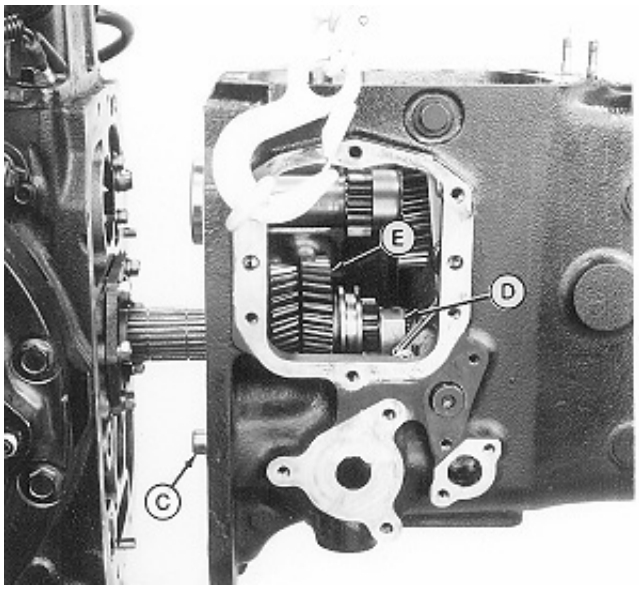
NOTE: It may be necessary to rotate the transmission shafts during installation of transmission.

4. Install transmission. Make sure park pawl shaft (C) aligns with bore in differential case. Push park pawl (D) inward after clearing gear (E).

A—Bearing
B—A Range and Creeper Shift Sliding Gear
C—Park Pawl Shaft
D—Park Pawl



LV1252 –UN–21DEC94



LV1251 –UN–21DEC94

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LV,5016HA,A53 –19–21NOV02–2/18

IMPORTANT: Early model tractors use 8.8 grade transmission mounting cap screws. Replace the 8.8 grade with 10.9 grade (see your parts catalog).

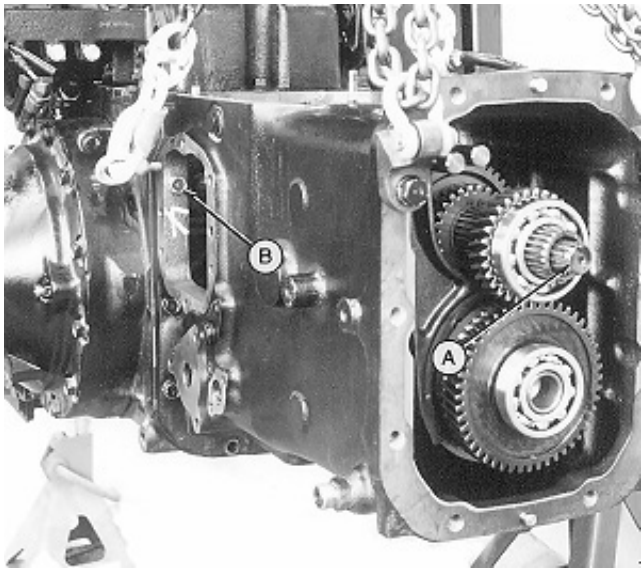
5. Install ten cap screws (B) and tighten to specification.

Specification

Transmission Cap Screws—
Torque ..... 140 N•m (105 lb-ft)

6. Install PTO shaft (A).

A—PTO Shaft
B—Cap Screw (10 used)



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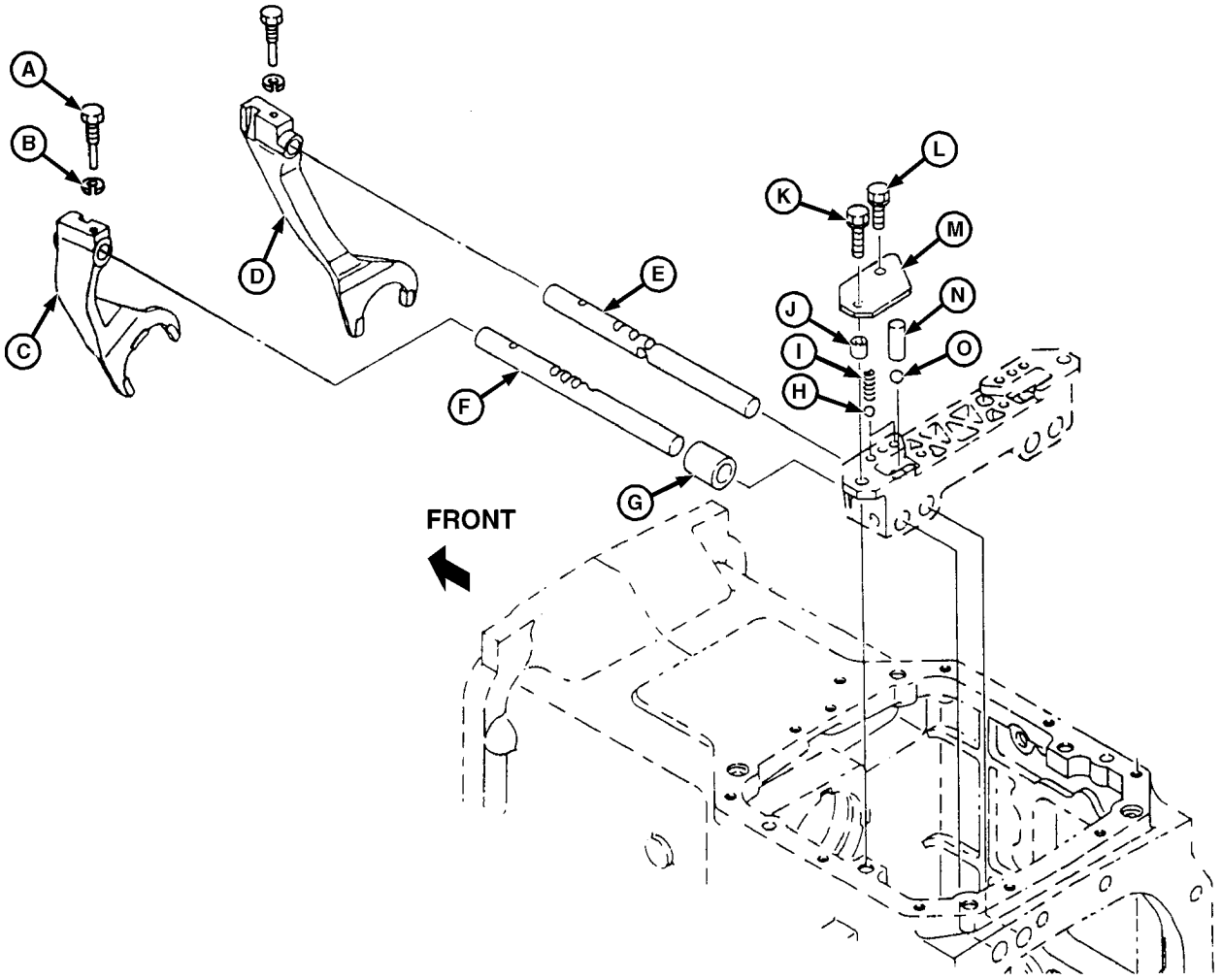

Range Shift Shaft Assembly

A—Cap Screw (2 used)
B—Lock Washer (2 used)
C—2nd and 3rd Range Shift Fork
D—1st Range and Creeper Shift Fork
E—1st Range and Creeper Shift Shaft
F—2nd and 3rd Range Shift Shaft
G—Sleeve
H—Ball (2 used)
I—Spring (2 used)
J—Bushing
K—Cap Screw
L—Cap Screw
M—Plate
N—Pin
O—Ball

7. Install shift fork (C and D).

8. Install sleeve (G) and slide shift shafts (E and F) into position.

9. Clean cap screws (A) with Clean and Cure Primer. Apply thread lock and sealer (medium strength) to threads of cap screws. Install lock washers (B) and cap screws (A). Tighten cap screws (A) to specification.

Specification
Shift Fork Cap Screws—Torque..... 27 N•m (20 lb-ft)

10. Install parts (H—O). Tighten cap screw (K and L) to specification.

Specification
Range Shift shaft Detent Plate
Cap Screws—Torque ..... 27 N•m (20 lb-ft)

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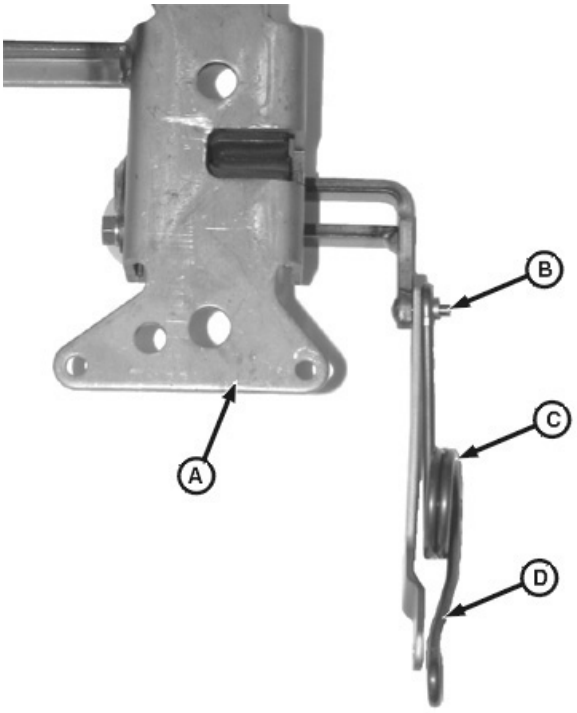
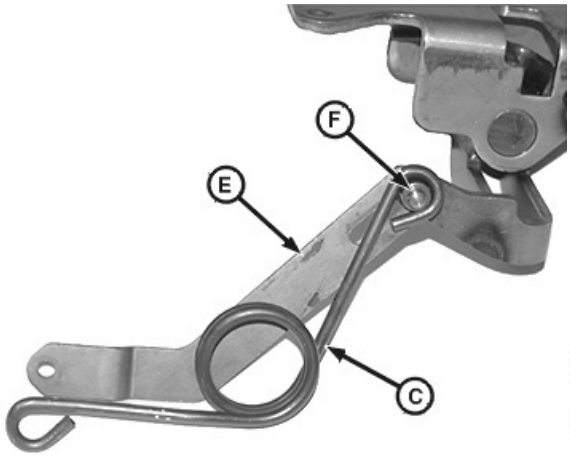
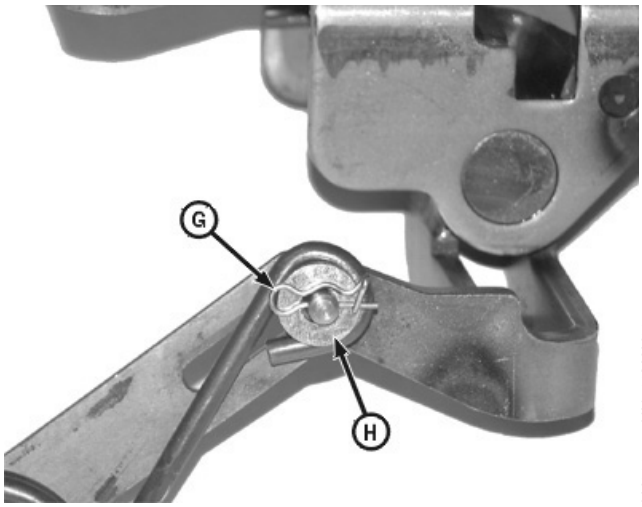


LV7327 –UN–10MAY02



LV6994 –UN–10MAY02



LV6995 –UN–10MAY02

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NOTE: Only one arm of tension spring (C) has an offset (D). This arm with the offset (D) must be connected to the pin on new cam inside transmission and the straight arm on tension spring (C) connected to pin (B) on park guide assembly (A).

11. Install arm (E) and bushing (F).

12. Install tension spring (C) with offset (D) on opposite end of bushing (F) as shown in photo.

13. Install washer (H) and spring pin (G).

A—Park Guide Assembly
B—Pin
C—Tension Spring
D—Offset
E—Arm
F—Bushing
G—Spring Pin
H—Washer

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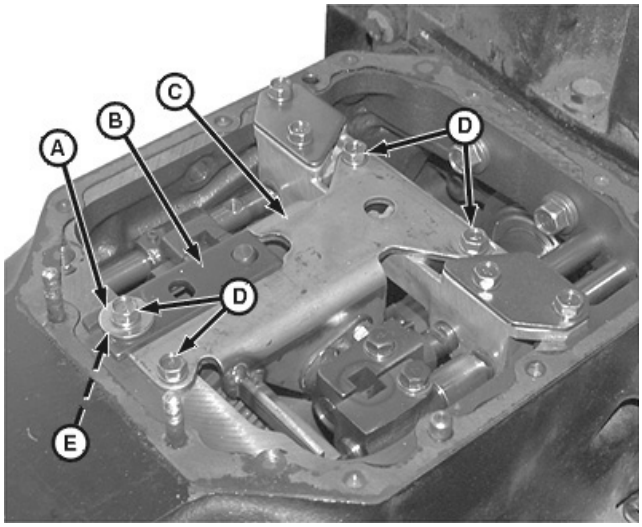
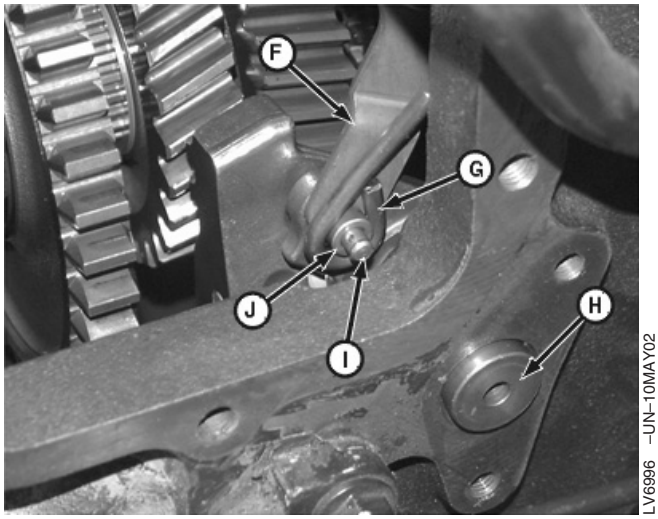


LV7923 –UN–10MAY02



LV6996 –UN–10MAY02

14. Install park guide assembly (C).

15. Install collar (E), link plate (B) and washer (A).

16. Install cap screws (D). Tighten cap screws to specification

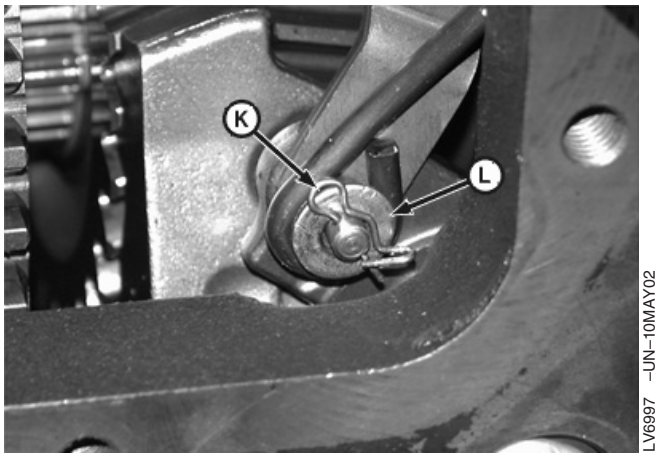
Specification

Park Guide Cap Screws—Torque..... 27 N•m (20 lb-ft)

17. Push inward on cam (H) and connect arm (F) to pin (I).

18. Install bushing (J) on pin (I). Install tension spring (G) on bushing.

19. Install washer (L) and spring pin (K). Make sure spring pin (K) is hooked, as shown in photo.



LV6997 –UN–10MAY02

A—Washer
B—Link Plate
C—Park Guide Assembly
D—Cap Screw (4 used)
E—Collar
F—Arm
G—Tension Spring
H—Cam
I—Pin
J—Bushing
K—Spring Pin
L—Washer

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16
35

Continued on next page

LV,5016HA,A53 –19–21NOV02–6/18

NOTE: Make sure shift forks (B and C) are in neutral position as shown in photo.

20. Install new gasket (A).

21. Position the range and gear shift levers in neutral to aid during alignment of transmission top cover (D).

22. Install transmission top cover (D) using cap screws (E) and nuts (F). Do not tighten mounting at this time.

23. Move range and gear shift levers in all positions to check for smooth and correct operation. If range and gear shift levers do not operate correctly, remove transmission top cover and realign shift levers into shift forks.

24. Install cap screws (E) and nuts (F), if removed. Tighten cap screws and nuts to specification.

Specification

Transmission Top Cover
Mounting Hardware—Torque ..... 27 N•m (20 lb-ft)

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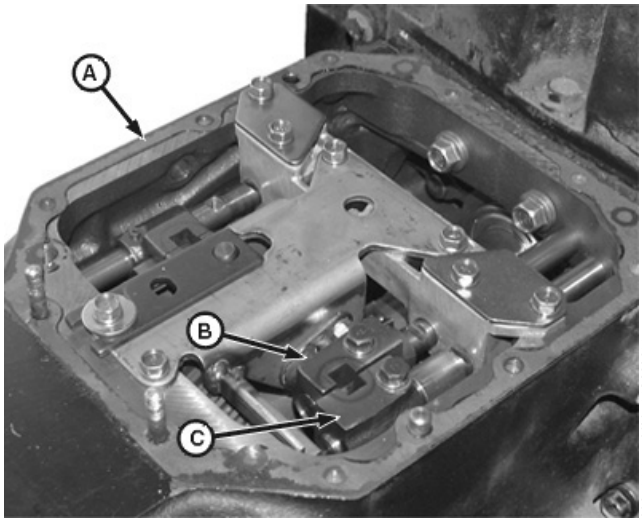
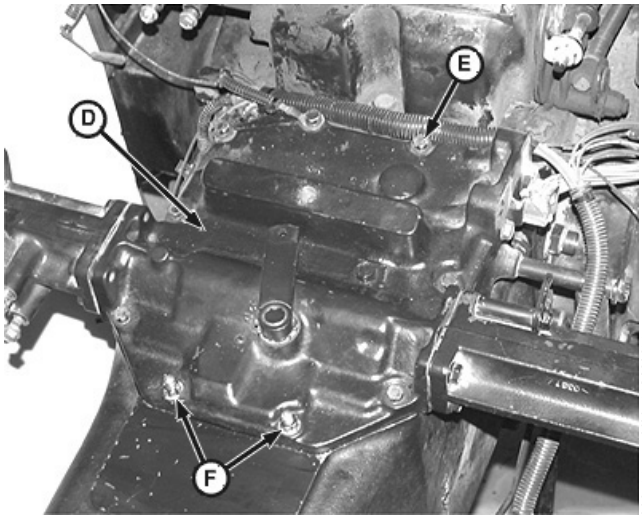
36

A—Gasket
B—Shift Fork
C—Shift Fork
D—Transmission Top Cover
E—Cap Screw (7 used)
F—Nut (2 used)



LV7924 –UN–13MAY02

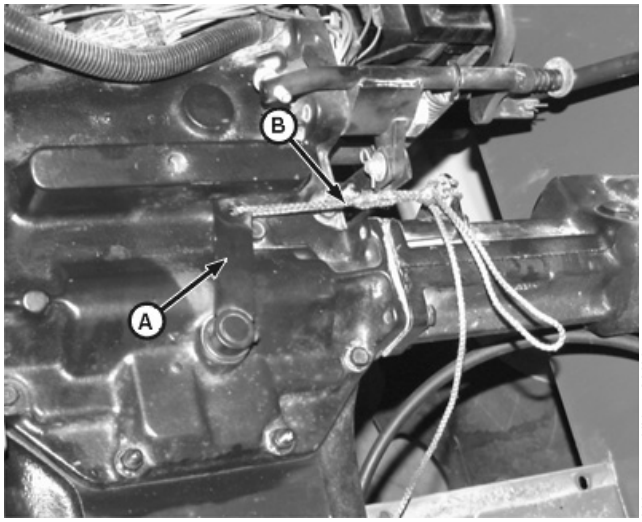


LV7067 –UN–13MAY02

LV,5016HA,A53 –19–21NOV02–7/18

25. Position and hold the park brake engagement lever (A) against the internal stop (toward the left side of tractor) using a length of rope or wire (B)

A—Park Brake Engagement Lever
B—Length of Rope or Wire



LV6511 –UN–15MAY02

Park Brake Engagement Lever

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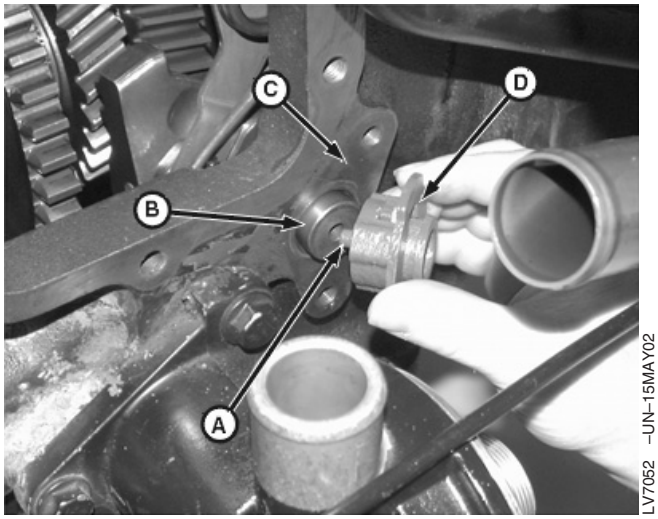
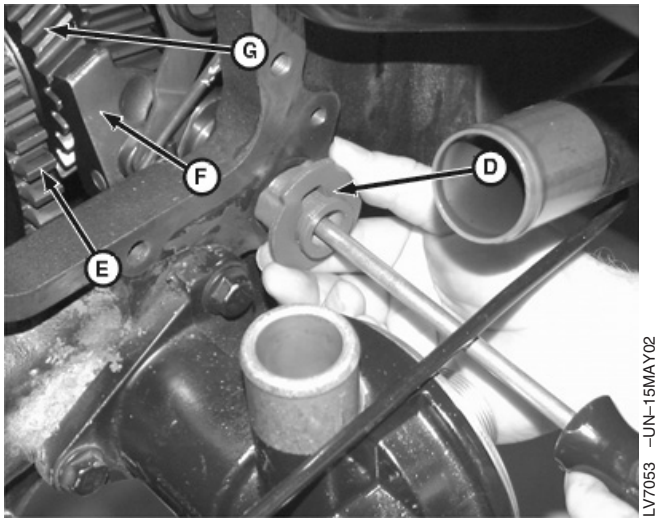
LV,5016HA,A53 –19–21NOV02–8/18



LV7052 –UN–15MAY02



LV7053 –UN–15MAY02

26. Make sure machined surface (C) is clean to achieve proper measurement.

27. Position shim gauge (D) over camshaft (B) with pin (A) inserted in center hole of camshaft.

28. Hold shim gauge (D) in position and apply inward force in center of shim gauge, using a tool with a flat or blunt end, as shown in photo.

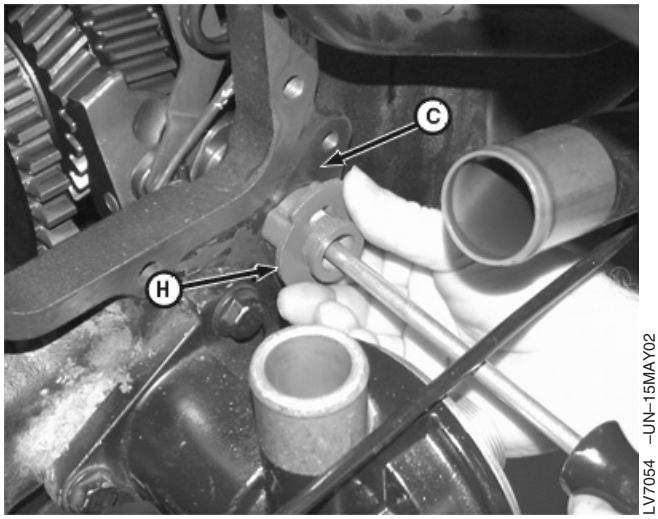
29. Make sure park pawl (F) is fully engaged in gear (G) by rotating the “A” range gear (E).

30. While applying inward force, slide outer collar (H) of shim gauge forward until seated against machined surface (C) of transmission housing.

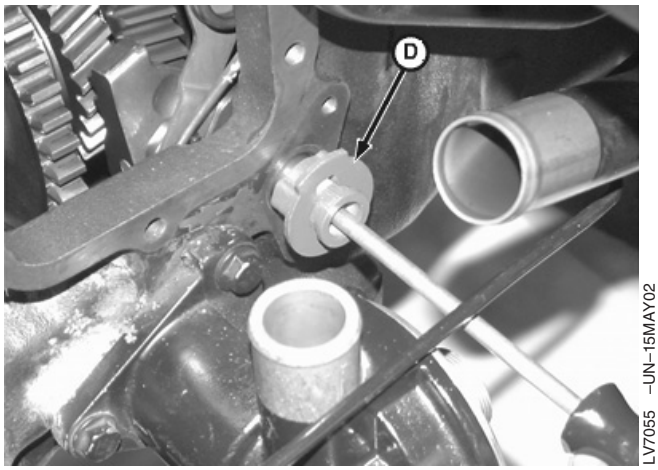
31. Remove fingers from shim gauge (D). Slowly and evenly remove the inward force applied to center of shim gauge by the tool with flat or blunt end.

32. Carefully remove shim gauge from cam shaft. Make sure not to move the shim gauge during removal; this could affect the shim gauge setting.

A—Pin
B—Camshaft
C—Machined Surface
D—Shim Gauge
E—A Range Gear
F—Park Pawl
G—Gear
H—Outer Collar



LV7054 –UN–15MAY02



LV7055 –UN–15MAY02

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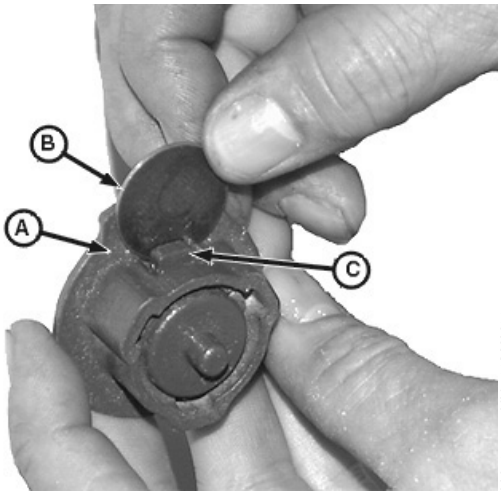
33. Install shims (B) one at a time, as necessary, between tab (C) and collar flange (A) on shim gauge. Do not force shims in gauge. Retain shims for installation into park cam cover.

A—Collar Flange
B—Shims (as required)
C—Tab



LV7056 –UN–13MAY02

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LV,5016HA,A53 –19–21NOV02–10/18

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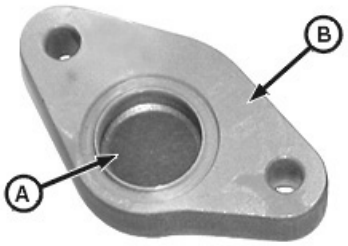
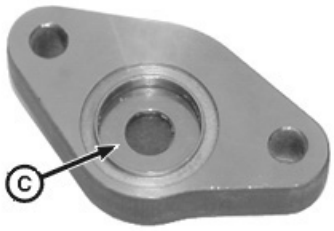


LV7002 –UN–15MAY02

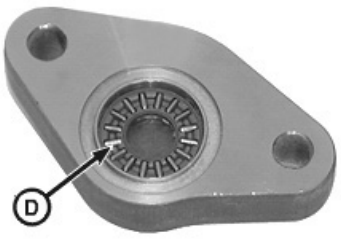


LV7003 –UN–15MAY02

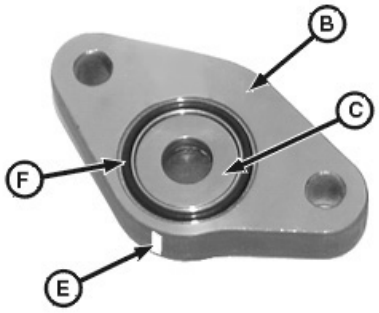
34. Install shims (A) from shim gauge setting in park cam cover (B).
35. Install one thrust washer (C) on top of shims.
36. Apply multi-purpose grease to both sides of needle bearing (D).
37. Install needle bearing (D) on top of thrust washer.
38. Install remaining thrust washer (C) on top of bearing.

IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

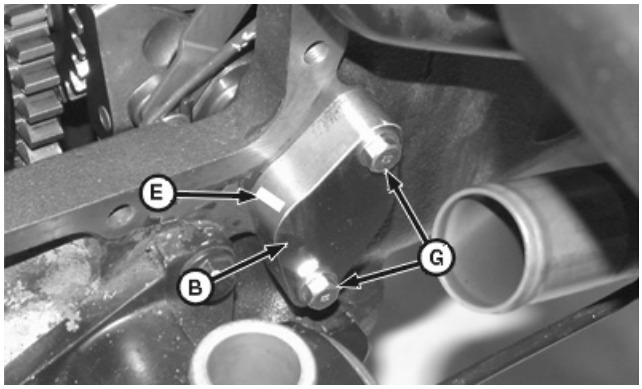
39. Apply multi-purpose grease to O-ring groove.
40. Install O-ring (F) in park cam cover (B).
41. Place a mark (E) on side edge of cover (B) closest to O-ring as, shown in photo, to aid during installation.
42. Remove rope or wire used to hold the park brake engagement lever in position.
43. Install park cam cover (B) with mark (E) made earlier facing rear of tractor. Make sure O-ring stays in position during installation.



LV7004 –UN–15MAY02



LV7005 –UN–15MAY02



LV7057 –UN–15MAY02

A—Shim (as required)
B—Park Cam Cover
C—Thrust Washer (2 used)
D—Needle Bearing
E—Mark
F—O-Ring
G—Cap Screw (2 used)

Continued on next page

LV,5016HA,A53 –19–21NOV02–11/18

44. Install cap screws (G). Tighten cap screws to specification.

Specification

Park Cam Cover Cap Screws—
Torque ..... 27 N•m (20 lb-ft)

45. Install clutch housing to transmission. (See Install Clutch Housing to Transmission in this group.)

LV,5016HA,A53 –19–21NOV02–12/18

46. Position park cable (B) in rear mounting bracket (A), located behind range shift lever housing.

47. Center bulkhead nuts (C) on threaded end of cable. Tighten two bulkhead nuts (C) on both sides of bracket (A) securely.

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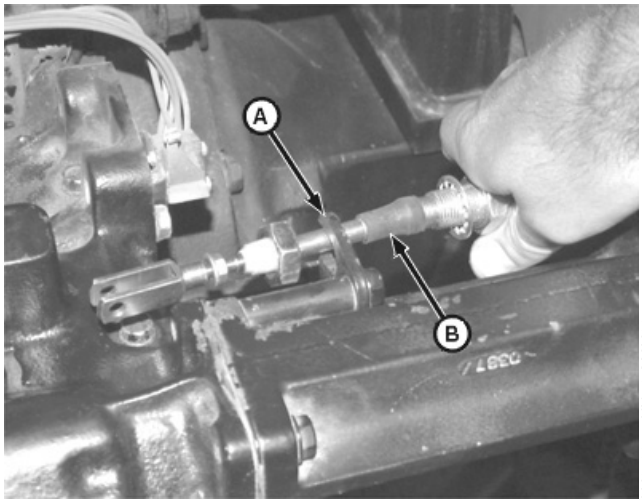
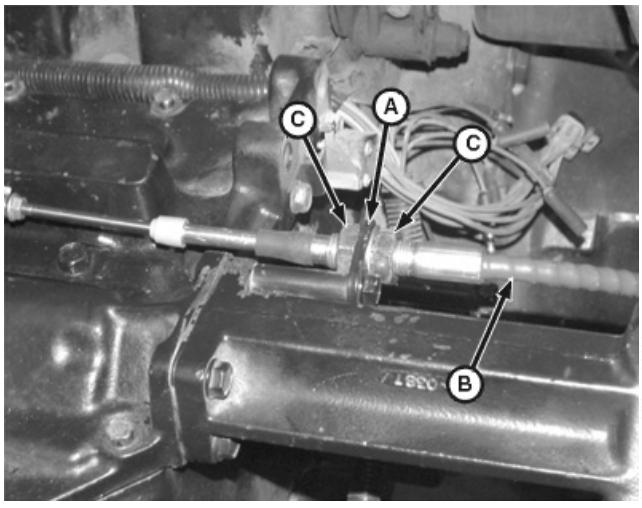
A—Bracket
B—Park Cable
C—Bulkhead Nut (2 used)



LV6583 –UN–15MAY02



LV7324 –UN–15MAY02

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LV,5016HA,A53 –19–21NOV02–13/18

48. Position and hold the control lever (A) in the bottom of park slot using a screwdriver as a wedge.

49. Position and hold park engagement lever (G) fully engaged to the left side of tractor using a vice grip (F).

50. Pull park cable (D) toward park engagement lever (G) to remove any slack in cable.

51. Turn yoke (E) on park brake cable (D) until hole in yoke aligns with hole in park engagement lever (G). Shorten cable by turning yoke (E) four full turns clockwise.

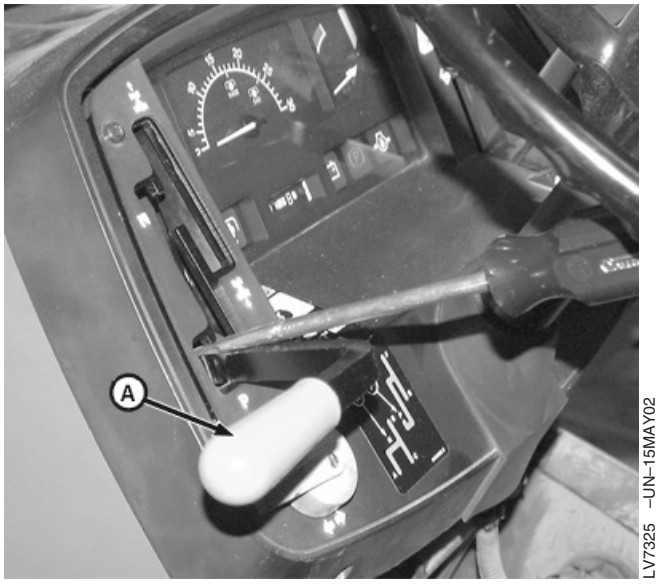
52. Remove vice grip from park engagement lever and screwdriver from control lever.

53. Position control lever in neutral.

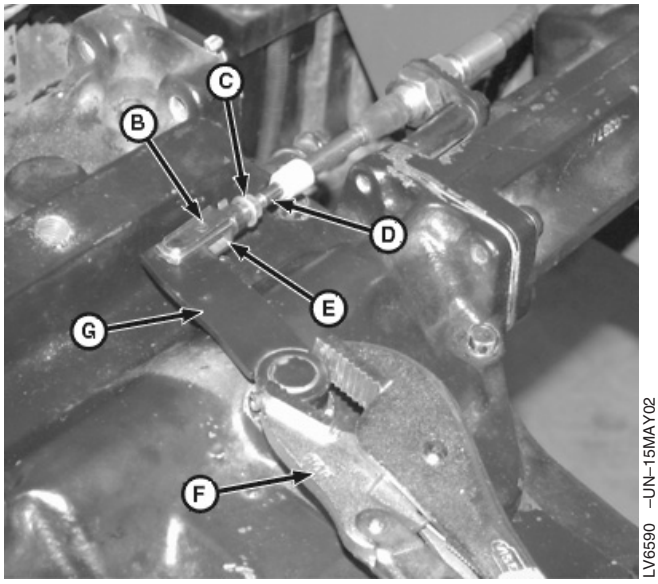
54. Install spring locking pin (B).

55. Tighten jam nut (C) against back of yoke (E).

A—Control Lever
B—Spring Locking Pin
C—Jam Nut
D—Park Cable
E—Yoke
F—Vice Grip
G—Park Engagement Lever



LV7325 –UN–15MAY02



LV6590 –UN–15MAY02

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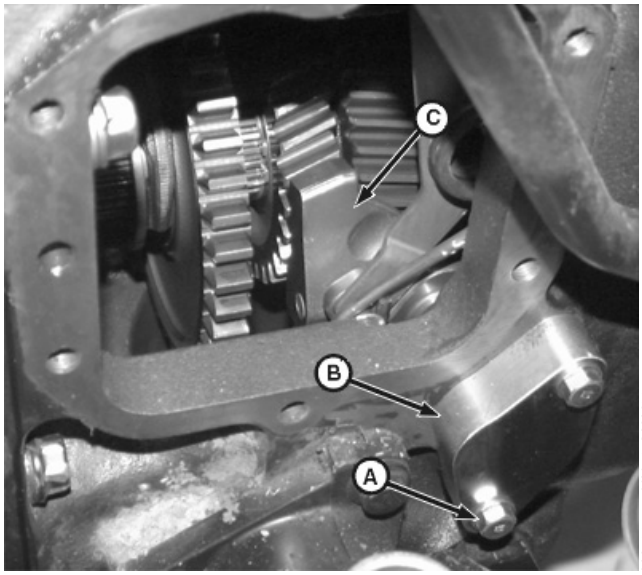
LV,5016HA,A53 –19–21NOV02–14/18

56. Move control lever from neutral to park position six or seven times. Leave control lever in park position and verify the following items

    - Make sure park pawl (C) has movement by pushing inward on park pawl (C). If park pawl has no movement, recheck shimming process with shim gauge.
    - If park pawl still has no movement after rechecking shimming process, remove park cam cover (B) and remove one shim from cover.
    - Install park cam cover and tighten cap screws (A) to specification. Recheck park pawl for movement by pushing inward on park pawl (C).

Specification

Park Cam Cover Cap Screws—
Torque ..... 27 N•m (20 lb-ft)



LV7925 –UN–15MAY02

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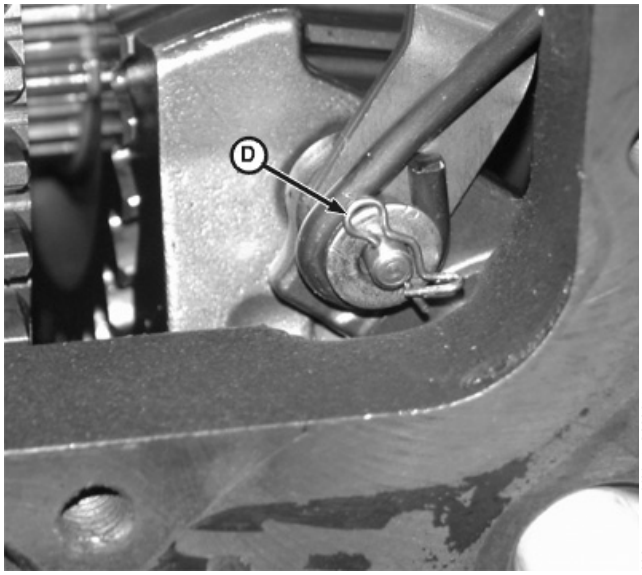
57. Shift control lever to neutral and check spring pin (D) remains installed, as shown in photo

A—Cap Screw (2 used)
B—Park Cam Cover
C—Park Pawl
D—Spring Pin



LV7926 –UN–15MAY02

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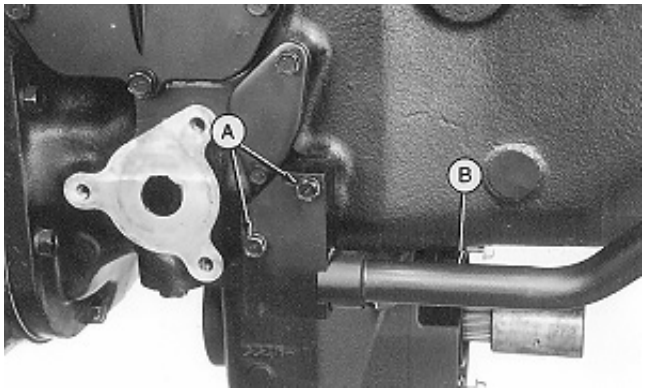
LV,5016HA,A53 –19–21NOV02–15/18

58. Install hydraulic reverser supply line (B) and cap screws (A).

59. Install MFWD drop gearbox, if equipped. (See Remove and Install MFWD Drop Gearbox in Group 35.)

60. Install side cover or, if equipped, the creeper assembly. (See Remove and Install Creeper Assembly in Group 40.)

61. Install hydraulic oil filter assembly. (See Remove and Install Hydraulic Filter/Manifold—Early Model or Remove and Install Hydraulic Filter/Manifold—Later Model in Section 70, Group 05.)



A—Cap Screw (2 used)
B—Hydraulic Reverser Supply Line

LV,5016HA,A53 –19–21NOV02–16/18

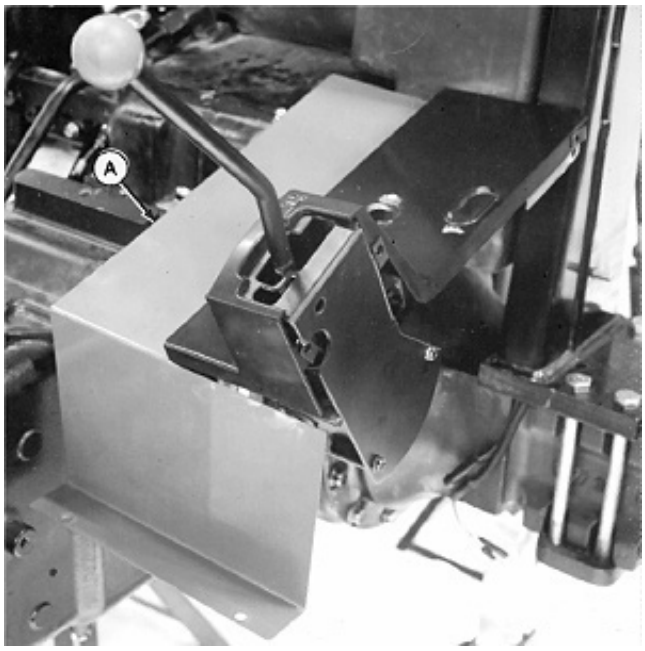
62. Tractors without cab: install left-hand control console (A).

NOTE: Long PTO rod assembly is installed after left-hand step.

63. Install PTO lever and linkage. (See Remove, Inspect and Install Rear PTO Lever and Linkage in group 20.)

64. Install MFWD lever and linkage, if equipped. (See Inspect and Repair MFWD Lever and Linkage in Group 35.)

65. Tractors with cab: install left and right control consoles and support plate. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)



Left-Hand Side

A—Left-Hand Control Console

Continued on next page

LV,5016HA,A53 –19–21NOV02–17/18

66. Install brake line (D).

67. Install SCV joystick and cable assembly (C) if equipped. (See Inspect and Repair Joystick and Linkage—Without Cab or Inspect and Repair Joystick and Linkage—With Cab in Section 70, Group 15.)

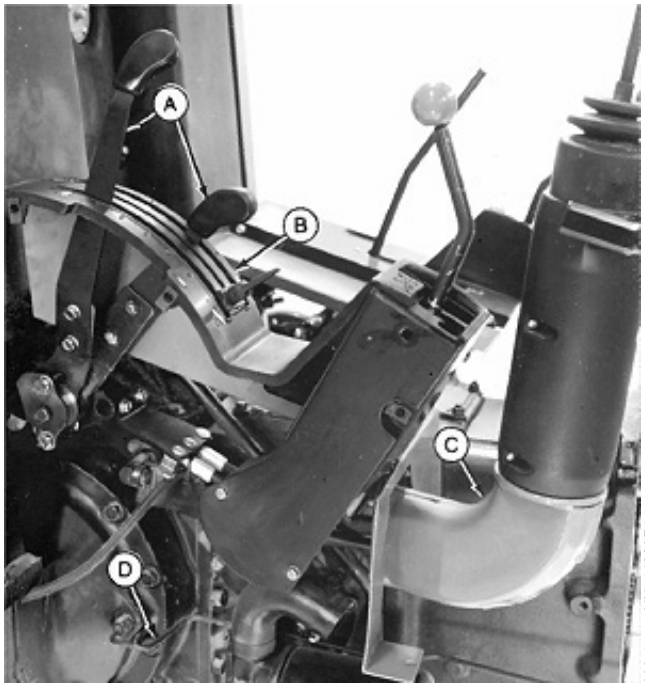
68. Tractors without cab: install right-hand control console (B).

69. Install rockshaft control lever (A).

70. Install cab if equipped. (See Cab Remove and Install in Section 90, Group 15.)

71. Tractors without cab: install fenders and rear wheels.

A—Rockshaft Levers
B—Right-Hand Control Console
C—SCV Joystick and Cable Assembly
D—Brake Line



LV527 –UN–03MAR92

Right-Hand Side

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LV,5016HA,A53 –19–21NOV02–18/18

Disassemble, Inspect, and Assemble Gear Shift Shaft Assemblies

1. Remove shift shaft assemblies (B and C) from transmission bottom shaft (A).

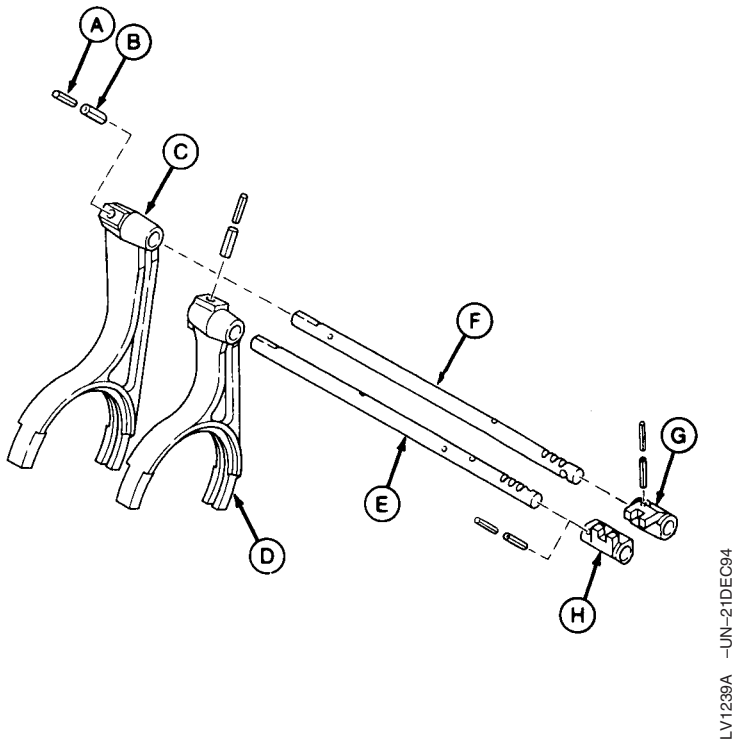
A—Transmission Bottom Shaft
B—Shift Shaft Assembly
C—Shift Shaft Assembly

LV1248 –UN–21DEC94

Bottom Shaft Synchronized

Continued on next page

AG,OUO1085,173 –19–21AUG00–1/2



A—Small Spring Pin (4 used)
B—Large Spring Pin (4 used)
C—1st and 2nd Gear Shift Fork
D—3rd and 4th Gear Shift Fork
E—3rd and 4th Gear Shift Shaft
F—1st and 2nd Gear Shift Shaft
G—1st and 2nd Gear Shift Yoke
H—3rd and 4th Gear Shift Yoke

2. Mark position and location of yokes (G and H) and forks (C and D) on shafts to aid in assembly.
3. Drive out spring pins (A and B).
4. Disassemble parts.
5. Inspect parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

IMPORTANT: Install pins (A) inside pins (B) with splits facing 180° from each other.

6. Assemble all parts.
7. Install shift shaft assemblies to transmission bottom shaft.

AG,OUO1085,173 –19–21AUG00–2/2

Disassemble, Inspect, and Assemble Transmission Bottom Shaft

1. Remove 1st and 2nd gear shift shaft assembly (B) and 3rd and 4th gear shift shaft assembly (C) from transmission bottom shaft (A).

A—Transmission Bottom Shaft
B—1st and 2nd Gear Shift Shaft Assembly
C—3rd and 4th Gear Shift Shaft Assembly

LV1248 –UN–21DEC94

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AG,OUO1085,174 –19–28JUN02–1/4

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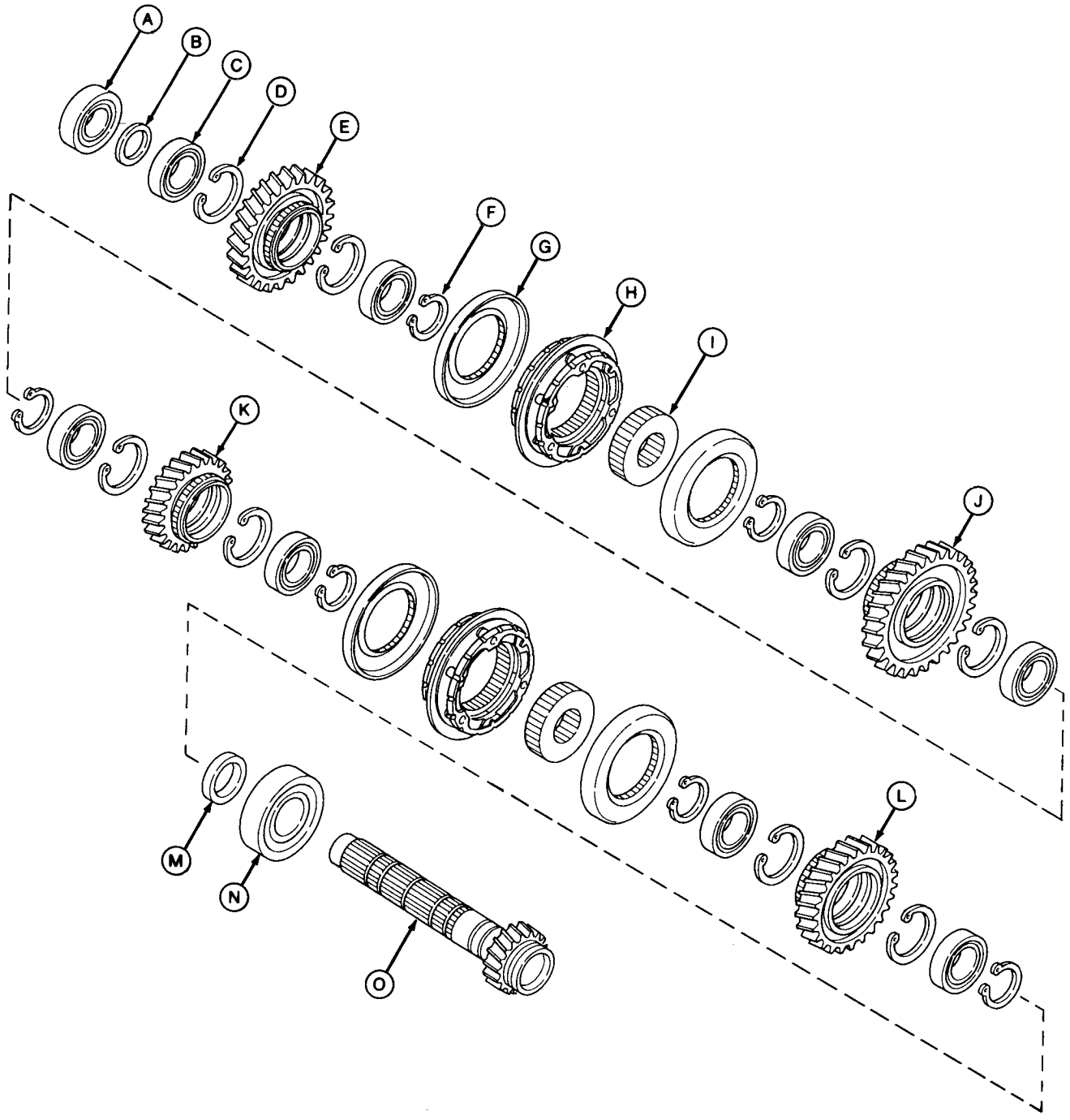


LV1240A –UN–21DEC94

A—Bearing
B—Spacer
C—Bearing (8 used)
D—Snap Ring (8 used)
E—2nd Speed Driven Gear
F—Snap Ring (6 used)
G—Cup
H—Synchronizer
I—Spline Collar
J—1st Speed Driven Gear
K—4th Speed Driven Gear
L—3rd Speed Driven Gear
M—Collar
N—Bearing
O—Driven Shaft

Continued on next page

AG,OUO1085,174 –19–28JUN02–2/4

NOTE: Bearings (A and N) are press fit on shaft (O). Use a knife-edged puller and a press to remove bearings.

To aid in assembly, keep parts together and in proper sequence as the gear cluster is disassembled.

2. Remove parts (B—M).

AG,OUO1085,174 –19–28JUN02–3/4

3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Apply Moly High Temperature EP Grease to ID of gears (E, J, K, and L).

5. Install all parts.

6. Install bearings (A and N) using a bushing, bearing, and seal driver set and a press.

7. Install shift shaft assemblies to the transmission bottom shaft.

LV1254 –UN–21DEC94

AG,OUO1085,174 –19–28JUN02–4/4

Disassemble, Inspect, and Assemble Range Reduction Shaft

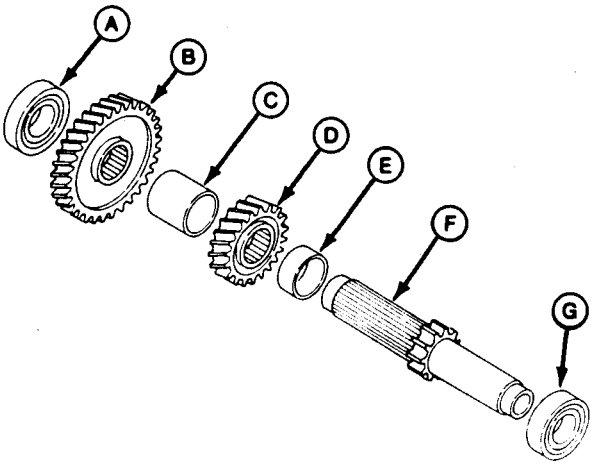
NOTE: Bearings (A and G) are press fit on shaft.

1. Remove bearings (A and G) using a knife-edged puller and a press.
2. Remove all parts.
3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Install all parts.

   Install bearings (A and G) using a bearing, bushing, and seal driver set and a press.



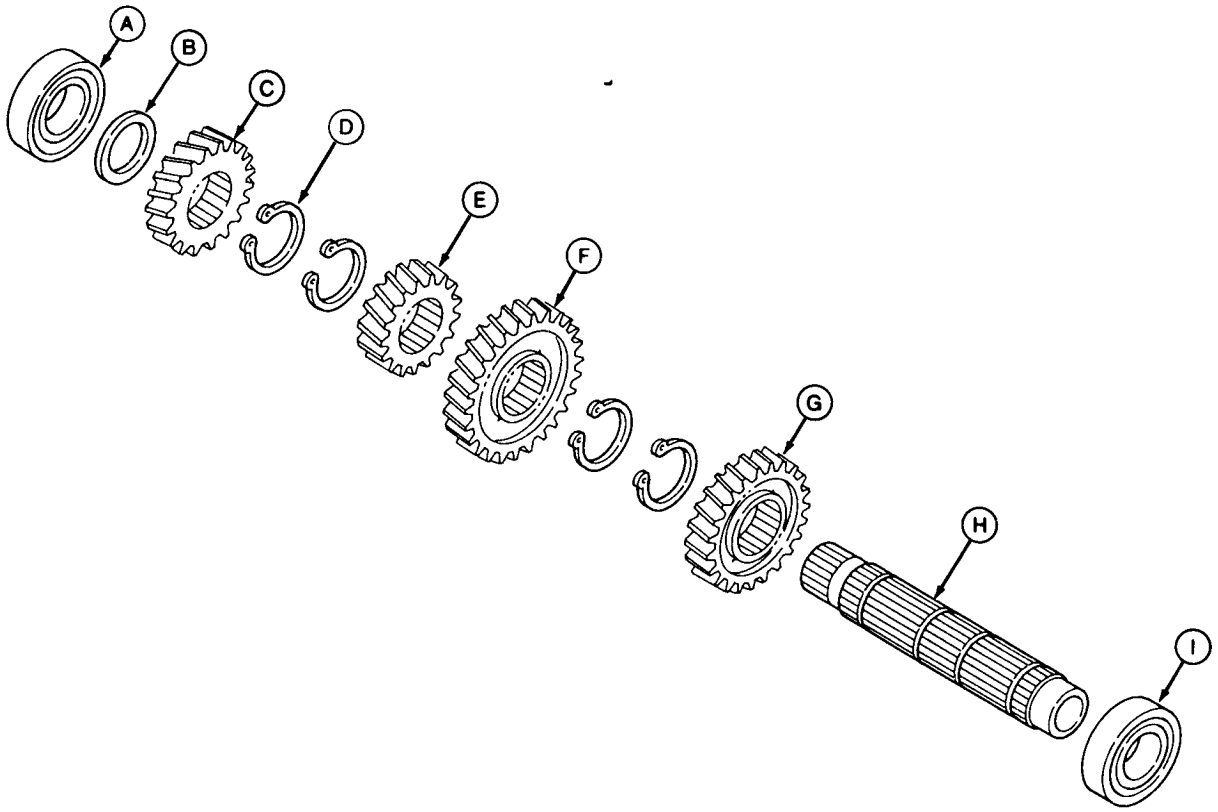
LV478A –UN–03MAR92

LV477 –UN–03MAR92

A—Bearing
B—Range Reduction Drive Gear
C—Collar
D—2nd Range Drive Gear
E—Collar
F—Range Reduction Shaft
G—Bearing

AG,OUO1085,176 –19–21AUG00–1/1

Disassemble, Inspect, and Assemble Top Shaft



LV1241A –UN–21DEC94

NOTE: Bearings (A and I) are press fit on shaft (H).

1. Remove bearing (A) using a knife-edged puller and a press.
2. Remove parts (B—G).
3. Remove bearing (I) using a knife-edged puller and a press.
4. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

5. Install bearing (I) using a bushing, bearing, and seal driver set and a press.
6. Install all parts.

LV1255 –UN–21DEC94

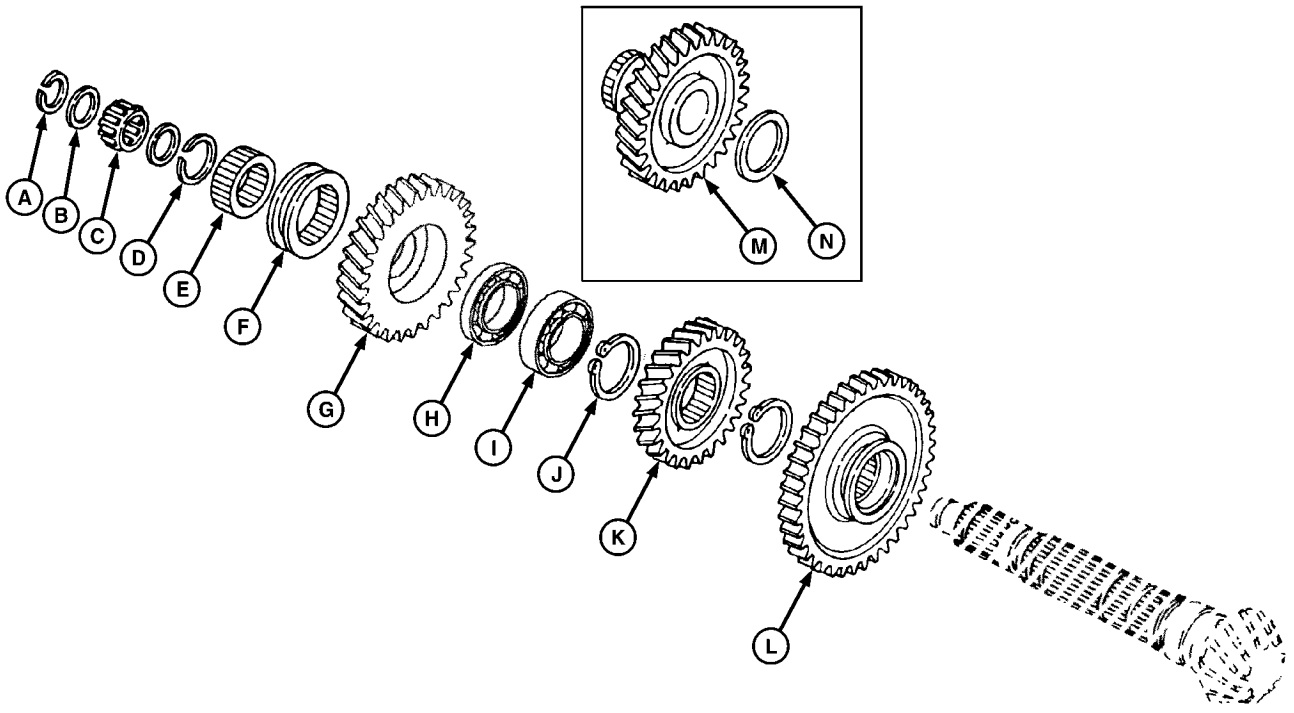
A—Bearing
B—Washer
C—2nd Speed Drive Gear
D—Snap Ring (4 used)
E—1st Speed Drive Gear
F—4th Speed Drive Gear
G—3rd Speed Drive Gear
H—Shaft
I—Bearing

Continued on next page

Install bearing (A) using a bearing, bushing, and seal driver set and a press.

AG,OUO1085,177 –19–21AUG00–2/2

Remove, Inspect, Install MFWD and Range Gears



LV480A –UN–09MAY02

NOTE: If it is necessary to remove the entire shaft, see Remove and Inspect Differential Drive Shaft in Group 25.

1. Remove transmission. (See Remove Transmission in this group.)
2. Remove parts (A—N).
3. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

4. Apply Moly High Temperature EP Grease to ID of gear (G).
5. Install all parts.
6. Install transmission.

LV498 –UN–03MAR92

A—Snap Ring
B—Washer (2 used)
C—Bearing
D—Snap Ring
E—Collar
F—B and C Range Shift Collar
G—B Range Driven Gear (Later Models)
H—Bearing (Later Models)
I—Bearing (Later Models)
J—Snap Ring (2 used)
K—MFWD Gear
L—A Range and Creeper Shift Sliding Gear
M—B Range Driven Gear (Early Models)
N—Washer (Early Models)

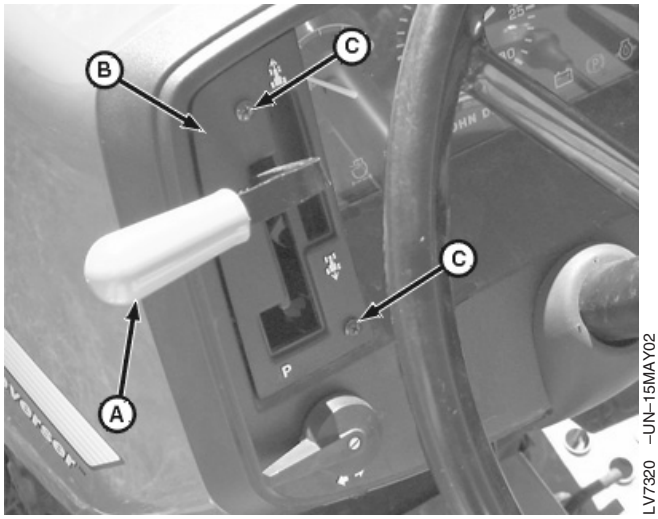
AG,OUO1085,178 –19–28JUN02–1/1

Remove, Inspect and Replace Hydraulic Reverser Control Lever

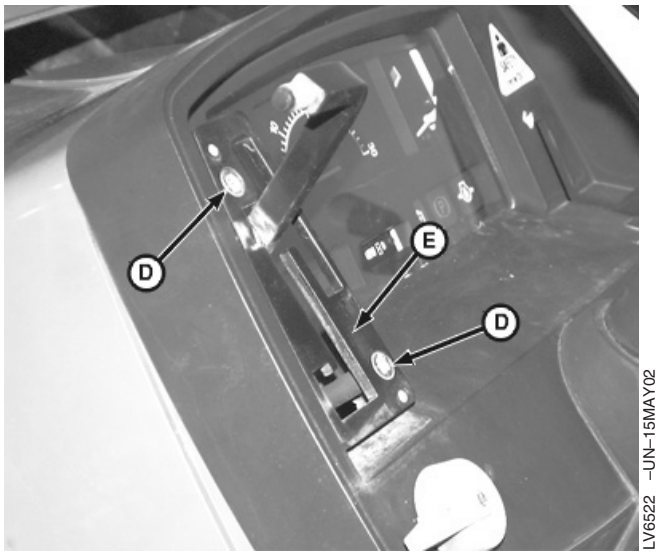
NOTE: Tractor without cab show. Tractors with cab are similar.

1. Remove knob (A), screws (C) and shift guide cover (B).
2. Remove screws (D) and shift guide plate (E).
3. Remove left-side control console and panel. (See Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15 or Remove and Install Left-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06.)

A—Knob
B—Shift Guide Cover
C—Screw (2 used)
D—Screw (2 used)
E—Shift Guide Plate



LV7320 –UN–15MAY02



LV6522 –UN–15MAY02

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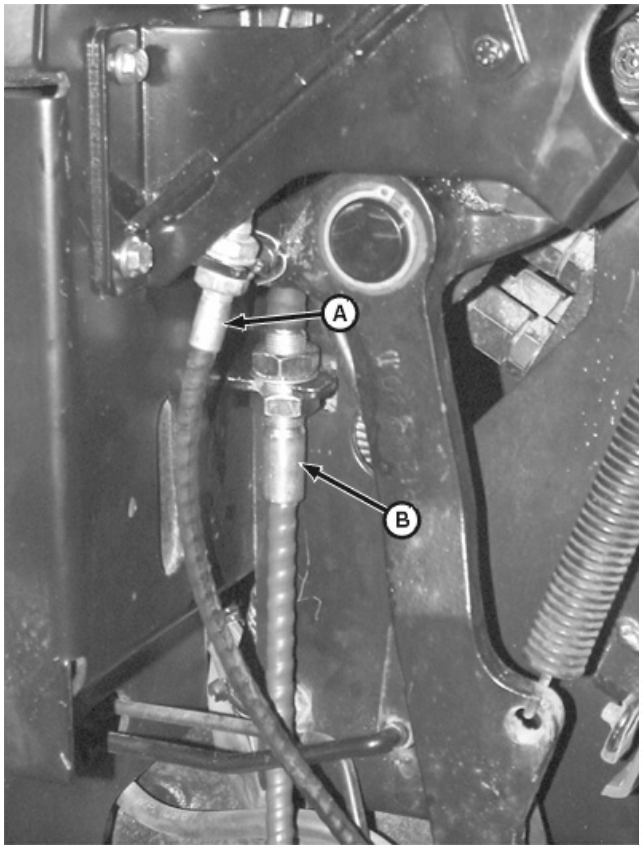
OUO1020,0001211 –19–14NOV02–1/4

4. Disconnect park cable (B) and F-N-R cable (A) from control lever.

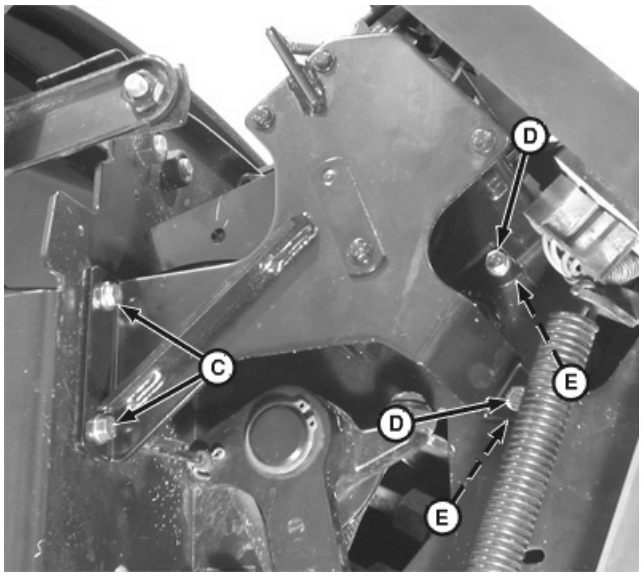
5. Remove cap screws, nuts and washers (C, D and E).

6. Remove control lever assembly. Inspect for wear or damage, replace if necessary.

A—F-N-R Cable
B—Park Cable
C—Cap Screw and Nut (2 used)
D—Cap Screw and Nut (2 used)
E—Washers



LV6584 –UN–15MAY02



LV6574 –UN–15MAY02

Continued on next page
OUO1020,0001211 –19–14NOV02–2/4

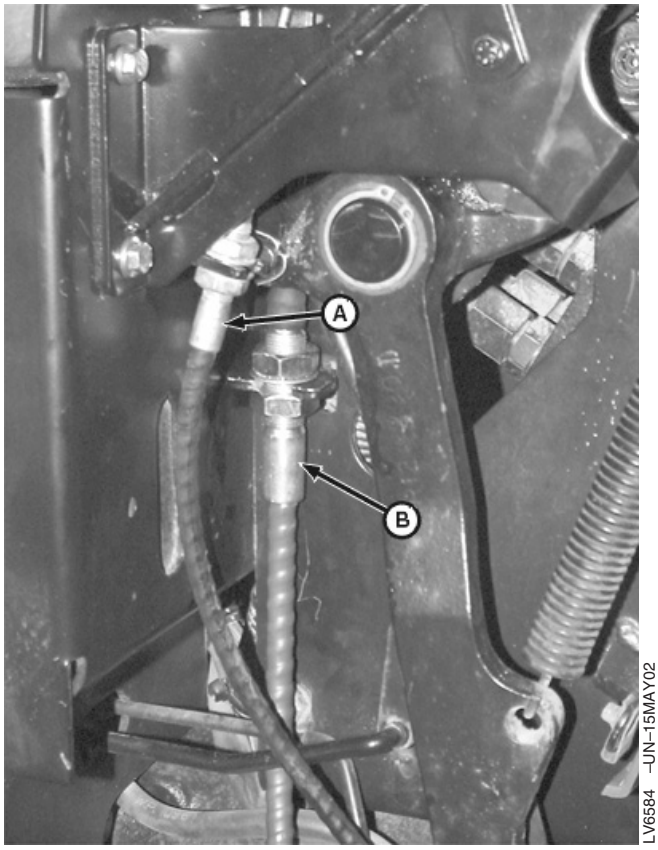
7. Install control lever assembly using cap screws, nuts and washers (C, D and E). Tighten cap screws and nuts to specification.

Specification

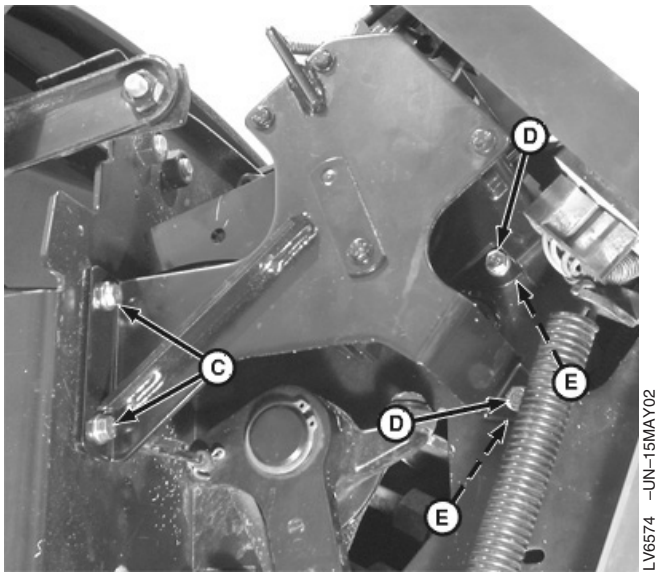
Hydraulic Reverser Control Lever—Torque ..... 17 N•m (12 lb-ft)

8. Connect park cable (B) and F-N-R cable (A) to control lever.

A—F-N-R Cable
B—Park Cable
C—Cap Screw and Nut (2 used)
D—Cap Screw and Nut (2 used)
E—Washers



LV6584 –UN–15MAY02



LV6574 –UN–15MAY02

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OUO1020,0001211 –19–14NOV02–3/4

9. Install shift guide plate (E) and screws (D). Tighten screws to specification.

Specification

Shift Guide Plate—Torque ..... 17 N•m (12 lb-ft)

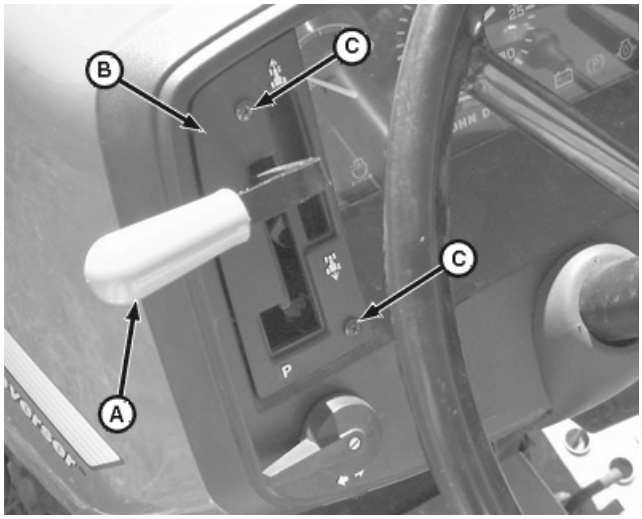
10. Install shift guide cover and screws (C).

11. Install dash panel.

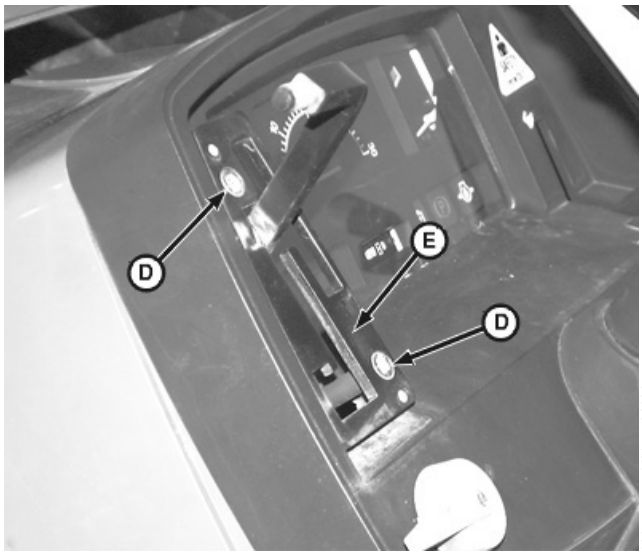
12. Adjust park brake cable. (See Park Brake Cable Adjustment in Section 250, Group 16.)

13. Adjust F-N-R cable. (See Forward-Neutral-Reverse Control Cable Adjustment in Section 250, Group 16.)

A—Knob
B—Shift Guide Cover
C—Screw (2 used)
D—Screw (2 used)
E—Shift Guide Plate



LV7320 –UN–15MAY02



LV6522 –UN–15MAY02

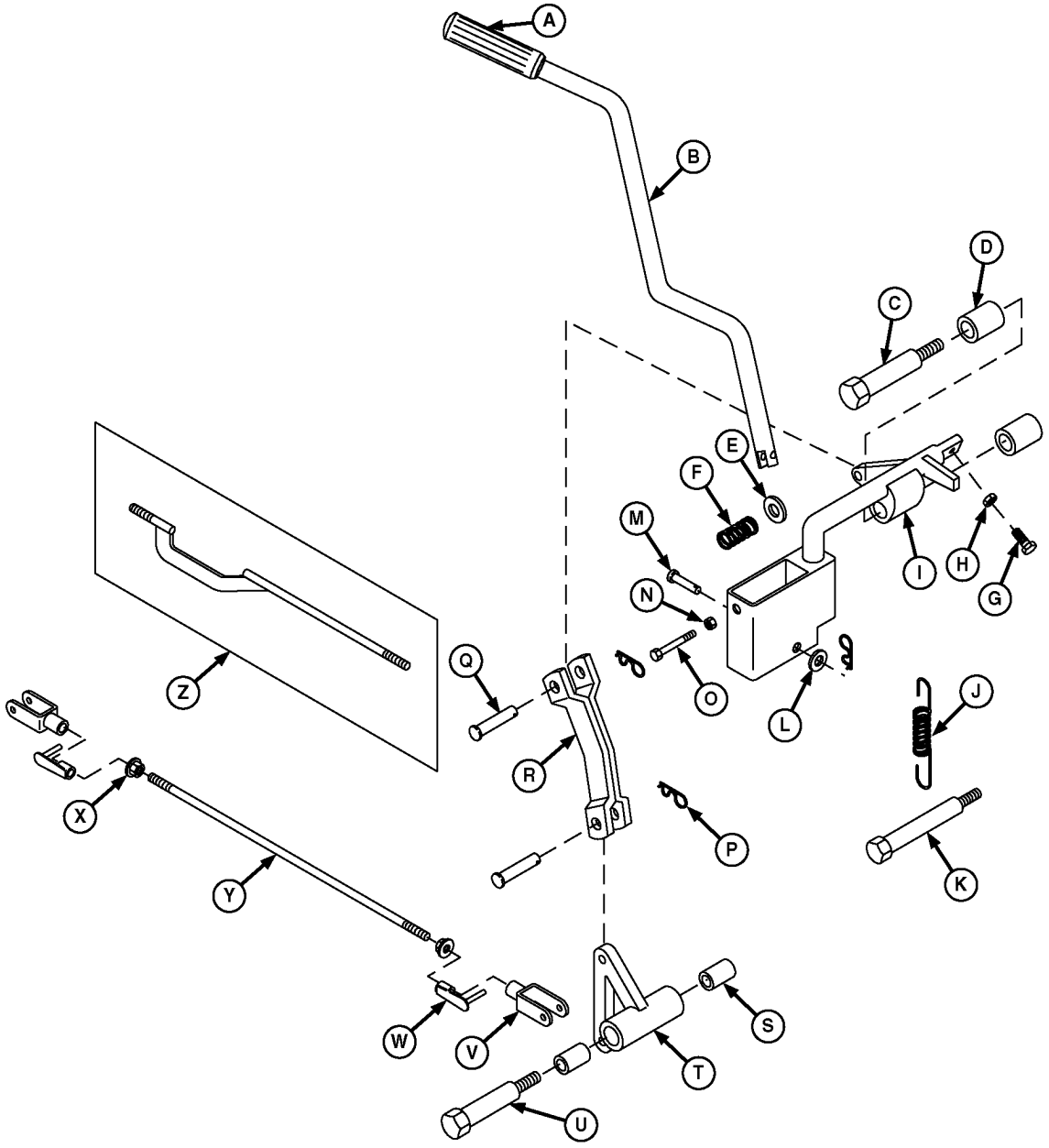
OUO1020,0001211 –19–14NOV02–4/4

Specifications

Item	Measurement	Specification
Wheel Cap Screws	Torque	175 N•m (130 lb-ft)
Rear PTO Drive Shaft Assembly Cap Screws	Torque	65 N•m (48 lb-ft)

OUO1043,0000EAE –19–28JUN02–1/1

Remove, Inspect and Install Rear PTO Lever and Linkage



Rear PTO Lever and Linkage

A—Knob
B—Rear PTO Lever
C—Shoulder Bolt
D—Bushing (2 used)
E—Washer
F—Compression Spring
G—Cap Screw
H—Nut
I—Hub
J—Extension Spring
K—Shoulder Bolt
L—Washer
M—Pin
N—Nut
O—Cap Screw
P—Retaining Ring (3 used)
Q—Pin (2 used)
R—Yoke
S—Bushing (2 used)
T—Bellcrank
U—Shoulder Bolt
V—Yoke (2 used)
W—Locking Pin (2 used)
X—Nut
Y—Rod
Z—Rod (used with PowrReverser™ only)

1. Tractors without cab: remove left rear wheel and fender.

Continued on next page

2. Tractors with cab: remove left control console and panel. (See Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)

NOTE: Bushings (D and S) are press fit. Remove bushings only if replacement is necessary.

3. Replace bushing (D or S) using a bearing, bushing, and seal driver set.

4. Inspect all parts for wear or damage. Replace as necessary.

5. Apply Moly High Temperature EP Grease to shaft of bolts (C and U).

6. Tractors without cab: install left fender and wheel.

7. Tractors with cab: install control console and support plate.

8. Tighten wheel cap screws to specification.

Specification

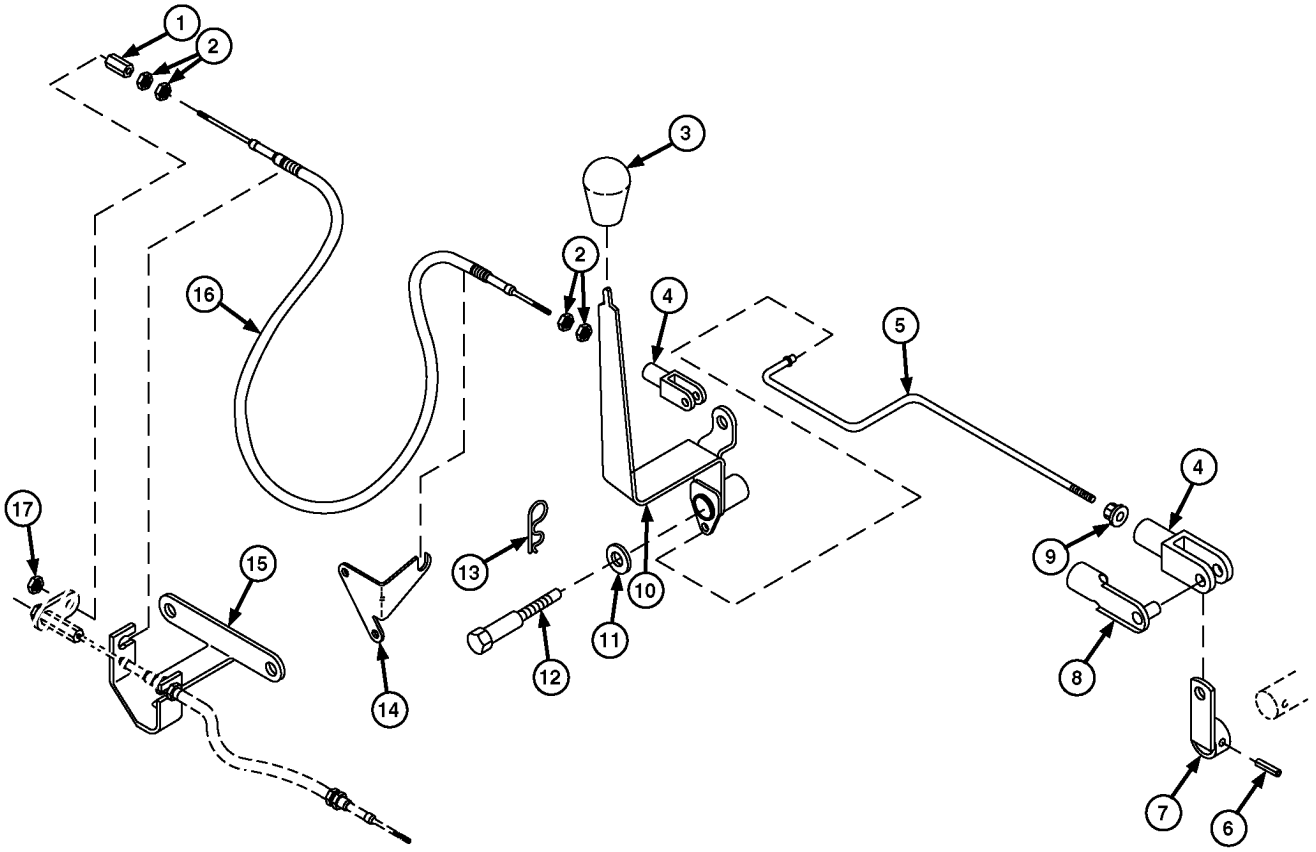
Wheel Cap Screws—Torque ..... 175 N•m (130 lb-ft)

9. Adjust PTO clutch lever. (See PTO Clutch Lever Adjustment in Section 250, Group 15.)

10. Adjust clutch pedal free play. (See Clutch Pedal Free Play Adjustment in Section 250, Group 15.)

AG,OUO1023,521 –19–28JUN02–2/2

Inspect and Repair PTO 540/540E Shift Lever and Linkage



LV2446 –UN–18DEC97

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1—Adjusting Nut
2—Jam Nut (2 used)
3—Knob
4—Yoke
5—Rod
6—Spring Pin
7—Arm
8—Locking Pin
9—Nut
10—Lever
11—Washer
12—Shoulder Bolt
13—Retainer Clip
14—Bracket
15—Bracket
16—Cable
17—Nut

1. Remove right rear wheel and fender.
2. Tractors with cab: remove left control console and panel. (See Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)
3. Tractors without cab: remove right step plate.
4. Inspect all parts for wear or damage. Replace as necessary.
5. Apply Moly High Temperature EP Grease to shaft of shoulder bolt (12).
6. Tractors without cab: install right step plate.
7. Tractors with cab: install left control console and panel.
8. Install right rear wheel and fender.

Continued on next page

AG,OUO1085,181 –19–28JUN02–1/2

9. Tighten wheel cap screws to specification.

Specification

Wheel Cap Screws—Torque ..... 176 N•m (130 lb-ft)

10. Adjust linkage. (See PTO 540/540E Lever and Linkage Adjustment in Section 250, Group 16.)

AG,OUO1085,181 –19–28JUN02–2/2

Remove and Install Standard Rear PTO Drive Shaft Assembly

NOTE: The approximate capacity of transmission/differential is 38 L (10 U.S. gal).

1. Drain transmission/differential.
2. Remove PTO shield.
3. Remove drawbar pin (B) and drawbar.
4. Remove ten cap screws (A), rear PTO drive shaft assembly, and gasket.

NOTE: Parts (D and C) may remove with rear PTO drive shaft assembly.

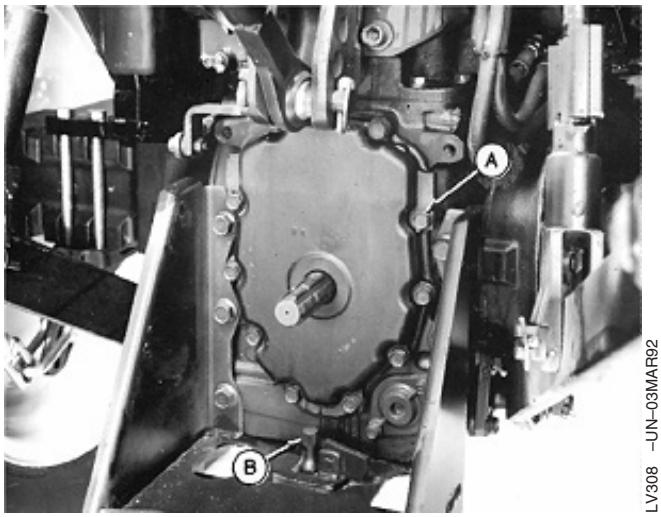
Rockshaft is removed for illustration purposes.

5. Make repairs as necessary. (See Disassemble, Inspect and Assemble Standard Rear PTO Drive Shaft Assembly in this group.)
6. Apply Moly High Temperature EP Grease to splined ends of intermediate shaft PTO pinion shaft (top shaft).
7. Install intermediate shaft and coupler.
8. Install rear PTO drive shaft assembly and new gasket. Tighten cap screws to specification.

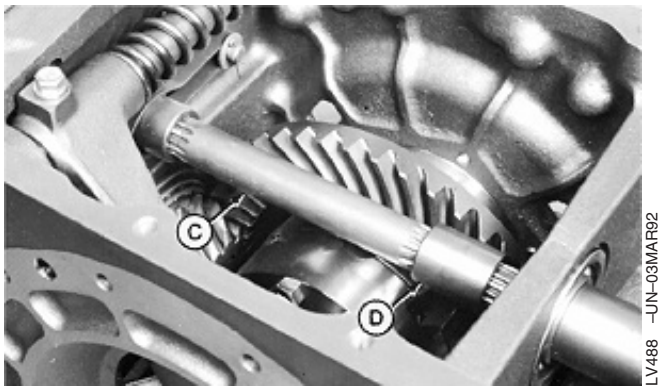
Specification

Rear PTO Drive Shaft Assembly
Cap Screws—Torque ..... 65 N•m (48 lb-ft)

9. Install drawbar and pin.
10. Install PTO shield.
11. Fill transmission/differential with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)



LV308 –UN–03MAR92



LV488 –UN–03MAR92

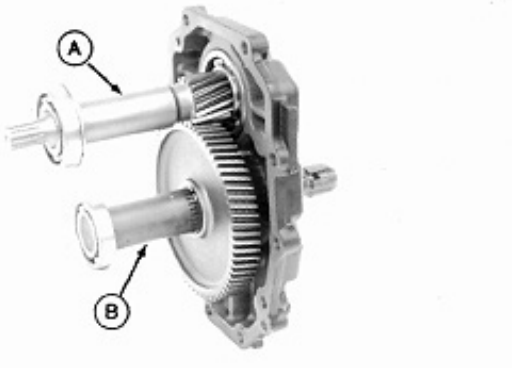
A—Cap Screw (10 used)
B—Drawbar Pin
C—Intermediate Shaft
D—Coupler

AG,OUO1085,182 –19–28JUN02–1/1

Disassemble, Inspect and Assemble Standard Rear PTO Drive Shaft Assembly

NOTE: Shaft assemblies are slip fit in cover.

1. Remove PTO output shaft assembly (B) from cover using a soft-faced hammer.
2. Remove PTO pinion shaft assembly (A).



LV309 –UN–03MAR92

A—PTO Pinion Shaft Assembly
B—PTO Output Shaft Assembly

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AG,OUO1085,183 –19–14NOV02–1/3

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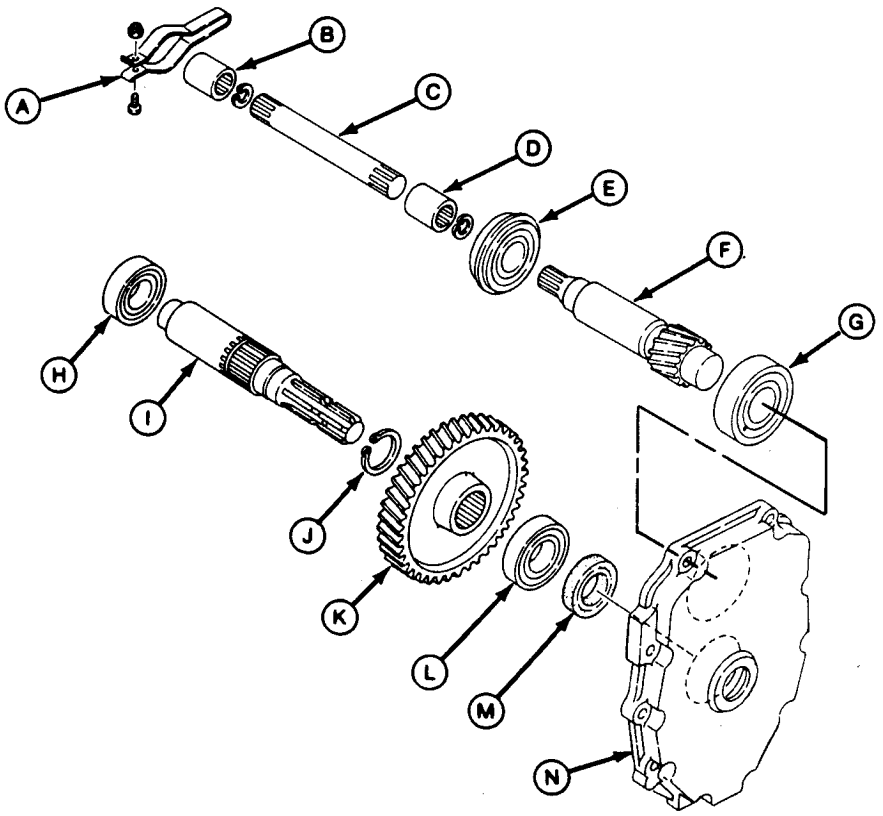

LV310A –UN–03MAR92

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A—Snubber
B—Coupler
C—Intermediate Shaft
D—Coupler
E—Bearing
F—Pinion Shaft
G—Bearing
H—Bearing
I—Output Shaft
J—Snap Ring
K—Drive Gear
L—Bearing
M—Seal
N—Cover

NOTE: Snubber (A) is mounted to differential housing. Coupler (B) is held in place by snubber. If replacement is necessary, remove rockshaft. (See Remove and Install Rockshaft Case in Section 70, Group 10.)

IMPORTANT: Replace seal. Damaged or used seal will leak.

3. Remove seal (M) using a screwdriver. Install seal into cover bore until it stops, using a bushing, bearing, and seal driver set.

NOTE: Bearing (L) is press fit on shaft.

4. Remove gear (K) and bearing (L) using a press.

5. Inspect parts (C—N) for wear or damage. Replace as necessary.

NOTE: Bearings (E, G, and H) are press fit. Remove bearings only if replacement is necessary.

6. Remove bearings (E, G, and H) using a knife-edged puller and a press.

7. Install new bearings (G and H) using a press.

NOTE: Install bearing (E) with flanged side toward pinion gear.

8. Install bearing (E) using a piece of pipe and a press.

9. Apply multipurpose grease to lips of seal.

10. Lubricate all parts with clean transmission/hydraulic oil.

Continued on next page

AG,OUO1085,183 –19–14NOV02–2/3

11. Assemble all parts.

AG,OUO1085,183 –19–14NOV02–3/3

Remove and Install 540/540E Rear PTO Drive Shaft Assembly

NOTE: The approximate capacity of transmission/differential is 38 L (10 U.S. gal).

1. Drain transmission/differential.
2. Remove PTO shield.
3. Remove drawbar pin (B) and drawbar.
4. Remove ten cap screws (A), rear PTO drive shaft assembly, and gasket.

NOTE: Parts (D and C) may come away with rear PTO drive shaft assembly.

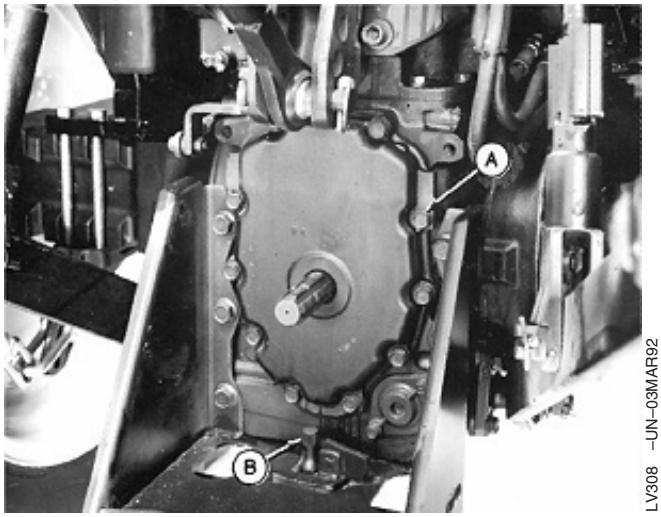
Rockshaft is removed for illustration purposes.

5. Make repairs as necessary. (See Disassemble, Inspect, and Assemble Rear 540/540E PTO Drive Shaft Assembly in this group.)
6. Apply Moly High Temperature EP Grease to splined ends of intermediate shaft and PTO pinion shaft (top shaft).
7. Install intermediate shaft and coupler.
8. Install rear PTO drive shaft assembly and new gasket. Tighten cap screws to specification.

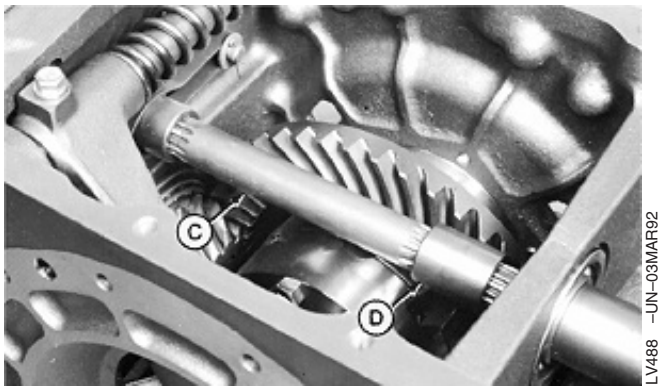
Specification

Rear PTO Drive Shaft Assembly	
Cap Screws—Torque	65 N•m (48 lb-ft)

9. Install drawbar and pin.
10. Install PTO shield.
11. Fill transmission/differential with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)



LV308 –UN–03MAR92



LV488 –UN–03MAR92

A—Cap Screw (10 used)
B—Drawbar Pin
C—Intermediate Shaft
D—Coupler

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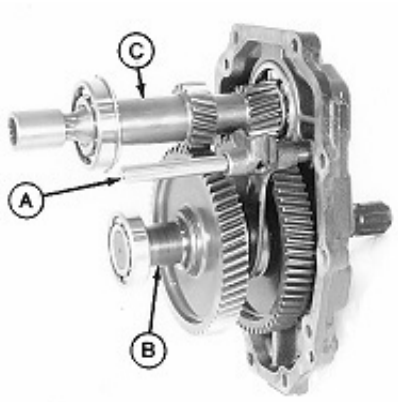
AG,OUO1085,184 –19–28JUN02–1/1

Disassemble, Inspect, and Assemble Rear 540/540E PTO Drive Shaft Assembly

NOTE: Shaft assemblies are slip fit in cover.

1. Remove shift fork assembly (A).
2. Remove PTO output shaft assembly (B) from cover using a soft-faced hammer.
3. Remove PTO pinion shaft assembly (C).

A—Shift Fork Assembly
B—PTO Output Shaft Assembly
C—PTO Pinion Shaft Assembly



LV980 –UN–21SEP94

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AG,OUO1085,185 –19–21AUG00–1/3

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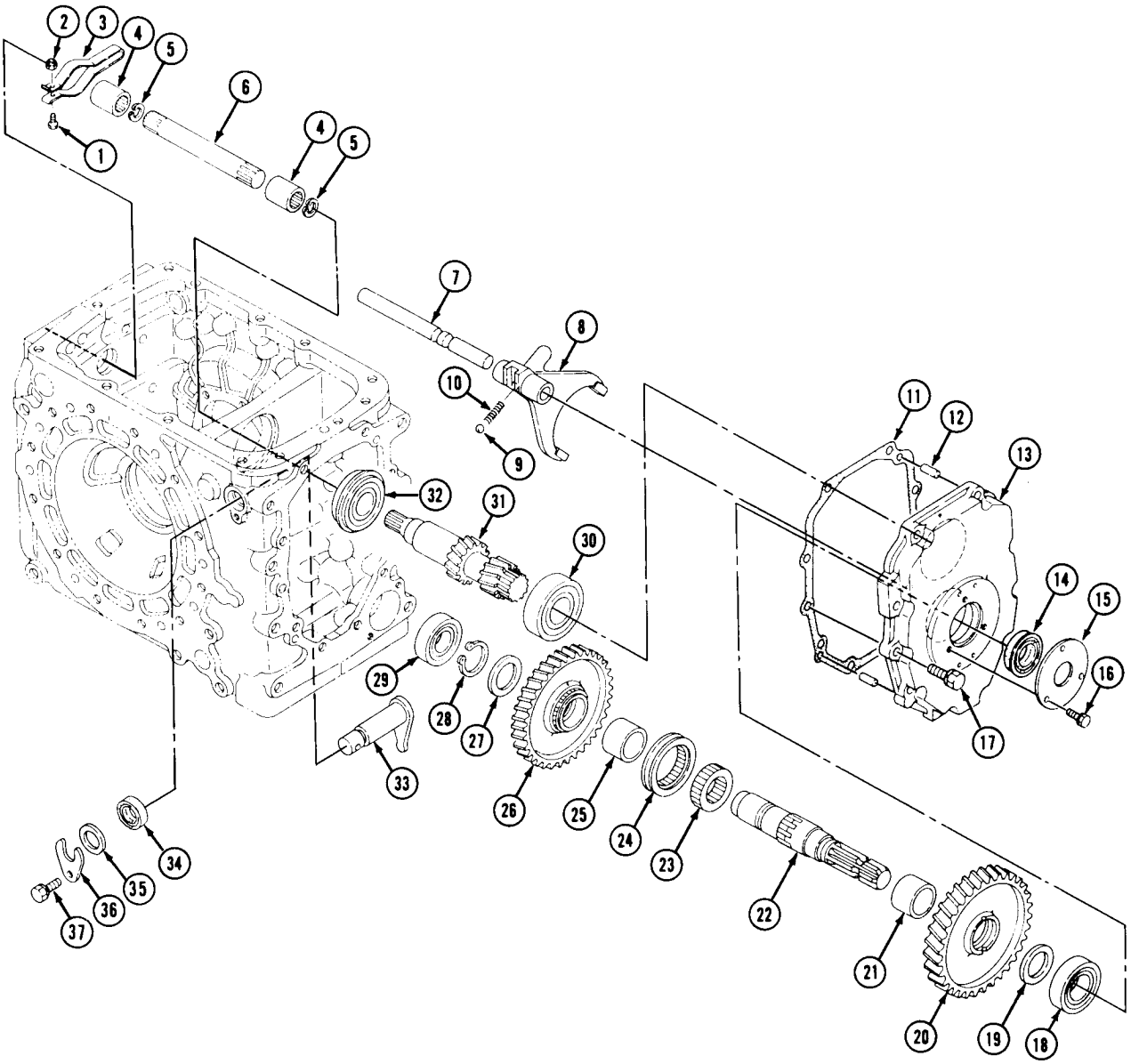

1—Cap Screw
2—Nut
3—Snubber
4—Coupler
5—Ring
6—Intermediate Shaft
7—Shaft
8—Fork
9—Ball
10—Spring
11—Gasket
12—Pin
13—Cover
14—Seal
15—Plate
16—Screw with Washer
17—Cap Screw
18—Ball Bearing
19—Washer
20—Gear
21—Bushing
22—Shaft
23—Shift Collar
24—Shifter
25—Bushing
26—Gear
27—Washer
28—Ring
29—Ball Bearing
30—Ball Bearing
31—Gear
32—Ball Bearing
33—Arm
34—Seal
35—Washer
36—Plate
37—Cap Screw

Continued on next page

AG,OUO1085,185 –19–21AUG00–2/3

NOTE: Snubber (3) is mounted to differential housing. Coupler (4) is held in place by snubber. If replacement is necessary, remove rockshaft. (See Remove and Install Rockshaft Case in Section 70, Group 10.)

IMPORTANT: Replace seal. Damaged or used seal will leak.

4. Remove screws (16) and plate (15).

5. Remove seal (14) using a screwdriver. Install seal into cover bore until it stops, using a bushing, bearing, and seal driver set.

NOTE: Bearing (18) is press fit on shaft.

6. Remove gear (20) and bearing (18) using a press.

7. Inspect parts (6—37) for wear or damage. Replace as necessary.

NOTE: Bearings (29, 30, and 32) are press fit. Remove bearings only of replacement is necessary.

8. Remove bearings (29, 30, and 32) using a knife-edged puller and a press.

9. Install bearings (29 and 30) using a press.

NOTE: Install bearing (32) with flanged side toward pinion gear.

10. Install bearing (32) using a piece of pipe and a press.

11. Apply multipurpose grease to lips of seal.

12. Lubricate all parts with clean transmission/hydraulic oil.

13. Assemble all parts.

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AG,OUO1085,185 –19–21AUG00–3/3

Essential Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

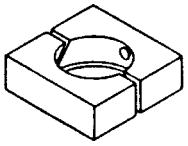
SERVICEGARD is a trademark of Deere & Company

OUO1023,0000015 –19–07APR04–1/4

JDG486 –UN–03MAR92

Pinion Shaft Holding Fixture JDG1164

Holds differential drive shaft when removing or torquing nut.

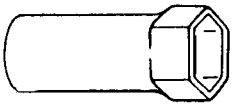


OUO1023,0000015 –19–07APR04–2/4

JT0735 –UN–03MAR92

Special Socket JDG735

Removes and torques differential drive shaft nut.

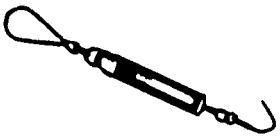


OUO1023,0000015 –19–07APR04–3/4

JDT42 –UN–03MAR92

Spring Scale JDT42

Measures differential drive shaft rolling drag torque.



OUO1023,0000015 –19–07APR04–4/4

Other Material

Number	Name	Use
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to the differential housing cap screw threads. Apply to the differential lock shaft-to-fork lock pin threads.

LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000EB1 –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Differential Cap Screws	Torque	58 N•m (43 lb-ft)
Differential Housing with Locking Pawl Cap Screw	Torque	95 N•m (70 lb-ft)
Differential Housing Cap Screw	Torque	78 N•m (58 lb-ft)
Differential Drive Shaft Spacer and Shims	Thickness	0.25—0.75 mm (0.010—0.030 in.) nominal
Differential Drive Shaft Nut	Torque	269 N•m (198 lb-ft)
Differential Drive Shaft	Force	10—30 N (2—7 lb-force)
Differential Drive Shaft Quil Cap Screw	Torque	52 N•m (38 lb-ft)
Cone Point	Dimension (A)	17.5 ± 0.05 mm (0.688 ± 0.002 in.)
Differential	Backlash	0.18—0.25 mm (0.007—0.010 in.)
Differential Quill	Angle	30°

OUO1043,0000EB2 –19–28JUN02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

Shim Kit—Differential Drive Shaft Bearing Preload

Shim Kit—Differential Drive Shaft Cone Point

Shim Kit—Differential Backlash

AG,OUO1085,188 –19–21AUG00–1/1

Remove and Install Differential Assembly

1. Remove differential lock assembly. (See Remove, Inspect, and Install Differential Lock Assembly in this group.)

2. Remove brake assemblies. (See Remove and Inspect Brakes in Section 60, Group 10.)

3. Remove rear PTO drive shaft assembly. (See Remove and Install Standard Rear PTO Drive Shaft Assembly or Remove and Install 540/540E Rear PTO Drive Shaft Assembly in Group 20.)

NOTE: Remove cab if equipped. (See Cab Remove and Install in Section 90, Group 15.)

4. Remove six cap screws (C) and shims (B). Turn differential quill (A) 30° and install cap screws in the two threaded holes. Use cap screws to draw out the quill.

5. Remove differential assembly.

6. Make repairs as necessary. (See Disassemble, Inspect, and Assemble Differential Assembly in this group.)

7. Install differential assembly.

8. Install differential quill, cap screws, and shims. Tighten cap screws to specification.

Specification

Differential Cap Screws—Torque..... 58 N•m (43 lb-ft)

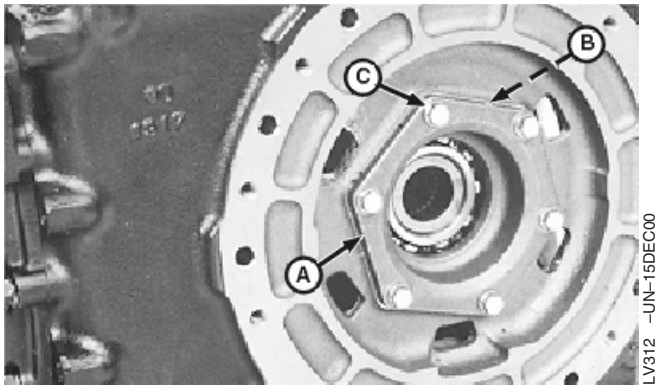
NOTE: Adjustment of backlash is not necessary unless the ring gear or differential drive shaft were replaced or cone point adjustment was made.

9. Adjust differential backlash. (See Differential Backlash Adjustment in this group.)

10. Install brake assemblies.

11. Install rear PTO drive gear shaft assembly.

12. Install differential lock assembly.



Right Side Shown

A—Differential Quill
B—Shim (6 used)
C—Cap Screw (6 used)

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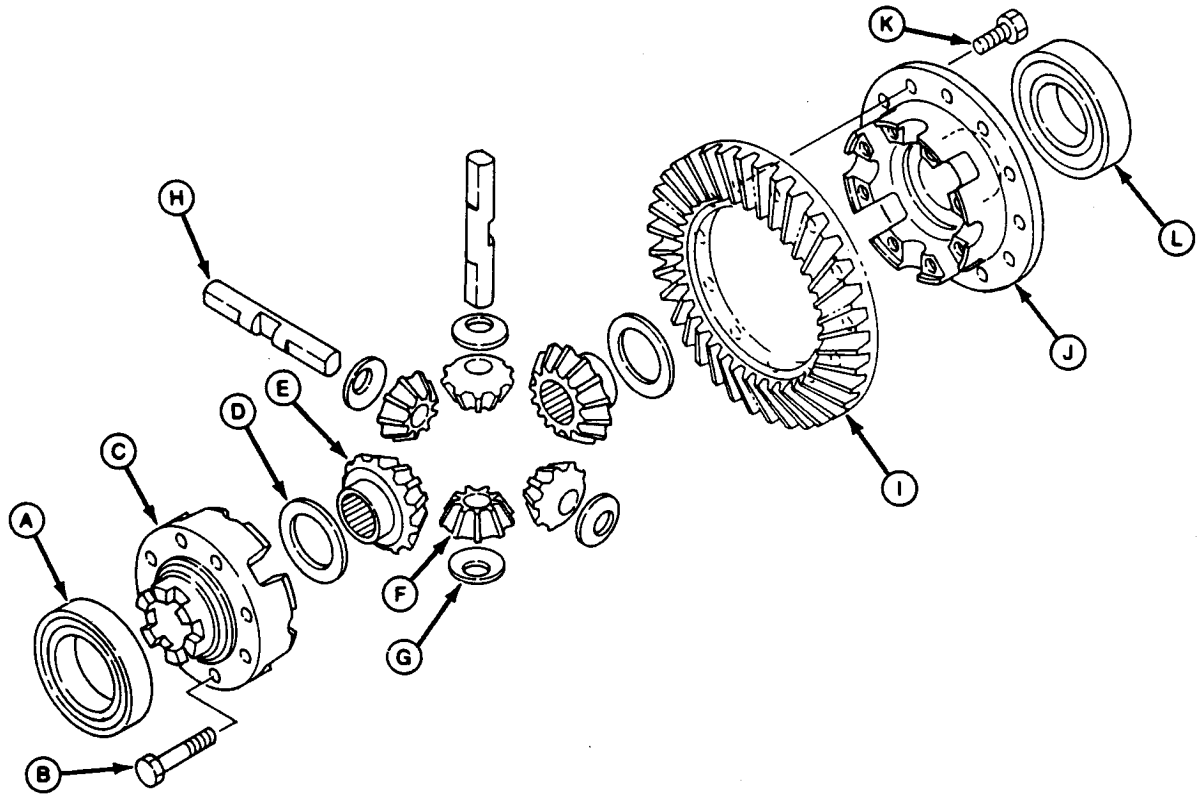
3

Continued on next page

13. Install cab if equipped.

AG,OUO1085,189 –19–28JUN02–2/2

Disassemble, Inspect, and Assemble Differential Assembly



LV313A –UN–03MAR92

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A—Bearing
B—Cap Screw (8 used)
C—Housing with Locking Pawl
D—Thrust Washer (2 used)
E—Bevel Gear (2 used)
F—Bevel Pinion (4 used)
G—Thrust Washer (4 used)
H—Pinion Shaft (2 used)
I—Ring Gear
J—Housing
K—Cap Screw (12 used)
L—Bearing

1. Disassemble parts (B—K).

NOTE: Bearings (A and L) are press fit. Remove bearings only if replacement is necessary.

2. Remove bearings (A and L) using a knife-edged puller and a press.

3. Inspect parts for wear or damage. Replace if necessary.

4. Apply thread lock and sealer (medium strength) to threads of cap screws (B and K). Tighten cap screws to specification.

Specification	
Differential Housing with Locking Pawl Cap Screw—Torque	95 N•m (70 lb-ft)
Differential Housing Cap Screw—Torque	78 N•m (58 lb-ft)

5. Apply clean transmission/hydraulic oil to all parts during assembly.

6. Assemble all parts.

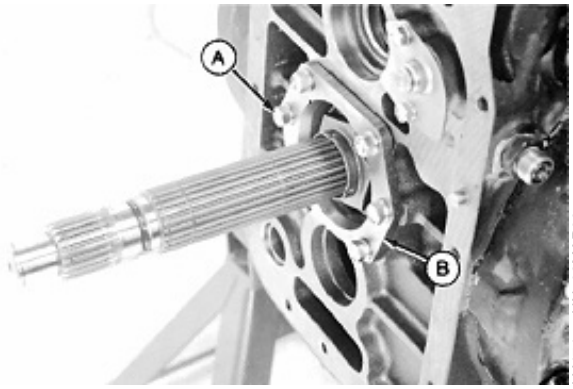
AG,OUO1085,190 –19–28JUN02–1/1

Remove and Inspect Differential Drive Shaft

1. Remove MFWD and range gears. (See Remove, Inspect, and Install MFWD and Range Gears in Group 15 for CollarShift/SyncShuttle™ Transmission or Remove, Inspect, and Install MFWD and Range Gears in Group 16 for PowrReverser™ Transmission.)
2. Remove six cap screws (A).

IMPORTANT: When prying around quill flange, take care not damage shim packs.

3. Pry around quill flange (B) using a screwdriver. Remove differential drive shaft quill and shims.



LV474 –UN–03MAR92

A—Cap Screw (6 used)
B—Quill Flange

OUO1023,0000016 –19–07APR04–1/4

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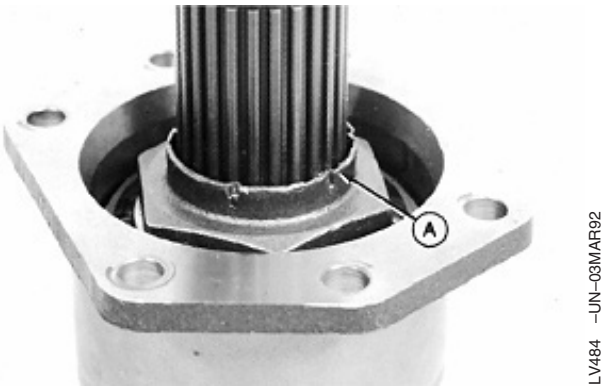
4. Straighten locking tabs (A) on collar of nut using a small punch.

A—Locking Tab

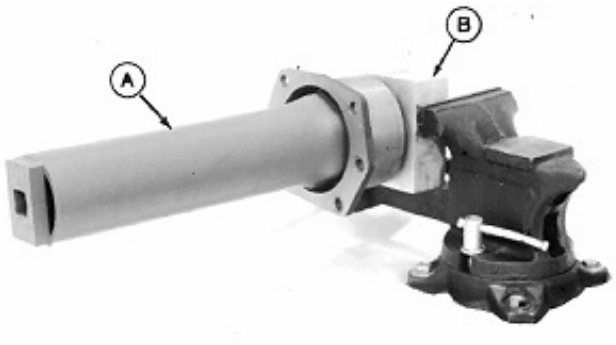


LV484 –UN–03MAR92

OUO1023,0000016 –19–07APR04–2/4

5. Place JDG1164 Pinion Shaft Holding Fixture (B) onto end of shaft.
6. Place assembly in a vise as shown.
7. Use JDG735 Special Socket (A) to remove nut.

A—JDG735 Special Socket
B—JDG1164 Pinion Shaft Holding Fixture



LV483 –UN–03MAR92

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OUO1023,0000016 –19–07APR04–3/4

NOTE: Bearing cones (B and H) are press fit on shaft.

8. Remove shaft (I) from quill (D) using a knife-edged puller and a press.

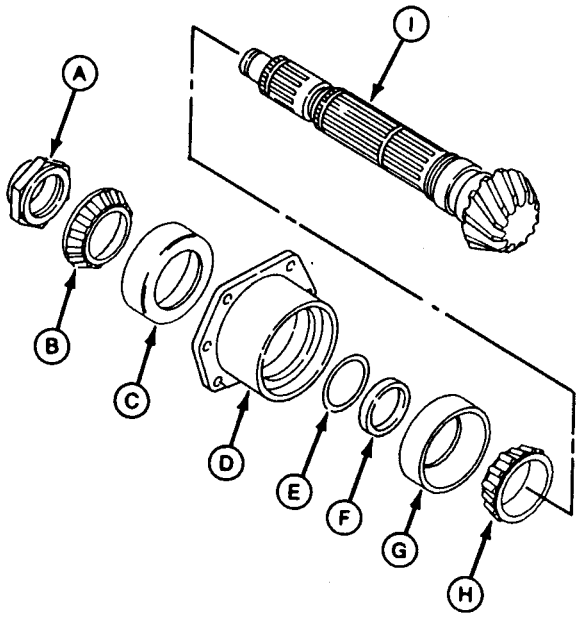
9. Remove parts (B, E, F, and H).

10. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Bearing cups (C and G) are press fit in quill (D). Remove cups only if replacement is necessary.

11. Remove bearing cups using a small punch and hammer.

IMPORTANT: Differential drive shaft and differential ring gear are a matched set. If shaft was replaced, ring gear must be replaced also.



LV485A –UN–03MAR92

A—Nut
B—Bearing Cone
C—Bearing Cup
D—Quill
E—Shim (number as required)
F—Spacer
G—Bearing Cup
H—Bearing Cone
I—Differential Drive Shaft

OUO1023,0000016 –19–07APR04–4/4

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Install Differential Drive Shaft

NOTE: Lubricate all parts with clean transmission/hydraulic oil during assembly.

1. Install bearing cup (C), if removed, into quill (D), using a bearing, bushing, and seal driver set and a press.

2. Install bearing cup (G), cone (H), and shaft (I) into quill (D), using a press.

NOTE: Shims are available in three thicknesses: 0.10, 0.15, and 0.20 mm (0.004, 0.006, and 0.008 in.).

3. Turn quill and shaft assembly around and install spacer (F) and shims (E) as necessary to obtain specified thickness.

Specification	
Differential Drive Shaft Spacer and Shims—Thickness	0.25—0.75 mm (0.010—0.030 in.) nominal

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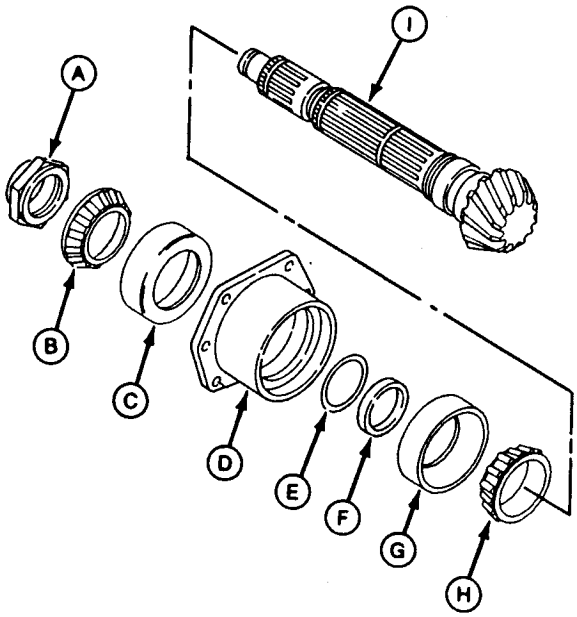
4. Install bearing cone (B) using a piece of pipe and a press.

IMPORTANT: Always use a new nut when assembling shaft.

5. Install new nut (A) and tighten by hand.



LV485A –UN–03MAR92

A—Nut
B—Bearing Cone
C—Bearing Cup
D—Quill
E—Shim (number as required)
F—Spacer
G—Bearing Cup
H—Bearing Cone
I—Differential Drive Shaft

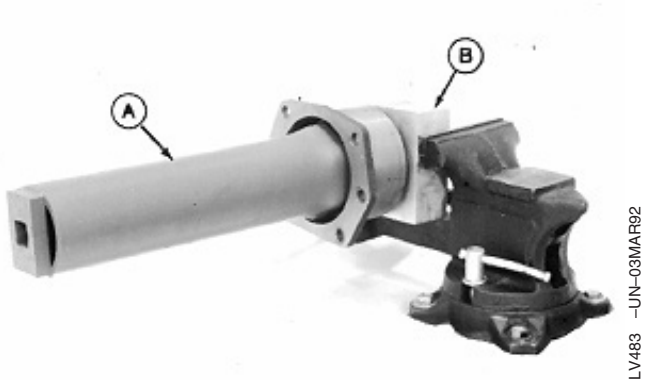
Continued on next page

AG,OUO1085,192 –19–28JUN02–1/5

6. Place JDG1164 Pinion Shaft Holding Fixture (B) onto end of shaft.
7. Place assembly in a vise as shown.
8. Use JDG735 Special Socket (A) to tighten nut to specification.

Specification

Differential Drive Shaft Nut—Torque ..... 269 N•m (198 lb-ft)



LV483 –UN–03MAR92

A—JDG735 Special Socket
B—JDG1164 Pinion Shaft Holding Fixture

AG,OUO1085,192 –19–28JUN02–2/5

9. Wrap a string (A) (approximately 1 m (3 ft) long) around differential drive shaft.
10. Attach a JDT42 Spring Scale (B) or its equivalent to the end of the string.
11. Pull spring scale away from differential drive shaft, noting the force (rolling drag) required to turn the differential drive shaft while holding the quill stationary. Repeat several times for an accurate reading. Rolling drag should be within specification. If rolling drag is high, add shims. If rolling drag is low, remove shims. Check and adjust until rolling drag is within specification.

Specification

Differential Drive Shaft—Rolling Drag ..... 10—30 N (2—7 lb-force)

RW2050 –UN–06MAR90

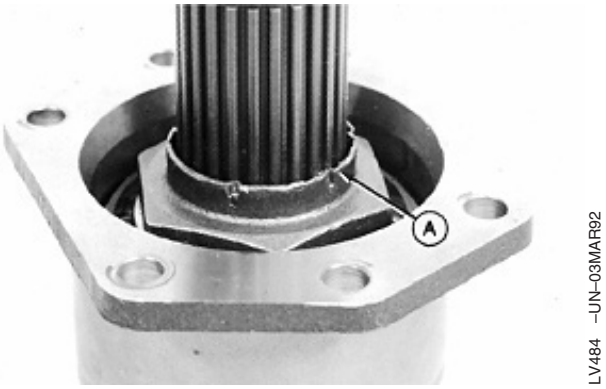
A—String
B—JDT42 Spring Scale

Continued on next page

AG,OUO1085,192 –19–28JUN02–3/5

12. Deform collar of nut (A) into splines of shaft at three places around nut, using a small punch.

A—Collar of Nut



AG,OUO1085,192 –19–28JUN02–4/5

IMPORTANT: Adjust differential cone points only if ring gear and shaft were replaced. If gear and shaft were not replaced, use same shim pack or same thickness of original shims removed.

13. Install differential drive shaft quill (B) using a rubber mallet.

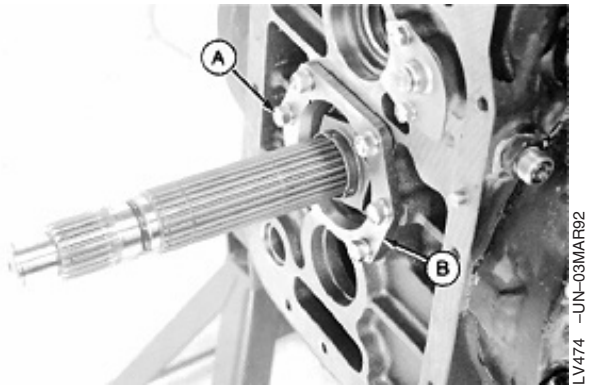
14. Install six cap screws (A) and original shim pack. Tighten cap screws to specifications.

Specification	
Differential Drive Shaft Quil Cap Screw—Torque	52 N•m (38 lb-ft)

15. Install MFWD and range gears. (See Remove, Inspect, and Install MFWD and Range Gears in Group 15 for CollarShift/SyncShuttle™ Transmission or Remove, Inspect, and Install MFWD and Range Gears in Group 16 for PowrReverser™ Transmission.)

NOTE: To adjust cone point, rockshaft case must be removed. (See Remove and Install Rockshaft Case in Section 70, Group 10.)

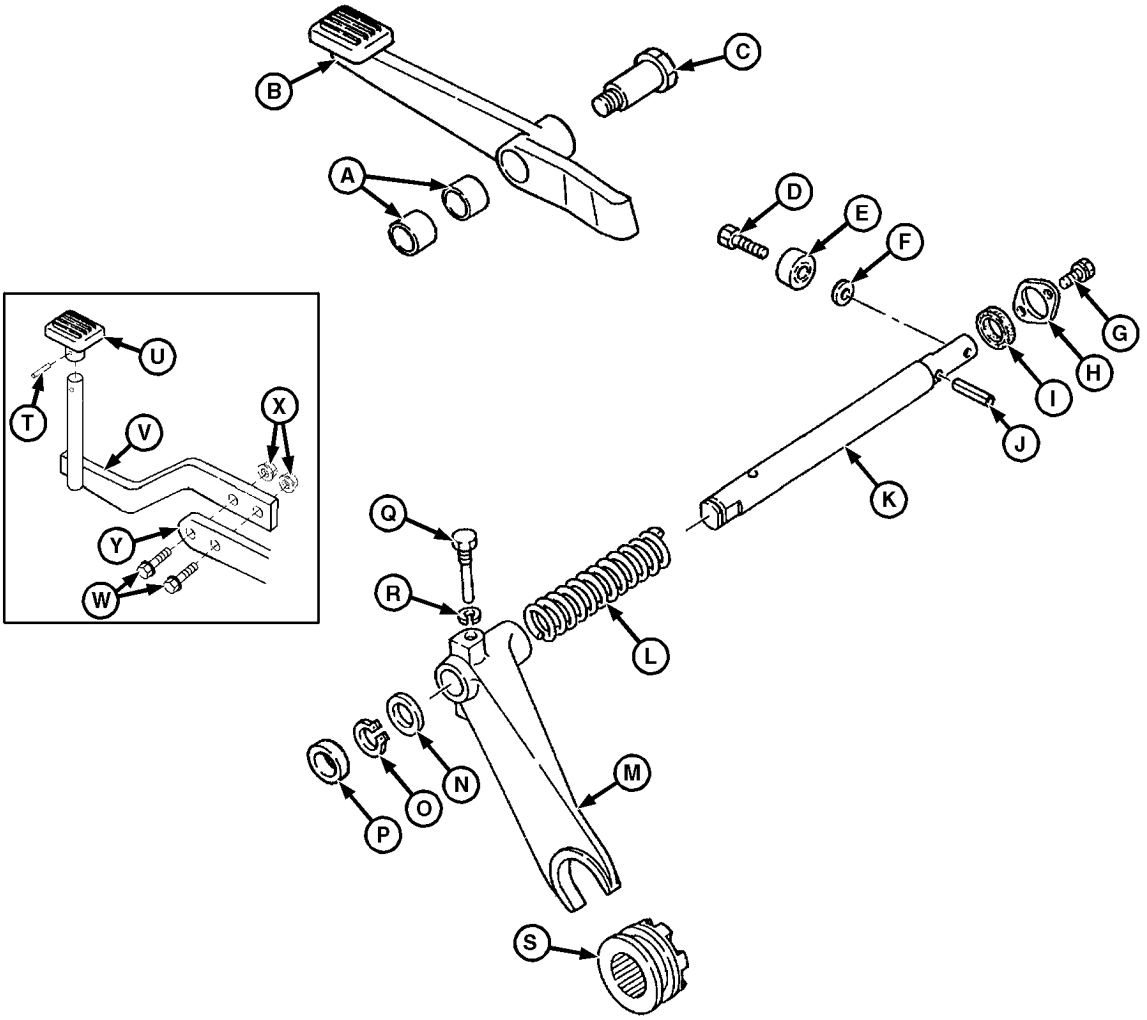
16. Adjust cone point, if necessary. (See Differential Cone Point Adjustment in this group.)



A—Cap Screw (6 used)
B—Differential Drive Shaft Quill

AG,OUO1085,192 –19–28JUN02–5/5

Remove, Inspect, and Install Differential Lock Assembly



LV2462 –UN–19DEC97

Differential Lock Assembly

A—Bushings
B—Differential Lock Pedal (Without Cab)
C—Shoulder Bolt
D—Cap Screw
E—Roller
F—Washer
G—Cap Screw (2 used)
H—End Plate
I—Seal
J—Spring Pin
K—Differential Lock Shaft
L—Spring
M—Fork
N—Washer
O—Snap Ring
P—End Cap
Q—Threaded Locking Pin
R—Lock Washer
S—Lock Collar
T—Pin (Cab Tractors Only)
U—Pedal (Cab Tractors Only)
V—Lever Extension (Cab Tractors Only)
W—Cap Screw (Cab Tractors Only) (2 used)
X—Nut (Cab Tractors Only) (2 used)
Y—Lever (Cab Tractors Only)

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in Section 70, Group 10.)
2. Remove parts (B—F).
3. Tractors with cab: remove parts (T—Y).

NOTE: Bushings (A) are press fit. Remove bushings only of replacement is necessary.

4. Replace bushings (A) using a bearing, bushing, and seal driver set.

Continued on next page

AG,OUO1085,193 –19–28JUN02–1/2

5. Pry between differential housing and fork (M) to remove pin (Q) and washer (R).

6. Remove parts (G—P).

NOTE: To service lock collar (S), remove left brake assembly. (See Remove and Inspect Brakes in Section 60, Group 10.)

7. Inspect all parts for wear or damage. Replace as necessary.

IMPORTANT: Replace seal (I). Damaged or used seals will leak.

Replace locking pin (Q). Always use a new pin when assembling shaft and fork.

8. Apply multipurpose grease to inside lips of seal (I) and to shoulder bolt (C).

9. Apply thread lock and sealer (medium strength) to threads of locking pin (Q).

10. Install all parts.

11. Install rockshaft case.

AG,OUO1085,193 –19–28JUN02–2/2

Differential Cone Point Adjustment

NOTE: Gears are removed from differential drive shaft for illustration purposes.

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in Section 70, Group 10.)

2. Measure cone point with a spacer of known dimension and feeler gauges. Measure spacer (drill bits work well) and add feeler gauges to equal specification. Insert spacer and feeler gauge to determine cone point dimension (A). Add shims to increase cone point; remove shims to decrease.

NOTE: Shims are available in three thicknesses: 0.1, 0.3 and 0.5 mm (0.004, 0.012 and 0.020 in.).

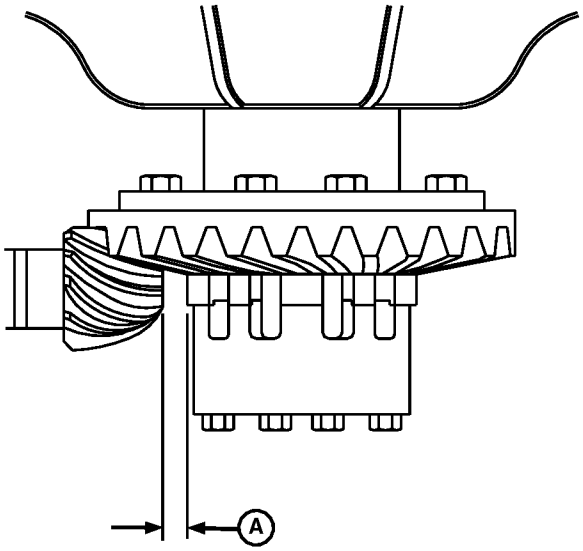
3. After adding or removing shims, tighten cap screws to specification and recheck cone point.

4. Check differential backlash. (See Differential Backlash Adjustment in this group.)

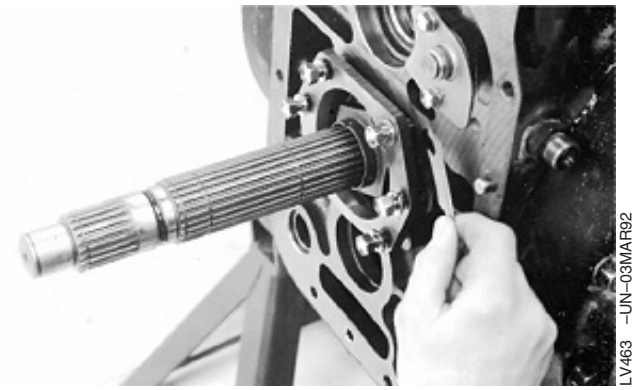
Specification

Cone Point—Dimension (A)	17.5 ± 0.05 mm (0.688 ± 0.002 in.)
Differential Drive Shaft Quil Cap Screw—Torque	52 N•m (38 lb-ft)

A—Cone Point Dimension



LV1617 –UN–12FEB96



LV463 –UN–03MAR92

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AG,OUO1085,194 –19–22AUG00–1/1

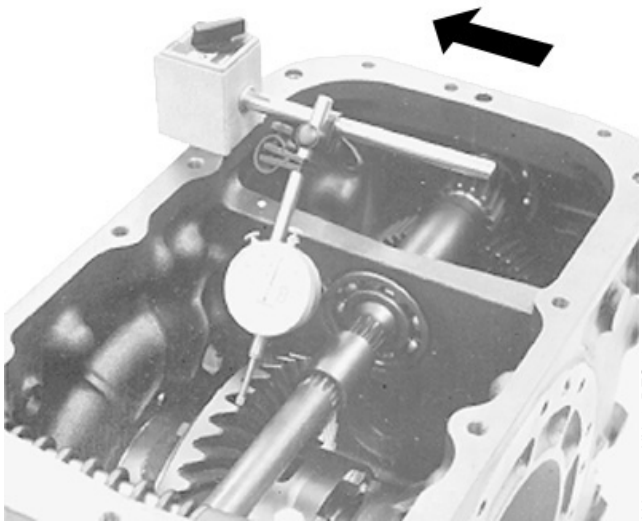
Differential Backlash Adjustment

IMPORTANT: Always check and adjust backlash after cone point adjustment has been made.

1. While slowly rotating differential carrier, lightly tap carrier with a soft-faced mallet to make sure bearing on other side of ring gear is seated.
2. Attach a dial indicator to housing, as shown, with contact point positioned on ring gear splines.
3. While holding input shaft, move carrier and ring gear to determine backlash. Backlash should be within specification.

Specification

Differential—Backlash ..... 0.18—0.25 mm (0.007—0.010 in.)



LV314 –UN–15DEC00

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AG,OUO1023,530 –19–28JUN02–1/2

4. To adjust backlash, remove six cap screws (C). Turn differential quill (A) 30° and install cap screws in the two threaded holes. Use cap screws to draw out the quill.

Specification

Differential Quill—Angle ..... 30°

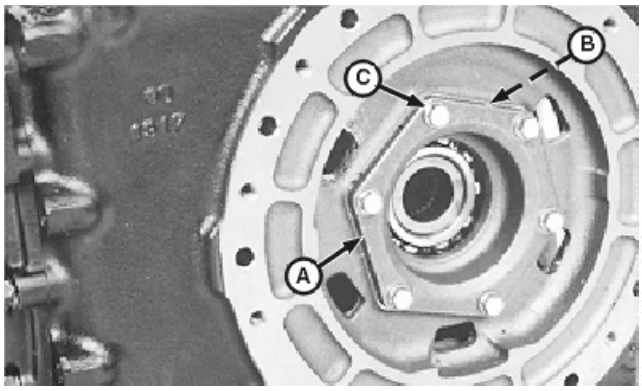
5. Remove shims (B) to decrease backlash, and add shims to increase.
6. Recheck backlash after removing or adding shims.

NOTE: Ring gear carrier is not preloaded and will have normal side-to-side movement.

7. Tighten cap screws to specification.

Specification

Differential Cap Screws—Torque..... 58 N•m (43 lb-ft)



LV312 –UN–15DEC00

A—Differential Quill
B—Shim
C—Cap Screw (6 used)

AG,OUO1023,530 –19–28JUN02–2/2

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

SERVICEGARD is a trademark of Deere & Company

OUO1043,0000EB4 –19–28JUN02–1/2

Final Drive Turning Tool DFLV1A

Turns final drive housing to set rolling torque.

OUO1043,0000EB4 –19–28JUN02–2/2

Other Material

Number	Name	Use
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY6304 (U.S.) TY9484 (Canadian) 518 (LOCTITE®)	Flexible Sealant	Seals differential carrier housing to axle housing.

LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000EB5 –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Final Drive Assembly Cap Screws	Torque	100 N•m (74 lb-ft)
Final Drive Housing	Rolling Drag Torque	9 N•m (80 lb-in.) increase above base line

OUO1043,0000EB6 –19–28JUN02–1/1

Remove and Install Final Drive Assembly

NOTE: Remove cab if equipped. (See Cab Remove and Install in Section 90, Group 15.)

1. Tractors without cab: remove ROLL-GARD™. (See Remove and Install ROLL-GARD™ in Section 90, Group 10.)

NOTE: The approximate capacity of transmission/differential is 38 L (10 U.S. gal).

2. Drain transmission/differential.

NOTE: Close all openings using caps and plugs.

Hydraulic line (B) is on left side only.

3. Disconnect lines (A and B).

NOTE: Disconnect draft link sway linkage from final drive housing.

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2

4. Attach lifting chains or strap to final drive housing.

5. Remove twelve cap screws (C).

6. Remove final drive assembly.

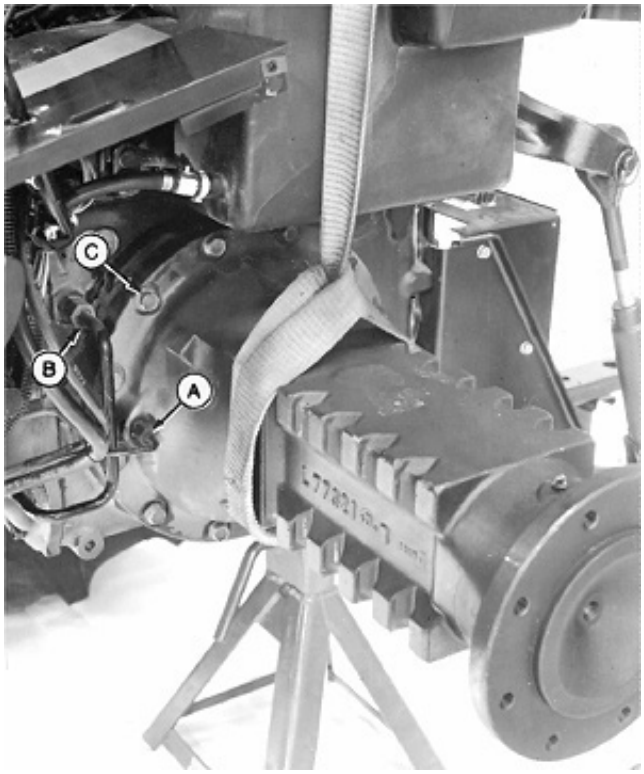
NOTE: To inspect or replace final drive pinion shaft, brakes must be removed. (See Remove and Inspect Brakes in Section 60, Group 10.)

7. Make repairs as necessary. (See Remove and Inspect Planetary Drive Assembly and Remove, Inspect, and Install Axle Shaft Assembly in this group.)

8. Clean mating surfaces of final drive and differential casings using Clean and Cure Primer. Apply a coat of Flexible Sealant or an equivalent to mating surfaces.

9. Install final drive assembly. Tighten cap screws to specification.

Specification	
Final Drive Assembly Cap Screws—Torque	100 N•m (74 lb-ft)



LV511 –UN–03MAR92

Left Side Shown

A—Hydraulic Line
B—Hydraulic Line
C—Cap Screw (12 used)

ROLL-GARD is a trademark of Deere & Company

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IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

10. Install new O-rings and connect hydraulic lines (B and A). Connect draft link sway linkage.

11. Fill transmission with specified transmission/hydraulic oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

12. Bleed brakes. (See Bleed Brake System in Section 260, Group 10.)

13. Install ROLL-GARD™.

14. Install cab if equipped. (See Cab Remove and Install in Section 90, Group 15.)

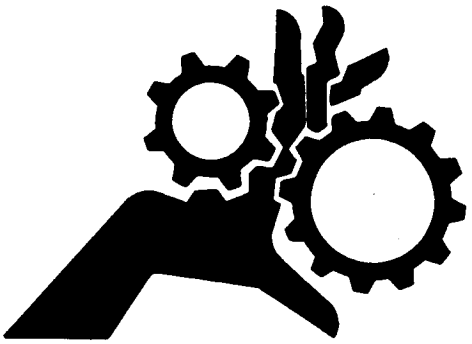
ROLL-GARD is a trademark of Deere & Company

AG,OUO1085,197 –19–28JUN02–2/2

Remove and Inspect Planetary Drive Assembly

CAUTION: Gears may turn. Keep fingers away from planetary gears.

1. Remove lock plate (B).
2. Remove cap screw (A).
3. Remove planetary carrier assembly (C).



T6639GK –UN–19OCT88

LV102 –UN–03MAR92

A—Cap Screw
B—Lock Plate
C—Planetary Carrier Assembly

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Continued on next page

AG,OUO1085,198 –19–22AUG00–1/3

NOTE: Planetary gears are press fit on carrier studs.

4. Remove snap ring (C).
5. Remove planetary gear (B) using a two-jaw puller.
6. Remove spacer (A).

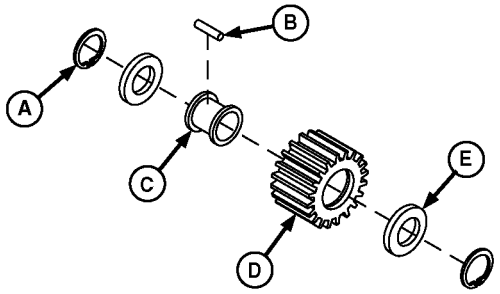
A—Spacer
B—Planetary Gear
C—Snap Ring

LV555 –UN–03MAR92

AG,OUO1085,198 –19–22AUG00–2/3

7. Disassemble parts (A—D) on 5210, 5310, and 5410 series tractors.
8. Disassemble parts (A—E) on 5510 series tractors.
9. Inspect all parts for wear or damage. Replace as necessary.

A—Retaining Ring (2 used)
B—Roller (17 used)
C—Bearing Race
D—Planetary Gear
E—Thrust Washer (2 used on 5510 series tractor only)



LV100AE –UN–18APR96

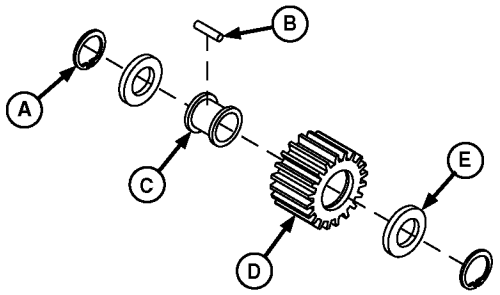
AG,OUO1085,198 –19–22AUG00–3/3

Install Planetary Drive Assembly

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

1. Assemble parts (A—D) and thrust washers (E), if equipped.

A—Retaining Ring (2 used)
B—Roller (17 used)
C—Bearing Race
D—Planetary Gear
E—Thrust Washer (2 used on 5510 series tractor only)



LV100AE –UN–18APR96

AG,OUO1085,199 –19–28JUN02–1/3

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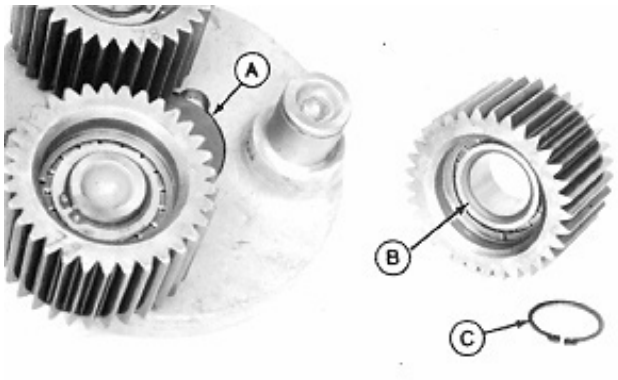
2. Install spacer (A).

3. Install planetary gears with bevel (B) facing carrier using a bushing, bearing, and seal driver set and a press.

4. Install snap ring (C).

A—Spacer
B—Bevel
C—Snap Ring



LV556 –UN–03MAR92

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AG,OUO1085,199 –19–28JUN02–2/3

IMPORTANT: Before assembling and adjusting final drives, rear axle should be bolted to a tractor wheel.

5. Attach final drive housing to a rear tractor wheel.

6. Install planetary carrier assembly (C) onto the axle shaft. Do not install cap screw (A).

NOTE: See DFLV1A—Final Drive Turning Tool in Section 299 for instructions to make turning tool.

7. Rotate final drive housing through three complete revolutions in each direction using DFLV1A Final Drive Turning Tool (D) to ensure proper seating of bearing rollers.

8. Rotate final drive housing a minimum of ten revolutions using a torque wrench and Turning Tool to determine rolling drag torque. This is the base line rolling drag torque.

9. Install a new cap screw (A). Tighten cap screw until the rolling drag torque increases 9 N•m (80 lb-in.) above the base line.

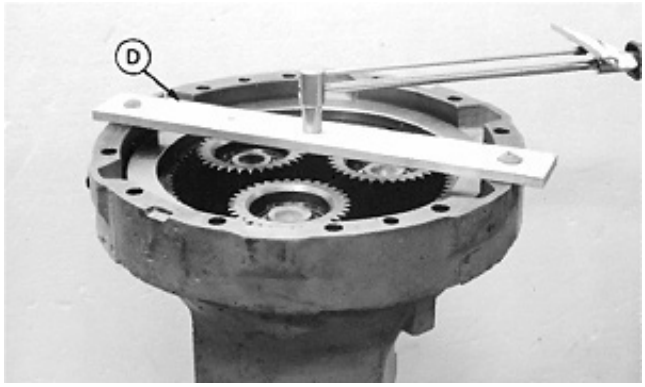
Specification

Final Drive Housing—Rolling Drag Torque	9 N•m (80 lb-in.) increase above base line

10. Install lock plate (B).

A—Special Cap Screw
B—Lock Plate
C—Planetary Carrier Assembly
D—DFLV1A Final Drive Turning Tool

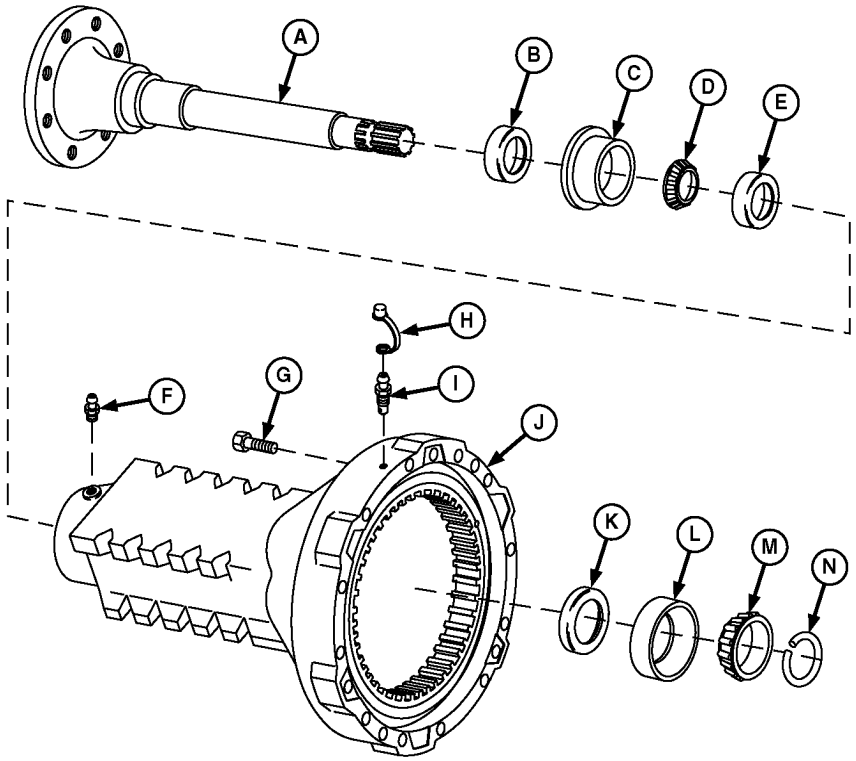
LV102 –UN–03MAR92



LV101 –UN–03MAR92

AG,OUO1085,199 –19–28JUN02–3/3

Remove, Inspect, and Install Axle Shaft Assembly



LV103A –UN–25AUG97

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A—Axle Shaft
B—Seal
C—Backup Ring
D—Bearing Cone
E—Bearing Cup
F—Grease Fitting
G—Plug (2 used)
H—Cap
I—Brake Bleeder
J—Final Drive Housing
K—Seal
L—Bearing Cup
M—Bearing Cone
N—Retaining Ring

1. Remove planetary drive assembly. (See Remove and Inspect Planetary Drive Assembly in this group.)
2. Remove retaining ring (N).
3. Remove axle (A) using a lead hammer on splined end of shaft.

NOTE: Bearing cone (D) is press fit on axle shaft. Bearing cups (E and L) are press fit in final drive housing.

Remove bearing cups only if replacement is necessary.

4. Remove bearing (D) using a knife-edged puller and a press.
5. Remove backup ring (C) and seal (B).
6. Pry out seal (K).
7. Inspect all parts for wear or damage. Replace as necessary.
8. Remove cups (E and L), if necessary, using a two-jaw inside puller and a slide hammer.

Continued on next page

AG,OUO1020,3454 –19–22AUG00–1/3

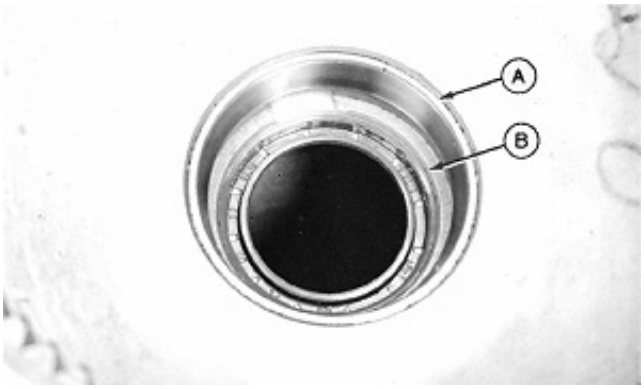
9. Install bearing cups (A) in both ends of housing until seated, using a bushing, bearing, and seal driver set.

IMPORTANT: Replace all seals. Damaged or used seals will leak.

10. Install seal (B) with lips facing planetary drive end of housing.

11. Apply multipurpose grease to lips of seal.

A—Bearing Cup
B—Seal



LV104 –UN–03MAR92

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AG,OUO1020,3454 –19–22AUG00–2/3

12. Install seal (A) and back-up ring (B) on axle shaft until seated.

CAUTION: DO NOT heat oil over 182°C (360°F). Oil fumes or oil can ignite above 193°C (380°F). Use a thermometer. DO NOT allow a flame or heating element to come in direct contact with the oil. Heat the oil in a well-ventilated area.

13. Heat bearing cones (C and D) to 150°C (300°F), immersed in oil.

14. Install bearing cone (C) on axle shaft.

15. Install axle shaft in housing.

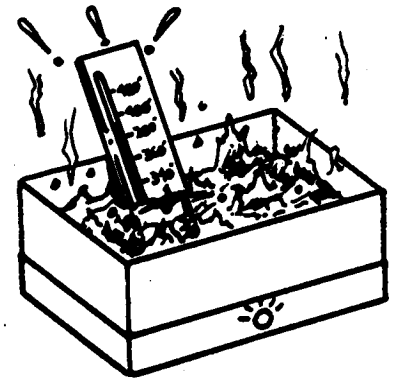
16. Install bearing cone (D) on axle shaft until seated.

17. Install new retaining ring (E).

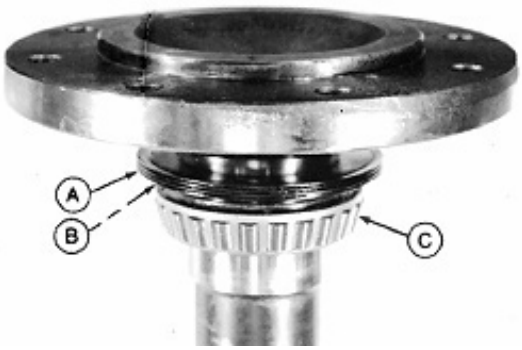
18. Apply multipurpose grease to hub and axle shaft bearing at grease fitting.

19. Install planetary drive assembly. (See Install Planetary Drive Assembly in this group.)

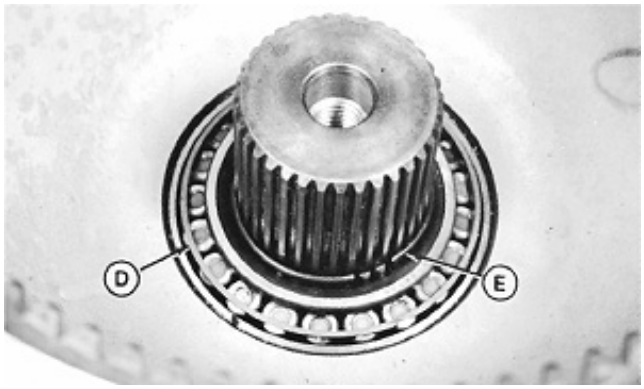
A—Seal
B—Backup Ring
C—Bearing Cone
D—Bearing Cone
E—Retaining Ring



T81191 –UN–23FEB89



LV105 –UN–03MAR92



LV106 –UN–03MAR92

AG,OUO1020,3454 –19–22AUG00–3/3

Essential Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

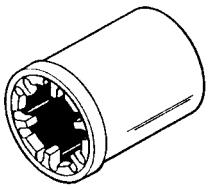
SERVICEGARD is a trademark of Deere & Company

OUO1023,0000013 –19–07APR04–1/2

JDG736 –UN–17JUN94

Spanner Wrench JDG736

To remove and install MFWD pinion shaft nut.



OUO1023,0000013 –19–07APR04–2/2

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

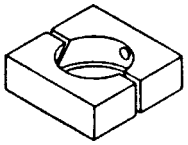
SERVICEGARD is a trademark of Deere & Company

OUO1043,0000EB8 –19–28JUN02–1/2

JDG486 –UN–03MAR92

Pinion Shaft Holding Fixture JDG486

Holds differential drive shaft when removing or torquing nut.



OUO1043,0000EB8 –19–28JUN02–2/2

Other Material

Number	Name	Use
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to the outer drive cap screws. Apply to the wheel mounting studs. Apply to the bevel gear cap screws.
T43515 (U.S.) TY9479 (Canadian) 635 (LOCTITE®)	Retaining Compound	Apply to outer drive thrust pad and differential carrier cover OD
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY6304 (U.S.) TY9484 (Canadian) 518 (LOCTITE®)	Flexible Sealant	Seals differential carrier housing to axle housing.

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LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000EB9 –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Wheel Cap Screws	Torque	175 N•m (130 lb-ft)
MFWD Drop Gearbox Cap Screw	Torque	132 N•m (97 lb-ft)
MFWD Drop Gearbox Shift Lever Bolt	Torque	26 N•m (230 lb-in.)
Drop Gearbox Drive Shaft Cover Cap Screws	Torque	26 N•m (230 lb-in.)
MFWD Drop Gearbox Top Shaft Nut	Torque	60 N•m (44 lb-ft)
Drive Shaft Guard Cap Screws	Torque	15 N•m (11 lb-ft)
Axle-to-Frame Cap Screws	Torque	650 N•m (479 lb-ft)
Front Wheel Nuts	Torque	300 N•m (220 lb-ft)
MFWD Outer Drive Cap Screws	Torque	78 N•m (58 lb-ft)
MFWD Outer Drive Studs	Torque	70 N•m (50 lb-ft)
Planet Pinion Carrier Socket Screws	Torque	25 N•m (18.5 lb-ft)
Planet Pinion Carrier Fill/Drain Plug	Torque	80 N•m (59 lb-ft)
Front Wheel Nuts	Torque	300 N•m (220 lb-ft)
MFWD Swivel Housing Cap Screw	Torque	120 N•m (89 lb-ft)
Tie Rod End Nut	Torque	165 N•m (122 lb-ft)
Planet Pinion Carrier Socket Screws	Torque	25 N•m (18.5 lb-ft)
Planet Pinion Carrier Fill/Drain Plug	Torque	80 N•m (59 lb-ft)
Front Wheel Nuts	Torque	300 N•m (220 lb-ft)
Differential Carrier-to-Axle Housing Cap Screws	Torque	169 N•m (125 lb-ft)
Axle Housing Fill Plug	Torque	70 N•m (50 lb-ft)
Friction Plate	Minimum Thickness New Thickness	1.30 mm (0.051 in.) 1.60 mm (0.063 in.)

Continued on next page

Item	Measurement	Specification
Drive Plate	Minimum Thickness New Thickness	1.47 mm (0.058 in.) 1.53 mm (0.060 in.)
Inner Thrust Plate	Minimum Thickness New Thickness	2.73 mm (0.107 in.) 2.83 mm (0.110 in.)
Differential Carrier Assembly Cap Screws	Torque	266 N•m (196 lb-ft)
Pinion Shaft	Rolling Drag	105—157 N (24—35 lb force)
Bevel Gear Cap Screw	Torque	78 N•m (58 lb-ft)
Differential Ring Gear-to-Pinion Gear	Backlash	0.16—0.21 mm (0.006—0.008 in.)
Pinion Shaft Plus Differential	Rolling Drag	142—213 N (32—48 lb force)
End Cap Screws	Torque	266 N•m (196 lb-ft)

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OUO1020,0001212 –19–14NOV02–2/2

Inspect and Repair MFWD Lever and Linkage

1. Tractors without cab: remove left rear wheel and fender.
2. Tractors with cab: remove left rear wheel, seat, support, and base plate. (Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)

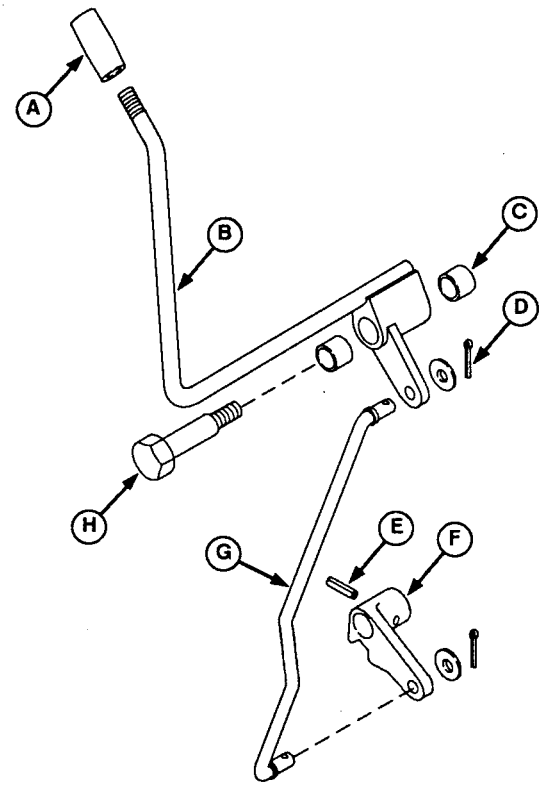
NOTE: Bushings (C) are press fit. Remove bushings only if replacement is necessary.

3. Replace bushing (C) using a bearing, bushing, and seal driver set.
4. Inspect all parts for wear or damage. Replace as necessary.
5. Apply Moly High Temperature EP Grease to shaft of bolt (H).
6. Install all parts.
7. Tractors without cab: install left fender and wheel.
8. Tighten wheel cap screws to specification.

Specification

Wheel Cap Screws—Torque..... 175 N•m (130 lb-ft)

9. Tractors with cab: install seat, support, and base plate.



LV456AE –UN–03MAR92

A—Knob
B—MFWD Lever
C—Bushing (2 used)
D—Cotter Pin (2 used)
E—Spring Pin
F—Arm
G—Rod
H—Shoulder Bolt

AG,OUO1085,201 –19–28JUN02–1/1

Remove and Install MFWD Drop Gearbox

NOTE: The approximate capacity of transmission is 38 L (10 U.S. gal).

1. Remove plug (B) and drain transmission/hydraulic oil.
2. Remove MFWD drive shaft. (See Remove, Inspect and Install MFWD Drive Shaft in this group.)
3. Disconnect link (C).

CAUTION: Approximate weight of drop gearbox is 20 kg (45 lbs).

4. Remove four cap screws and washers (A) to remove drop gearbox.
5. Make repairs as necessary. (See Disassemble and Inspect MFWD Drop Gearbox in this group.)

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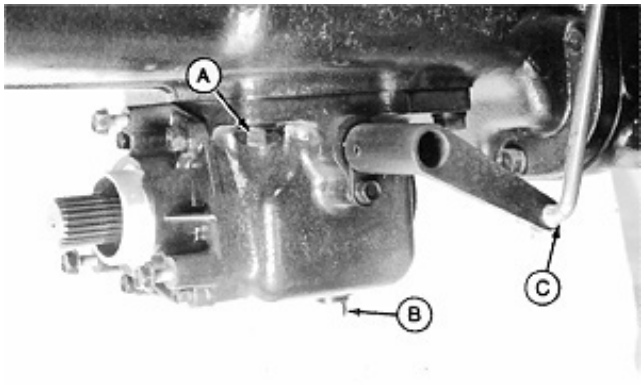
IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

6. Install gearbox and new O-ring. Tighten cap screws to specification.

Specification	
MFWD Drop Gearbox Cap Screw—Torque	132 N•m (97 lb-ft)

7. Connect shift link.
8. Install drive shaft.
9. Install plug and new O-ring. Fill transmission with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)



LV494 –UN–03MAR92

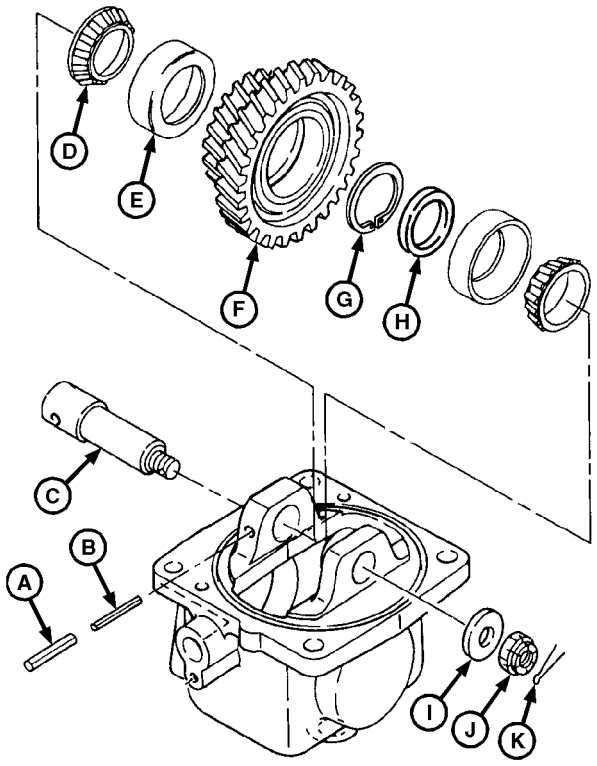
A—Cap Screw and Washer (4 used)
B—Plug
C—Link

AG,OUO1085,202 –19–28JUN02–1/1

Disassemble and Inspect MFWD Drop Gearbox

1. Remove cotter pin (K), nut (J), and washer (I).
2. Remove spring pins (A and B) using a punch and hammer.
3. Remove shaft (C), using a brass drift and hammer.
4. Remove bearing cones (D), bearing cups (E), spacer (H), and gears (F). Remove snap ring (G) only if necessary.

A—Large Spring Pin
B—Small Spring Pin
C—Top Shaft
D—Bearing Cone (2 used)
E—Bearing Cup (2 used)
F—Driven Gears
G—Snap Ring
H—Spacer
I—Washer
J—Nut
K—Cotter Pin



LV495A –UN–20SEP96

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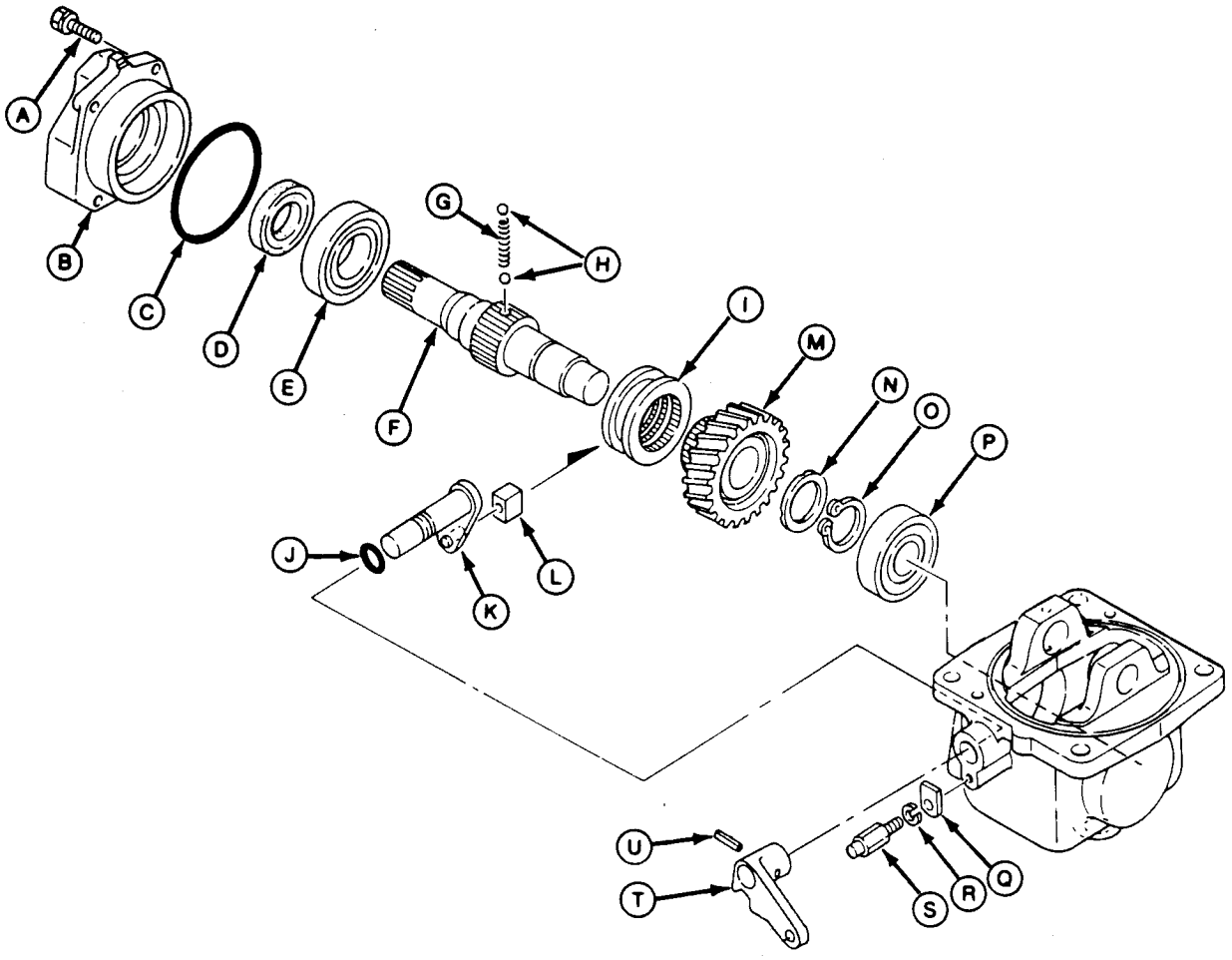
AG,OUO1008,220 –19–06OCT99–1/3



LV496A –UN–09MAR92

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A—Cap Screw (4 used)
B—Cover
C—O-Ring
D—Seal
E—Bearing
F—Output Shaft
G—Spring
H—Ball (2 used)
I—Shift Collar
J—O-Ring
K—Shift Lever
L—Shift Block
M—Idler Gear
N—Washer
O—Snap Ring
P—Bearing
Q—Lock Plate
R—Lock Washer
S—Bolt
T—Shift Arm
U—Spring Pin

5. Remove parts (A—D).

6. Remove parts (Q, R, and S).

7. Pull arm (T) toward gearbox.

8. Remove parts (E—I) and (M—P) as an assembly.

9. Remove parts (U and T) and (J—L).

NOTE: Bearings (E and P) are press fit on shaft (H). Remove bearing (E) only if replacement is necessary.

10. Remove bearing (P) using a knife-edged puller and a press.

CAUTION: Balls (H) and spring (G) will shoot out of shaft when removing collar (I). Use care when removing collar.

11. Remove parts (O—M) and (I, H, and G).

12. Inspect all parts for wear or damage. Replace as necessary.

Continued on next page

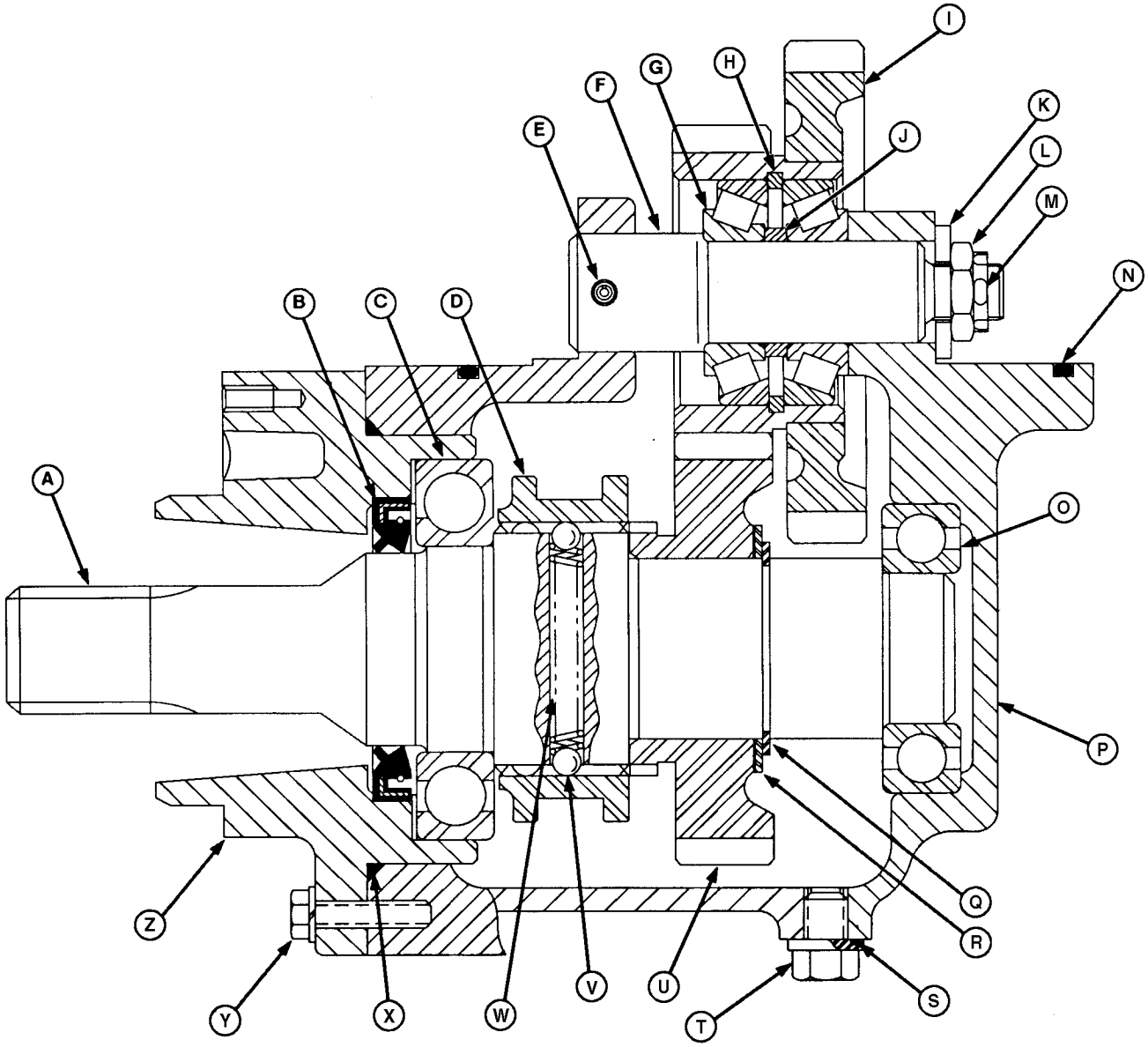
AG,OUO1008,220 –19–06OCT99–2/3

IMPORTANT: Replace all seals. Damaged or used seals will leak.

13. Remove seal (D) using a screwdriver. Install new seal, with lips facing toward shaft assembly, into cover bore until it stops, using a bearing, bushing, and seal driver set.

AG,OUO1008,220 –19–06OCT99–3/3

MFWD Drop Gearbox Cross Section



LV497AE –UN–07NOV96

A—Output Shaft
B—Seal
C—Bearing
D—Shift Collar
E—Dual Spring Pins
F—Top Shaft
G—Bearing Assembly
H—Snap Ring
I—Driven Gears
J—Spacer
K—Washer
L—Nut
M—Cotter Pin
N—O-Ring
O—Bearing
P—MFWD Drop Gearbox
Q—Snap Ring
R—Washer
S—O-Ring
T—Drain Plug
U—Idler Gear
V—Ball (2 used)
W—Spring
X—O-Ring
Y—Cap Screw (4 used)
Z—Cover

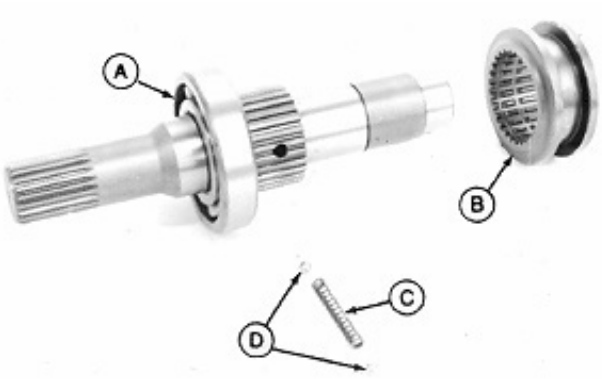
AG,OUO1085,203 –19–22AUG00–1/1

Assemble MFWD Drop Gearbox

IMPORTANT: Use new seals and O-rings during assembly. Damaged or used seals and O-rings will leak.

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

1. Install bearing (A), if removed, using a piece of pipe and a press.
2. Apply multipurpose grease to balls (D) and spring (C).
3. Install balls and spring in hole in shaft.
4. Install collar (B) over balls with shoulder of collar facing bearing (A).



LV560 –UN–09MAR92

A—Bearing
B—Shift Collar
C—Spring
D—Ball (2 used)

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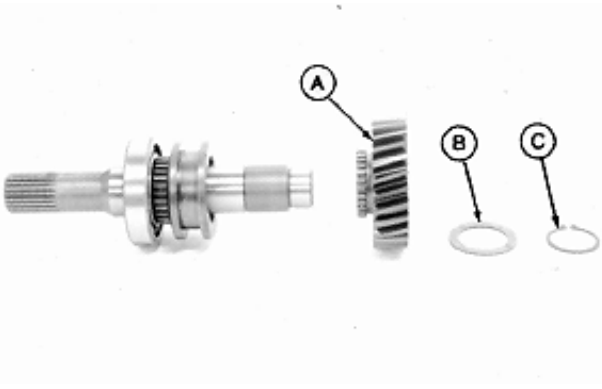
AG,OUO1085,206 –19–28JUN02–1/6

IMPORTANT: Small splines on gear (A) must face shift collar.

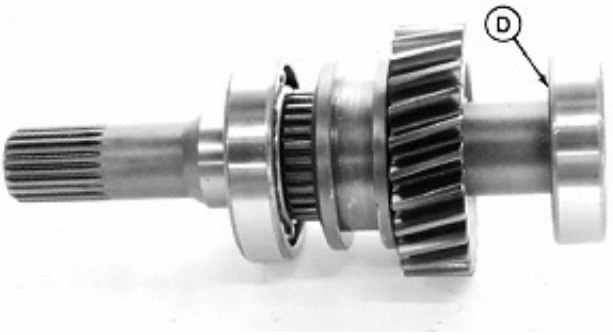
Grooves in washer (B) must face gear (A).

5. Install gear (A), washer (B), and snap ring (C).
6. Press bearing (D) tight against shoulder of shaft.



LV561 –UN–09MAR92

A—Idler Gear
B—Washer
C—Snap Ring
D—Bearing



LV562 –UN–09MAR92

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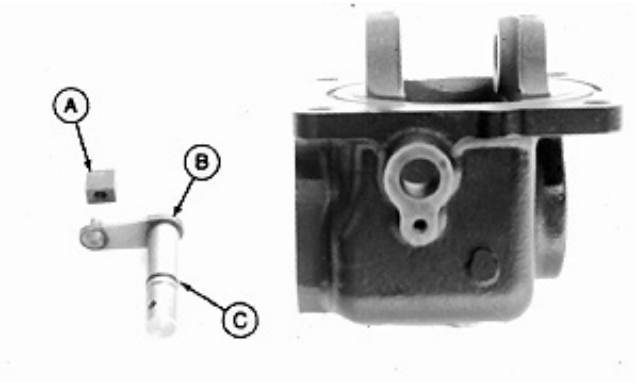
AG,OUO1085,206 –19–28JUN02–2/6

7. Apply multipurpose grease to shift lever shaft (C), new O-ring (B), and shift block (A).

8. Install shift block on lever.

9. Install lever in gearbox. Pull lever tight against gearbox and install O-ring.

A—Shift Block
B—O-Ring
C—Shift Lever Shaft



LV563 –UN–09MAR92

AG,OUO1085,206 –19–28JUN02–3/6

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10. Install shaft assembly (A).

11. Position shift block on lever (C) between shoulders of shift collar. Push lever into gearbox.

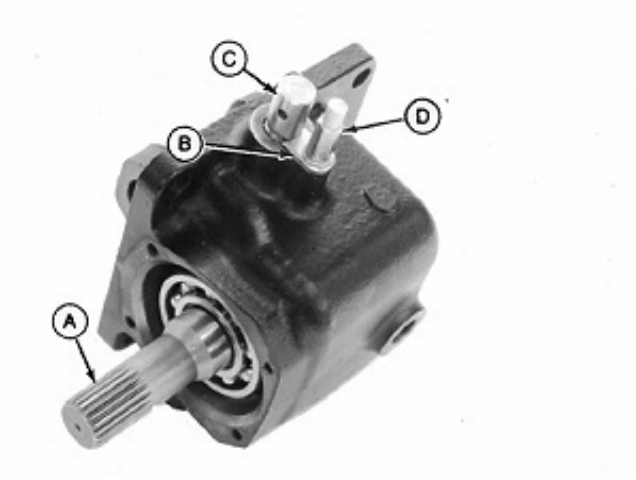
12. Install plate (B) in groove of lever and install bolt (D). Tighten bolt to specification.

Specification

MFWD Drop Gearbox Shift Lever
Bolt—Torque..... 26 N•m (230 lb-in.)

13. Install shift arm with long end pointing in opposite direction of output shaft.

A—Output Shaft Assembly
B—Lock Plate
C—Shift Lever
D—Bolt



LV564 –UN–09MAR92

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AG,OUO1085,206 –19–28JUN02–4/6

14. Apply multipurpose grease to inside lips of cover seal.

15. Install new O-ring and cover (A).

16. Install four cap screws (B) and tighten to specification.

Specification

Drop Gearbox Drive Shaft Cover
Cap Screws—Torque ..... 26 N•m (230 lb-in.)

17. Install new O-ring and plug (C).

A—O-Ring and Cover
B—Cap Screw (4 used)
C—O-Ring and Plug

LV565 –UN–09MAR92

Continued on next page

AG,OUO1085,206 –19–28JUN02–5/6

18. Install snap ring (G) if removed.

19. Install spacer (H) and bearing cups (E) into gear (F).

CAUTION: DO NOT heat oil over 182°C (360°F). Oil fumes or oil can ignite above 193°C (380°F). Use a thermometer. DO NOT allow a flame or heating element to come in direct contact with the oil. Heat the oil in a well-ventilated area.

20. Heat bearing cones (D) to 149°C (300°F).

21. Assemble bearing cones (D) to gear (F).

NOTE: Align hole in shaft with hole in gearbox when installing shaft.

22. Position gear and bearings between ears of gearbox and install shaft (C) using a brass drift and hammer. Shoulder on shaft must be flush with bearing cone.

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NOTE: Install spring pin (B) inside spring pin (A) with splits facing 180° (opposite) from each other.

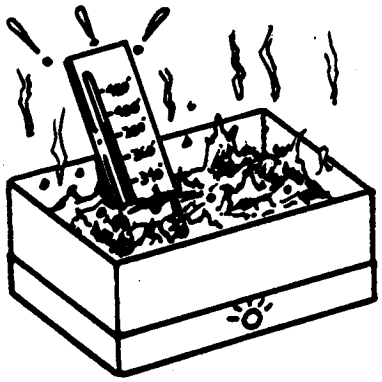
23. Install spring pins (A and B).

24. Install washer (I) and nut (J). Tighten nut to specification.

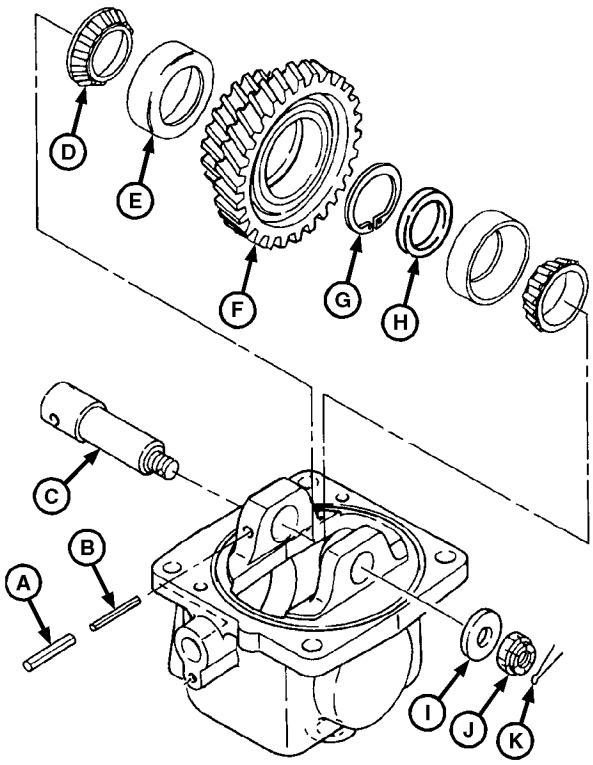
Specification

MFWD Drop Gearbox Top Shaft
Nut—Torque ..... 60 N•m (44 lb-ft)

25. Install cotter pin (K).



T81191 –UN–23FEB89

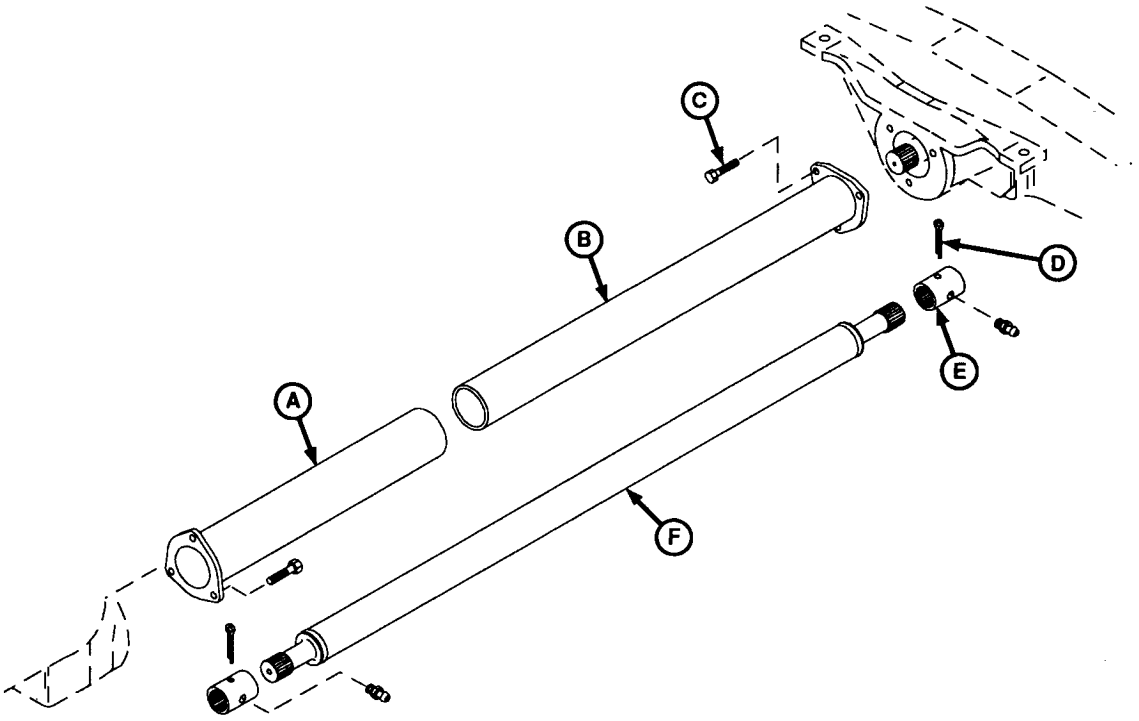


LV495A –UN–20SEP96

A—Large Spring Pin
B—Small Spring Pin
C—Top Shaft
D—Bearing Cone (2 used)
E—Bearing Cup (2 used)
F—Driven Gears
G—Snap Ring
H—Spacer
I—Washer
J—Nut
K—Cotter Pin

AG,OUO1085,206 –19–28JUN02–6/6

Remove, Inspect and Install MFWD Drive Shaft



LV280AE –UN–17JUN94

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A—Drive Shaft Guard (inner)
B—Drive Shaft Guard (outer)
C—Cap Screw (6 used)
D—Cotter Pin (2 used)
E—Coupler (2 used)
F—Drive Shaft

1. Remove cap screws (C).
2. Slide guards (A and B) together.
3. Remove cotter pins (D).
4. Slide couplers (E) toward drive shaft (F) and remove drive shaft assembly.
5. Inspect parts for wear or damage. Check drive shaft for straightness. Replace parts as necessary.
6. Apply Moly High Temperature EP Grease to ID of couplers (E).
7. Install drive shaft assembly.
8. Install drive shaft guard cap screws (C). Tighten to specification.

Specification	
Drive Shaft Guard Cap Screws—Torque	15 N•m (11 lb-ft)

AG,OUO1085,207 –19–28JUN02–1/1

Remove and Install MFWD Axle Housing Assembly

1. Remove drive shaft. (See Remove, Inspect and Install MFWD Drive Shaft in this group.)

2. Raise front of tractor. Securely support tractor below the engine/transmission junction.

CAUTION: Axle will pivot to one side when one wheel is removed. Install wooden blocks between the axle stops and frame to prevent axle from tipping.

3. Install wooden blocks between axle and frame.

4. Remove front wheels.

5. Position a transmission jack or floor jack under center of axle as shown. Ensure axle will be stable on the floor jack when cap screws (B) are removed.

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NOTE: Close all openings using caps and plugs.

6. Disconnect hydraulic hoses (A). Close all openings using caps and plugs.

7. Remove cap screws (B) and lower axle.

8. Make repairs as necessary. (See procedures in this group.)

9. Raise axle into position and install cap screws. Tighten cap screws to specifications.

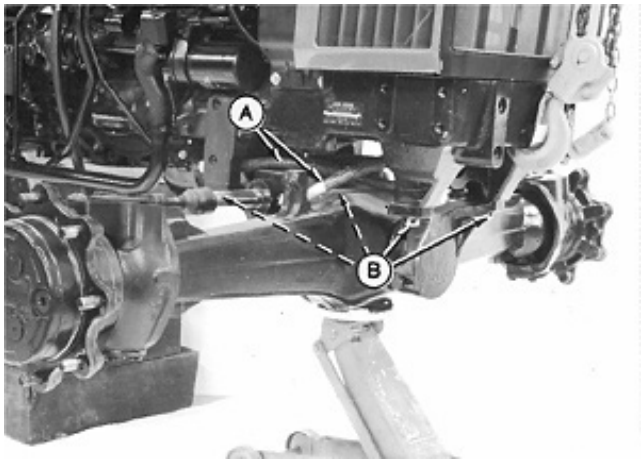
Specification	
Axle-to-Frame Cap Screws—Torque	650 N•m (479 lb-ft)

10. Connect hydraulic hoses.

11. Install front wheels. Tighten wheel nuts to specification.

Specification	
Front Wheel Nuts—Torque	300 N•m (220 lb-ft)

12. Remove all supports and lower tractor.



LV282 –UN–03MAR92

A—Hydraulic Hose (2 used)
B—Cap Screw (4 used)

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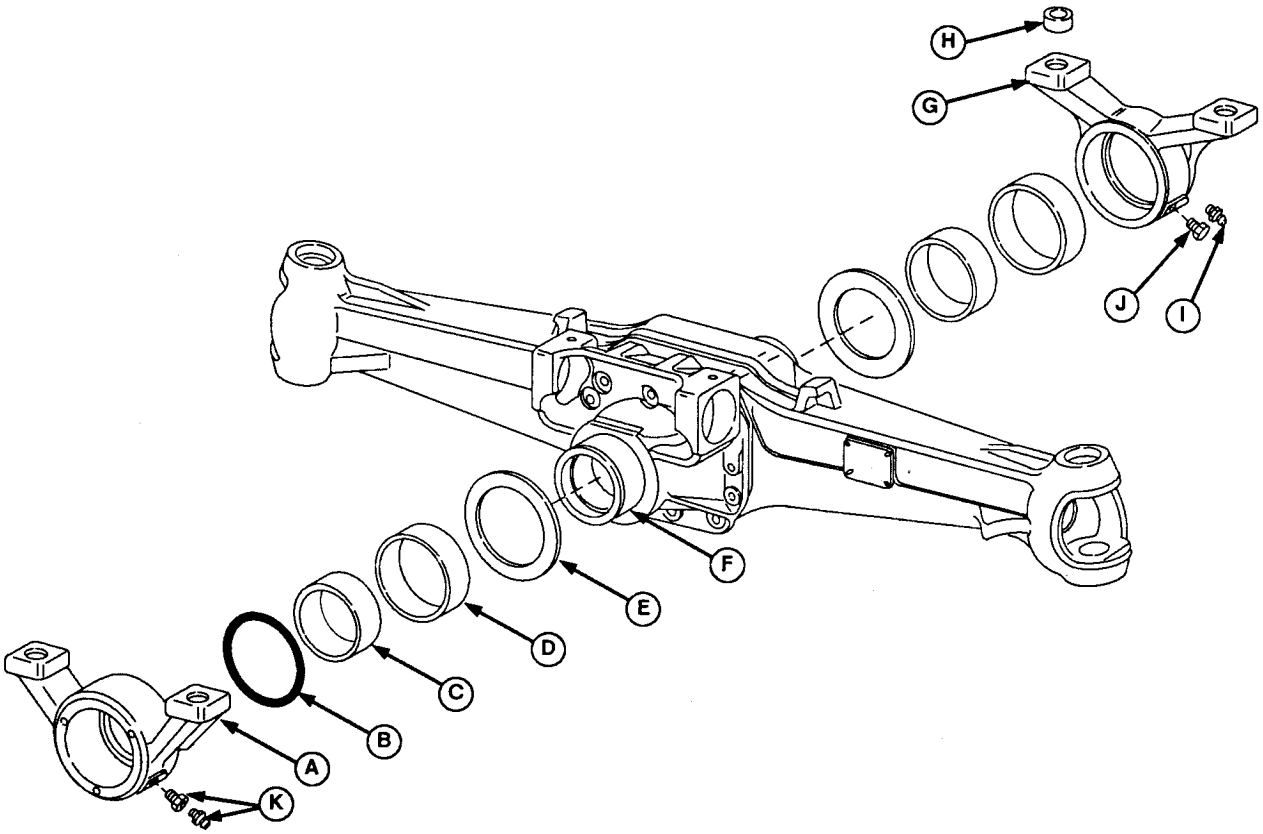
13. Install drive shaft.

AG,OUO1085,208 –19–28JUN02–2/2

Remove, Inspect and Install MFWD Axle Supports



LV283AE –UN–09MAR92

MFWD Axle Supports

A—Rear Support
B—O-Ring
C—Trunnion Bushing (2 used)
D—Support Bushing (2 used)
E—Thrust Washer (2 used)
F—Axle Trunnion
G—Front Support
H—Bushing (4 used)
I—Lubrication Fitting
J—Locating Bolt
K—Lubrication Fitting Assembly

1. Remove MFWD axle. (See Remove and Install MFWD Axle Housing Assembly in this group.)
2. Remove supports (A and G).
3. Remove O-ring (B).
4. Clean supports and axle trunnions. Do not remove bushings (C and D).
5. Install supports on axle trunnions (F). Rock supports from side to side. Replace bushings (C and D) if excessive play is noted.
6. Inspect all parts for wear or damage. Replace as necessary.

NOTE: The inner and outer bushings (C and D) are a matched set. Always replace both if replacement is necessary.

Bushings (D) are press fit inside supports (A and G). Bushings (C) are press fit on trunnions (F). Remove bushings only if replacement is necessary.

7. Remove parts (I—K).

Continued on next page

8. Cut bushings to remove.
9. Install bushings using a press or a brass drift and hammer.
10. Install parts (I—K).
11. Apply multipurpose grease to all bushings.
12. Install new O-ring (B) in support (A). Install supports on axle trunnions.
13. Install MFWD axle. (See Remove and Install MFWD Axle Housing Assembly in this group.)
14. Apply multipurpose grease to fittings (I and K).

AG,OUO1008,364 –19–22AUG00–2/2

Disassemble and Inspect MFWD Outer Drive

NOTE: Outer drive assembly can be serviced without removing axle.

1. Raise and support MFWD axle.
2. Remove front wheel.
3. Turn outer drive until filler/drain plug (C) is at the lowest position.

NOTE: Approximate capacity of wheel hub is 0.6 L (0.63 U.S. qt).

4. Remove plug (C) to drain wheel hub.
5. Remove two socket head screws (A).
6. Remove planet pinion carrier (B).

LV284 –UN–09MAR92

A—Socket Head Screw (2 used)
B—Planet Pinion Carrier
C—Filler/Drain Plug

Continued on next page

AG,OUO1008,365 –19–28JUN02–1/3

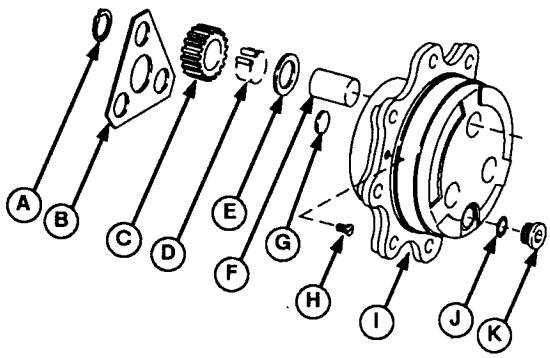
IMPORTANT: Keep each planet gear assembly together as a set.

7. Remove parts (A—E) from planet pinion carrier (I).

NOTE: Pad (G) is held with adhesive to carrier (I). Replace only if necessary.

Shaft (F) and carrier (I) are interference fit and are a matched set. If shafts or carrier are worn or damaged, replace as one unit.

8. Inspect all parts for wear or damage. Replace as necessary.



LV567AE –UN–09MAR92

A—Snap Ring (3 used)
B—Pinion Plate
C—Planet Pinion (3 used)
D—Needle Bearings (30 per gear)
E—Thrust Washer (3 used)
F—Pinion Shaft (3 used)
G—Thrust Pad
H—Socket Head Screw (2 used)
I—Planet Pinion Carrier
J—O-Ring
K—Filler/Drain Plug

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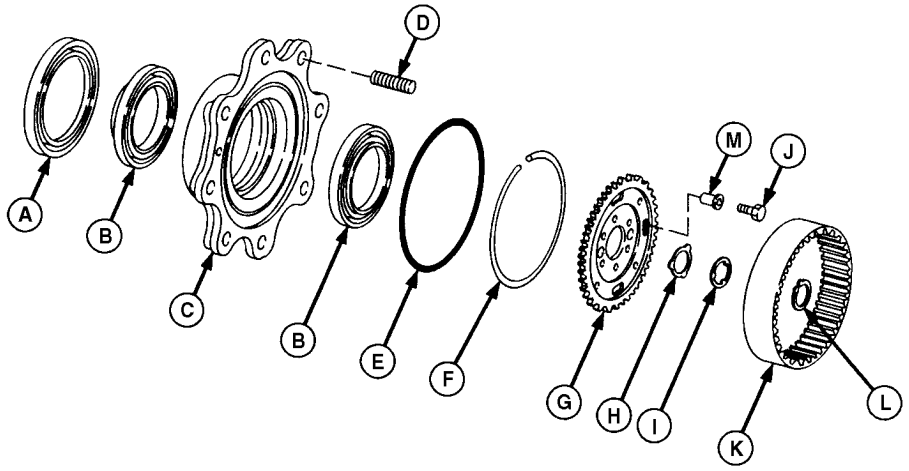
AG,OUO1008,365 –19–28JUN02–2/3



LV2128 –UN–09JUN97

A—Seal
B—Bearing (2 used)
C—Hub
D—Stud (8 used)
E—O-Ring
F—Retaining Ring
G—Ring Gear Plate
H—Thrust Washer
I—Spacer
J—Cap Screw (6 used)
K—Ring Gear
L—Snap Ring
M—Bushing (6 used)

9. Remove snap ring (L) and washers (H and I).

10. Remove cap screws (J).

11. Install two of the 10 mm cap screws (J) in the threaded jacking holes located in plate (G). Tighten cap screws evenly to remove ring gear assembly.

NOTE: Bushings (M) are press fit. Remove only if replacement is necessary.

12. Remove retaining ring (F) to separate plate (G) from ring gear (K).

IMPORTANT: The cone and cup of bearings (B) are matched sets. Tag bearing cones to identify each cone with its respective bearing cup to aid in assembly.

Replace all seals. Damaged or used seals will leak.

NOTE: Bearing cups are press fit in hub (C). Remove cups only if replacing bearings.

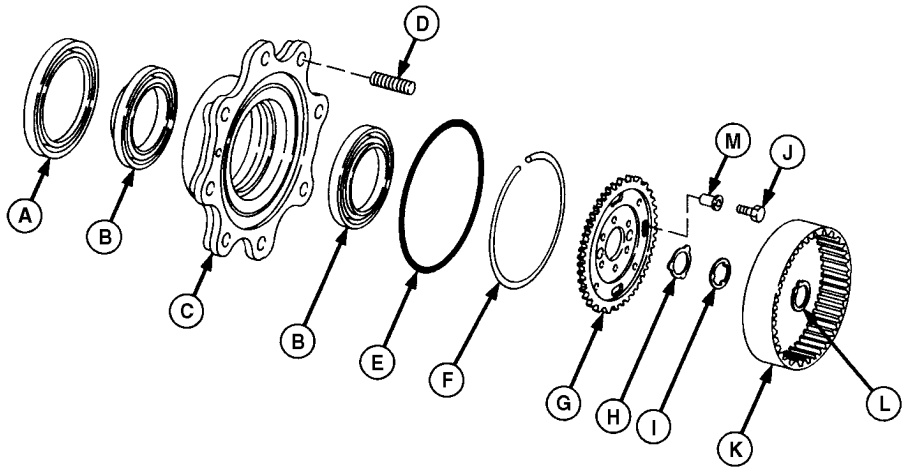
Remove studs (D) only if replacement is necessary.

13. Remove parts (A—E).

14. Inspect all parts for wear or damage. Replace as necessary.

AG,OUO1008,365 –19–28JUN02–3/3

Assemble MFWD Outer Drive



LV2128 –UN–09JUN97

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A—Seal
B—Bearing (2 used)
C—Hub
D—Stud (8 used)
E—O-Ring
F—Retaining Ring
G—Ring Gear Plate
H—Thrust Washer
I—Spacer
J—Cap Screw (4 used)
K—Ring Gear
L—Snap Ring
M—Bushing (4 used)

IMPORTANT: Use new O-rings during assembly. Damaged or used O-rings will leak.

Lubricate all internal parts with clean oil during assembly.

1. Apply multipurpose grease to lips of seal (A).
2. Install bearing cone (B) on swivel housing.
3. Install hub (C), remaining bearing cone, and new O-ring (E).
4. Assemble parts (F, G and K).
5. Press bushings (M) into bores of plate (G).
6. Apply thread lock and sealer (medium strength) to threads of cap screws (J).
7. Install ring gear assembly and cap screws. Tighten cap screws to specification.

Specification

MFWD Outer Drive Cap Screws—Torque ..... 78 N•m (58 lb-ft)

8. Install washers (H and I) and snap ring (L).
9. If studs (D) were removed:
   - Apply thread lock and sealer (medium strength) to threads of studs.
   - Install studs and tighten to specifications.

Specification

MFWD Outer Drive Studs—Torque..... 70 N•m (50 lb-ft)

Continued on next page

AG,OUO1008,366 –19–28JUN02–1/2

10. If thrust pad (G) was removed:

    - Clean thrust pad and surface of carrier housing (where pad contacts housing) with solvent. Allow to air dry.
    - Apply retaining compound to pad.
    - Install pad in carrier housing.

11. Install parts (A—E) into carrier (I). Install needle bearings (D) using grease to hold the individual bearings in position.

12. Install carrier assembly to hub.

13. Install two socket head screws (H). Tighten to specifications.

Specification

Planet Pinion Carrier Socket Screws—Torque ..... 25 N•m (18.5 lb-ft)

14. Rotate outer drive until filler/drain plug hole is approximately at the 3:00 o'clock position and oil level line is horizontal. Fill to level line with specified gear oil. (See MFWD Gear Oil in Section 10, Group 20.)

15. Install O-ring (J) and plug (K). Tighten plug to specifications.

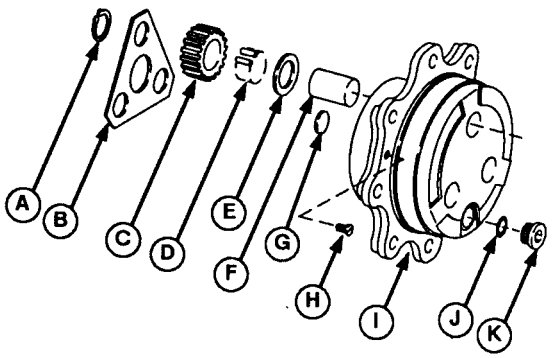
Specification

Planet Pinion Carrier Fill/Drain Plug—Torque..... 80 N•m (59 lb-ft)

16. Install wheel. Tighten wheel nuts to specifications.

Specification

Front Wheel Nuts—Torque ..... 300 N•m (220 lb-ft)



LV567AE –UN–09MAR92

A—Snap Ring (3 used)
B—Pinion Plate
C—Planet Pinion (3 used)
D—Needle Bearing (30 per gear)
E—Thrust Washer (3 used)
F—Pinion Shaft (3 used)
G—Thrust Pad
H—Socket Screw (2 used)
I—Planet Pinion Carrier
J—O-Ring
K—Filler/Drain Plug

AG,OUO1008,366 –19–28JUN02–2/2

Remove, Inspect, and Install MFWD Swivel Housing

1. Raise and support MFWD axle.
2. Remove front wheel.
3. Turn outer drive so that filler/drain plug (C) is at the lowest position.

NOTE: Approximate capacity of wheel hub is 0.6 L (0.63 U.S. qt).

4. Remove plug (C) to drain wheel hub.
5. Remove two socket head screws (A).
6. Remove planet pinion carrier (B).

LV284 –UN–09MAR92

A—Socket Head Screw (2 used)
B—Planet Pinion Carrier
C—Filler/Drain Plug

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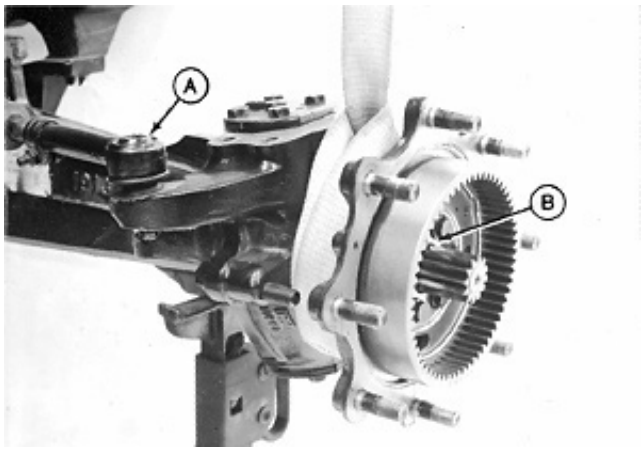
AG,OUO1008,383 –19–28JUN02–1/5

7. Attach lifting chain or sling around swivel housing.
8. Disconnect tie rod end (A).
9. Remove snap ring and washers (B) from axle shaft.

A—Tie Rod End
B—Washer



LV286 –UN–09MAR92

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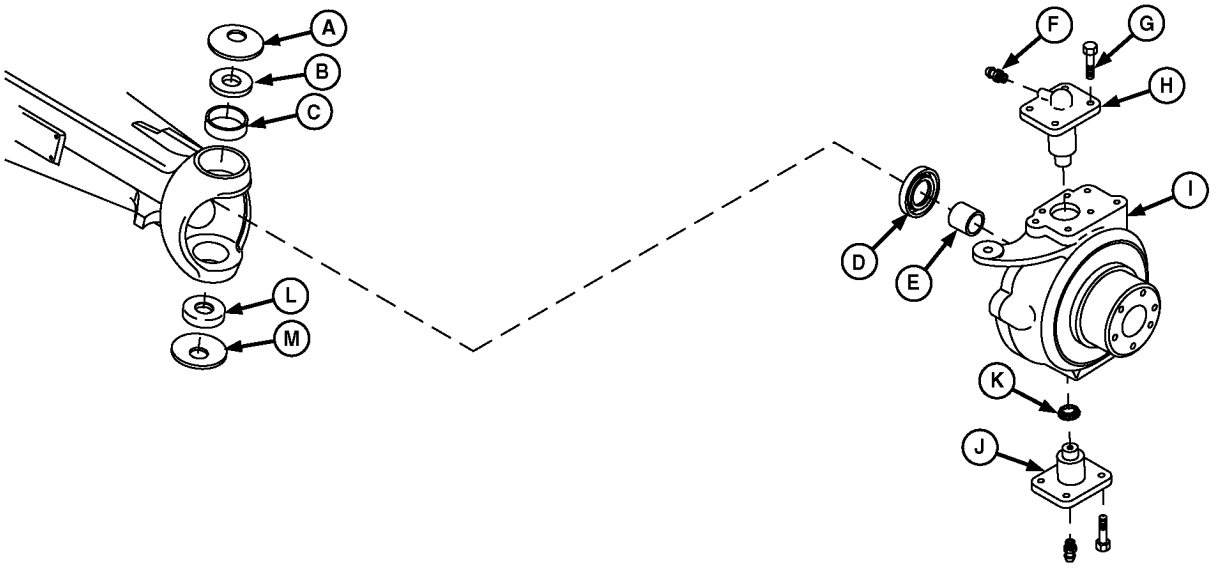
AG,OUO1008,383 –19–28JUN02–2/5



LV2129 –UN–09JUN97

A—Belleville Washer
B—Spacer
C—Bushing
D—Seal
E—Bushing
F—Lubrication Fitting (2 used)
G—Cap Screw (8 used)
H—Upper Swivel Pin
I—Swivel Housing
J—Lower Swivel Pin
K—Bearing Cone
L—Bearing Cup
M—Belleville Washer

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NOTE: When removing swivel housing (I), keep axle shaft with axle housing. Hold shaft in position while pulling swivel housing away from axle housing.

10. Remove parts (G—J).

NOTE: All bushings and bearings are press fit. Remove only if replacement is necessary.

If replacing bearing cone (K), it may be necessary to heat the axle housing and chill the bearing cone to aid in installation.

11. Inspect all parts for wear or damage. Replace as necessary.

IMPORTANT: Replace all seals. Damaged or used seals will leak.

Remove burrs from mating surfaces of parts (H, I, and J). Raised imperfections on these surfaces will affect swivel pin bearing preload.

12. Install all parts using the following instructions:

- Install seals using a bearing, bushing, and seal driver set. Install seal (D) with lips toward swivel housing.
- Apply multipurpose grease to inside lips of seals.
- Apply Moly High Temperature EP Grease to shaft of pins (H and J).
- Belleville washers (A and M) are used to preload the swivel pin bearings. No adjustment is necessary.
- Tighten cap screws (G) to specification.

Specification	
MFWD Swivel Housing Cap Screw—Torque	120 N•m (89 lb-ft)

Continued on next page

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NOTE: Washer with tangs on its outer edge goes against ring gear plate.

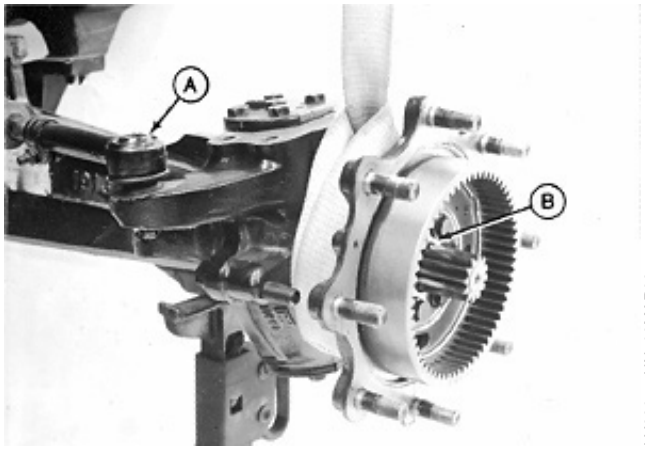
13. Install washers and snap ring (B).

14. Connect tie rod end (A) to swivel housing. Tighten nut to specification.

Specification

Tie Rod End Nut—Torque..... 165 N•m (122 lb-ft)

A—Tie Rod End
B—Snap Ring



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26

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

15. Install planet pinion carrier (B) with new O-ring.

16. Install two socket head screws (A). Tighten to specifications.

Specification

Planet Pinion Carrier Socket Screws—Torque..... 25 N•m (18.5 lb-ft)

17. Turn outer drive until filler/drain plug hole is approximately at the 3:00 o'clock position and oil level line is horizontal (parallel to ground). Fill with specified gear oil. (See MFWD Gear Oil in Section 10, Group 20.)

18. Install plug (C) with new O-ring. Tighten plug to specifications.

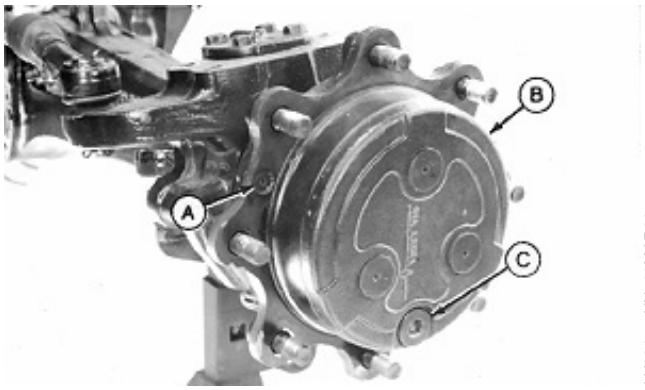
Specification

Planet Pinion Carrier Fill/Drain Plug—Torque..... 80 N•m (59 lb-ft)

19. Install wheel. Tighten wheel nuts to specifications.

Specification

Front Wheel Nuts—Torque ..... 300 N•m (220 lb-ft)



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A—Socket Head Screw (2 used)
B—Planet Pinion Carrier
C—Plug

AG,OUO1008,383 –19–28JUN02–5/5

Remove, Inspect, and Install MFWD Axle Shaft

1. Remove swivel housing. (See Remove, Inspect, and Install MFWD Swivel Housing in this group.)
2. Remove axle shaft assembly (A). Support shaft as it is removed from housing so as not to damage axle housing oil seal.

A—Axle Shaft Assembly

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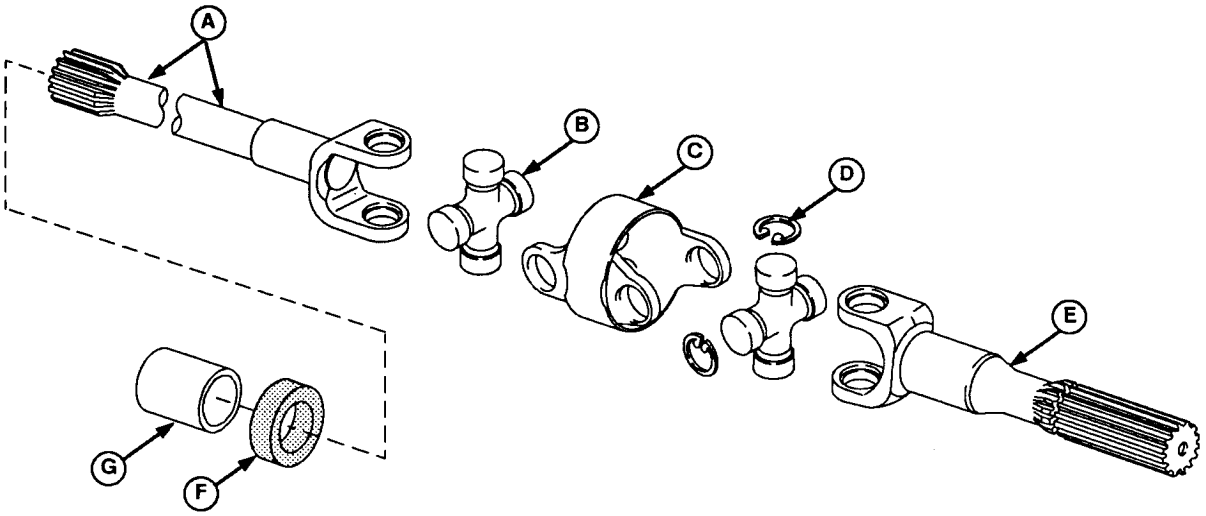
AG,OUO1008,384 –19–22AUG00–1/2



LV289AE –UN–09MAR92

50 35 28

A—Long Axle Shaft
B—Cross and Bearing Assembly (2 used)
C—Center Yoke
D—Retaining Ring (8 used)
E—Short Axle Shaft
F—Seal
G—Bushing

NOTE: Bushing (G) is press fit in MFWD axle housing. Remove bushing only if replacement is necessary.

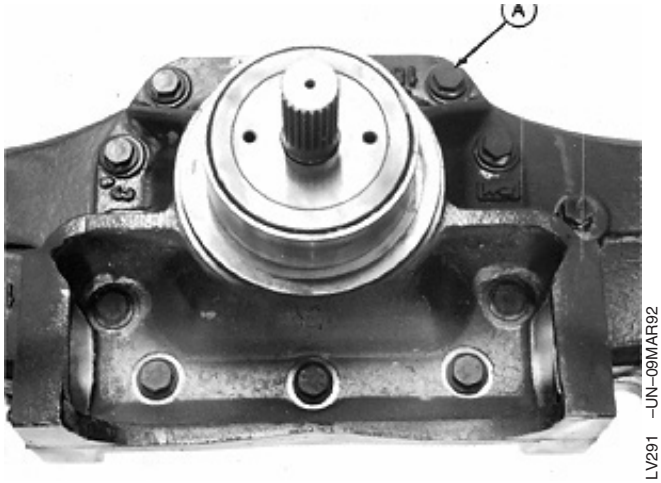
3. Inspect parts (A—G) for wear or damage. Replace as necessary.

IMPORTANT: Replace all seals. Damaged or used seals will leak.

4. Pry seal (F) out of axle housing. Install new seal with lips facing bushing (G), using a bearing, bushing, and seal driver set. Install seal into axle bore until tight against shoulder in bore.
5. Apply multipurpose grease to lips of seal.
6. Install axle shaft assembly.
7. Install swivel housing. (See Remove, Inspect, and Install MFWD Swivel Housing in this group.)

AG,OUO1008,384 –19–22AUG00–2/2

Remove and Install MFWD Differential Carrier Assembly



A—Cap Screw (10 used)

1. Remove steering cylinder. (See Remove and Install Steering Cylinder—MFWD Axle in Section 60, Group 05.)
2. Remove axle supports. (See Remove, Inspect and Install MFWD Axle Supports in this group.)
3. Remove MFWD axle shafts. (See Remove, Inspect, and Install MFWD Axle Shaft in this group.)

NOTE: Approximate capacity of axle housing is 5 L (5.3 U.S. qt).

4. Drain axle housing.
5. Remove ten cap screws (A) to remove carrier housing.
6. Make repairs as necessary. (See Disassemble and Inspect MFWD Differential Carrier Assembly in this group.)
7. Clean mating surfaces of housing using Clean and Cure Primer. Apply John Deere Flexible Sealant to mating surfaces of housings.
8. Install differential carrier housing.
9. Install cap screws and tighten to specifications.

Specification	
Differential Carrier-to-Axle Housing Cap Screws—Torque	169 N•m (125 lb-ft)

10. Install steering cylinder. (See Remove and Install Steering Cylinder—MFWD Axle in Section 60, Group 05.)
11. Install MFWD axle shafts. (See Remove, Inspect, and Install MFWD Axle Shaft in this group.)
12. Install MFWD axle and supports. (See Remove, Inspect and Install MFWD Axle Supports and Remove and Install MFWD Axle Housing Assembly in this group.)

Continued on next page

13. Fill axle housing with specified gear oil. (See MFWD Gear Oil in Section 10, Group 20.)

14. Tighten axle housing fill plug to specification.

Specification	
Axle Housing Fill Plug—Torque	70 N•m (50 lb-ft)

AG,OUO1008,385 –19–28JUN02–2/2

Disassemble and Inspect MFWD Differential Carrier Assembly

1. Remove MFWD differential carrier assembly. (See Remove and Install MFWD Differential Carrier Assembly in this group.)

2. Remove cover (A) using a puller.

A—Cover

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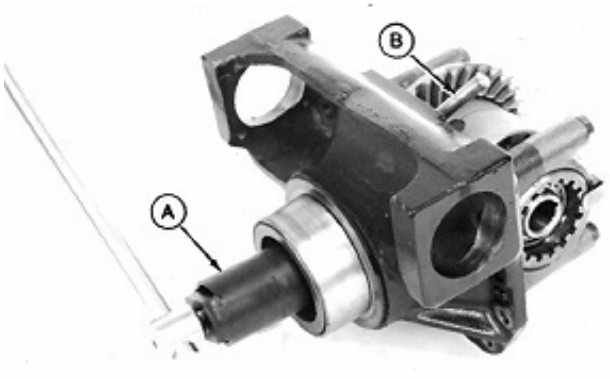
3. Straighten locking tabs on collar of nut using a small punch.

4. Wedge a brass drift (B) or piece of hard wood between ring gear and pinion shaft.

5. Loosen pinion nut using JDG736 Spanner Wrench (A).

A—Spanner Wrench
B—Brass Drift



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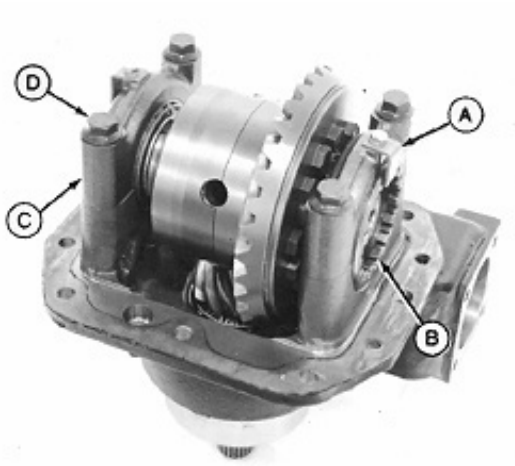
IMPORTANT: Ring nut (B), end cap (C), and the related bearing boss on each side of carrier housing are matched sets. Do not interchange parts.

6. Mark each end cap (C) and related bearing boss to identify for assembly purposes.
7. Mark position of each ring nut (B) in respect to the end cap and related bearing boss to aid in assembly.
8. Remove parts (A—D).
9. Remove differential and ring gear assembly from carrier housing.



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A—Lock Plate (2 used)
B—Ring Nut (2 used)
C—Bearing End Cap (2 used)
D—Cap Screw (4 used)

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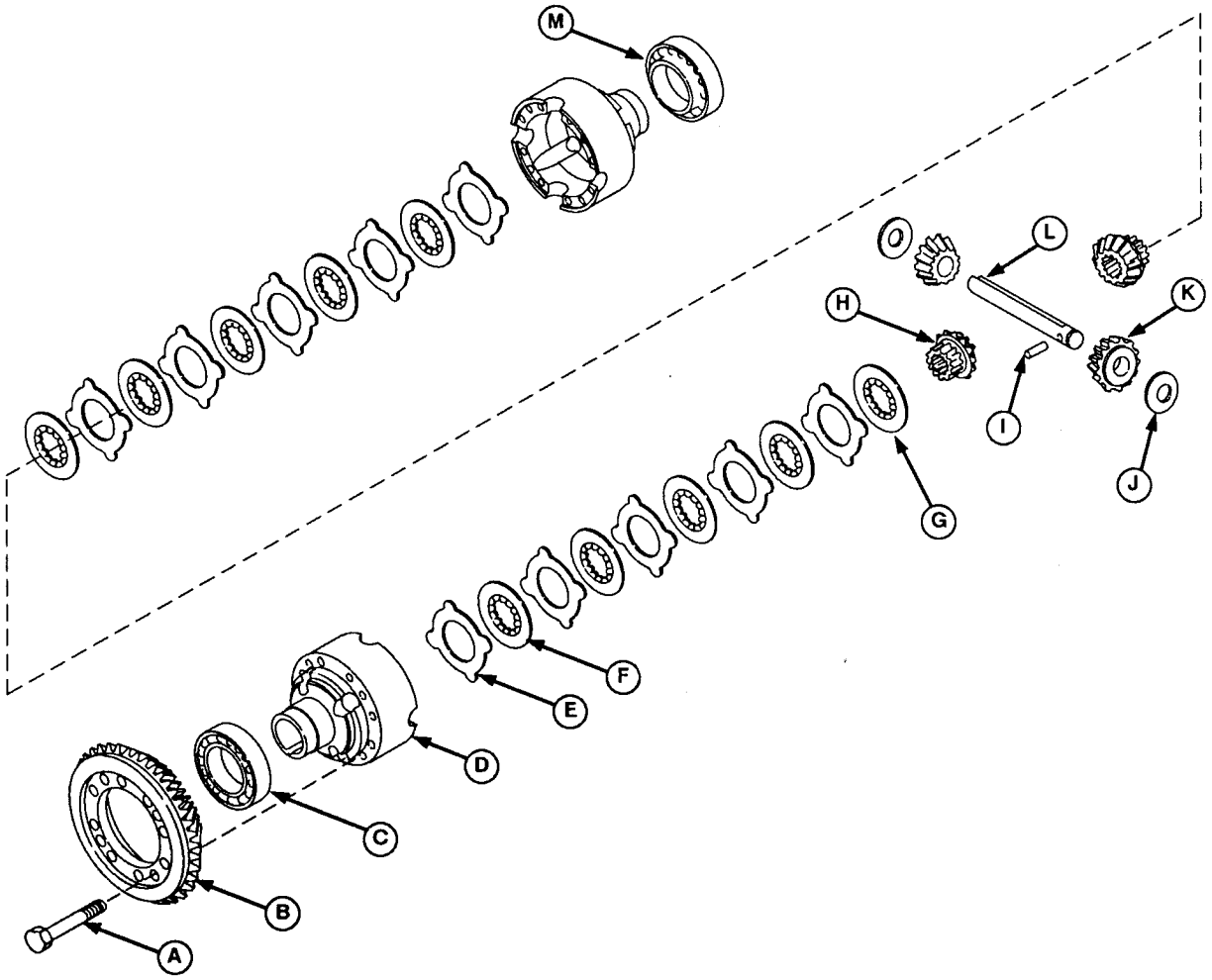
AG,OUO1008,386 –19–28JUN02–3/6



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A—Cap Screw (12 used)
B—Bevel Gear
C—Roller Bearing
D—Differential Housing (2 halves used)
E—Drive Plate (10 used)
F—Friction Plate (8 used)
G—Inner Thrust Plate (2 used)
H—Bevel Gear (2 used)
I—Spring Pin
J—Thrust Washer (2 used)
K—Bevel Pinion (2 used)
L—Pinion Shaft
M—Roller Bearing

IMPORTANT: Keep plates (E—G) together and in sequence removed to aid in assembly.

Keep cup and cone of each bearing (C and M) together as a set.

10. Disassemble parts (A—M). Remove bearing cones of bearings (C and M) only if replacement is necessary.

11. Inspect all parts for wear or damage. Replace as necessary.

12. Measure thickness of plates (E—G). Replace if not to specification.

	Specification
Friction Plate—Minimum Thickness	1.30 mm (0.051 in.)
New Thickness	1.60 mm (0.063 in.)
Drive Plate—Minimum Thickness	1.47 mm (0.058 in.)
New Thickness	1.53 mm (0.060 in.)
Inner Thrust Plate—Minimum Thickness	2.73 mm (0.107 in.)
New Thickness	2.83 mm (0.110 in.)

Continued on next page
AG,OUO1008,386 –19–28JUN02–4/6

IMPORTANT: If either ring gear or pinion shaft is worn or damaged, both components must be replaced as a matched set.

AG,OUO1008,386 –19–28JUN02–5/6

IMPORTANT: Replace all seals. Damaged or used seals will leak.

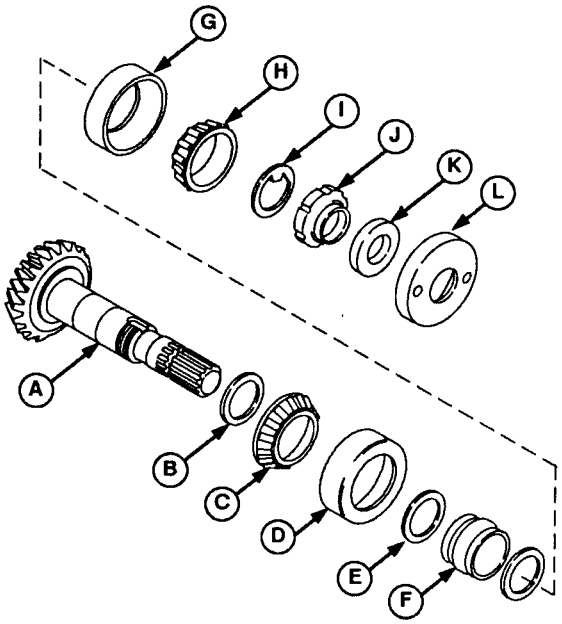
DO NOT use old collapsible spacer (F) and pinion nut (J). If removed, always install new spacer and nut.

NOTE: Bearing cone (C) and bearing cups (D and G) are press fit. Remove only if replacement is necessary.

13. Remove parts (A—K). Remove bearing cone (C) and shim (B) using a knife-edged puller and a press.

14. Inspect all parts for wear or damage. Replace as necessary.

A—Pinion Shaft
B—Shim
C—Bearing Cone
D—Bearing Cup
E—Washer (2 used)
F—Collapsible Spacer
G—Bearing Cup
H—Bearing Cone
I—Washer
J—Nut
K—Seal
L—Cover



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AG,OUO1008,386 –19–28JUN02–6/6

Assemble MFWD Differential Carrier Assembly

IMPORTANT: If the ring gear and pinion assembly, pinion bearings, or the differential carrier housing have been replaced, it will be necessary to calculate for thickness of shim (B) to adjust cone point.

1. If either the ring gear and pinion assembly, pinion bearings, or carrier housing are replaced, cone point will require adjusting. Continue to step 2.

   If all the components are reused, no adjustment is required. Go to step 10. Use original shim value.

2. Install the differential side bearing end caps and cap screws. Tighten cap screws to specification.

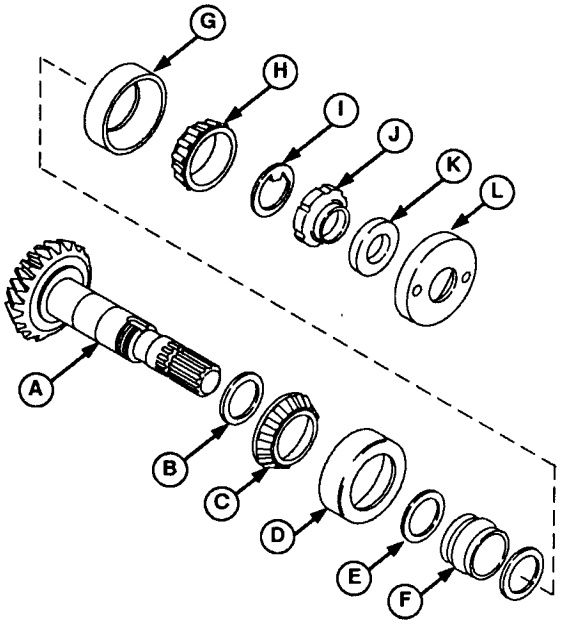
Specification

Differential Carrier Assembly Cap Screws—Torque ..... 266 N•m (196 lb-ft)

50 35 34

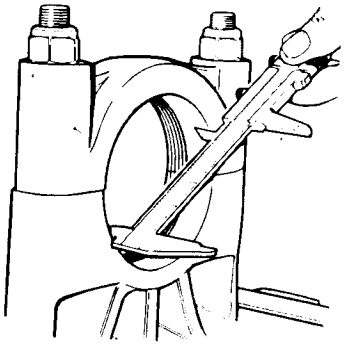
3. Measure the side bearing bore using an internal micrometer or vernier gauge. Record the reading obtained.

4. Remove end caps.



LV551AE –UN–09MAR92

A—Pinion Shaft
B—Shim
C—Bearing Cone
D—Bearing Cup
E—Washer (2 used)
F—Collapsible Spacer
G—Bearing Cup
H—Bearing Cone
I—Washer
J—Pinion Nut
K—Seal
L—Cover



LV301A –UN–09MAR92

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OUO1023,0000014 –19–07APR04–1/10

5. If pinion bearing cups were removed, install new cups in carrier housing with large ID of taper facing outward from housing. Press cups tight against shoulder in housing bore.

6. Install and clamp bearing cones (G) into carrier housing using an M12 x 110 mm cap screw, nut, and washers (F).

   Tighten the cap screw so that bearing cones can just be turned by hand. DO NOT overtighten.

7. Lay a 25 x 228 mm (0.984 x 8.976 in.) circular bar (E) across the inside surface of the two side bearing bores. Measure for dimension (B) using a depth gauge (D).

8. Calculate:

   Dimension (A) = dimension (B) minus diameter of bar (E) [25 mm (0.984 in.)] plus [1/2 diameter of bore (C)] recorded in step 3.

NOTE: Dimension (H) is etched on the head of the pinion gear.

   Actual shim thickness = dimension (A) minus dimension (H).

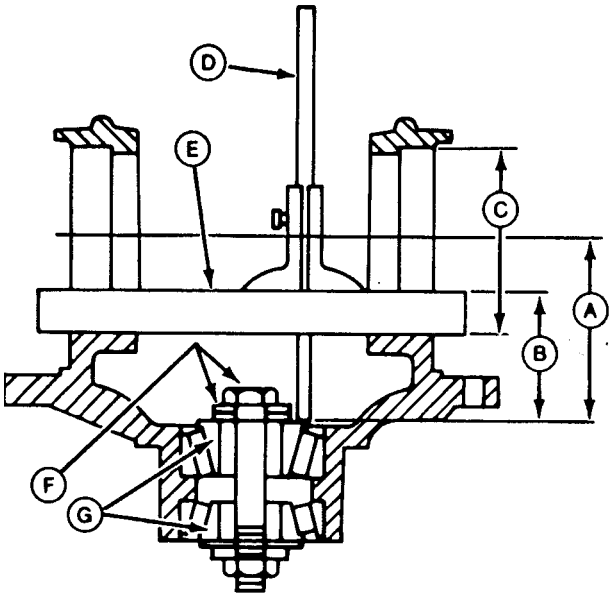
   EXAMPLE (calculated in metric):

   Dimension (A) = 104.1 - 25 + [1/2 (90) = 45] = 124.1

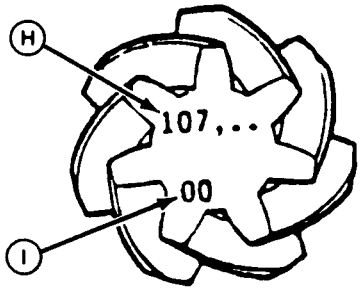
   Etched on the head of the pinion is 121.0

   124.1 - 121.0 = 3.1 mm (shim thickness)

9. Remove items (E—G).



LV302A –UN–09MAR92



LV303A –UN–09MAR92

A—Dimension (bore center to bearing)
B—Dimension (rod to bearing)
C—Bore Diameter (from step 3)
D—Depth Gauge
E—Circular Bar
F—M12 Cap Screw, Nut, and Washers
G—Bearing (2 used)
H—Pinion Dimension
I—Ring Gear/Pinion Mating Number

Continued on next page

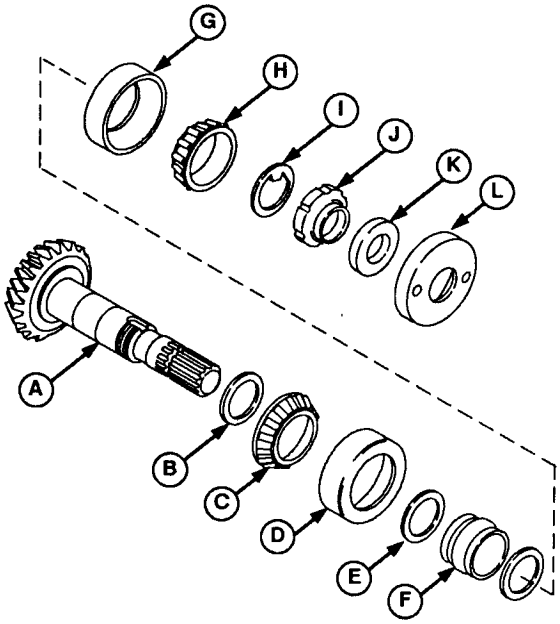
IMPORTANT: DO NOT use old collapsible spacer (F) and pinion nut (J). Always install new spacer and nut.

To prevent damaging bearing (C), apply force only to inner race of bearing cone during installation.

Lubricate all internal parts with clean gear oil during assembly.

10. Install parts (A—J) using the following instructions:

    - Install shim (B) with the chamfer adjacent to the pinion gear.
    - Install bearing cone (C) with large OD of taper toward pinion gear. Install bearing tight against shoulder of pinion shaft using a piece of pipe and a press.
    - Tighten nut (J) by hand using JDG736 Spanner Wrench.
      Apply only enough force needed to just remove free play from bearings.
    - DO NOT install seal (K) at this time.



LV551AE –UN–09MAR92

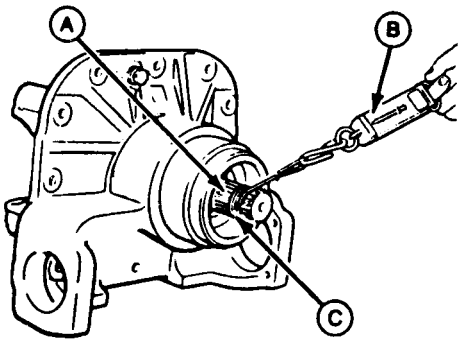
A—Pinion Shaft
B—Shim
C—Bearing Cone
D—Bearing Cup
E—Washer (2 used)
F—Collapsible Spacer
G—Bearing Cup
H—Bearing Cone
I—Washer
J—Pinion Nut
K—Seal
L—Cover

Continued on next page

OUO1023,0000014 –19–07APR04–3/10

11. Measure and adjust pinion bearing preload using the following method:

    - Wrap a length of string (C) evenly (do not overlap) around the exposed pinion shaft (A).
    - Attach a spring scale (B) to string. Pull scale firmly and evenly to measure the force required to rotate the pinion shaft.
    - Read scale during rotation of the pinion shaft. Do not read scale at the point where rotation starts.
    - Record the reading (rolling drag) obtained.



LV304A –UN–22NOV94

A—Pinion Shaft
B—Spring Scale
C—String

OUO1023,0000014 –19–07APR04–4/10

12. Attach JDG1164 Pinion Shaft Holding Fixture to pinion gear and install assembly in a vise.

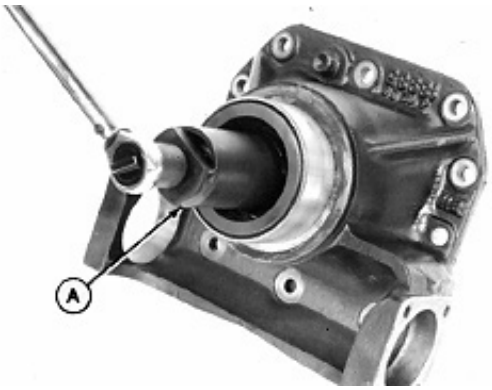
IMPORTANT: Over-tightening the pinion nut may damage the collapsible spacer.

13. Tighten or loosen the pinion nut using JDG736 Spanner Wrench (A) until rolling drag is within specification.

Specification

Pinion Shaft—Rolling Drag..... 105—157 N (24—35 lb force)

14. Lock the pinion nut to the shaft by peening collar of nut into the slot on pinion shaft.



LV281 –UN–09MAR92

A—JDG736 Spanner Wrench

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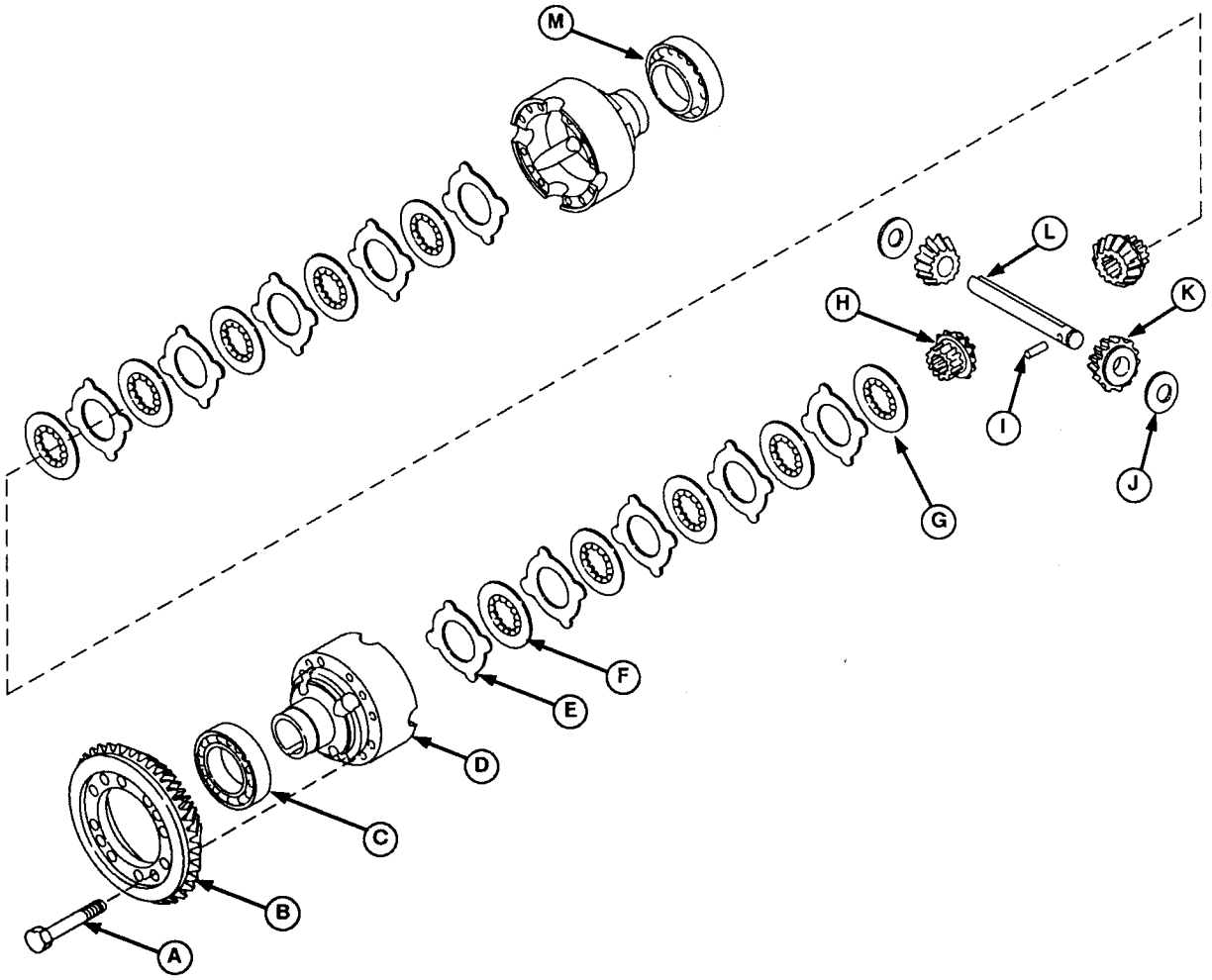
OUO1023,0000014 –19–07APR04–5/10



LV292AE –UN–09MAR92

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35
38

A—Cap Screw (12 used)
B—Bevel Gear
C—Roller Bearing
D—Differential housing (2 halves used)
E—Drive Plate (10 used)
F—Friction Plate (8 used)
G—Inner Thrust Plate (2 used)
H—Bevel Gear (2 used)
I—Spring Pin
J—Thrust Washer (2 used)
K—Bevel Pinion (2 used)
L—Pinion Shaft
M—Roller Bearing

15. Assemble parts (A—M). Apply thread lock and sealer (medium strength) to threads of cap screws (A) and tighten cap screws to specification.

	Specification
Bevel Gear Cap Screw—Torque	78 N•m (58 lb-ft)

Continued on next page

OUO1023,0000014 –19–07APR04–6/10

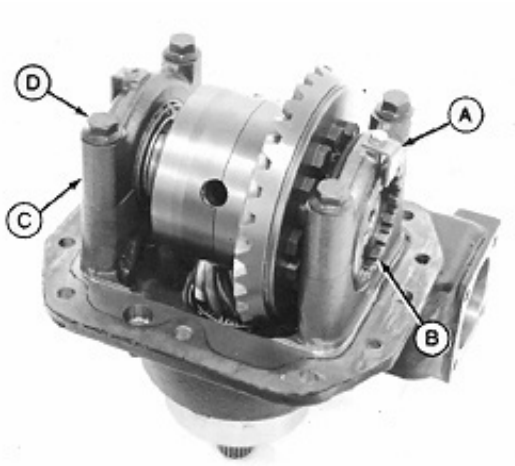
NOTE: When the differential and bevel gear assembly is properly installed in the carrier housing, the bevel gear will be to the left of the pinion gear when viewed from the input shaft side of carrier housing and the carrier housing drain hole is at bottom.

16. Install differential and bevel gear assembly in the carrier housing.

17. Install end caps (C) and ring nuts (B).

IMPORTANT: When tightening cap screws (D), be careful not to force the bevel gear against the pinion gear. This could seriously damage the gear set.

18. Install cap screws (D) and tighten cap screws until the end caps just hold ring nuts and bearing cups in position. At the same time, carefully adjust the ring nuts to ensure the bevel gear is not forced against the pinion gear.



LV296 –UN–09MAR92

A—Lock Plate (2 used)
B—Ring Nut (2 used)
C—End Cap (2 used)
D—Cap Screw (4 used)

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35
39

Continued on next page

OUO1023,0000014 –19–07APR04–7/10

19. Adjust both ring nuts (C) to remove all side bearing free play.

20. Move bevel gear (B) inward toward the pinion gear by turning the left ring nut (bevel gear side) clockwise while turning the right ring nut the same amount counterclockwise. Continue moving bevel gear inward until the bevel gear fully meshes with the pinion gear (do not force the ring nuts). At the same time, keep bearings aligned by lightly hitting the end caps with a soft-faced hammer.

21. Install a dial indicator (A) with its stylus in contact with and 90° to a tooth on the bevel gear.

22. Adjust the ring nuts equally, moving the bevel gear towards or away from the pinion gear until specified backlash reading is achieved.

Specification

Differential Ring Gear-to-Pinion Gear—Backlash..... 0.16—0.21 mm (0.006—0.008 in.)

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35
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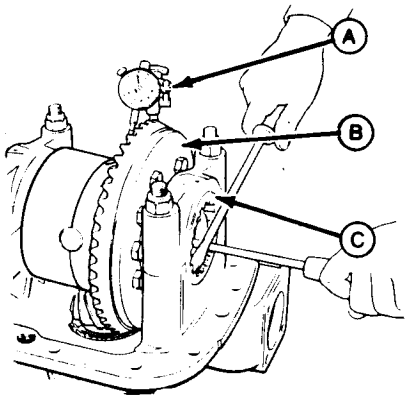
23. Tap each end cap with a soft-faced hammer to make sure end caps and bearings remain correctly positioned during the procedure.

24. Repeat steps 21—23 at two or more locations on bevel gear that are an equal distance from each other.



LV300A –UN–09MAR92

A—Dial Indicator
B—Bevel Gear
C—Ring Nut (2 used)

Continued on next page

NOTE: Before adjusting differential side bearing preload, the pinion bearing preload and pinion-to-bevel gear backlash must be to specification.

25. Measure differential side bearing preload using the following method:

    - Wrap a length of string (C) evenly (do not overlap) around the exposed input shaft (A).
    - Attach a spring scale (B) to string. Pull scale firmly and evenly to measure the force required to rotate the pinion shaft.
    - Read scale during rotation of the pinion. DO NOT read scale at the point where rotation starts.
    - Record the reading (rolling drag) obtained.

NOTE: The differential side bearing preload specification (rolling drag) is the sum of the pinion shaft rolling drag specification and the differential rolling drag.

26. Tighten both ring nuts equally to retain the backlash adjustment until specified rolling drag is achieved.

Specification

Pinion Shaft Plus Differential—
Rolling Drag..... 142—213 N (32—48 lb force)

27. Tighten the end cap screws to specification.

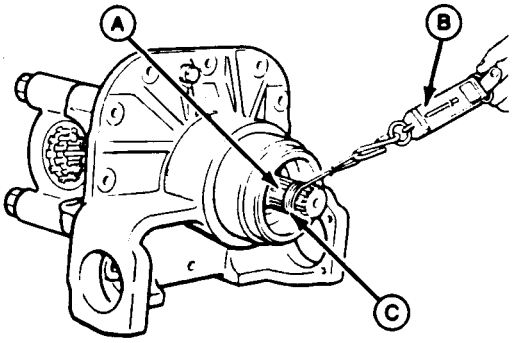
Specification

End Cap Screws—Torque..... 266 N•m (196 lb-ft)

28. Recheck the backlash.

29. Install ring nut locking tabs. If nearest slot in the ring nut does not align with tab, tighten ring nut until slot aligns.

30. Recheck rolling drag.



LV312A –UN–09MAR92

A—Input Shaft
B—Spring Scale
C—String

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35
41

Continued on next page

NOTE: Lips of seal (A) must face toward differential when cover is installed.

31. Install oil seal into cover (A). Apply multipurpose grease to lips of seal.
32. Apply retaining compound to OD of cover (A) to hold cover in position.
33. Install cover using a brass drift and hammer.
34. Install differential carrier. (See Remove and Install MFWD Differential Carrier Assembly in this group.)

A—Seal and Cover

LV294 –UN–09MAR92

OUO1023,0000014 –19–07APR04–10/10

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35
42

Other Material

Number	Name	Use
TY6305 (U.S.) TY9485 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY6304 (U.S.) TY9484 (Canadian) 518 (LOCTITE®)	Flexible Sealant	Seals creeper assembly to transmission case.

LOCTITE is a registered trademark of Loctite Corp.

OUO1043,0000EBE –19–28JUN02–1/1

Specifications

Item	Measurement	Specification
Creeper Assembly Cap Screws	Torque	50 N•m (37 lb-ft)
Rear Wheel Bolt	Torque	175 N•m (130 lb-ft)

OUO1043,0000EBF –19–28JUN02–1/1

Remove and Install Creeper Assembly

NOTE: Tractor is equipped with dual selective control valve (SCV) only. Removal of creeper assembly is similar on tractors equipped with single (third) SCV option.

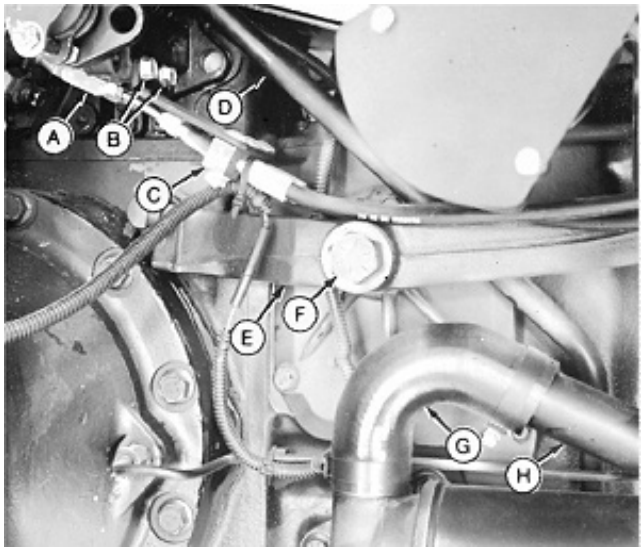
1. Tractors without cab: remove right rear wheel and fender.
2. Tractors with cab: remove rear cab liner behind seat.
3. Drain approximately 7.5 L (2 U.S. gal) of oil from transmission.
4. If equipped with dual SCV: remove cap screws (B) and lock pins (A) to disconnect cable assembly (C). Position cable assembly out of the way.
5. Remove shoulder bolt (F) and pedal (E).

NOTE: Remove suction line (H) hold-down bracket, located between pump and filter, to allow movement of suction line and line (D).

6. Remove suction line (H) hold-down bracket.

NOTE: Close all openings using caps and plugs.

7. Remove hose elbow (G).
8. Disconnect hydraulic line (D) located on top of SCV.



LV194 –UN–03MAR92

A—Clevis Lock Pins
B—Cap Screw (2 used)
C—Cable Assembly
D—Inlet Housing Hydraulic Line
E—Differential Lock Pedal
F—Shoulder Bolt
G—Hose Elbow
H—Suction Line

Continued on next page

AG,OUO1085,210 –19–28JUN02–1/3

9. Remove six cap screws (A).

10. Separate creeper assembly (B) from transmission case. Remove creeper assembly.

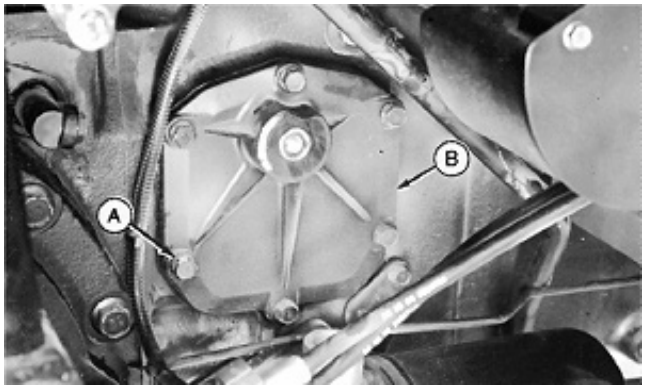
11. Make repairs as necessary. (See Disassemble, Inspect, and Assemble Creeper Assembly in this group.)

12. Clean mating surface of creeper assembly and transmission case using Clean and Cure Primer. Apply a coat of Flexible Sealant to mating surfaces.

13. Install creeper assembly and cap screws. Tighten cap screws to specification.

Specification

Creeper Assembly Cap Screws—
Torque ..... 50 N•m (37 lb-ft)



LV195 –UN–03MAR92

A—Cap Screw (6 used)
B—Creeper Assembly

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3

Continued on next page

AG,OUO1085,210 –19–28JUN02–2/3

14. Connect hydraulic line (D).

15. Install hose elbow (G).

16. Install suction line (H) hold-down bracket.

IMPORTANT: If installing an optional creeper kit assembly on a tractor that did not have one previously installed from the factory or dealer, remove stop screw (F) and replace it with a M10 x 30 mm cap screw supplied with kit. Also cut tab off range shift plate.

17. Install pedal (E) and shoulder bolt (F).

18. If equipped with dual SCV: install cable assembly (C) by installing clevis lock pins (A) and cap screws (B).

19. Tractors without cab: install fender and wheel. Tighten rear wheel bolts to specification.

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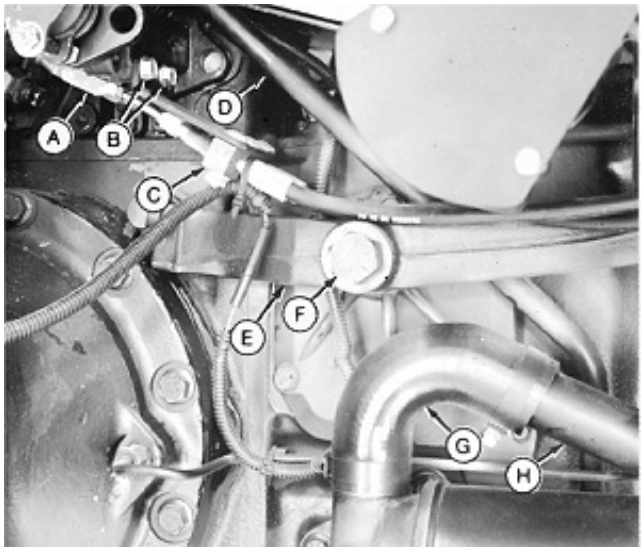
40
4

Specification

Rear Wheel Bolt—Torque ..... 175 N•m (130 lb-ft)

20. Install rear cab liner if removed.

21. Fill transmission with specified transmission/hydraulic oil. (See Transmission and Hydraulic Oil in Section 10, Group 20)

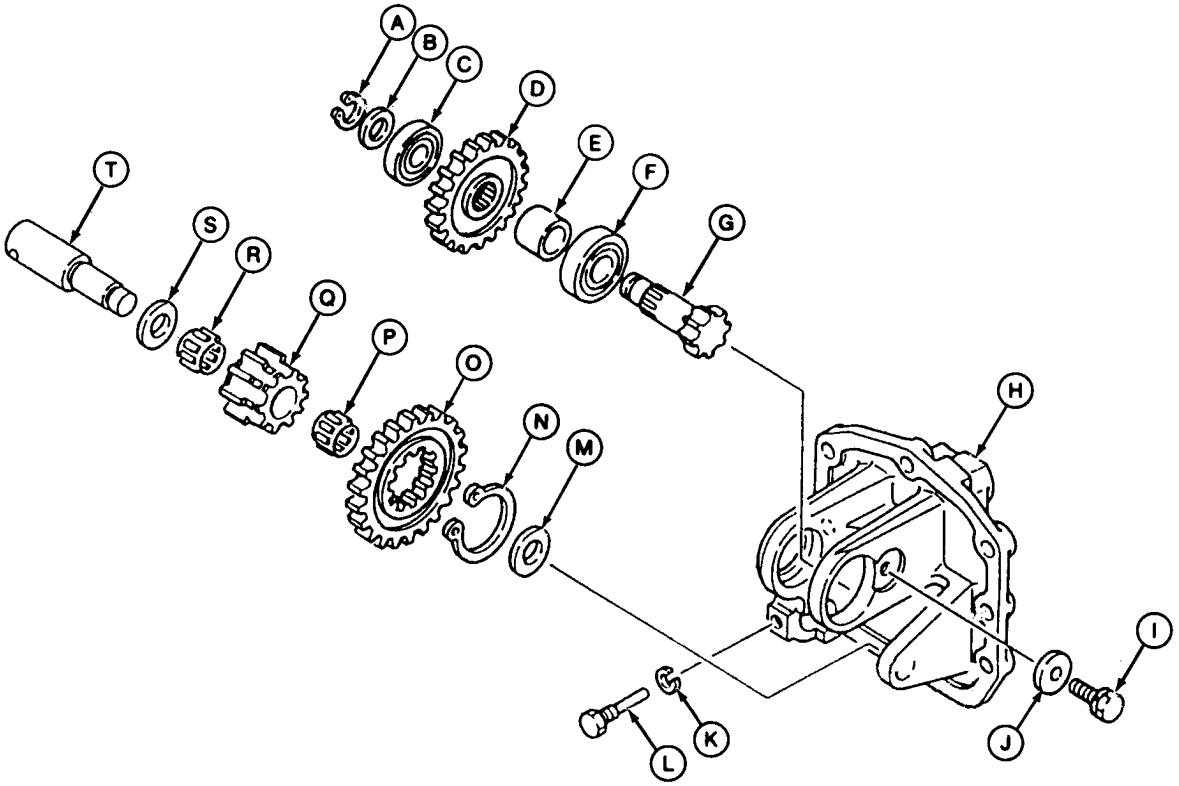


LV194 –UN–03MAR92

A—Clevis Lock Pins
B—Cap Screw (2 used)
C—Cable Assembly
D—Inlet Housing Hydraulic Line
E—Differential Lock Pedal
F—Shoulder Bolt
G—Hose Elbow
H—Suction Line

AG,OUO1085,210 –19–28JUN02–3/3

Disassemble, Inspect, and Assemble Creeper Assembly



LV1630 –UN–18APR96

Creeper Assembly

A—Snap Ring
B—Washer
C—Bearing
D—Drive Gear
E—Spacer
F—Bearing
G—Shaft
H—Housing
I—Cap Screw
J—Washer
K—Lock Washer
L—Screw
M—Washer'
N—Snap Ring
O—Gear
P—Needle Bearing
Q—Gear
R—Gear
S—Washer
T—Shaft

NOTE: Bearings (C and F) are press fit on shaft (G).

1. Remove snap ring (A) and washer (B).
2. Remove shaft (G) using a brass drift and hammer on end of shaft that snap ring was removed from.
3. Remove parts (C—E) and (I, J, and F).
4. Remove screw (L) and lock washer (K). Remove shaft (T).
5. Remove parts (M—S).
6. Remove snap ring (N) and remove gear (O) from gear (Q).
7. Inspect all parts for wear or damage. Replace as necessary.
8. Lubricate all parts with clean transmission/hydraulic oil during assembly.
9. Assemble all parts.

AG,OUO1085,214 –19–23AUG00–1/1

Section 60
Steering and Brake Repair

Contents

Other Material

Number	Name	Use
T43512 (U.S.) TY9473 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	2WD Steering Cylinder Mounting Cap Screws
TY6333 (U.S.) TY6347 (U.S.)	Moly High Temperature EP Grease	Apply to mating surfaces of steering cylinder and differential case

LOCTITE is a trademark of Loctite Corp.

OUO1080,0000279 –19–03JUL02–1/1

Specifications

Item	Measurement	Specification
Steering Column-to-Support Cap Screws	Torque	71 N•m (52 lb-ft)
Steering Wheel Nut	Torque	68 N•m (50 lb-ft)
Steering Valve Cover-to-Steering Valve Cap Screws	Torque	30 N•m (22 lb-ft)
Steering Cylinder Cap Screws (2WD)	Torque	200 N•m (147 lb-ft)
Steering Cylinder Cap Screws (MFWD)	Torque	94 N•m (69 lb-ft)
Ball Joint-to-Piston Rod	Torque	300 N•m (221 lb-ft)
Tie Rod-to-Inner Sleeve Cap Screws	Torque	90 N•m (66 lb-ft)
Tie Rod Lock Nut	Torque	165 N•m (122 lb-ft)
Ball Joint Jam Nut	Torque	120 N•m (89 lb-ft)

OUO1080,000024D –19–26JUN02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

Steering Valve Seal Kit

Steering Cylinder Seal Kit

AG,OUO1023,367 –19–25AUG00–1/1

Remove and Install Steering Column and Valve

1. Remove steering wheel.

NOTE: Straight steering column is shown. Removal and installation of tilt steering column is the same.

Wiring harness and relay blocks are removed for clarity of photograph.

2. Remove instrument panel and dash panels. See Replace Instrument Panel—CollarShift/SyncShuttle™ Transmission or Replace Instrument Panel—PowrReverser™ Transmission in Section 40, Group 10.

3. Disconnect hydraulic lines (C).

IMPORTANT: Support steering valve before removing mounting cap screws. When cap screws are removed, steering column and valve are separated.

4. Remove four cap screws (B), steering column (A), and valve and O-ring (D).

NOTE: Straight steering column is non-serviceable.

5. Inspect steering column for wear or damage. Replace if necessary.

6. Make repairs as necessary to steering valve. (See Disassemble and Inspect Steering Valve in this group.)

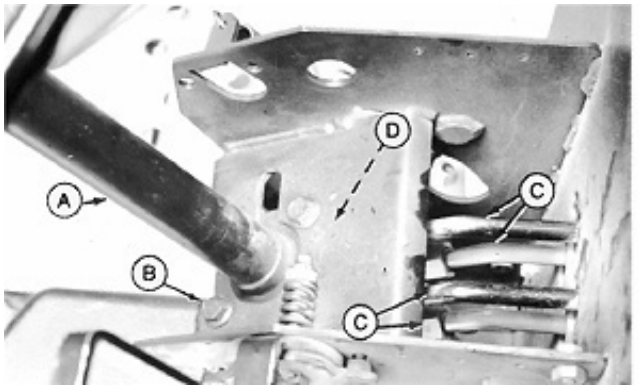
IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

7. Install steering valve with new O-ring, steering column, and cap screws. Do not tighten cap screws at this time.

8. Connect hydraulic lines.

9. Tighten cap screws (B) to specification.

Specification	
Steering Column-to-Support Cap Screws—Torque	71 N•m (52 lb-ft)



LV361 –UN–09MAR92

A—Steering Column
B—Cap Screw (4 used)
C—Hydraulic Line
D—Steering Valve and O-Ring

60
05
3

Continued on next page

AG,OUO1085,219 –19–25AUG00–1/2

10. Install dash panels and instrument panel.

11. Install steering wheel. Tighten steering wheel nut to specification.

Specification	
Steering Wheel Nut—Torque	68 N•m (50 lb-ft)

AG,OUO1085,219 –19–25AUG00–2/2

Disassemble and Inspect Steering Valve

NOTE: Special cap screw (B) is identified by the raised center of hex head.

1. Remove six cap screws and washers (A) and special cap screw and washer (B).

A—Cap Screw (6 used)
B—Special Cap Screw and Washer

LV000 –UN–09MAR92

AG,OUO1085,220 –19–25AUG00–1/8

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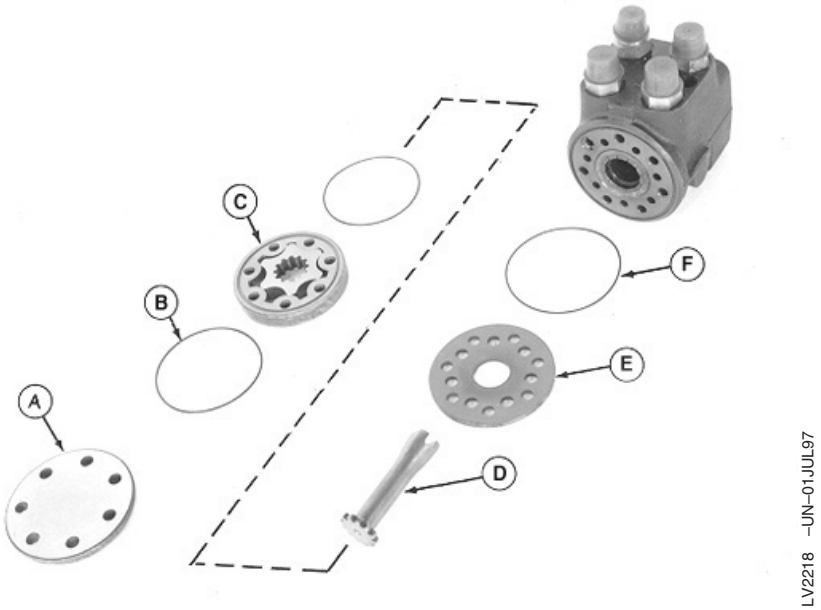
05
4



LV2218 –UN–01JUL97

A—Cover
B—O-Ring
C—Gerotor Set
D—Drive Shaft
E—Distributing Plate
F—O-Ring

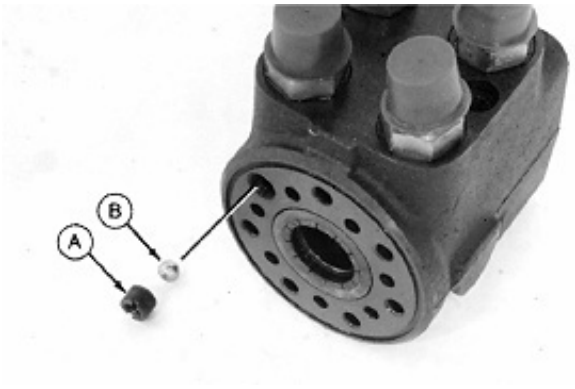
2. Remove parts (A—F).

Continued on next page

AG,OUO1085,220 –19–25AUG00–2/8

3. Remove threaded bushing (A) and ball (B).

A—Threaded Bushing
B—Ball



LV008 –UN–09MAR92

AG,OUO1085,220 –19–25AUG00–3/8

IMPORTANT: If spool and sleeve assembly must be removed from valve body for cleaning, handle parts with care. Tolerances on these parts are very close. When replacement is necessary, the spool, sleeve, and valve body must be replaced as a set.

Use care so not to drop or lose parts when removing sleeve and spool assembly. Keep cross pin in assembly horizontal.

4. Push and turn sleeve and spool assembly (A) to remove from valve body.

NOTE: Thin bearing race may remain in valve body.

5. Remove parts (B—D).

LV009 –UN–09MAR92

A—Spool and Sleeve Assembly
B—Thick Bearing Race
C—Needle Bearing
D—Thin Bearing Race

60
05
5

Continued on next page

AG,OUO1085,220 –19–25AUG00–4/8

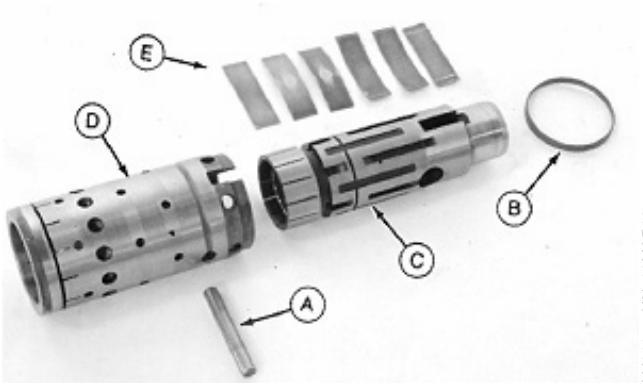
6. Remove cross pin (A) and ring (B).

7. Carefully slide spool (C) from sleeve (D).

NOTE: Spring set consists of two flat and four curved leafs.

8. Push spring set (E) from spool.

A—Cross Pin
B—Ring
C—Spool
D—Sleeve
E—Spring

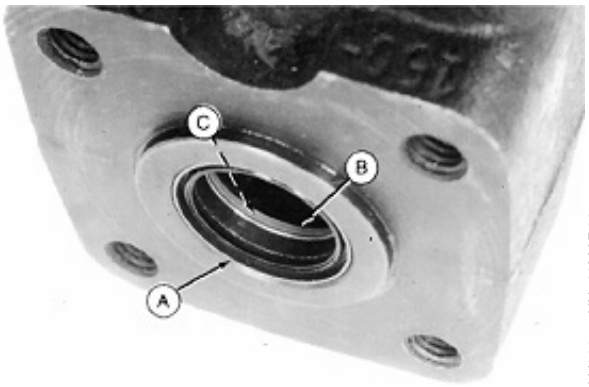


LV010 –UN–09MAR92

AG,OUO1085,220 –19–25AUG00–5/8

9. Remove dust seal (A), kin-ring (B), and O-ring (C).

A—Dust Seal
B—Kin-Ring
C—O-Ring



LV011 –UN–09MAR92

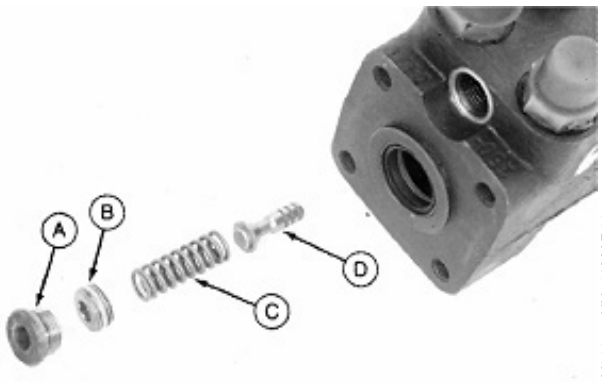
AG,OUO1085,220 –19–25AUG00–6/8

IMPORTANT: If relief valve is removed, steering relief valve pressure must be checked and adjusted.

Relief valve seat in valve body is not serviceable. Valve body, spool, and sleeve must be replaced as a set if relief valve seat is damaged.

NOTE: Count the number of turns needed to remove plug (B). This will help to initially set relief valve pressure at assembly.

10. Remove parts (A—D) to inspect and clean relief valve. Be sure orifice in piston (D) is free of obstruction.



LV012 –UN–09MAR92

A—Plug and O-Ring
B—Adjustable Plug
C—Spring
D—Piston

Continued on next page

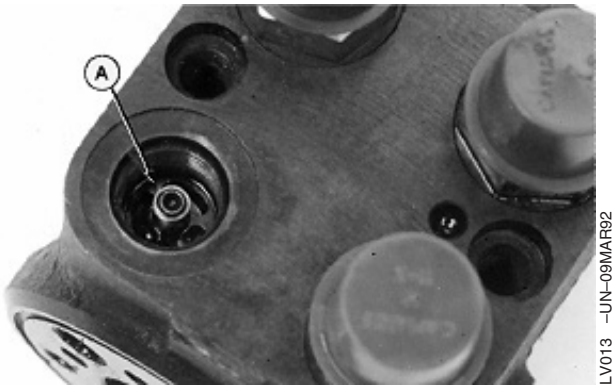
AG,OUO1085,220 –19–25AUG00–7/8

11. Remove hydraulic fitting from inlet port to inspect check valve (A). Remove any obstructions from check valve. If check valve is worn or damaged, valve body, spool, and sleeve must be replaced as a set.

12. Install and tighten hydraulic fitting.

13. Inspect all parts for scoring, wear, or damage. Replace as necessary.

A—Check Valve



LV013 –UN–09MAR92

AG,OUO1085,220 –19–25AUG00–8/8

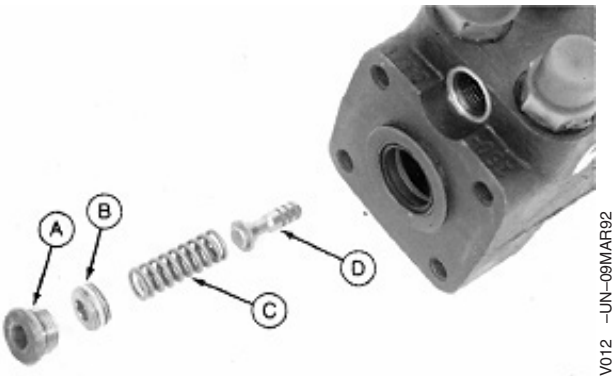
Assemble Steering Valve

NOTE: Apply clean transmission/hydraulic oil to all internal parts.

IMPORTANT: Always replace all O-rings and seals. Damaged or used parts will leak.

1. Install parts (A—D). Install plug (B) the same number of turns as needed to remove the plug.

A—Plug and O-Ring
B—Adjustable Plug
C—Spring
D—Piston



LV012 –UN–09MAR92

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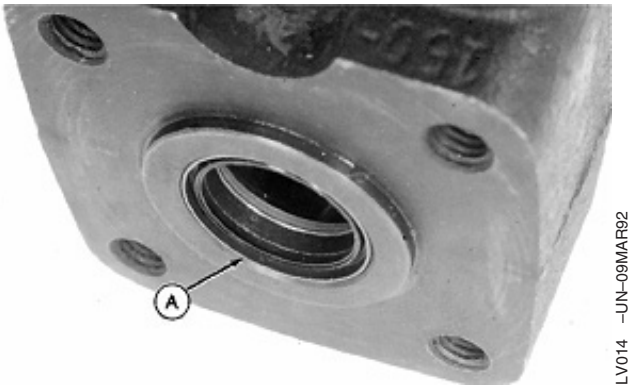
AG,OUO1085,221 –19–25AUG00–1/7

2. Install dust seal (A) with seal lip away from valve body and to bottom of bore.

A—Dust Seal



LV014 –UN–09MAR92

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AG,OUO1085,221 –19–25AUG00–2/7

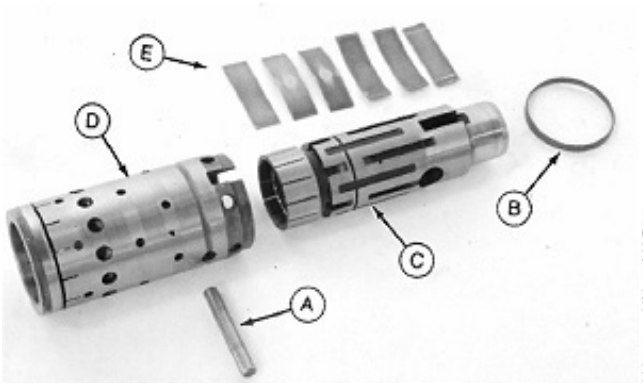
3. Install two flat leafs of spring set (E) in slot of spool (C). Install curved leafs so their centers touch and curved leafs fit between the flat leafs.

4. Slide spool and springs into sleeve (D). Squeeze spring ends together so springs fit into slot of sleeve. Make sure leaf ends are aligned and centered.

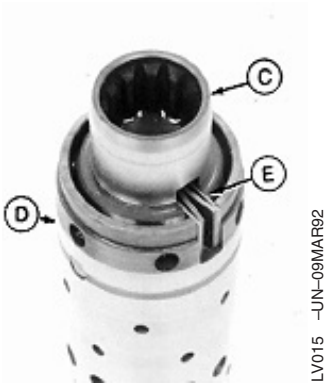
5. Install ring (B) with rounded end away from sleeve. Ring must rotate freely on sleeve.

6. Install pin (A).

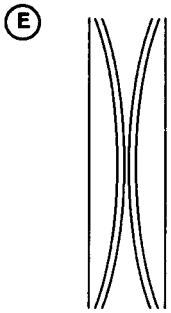
A—Cross Pin
B—Ring
C—Spool
D—Sleeve
E—Spring Set



LV010 –UN–09MAR92



LV015 –UN–09MAR92



LV016AE –UN–13MAR92

AG,OUO1085,221 –19–25AUG00–3/7

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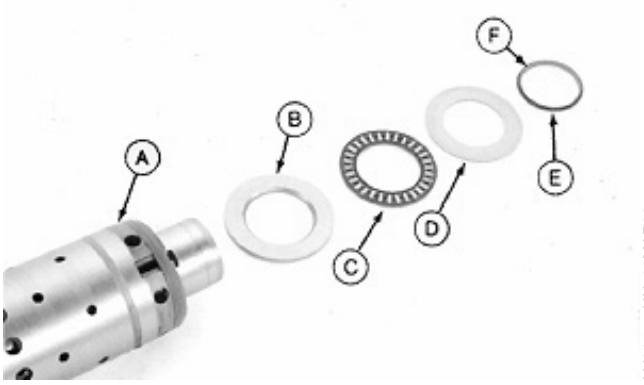
7. Install parts (B—D) on spool and sleeve assembly (A). Inner chamfer of thick bearing race (B) must be towards spool.

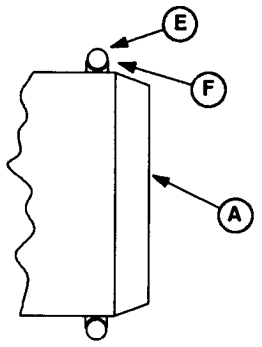
8. Put O-ring (E) on kin-ring (F). Install O-ring and kin-ring on spool just past spool chamfer.

9. Put spool and sleeve assembly in valve body using a turning motion. Position the cross pin so it is parallel to surface of valve body with hose connections. Push assembly into body until end of assembly is even with machined surface of valve body.

A—Spool and Sleeve Assembly
B—Thick Bearing Race
C—Needle Bearing Race
D—Thin Bearing Race
E—O-Ring
F—Kin-Ring



LV017 –UN–09MAR92



LV018AE –UN–09MAR92

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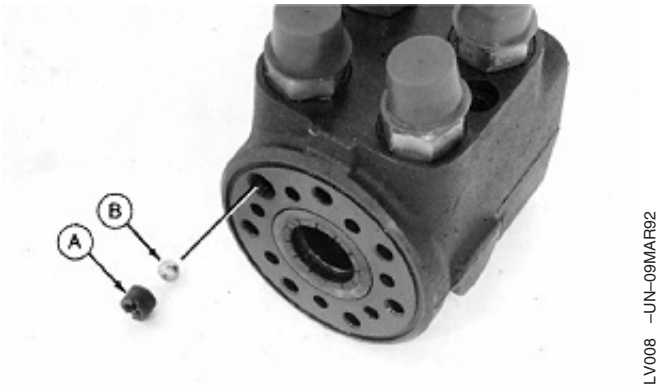
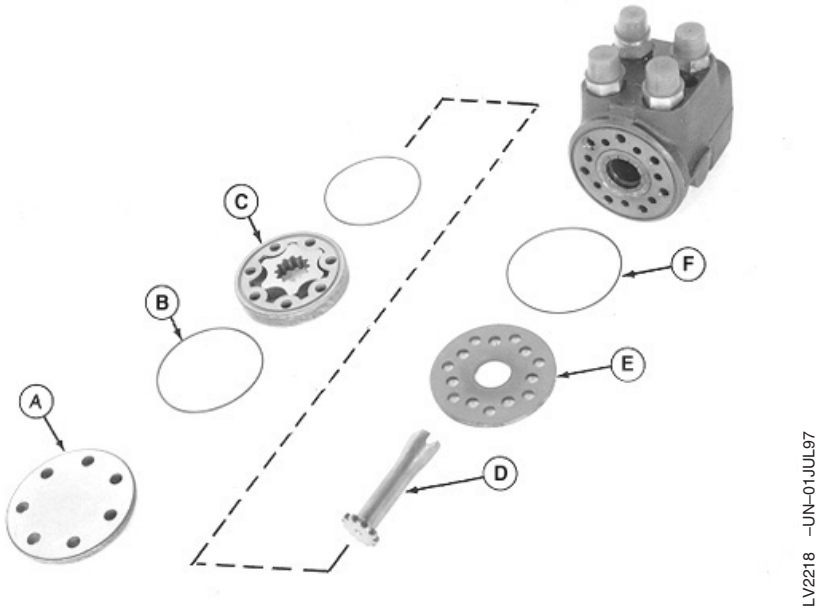
AG,OUO1085,221 –19–25AUG00–4/7

10. Install ball (B) and threaded bushing (A). Top of bushing must be below surface of valve body.

A—Threaded Bushing
B—Ball



AG,OUO1085,221 –19–25AUG00–5/7



A—Cover
B—O-Ring (2 used)
C—Gerotor Set
D—Drive Shaft
E—Distributing Plate
F—O-Ring

11. Install parts (B—F).

IMPORTANT: Violent steering wheel oscillation can occur if gerotor is not timed correctly.

12. Make sure gerotor is timed. Install inner rotor of gerotor so that the center of a valley of the rotor is aligned with the center line of the cross pin. Turn outer gear of gerotor until holes are aligned.

13. Install cover (A).

Continued on next page

AG,OUO1085,221 –19–25AUG00–6/7

14. Install six washers and cap screws (A) and washer and special cap screw (B). Tighten cap screws in crisscross sequence as indicated to specification.

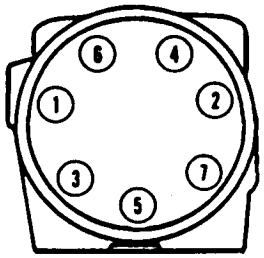
Specification

Steering Valve Cover-to-Steering Valve Cap Screws—Torque ..... 30 N•m (22 lb-ft)

15. If relief valve was removed, relief valve pressure must be checked and adjusted after installing steering valve on tractor. (See Steering Valve Relief Test in Section 260, Group 15.)

A—Cap Screw (6 used)
B—Special Cap Screw

LV000 –UN–09MAR92



M53502 –UN–20NOV89

AG,OUO1085,221 –19–25AUG00–7/7

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Remove and Install Steering Cylinder—2WD Axle

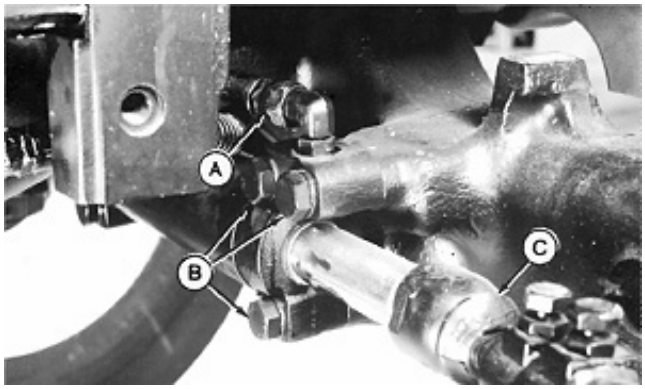
1. Remove tie rod ends (C). (See Remove, Inspect and Install Tie Rod Assembly—2WD Axle in this group.)
2. Disconnect hoses (A). Close all openings using caps and plugs.
3. Remove cap screws and lock washers (B) from both ends of cylinder. Remove cylinder.
4. Make repairs as necessary. (See Disassemble, Inspect, and Assemble Steering Cylinder—2WD Axle in this group.)
5. Apply thread lock and sealer (medium strength) to threads of cap screws (B).
6. Install steering cylinder, lock washers, and cap screws. Tighten cap screws to specification.

Specification

Steering Cylinder Cap Screws (2WD)—Torque ..... 200 N•m (147 lb-ft)

IMPORTANT: Always replace all O-rings. Damaged or used O-rings will leak.

7. Install new O-rings and connect hydraulic hoses.
8. Install tie rod ends.
9. Start engine. Operate steering and check for hydraulic leaks.



LV552 –UN–09MAR92

Right-Hand Side Shown

A—Hose
B—Cap Screw and Lock Washer
C—Tie Rod End

AG,OUO1085,222 –19–25AUG00–1/1

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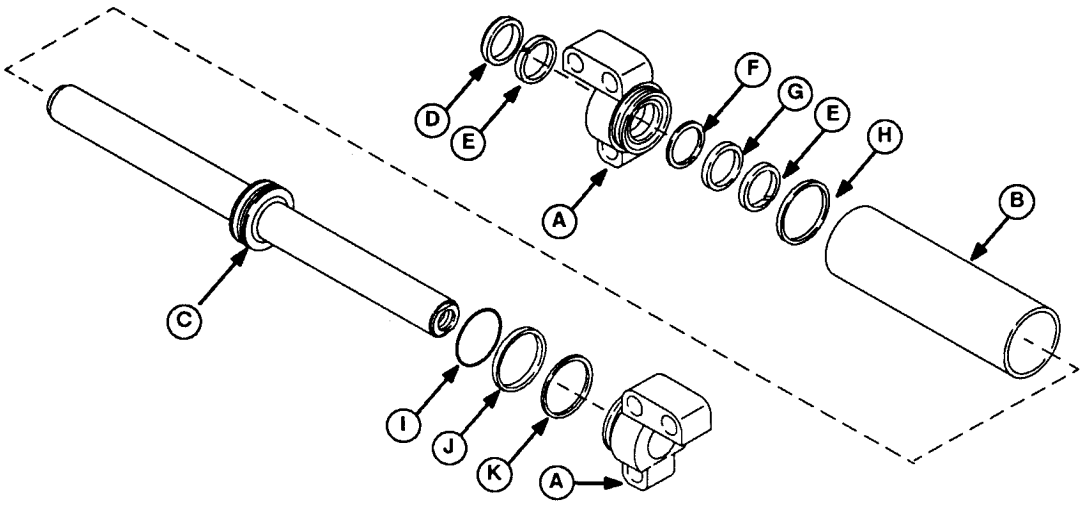
11

Disassemble, Inspect, and Assemble Steering Cylinder—2WD Axle



LV002AE –UN–09MAR92

A—Rod Guide (2 used)
B—Cylinder Barrel
C—Rod and Piston Assembly
D—Wiper Seal (2 used)
E—Split Wear Ring (4 used)
F—Backup Ring (2 used)
G—Seal (2 used)
H—Ring Seal (2 used)
I—O-Ring
J—Split Wear Ring
K—Piston Seal

NOTE: Ball joints must be removed from steering cylinder rod for cylinder disassembly.

1. Pull rod guides (A) from cylinder barrel (B) and remove from rod and piston assembly (C).
2. Pull rod and piston assembly from barrel.
3. Remove two wear rings (E), seal (G), backup ring (F), wiper seal (D), and ring seal (H) from each guide.
4. Remove piston seal (K), wear ring (J), and O-ring (I).
5. Inspect rod and barrel for scoring, wear, or damage. Replace cylinder if necessary.
6. Install new seals and wear rings.
7. Apply clean transmission/hydraulic oil to all internal parts during assembly.
8. Install rod and piston assembly into barrel.
9. Carefully install rod guides on rod and in barrel so as not to damage seals.

AG,OUO1085,223 –19–25AUG00–1/1

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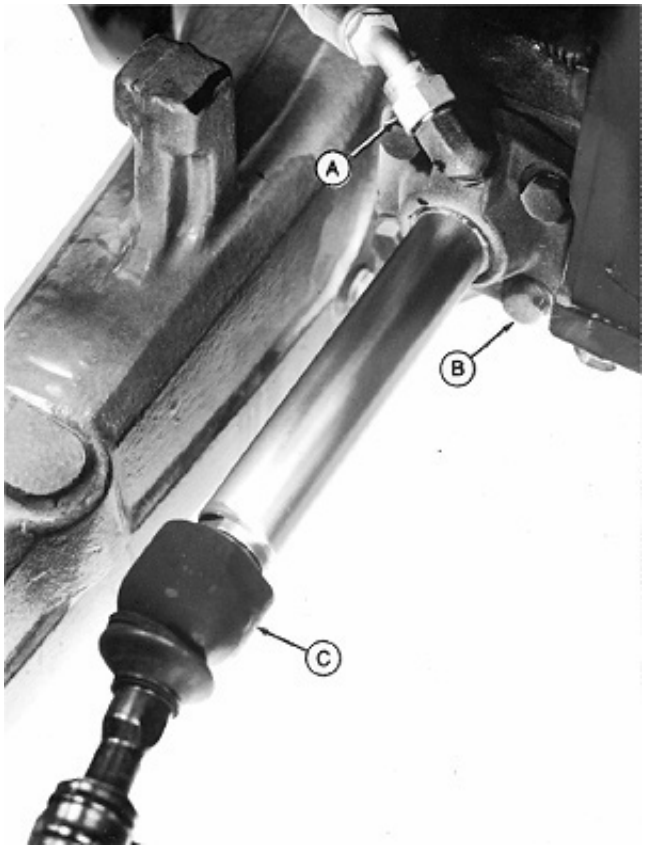
Remove and Install Steering Cylinder—MFWD Axle

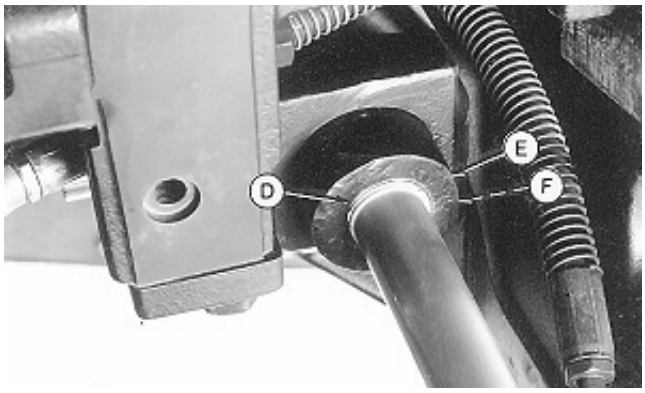
1. Turn the front wheels all the way to the right. This will allow room for removal of steering assembly.
2. Loosen cap screws (B) by two turns each.
3. Turn the steering wheel to left. This will unseat the end cap and cylinder from the differential casing.
4. Disconnect hoses (A). Close all openings using caps and plugs.
5. Remove tie rod ends (C). (See Remove, Inspect and Install Tie Rod Assembly—MFWD Axle in this group.)
6. Remove hydraulic fitting on right-hand side of cylinder.
7. Remove cap screws.

IMPORTANT: Steering cylinder may be seized to differential case. Do not strike cylinder end near edges (D and E). Striking at these points can distort wiper seal area or cause distortion of outer edge, preventing removal of cylinder. Use a brass drift and hammer to remove cylinder.

8. Remove steering cylinder assembly using a brass drift and hammer, if necessary.
9. Make repairs as necessary. (See Disassemble, Inspect, and Assemble Steering Cylinder—MFWD Axle in this group.)
10. Apply Moly High Temperature EP Grease to mating surfaces of steering cylinder and differential case. Install cylinder with hydraulic fitting port (F) facing front of machine.
11. Install the steering cylinder assembly.



LV297 –UN–09MAR92



LV631 –UN–17JUN94

A—Steering Hose
B—Cap Screw (4 used)
C—Tie Rod End
D—Cylinder Inner Edge
E—Cylinder Outer Edge
F—Hydraulic Fitting Port

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13

Continued on next page

12. Install cap screws and tighten to specification.

Specification	
Steering Cylinder Cap Screws (MFWD)—Torque	94 N•m (69 lb-ft)

IMPORTANT: Always replace all O-rings. Damaged or used O-rings will leak.

13. Install new O-ring and hydraulic fitting.
14. Install new tie rod ends.
15. Install new O-rings and connect hydraulic hoses.
16. Start engine. Operate steering and check for hydraulic leaks.

AG,OUO1085,224 –19–25AUG00–2/2

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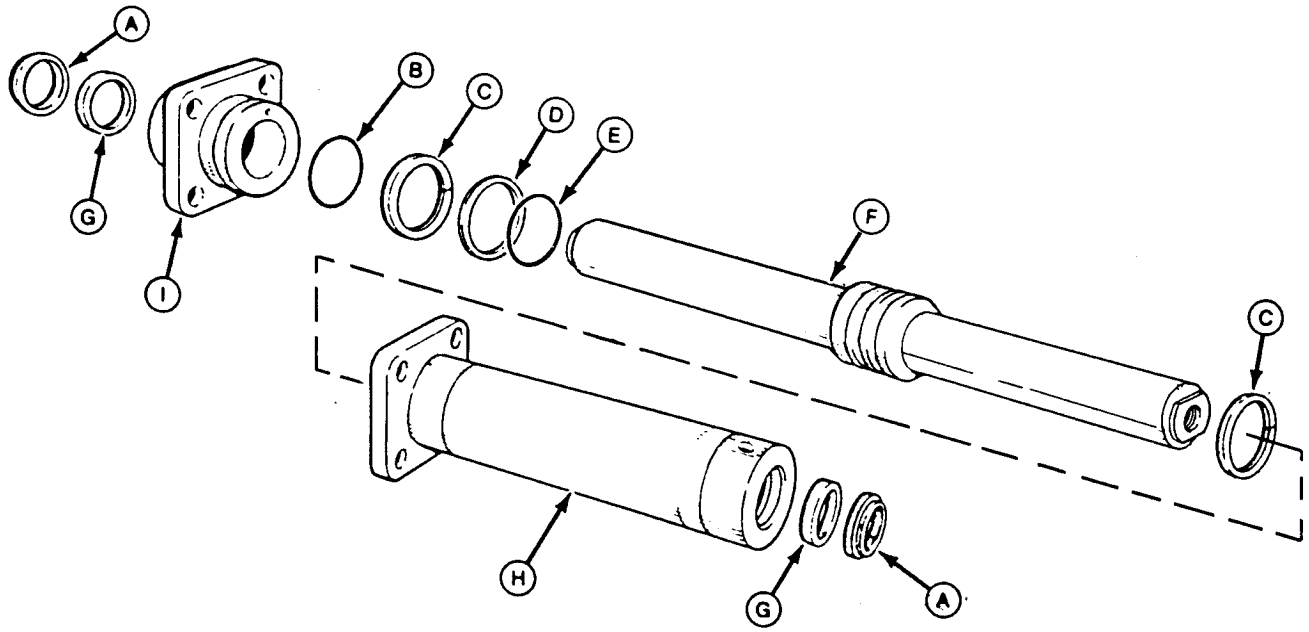
Disassemble, Inspect, and Assemble Steering Cylinder—MFWD Axle



LV299A –UN–09MAR92

A—Wiper Seal (2 used)
B—O-Ring
C—Wear Ring (2 used)
D—Piston Seal
E—O-Ring
F—Rod and Piston Assembly
G—Oil Seal (2 used)
H—Cylinder Barrel
I—End Plate

1. Remove parts (A—I).
2. Inspect rod and barrel for wear or damage. Replace as necessary.
3. Install new seals and wear rings.
4. Apply clean transmission/hydraulic oil to all parts during assembly.

NOTE: Allow the center piston seal to contract naturally on top of the O-ring before installing the piston and rod assembly into the cylinder barrel.

5. Install all parts.

AG,OUO1085,225 –19–25AUG00–1/1

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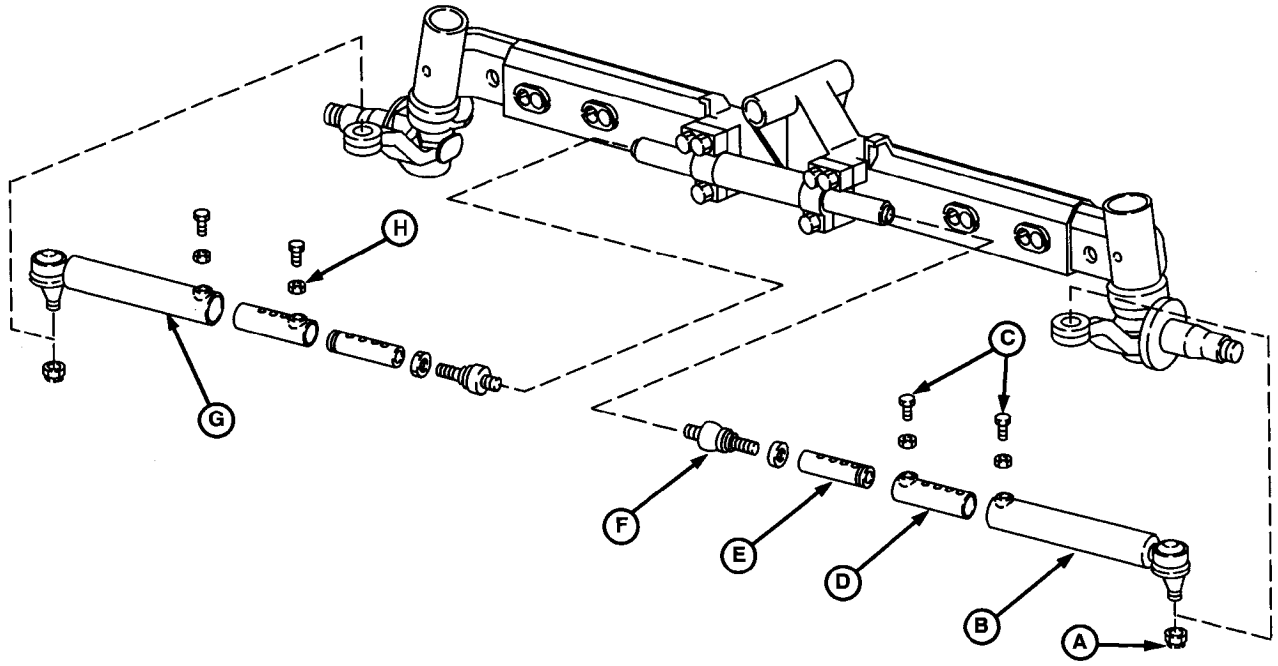
Remove, Inspect and Install Tie Rod Assembly—2WD Axle



LV001AE –UN–08JUL02

A—Lock Nut (2 used)
B—Right Tie Rod End
C—Cap Screw (4 used)
D—Inner Sleeve (2 used)
E—Rod (2 used)
F—Ball Joint (2 used)
G—Left Tie Rod End
H—Lock Nut (4 used)

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16

NOTE: Tie rod end is a tapered bore fit. Use a ball joint fork or puller to ease removal.

1. Remove lock nut (A). Remove tie rod end from spindle arm.

2. Inspect parts (A—H) for wear or damage.

NOTE: To replace ball joints (F), use a standard 46-mm wrench on flats on both ball joints. Turn one side while holding the other.

3. Remove parts (B—H) as necessary for replacement.

4. Apply a small amount of Moly High Temperature EP Grease to outer surface of rod (E) and inner sleeve (D).

5. Install parts (B—H). Tighten ball joint (F) to specification.

Specification

Ball Joint-to-Piston Rod—Torque ..... 300 N•m (221 lb-ft)

6. Adjust length of tie rod (E) assembly by positioning inner sleeve (D) so wheel is approximately straight forward when steering cylinder is centered and tie rod end fits into arm of spindle. Tighten cap screws (C) to specification.

Specification

Tie Rod-to-Inner Sleeve Cap Screws—Torque ..... 90 N•m (66 lb-ft)

7. Tighten lock nuts (H) securely.

8. Install and tighten lock nut (A) to specification.

Specification

Tie Rod Lock Nut—Torque..... 165 N•m (122 lb-ft)

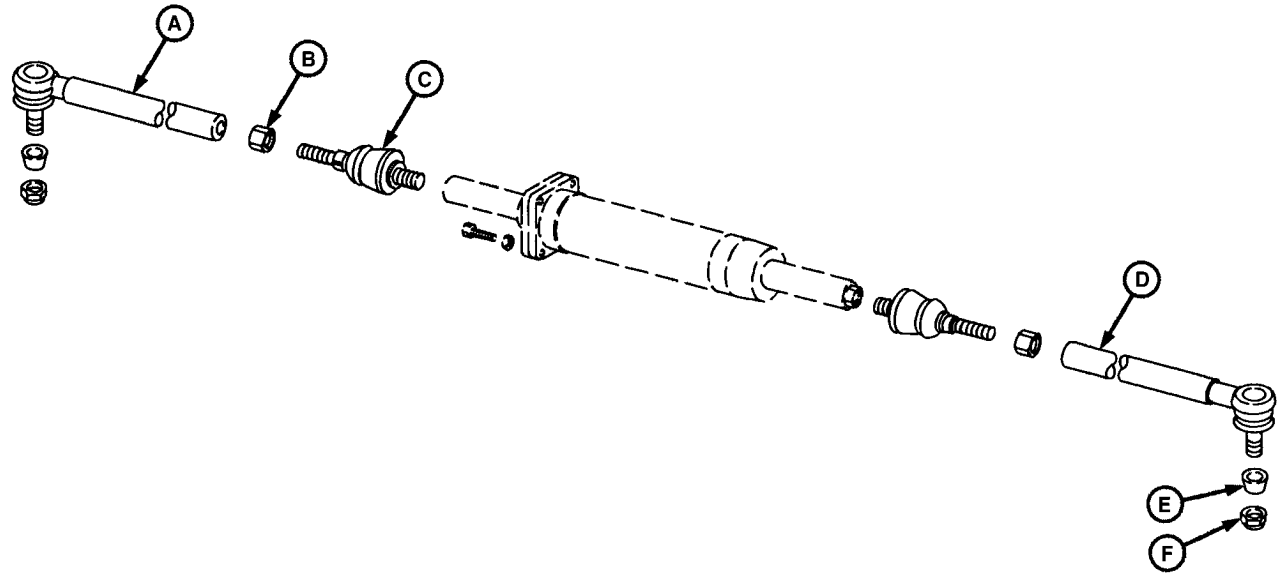
Continued on next page

AG,OUO1085,226 –19–25AUG00–1/2

9. Adjust front axle toe-in. (See Toe-In Check and Adjustment—Standard Axle in Section 260, Group 15.)

AG,OUO1085,226 –19–25AUG00–2/2

Remove, Inspect and Install Tie Rod Assembly—MFWD Axle



LV298AE –UN–15DEC97

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A—Left Tie Rod End
B—Nut (2 used)
C—Ball Joint (2 used)
D—Right Tie Rod End
E—Boot
F—Lock Nut (2 used)

1. Remove lock nut (F). Remove tie rod from spindle arm.
2. Inspect parts (A—E) for wear or damage.

NOTE: To remove ball joint (C), place wrench on flats of both ball joints. Turn one side while holding the other.

3. Remove parts (A—E) as necessary for replacement.
4. Install parts (A—F). Tighten ball joint (C) to specification.

Specification

Ball Joint-to-Piston Rod—Torque..... 300 N•m (221 lb-ft)

5. Adjust length of tie rod assembly by turning tie rod end (A or D) so wheel is approximately straight forward when steering cylinder is centered and tie rod end fits into arm spindle. Tighten nut (B) to specification.

Specification

Ball Joint Jam Nut—Torque ..... 120 N•m (89 lb-ft)

6. Install and tighten lock nut (F) to specification.

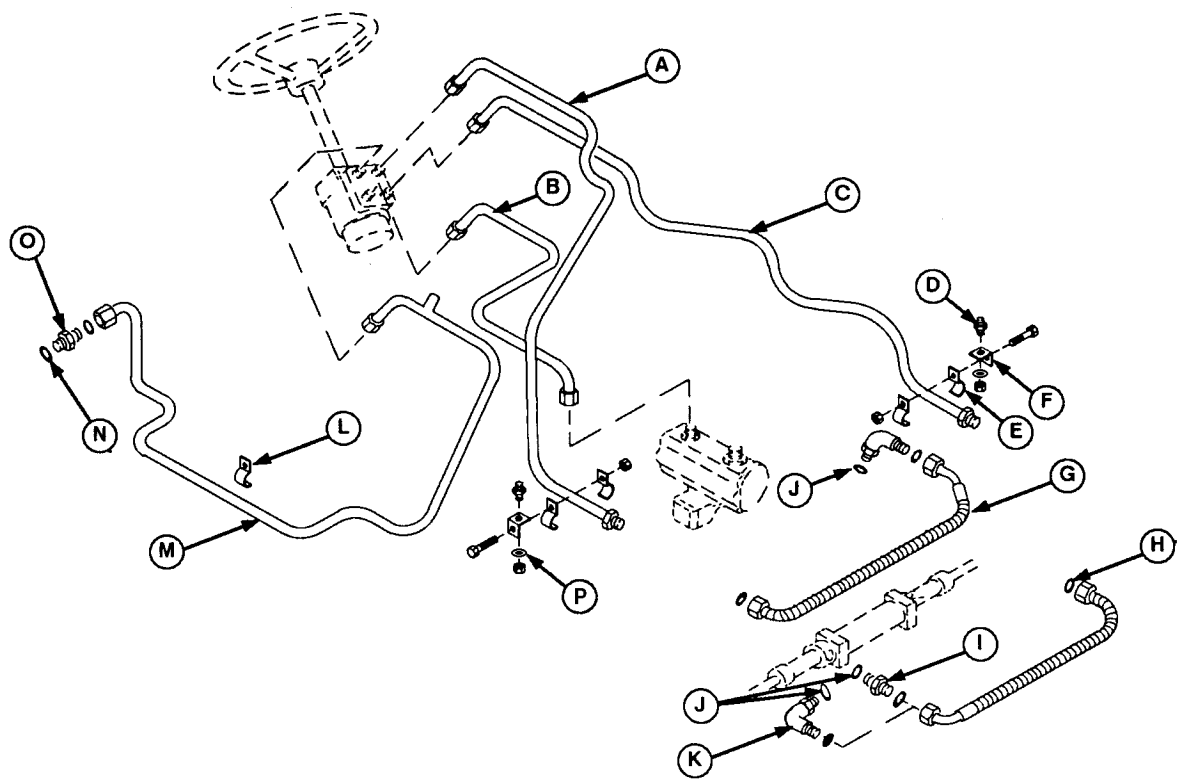
Specification

Tie Rod Lock Nut—Torque..... 165 N•m (122 lb-ft)

7. Adjust front axle toe-in. (See Toe-In Check and Adjustment—MFWD in Section 260, Group 15.)

AG,OUO1085,227 –19–25AUG00–1/1

Inspect and Replace Steering Hydraulic Lines—Without Oil Cooler



LV458AE –UN–03MAY01

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18

A—Pressure Line-to-Steering Cylinder
B—Hydraulic Pump-to-Steering Valve Supply Line
C—Pressure Line-to-Steering Cylinder
D—Stud (2 used)
E—Clamp (4 used)
F—Bracket (2 used)
G—Steering Valve-to-Cylinder Hose (2 used)
H—O-Ring (5 used)
I—Connector
J—O-Ring (3 used)
K—Fitting (2 used)
L—Clamp (2 used)
M—Steering Valve Return/Transmission Lube Line
N—O-Ring
O—Fitting

NOTE: If equipped with cab, lower front cab windows must be removed before removing dash panels. (See Remove and Install Lower Front Windows in Section 90, Group 15.)

1. Remove left and right dash panels and front grille panels.

NOTE: Remove brake pedals to replace hydraulic lines (B and M).

Remove fuel filter and disconnect brake lines to replace hydraulic line (B).

2. Inspect hydraulic lines and hoses for wear or damage. Replace as necessary.

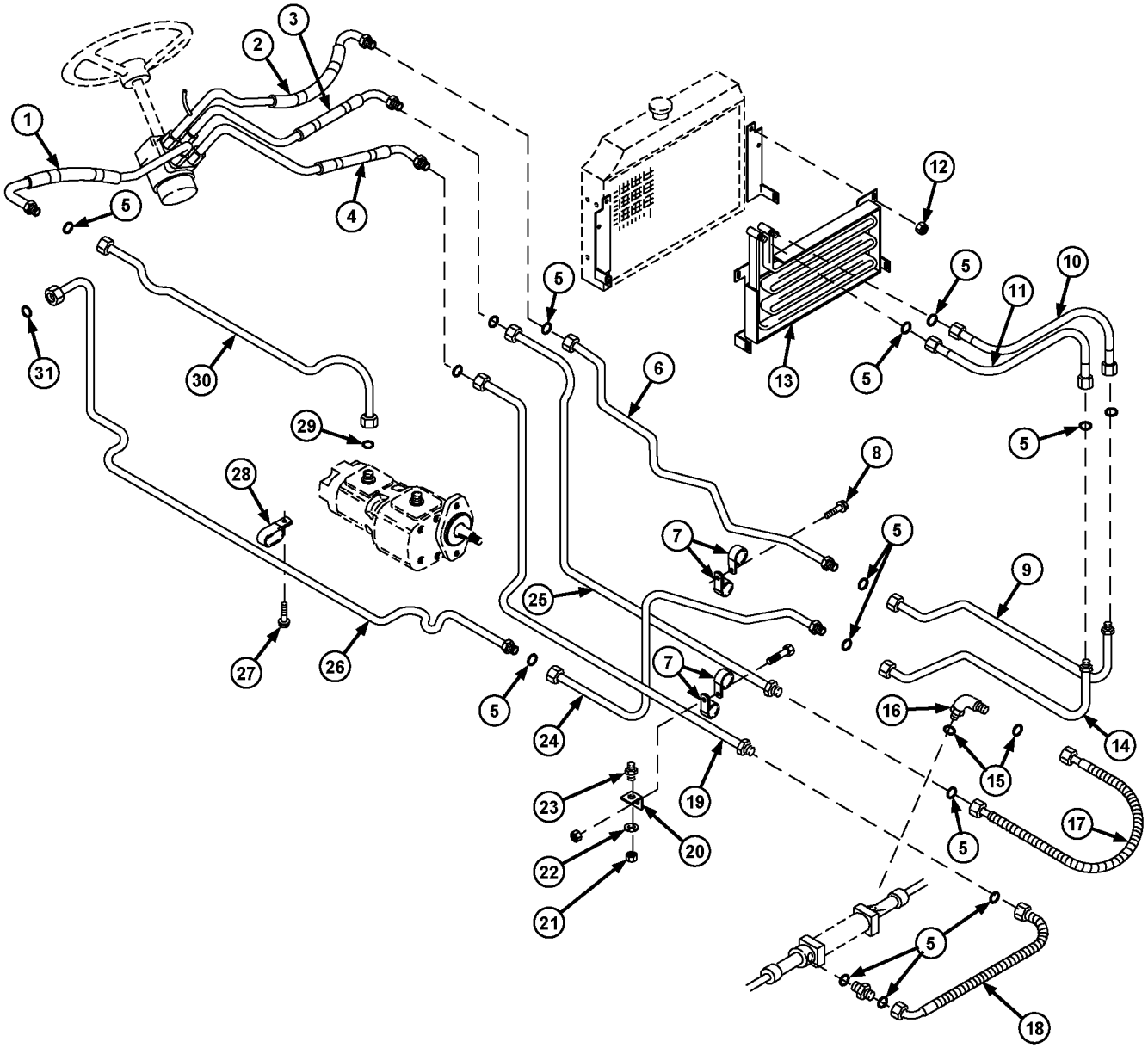
IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

3. Install side dash and grille panels.

4. Adjust hydraulic oil level to full mark with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

AG,OUO1085,229 –19–25AUG00–1/1

Inspect and Replace Steering Hydraulic Lines—With Oil Cooler



LV1371 –UN–20APR98

Steering Hydraulic Lines (With Oil Cooler)

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AG,OUO1085,320 –19–29AUG00–1/2

1—Steering Valve Supply Line
2—Steering Valve Return Line
3—Pressure Line-to-Steering Cylinder
4—Pressure Line-to-Steering Cylinder
5—O-Ring (11 used)
6—Steering Valve-to-Hydraulic Oil Cooler
7—Clamp (4 used)
8—Cap Screw
9—Steering Valve-to-Oil Cooler Inlet
10—Oil Cooler Inlet Line
11—Oil Cooler Outlet Line
12—Nut (2 used)
13—Hydraulic Oil Cooler
14—Oil Cooler Return/Transmission Lube Line
15—O-Ring (4 used)
16—Elbow Connector
17—Steering Cylinder Pressure Line
18—Steering Cylinder Pressure Line
19—Steering Valve-to-Steering Pressure Line
20—Bracket
21—Nut (2 used)
22—Washer
23—Stud
24—Oil Cooler Outlet-to-Transmission Return Line
25—Steering Valve-to-Steering Pressure Line
26—Transmission Return Lube Line
27—Cap Screw
28—Clamp
29—O-Ring
30—Hydraulic Pump-to-Steering Valve Supply Line
31—O-Ring

NOTE: If equipped with cab, lower front cab windows must be removed before removing dash panels. (See Remove and Install Lower Front Windows in Section 90, Group 15.)

1. Remove left and right dash and front grille panels.

NOTE: Remove brake pedals to replace hydraulic lines (1 and 2). Remove fuel filter and disconnect brake lines to replace hydraulic line (30).

2. Inspect hydraulic lines and hoses for wear or damage. Replace as necessary.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

3. Install side dash and grille panels.

4. Adjust hydraulic oil level to full mark with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

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AG,OUO1085,320 –19–29AUG00–2/2

Other Material

Number	Name	Use
TY9371 (U.S.) TY9478 (Canadian) 271 (LOCTITE®)	Thread Lock and Sealer (High Strength)	Apply to threads of brake return compression spring assemblies.

LOCTITE is a registered trademark of Loctite Corp.

OUO1080,0000250 –19–26JUN02–1/1

Specifications

Item	Measurement	Specification
Brake Valve Mounting Cap Screws	Torque	70 N•m (52 lb-ft)
Brake Valve Outlet Fittings	Torque	11 N•m (97 lb-in.)
Brake Valve Inlet Check Valve Seat	Torque	73 N•m (54 lb-ft)
Brake Valve Plug	Torque	37 N•m (27 lb-ft)
Brake Valve Spring Seat	Torque	92 N•m (68 lb-ft)
Brake Retractor Spring	Torque	15 N•m (133 lb-in.)
Mating Surface of Final Drive Housing to Face of Piston	Distance	12.40—12.80 mm (0.488—0.503 in.)

OUO1080,0000251 –19–26JUN02–1/1

Remove and Install Brake Valve and Pedals

1. Tractors without cab: remove left and right dash panels.

NOTE: Close all openings with caps and plugs.

2. Disconnect return and supply hoses (B and C).

3. Disconnect brake lines (D).

NOTE: Outlet fittings are removed to allow clearance for brake valve removal.

Use care during valve removal to prevent loss of check balls and springs from outlet fitting ports.

4. Remove outlet fittings (A).

5. Remove four cap screws and brake valve.

6. Make repairs as necessary. (See Disassemble and Inspect Brake Valve in this group.)

7. Install brake valve. Tighten cap screws to specification.

Specification	
Brake Valve Mounting Cap Screws—Torque	70 N•m (52 lb-ft)

60 10 2

IMPORTANT: Replace O-rings. Damaged or used O-rings will leak.

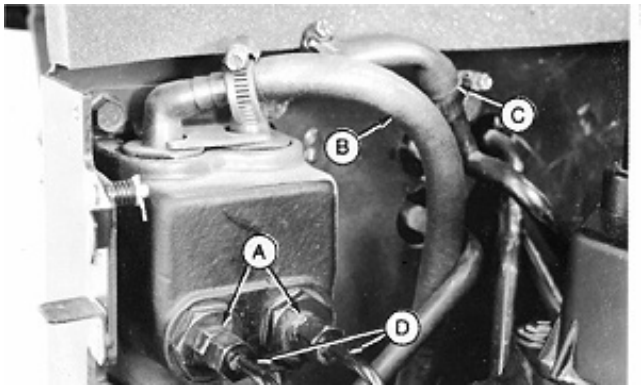
8. Install outlet fittings (A) with new O-rings. Tighten fittings to specification.

Specification	
Brake Valve Outlet Fittings—Torque	11 N•m (97 lb-in.)

9. Connect hoses and lines.

10. Install dash panels if removed.

11. Start engine. Run at idle speed for several minutes to fill brake valve with transmission/hydraulic oil. Shut off engine.



LV362 –UN–09MAR92

A—Outlet Fittings
B—Return Hose
C—Supply Hose
D—Brake Lines

Continued on next page

AG,OUO1085,321 –19–30AUG00–1/2

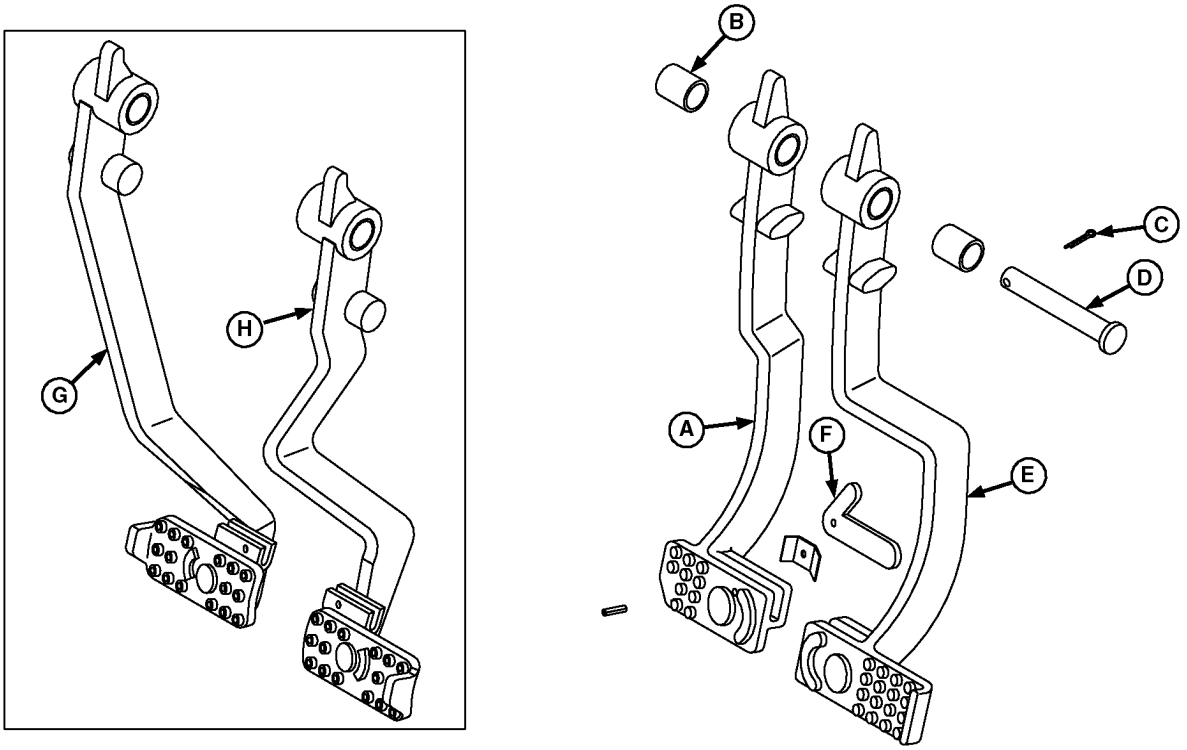
12. Apply pressure to both brake pedals and loosen brake lines (D) slightly, to bleed air from brake valve and lines.

13. Repeat as necessary.

14. Check and adjust transmission/hydraulic oil level.

AG,OUO1085,321 –19–30AUG00–2/2

Disassemble and Inspect Brake Valve



LV568AE –UN–07FEB96

A—Left Brake Pedal
B—Bushing (2 used)
C—Cotter Pin
D—Pivot Shaft
E—Right Brake Pedal
F—Lock Plate
G—Left Brake Pedal (cab tractors only)
H—Right Brake Pedal (cab tractors only)

1. Remove left and right dash panels.

NOTE: Cab tractors are equipped with brake pedals (G and H) in place of brake pedals (A and E).

2. Disengage lock plate (F).

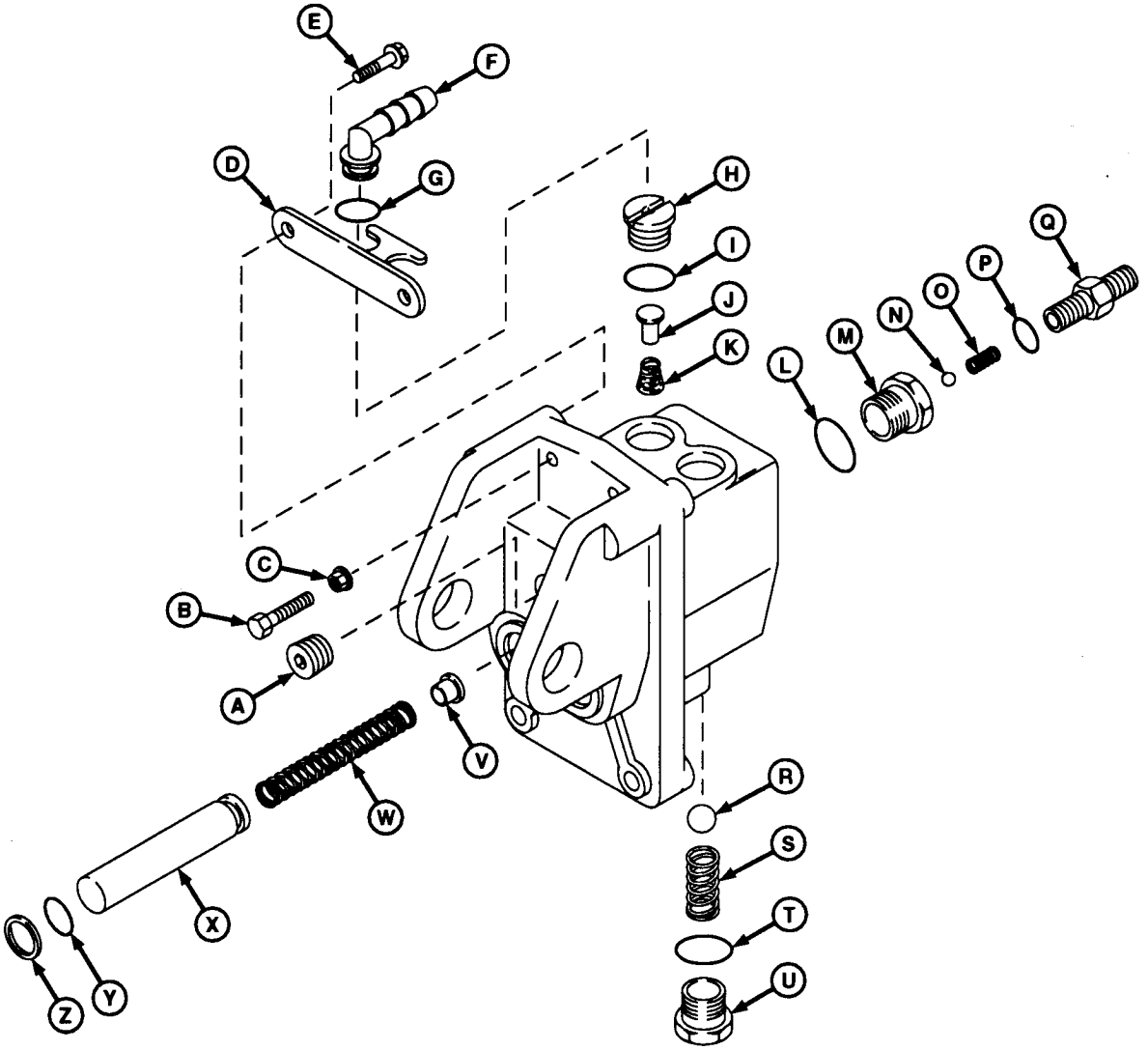
3. Remove cotter pin (C) to remove shaft (D) and pedals (A and E).

NOTE: Bushings (B) are press fit in pedals. Remove bushings only if replacement is necessary.

4. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

AG,OUO1085,322 –19–30AUG00–1/3



LV569AE –UN–17JUN94

Brake Valve

A—Plug
B—Cap Screw (2 used)
C—Nut (2 used)
D—Bracket
E—Cap Screw (4 used)
F—Elbow Fitting (2 used)
G—O-Ring (2 used)
H—Inlet Check Valve Seat (2 used)
I—O-Ring (2 used)
J—Inlet Check Valve (2 used)
K—Spring (2 used)
L—O-Ring (2 used)
M—Spring Seat (2 used)
N—Outlet Check Ball (2 used)
O—Spring (2 used)
P—O-Ring (2 used)
Q—Outlet Fitting (2 used)
R—Pressure Equalizing Ball (2 used)
S—Spring (2 used)
T—O-Ring (2 used)
U—Plug (2 used)
V—Outlet Check Valve (2 used)
W—Spring (2 used)
X—Brake Piston (2 used)
Y—O-Ring (2 used)
Z—Seal (2 used)

5. Remove parts (E—K).

6. Remove parts (R—U).

Continued on next page

NOTE: Parts (D, E, P, and Q) were removed during brake valve removal.

CAUTION: Spring seats (M) are under spring pressure. Hold seat firmly while removing.

7. Remove parts (L—O) and (V—Y).

IMPORTANT: Replace all seals. Damaged or used seals will leak.

8. Pry out seals (Z). Install new seal with lips facing away from valve using a bearing, bushing, and seal driver set.

9. Inspect all parts for wear or damage. Replace as necessary.

AG,OUO1085,322 –19–30AUG00–3/3

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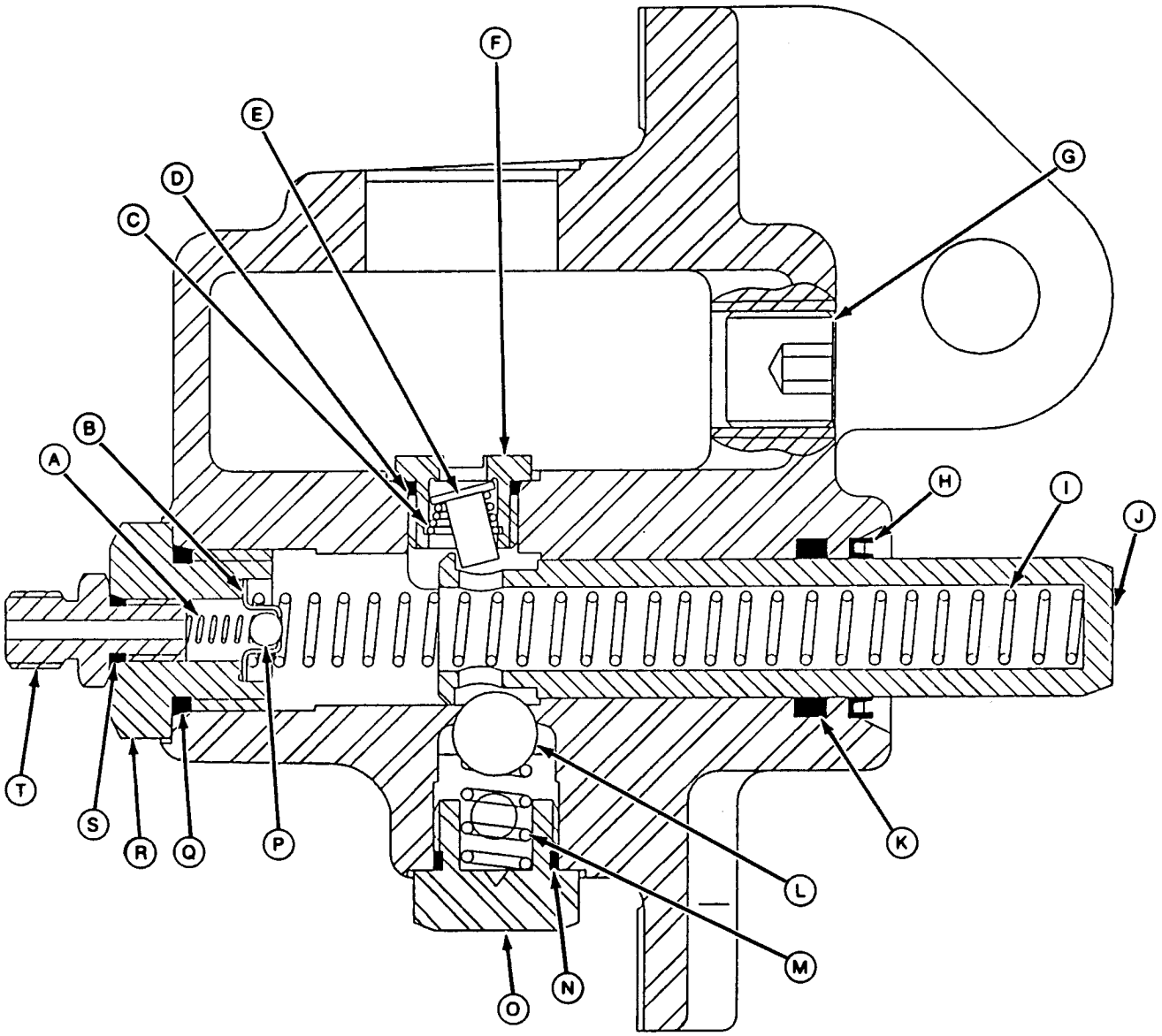
Brake Valve Cross Section



LV570AE –UN–09MAR92

A—Spring (2 used)
B—Outlet Check Valve (2 used)
C—Spring (2 used)
D—O-Ring (2 used)
E—Inlet Check Valve (2 used)
F—Inlet Check Valve Seat (2 used)
G—Plug
H—Seal (2 used)
I—Spring (2 used)
J—Brake Piston (2 used)
K—O-Ring (2 used)
L—Pressure Equalizing Ball (2 used)
M—Spring (2 used)
N—O-Ring (2 used)
O—Plug (2 used)
P—Outlet Check Ball (2 used)
Q—O-Ring (2 used)
R—Spring Seat (2 used)
S—O-Ring (2 used)
T—Fitting (2 used)

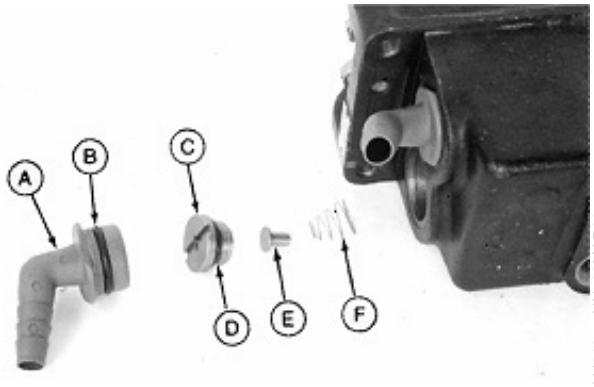
AG,OUO1085,323 –19–30AUG00–1/1

Assemble Brake Valve

NOTE: Lubricate all internal parts with clean transmission/hydraulic oil during assembly.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

Inlet check valves must be installed before brake pistons to ensure proper position of check valve in relation to piston.



LV019 –UN–09MAR92

A—Elbow Fitting (2 used)
B—O-Ring (2 used)
C—Inlet Check Valve Seat (2 used)
D—O-Ring (2 used)
E—Inlet Check Valve (2 used)
F—Spring (2 used)

1. Install new O-rings (B and D).
2. Install spring (F), check valve (E), and valve seat (C). Tighten seat to specification.

Specification	
Brake Valve Inlet Check Valve Seat—Torque	73 N•m (54 lb-ft)

3. Install fitting (A).

AG,OUO1085,324 –19–30AUG00–1/4

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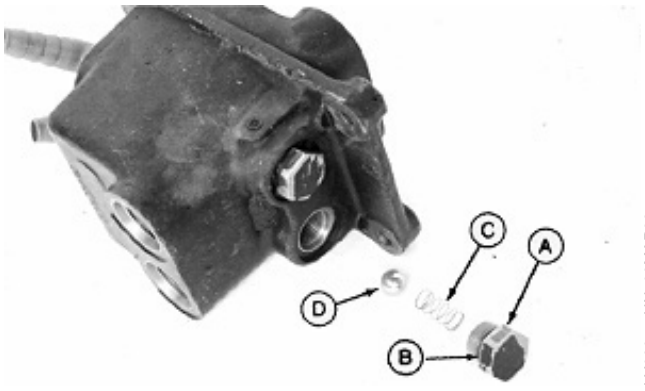
4. Install new O-ring (B).
5. Install ball (D), spring (C), and plug (A). Tighten plug to specification.

Specification	
Brake Valve Plug—Torque	37 N•m (27 lb-ft)



LV020 –UN–09MAR92

A—Plug (2 used)
B—O-Ring (2 used)
C—Spring (2 used)
D—Pressure Equalizing Ball (2 used)

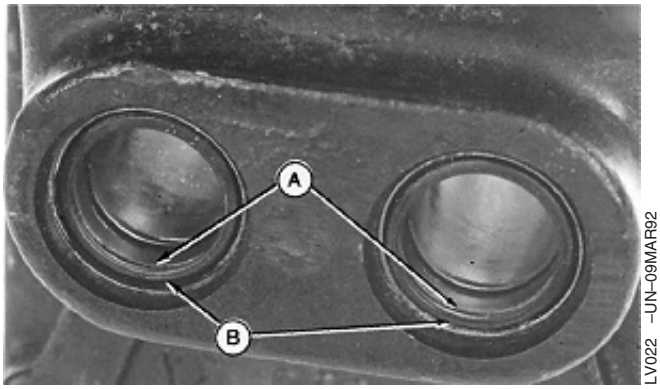
Continued on next page

AG,OUO1085,324 –19–30AUG00–2/4

6. Install new O-rings (A).

7. Apply multipurpose grease to lips of seals (B).

A—O-Ring
B—Seal



AG,OUO1085,324 –19–30AUG00–3/4

8. Install new O-ring (B).

9. Install parts (C—H). Tighten spring seat (C) to specification.

Specification

Brake Valve Spring Seat—Torque ..... 92 N•m (68 lb-ft)

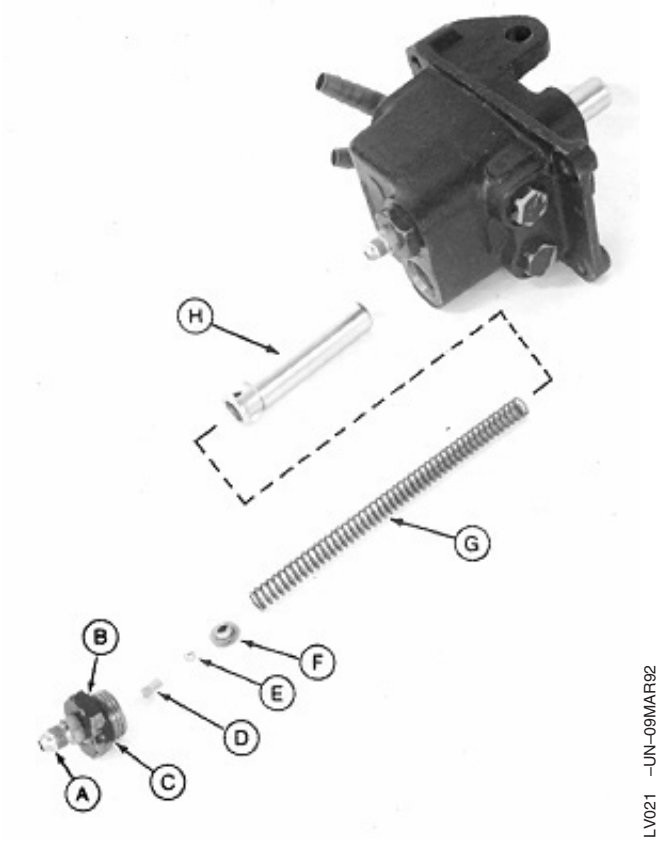
NOTE: Install fittings (A) loosely. Fittings are removed for brake valve installation.

10. Install new O-ring and fitting (A). Tighten fitting finger tight.

11. Install brake pedals, pivot shaft, and cotter pin.

12. Adjust brake pedals. (See Brake Pedal Adjustment in Section 260, Group 15.)

A—Outlet Fitting (2 used)
B—O-Ring (2 used)
C—Spring Seat (2 used)
D—Spring (2 used)
E—Outlet Check Ball (2 used)
F—Outlet Check Valve (2 used)
G—Spring (2 used)
H—Brake Piston (2 used)



AG,OUO1085,324 –19–30AUG00–4/4

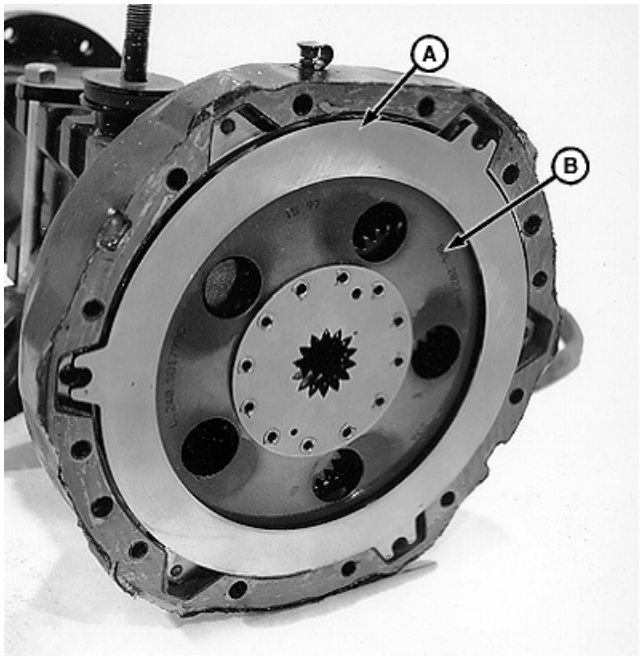
Remove and Inspect Brakes

1. Remove final drive assembly. (See Remove and Install Final Drive Assembly in Section 50, Group 30.)
2. Remove back plate (A) and friction disc (B).

NOTE: Piston assembly is press fit into final drive housing. Remove only if necessary.

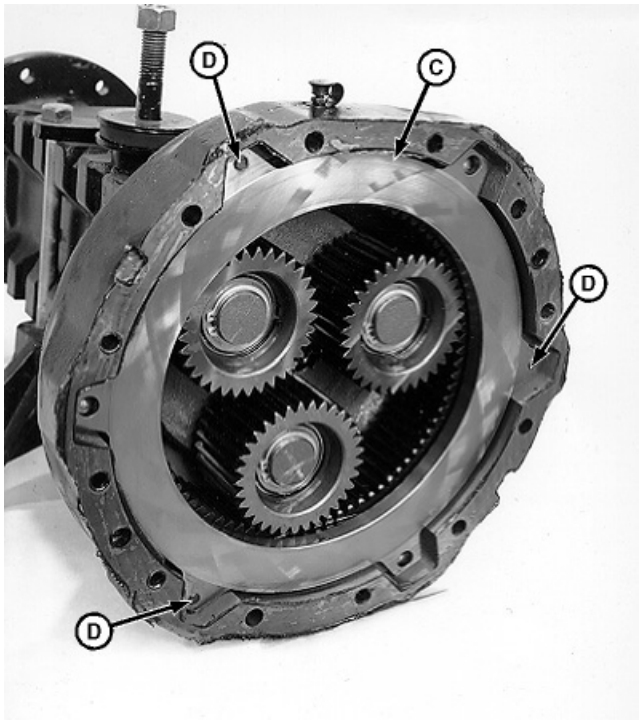
3. Remove piston assembly (C) using a pry bar. Pry at three retractor locations (D) evenly until piston assembly is removed.
4. Inspect piston ring and piston ring bore in axle housing for scoring or damage.

A—Back Plate
B—Friction Disc
C—Piston Assembly
D—Retractor (3 used)



LV2402 –UN–16DEC97

Left-Hand Side Shown



LV2403 –UN–16DEC97

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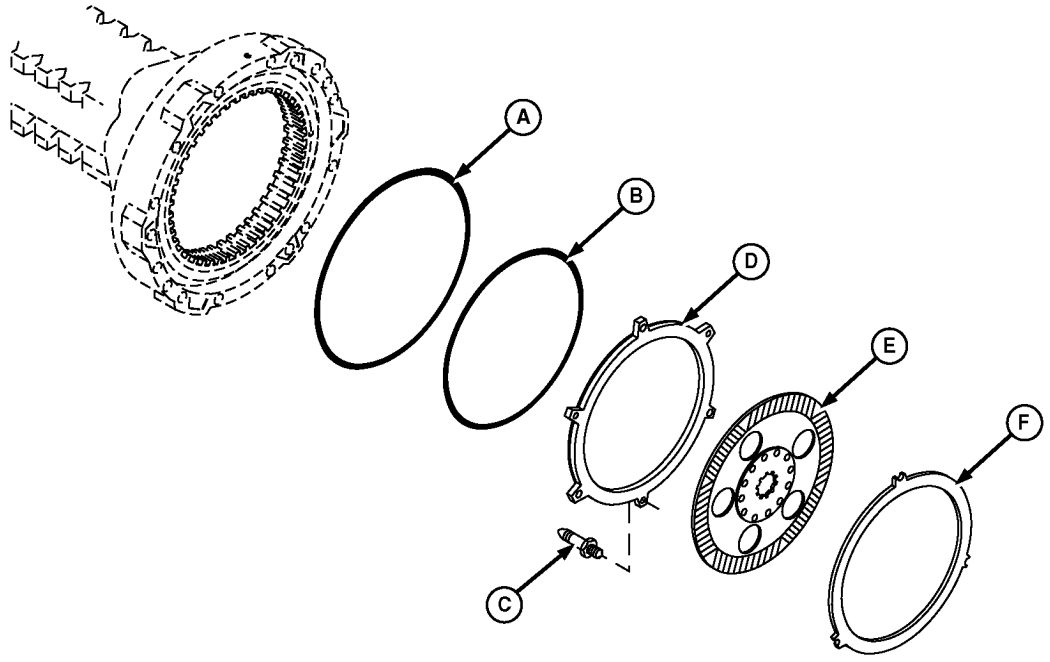
AG,OUO1085,325 –19–30AUG00–1/2



LV2396 –UN–16DEC97

A—Outer O-Ring
B—Inner O-Ring
C—Retractor Spring (3 used)
D—Piston
E—Friction Disc
F—Back Plate

IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

5. Replace the inner and outer O-rings (A and B).

NOTE: Retractor springs (C) are threaded into piston (D).

6. Remove retractor spring (C).

7. Inspect parts (A—F) for wear or damage. Check piston (D) and plate (F) for warpage. Replace parts as necessary.

AG,OUO1085,325 –19–30AUG00–2/2

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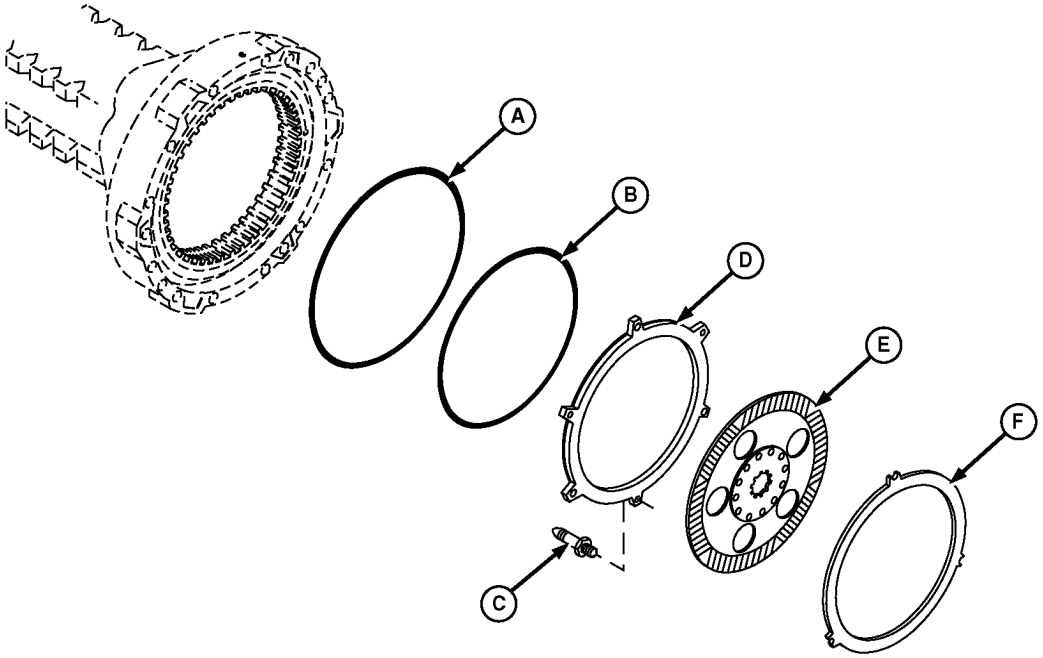
Install Brakes



LV2396 –UN–16DEC97

A—Outer O-Ring
B—Inner O-Ring
C—Retractor Spring (3 used)
D—Piston
E—Friction Disc
F—Back Plate

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1. Apply thread lock and sealer (high strength) to threads of return retractor spring (C).
2. Install retractor spring (C) into piston (D). Tighten to specification.

Specification	
Brake Retractor Spring—Torque	15 N•m (133 lb-in.)

3. Install new O-rings (A and B). Apply hydraulic oil to inside and outside diameter of piston (D).

Continued on next page

AG,OUO1085,326 –19–30AUG00–1/3

4. Install piston (A) into final drive housing using a cross beam (B) from a bushing, bearing, and seal driver set or equivalent type set-up, to drive retractors and piston into final drive housing.

5. Remove cross beam set-up (B).

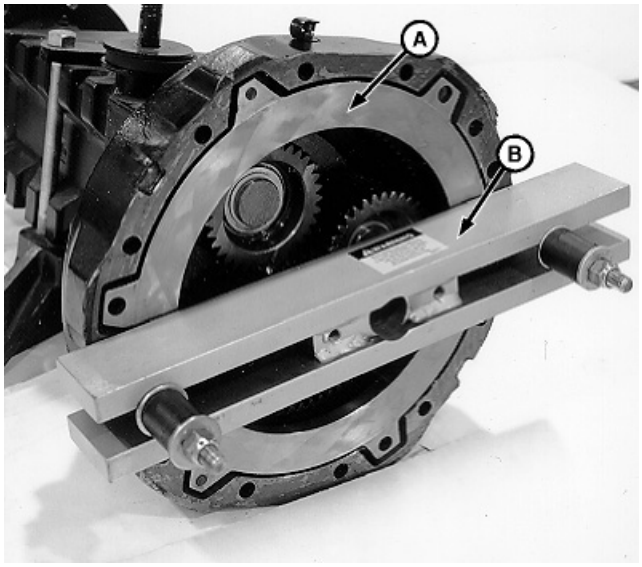
IMPORTANT: Seat retractors and piston to specification (E) as shown. If not seated to specification damage will occur.

6. Place a deep socket on each retractor and hit evenly using a soft-faced hammer, until retractors and piston are seated in final drive housing. Seat to specification.

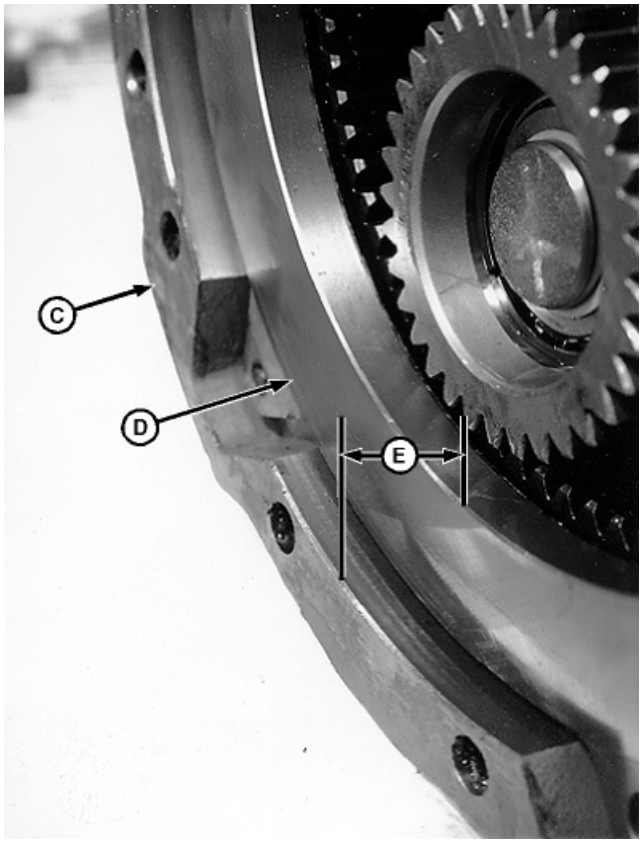
Specification	
Mating Surface of Final Drive Housing to Face of Piston—Distance	12.40—12.80 mm (0.488—0.503 in.)

7. Using a depth gauge, measure the distance from the mating surface of final drive housing (C) to face of piston (D). When properly seated, measurement (E) will be 12.40 mm (0.488 in.) to 12.80 mm (0.503 in.).

A—Piston
B—Cross Beam
C—Mating Surface of Final Drive Housing
D—Piston Face
E—Measurement Specification



LV2404 –UN–16DEC97



LV2405 –UN–16DEC97

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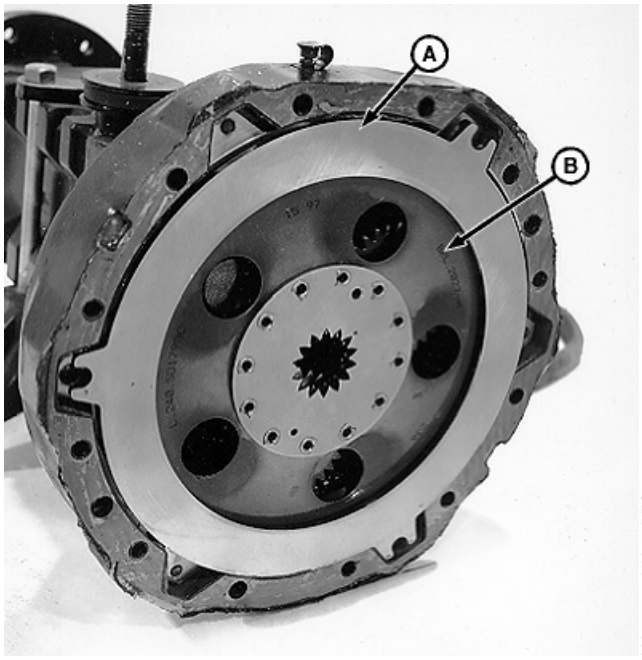
AG,OUO1085,326 –19–30AUG00–2/3

IMPORTANT: Back plate (A) is machined on one side only. Plates must be installed so that machined side of plate (A) is facing friction disc (B).

8. Install friction disc (B) and back plate (A) with machined side facing friction disc.

9. Install final drive assembly. (See Remove and Install Final Drive Assembly in Section 50, Group 30.)

A—Back Plate
B—Friction Disc



LV2402 –UN–16DEC97

AG,OUO1085,326 –19–30AUG00–3/3

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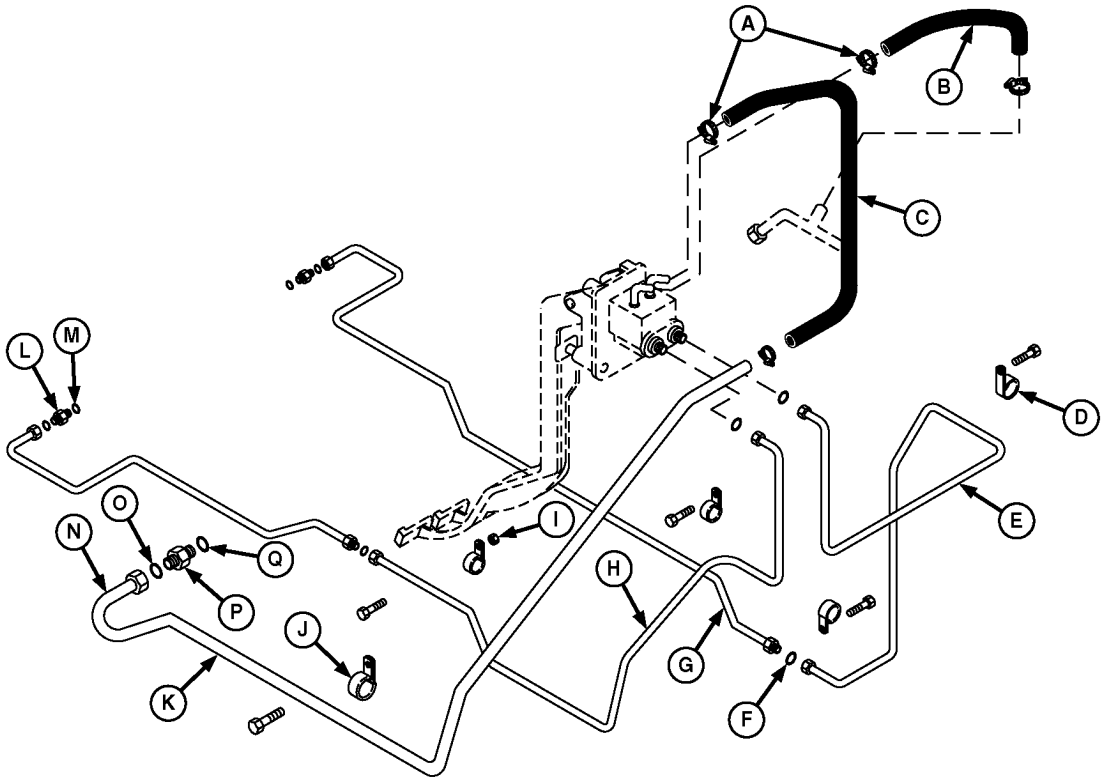
14

Inspect and Replace Brake Hydraulic Lines



LV2131 –UN–09JUN97

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A—Hose Clamp (4 used)
B—Steering Valve Return-to-Brake Valve
C—Brake Valve Return Hose
D—Line Clamp (4 used)
E—Pressure Line from Brake Valve
F—O-Rings (4 used)
G—Pressure Line-to-Left-Hand Brakes
H—Pressure Line from Brake Valve
I—Bushing
J—Line Clamp
K—Pressure Line-to-Right-Hand Brake
L—Fitting (2 used)
M—O-Ring (2 used)
N—Brake Valve Return Line
O—O-Ring
P—Fitting
Q—O-Ring

NOTE: 5210 and 5310 tractor shown. 5410 and 5510 tractors are similar.

If equipped with cab, lower front cab windows must be removed before removing dash panels. (See Remove and Install Lower Front Windows in Section 90, Group 15.)

1. Remove right and left dash panels.
2. Inspect hydraulic lines and hoses for wear or damage. Replace as necessary.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

3. Install dash panels.
4. Bleed brakes. (See Bleed Brake System in Section 260, Group 15.)
5. Install lower front cab windows, if removed.
6. Check transmission/hydraulic oil level, add fluid if necessary. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

AG,OUO1085,329 –19–30AUG00–1/1

Section 70
Hydraulic Repair

Contents

Continued on next page

Page

Specifications

Item	Measurement	Specification
Pick-Up Screen Cover Cap Screws	Torque	23 N•m (17 lb-ft)
Hydraulic Pump-to-Engine Cap Screws (5210—5310)	Torque	50 N•m (37 lb-ft)
Hydraulic Pump-to-Engine Cap Screws (5410—5510)	Torque	50 N•m (37 lb-ft)
Hydraulic Pump Assembly Cap Screws (5210—5310)	Torque	50 N•m (37 lb-ft)
Hydraulic Pump Assembly Cap Screws (5410—5510)	Torque	50 N•m (37 lb-ft)
Steering Pump Outlet Fitting	Torque	28 N•m (21 lb-ft)
Main Hydraulic Pump Outlet Fitting	Torque	46 N•m (34 lb-ft)
Pump Shaft Nut	Torque	55 N•m (41 lb-ft)
Pump Bracket-to-Pump Nuts	Torque	50 N•m (37 lb-ft)
Hydraulic Filter/Manifold Cap Screws	Torque	70 N•m (52 lb-ft)
Wheel Cap Screws	Torque	175 N•m (130 lb-ft)

OUO1089,000024F –19–18JUL02–1/1

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1

Service Parts Kits

The following kit is available through your parts catalog:

Hydraulic Pump Seal Kit

LV,7005HA,A1A –19–07MAY96–1/1

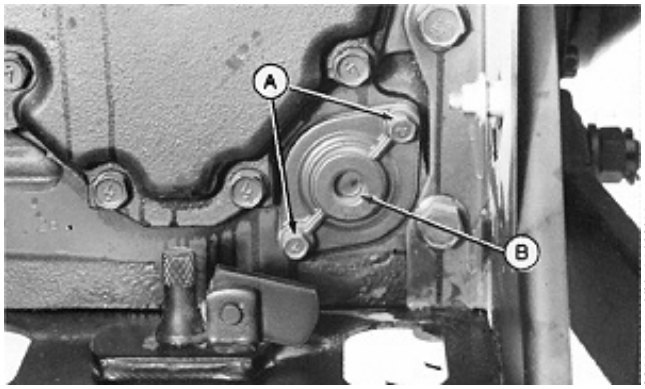
Remove, Inspect and Install Hydraulic Oil Pick-Up Screen

NOTE: The approximate capacity of CollarShift/SyncShuttle™ transmission is 37.9 L (10 U.S. gal), and 43.5 L (11.5 U.S. gal) for PowrReverser™ transmissions.

1. Drain transmission/hydraulic oil.
2. Remove cap screws (A) and cover (B).
3. Remove screen and inspect for damage. Replace if necessary.
4. Clean undamaged pick-up screen in solvent and blow dry with compressed air.
5. Install pick-up screen into differential case.
6. Install cover (B) and cap screws (A). Tighten cap screws to specification.

Specification	
Pick-Up Screen Cover Cap Screws—Torque	23 N•m (17 lb-ft)

7. Fill transmission with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)



A—Cap Screw
B—Cover

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AG,OUO1085,338 –19–30AUG00–1/1

Remove and Install Hydraulic Pump—5210 and 5310

1. Disconnect negative (—) cable at battery.

NOTE: Close all openings with caps and plugs.

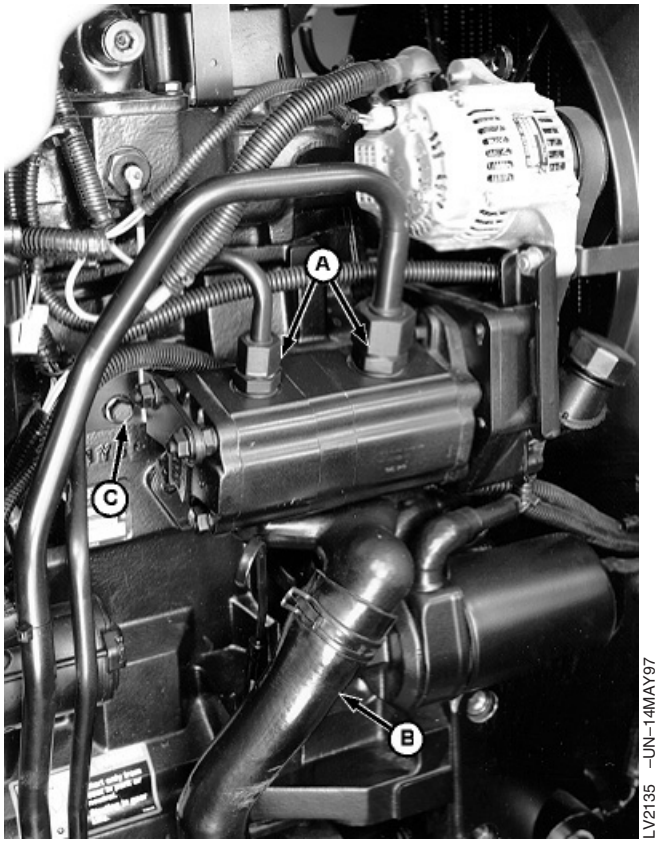
2. Disconnect lines (A) and hose (B).
3. Remove one cap screw (C) and two cap screws (D).
4. Remove hydraulic pump and O-ring.
5. Make repairs as necessary. (See Remove Hydraulic Pump External Components—5210 and 5310 and Disassemble and Inspect Hydraulic Pump—5210 and 5310 in this group.)

IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

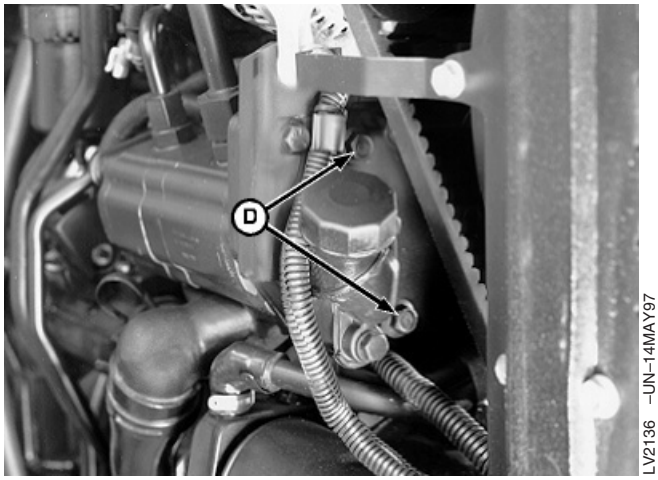
6. Place new O-ring on pump flange. Install pump on engine.
7. Install cap screws. Tighten to specifications.
8. Connect hydraulic lines and hose.
9. Connect negative (—) cable to battery.
10. Start engine and operate machine hydraulics. Check and adjust transmission/hydraulic oil level.

Specification

Hydraulic Pump-to-Engine Cap Screws (5210—5310)—Torque..... 50 N•m (37 lb-ft)



LV2135 –UN–14MAY97



LV2136 –UN–14MAY97

A—Outlet Line
B—Suction Hose
C—Bracket-to-Engine Cap Screw
D—Mounting Cap Screw

AG,OUO1085,339 –19–30AUG00–1/1

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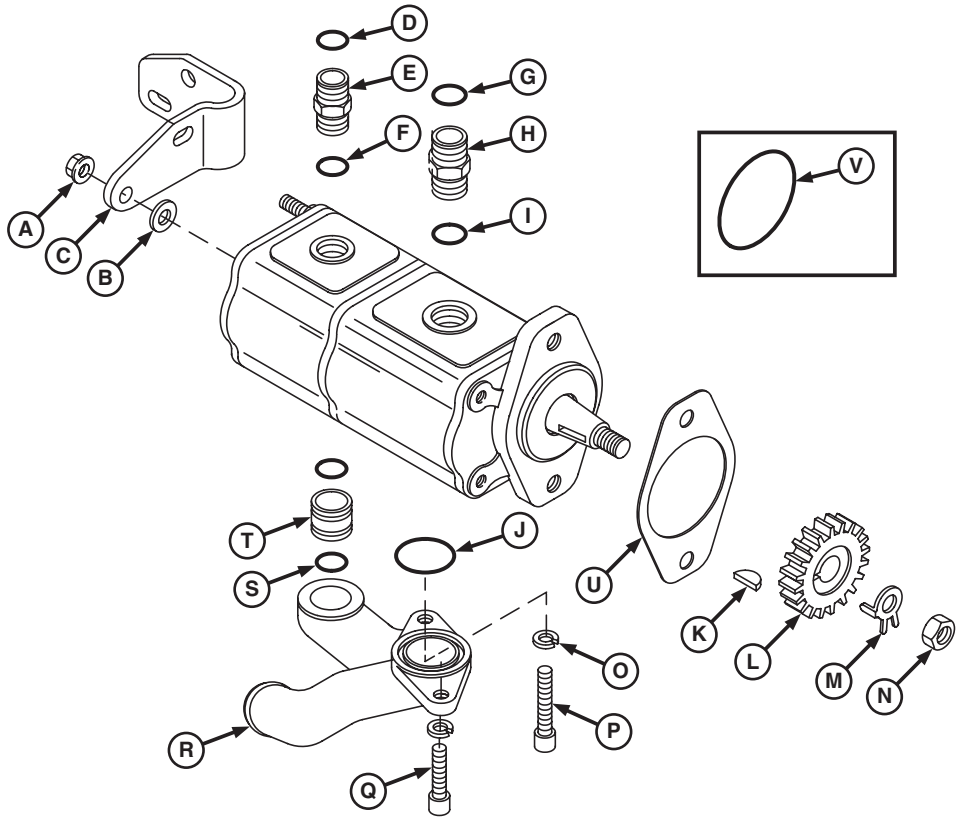
3

Remove Hydraulic Pump External Components—5210 and 5310



LV371AE –UN–05MAR03

A—Nut (2 used)
B—Lock Washer (2 used)
C—Bracket
D—O-Ring
E—Rear Fitting
F—O-Ring
G—O-Ring
H—Front Fitting
I—O-Ring
J—O-Ring
K—Woodruff Key
L—Gear
M—Tab Washer
N—Nut
O—Lock Washer (2 used)
P—Socket Head Cap Screw
Q—Socket Head Cap Screw
R—Manifold
S—O-Ring
T—Tube
U—O-Ring

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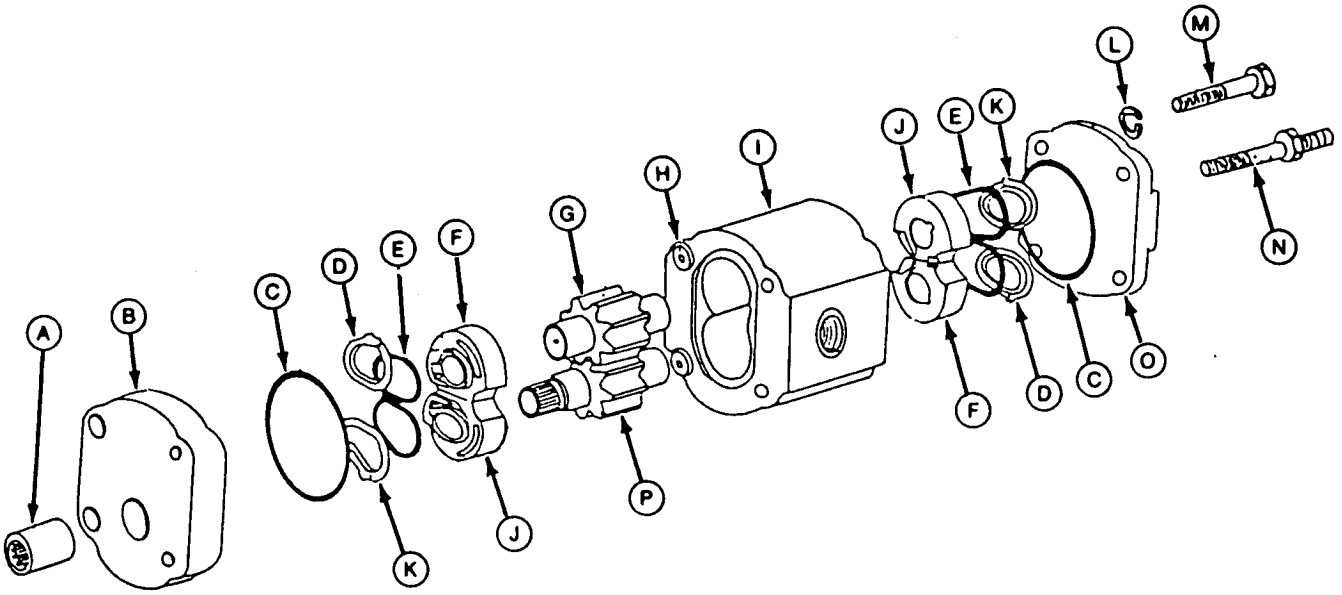
NOTE: O-ring (U) was removed during pump removal.

1. Remove parts (A—C).
2. Remove manifold (R) and tube (T). Remove O-rings (J and S).
3. Flatten tabs of washer (M) with hammer and punch.
4. Remove nut (N) and tab washer.
5. Remove gear (L) using a two-jaw puller.
6. Remove woodruff key (K).
7. Remove fittings (E and H) and O-rings (D, F, G, and I).

AG,OUO1085,340 –19–23JUL02–1/1

Disassemble and Inspect Hydraulic Pump—5210 and 5310



LV373A –UN–09MAR92

Rear Pump Section

A—Coupling	**E—O-Ring Seal**	**I—Housing**	**M—Cap Screw (2 used)**
B—Plate	**F—Bushing**	**J—Bushing**	**N—Bolt (2 used)**
C—Body Seal	**G—Driven Gear**	**K—Packing Ring**	**O—End Plate**
D—Packing Ring	**H—Dowel (2 used)**	**L—Lock Washer (4 used)**	**P—Drive Gear**

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5

NOTE: Hydraulic pump components are not serviceable. Replace complete pump if any part, other than seals, is worn or damaged.

1. Thoroughly clean and dry outside of pump.
2. Mark or number pump sections to aid during assembly.

IMPORTANT: Separate pump sections carefully. Do not allow parts to fall out. Keep individual pump components together as matched sets.

3. Mount pump in a vise and remove cap screws and bolts (M and N).
4. Remove end plate (O) and parts (C, D, E, and K).
5. Mark teeth of pump gears (G and P) to aid during assembly.
6. Remove remaining parts of rear pump. If bushings (F and J) do not come out easily, push on shaft of drive gear (P).
7. Clean and dry parts. Inspect parts for wear or damage. Replace complete pump if necessary.

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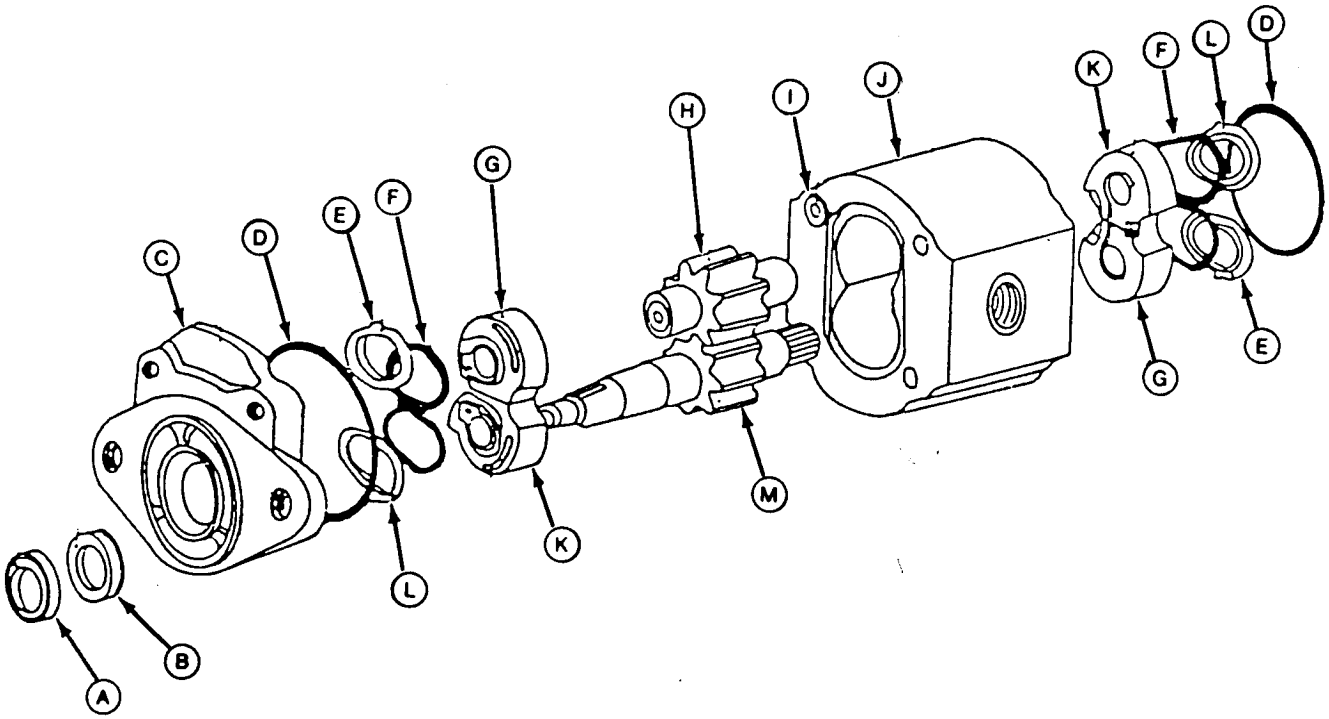
AG,OUO1085,341 –19–30AUG00–1/2



LV372A –UN–09MAR92

Front Pump Section

A—Oil Seal
B—Oil Seal
C—Mounting Flange
D—Body Seal
E—Packing Ring
F—O-Ring Seal
G—Bushing
H—Driven Gear
I—Dowel (2 used)
J—Housing
K—Bushing
L—Packing Ring
M—Drive Gear

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05
6

8. Separate mounting flange (C) from housing (J).

9. Remove parts (D, E, F, and L).

10. Mark teeth of pump gears (H and M) to aid during assembly.

11. Remove remaining parts of front pump. If bushings (G and K) do not come out easily, push on shaft of drive gear (M).

IMPORTANT: Always replace seals. Damaged or used seals will leak.

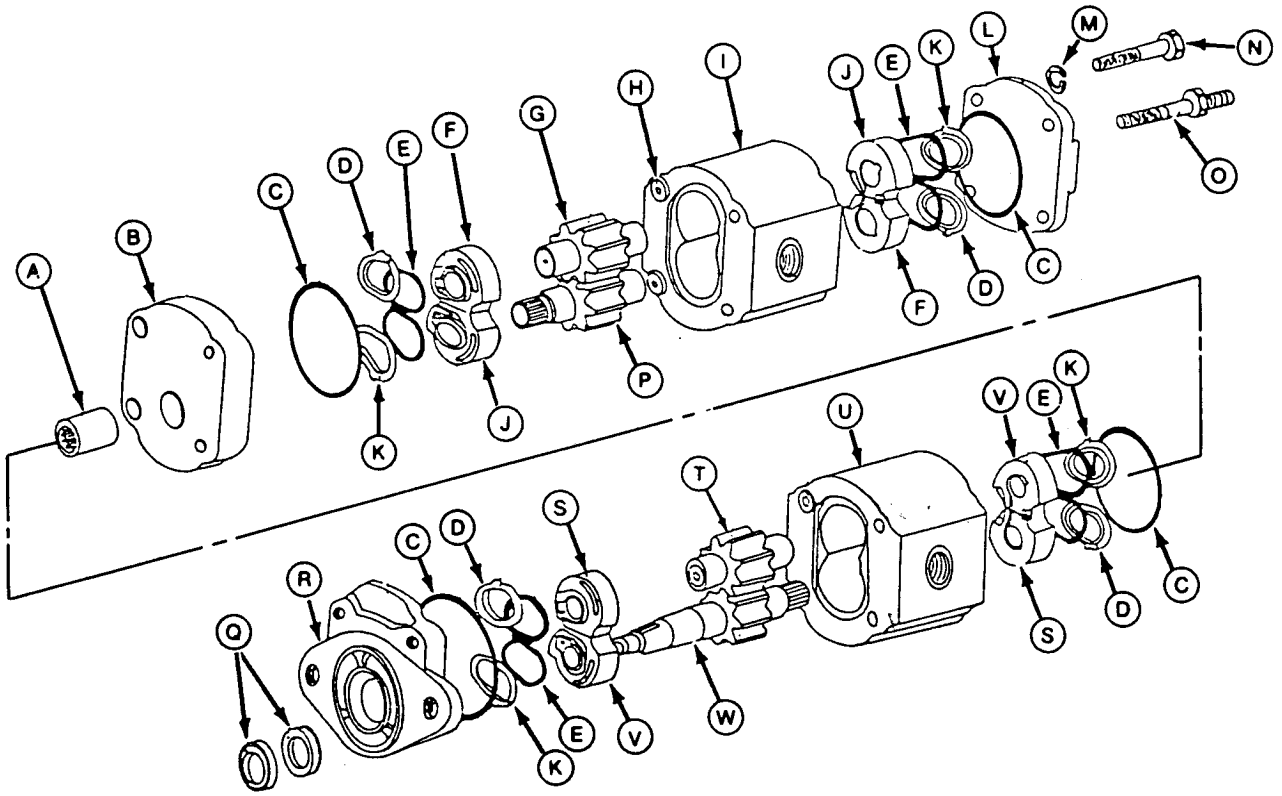
NOTE: Install seals with lips facing away from each other.

12. Pry out seals (A and B). Install seals using a bearing, bushing, and seal driver set. Install seal (B) with lips toward pump gears. Install seal (A) with lips away from pump gears.

13. Clean and dry parts. Inspect parts for wear or damage. Replace complete pump if necessary.

AG,OUO1085,341 –19–30AUG00–2/2

Assemble Hydraulic Pump—5210 and 5310



LV374A –UN–09MAR92

A—Coupling
B—Plate
C—Body Seal
D—Packing Ring
E—O-Ring Seal
F—Bushing
G—Driven Gear
H—Dowel (4 used)
I—Housing
J—Bushing
K—Packing Ring
L—End Plate
M—Lock Washer (4 used)
N—Cap Screw (2 used)
O—Bolt (2 used)
P—Drive Gear
Q—Oil Seals
R—Mounting Flange
S—Bushing
T—Driven Gear
U—Housing
V—Bushing
W—Drive Gear

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7

IMPORTANT: Always use new seals and O-rings. Damaged or used seals and O-rings will leak.

Apply clean hydraulic oil to all internal parts before assembly. Premature pump failure can result if pump is assembled dry.

1. Apply multipurpose grease to inside lips of seals (Q).

2. Assemble pump sections with new seals and O-rings, aligning all marks made during disassembly.

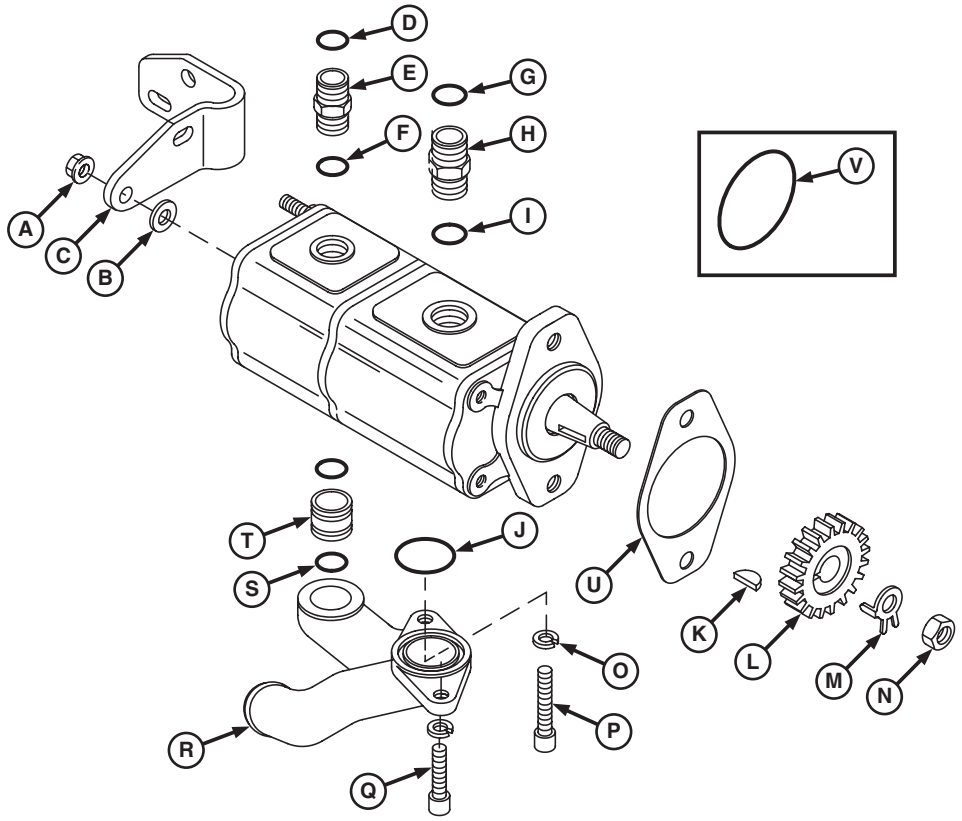
IMPORTANT: Make sure that pump shaft can be turned with a pair of 6 in. pliers when tightening bolts. A seized shaft indicates misaligned components. Disassemble pump to determine cause.

3. Tighten cap screws (N) and bolts (O) to specification.

Specification	
Hydraulic Pump Assembly Cap Screws and Bolts (5210—5310)—Torque	50 N•m (37 lb-ft)

AG,OUO1085,342 –19–30AUG00–1/1

Install Hydraulic Pump External Components—5210 and 5310



LV371AE –UN–05MAR03

A—Nut (2 used)
B—Lock Washer (2 used)
C—Bracket
D—O-Ring
E—Rear Fitting
F—O-Ring
G—O-Ring
H—Front Fitting
I—O-Ring
J—O-Ring
K—Woodruff Key
L—Gear
M—Tab Washer
N—Nut
O—Lock Washer (2 used)
P—Socket Head Cap Screw
Q—Socket Head Cap Screw
R—Manifold
S—O-Ring (2 used)
T—Tube
U—O-Ring

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IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

1. Install new O-rings (D, F, G, and I).
2. Install fittings (E and H). Tighten fittings to specifications.
3. Install parts (L—N). Tighten nut to specifications. Bend tabs of washer up against nut.

NOTE: O-ring (U) is installed during pump installation.

4. Install new O-rings (S) and tube (T).
5. Install new O-ring (J) and manifold (R).
6. Install parts (A—C). Tighten nuts (A) to specifications after pump is installed on engine.

Specification	
Steering Pump Outlet Fitting—Torque	28 N•m (21 lb-ft)
Main Hydraulic Pump Outlet Fitting—Torque	46 N•m (34 lb-ft)
Pump Shaft Nut—Torque	55 N•m (41 lb-ft)
Pump Bracket-to-Pump Nuts—Torque	50 N•m (37 lb-ft)

AG,OUO1085,343 –19–23JUL02–1/1

Remove and Install Hydraulic Pump—5410 and 5510

1. Disconnect negative (—) cable at battery.

NOTE: Close all openings with caps and plugs.

2. Disconnect hydraulic lines (A) and suction hose (B).

NOTE: Provide adequate support when removing pump mounting screws. Pump weighs approximately 12.7 kg (28 lb).

3. Remove two cap screws (C).

4. Remove hydraulic pump and O-ring.

5. Make repairs as necessary. (See Remove Hydraulic Pump External Components—5410 and 5510 and Disassemble and Inspect Hydraulic Pump—5410 and 5510 in this group.)

IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

6. Place new O-ring on pump flange. Install pump on engine.

7. Install cap screws (C) and tighten to specification.

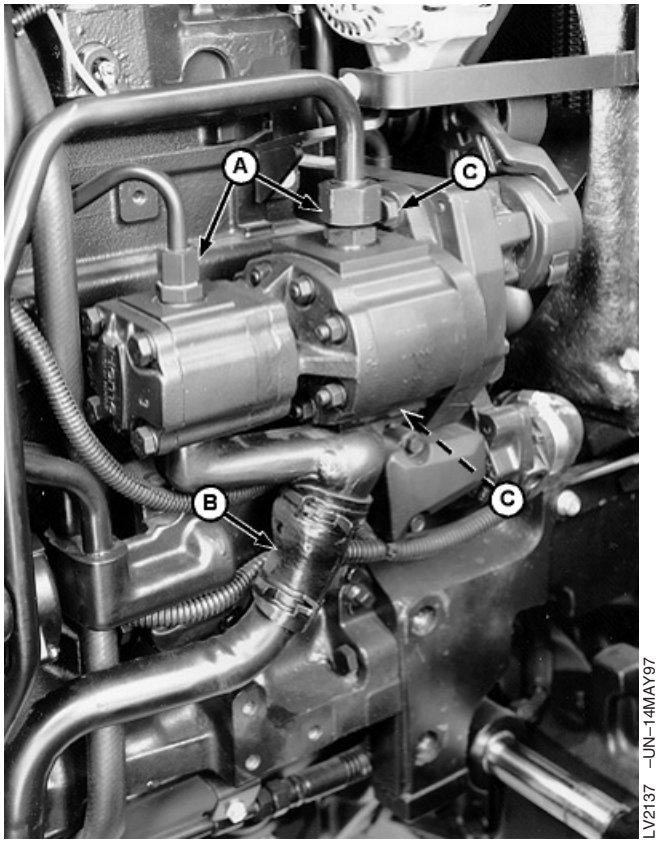
Specification

Hydraulic Pump-to-Engine Cap Screws (5410—5510)—Torque..... 50 N•m (37 lb-ft)

8. Connect hydraulic lines (A) and hose (B).

9. Connect negative (—) cable to battery.

10. Start engine and operate machine hydraulics. Check for leaks and adjust transmission/hydraulic oil level.



LV2137 –UN–14MAY97

A—Outlet Line
B—Suction Hose
C—Cap Screw (2 used)

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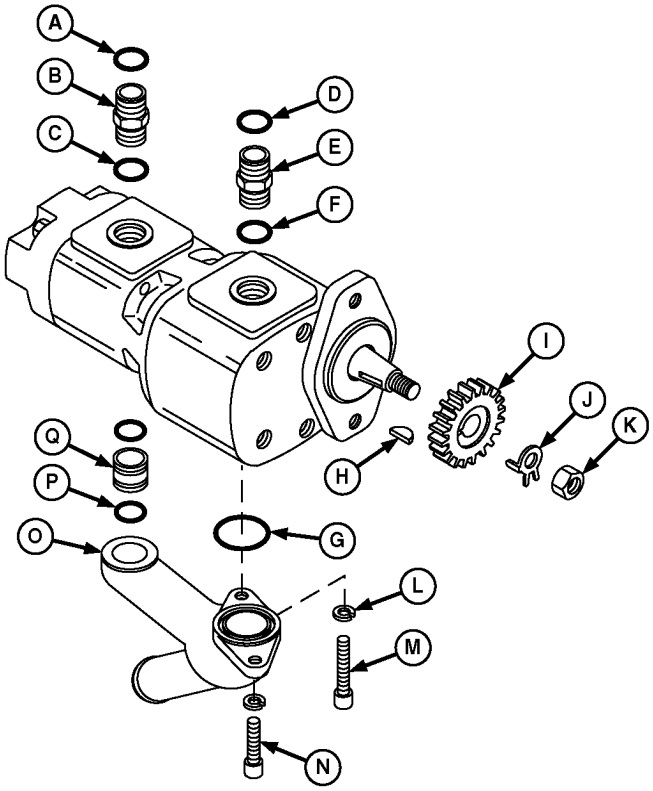
AG,OUO1085,344 –19–30AUG00–1/1

Remove Hydraulic Pump External Components—5410 and 5510



LV2138 –UN–09JUN97

A—O-Ring
B—Rear Fitting
C—O-Ring
D—O-Ring
E—Front Fitting
F—O-Ring
G—O-Ring
H—Woodruff Key
I—Gear
J—Tab Washer
K—Nut
L—Lock Washer (2 used)
M—Socket Head Cap Screw
N—Socket Head Cap Screw
O—Manifold
P—O-Ring (2 used)
Q—Tube

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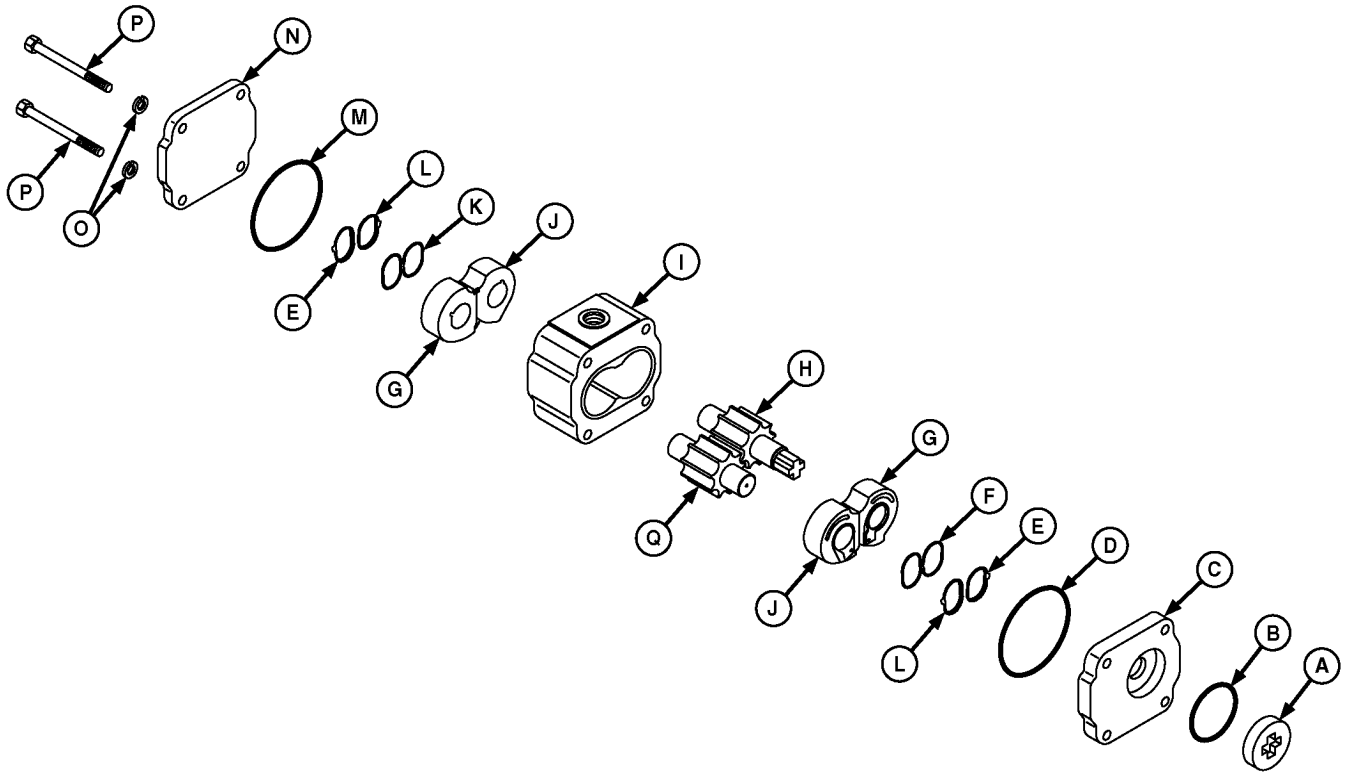
1. Remove manifold (O) and tube (Q). Remove O-rings (G and P).
2. Flatten tabs of washer (J) with hammer and punch.
3. Remove nut (K) and tab washer.
4. Remove gear (I) using a two-jaw puller.
5. Remove woodruff key (H).
6. Remove fittings (B and E) and O-rings (A, C, D, and F).

AG,OUO1085,345 –19–30AUG00–1/1

Disassemble and Inspect Hydraulic Pump—5410 and 5510



Rear Pump Section

A—Coupling
B—O-Ring
C—Plate
D—Body Seal
E—Packing Ring
F—O-Ring Seal
G—Bushing
H—Drive Gear
I—Housing
J—Bushing
K—O-Ring Seal
L—Packing Ring
M—Body Seal
N—End Plate
O—Lock Washer (4 used)
P—Cap Screw (2 used)
Q—Driven Gear

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NOTE: Hydraulic pump components are not serviceable. Replace complete pump if any part, other than seals, is worn or damaged.

1. Thoroughly clean and dry outside of pump.
2. Mark or number pump sections to aid during assembly.

IMPORTANT: Separate pump sections carefully. Do not allow parts to fall out. Keep individual pump components together as matched sets.

3. Mount pump in a vise and remove cap screws (P).
4. Remove end plate (N) and parts (M, E, L, K, F, D, and B).
5. Mark teeth of pump gears (H and Q) to aid during assembly.
6. Remove remaining parts of rear pump. If bushings (G and J) do not come out easily, push on shaft of drive gear (H).
7. Clean and dry parts. Inspect parts for wear or damage. Replace complete pump if necessary.

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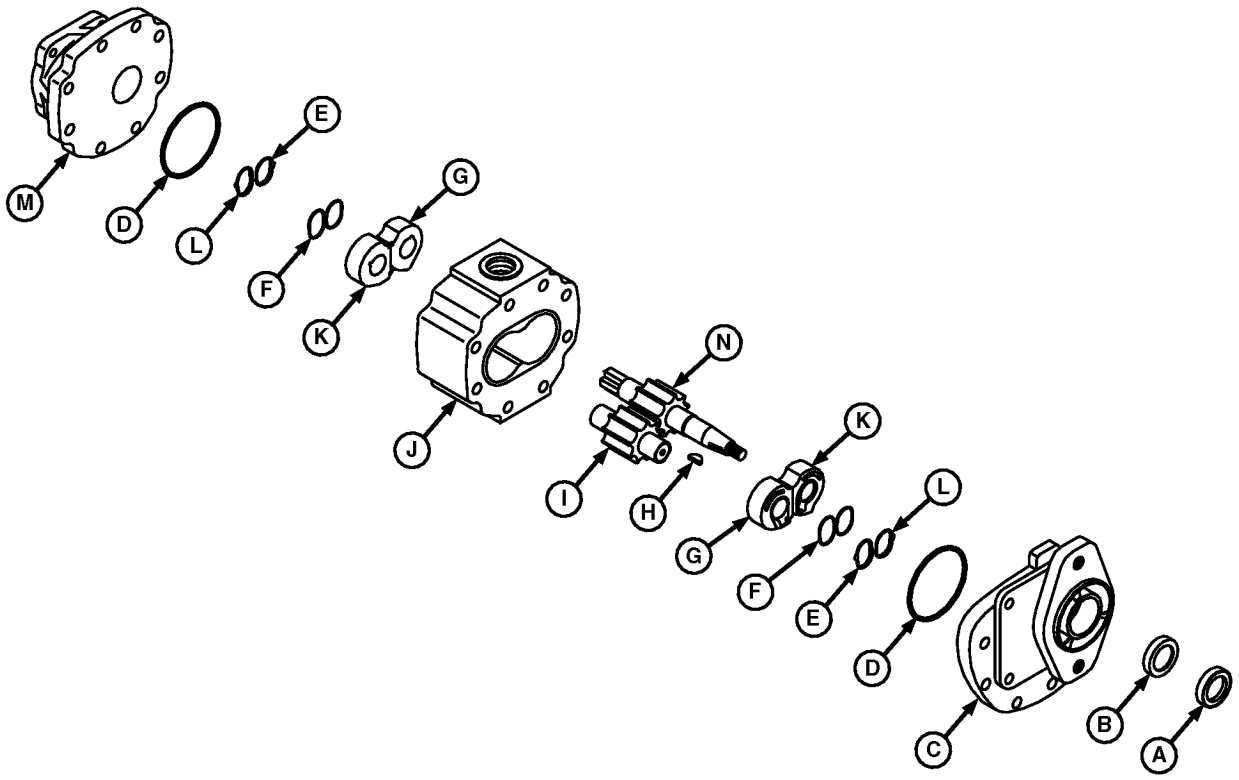

LV1379AE –UN–20NOV95

Front Pump Section

A—Oil Seal
B—Oil Seal
C—Mounting Flange
D—Body Seal
E—Packing Ring
F—O-Ring Seal
G—Bushing
H—Woodruff Key
I—Drive Gear
J—Housing
K—Bushing
L—Packing Ring
M—Adapter Plate
N—Drive Gear

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8. Separate mounting flange (C) from housing (J).

9. Remove parts (D, E, F, and L).

10. Mark teeth of pump gears (I and N) to aid during assembly.

11. Remove remaining parts of front pump. If bushings (G and K) do not come out easily, push on shaft of drive gear (N).

IMPORTANT: Always replace seals. Damaged or used seals will leak.

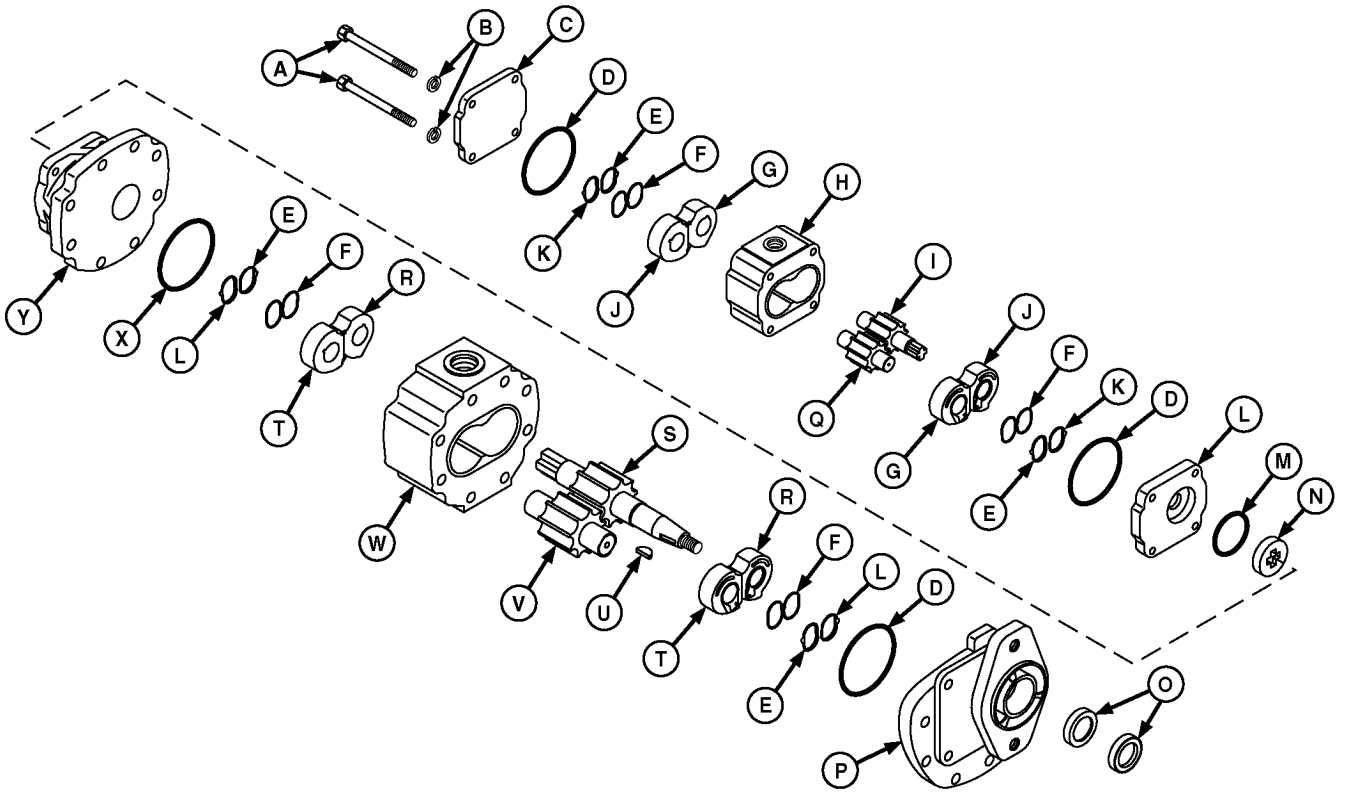
NOTE: Install seals with lips facing away from each other.

12. Pry out seals (A and B). Install seals using a bushing, bearing, and seal driver set. Install seal (B) with lips toward pump gears. Install seal (A) with lips away from pump gears.

13. Clean and dry parts. Inspect parts for wear or damage. Replace complete pump if necessary.

AG,OUO1085,347 –19–30AUG00–2/2

Assemble Hydraulic Pump—5410 and 5510



LV1360AE –UN–17APR98

A—Cap Screw (4 used)
B—Lock Washer (4 used)
C—End Plate
D—Body Seal
E—Packing Ring
F—O-Ring Seal
G—Bushing
H—Housing
I—Drive Gear
J—Bushing
K—Packing Ring
L—Plate
M—O-Ring
N—Coupling
O—Oil Seals
P—Mounting Flange
Q—Driven Gear
R—Bushing
S—Drive Gear
T—Bushing
U—Woodruff Key
V—Driven Gear
W—Housing
X—Body Seal
Y—Adapter Plate

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13

IMPORTANT: Always use new seals and O-rings. Damaged or used seals and O-rings will leak.

Apply clean hydraulic oil to all internal parts before assembly. Premature pump failure can result if pump is assembled dry.

1. Apply multipurpose grease to inside lips of seals (O).
2. Assemble pump sections with new seals and O-rings, aligning all marks made during disassembly.

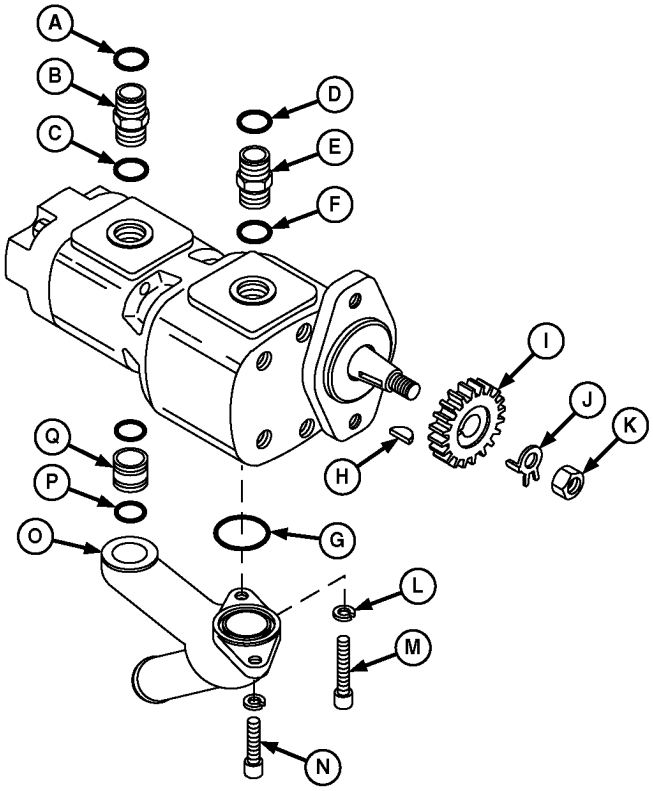
IMPORTANT: Make sure that pump shaft can be turned with a pair of 6 in. pliers when tightening bolts. A seized shaft indicates misaligned components. Disassemble pump to determine cause.

3. Tighten cap screws (A) to specification.

Specification	
Hydraulic Pump Assembly Cap Screws (5410—5510)—Torque	50 N•m (37 lb-ft)

OUO1085,000015D –19–30AUG00–1/1

Install Hydraulic Pump External Components—5410 and 5510



LV2138 –UN–09JUN97

A—O-Ring
B—Steering Pump Outlet Fitting
C—O-Ring
D—O-Ring
E—Main Hydraulic Pump Outlet Fitting
F—O-Ring
G—O-Ring
H—Woodruff Key
I—Gear
J—Tab Washer
K—Nut
L—Lock Washer (2 used)
M—Socket Head Cap Screw
N—Socket Head Cap Screw
O—Manifold
P—O-Ring (2 used)
Q—Tube

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IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

1. Install new O-rings (A, C, D, and F).
2. Install steering and main pump outlet fittings (B and E). Tighten fittings to specifications.
3. Install parts (I—K). Tighten nut (K) to specifications. Bend tabs of washer up against nut.
4. Install new O-rings (P) and tube (Q).
5. Install new O-ring (G) and manifold (O).

Specification	
Steering Pump Outlet Fitting—Torque	28 N•m (21 lb-ft)
Main Hydraulic Pump Outlet Fitting—Torque	46 N•m (34 lb-ft)
Pump Shaft Nut—Torque	55 N•m (41 lb-ft)

OUO1085,000015E –19–31AUG00–1/1

Remove and Install Hydraulic Filter/Manifold—Early Model

NOTE: The approximate capacity of CollarShift/SyncShuttle™ transmission is 37.9 L (10 U.S. gal), and 43.5 L (11.5 U.S. gal) for PowrReverser™ transmissions.

1. Drain transmission/hydraulic oil.

NOTE: Close all openings using caps and plugs.

2. Remove hose elbow (C).

3. Remove three cap screws (B) to remove hydraulic oil filter assembly (A).

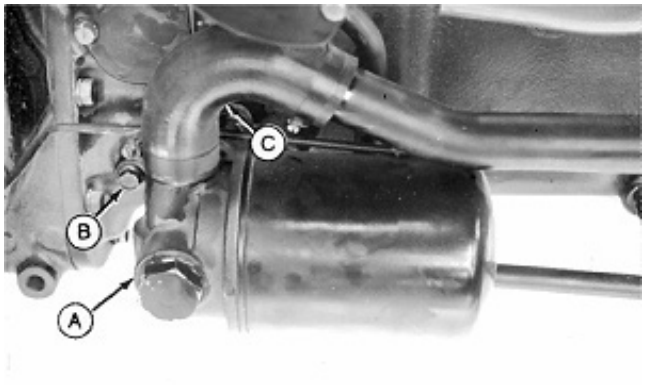
IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

4. Install new O-ring and oil filter assembly. Tighten cap screws to specification.

Specification	
Hydraulic Filter/Manifold Cap Screws—Torque	70 N•m (52 lb-ft)

5. Install hose elbow.

6. Fill transmission with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)



LV513 –UN–28FEB92

Filter/Manifold (Early Model Tractors)

A—Hydraulic Oil Filter Assembly
B—Cap Screw (3 used)
C—Hose Elbow

OUO1085,000015F –19–31AUG00–1/1

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Remove and Install Hydraulic Filter/Manifold—Later Model

NOTE: The approximate capacity of CollarShift/SyncShuttle™ transmission is 37.9 L (10 U.S. gal), and 43.5 L (11.5 U.S. gal) for PowrReverser™ transmissions.

1. Drain transmission/hydraulic oil.

NOTE: Close all openings using caps and plugs.

2. Remove three cap screws (B).

3. Remove hydraulic oil filter assembly (A) by sliding rearward of suction line (C).

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

4. Install new O-ring and oil filter assembly. Tighten cap screws to specification.

Specification	
Hydraulic Filter/Manifold Cap Screws—Torque	70 N•m (52 lb-ft)

5. Fill transmission with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

LV7955 –UN–01JUL02

A—Hydraulic Oil Filter Assembly
B—Cap Screw (3 used)
C—Suction Line

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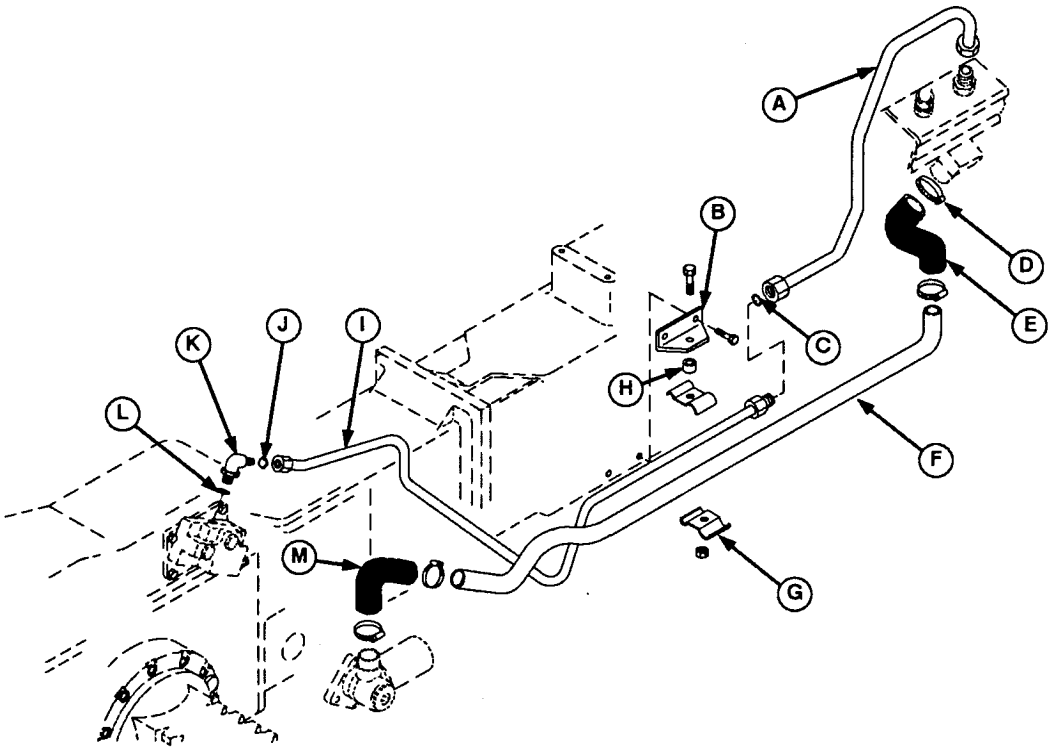
16

OUO1023,0000407 –19–03JUL02–1/1

Inspect and Replace Hydraulic Supply/Return Line



LV457AE –UN–28FEB92

A—Pump-to-Inlet Housing Supply Line
B—Bracket
C—O-Ring
D—Clamp (4 used)
E—Suction Line-to-Pump Hose
F—Filter Manifold-to-Pump Suction Line
G—Clamp (2 used)
H—Spacer
I—Pump-to-Inlet Housing Pressure Line
J—O-Ring
K—Fitting
L—O-Ring
M—Filter Manifold-to-Suction Line Hose

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1. Remove right-hand rear wheel and fender.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

NOTE: To remove fitting (K) on tractors without cab it is necessary to remove fuel tank. (See Remove, Inspect and Install Fuel Tank—Without Cab in Section 30, Group 05.)

To remove fitting (K) on tractors with cab it is necessary to remove right-side control console and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)

NOTE: If replacement of lines or hoses is necessary, drain transmission/hydraulic oil.

2. Inspect hydraulic lines and hoses for wear or damage. Replace as necessary.

3. Install fender and wheel. Tighten wheel cap screws to specification.

Specification	
Wheel Cap Screws—Torque	175 N•m (130 lb-ft)

4. Adjust transmission/hydraulic oil level to full mark with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

OUO1085,0000160 –19–31AUG00–1/1

Remove, Inspect, and Install Hydraulic Oil Cooler

1. Remove left- and right-side front grille panels.

NOTE: On tractors equipped with air conditioning, remove A/C condenser. (See Remove, Inspect, and Install Air Conditioning Condenser in Section 90, Group 20.)

2. Disconnect negative (—) battery cable.

NOTE: Hydraulic oil cooler can be inspected without removing oil cooler.

Front grille-to-radiator brace removed for clarity of photo only.

3. Remove nut (B) on both sides of oil cooler and tilt cooler (D) forward.

4. Inspect oil cooler for bent fins, cracks, and damaged seams. Repair as necessary.

5. Disconnect two hydraulic lines (A).

6. Remove two cap screws and nuts (C). Remove oil cooler.

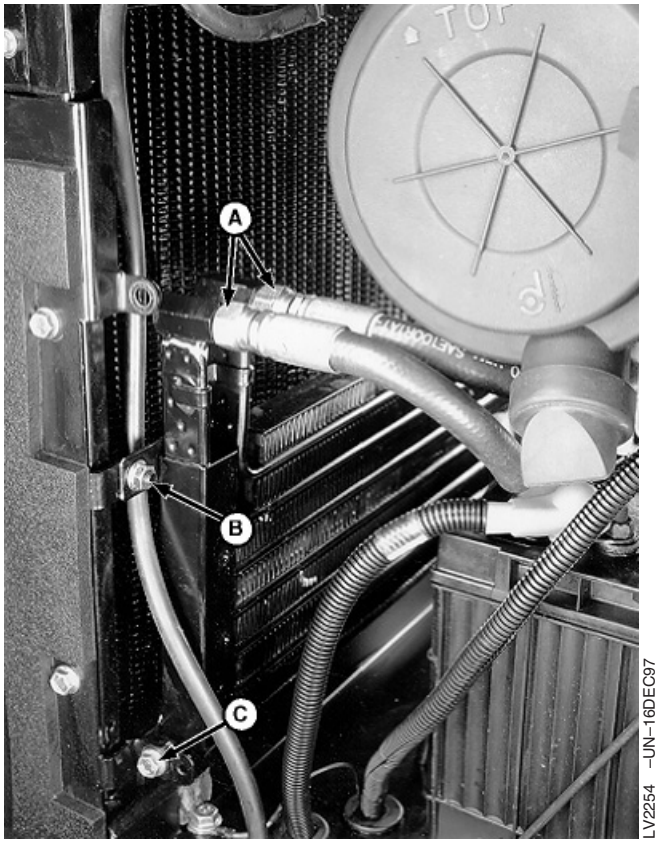
CAUTION: Reduce compressed air to less than 210 kPa (2 bar) (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips or debris and wear personal protection equipment including eye protection.

7. Check oil cooler for debris lodged in fins. Clean cooler using compressed air or pressure washer.

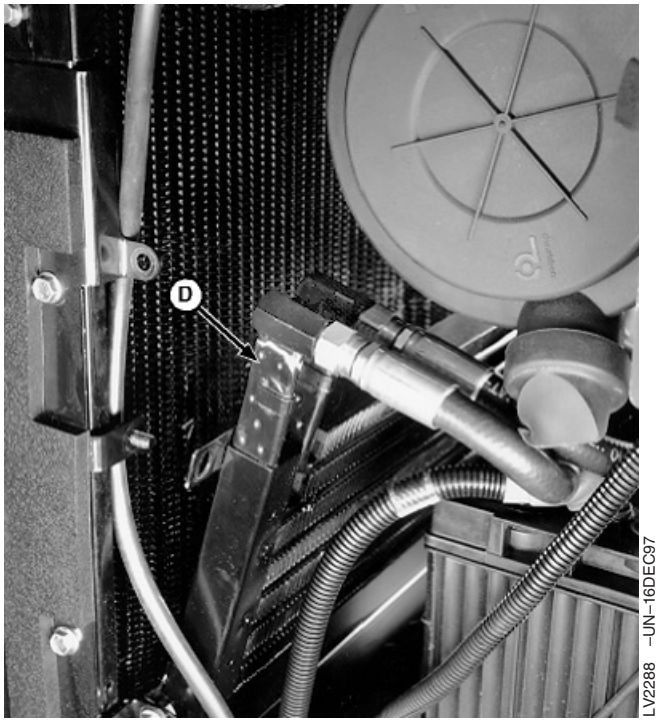
8. Install oil cooler using two cap screws and nuts (C).

9. Install two nuts (B) and connect hydraulic lines (A).

A—Hydraulic Line
B—Nut (2 used)
C—Cap Screw and Nut (2 used)
D—Hydraulic Oil Cooler



LV2254 –UN–16DEC97



LV2288 –UN–16DEC97

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NOTE: Tractors equipped with cab, install A/C condenser. (See Remove, Inspect, and Install Air Conditioning Condenser in Section 90, Group 20.)

10. Connect negative (—) battery cable.

11. Start engine and operate tractor hydraulics system. Check for leaks. Check and adjust transmission/hydraulic oil level.

12. Install right- and left-side grille panels.

OUO1085,0000161 –19–31AUG00–2/2

Other Material

Number	Name	Use
TY9375 (U.S.) TY9480 (Canadian) 592 (LOCTITE®)	Pipe Sealant	Apply to threads of rockshaft control lever support socket head cap screws.
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to the following: rockshaft control valve-to-inlet housing socket head cap screws, inlet housing-to-rockshaft case cap screws.
TY6305 (U.S.) TY9477 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY6304 (U.S.) TY9484 (Canadian) 518 (LOCTITE®)	Flexible Sealant	Seals the following: inlet housing to rockshaft case, rockshaft case to differential housing.
TY9370 (U.S.) TY9477 (Canadian) 242 (LOCTITE®)	Thread Lock and Sealer (Medium Strength)	Apply to the following: rockshaft control valve-to-inlet housing socket head cap screws, inlet housing-to-rockshaft case cap screws.
TY6305 (U.S.) TY9477 (Canadian) 7649 (LOCTITE®)	Clean and Cure Primer	Cleans mating surfaces and reduces sealant curing time.
TY6304 (U.S.) TY9484 (Canadian) 518 (LOCTITE®)	Flexible Sealant	Seals the following: inlet housing to rockshaft case, rockshaft case to differential housing.

OUO1023,000040A –19–23JUL02–1/1

Specifications

Item	Measurement	Specification
Draft Sensing Support Assembly Socket Head Cap Screws	Torque	375 N•m (277 lb-ft)
Main Relief Valve	Torque	51 N•m (38 lb-ft)
Surge Relief Valve	Torque	34 N•m (25 lb-ft)
Rate-of-Drop Valve	Torque	50 N•m (37 lb-ft)
Rockshaft Control Valve Socket Head Cap Screws	Torque	13.6 N•m (120 lb-in.)
Inlet Housing Mounting Cap Screws	Torque	35 N•m (26 lb-ft)
Rockshaft Case Cap Screws	Torque	125 N•m (92 lb-ft)
Hydraulic Pump Outlet Line Fitting	Torque	60 N•m (45 lb-ft)
Bushing Outer Edge to Edge of Bore	Distance (Minimum)	7 mm (0.283 in.)

OUO1089,0000258 –19–18JUL02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

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2

Inlet Housing Seal Kit

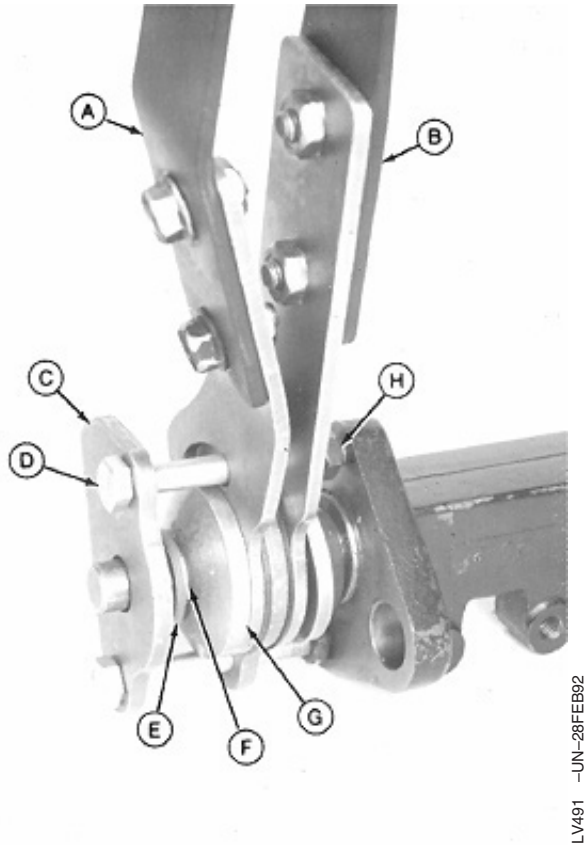
Rockshaft Cylinder Seal Kit

OUO1085,0000163 –19–31AUG00–1/1

Inspect and Repair Rockshaft Control Lever Assembly

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in this group.)
2. Remove levers (A and B).
3. Loosen nuts (H).
4. Remove parts (C—H).

A—Position Sensing Lever
B—Draft Sensing Lever
C—Alignment Plate
D—Cap Screw (2 used)
E—Spring Washer (4 used)
F—Washer
G—Spacer
H—Jam Nut (2 used)



LV491 –UN–28FEB92

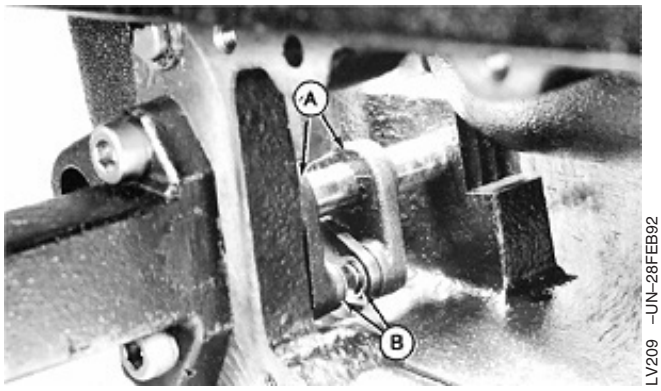
OUO1085,0000164 –19–31AUG00–1/5

5. Remove inlet housing. (See Replace Rockshaft Control Valve in this group.)

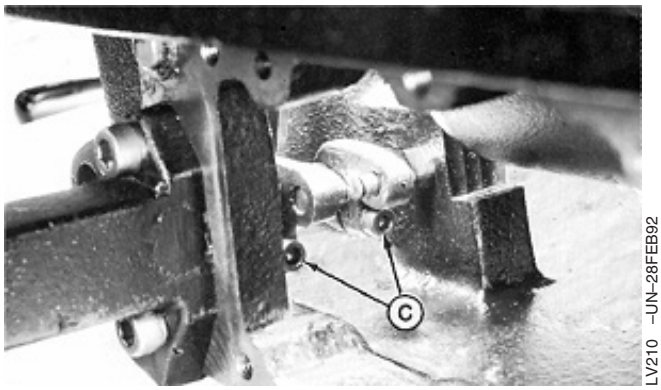
NOTE: To access links inside rockshaft case, rockshaft case must be placed upside down.

6. Turn rockshaft case upside down.
7. Remove E-clips (B). Disconnect links from levers (A).
8. Rotate levers and remove socket head cap screws (C).

A—Lever
B—E-Clip
C—Socket Head Cap Screw



LV209 –UN–28FEB92



LV210 –UN–28FEB92

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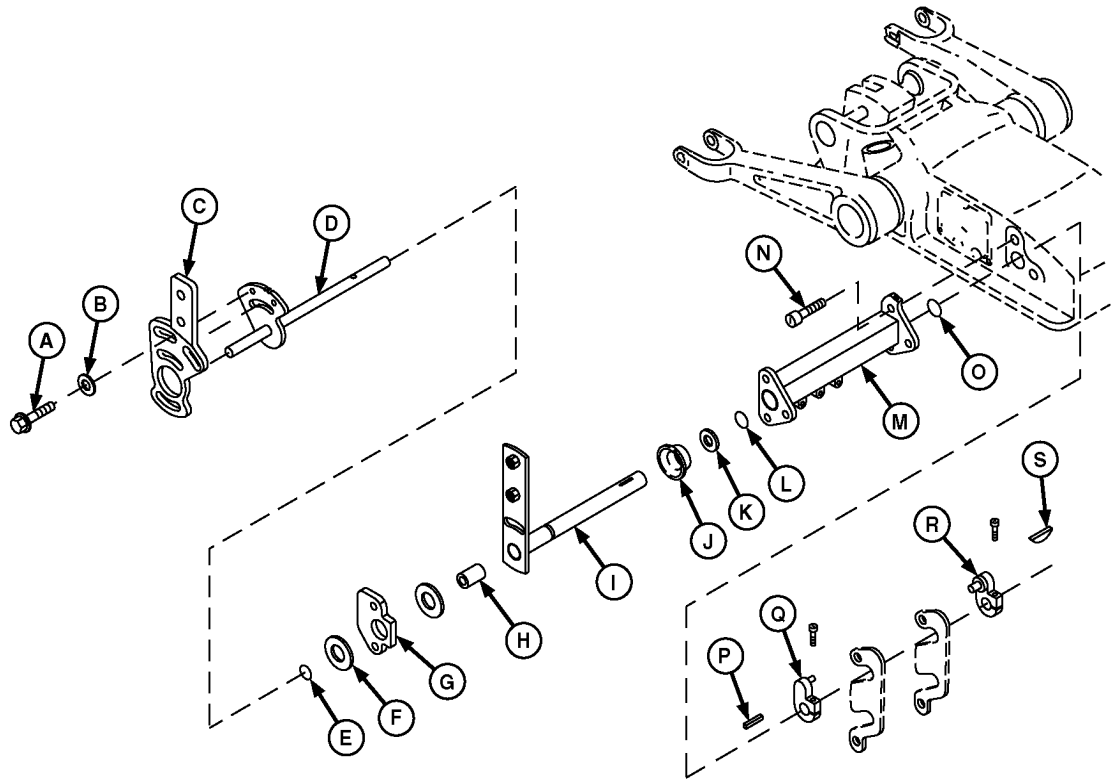

LV2139 –UN–09JUN97

A—Cap Screw (2 used)
B—Washer (2 used)
C—Alignment Plate
D—Position Control Shaft
E—O-Ring
F—Friction Disk (2 used)
G—Alignment Plate
H—Bushing
I—Draft Control Shaft
J—Spacer
K—Washer
L—O-Ring
M—Support
N—Socket Head Cap Screw (2 used)
O—O-Ring
P—Key
Q—Draft Control Actuating Lever
R—Position Control Actuating Lever
S—Woodruff Key

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NOTE: Levers (Q and R) are keyed to shafts (I) and (D), respectively, inside rockshaft case. Levers and keys (P and S) will drop into case when lever assembly is removed.

9. Remove parts (A—S).

IMPORTANT: Always use new O-rings during assembly. Damaged or used O-rings will leak.

NOTE: Bushing (H) is press fit inside shaft (I).

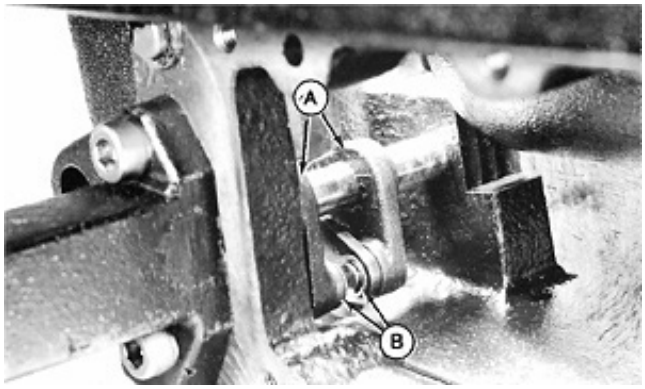
10. Inspect all parts for wear or damage. Replace as necessary.
11. Install new O-rings (E, L, and O).
12. Apply multipurpose grease to shafts (D and I).
13. Apply thread sealant to threads of cap screws (N).
14. Install all parts.

Continued on next page

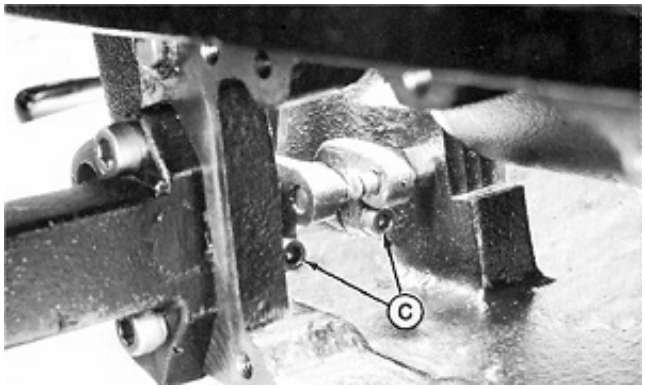
OUO1085,0000164 –19–31AUG00–3/5

15. Install and tighten socket head cap screws (C).
16. Connect links to levers (A) and install E-clips (B).
17. Install inlet housing. (See Replace Rockshaft Control Valve in this group.)

A—Lever
B—E-Clip
C—Socket Head Cap Screw



LV209 –UN–28FEB92



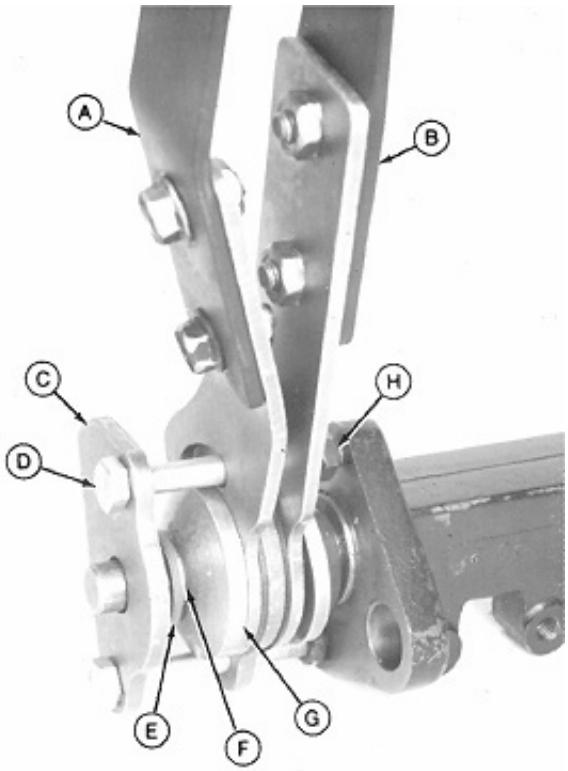
LV210 –UN–28FEB92

OUO1085,0000164 –19–31AUG00–4/5

IMPORTANT: Each pair of spring washers (E) must be installed with concave sides facing each other.

18. Install parts (C—H).
19. Install levers (A and B).
20. Install rockshaft case. (See Remove and Install Rockshaft Case in this group.)
21. Adjust rockshaft control lever friction. (See Rockshaft Control Lever Friction Adjustment in Section 270, Group 19.)

A—Position Sensing Lever
B—Draft Sensing Lever
C—Alignment Plate
D—Cap Screw (2 used)
E—Spring Washer (4 used)
F—Washer
G—Spacer
H—Jam Nut (2 used)



LV491 –UN–28FEB92

OUO1085,0000164 –19–31AUG00–5/5

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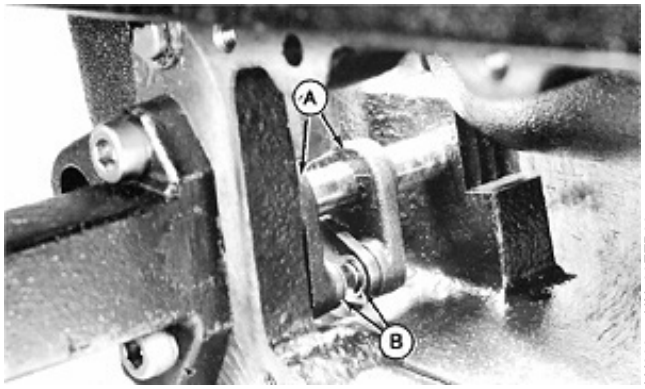
Inspect and Repair Rockshaft Control Linkage

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in this group.)
2. Remove inlet housing. (See Replace Rockshaft Control Valve in this group.)

NOTE: To access links inside rockshaft case, rockshaft case must be placed upside down.

3. Turn rockshaft case upside down.
4. Remove E-clips (B). Disconnect links from levers (A).



A—Lever
B—E-Clip

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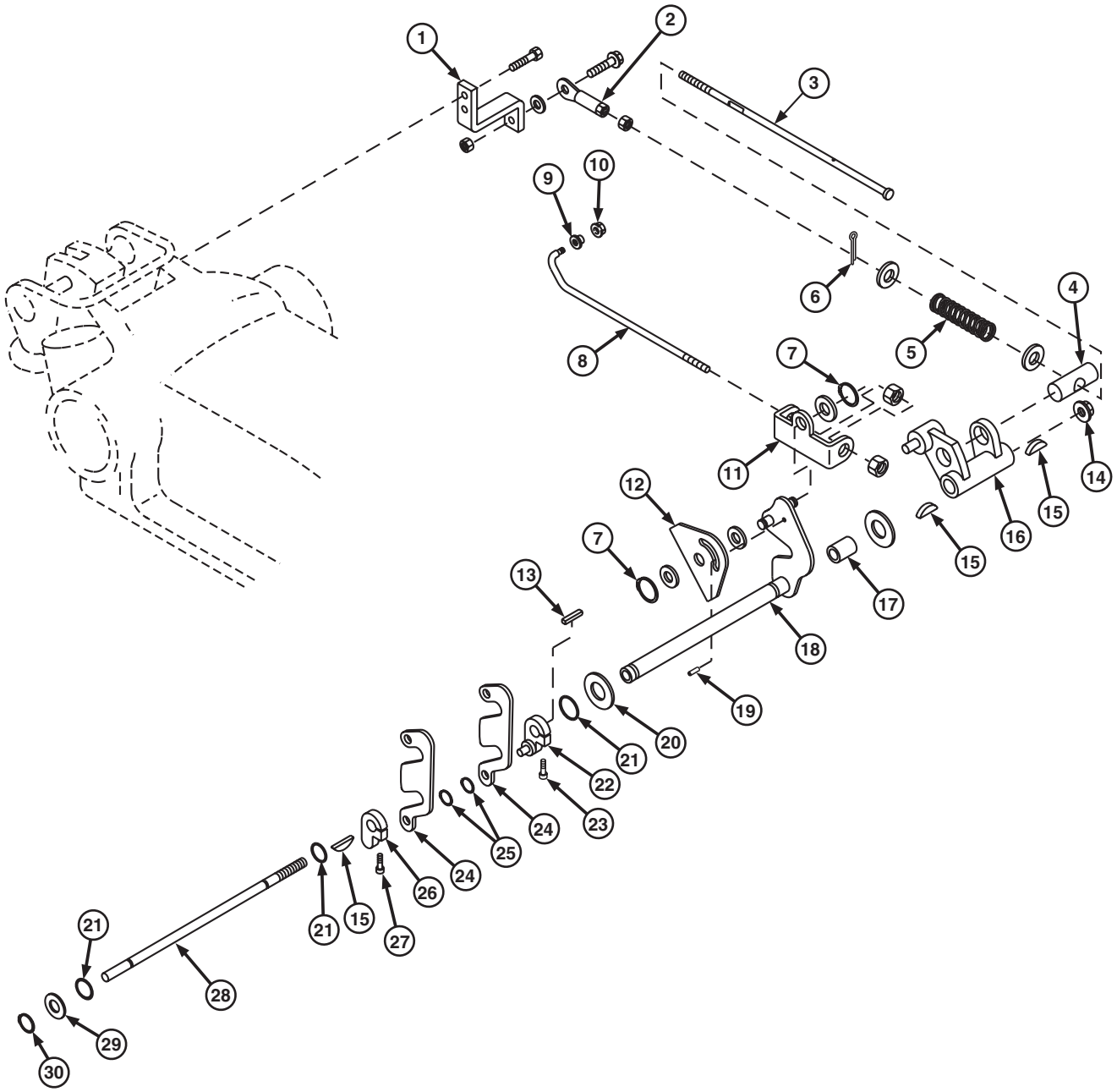
OUO1085,0000165 –19–31AUG00–1/4



LV2140 –UN–01JUL02

Rockshaft Control Linkage

1—Bracket
2—Clevis
3—Draft Sensing Rod
4—Pin
5—Compression Spring
6—Cotter Pin
7—E-Clip (2 used)
8—Position Sensing Feedback Rod
9—Bushing
10—Nut
11—Bracket
12—Lever
13—Square Key
14—Nut
15—Woodruff Key (3 used)
16—Lever
17—Bushing
18—Shaft
19—Spring Pin
20—Washer (as required)
21—O-Ring
22—Lever
23—Socket Head Cap Screw
24—Link (2 used)
25—E-Clips
26—Lever
27—Socket Head Cap Screw
28—Shaft
29—Washer
30—Snap Ring

Continued on next page

5. Remove parts (1—11).
6. Remove socket head cap screws (23 and 27).
7. Remove E-clips (25).
8. Remove and inspect parts for wear or damage. Replace as necessary.

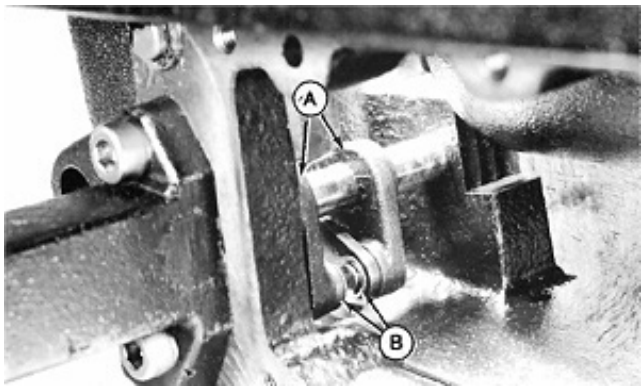
IMPORTANT: Always use new O-rings during assembly. Damaged or used O-rings will leak.

NOTE: Bushing (17) is press fit inside lever (16).

9. Apply multipurpose grease to shafts (18 and 28) and bushing (17).
10. Install all parts.
11. Tighten nut (14) until shaft stops. Then back off 1/2 turn.

OUO1085,0000165 –19–31AUG00–3/4

12. Connect links to levers (A).
13. Install E-clips (B).
14. Install inlet housing. (See Replace Rockshaft Control Valve in this group.)
15. Install rockshaft case. (See Remove and Install Rockshaft Case in this group.)
16. Adjust rockshaft position and draft sensing feedback linkages. (See Rockshaft Position-Sensing Feedback Linkage Adjustment and Rockshaft Draft-Sensing Feedback Linkage Adjustment in Section 270, Group 15.)



LV209 –UN–28FEB92

A—Lever
B—E-Clip

OUO1085,0000165 –19–31AUG00–4/4

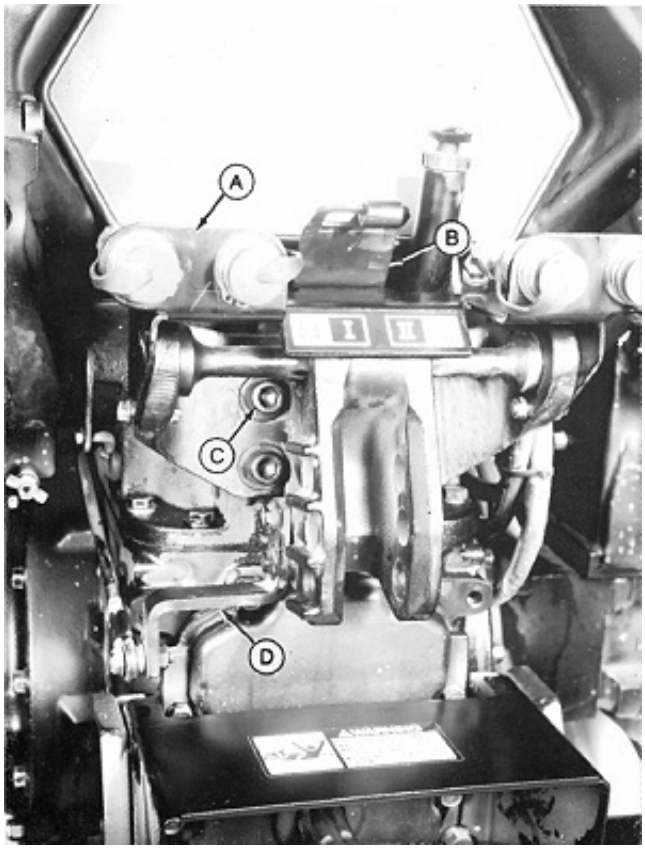
Inspect and Repair Draft Sensing Support Assembly

1. Open rate-of-drop valve and lower rockshaft arms completely.
2. Move draft sensing control lever full forward.
3. Remove center link and bracket (B).
4. Remove bracket (A), if equipped.
5. Remove bracket (D) from support assembly.
6. Remove four socket head cap screws (C) and support assembly.
7. Inspect support assembly for wear or damage. Replace if necessary.
8. Install support assembly. Tighten four socket head cap screws (C) to specification.

Specification

Draft Sensing Support Assembly
Socket Head Cap Screws—
Torque ..... 375 N•m (277 lb-ft)

9. Install draft-sensing rod bracket.
10. Install SCV outlet bracket, if equipped.
11. Install center link bracket and center link.
12. Adjust draft-sensing feedback linkage. (See Rockshaft Draft-Sensing Feedback Linkage Adjustment in Section 270, Group 15.)



LV395 –UN–28FEB92

Dual SCV Shown

A—SCV Outlet Bracket
B—Center Link Bracket
C—Socket Head Cap Screw (4 used)
D—Draft-Sensing Rod Bracket

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OUO1085,0000166 –19–31AUG00–1/1

Replace Main Relief Valve

NOTE: Right-hand control console removed to show valve location.

1. Lower rockshaft arms completely.

NOTE: Main relief valve can be accessed from rear or underneath tractor, between right rear fender and rockshaft housing.

2. Remove main relief valve (A) from inlet housing end plate or dual SCV, if equipped.

IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

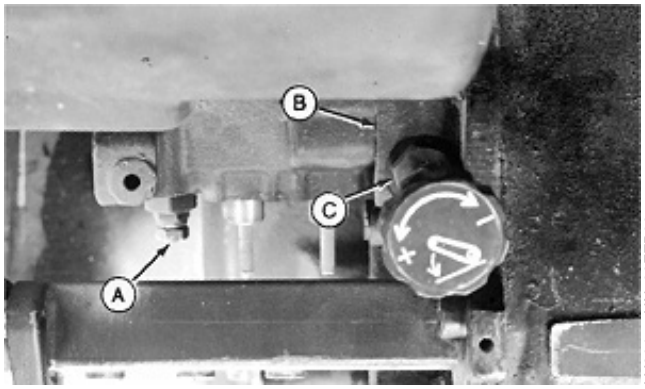
3. Install O-rings (D and G) and backup rings (E and F).

4. Install main relief valve. Tighten to specification.

Specification

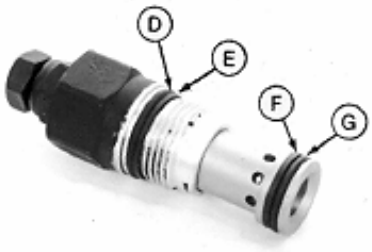
Main Relief Valve—Torque ..... 51 N•m (38 lb-ft)

5. Operate machine hydraulics. Check and adjust transmission/hydraulic oil level.



LV364 –UN–28FEB92

Dual SCV Shown



LV370 –UN–28FEB92

A—Main Relief Valve
B—Inlet Housing
C—Rate-of-Drop Valve
D—O-Ring
E—Backup Ring
F—Backup Ring
G—O-Ring

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OUO1085,0000167 –19–31AUG00–1/1

Replace Rockshaft Surge Relief Valve

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in this group.)
2. Remove surge relief valve (A).

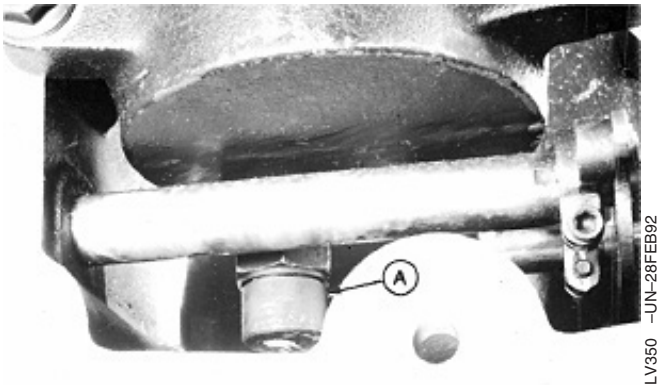
IMPORTANT: Always use new O-rings. Damaged or used O-rings will leak.

3. Install new O-rings (B and C).
4. Install surge relief valve. Tighten relief valve to specification.

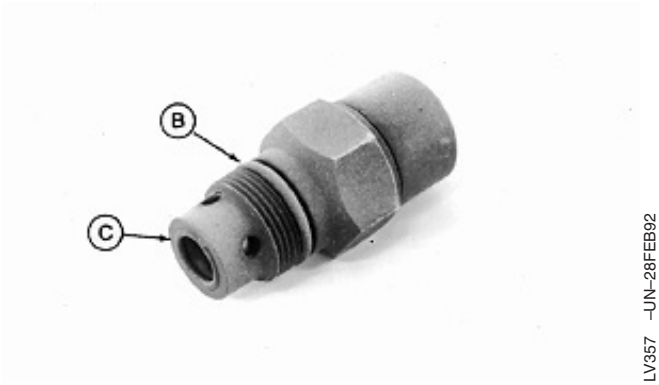
Specification

Surge Relief Valve—Torque ..... 34 N•m (25 lb-ft)

5. Install rockshaft case.



LV350 –UN–28FEB92



LV357 –UN–28FEB92

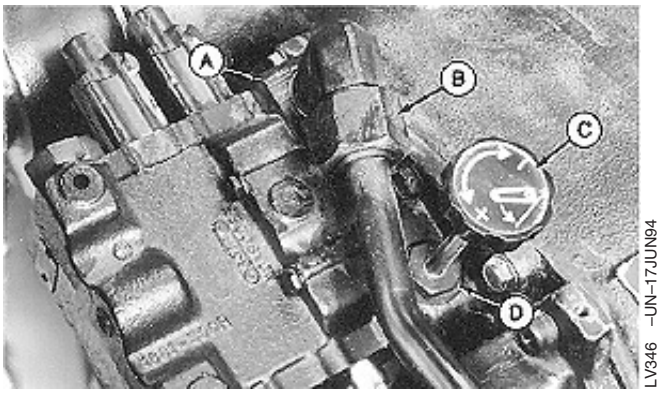
A—Surge Relief Valve
B—O-Ring
C—O-Ring

OUO1085,0000168 –19–31AUG00–1/1

Remove, Inspect and Install Rate-of-Drop Valve

NOTE: Rate-of-drop valve is mounted to inlet housing (A), located on right-hand side of rockshaft case.

1. Open rate-of-drop valve and lower rockshaft arms completely.
2. Operate all SCV levers, if equipped, to relieve any possible hydraulic pressure in the system.
3. Tractors equipped with cab: remove rear cab liner and right-side control console and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)
4. Disconnect hydraulic line (B) if necessary.
5. Loosen set screw to remove knob (C).
6. Remove rate-of-drop valve (D) using a crow's foot wrench.



LV346 –UN–17JUN94

A—Inlet Housing
B—Hydraulic Line
C—Knob
D—Rate-of-Drop Valve

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Continued on next page

OUO1085,0000169 –19–31AUG00–1/2

NOTE: Turn valve stem (A) clockwise to remove from fitting (C).

7. Disassemble parts (A—D).

8. Inspect valve face (F) for wear or damage. Replace parts as necessary.

IMPORTANT: Always use new O-rings and backup rings. Damaged or used parts will leak.

9. Apply multipurpose grease to O-rings, backup ring, and valve stem shaft.

10. Assemble all parts.

11. Install rate-of-drop valve. Tighten valve to specification.

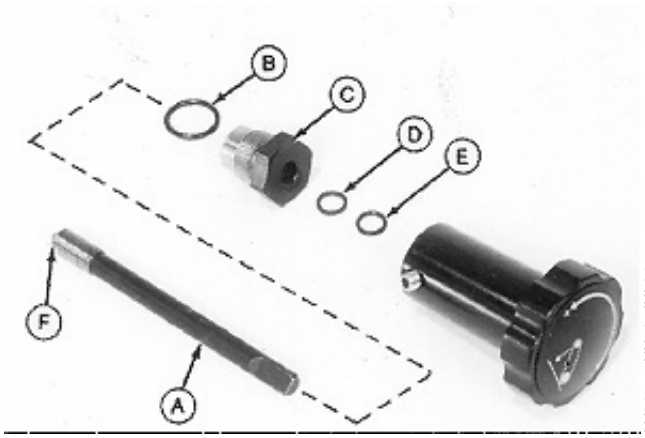
Specification	
Rate-of-Drop Valve—Torque	50 N•m (37 lb-ft)

12. Install knob.

13. Connect hydraulic line if removed.

14. Tractors with cab: install right side control and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)

15. Tractors with cab: install rear cab upholstery liner.



A—Valve Stem
B—O-Ring
C—Valve Fitting
D—Backup Ring
E—O-Ring
F—Valve Face

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OUO1085,0000169 –19–31AUG00–2/2

Replace Rockshaft Control Valve

1. Open rate-of-drop valve and lower rockshaft arms completely.

2. Move SCV joystick or lever through all positions, if equipped.

NOTE: If equipped with cab, remove fuel tank. (See Remove, Inspect and Install Fuel Tank—With Cab in Section 30, Group 05.) Also remove seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Section 90.)

3. Tractors without cab: remove right-hand fender.

4. Remove right-side control console and panel on tractors with and without cab. (See Remove and Install Right-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06 or Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Sectio 90, Group 15.)

5. Tractors without cab: disconnect right-hand fuel tank strap.

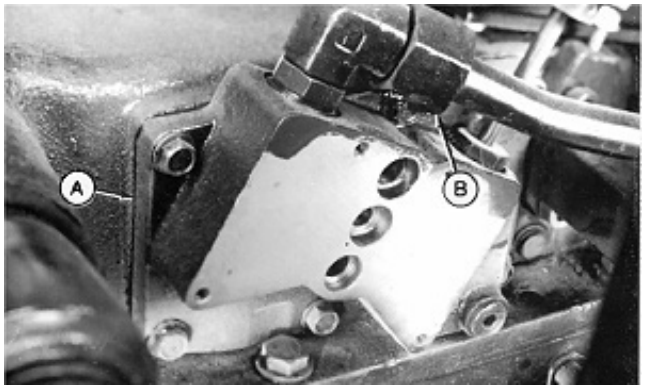
NOTE: If equipped with SCVs, it is not necessary to disconnect hydraulic hoses. Disconnect SCV linkages and control cables as necessary to remove SCVs. Move SCVs away from inlet housing.

6. Remove SCVs, if equipped. (See Remove and Install Dual Selective Control Valve (SCV) and/or Remove and Install Single (Third) Selective Control Valve (SCV) in Groups 15 or 16.)

7. Disconnect hydraulic line (B).

NOTE: Tractors without cab: move fuel tank as necessary to allow clearance for inlet housing removal.

8. Remove six cap screws and inlet housing (A).



LV355 –UN–28FEB92

A—Inlet Housing
B—Hydraulic Line

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9. Remove three socket head cap screws (A) and control valve (B).

IMPORTANT: Use new O-rings during assembly. Damaged or used O-rings will leak.

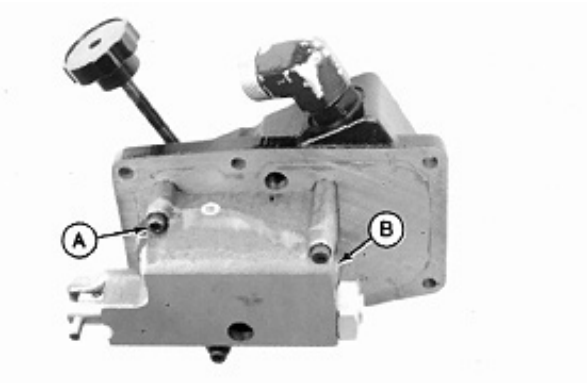
10. Install new O-rings (C and D) and control valve.
11. Apply thread lock and sealer (medium strength) to threads of socket head cap screws.
12. Install socket head cap screws. Tighten to specifications.
13. Clean mating surfaces of rockshaft case and inlet housing Clean and Cure Primer. Apply a coat of Flexible Sealant to mating surfaces.
14. Apply thread lock and sealer (medium strength) to threads of mounting cap screws.

NOTE: Rockshaft position-sensing lever must be in forward position to install inlet housing.

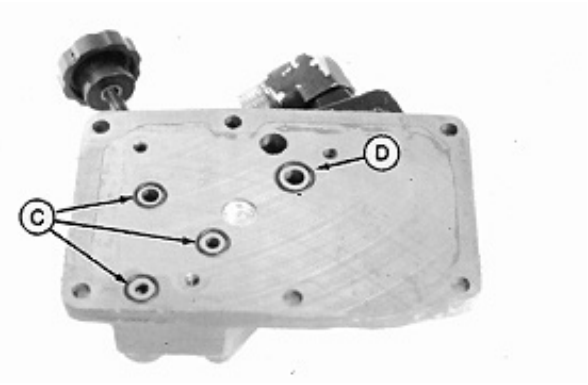
15. Install inlet housing and cap screws. Tighten cap screws to specifications.
16. Connect hydraulic line.
17. Install SCVs, if equipped. (See Remove and Install Dual Selective Control Valve (SCV) and/or Remove and Install Single (Third) Selective Control Valve (SCV) in Groups 15 or 16.)
18. Tractors with cab: install seat and support, fuel tank.
19. Tractors without cab: connect right-hand fuel tank strap.
20. Tractors with and without cab: install right-hand control console and panel.
21. Tractors without cab: install right-hand fender.

Specification

Rockshaft Control Valve Socket Head Cap Screws—Torque	13.6 N•m (120 lb-in.)
Inlet Housing Mounting Cap Screws—Torque	35 N•m (26 lb-ft)



LV356 –UN–28FEB92



LV349 –UN–28FEB92

A—Socket Head Cap Screw (3 used)
B—Rockshaft Control Valve
C—O-Ring
D—O-Ring

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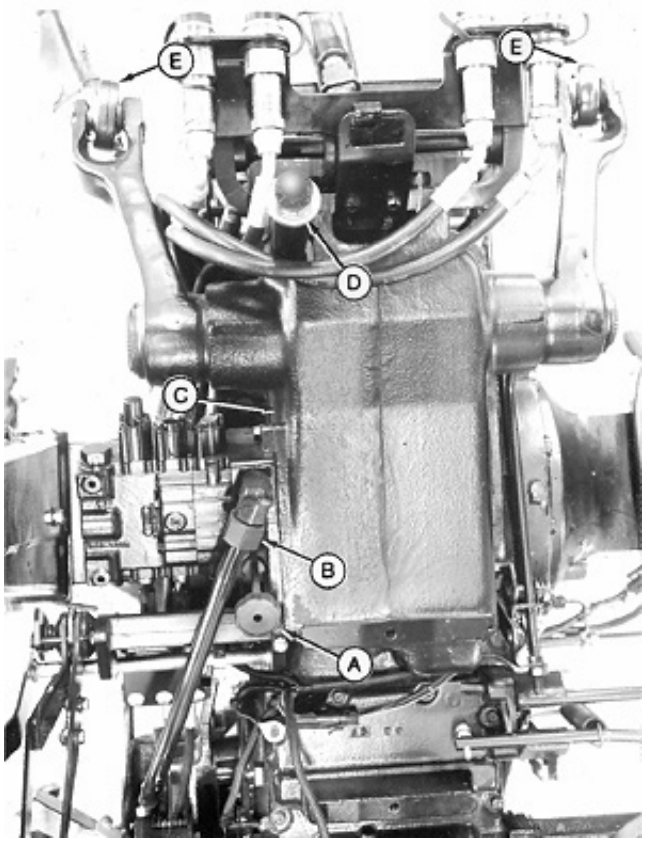
OUO1085,000016A –19–31AUG00–2/2

Remove and Install Rockshaft Case

1. Open rate-of-drop valve (A) and lower rockshaft arms completely.
2. If equipped with SCV, move joystick or control lever through all positions.
3. Tractors without cab: remove fuel tank. (See Remove, Inspect and Install Fuel Tank—Without Cab in Section 30, Group 05.)
4. Tractors equipped with cab: remove cab. (See Cab Remove and Install in Section 90, Group 15.)
5. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
6. Tractors without cab: remove fenders, consoles and covers surrounding rockshaft case and levers.
7. Tractors with cab: remove left- and right-side control consoles and panels. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in Section 90, Group 15.)
8. Disconnect hydraulic line (B). Close all openings with caps and plugs.
9. Remove dipstick (D).
10. Disconnect wiring harness as necessary to allow lifting of rockshaft case.
11. Disconnect SCV cables and linkage, if equipped. (See Inspect and Repair Joystick and Linkage—With Cab or Inspect and Repair Joystick and Linkage—Without Cab and/or Inspect and Repair Single (Third) SCV Lever and Linkage in Groups 15 or 16.)
12. Remove center link and lift links (E).



A—Rate-of-Drop Valve
B—Hydraulic Pump Outlet Line
C—Rockshaft Case Assembly
D—Dipstick
E—Lift Links

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Continued on next page

CAUTION: The approximate weight of the rockshaft case assembly is 82 kg (180 lb).

13. Remove eleven cap screws, rockshaft case assembly (C), and gasket, if equipped.

14. Make repairs as necessary. (See procedures in this group.)

15. Clean mating surfaces of rockshaft case and differential housing using Clean and Cure Primer. Apply a coat of Flexible Sealant to mating surfaces.

16. Install rockshaft case. Install and tighten cap screws to specification.

Specification	
Rockshaft Case Cap Screws—Torque	125 N•m (92 lb-ft)

17. Install lift links and center link.

18. Connect SCV cables and linkage, if equipped.

19. Connect wiring harness.

20. Install fuel tank.

21. Connect hydraulic pump outlet line. Tighten fitting to specification.

Specification	
Hydraulic Pump Outlet Line Fitting—Torque	60 N•m (45 lb-ft)

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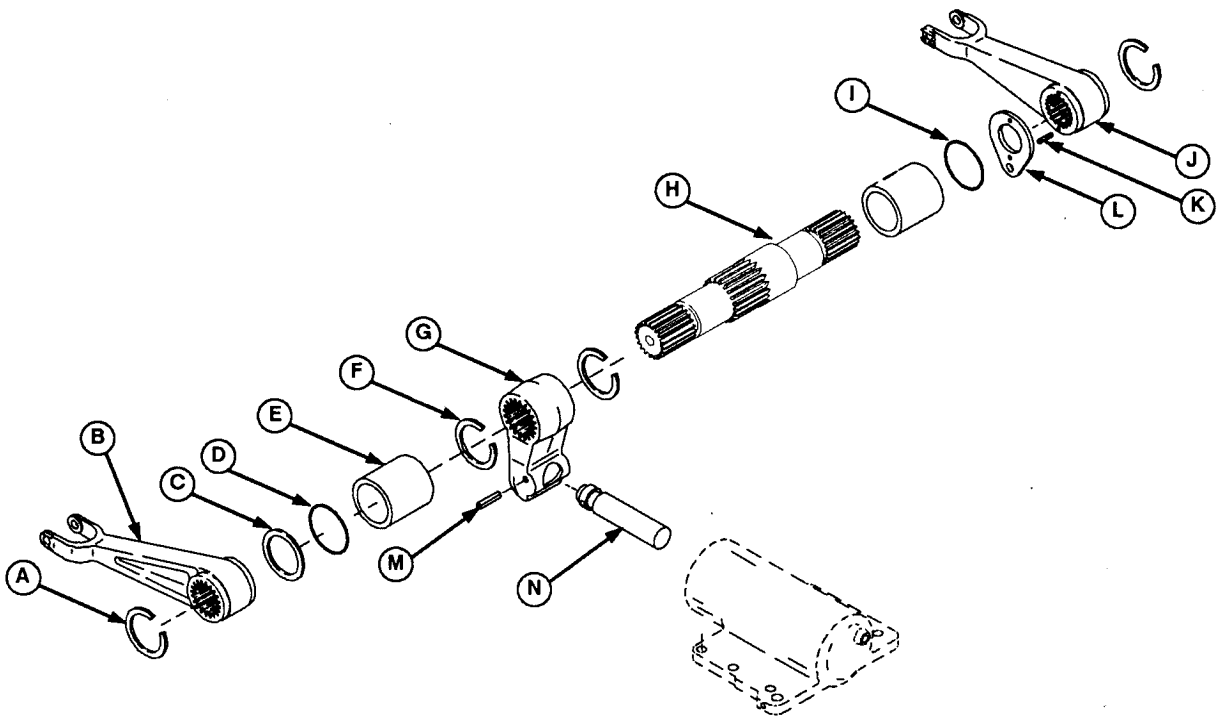
22. Tractors without cab: install covers, consoles, and fenders.

23. Tractors with cab: install control consoles and seat.

24. Install cab. (See Cab Remove and Install in Section 90.)

25. Install dipstick.

Remove, Inspect and Install Rockshaft Lift Arms



LV397AE –UN–28FEB92

A—Retaining Ring (2 used)
B—Right-Hand Lift Arm
C—Washer
D—O-Ring
E—Bushing (2 used)
F—Retaining Ring (2 used)
G—Crank
H—Rockshaft
I—O-Ring
J—Left-Hand Lift Arm
K—Spring Pin (2 used)
L—Plate
M—Spring Pin
N—Piston Rod

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in this group.)
2. Disconnect feedback linkage (B, G, H, and J) from plate (L).

NOTE: Although parts (B, G, H, and J) have indexed splines, these splines are difficult to locate. Index parts with a punch mark before disassembly to aid in correct alignment of these parts during assembly.

3. Use a punch to index parts (B, G, H, and J).
4. Remove retaining rings (A and F).
5. Remove and inspect all parts for wear or damage. Replace as necessary.

NOTE: Bushings (E) are pressed in rockshaft case.

6. Replace bushings (E) using a bushing driver set. Press new bushings into rockshaft case so bushing outer edge is below edge of bore to specification.

Specification

Bushing Outer Edge to Edge of Bore—Distance (Minimum)..... 7 mm (0.283 in.)

7. Apply clean transmission/hydraulic oil to all internal parts.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

8. Install all parts.

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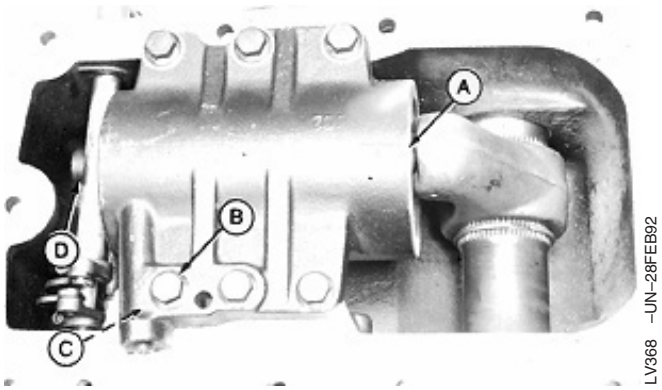
OUO1085,000016C –19–31AUG00–1/2

9. Connect feedback link.
10. Install rockshaft case.

OUO1085,000016C –19–31AUG00–2/2

Remove, Inspect and Install Rockshaft Piston and Cylinder

1. Remove rockshaft case. (See Remove and Install Rockshaft Case in this group.)
2. Remove six cap screws (B).
3. Remove cylinder (A).
4. Remove O-ring (C).
5. Remove surge relief valve (D).

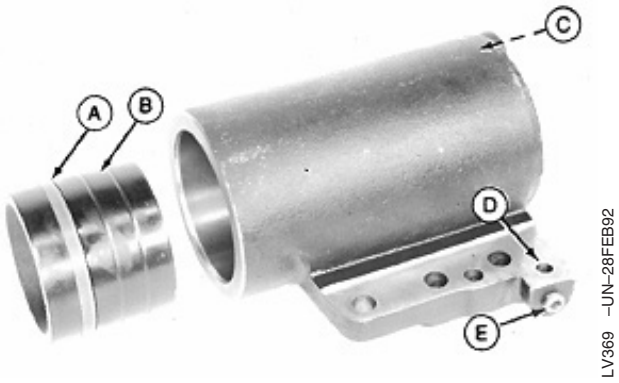


LV368 –UN–28FEB92

A—Rockshaft Cylinder
B—Cap Screw (6 used)
C—O-Ring
D—Surge Relief Valve

OUO1085,000016D –19–31AUG00–1/3

6. Insert a 6 x 254 mm (1/4 x 10 in.) long wood dowel or brass drift through orifice (C) to remove piston (B).
7. Remove plug (E) to check oil passage (D) for clogging of debris.
8. Replace seal ring (A).
9. Inspect all parts for wear or damage. Check piston and cylinder for cracks. Replace as necessary.
10. Apply clean transmission/hydraulic oil to piston and cylinder walls.
11. Install piston.
12. Install plug.



LV369 –UN–28FEB92

A—Seal Ring
B—Piston
C—Surge Relief Valve Orifice
D—Oil Passage
E—Plug

Continued on next page

OUO1085,000016D –19–31AUG00–2/3

13. Install surge relief valve (D). Tighten to specification.

Specification

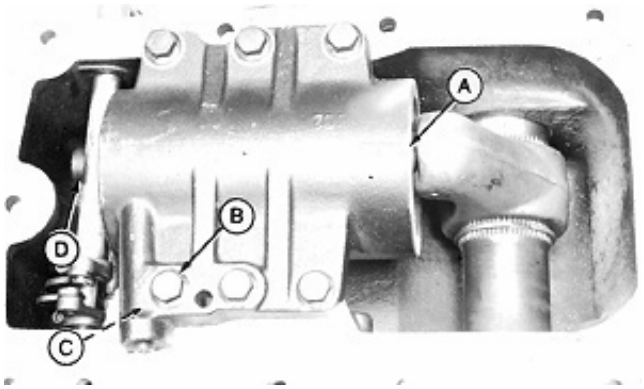
Surge Relief Valve—Torque ..... 34 N•m (25 lb-ft)

14. Install new O-ring (C).

15. Install cylinder assembly (A).

16. Install cap screws (B).

17. Install rockshaft case. (See Remove and Install Rockshaft Case in this group.)



A—Rockshaft Cylinder
B—Cap Screw (6 used)
C—O-Ring
D—Surge Relief Valve

OUO1085,000016D –19–31AUG00–3/3

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Other Material

Number	Name	Use
TY9371 (U.S.) TY9478 (Canadian) 271 (LOCTITE®)	Thread Lock and Sealer (High Strength)	Apply to threads of dual SCV spool detents.
TY9369 (U.S.) NA (Canadian) 222 (LOCTITE®)	Thread Lock and Sealer (Low Strength)	Apply to threads of spool cap-to-valve housing socket head cap screws.

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OUO1089,000025B –19–18JUL02–1/1

Specifications

Item	Measurement	Specification
Wheel Cap Screws	Torque	175 N•m (130 lb-ft)
Wheel Bolts	Torque	175 N•m (130 lb-ft)
SCV Cap Screws	Torque	12 N•m (106 lb-in.)
Main Relief Valve	Torque	51 N•m (38 lb-ft)
Spool Detents	Torque	4 N•m (35 lb-in.)
Dual SCV End Cap Socket Head Cap Screws	Torque	7 N•m (62 lb-in.)

OUO1089,000025C –19–18JUL02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

Tube Kit

Cap Kit

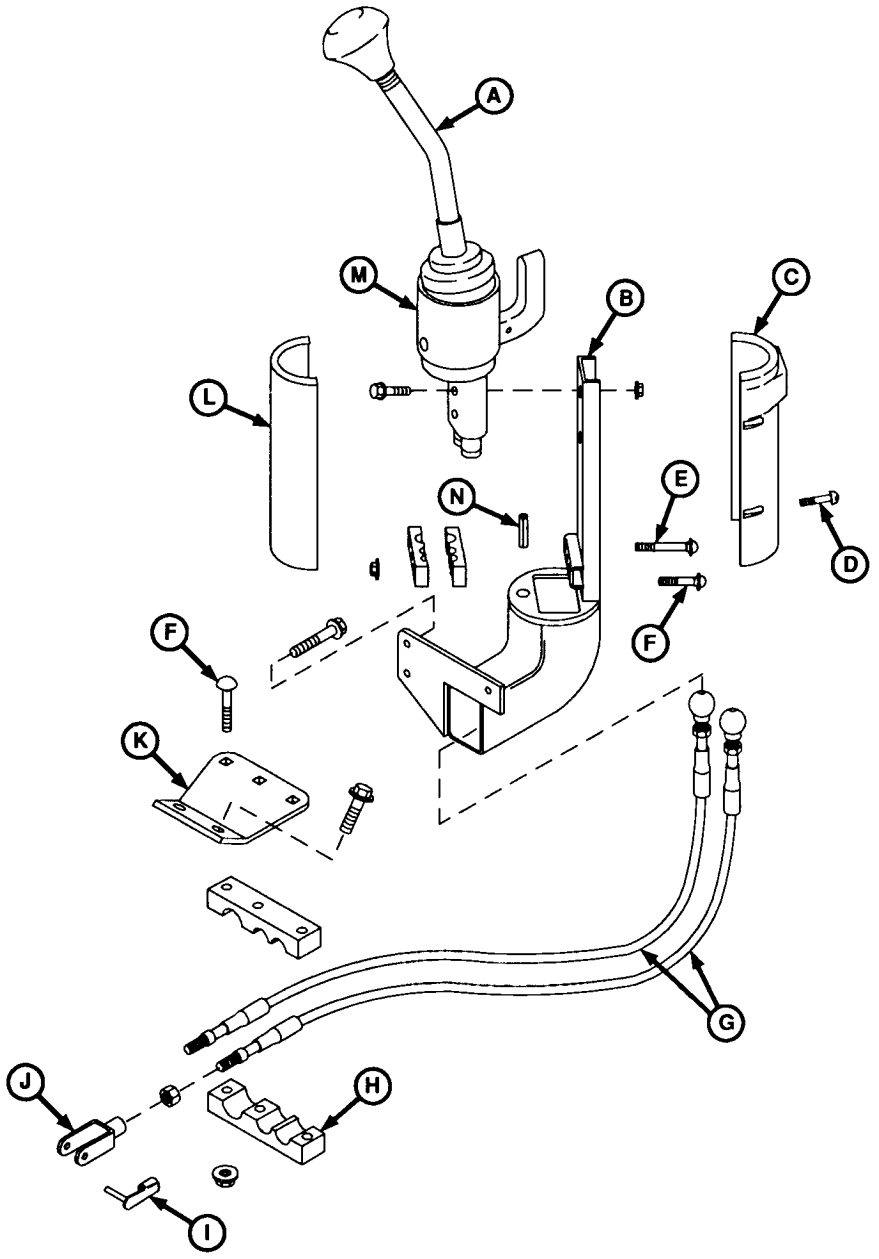
Load Check Valve Kit

Seal Kit

Lock Handle Kit

OUO1085,0000170 –19–31AUG00–1/1

Inspect and Repair Joystick and Linkage—Without Cab



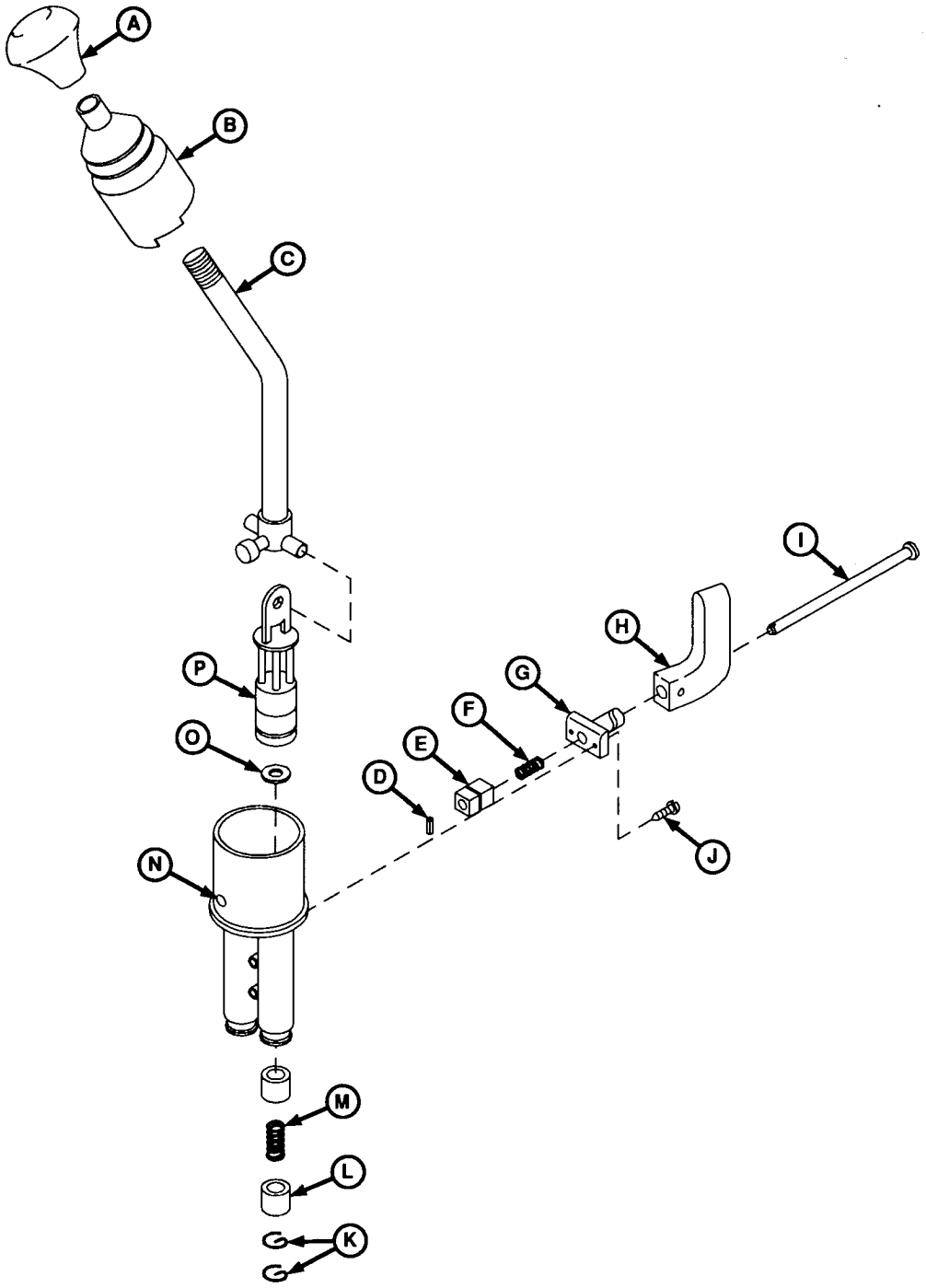
LV633AE –UN–05JUL94

A—Joystick Assembly
B—Support
C—Right-Hand Shield
D—Screw (4 used)
E—Carriage Bolt (50 mm) (1.969 in.)
F—Carriage Bolt (5 used)
G—Cable
H—Clamp (4 used)
I—Pin (2 used)
J—Yoke (2 used)
K—Plate
L—Left-Hand Shield
M—Boot
N—Spring Pin

1. Remove right-hand wheel and fender.
2. Remove right-hand control console.
3. Remove shields (C and L).
4. Remove joystick assembly (A).
5. Remove remaining parts. Inspect parts for wear or damage. Replace as necessary.

Continued on next page

OUO1085,0000171 –19–31AUG00–1/3



LV634AE –UN–17JUN94

A—Knob
B—Boot
C—Lever
D—Spring Pin
E—Insert
F—Compression Spring
G—Drive
H—Handle
I—Rod
J—Screw (2 used)
K—Retaining Ring
L—Bushing (4 used)
M—Spring
N—Lubrication Hole
O—Seat (2 used)
P—Piston (2 used)

6. Remove spring pin (D), rod (I), and lever (H).
7. Remove remaining parts.

Continued on next page
OUO1085,0000171 –19–31AUG00–2/3

8. Inspect all parts for wear or damage. Replace as necessary.
9. Install all parts. Apply multipurpose grease to parts (E and G) and moving components of joystick lever (C).
10. Apply multipurpose grease to hole (N).
11. Install control console.
12. Install fender and wheel. Tighten wheel cap screws to specification.

Specification

Wheel Cap Screws—Torque ..... 175 N•m (130 lb-ft)

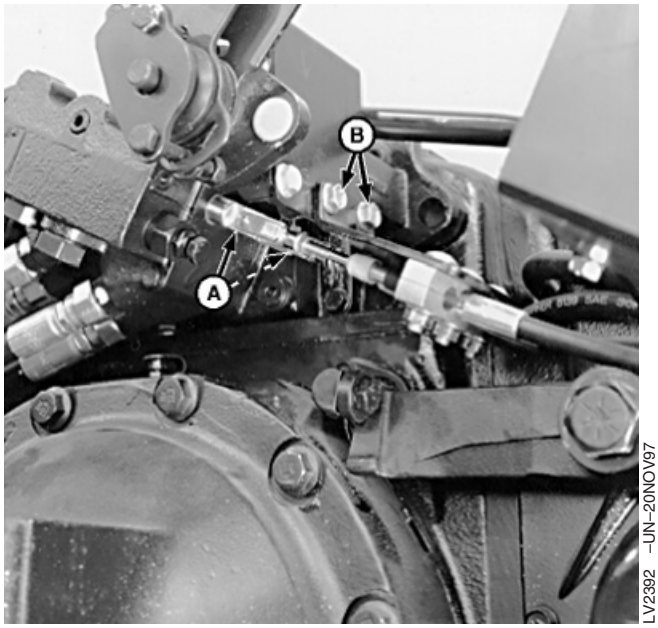
OUO1085,0000171 –19–31AUG00–3/3

Inspect and Repair Joystick and Linkage—With Cab

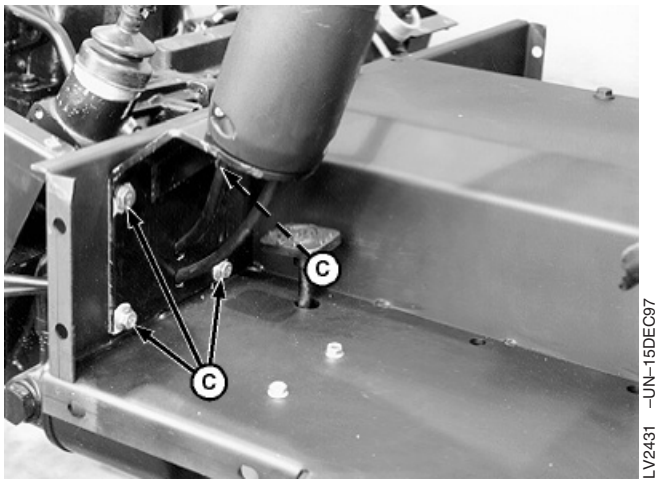
NOTE: Cab removed for clarity of photo only. Access joystick linkage under right-side cab floor.

1. Disconnect control linkage (A) and remove two cap screws (B).
2. Move floor mat and remove four cap screws (C), securing joystick mounting bracket to right-side floor kick plate.
3. Remove SCV joystick and linkage assembly. Inspect and repair as necessary. See following procedures.

A—Control Linkage
B—Cap Screw (2 used)
C—Cap Screw (4 used)



LV2392 –UN–20NOV97



LV2431 –UN–15DEC97

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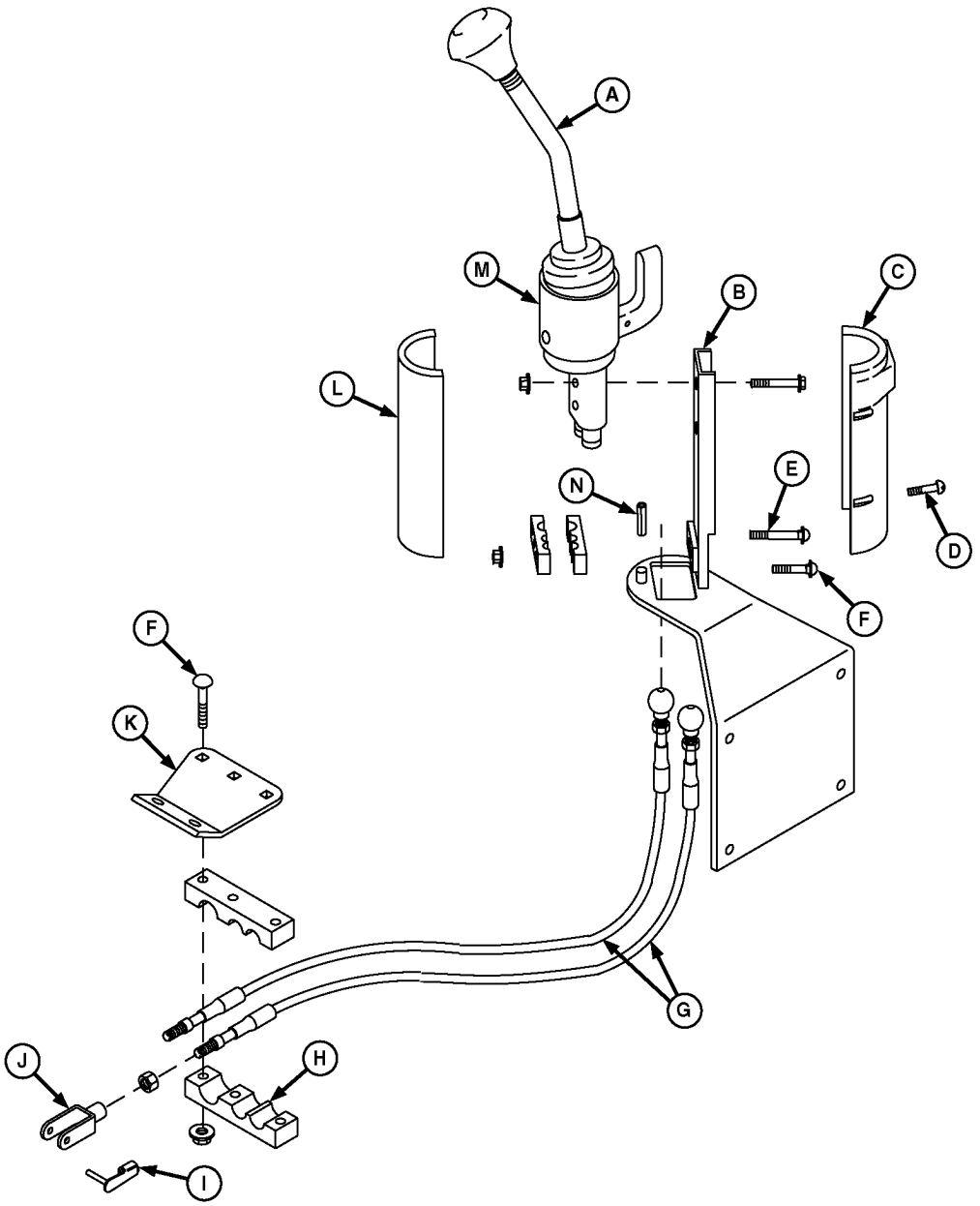
OUO1085,0000172 –19–31AUG00–1/4



LV1471 –UN–16DEC97

A—Joystick Assembly
B—Support
C—Right-Hand Shield
D—Screw (4 used)
E—Carriage Bolt (50 mm) (1.969 in.)
F—Carriage Bolt (5 used)
G—Cable
H—Clamp (4 used)
I—Pin (2 used)
J—Yoke (2 used)
K—Plate
L—Left-Hand Shield
M—Boot
N—Spring Pin

4. Remove shields (C and L).
5. Remove joystick assembly (A).
6. Remove remaining parts. Inspect parts for wear or damage. Replace as necessary.

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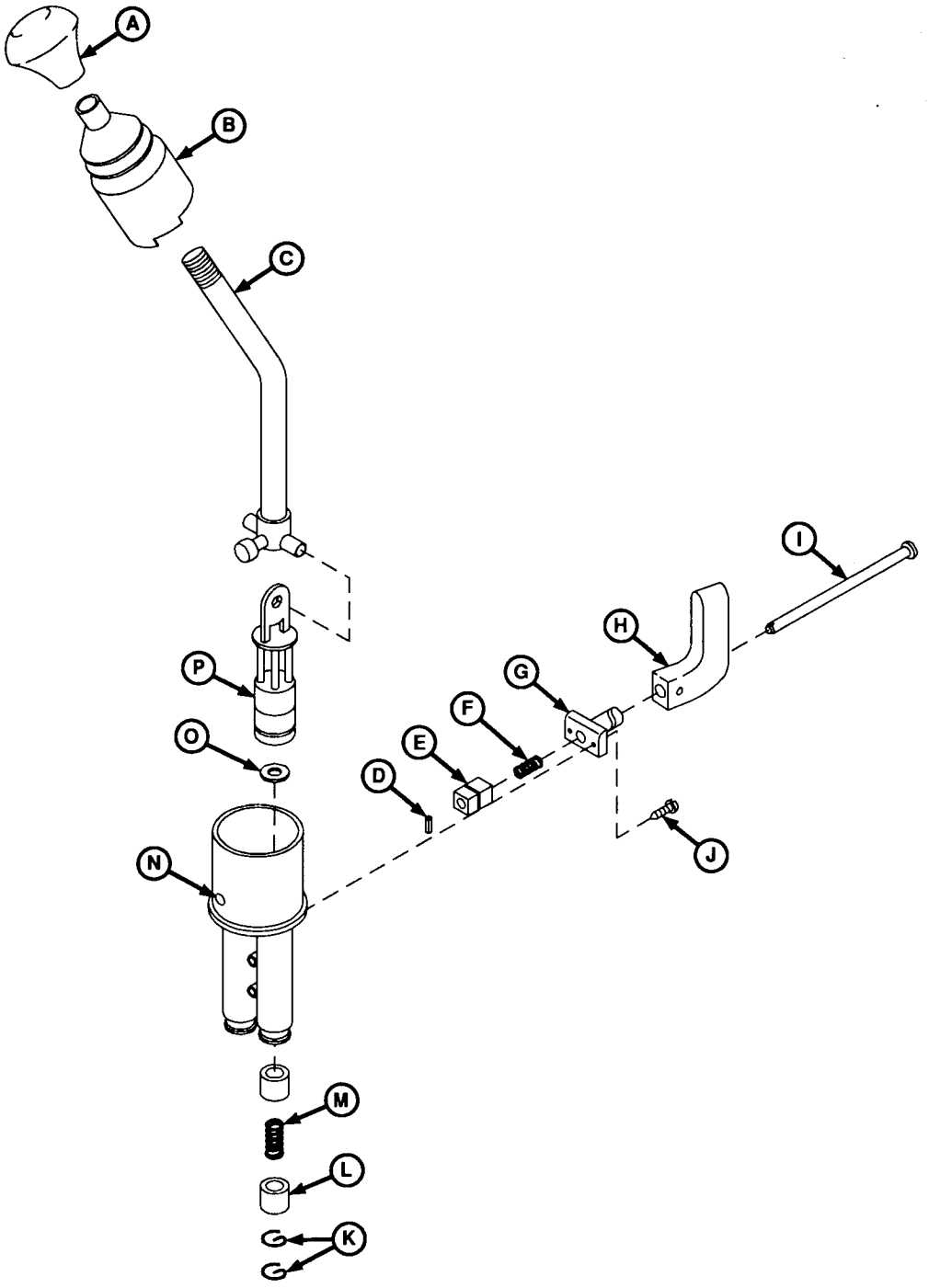
OUO1085,0000172 –19–31AUG00–2/4



LV634AE –UN–17JUN94

A—Knob
B—Boot
C—Lever
D—Spring Pin
E—Insert
F—Compression Spring
G—Drive
H—Lever
I—Rod
J—Screw (2 used)
K—Retaining Ring
L—Bushing (4 used)
M—Spring
N—Lubrication Hole
O—Seat (2 used)
P—Piston (2 used)

7. Remove spring pin (D), rod (I), and lever (H).
8. Remove remaining parts.

Continued on next page

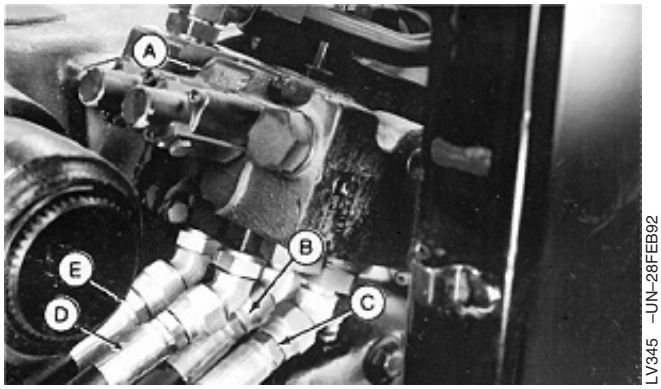
OUO1085,0000172 –19–31AUG00–3/4

9. Inspect all parts for wear or damage. Replace as necessary.
10. Install all parts. Apply multipurpose grease to parts (E and G) and moving components of joystick lever (C).
11. Apply multipurpose grease to hole (N).
12. Install joystick and linkage assembly to floor kick plate and reposition floor mat.
13. Connect control linkage to valve under cab floor.

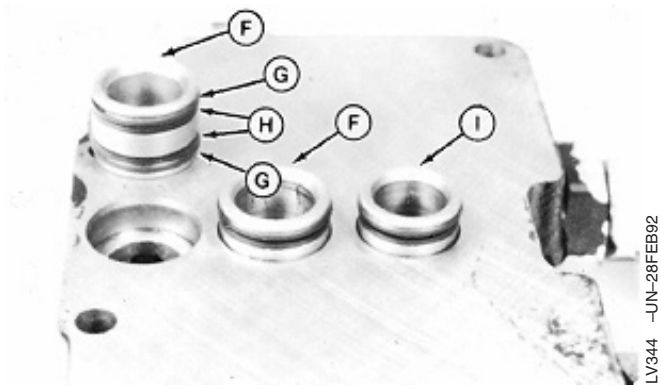
OUO1085,0000172 –19–31AUG00–4/4

Remove and Install Dual Selective Control Valve (SCV)

1. Open rate-of-drop valve and lower rockshaft arms completely.
2. Move SCV joystick through all positions.
3. Tractors without cab: remove right-hand rear wheel and fender.
4. Tractors with and without cab: remove right-side control console and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors Without Cab in Section 90, Group 06 or Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)
5. Tractors with cab: remove fuel tank. (See Remove, Inspect and Install Fuel Tank—With Cab in Section 30, Group 05.)
6. Tractors with cab: remove seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Section 90 Group 05.)
7. Tag all hoses to aid in installation.
8. Disconnect hoses (B—E). Close all openings using caps and plugs.
9. Disconnect control cables.
10. Remove selective control valve (A).
11. Make repairs as necessary. (See Disassemble, Inspect, and Assemble Dual Selective Control Valve (SCV) in this group.)



LV345 –UN–28FEB92



LV344 –UN–28FEB92

A—Selective Control Valve
B—Hydraulic Hose
C—Hydraulic Hose
D—Hydraulic Hose
E—Hydraulic Hose
F—Large Tube
G—O-Ring (6 used)
H—Square Cut Seal (6 used)
I—Small Tube

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Continued on next page
OUO1085,0000173 –19–31AUG00–1/3

IMPORTANT: Always use new O-rings and seals. Damaged or used parts will leak.

NOTE: The control valve has two large tubes with a total of four O-rings (G) and four square cut seals (H).

In addition, the control valve also has one small tube with a total of two O-rings (G) and two square cut seals (H).

Tubes, O-rings, and seals are replaced together as a kit.

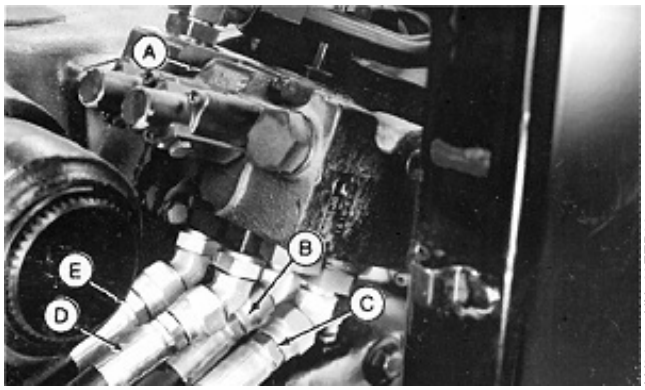
12. Replace tubes (F and I), O-rings (G), and seals (H).

OUO1085,0000173 –19–31AUG00–2/3

13. Install selective control valve. Tighten cap screws to specifications.
14. Connect control cables.
15. Install new O-rings on fittings and connect hoses as follows:
    - Hose D—SCV-to-left-hand (extend) coupler of pair marked I.
    - Hose C—SCV-to-right-hand (retract) coupler of pair marked I.
    - Hose E—SCV-to-left-hand (extend) coupler of pair marked II.
    - Hose B—SCV-to-right-hand (retract) coupler of pair marked II.
16. Install right-side control console and panel.
17. Tractors with cab: install fuel tank and operator seat.
18. Install fender and wheel if removed. Tighten wheel bolts to specifications.
19. Start engine and operate SCV lever. Check all connections for leaks.

Specification

SCV Cap Screws—Torque	12 N•m (106 lb-in.)
Wheel Bolts—Torque	175 N•m (130 lb-ft)



LV345 –UN–28FEB92

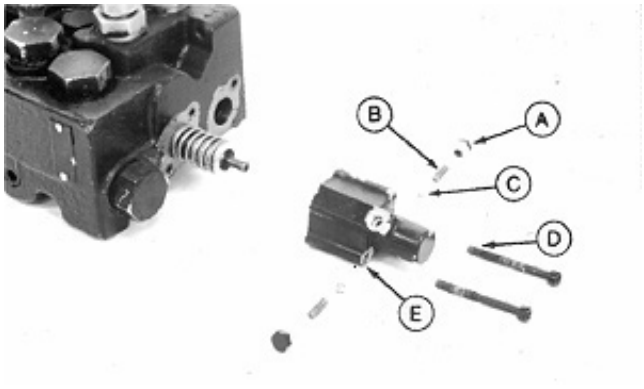
A—Selective Control Valve
B—Hydraulic Hose
C—Hydraulic Hose
D—Hydraulic Hose
E—Hydraulic Hose

OUO1085,0000173 –19–31AUG00–3/3

Disassemble, Inspect, and Assemble Dual Selective Control Valve (SCV)

1. Remove plugs (A), springs (B), and balls (C).
2. Remove socket head cap screws (D) and caps (E).

A—Plug (4 used)
B—Spring (4 used)
C—Ball (4 used)
D—Socket Head Cap Screw (4 used)
E—Cap (2 used)



LV341 –UN–28FEB92

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OUO1085,0000174 –19–23JUL02–1/4

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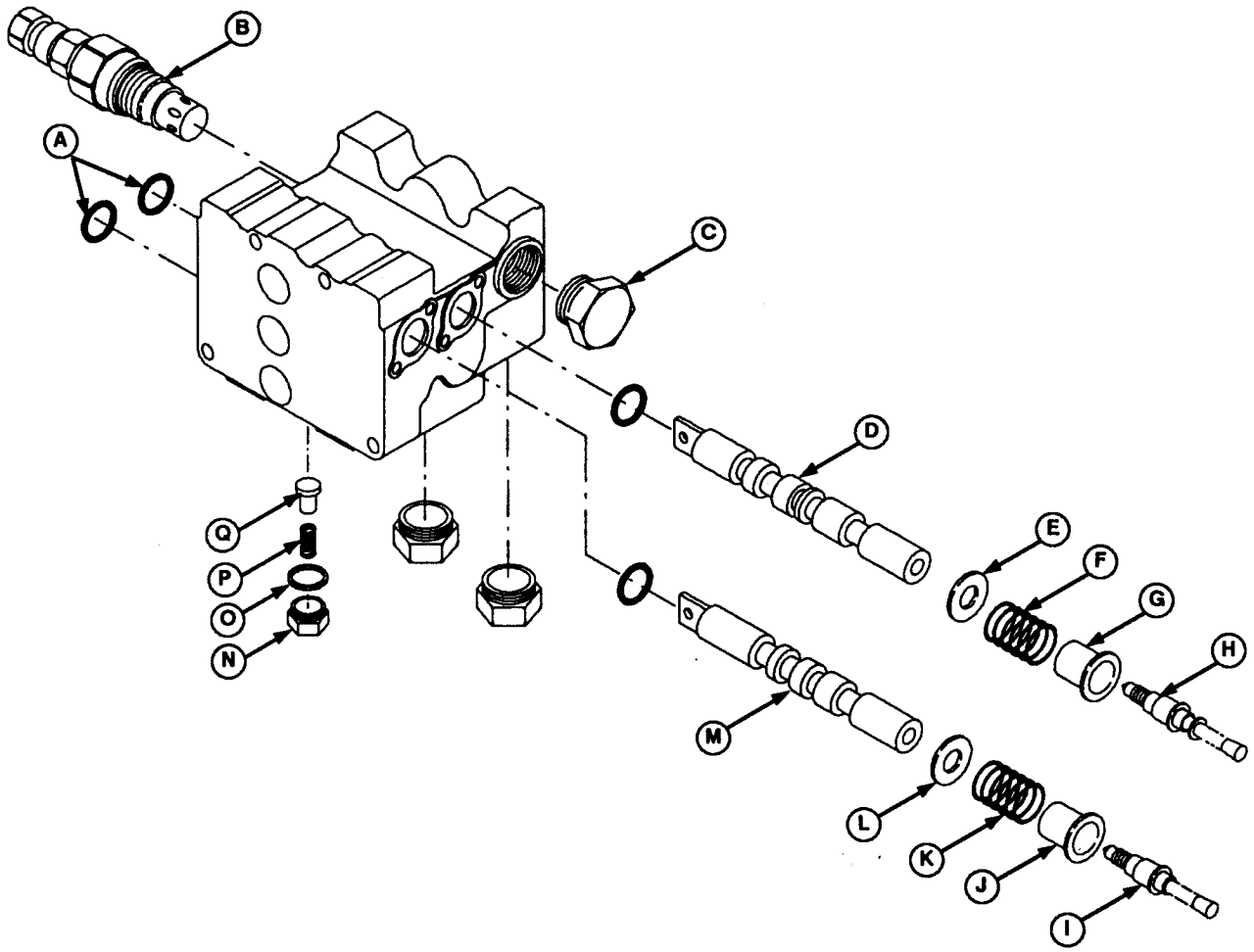

LV340AE –UN–28FEB92

Dual Selective Control Valve

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A—O-Ring (4 used)
B—Main Relief Valve
C—Plug (3 used)
D—Boom Spool
E—Washer
F—Spring
G—Retainer
H—Notched Spool Detent
I—Straight Spool Detent
J—Retainer
K—Spring
L—Washer
M—Bucket Spool
N—Plug (2 used)
O—O-Ring (2 used)
P—Spring (2 used)
Q—Load Check Valve (2 used)

IMPORTANT: Spools and housing are matched and must be replaced as a unit. Make sure spools are installed in their original bores to ensure proper operation.

Use new O-rings during assembly. Damaged or used O-rings will leak.

NOTE: Parts (D—H), (I—M), and (N—Q) are serviced as separate assemblies and are replaced as kits only.

3. Remove parts (A—Q).

4. Clamp flat end of spool in a soft-jawed vise.

NOTE: The threads of spool detents (H and I) are coated with high-strength thread lock and sealer. Applying moderate heat to detent end of spool softens sealer to aid detent removal.

5. Heat spool end. Remove parts (E—H) or (I—L).

Continued on next page

6. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Notched spool detent (H) is used on 5-groove spool (D) only.

7. Install parts (C) and (N—Q).

8. Install main relief valve (B). Tighten to specifications.

9. Apply thread lock and sealer (high-strength) to threads of spool detents (H and I).

10. Install parts (E—H) or (I—L) to spool ends.

11. Install new O-rings (A) in housing.

12. Coat spools and bores with clean transmission/hydraulic oil.

13. Install spools.

14. Apply multipurpose grease to springs (F and K).

Specification

Main Relief Valve—Torque ..... 51 N•m (38 lb-ft)
Spool Detents—Torque ..... 4 N•m (35 lb-in.)

OUO1085,0000174 –19–23JUL02–3/4

15. Install caps (E).

16. Apply multipurpose grease to balls (C).

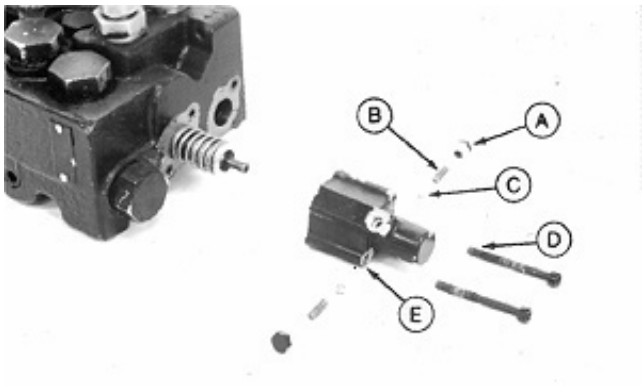
17. Install parts (A—C).

18. Apply thread lock and sealer (low strength) to threads of socket head cap screws (D).

19. Install socket head cap screws and tighten to specification.

Specification

Dual SCV End Cap Socket Head Cap Screws—Torque ..... 7 N•m (62 lb-in.)

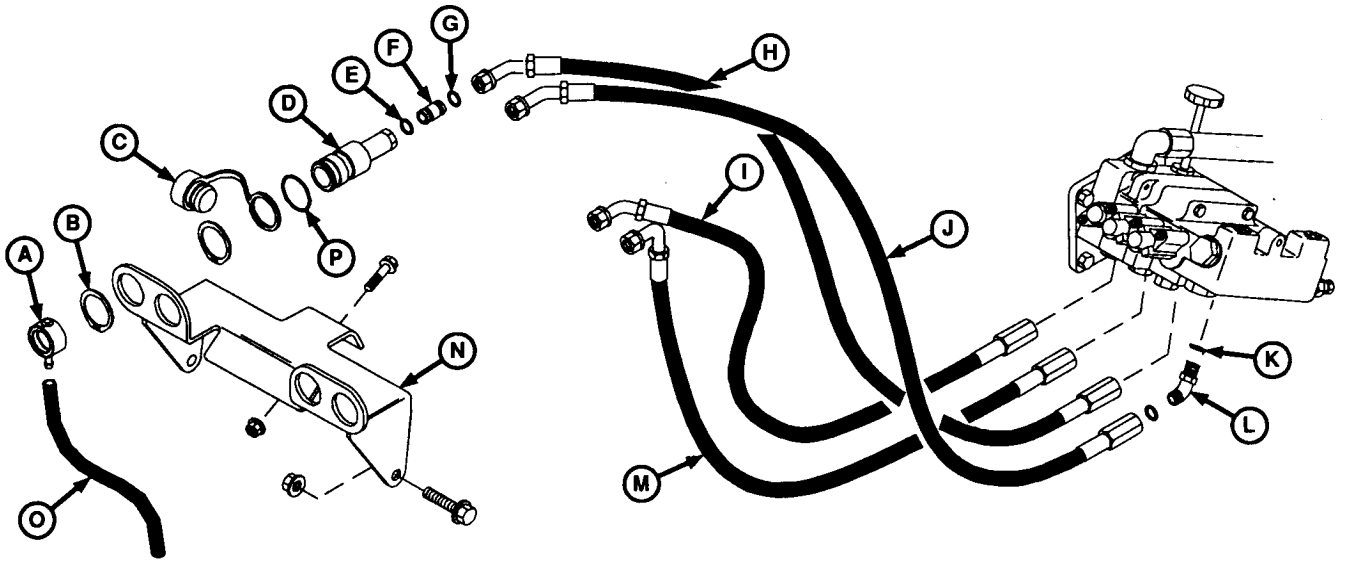


LV341 –UN–28FEB92

A—Plug (4 used)
B—Spring (4 used)
C—Ball (4 used)
D—Socket Head Cap Screw (4 used)
E—Cap (2 used)

OUO1085,0000174 –19–23JUL02–4/4

Inspect and Replace Hydraulic Hoses—Dual Selective Control Valve (SCV)



LV542AE –UN–17JUN94

A—Cap (4 used)
B—Snap Ring (8 used)
C—Plug (4 used)
D—Double-Acting Sleeve Coupler (4 used)
E—O-Ring (4 used)
F—Adapter (4 used)
G—O-Ring (8 used)
H—Hydraulic Hose
I—Hydraulic Hose
J—Hydraulic Hose
K—O-Ring (4 used)
L—Fitting (4 used)
M—Hydraulic Hose
N—Bracket
O—Drain Hose (4 used)
P—O-Ring (4 used)

1. Operate dual SCV joystick to relieve any pressure in the system.
2. Inspect hoses and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft, or swollen.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

3. Start engine. Operate dual SCV. Check for leaks and correct hose routing.
4. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

OUO1085,0000175 –19–01SEP00–1/1

Other Material

Number	Name	Use
TY9371 (U.S.) TY9478 (Canadian) 271 (LOCTITE®)	Thread Lock and Sealer (High Strength)	Apply to threads of single SCV detent spool.
TY9369 (U.S.) NA (Canadian) 222 (LOCTITE®)	Thread Lock and Sealer (Low Strength)	Apply to threads of spool cap-to-valve housing socket head cap screws.

LOCTITE is a registered trademark of Loctite Corp.

OUO1089,000025F –19–18JUL02–1/1

Specifications

Item	Measurement	Specification
Wheel Mounting Cap Screws	Torque	175 N•m (130 lb-ft)
Wheel Bolts	Torque	175 N•m (129 lb-ft)
Single (Third) Selective Control Valve Cap Screws	Torque	12 N•m (106 lb-in.)
Single (Third) Selective Control Valve Retainer Screw	Torque	4 N•m (35 lb-in.)
Single (Third) Selective Control Valve Socket Head Cap Screws	Torque	7 N•m (62 lb-in.)

OUO1089,0000260 –19–18JUL02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

Tube Kit

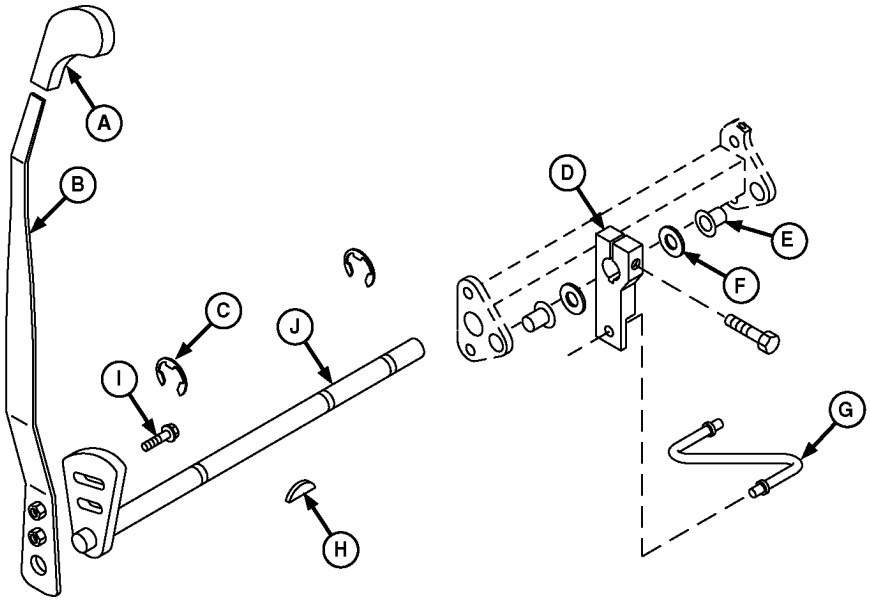
Seal Kit

Cap Kit

Load Check Valve Kit

OUO1085,0000176 –19–01SEP00–1/1

Inspect and Repair Single (Third) SCV Lever and Linkage



LV2141 –UN–09JUN97

A—Handle
B—SCV Lever
C—Snap Ring (2 used)
D—Lever
E—Bushing (2 used)
F—Washer (2 used)
G—Link
H—Woodruff Key
I—Cap Screw (2 used)
J—Control Shaft

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2

1. Tractors without cab, remove right-hand rear wheel and fender.
2. Tractors equipped with cab, remove right-side control console and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)
3. Inspect parts for wear or damage. Replace as necessary.
4. Tractors without cab, install fender and wheel. Tighten wheel mounting cap screws to specification.

Specification

Wheel Mounting Cap Screws—Torque	175 N•m (130 lb-ft)

5. Tractors with cab, install control console and panel.

OUO1085,0000177 –19–01SEP00–1/1

Remove and Install Single (Third) Selective Control Valve (SCV)

1. Open rate-of-drop valve and lower rockshaft arms.
2. Move SCV lever back and forth.
3. Tractors without cab, remove right-hand rear wheel and fender.
4. Remove right-hand control console and panel.
5. Tag all hoses to aid in installation.
6. Disconnect hoses (C and D). Close all openings using caps and plugs.
7. Disconnect SCV joystick linkage.
8. Remove end plate (B) and selective control valve (A).
9. Make repairs as necessary. (See Disassemble, Inspect and Assemble Single (Third) Selective Control Valve (SCV) in this group.)

IMPORTANT: Always use new O-rings and seals. Damaged or used parts will leak.

NOTE: The control valve has two large tubes with a total of four O-rings (F) and four square cut seals (G).

In addition, the control valve also has one small tube with a total of two O-rings (F) and two square cut seals (G).

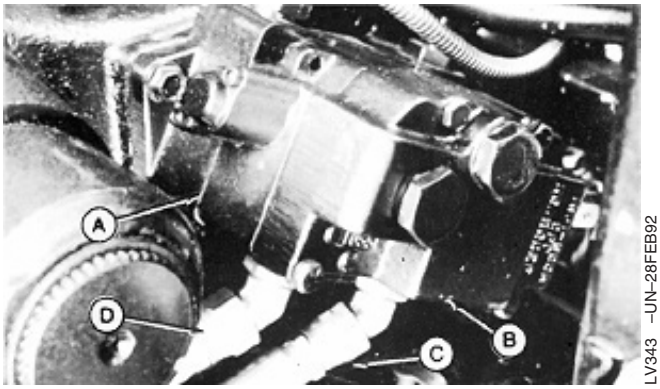
Tubes, O-rings, and seals are replaced together as a kit.

10. Replace tubes (E and H), O-rings (F), and seals (G).
11. Install selective control valve and end plate. Tighten cap screws to specification.

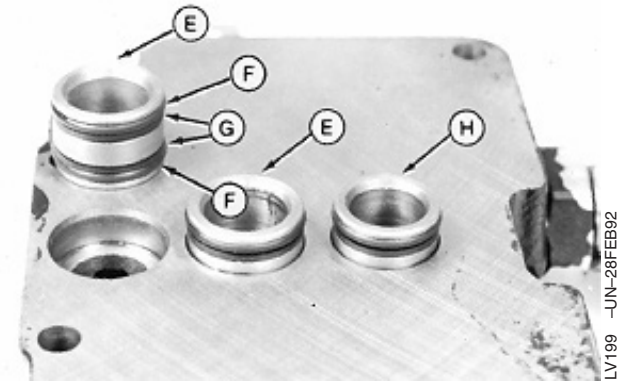
Specification

Single (Third) Selective Control Valve Cap Screws—Torque ..... 12 N•m (106 lb-in.)

12. Connect SCV joystick linkage.



LV343 –UN–28FEB92



LV199 –UN–28FEB92

A—Selective Control Valve
B—End Plate
C—SCV-to-Top Rear Outlet Hose
D—SCV-to-Bottom Rear Outlet Hose
E—Large Tube
F—O-Ring (6 used)
G—Square Cut Seal (6 used)
H—Small Tube

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16
3

Continued on next page

13. Install new O-rings on fittings and connect hoses.

14. Install control console and panel.

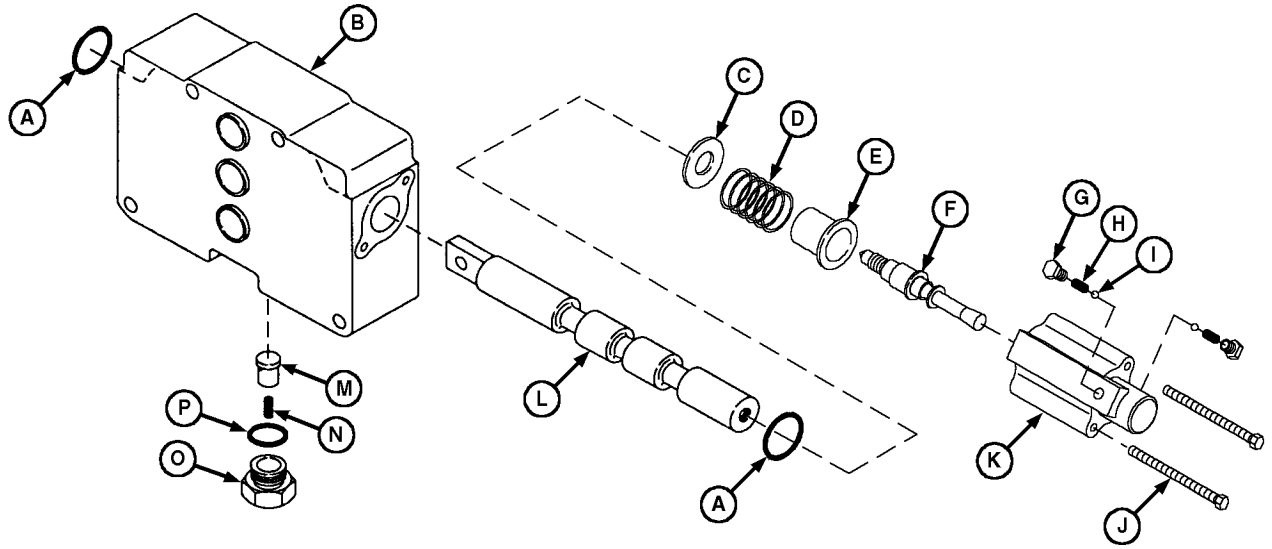
15. Install fender and wheel. Tighten wheel bolts to specification.

Specification	
Wheel Bolts—Torque	175 N•m (129 lb-ft)

16. Start engine and operate SCV lever. Check all connections for leaks.

OUO1085,0000178 –19–01SEP00–2/2

Disassemble, Inspect and Assemble Single (Third) Selective Control Valve (SCV)



LV7956 –UN–01JUL02

Single (Third) SCV

A—O-Ring (2 used)
B—Housing
C—Washer
D—Spring
E—Retainer
F—Detent Spool
G—Plug (2 used)
H—Spring (2 used)
I—Ball (2 used)
J—Socket Head Cap Screw (2 used)
K—Cap
L—Spool
M—Load Check Valve
N—Spring
O—Plug
P—O-Ring

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16
5

IMPORTANT: Spool and housing are matched and must be replaced as a unit.

Use new O-rings during assembly. Damaged or used O-rings will leak.

NOTE: Parts (C—K) and (M—P) are serviced as two separate assemblies and are replaced as kits only.

1. Remove socket head cap screws (J).
2. Remove parts (C—P).
3. Clamp flat end of spool (L) in a soft-jawed vise.

NOTE: The threads on detent spool (F) are coated with high-strength thread lock and sealer. Applying moderate heat to detent end of spool softens sealer to aid detent removal.

4. Heat spool end. Remove parts (C—F).
5. Inspect all parts for wear or damage. Replace as necessary.
6. Apply thread lock and sealer (high-strength) to threads of detent spool (F).
7. Install parts (C—F). Tighten retainer screw to specifications.

Continued on next page

8. Install new O-rings (A) in housing.
9. Install parts (M—P).
10. Coat spool and bore with clean transmission/hydraulic oil.
11. Install spool.
12. Apply multipurpose grease to spring (D).
13. Install cap (K) with parts (G—I).
14. Apply thread lock and sealer (low strength) to threads of socket head cap screws (J).
15. Install socket head cap screws and tighten to specifications.

Specification	
Single (Third) Selective Control Valve Retainer Screw—Torque	4 N•m (35 lb-in.)
Single (Third) Selective Control Valve Socket Head Cap Screws—Torque	7 N•m (62 lb-in.)

OUO1085,0000179 –19–01SEP00–2/2

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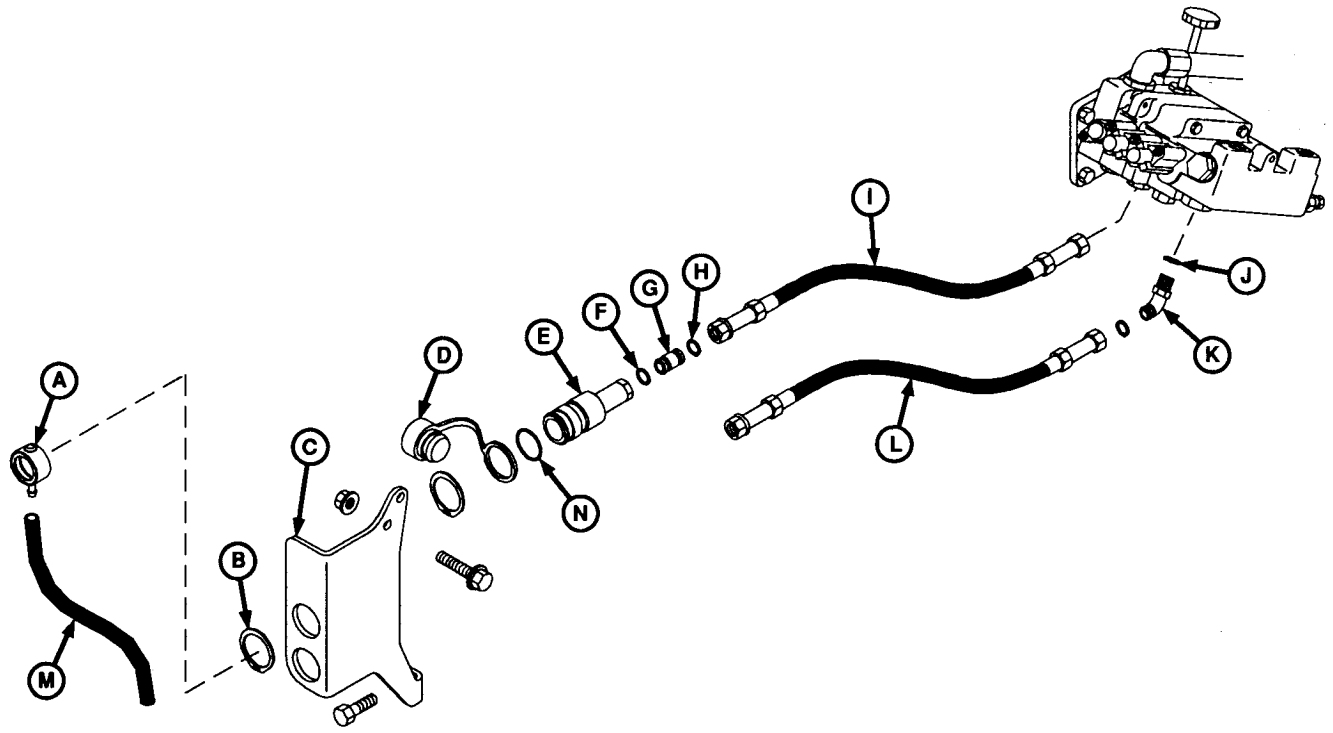
16
6

Inspect and Replace Hydraulic Hoses—Single (Third) Selective Control Valve (SCV)



LV543AE –UN–17JUN94

A—Cap (2 used)
B—Snap Ring (4 used)
C—Bracket
D—Plug (2 used)
E—Double-Acting Sleeve Coupler (2 used)
F—O-Ring (2 used)
G—Adapter (2 used)
H—O-Ring (4 used)
I—Hydraulic Hose
J—O-Ring (2 used)
K—Fitting (2 used)
L—Hydraulic Hose
M—Drain Hose (2 used)
N—O-Ring (2 used)

1. Operate single SCV lever to relieve any pressure in the system.
2. Inspect hoses and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft, or swollen.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

3. Start engine. Operate SCV. Check for leaks and correct hose routing.
4. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

OUO1085,000017A –19–01SEP00–1/1

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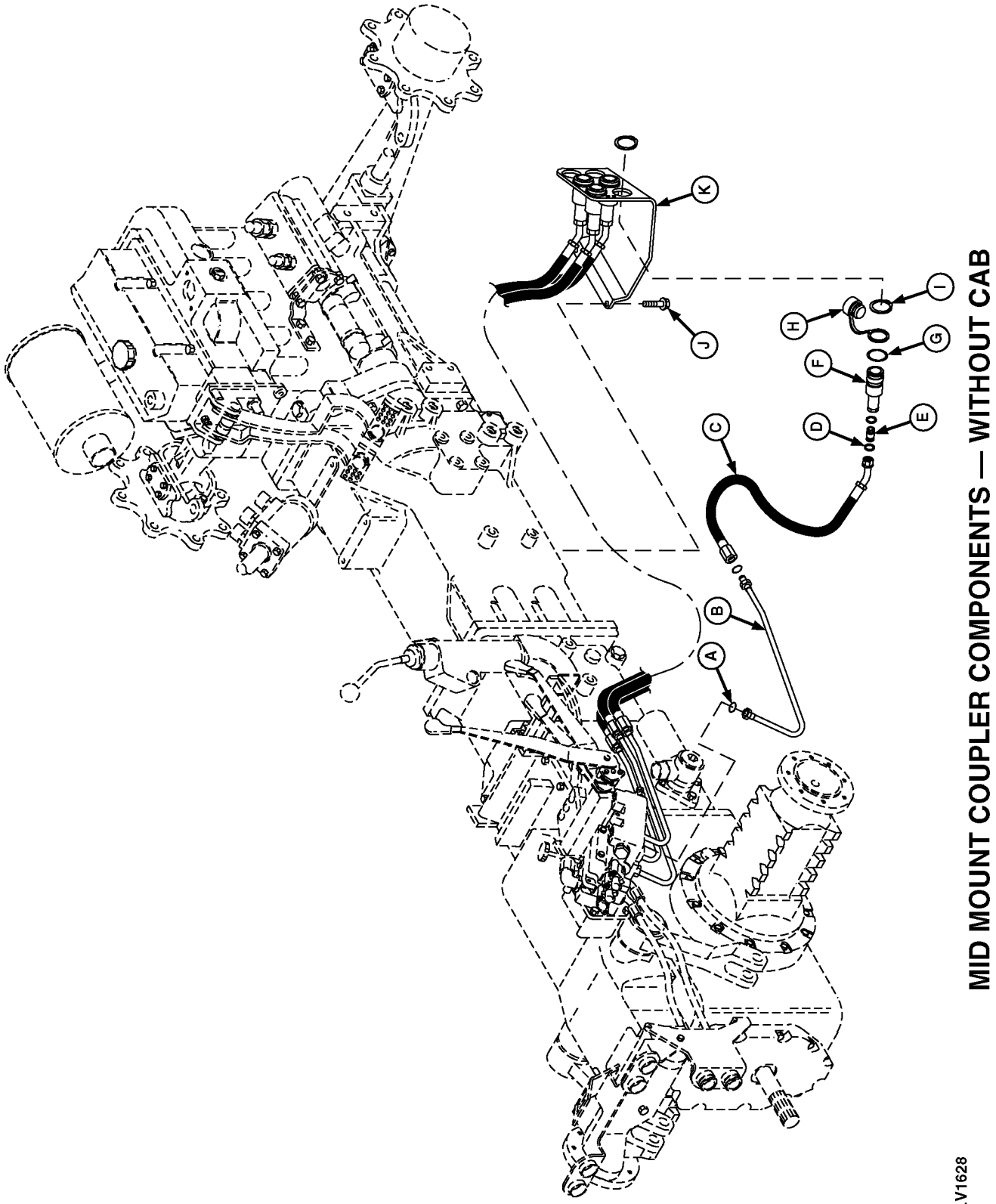
Inspect and Replace Hydraulic Hoses—Mid Mount Coupler Without Cab



LV1628 –19–02APR96

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OUO1085,000017C –19–01SEP00–1/2

A—O-Ring
B—Oil Line
C—Hose
D—O-Ring
E—Adapter
F—Breakaway Coupler
G—Snap Ring
H—Plug
I—Snap Ring
J—Cap Screw
K—Bracket

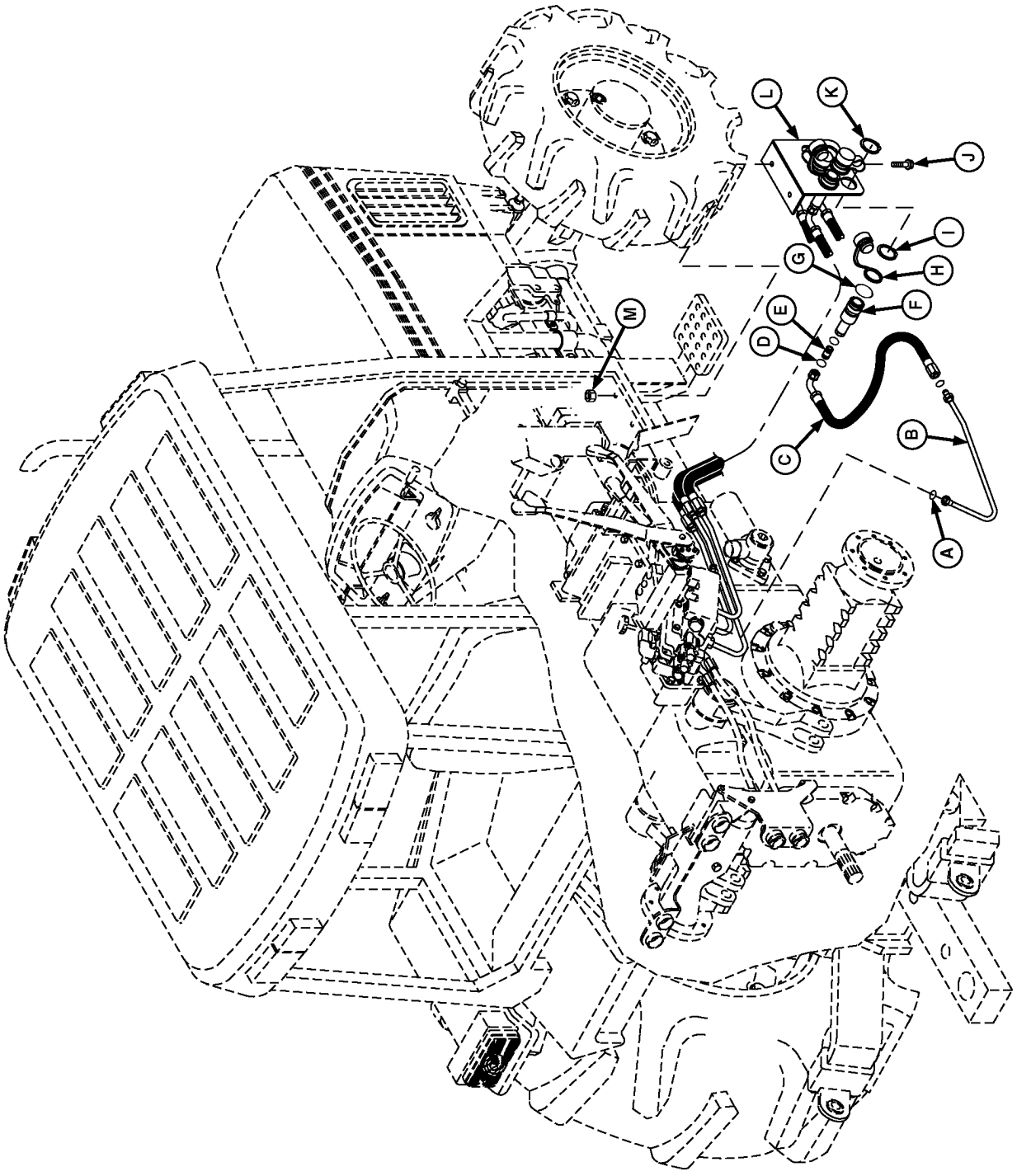
1. Operate SCV joystick to relieve any pressure in the system.
2. Remove right-hand rear wheel and fender.
3. Remove right-hand control console and panel.
4. Inspect hoses, lines, and fitting. Replace worn or damaged parts. Replace hoses that are cracked, soft, or swollen.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

5. Start engine. Operate SCV joystick. Check for leaks and correct line and hose routing.
6. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

OUO1085,000017C –19–01SEP00–2/2

Inspect and Replace Hydraulic Hoses—Mid Mount Coupler With Cab



MID MOUNT COUPLER COMPONENTS — WITH CAB

LV1629

LV1629 –19–02APR96

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OUO1085,000017D –19–01SEP00–1/2

A—O-Ring
B—Oil Line
C—Hose
D—O-Ring
E—Adapter
F—Breakaway Coupler
G—O-Ring
H—Plug
I—Snap Ring
J—Cap Screw
K—Snap Ring
L—Bracket
M—Nut

1. Operate SCV joystick to relieve any pressure in the system.
2. Remove seat and support if necessary. (See Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
3. Remove right-side control console and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)
4. Inspect hoses, lines, and fitting. Replace worn or damaged parts. Replace hoses that are cracked, soft, or swollen.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

5. Start engine. Operate SCV joystick. Check for leaks and correct line and hose routing.
6. Install seat and right-side control console and panel.
7. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

OUO1085,000017D –19–01SEP00–2/2

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20
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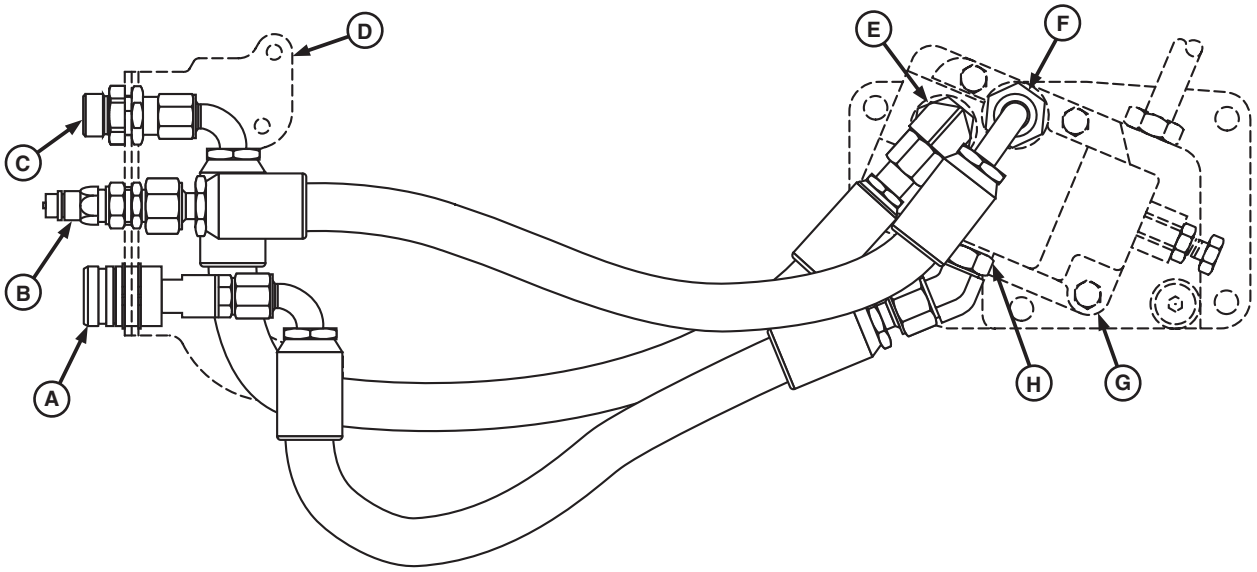
Specifications

Item	Measurement	Specification
3-Cylinder Engines		
Open Center	Flow Rate	43.2 L/m (11.4 gpm)
Open Center	Pressure	18 995 kPa (190 bar) (2755 psi)
4-Cylinder Engines		
Open Center	Flow Rate	60.2 L/m (15.9 gpm)
Open Center	Pressure	18 995 kPa (190 bar) (2755 psi)

OUO1089,0000269 –19–18JUL02–1/1

Inspect and Replace Power Beyond Hydraulic Lines and Fittings



LV7947 –UN–17JUL02

TRACTORS WITHOUT MID-MOUNT CONTROL VALVE AND ONE OR NO SCV

A—Power Beyond Pressure "P" Coupler
B—Power Beyond Tank "T" Coupler
C—Power Beyond Return "R" Fitting
D—Rear Power Beyond Coupler Bracket
E—Excess Flow Return Oil Port
F—Return to Tank Port
G—End Cap
H—Pressure Oil Port

IMPORTANT: Power beyond connections must be used when operating any external hydraulic orbital motor with the tractor's hydraulic system. Failing to comply with power beyond connections will overheat and possibly damage the tractor's hydraulic components.

NOTE: Be sure hydraulic functions to be connected are compatible with the tractor's open center system of 43.2 L/m (11.4 gpm) and 18 995 kPa (190 bar) (2755 psi) for 3-cylinder engines and 60.2 L/m (15.9 gpm) and 18 995 kPa (190 bar) (2755 psi) for 4-cylinder engines.

3-Cylinder Engines—Specification

Open Center—Flow Rate	43.2 L/m (11.4 gpm)
Open Center—Pressure	18 995 kPa (190 bar) (2755 psi)

4-Cylinder Engines—Specification

Open Center—Flow Rate	60.2 L/m (15.9 gpm)
Open Center—Pressure	18 995 kPa (190 bar) (2755 psi)

NOTE: Refer to one of five different Power Beyond hydraulic line routing illustrations applicable to equipment.

1. Operate SCV levers to relieve any pressure in system.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

2. Inspect lines and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft or swollen.

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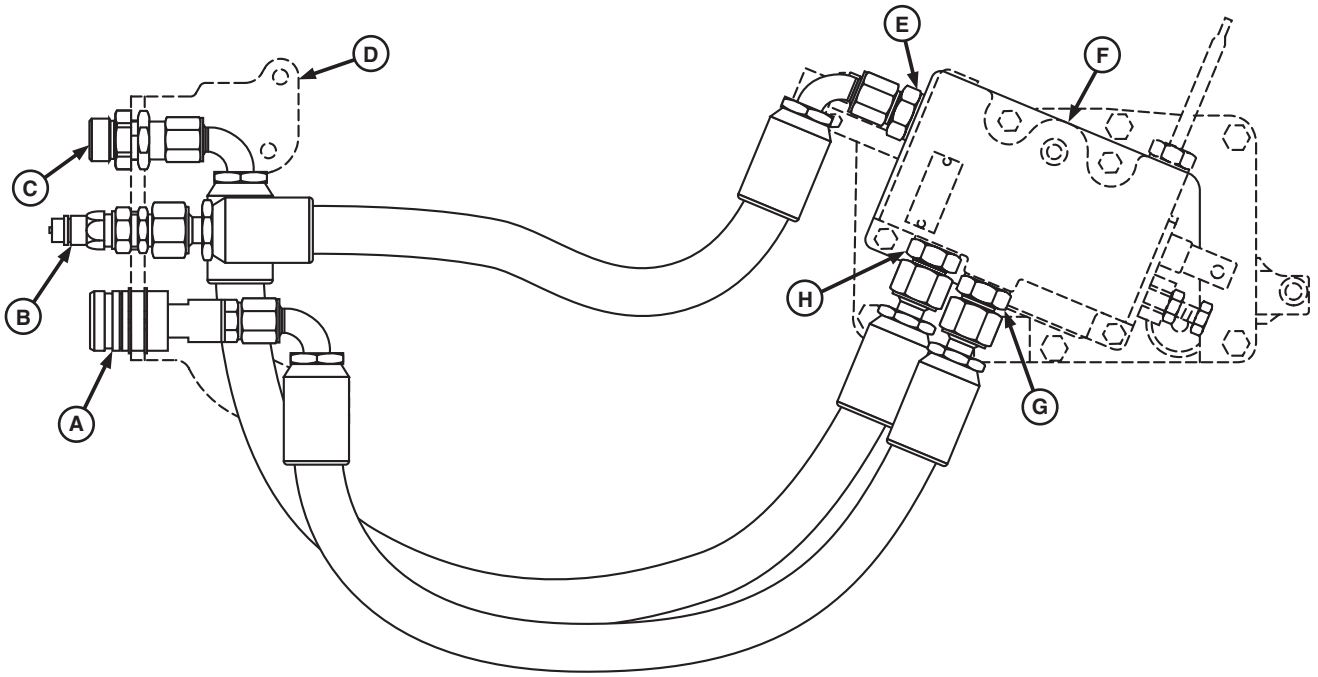
AG,OUO1085,193 –19–16JUL02–1/6

3. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

AG,OUO1085,193 –19–16JUL02–2/6



LV7948 –UN–17JUL02

TRACTORS WITH REAR SCV AND WITHOUT MID-MOUNT CONTROL VALVE

A—Power Beyond Pressure "P" Coupler
B—Power Beyond Tank "T" Coupler
C—Power Beyond Return "R" Fitting
D—Rear Power Beyond Coupler Bracket
E—Return to Tank Port
F—End Cap
G—Pressure Oil Port
H—Excess Flow Return Oil Port

70
25
3

1. Operate SCV levers to relieve any pressure in system.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

2. Inspect lines and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft or swollen.
3. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

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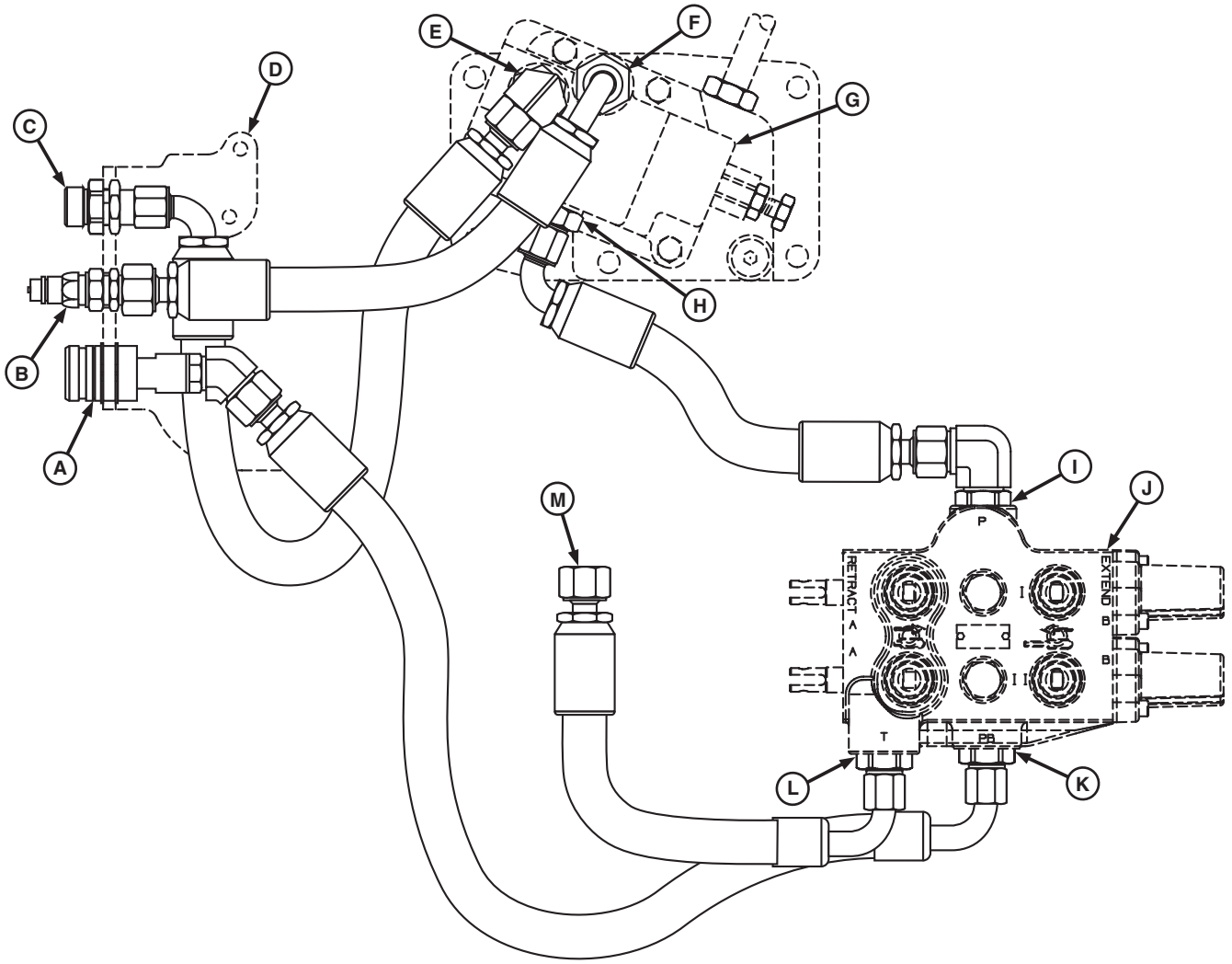
AG,OUO1085,193 –19–16JUL02–3/6



TRACTORS WITH MID-MOUNT CONTROL VALVE AND NO REAR SCV

A—Power Beyond Pressure "P" Coupler
B—Power Beyond Tank "T" Coupler
C—Power Beyond Return "R" Fitting
D—Rear Power Beyond Coupler Bracket
E—Excess Flow Return Oil Port
F—Return to Tank Port
G—End Cap
H—Pressure Oil Port
I—Pressure Oil Port
J—Mid–Mount Control Valve
K—Power Beyond Port
L—Return to Tank Port
M—To Transmission Housing

1. Operate SCV levers to relieve any pressure in system.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

2. Inspect lines and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft or swollen.
3. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

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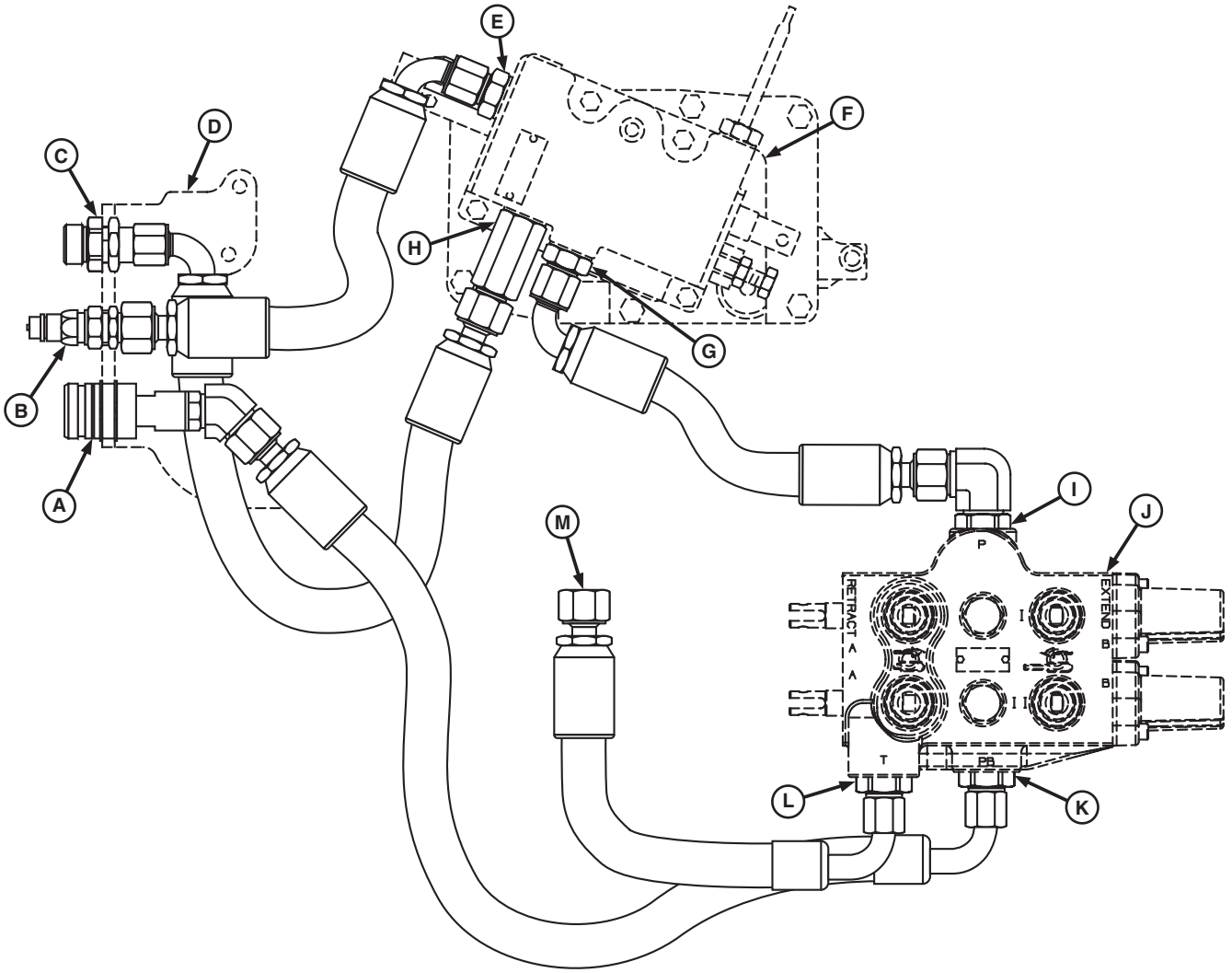

LV7950 –UN–17JUL02

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TRACTORS WITH MID-MOUNT CONTROL VALVE AND REAR SCV

A—Power Beyond Pressure "P" Coupler
B—Power Beyond Tank "T" Coupler
C—Power Beyond Return "R" Fitting
D—Rear Power Beyond Coupler Bracket
E—Excess Flow Return Oil Port
F—Return to Tank Port
G—End Cap
H—Pressure Oil Port
I—Pressure Oil Port
J—Mid–Mount Control Valve
K—Power Beyond Port
L—Return to Tank Port
M—To Transmission Housing

1. Operate SCV levers to relieve any pressure in system.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

2. Inspect lines and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft or swollen.
3. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

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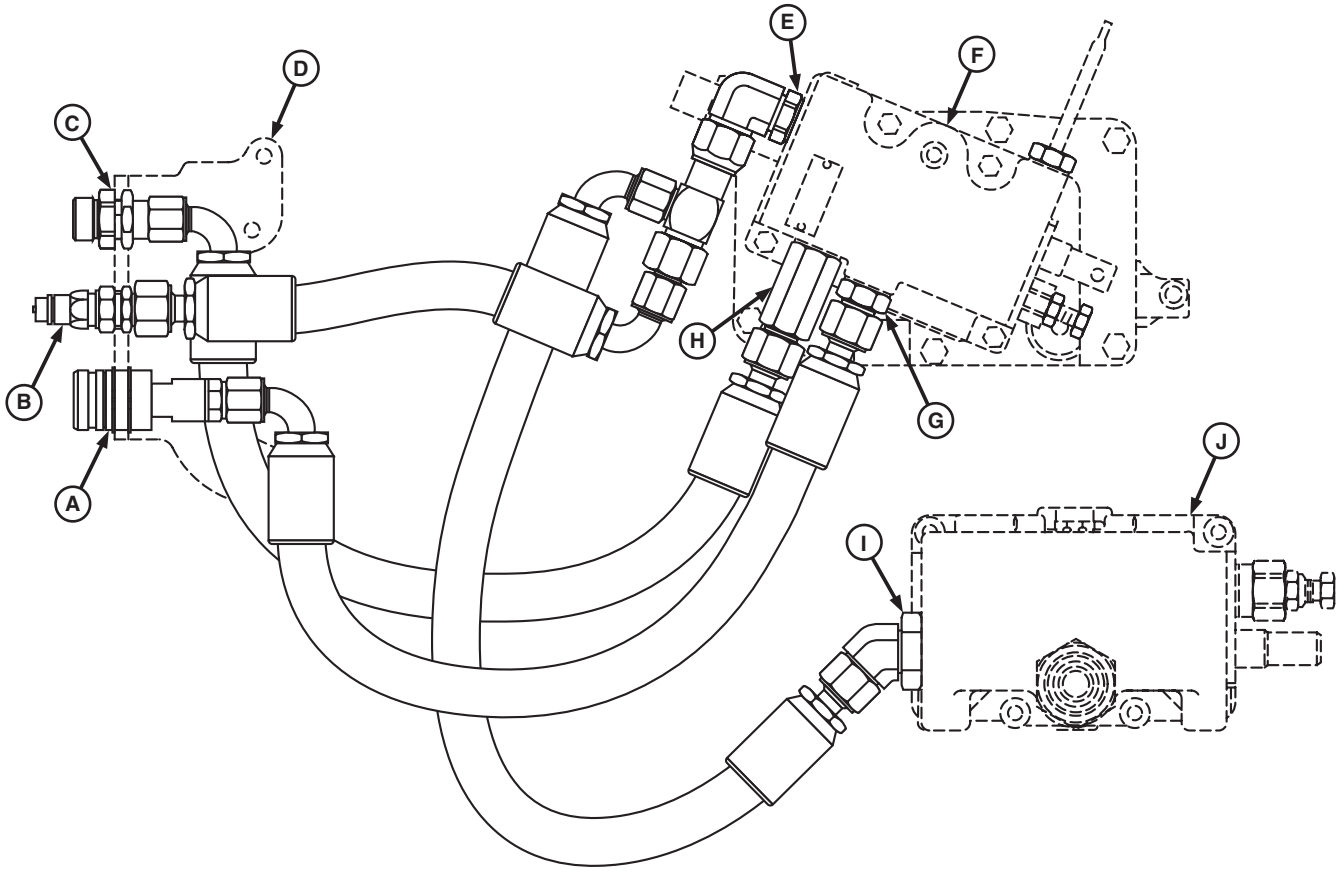
AG,OUO1085,193 –19–16JUL02–5/6



LV7951 –UN–17JUL02

TRACTORS WITH 4TH AND 5TH SCV

A—Power Beyond Pressure "P" Coupler
B—Power Beyond Tank "T" Coupler
C—Power Beyond Return "R" Fitting
D—Rear Power Beyond Coupler Bracket
E—Excess Flow Return Oil Port
F—Return to Tank Port
G—End Cap
H—Pressure Oil Port
I—4th and 5th SCV Return Oil Port
J—4th and 5th SCV

70
25
6

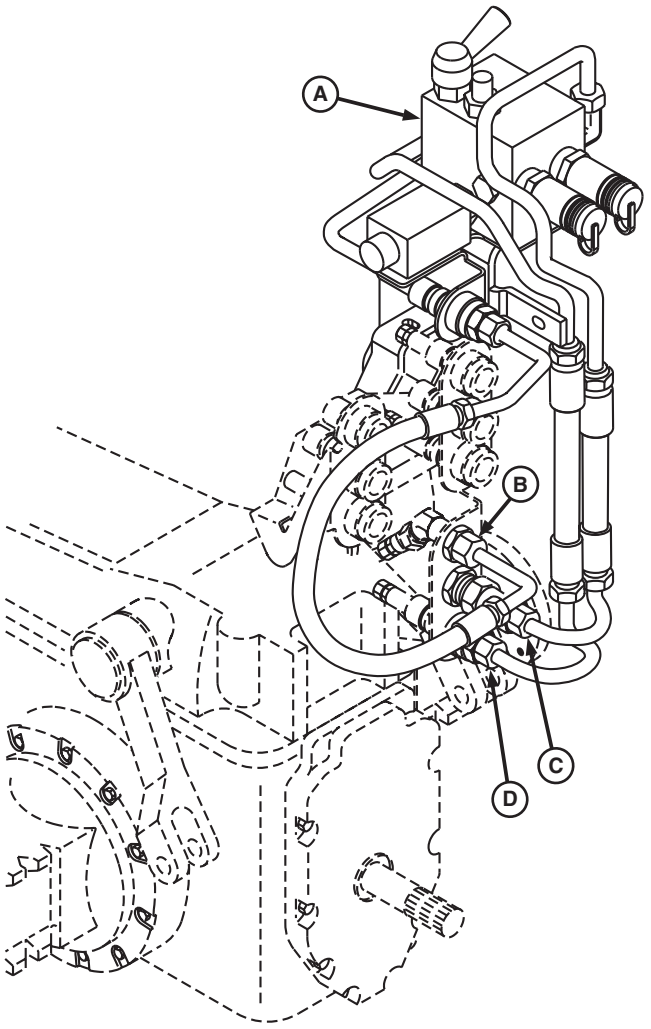
1. Operate SCV levers to relieve any pressure in system.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

2. Inspect lines and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft or swollen.
3. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

AG,OUO1085,193 –19–16JUL02–6/6

Inspect Power Beyond Motor Control Lines and Fittings



LV7959 –UN–17JUL02

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A—Power Beyond Motor Control

B—Power Beyond Return "R" Coupler

C—Power Beyond Tank "T" Coupler

D—Power Beyond Pressure "P" Coupler

1. Operate SCV levers to relieve any pressure in system.

IMPORTANT: Replace all O-rings. Damaged or used O-rings will leak.

2. Inspect lines and fittings. Replace worn or damaged parts. Replace hoses that are cracked, soft or swollen.

3. Adjust transmission/hydraulic oil to correct level with proper oil. (See Transmission and Hydraulic Oil in Section 10, Group 20.)

OUO1023,0000409 –19–16JUL02–1/1

Section 80
Miscellaneous Repair

Contents

Specifications

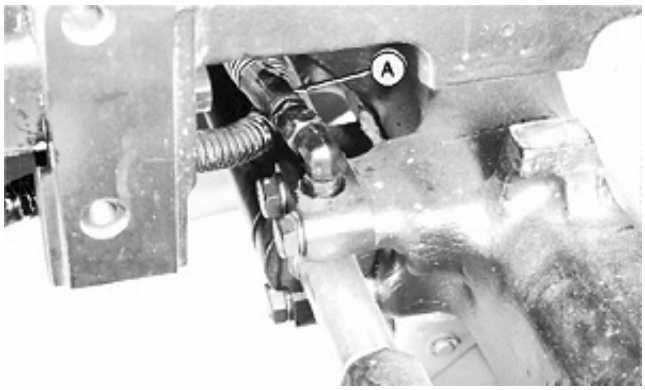
Item	Measurement	Specification
2WD Front Axle	End Play	8 mm (0.030 in.)
2WD Front Axle Pivot Pin Retainer Cap Screws	Torque	135 N•m (100 lb-ft)
2WD Axle Spindle Nut	Torque	415 N•m (306 lb-ft)
2WD Tie Rod End Nut	Torque	165 N•m (122 lb-ft)
Front Wheel Cap Screws	Torque	175 N•m (130 lb-ft)

OUO1080,0000256 –19–27JUN02–1/1

Remove and Install Front Axle—2WD

1. Raise front of tractor and remove front wheels.
2. Install support stands under front of clutch housing.
3. Disconnect hydraulic hose (A) from both ends of steering cylinder. Close all openings using caps and plugs.

A—Hydraulic Hose



LV553 –UN–27FEB92

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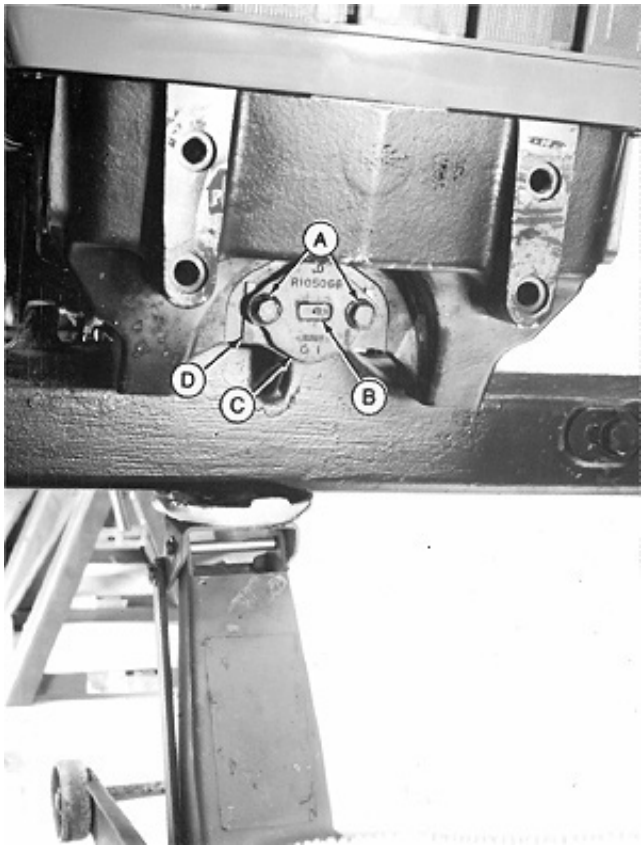
AG,OUO1023,282 –19–17JUL02–1/3

4. Place a floor jack under center of axle.
5. Remove cap screws (A).
6. Remove retainer (C) and shims (D).
7. Remove pivot pin (B).
8. Remove axle.
9. Inspect axle, pivot pin, and bushings. Make repairs as necessary. (See Inspect and Replace Pivot Pin and Bushings—2WD Axle in this group.)
10. Install axle. Lift axle into place and align axle housing hole with pivot pin hole.
11. Install pivot pin.
12. Install retainer (C), shims (D), and cap screws (A). Before tightening cap screws, check axle end play.

A—Cap Screw (2 used)
B—Pivot Pin
C—Retainer
D—Shim (3 used)



LV554 –UN–27FEB92

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AG,OUO1023,282 –19–17JUL02–2/3

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13. Check axle end play between points (A and B) to specification using feeler gauges.

14. End play should not exceed 8 mm (0.030 in.) forward and aft.

Specification

2WD Front Axle—End Play..... 8 mm (0.030 in.)

15. Axle should oscillate freely. Remove or install shims to maintain end play.

16. Tighten pivot pin retainer cap screws to specification.

Specification

2WD Front Axle Pivot Pin
Retainer Cap Screws—Torque ..... 135 N•m (100 lb-ft)

IMPORTANT: Use new O-rings. Used or damaged O-rings will leak.

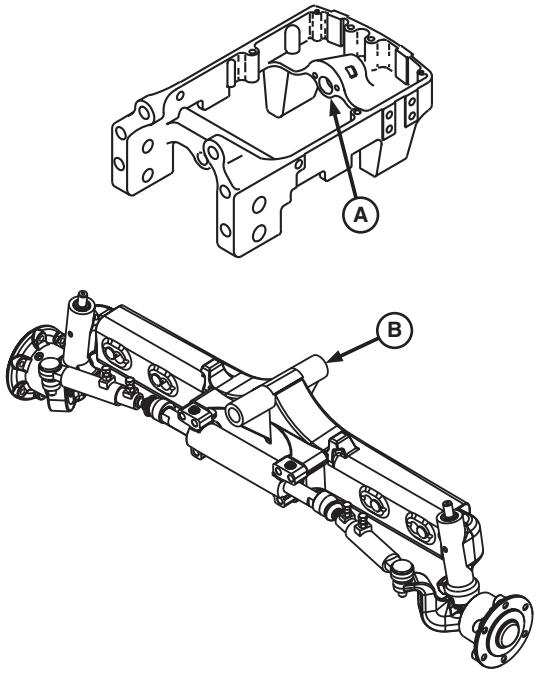
17. Install new O-rings and connect hydraulic steering hoses.

18. Install wheels. Tighten cap screws to specification.

Specification

Front Wheel Cap Screws—
Torque ..... 175 N•m (130 lb-ft)

19. Lubricate front axle pivot pin grease fittings with multipurpose grease.



LV1494 –UN–20MAY02

A—Axle End Play Check Point
B—Axle End Play Check Point

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3

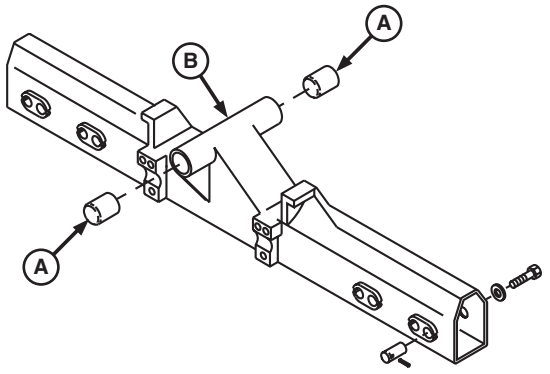
AG,OUO1023,282 –19–17JUL02–3/3

Inspect and Replace Pivot Pin and Bushings—2WD Axle

1. Inspect pivot pin and bushings for wear or damage. Replace if necessary.
2. Remove bushings (A) from axle using a blind hole puller set.

NOTE: Make sure lubrication holes in bushings (A) align with lubrication holes in axle pivot (B).

3. Install new bushings flush with axle surface using a bushing, bearing, and seal driver set.



LV004AE –UN–20MAY02

A—Bushing
B—Axle Pivot

AG,OUO1085,195 –19–17JUL02–1/1

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Remove and Install Spindle Assembly—2WD Axle

CAUTION: Block pivoting front axle to prevent pinching and personal injury.

1. Install a small block of wood between front axle and tractor frame on both sides.
2. Lift and support front of tractor. Remove wheel.

NOTE: Tie rod end is a tapered bore fit. Use a ball joint fork or puller to ease removal.

3. Remove lock nut (A). Remove tie rod end from spindle arm.
4. Remove nut (C) and washer (B) to remove spindle assembly.
5. Inspect spindle shaft for wear or damage. Replace if necessary.
6. Inspect spindle shaft bushings for wear or damage. (See Inspect and Replace Spindle Shaft Bushings—2WD Axle in this group.)
7. Install spindle, washer, and nut. Tighten nut to specification.

Specification

2WD Axle Spindle Nut—Torque..... 415 N•m (306 lb-ft)

8. Connect tie rod end. Install and tighten nut to specification.

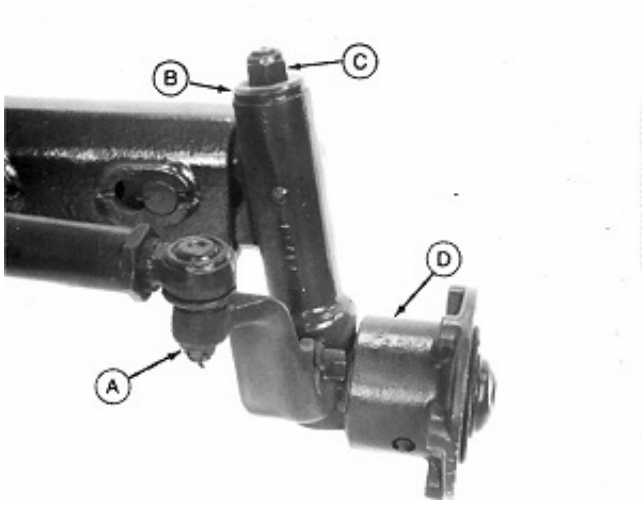
Specification

2WD Tie Rod End Nut—Torque ..... 165 N•m (122 lb-ft)

9. Install wheel and tighten wheel cap screws to specification.

Specification

Front Wheel Cap Screws—
Torque ..... 175 N•m (130 lb-ft)



LV005 –UN–26FEB92

A—Lock Nut
B—Washer
C—Nut
D—Spindle Assembly

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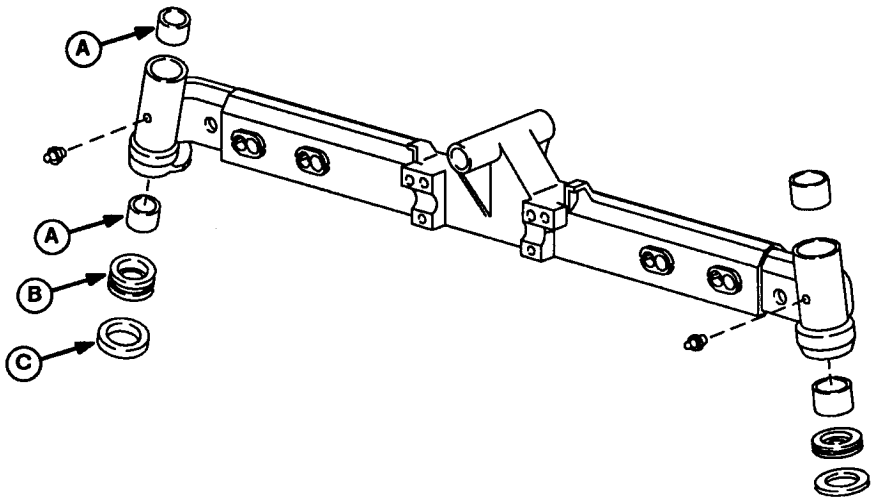
AG,OUO1085,196 –19–17JUL02–1/1

Inspect and Replace Spindle Shaft Bushings—2WD Axle



LV006AE –UN–26FEB92

A—Bushing **B—Bearing** **C—Seal**

1. Inspect bearings (B) for wear or damage. Bearings must rotate smoothly and freely. Replace if necessary.
2. Inspect spindle shaft and bushings (A) for scoring or damage. Replace if necessary.
3. Remove bushings from axle using a blind hole puller set.
4. Install new bushings and seals (C) using a bushing, bearing, and seal driver set. Install seals with seal lips away from axle.
5. Apply multipurpose grease to all parts and assemble.

AG,OUO1085,197 –19–17JUL02–1/1

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05
6

Specifications

Item	Measurement	Specification
Front Wheel Cap Screws	Torque	175 N•m (130 lb-ft)

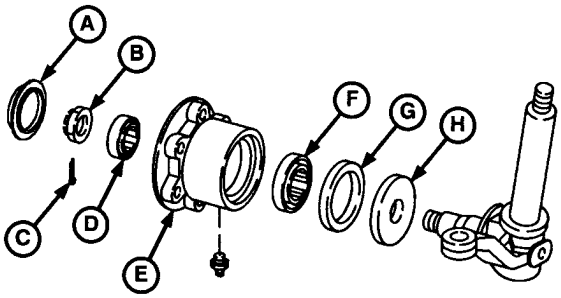
OUO1080,000025A –19–27JUN02–1/1

Inspect and Replace Front Wheel Bearings

1. Remove wheel.
2. Remove cover (A), cotter pin (C), and nut (B) to remove wheel hub (E).
3. Remove bearing cones and cups (D and F) and seal (G) using a brass drift and hammer or puller.
4. Remove spacer (H) using a puller.
5. Clean all parts and allow to air dry.
6. Inspect parts for wear or damage. Replace as necessary.
7. Pack bearing cones with multipurpose grease.
8. Install inner and outer bearing cups into hub using a bearing, bushing, and seal driver set.
9. Position the inner bearing cone on the inner cup. Install seal (G) with lips of seal toward the inner bearing. Install using a bearing, bushing, and seal driver set.
10. Install spacer (H) onto spindle with the small O.D. of spacer facing outwards, away from spindle.
11. Install hub assembly, outer bearing cone, washer, and nut. Tighten until a slight drag is felt while turning hub. Back off nut just enough to install cotter pin in hole of spindle.
12. Apply flexible sealant to mating surfaces of cover (A) and hub (E). Install cover.
13. Install wheel. Tighten cap screws to specification.

Specification

Front Wheel Cap Screws—
Torque ..... 175 N•m (130 lb-ft)



LV003AE –UN–04APR01

A—Cover
B—Retaining Nut
C—Cotter Pin
D—Outer Bearing Cup and Cone
E—Wheel Hub
F—Inner Bearing Cup and Cone
G—Seal
H—Spacer

AG,OUO1085,199 –19–17JUL02–1/1

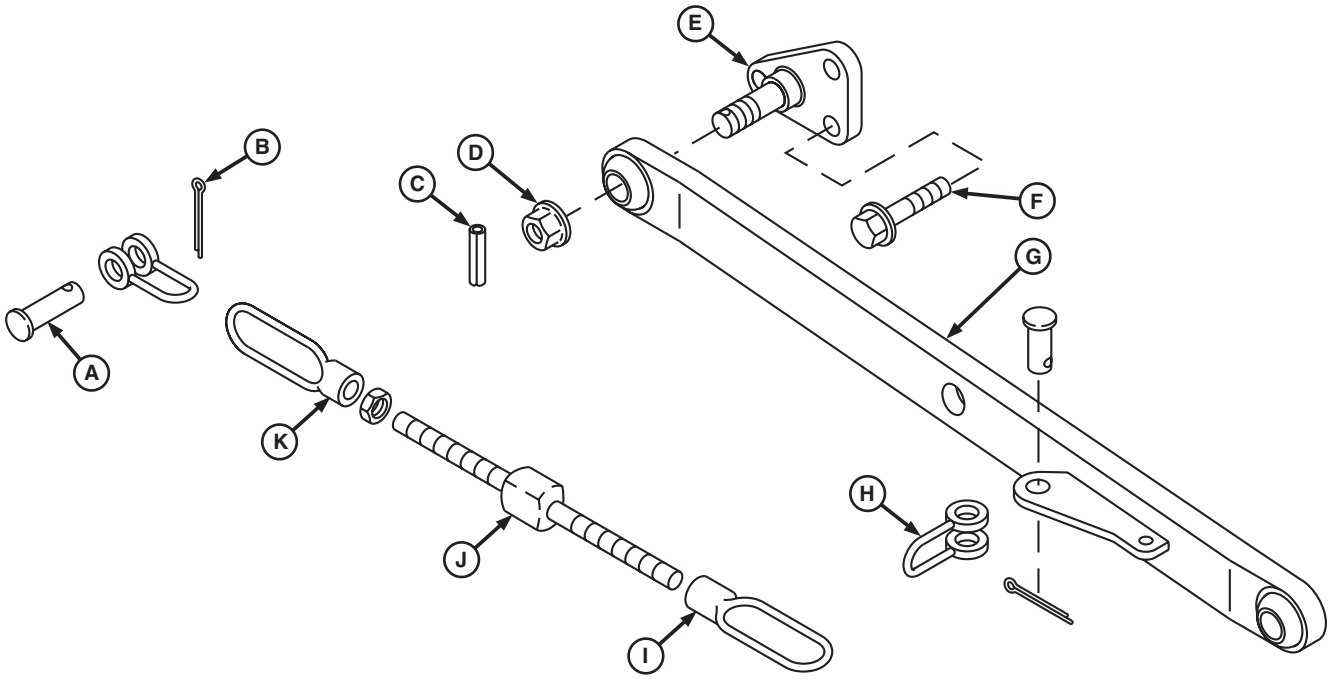
80
10
2

Specifications

Item	Measurement	Specification
Draft Link Support Cap Screw	Torque	200 N•m (148 lb-ft)
Rear Drawbar Cap Screws	Torque	200 N•m (148 lb-ft)
Bottom Drawbar Cap Screws	Torque	310 N•m (228 lb-ft)

OUO1080,000025E –19–27JUN02–1/1

Inspect and Repair Fixed Draft Links



LV392AE –UN–19APR01

Left Side Shown

A—Pin (2 used)
B—Cotter Pin (2 used)
C—Spring Pin
D—Flanged Nut
E—Support
F—Cap Screw (6 used)
G—Draft Arm
H—Clevis (2 used)
I—Link Nut (Left-Hand Thread)
J—Sway Link Stud
K—Link Nut (Right-Hand Thread)

1. Inspect draft link assembly for wear or damage. Replace as necessary.

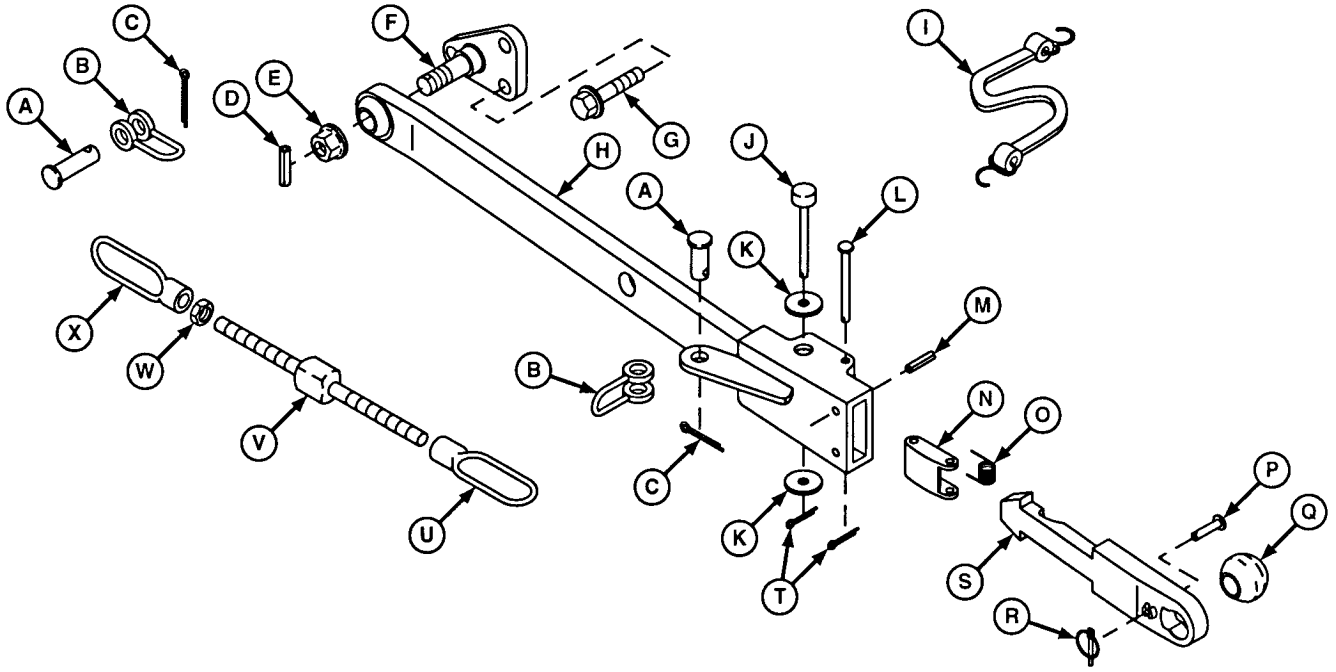
2. Tighten cap screws (F) to specification.

80
15
2

Specification	
Draft Link Support Cap Screw—Torque	200 N•m (148 lb-ft)

AG,OUO1085,201 –19–17JUL02–1/1

Inspect and Repair Telescoping Draft Links



Left Side Shown

A—Pin (4 used)
B—Clevis (4 used)
C—Cotter Pin (4 used)
D—Spring Pin (2 used)
E—Flange Nut (2 used)
F—Support (2 used)
G—Cap Screw (6 used)
H—Draft Link (2 used)
I—Strap
J—Push Button (2 used)
K—Sealing Washer (2 used)
L—Pin (2 used)
M—Spring Pin (4 used)
N—Pawl (2 used)
O—Torsion Spring (2 used)
P—Pin (2 used)
Q—Ball (2 used)
R—Spring Locking Pin (2 used)
S—Draft Link End (2 used)
T—Cotter Pin (4 used)
U—Link Nut (2 used)
V—Stud (2 used)
W—Nut (2 used)
X—Link Nut (2 used)

NOTE: Quantities listed are for both sides.

1. Inspect draft link assembly for wear or damage. Replace as necessary.

2. Tighten cap screws (G) to specification.

	Specification
Draft Link Support Cap Screw—Torque	200 N•m (148 lb-ft)

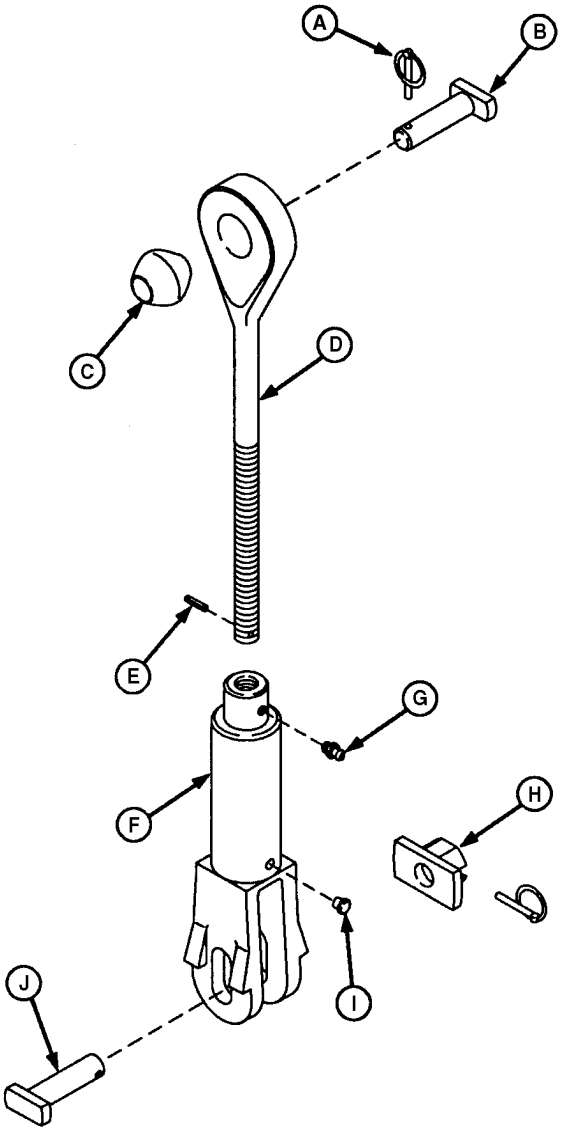
AG,OUO1085,202 –19–17JUL02–1/1

80
15
3

Inspect and Repair Standard Lift Link

1. Remove plugs (I).
2. Thread link end (D) in until spring pin (E) is centered with plug holes.
3. Remove spring pin using a punch and hammer.
4. Thread link end out.
5. Inspect all parts for wear or damage. Replace as necessary.
6. Assemble all parts.
7. Lubricate lift link assembly at fittings (G) using multipurpose grease.

A—Quick-Lock Pin (2 used)
B—Pin
C—Ball
D—Lift Link End
E—Spring Pin
F—Lift Link Body
G—Lubrication Fitting
H—Retainer
I—Plug (2 used)
J—Pin



LV393AE –UN–15JUL97

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AG,OUO1085,203 –19–05SEP00–1/1

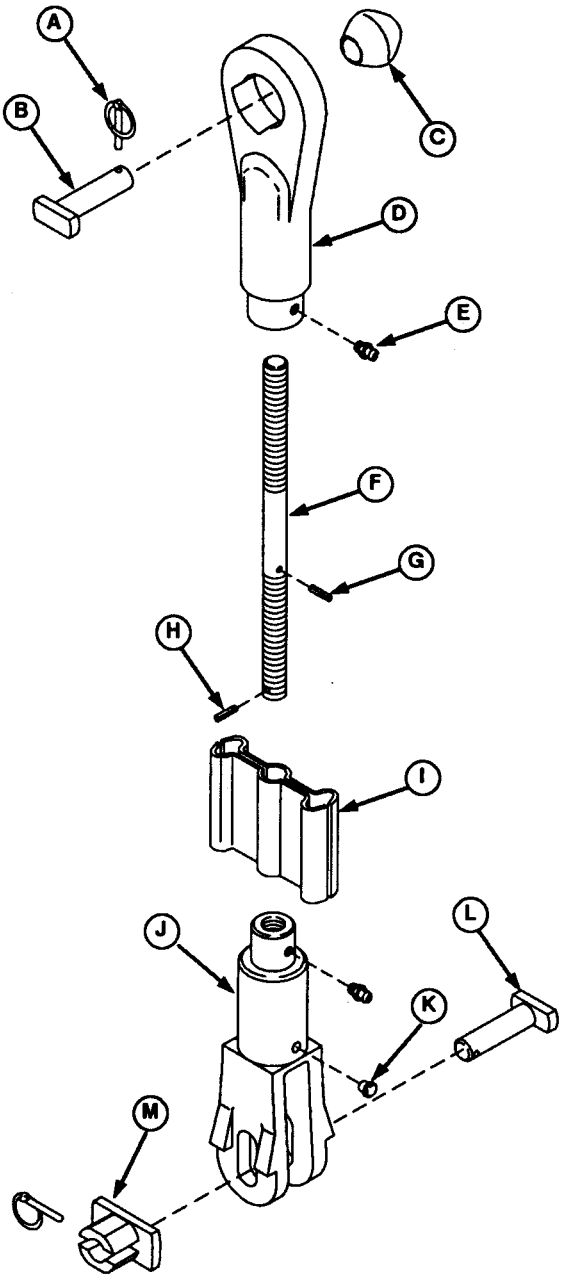
Inspect and Repair Adjustable Lift Link

1. Remove plugs (K).
2. Thread link body (J) in until spring pin (H) is centered with plug holes.
3. Remove spring pin using a punch and hammer.
4. Disassemble all parts.
5. Inspect all parts for wear or damage. Replace as necessary.

NOTE: Install handle (I) with notches toward lift link body (J).

6. Assemble all parts.
7. Lubricate lift link assembly at fittings (E) using multipurpose grease.

A—Quick-Lock Pin (2 used)
B—Pin
C—Ball
D—Lift Link End
E—Lubrication Fitting (2 used)
F—Link Rod
G—Spring Pin
H—Spring Pin
I—Handle
J—Lift Link Body
K—Plug (2 used)
L—Pin
M—Retainer



LV489AE –UN–26FEB92

AG,OUO1085,204 –19–05SEP00–1/1

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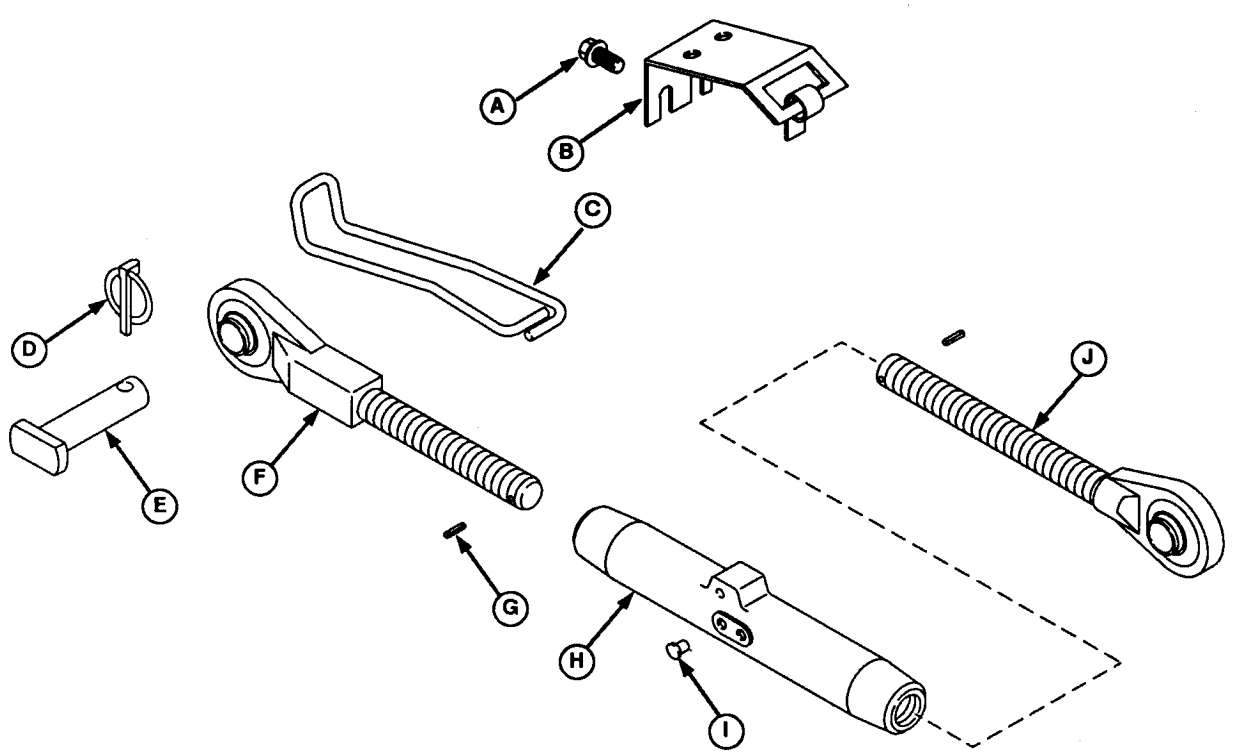
Inspect and Repair Center Link



LV394AE –UN–26FEB92

A—Cap Screw (2 used)
B—Bracket
C—Lever
D—Quick-Lock Pin
E—Pin
F—Center Link End
G—Spring Pin (2 used)
H—Center Link Body
I—Plug (4 used)
J—Center Link End

NOTE: Bracket (B) is mounted to draft-sensing assembly. Loosen cap screws (A) to remove bracket.

1. Remove plugs (I).
2. Thread link ends (F and J) in until spring pins (G) are centered with plug holes.
3. Remove spring pins using a punch and hammer.
4. Disassemble all parts.
5. Inspect all parts for wear or damage. Replace as necessary.
6. Apply multipurpose grease to I.D., at both ends, of body (H).
7. Assemble all parts.

AG,OUO1085,205 –19–05SEP00–1/1

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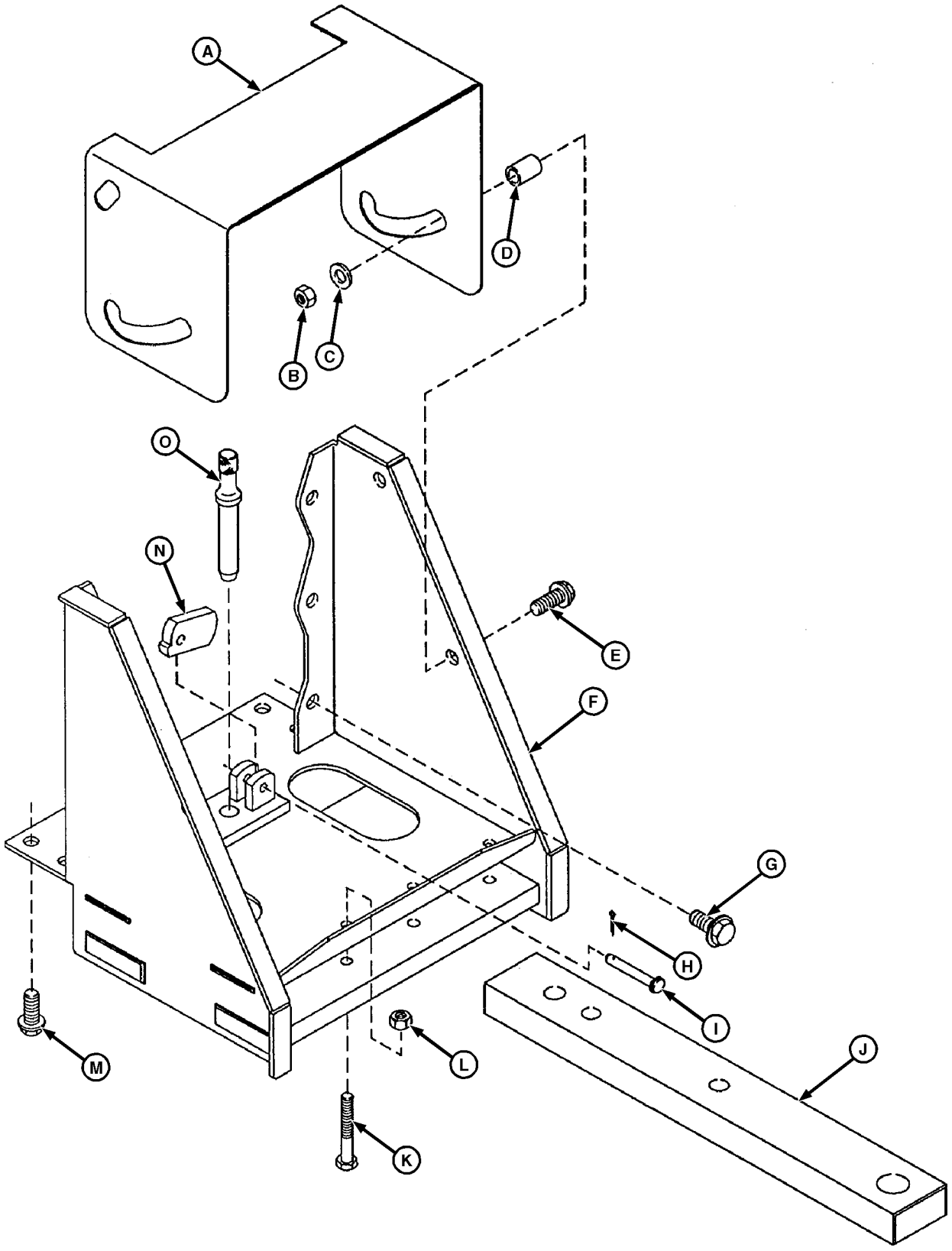
6

Remove and Install Drawbar and Support



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AG,OUO1085,206 –19–17JUL02–1/2

A—Shield
B—Nut
C—Washer
D—Bushing
E—Cap Screw
F—Support
G—Rear Drawbar Cap Screw (6 used)
H—Cotter Pin
I—Pin
J—Drawbar
K—Cap Screw (2 used)
L—Nut
M—Bottom Drawbar Cap Screw (4 used)
N—Latch
O—Pin

1. Remove parts (A—E).
2. Lift latch (N) and pull pin (O) upward.
3. Remove drawbar (J).

NOTE: Use a floor jack under support (F) to support weight during removal.

4. Install floor jack under support (F) and remove cap screws (G and M).
5. Inspect all parts for wear or damage. Replace if necessary.
6. Install parts (A—O). Tighten rear drawbar cap screws (G) and bottom drawbar cap screws (M) to specification.

Specification	
Rear Drawbar Cap Screws—Torque	200 N•m (148 lb-ft)
Bottom Drawbar Cap Screws—Torque	310 N•m (228 lb-ft)

AG,OUO1085,206 –19–17JUL02–2/2

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Section 90
Operator Station Repair

Contents

Continued on next page

Page

Specifications

Item	Measurement	Specification
Seat Assembly Cap Screws	Torque	125 N•m (92 lb-ft)

OUO1080,0000262 –19–02JUL02–1/1

Remove and Install Seat and Support—Tractors Without Cab

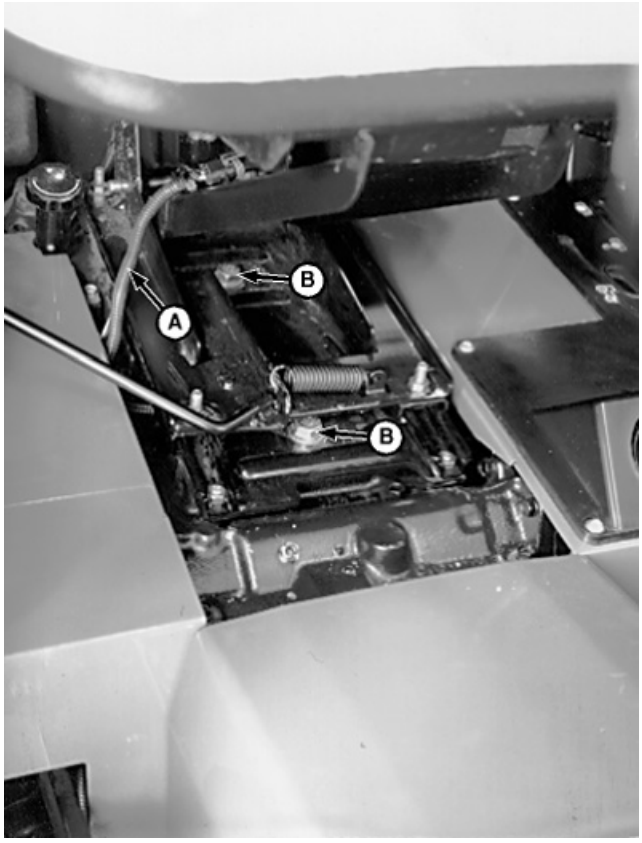
1. Disconnect wiring connector (A).
2. Remove cap screws (B).
3. Remove seat assembly.
4. Install seat assembly. Tighten cap screws to specification.

Specification

Seat Assembly Cap Screws—
Torque ..... 125 N•m (92 lb-ft)

5. Connect wiring connector.

A—Wiring Connector
B—Cap Screws (2 used)



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AG,OUO1085,211 –19–17JUL02–1/1

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Remove and Install Seat and Support Plate—Tractors With Cab

1. Disconnect seat safety switch wiring connector (A).
2. Remove four nuts (B).
3. Remove seat assembly.
4. Remove five cap screws (C).
5. Remove seal (D) on left and right edge of base plate.

NOTE: To remove base plate (E) it is necessary to remove the cab to rear axle mounting hardware.

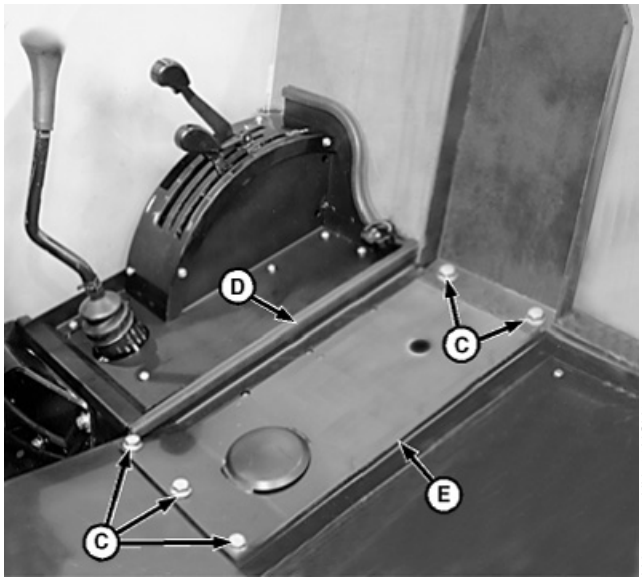
6. Lift rear of cab upward 25 mm (1 in.) off rear mounts to aid during removal of base plate (E).
7. Remove base plate (E) if necessary. Inspect seal for wear or damage. Replace seal if necessary.

NOTE: To aid during installation of seals (D) onto base plate (E), install seal on only one edge of base plate, then install other edge seal after base plate has been installed.

8. Install seal (D) on one edge of plate and install base plate (E) using cap screws (C). Install remaining seal.
9. Install seat onto base plate using four nuts (B) and connect wiring connector (A).

A—Wiring Connector
B—Nut (4 used)
C—Cap Screw (5 used)
D—Seal
E—Base Plate

LV2344 –UN–20NOV97



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AG,OUO1032,3419 –19–23JUN03–1/1

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Remove and Install Right-Side Control Console and Panel—Tractors Without Cab

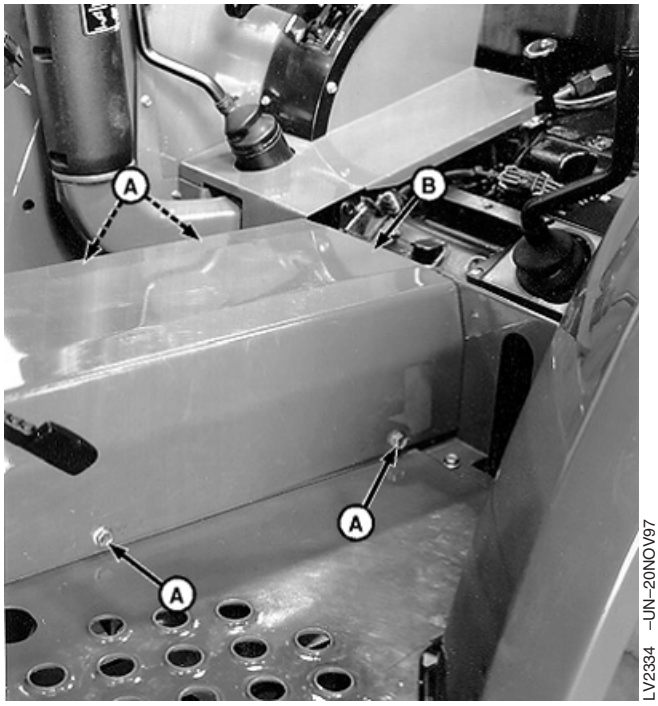
1. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab in Group 05.)

2. Remove four cap screws (A) and clutch housing cover (B).

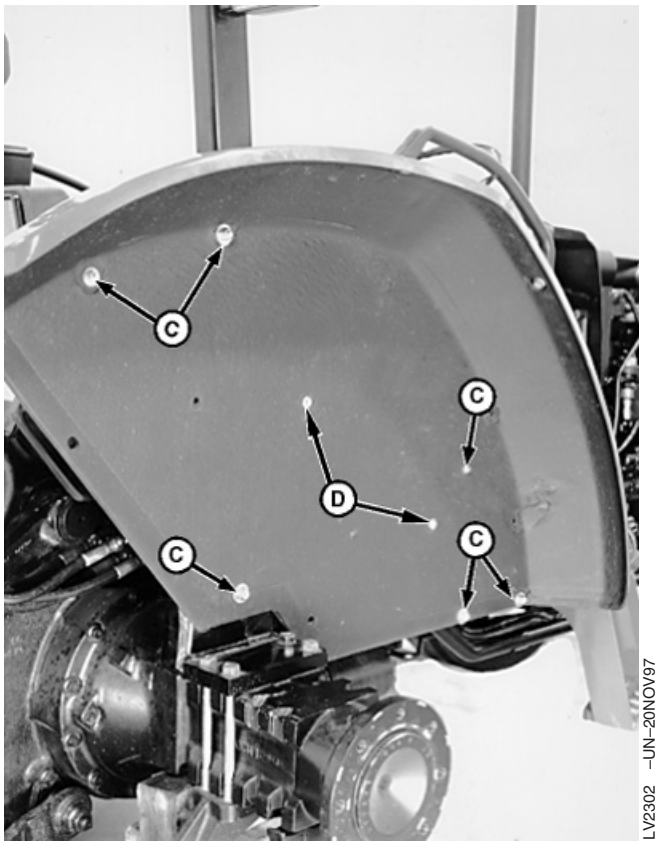
NOTE: Right-side tire removed only for clarity of photo.

3. Remove nuts (C), cap screws (D) and right-side fender.

A—Cap Screw (4 used)
B—Clutch Housing Cover
C—Nut (6 used)
D—Cap Screw (2 used)



LV2334 –UN–20NOV97



LV2302 –UN–20NOV97

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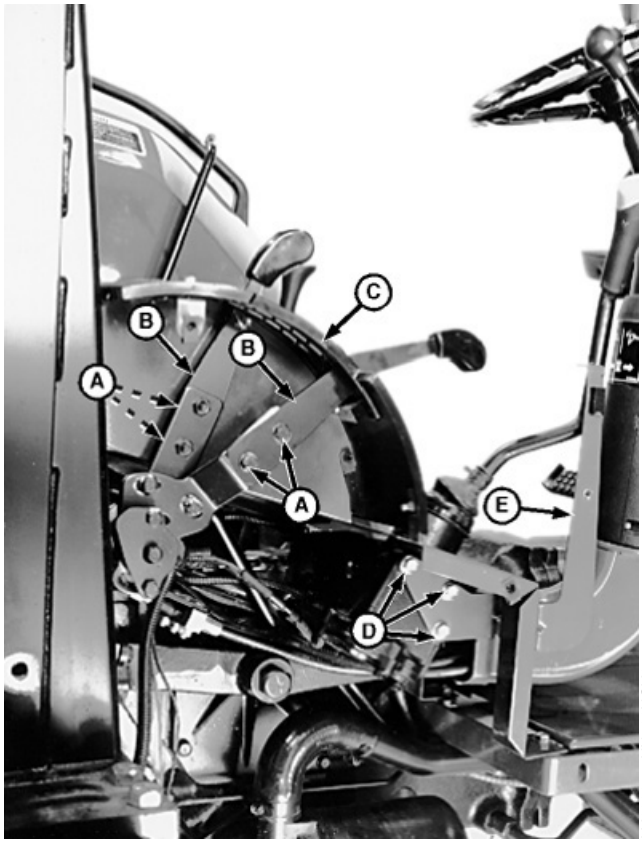
AG,OUO1085,212 –19–17JUL02–1/2

4. Remove cap screws (A) and rock shaft control levers (B).
5. Remove mounting hardware and lever control console (C).
6. Remove cap screws (D) and bracket (E).
7. Remove cap screws (F) and right-side control panel (G). Make repairs as necessary.
8. Install control panel (G) and cap screws (F).
9. Install bracket (E), cap screws (D), and control console (C).
10. Install rock shaft control levers (B) and cap screws (A).
11. Install right-side fender and clutch housing cover.
12. Install seat and support.

A—Cap Screw (4 used)
B—Rock Shaft Control Lever
C—Control Console
D—Cap Screw (3 used)
E—Gear Shift Lever Park Bracket
F—Cap Screw (3 used)
G—Right-Side Control Panel



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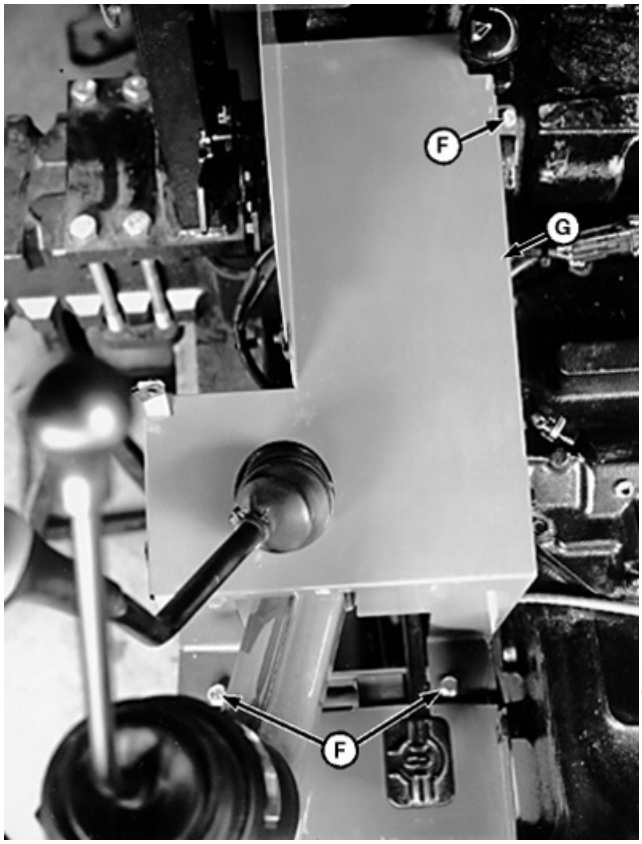


LV2304 –UN–20NOV97

AG,OUO1085,212 –19–17JUL02–2/2

Remove and Install Left-Side Control Console and Panel—Tractors Without Cab

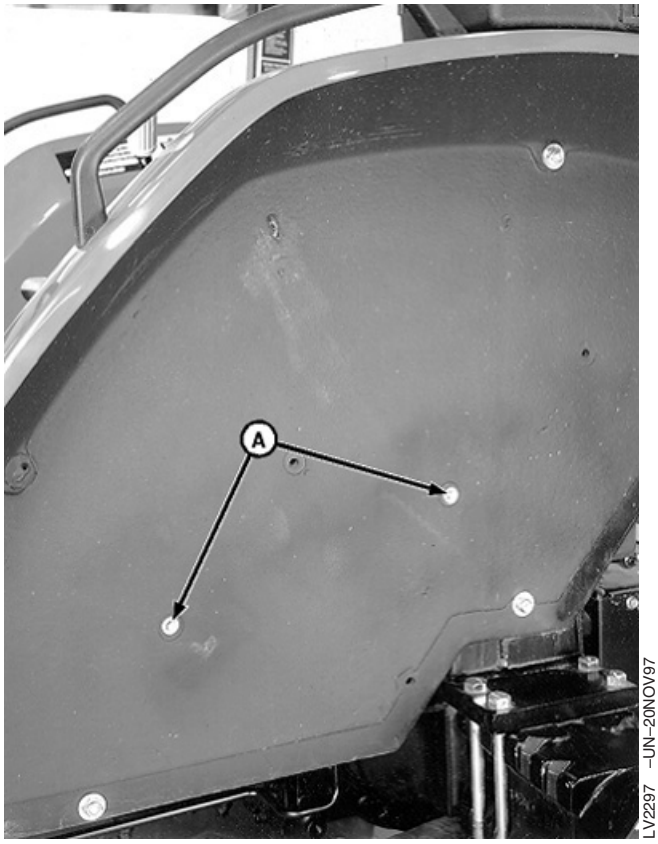
1. Remove seat and support. (See Remove and Install Seat and Support—Tractors Without Cab in Group 05.)

NOTE: Left-side tire removed only for clarity of photo.

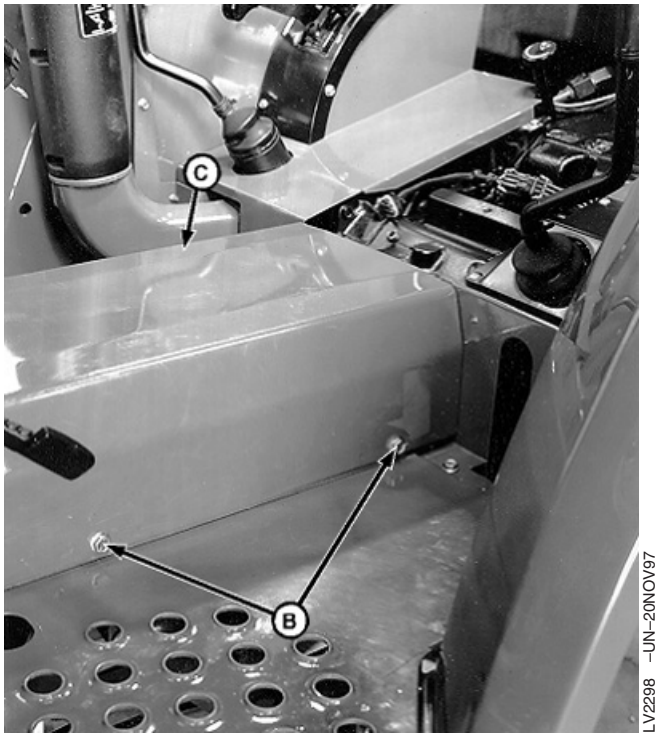
2. Remove two cap screws (A).

3. Remove four cap screws (B) and clutch housing cover (C).

A—Cap Screw (2 used)
B—Cap Screw (4 used)
C—Clutch Housing Cover



LV2297 –UN–20NOV97



LV2298 –UN–20NOV97

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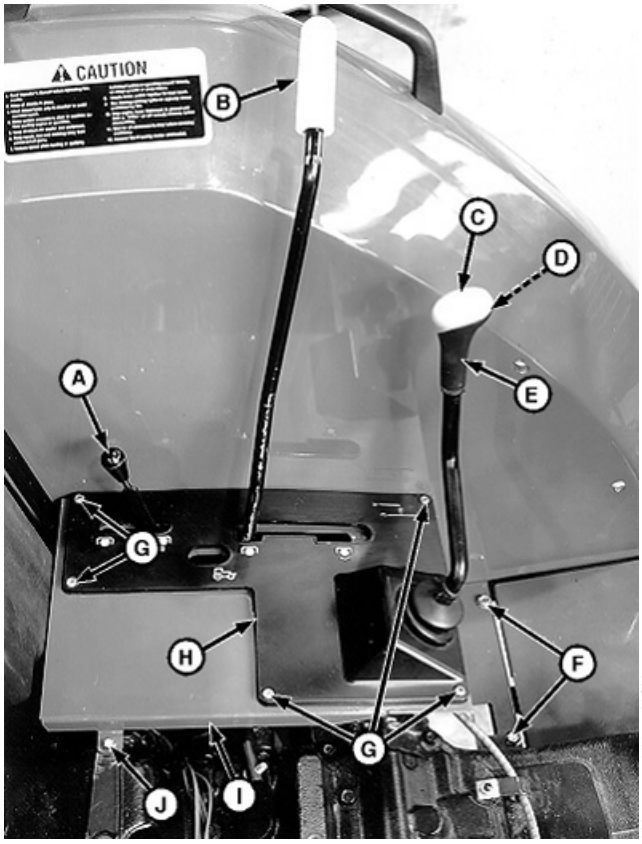
AG,OUO1085,213 –19–06SEP00–1/3

NOTE: Tractor without MFWD shown. For tractor equipped with MFWD, this procedure is similar.

540/540E knob (A) is screwed onto lever and PTO knob (B) is pressed on.

4. Unscrew and remove knob (A).
5. Turn and pull knob (B) to remove.
6. Remove cap (C), cap screw (D), and range shift knob (E).
7. Remove screws (G) and control console (H).
8. Remove cap screws and nuts (F), screw (J), and control panel (I). Make repairs as necessary.
9. Install panel (I), screw (J), and cap screws and nuts (F).
10. Install control console (H), screw (G), and knobs (A and B).
11. Install knob (E), cap screw (D), and cap (C).



A—540/540E Control Knob
B—PTO Knob
C—Cap
D—Cap Screw
E—Range Shift Knob
F—Cap Screw and Nut (2 used)
G—Screw (5 used)
H—Left-Side Control Console
I—Left-Side Control Panel
J—Cap Screw

Continued on next page

AG,OUO1085,213 –19–06SEP00–2/3

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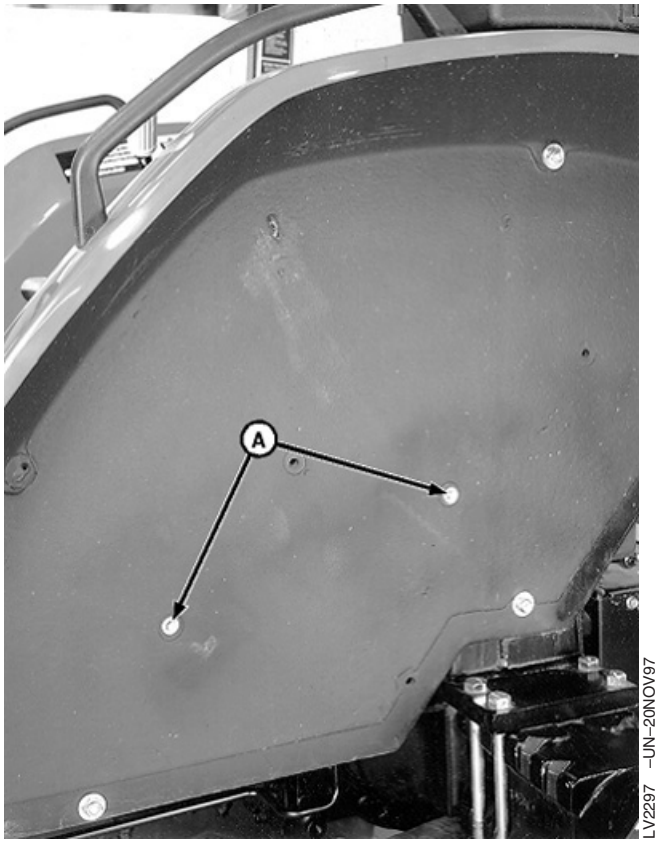
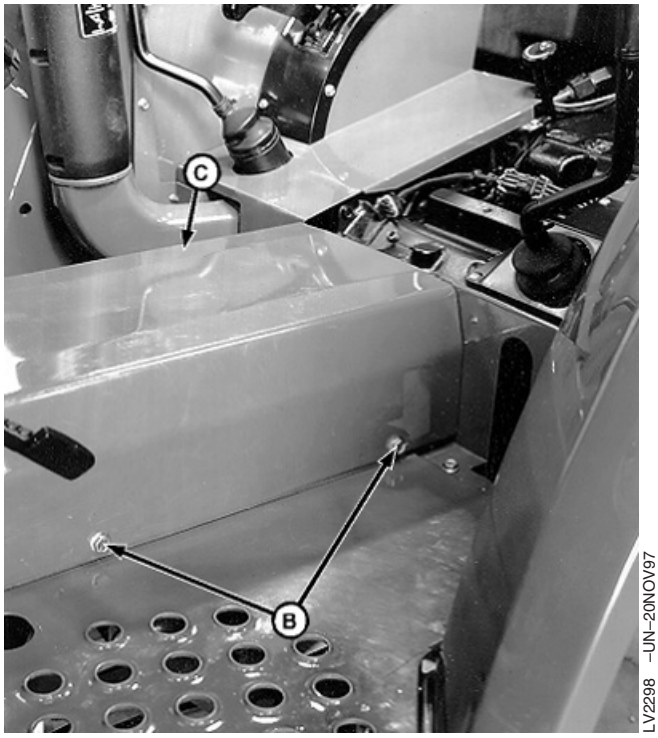
12. Install cap screws (A), clutch housing cover (C), and cap screws (B).

13. Install seat and support.

A—Cap Screw (2 used)
B—Cap Screw (4 used)
C—Clutch Housing Cover





AG,OUO1085,213 –19–06SEP00–3/3

Specifications

Item	Measurement	Specification
Roll Guard Post Mounting Cap Screws	Torque	335 N•m (247 lb-ft)

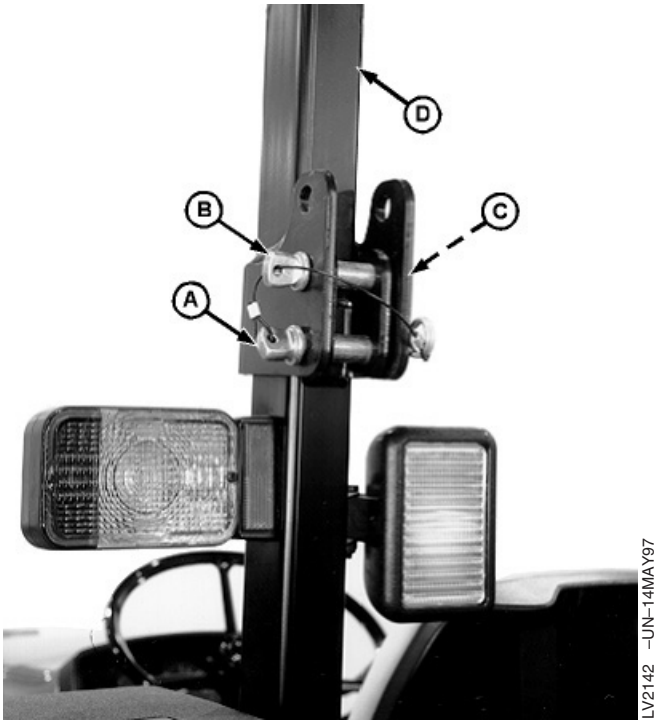
OUO1080,000026A –19–02JUL02–1/1

Remove and Install ROLL-GARD™

1. Remove rear wheels.
2. Remove fenders.
3. Remove locking pin (A).
4. Remove snap ring (C).

NOTE: Pivot pin (B) is press fit in outside flange of post.

5. Remove pivot pin (B) using a brass drift and hammer.
6. Repeat steps (3, 4, and 5) for opposite side of ROLL-GARD™.
7. Remove crossbar (D).



LV2142 –UN–14MAY97

A—Locking Pin
B—Pivot Pin
C—Snap Ring
D—Crossbar

ROLL-GARD is a trademark of Deere & Company

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AG,OUO1085,214 –19–17JUL02–1/3

8. Disconnect wiring connectors (A).

9. Remove screw (C) and nut (B) to remove fuel tank retaining strap (D).

10. Remove four cap screws (F) and stabilizer (G) to remove post (E).

11. Repeat procedures to remove post on other side.

NOTE: Remove lights if ROLL-GARD™ repair or replacement is necessary.

12. Inspect all parts for damage. Replace as necessary.

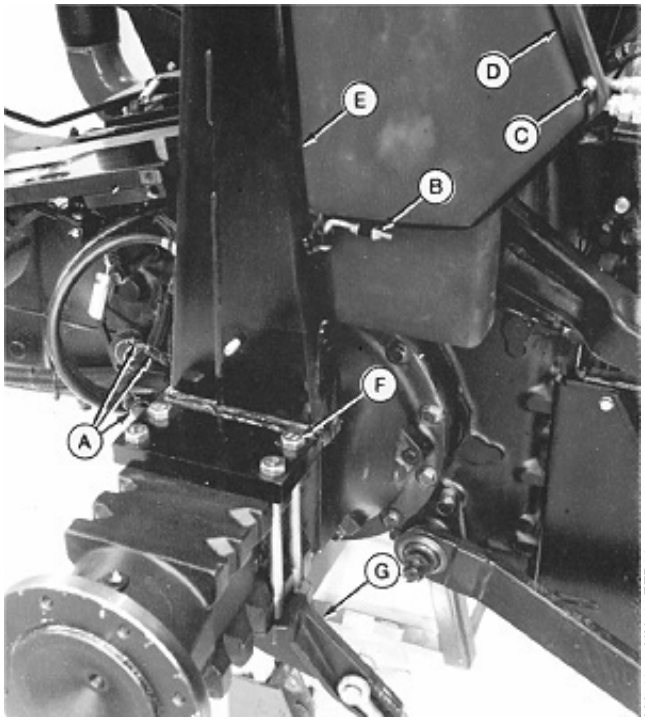
13. Install post (E), stabilizer (G), and cap screws (F). Tighten cap screws to specification.

Specification

Roll Guard Post Mounting Cap Screws—Torque ..... 335 N•m (247 lb-ft)

14. Install fuel tank retaining straps.

15. Connect wiring connectors.



Left-Hand Side

A—Wiring Connector
B—Nut
C—Screw
D—Strap
E—Post
F—Cap Screw (4 used)
G—Stabilizer

ROLL-GARD is a trademark of Deere & Company

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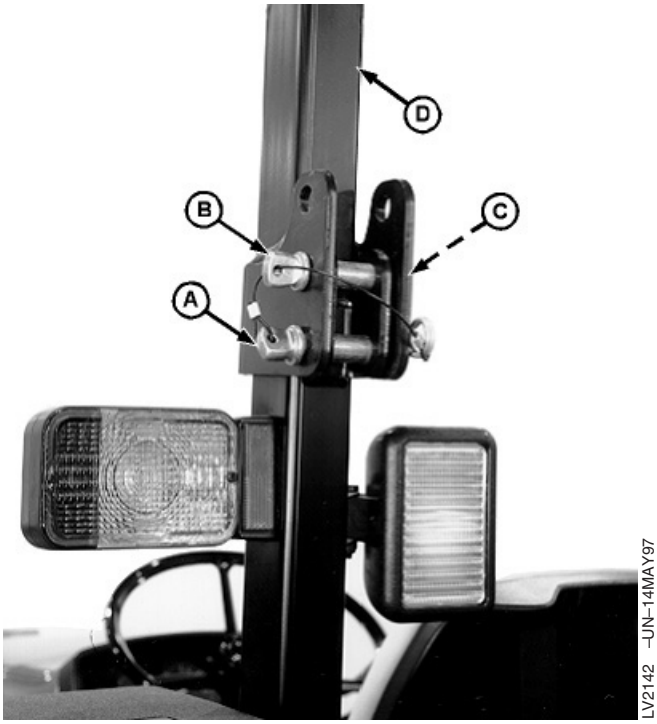
AG,OUO1085,214 –19–17JUL02–2/3

16. Install crossbar (D).
17. Install parts (A—C).
18. Install fenders.
19. Install wheels.

A—Pivot Pin
B—Retaining Pin
C—Snap Ring
D—Crossbar



LV2142 –UN–14MAY97

AG,OUO1085,214 –19–17JUL02–3/3

Essential Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

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OUO1080,000026B –19–02JUL02–1/2

Cab Lifting Bar JDG1580

Remove and Install Cab

OUO1080,000026B –19–02JUL02–2/2

Other Material

Number	Name	Use
R36757 (U.S.)	John Deere Cleaner	Cleans air filters
TY15130 (3 oz. tube) (U.S.) TY15443 (10.3 oz. cartridge) (U.S.)	Clear Silicone Adhesive Sealant	Apply to cab roof and window frames.

OUO1080,000026D –19–02JUL02–1/1

Specifications

Item	Measurement	Specification
Lower Front Window Mounting Hardware	Torque	1.5 N•m (13.5 lb-in.)
Cab Door Hinge Mounting Screws	Torque	27 N•m (20 lb-ft)
Rear Cab Mount Nuts	Torque	203 N•m (150 lb-ft)
Rear Wheel Cap Screws	Torque	175 N•m (130 lb-ft)

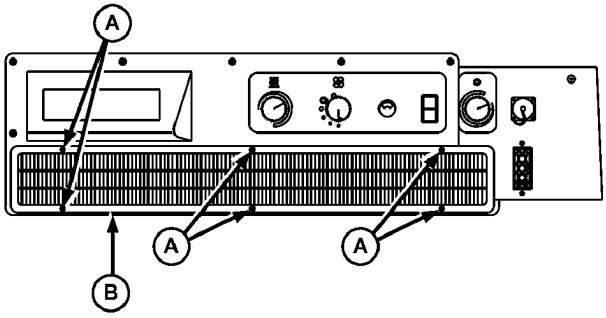
OUO1080,000026E –19–02JUL02–1/1

Remove, Inspect, and Install Cab Interior Recirculating Air Filter

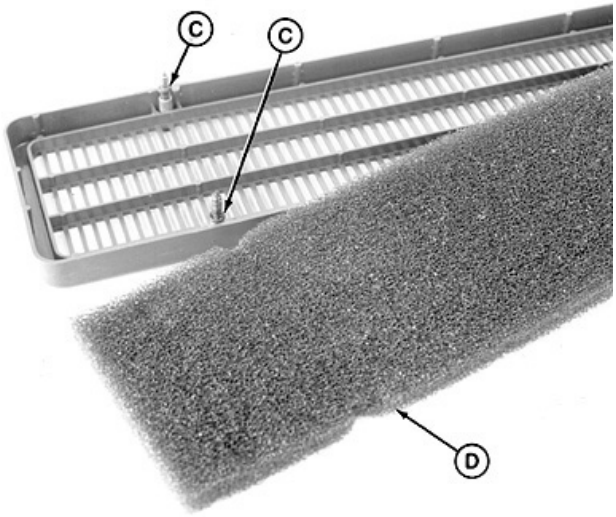
NOTE: Screws (A) are retained in filter cover (B) with small O-rings (C), and will not fall out when removing filter cover (B).

1. Loosen six screws (A) and remove filter cover (B).
2. Remove filter (D).
3. Add John Deere R36757 filter element cleaner or an equivalent non-sudsing detergent to water. Move the filter around in this solution to loosen dirt.
4. Flush filter with clean water. Use water pressure under 208 kPa (2.0 bar) (30 psi).
5. Shake filter to remove water. Do not install filter in machine until dry.
6. Inspect filter for wear or damage. Replace if necessary.
7. Install filter (D) and cover (B).
8. Tighten screws (A).

A—Screw (6 used)
B—Filter Cover
C—O-Ring (6 used)
D—Filter



LV1398 –UN–08AUG97

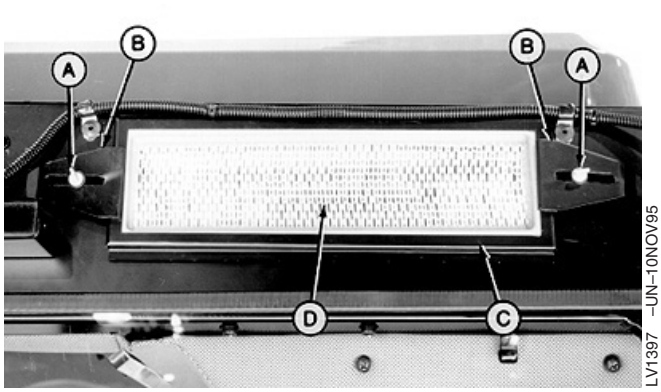


LV1399 –UN–10NOV95

AG,OUO1085,216 –19–06SEP00–1/1

Remove, Inspect, and Install Exterior Cab Intake Air Filter

1. Loosen screws (A) and slide retainer plates (B) outward away from filter.
2. Remove filter retainer (C) and filter (D).
3. Inspect filter for wear or damage. Replace if necessary.
4. Install filter (D) and retainer (C).
5. Slide plates (B) onto outer edge of filter retainer (C) and tighten screws
6. Repeat the above steps for the intake filter on opposite side of cab.



Right Side Filter Shown

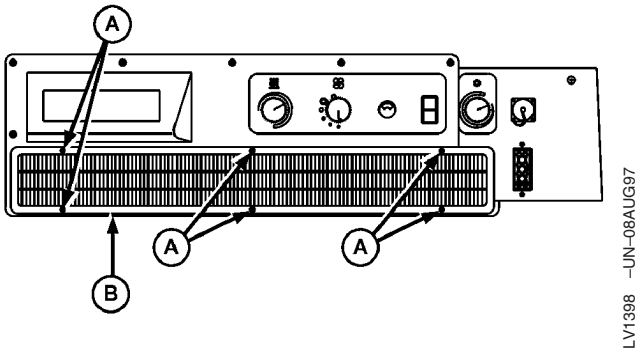
A—Screw (2 used)
B—Retainer Plate (2 used)
C—Filter Retainer
D—Filter

AG,OUO1085,217 –19–06SEP00–1/1

Remove and Install Front Headliner

1. Loosen six screws (A) and remove air recirculating intake cover and filter (B).

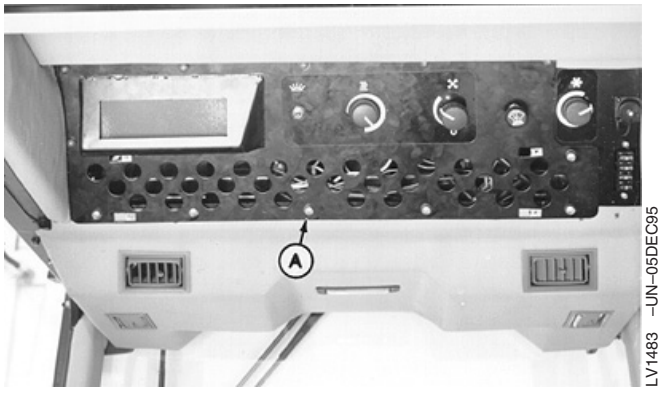
A—Screw (6 used)
B—Filter



AG,OUO1085,218 –19–17JUL02–1/3

2. Remove five screws (A) from bottom edge of control panel.

A—Screw (5 used)



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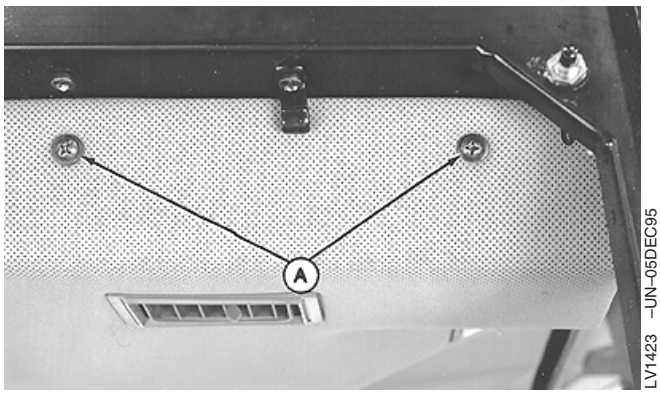
AG,OUO1085,218 –19–17JUL02–2/3

NOTE: Dome light is snap-fit in headliner. Remove dome light and push through opening when headliner is removed.

Headliner will drop when side mounting screws are removed.

3. Remove two screws (A) on both sides of headliner.
4. Remove headliner.
5. Install headliner and four screws (A).
6. Pull dome light through opening in headliner.
7. Install dome light.
8. Install control panel lower mounting screws and recirculating air intake cover and filter.



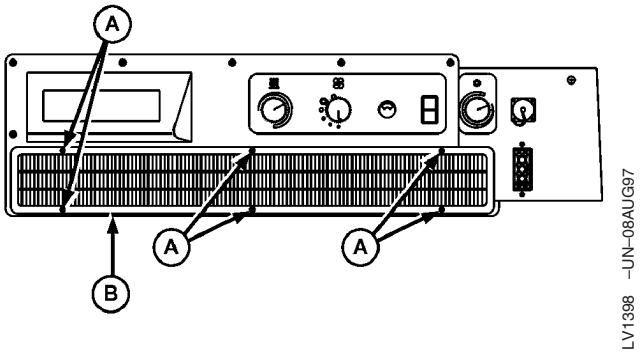
A—Screw (4 used)

AG,OUO1085,218 –19–17JUL02–3/3

Remove and Install Rear Headliner

1. Loosen six screws (A) and remove air recirculating intake cover and filter (B).

A—Screw (6 used)
B—Filter



AG,OUO1085,219 –19–17JUL02–1/3

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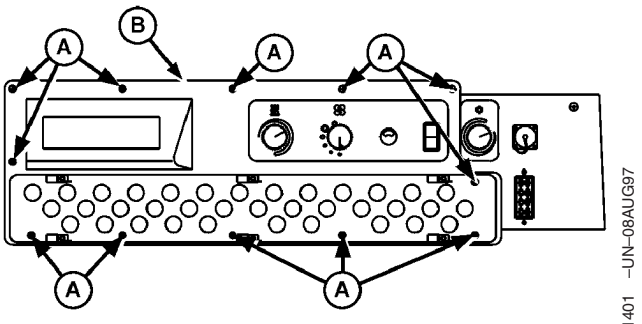
NOTE: Support control panel (B) using wire or rope to prevent weight of panel from pulling on wiring connectors and leads.

2. Remove twelve screws (A) and control panel (B). Support weight of control panel using wire or rope.

A—Screw (12 used)
B—Control Panel



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AG,OUO1085,219 –19–17JUL02–2/3

IMPORTANT: When removing rear headliner, make sure speakers located behind left and right side headliner do not get damaged.

3. Pull in and downward on front corners (A) of left and right side panels.

4. Remove rear headliner (B). Replace if necessary.

NOTE: Install back panel of headliner (B) into position first.

5. Install rear headliner.

6. Install control panel.

7. Install recirculating air intake cover and filter.

A—Front Corner
B—Rear Headliner

LV1421 –UN–10NOV95

Left Side Shown

AG,OUO1085,219 –19–17JUL02–3/3

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Remove and Install Lower Front Windows

1. Remove caps (A) to access window mounting hardware.

NOTE: Observe position and location of mounting hardware and rubber grommets during removal.

2. Remove lower mounting hardware first from window.

NOTE: Support lower front window to prevent it from falling when remaining hardware is removed.

3. Remove upper mounting hardware from window and remove window (B).

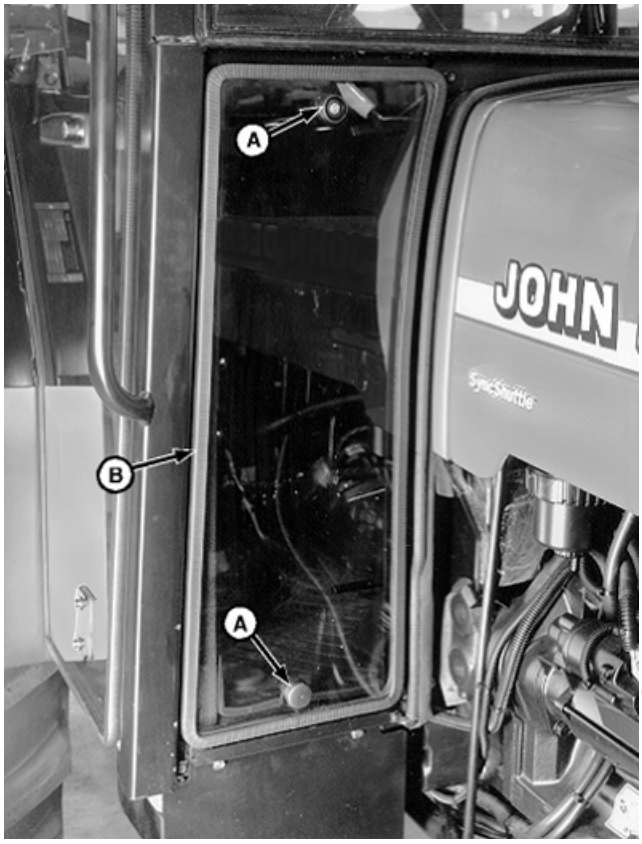
4. Repeat steps 1 through 3 for opposite side of cab if necessary.

5. Install window and mounting hardware. Tighten mounting hardware to specification.

Specification

Lower Front Window Mounting Hardware—Torque ..... 1.5 N•m (13.5 lb-in.)

A—Cap
B—Window



LV2276 –UN–20NOV97

AG,OUO1085,220 –19–17JUL02–1/1

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6

Remove and Install Windowpanes

NOTE: It is recommended that an auto glass dealer install the windowpanes. If an auto glass dealer is not installing the windowpanes, use the following procedure.

IMPORTANT: Windowpanes must have an ultraviolet barrier around the edge of the glass since ultraviolet rays will deteriorate the adhesive. Windowpanes ordered through John Deere parts have the ultraviolet barrier. If the windowpane is purchased through a glass dealer, the dealer must put an ultraviolet barrier on the glass. DO NOT apply paint to the border of the glass.

1. Remove and scrape broken glass off existing adhesive. DO NOT remove adhesive from window frame on cab.
2. Trim existing adhesive so it has a smooth surface.
3. Apply a 12.5 mm (1/2 in.) bead of adhesive on to of the existing adhesive.
4. Put a new windowpane into position. Use light hand pressure to force windowpane down around the edges until even with metal frame. DO NOT over-press adhesive.
5. Use tape to hold windowpane in place while adhesive cures.

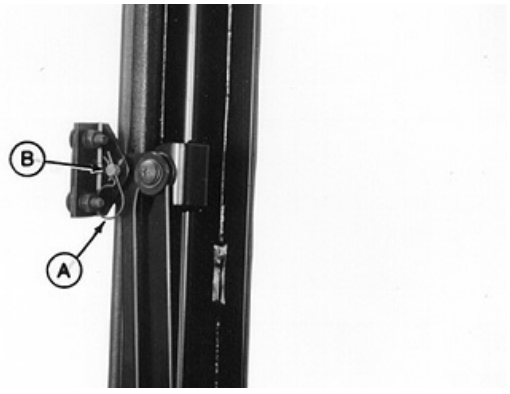
NOTE: This type of silicone adhesive sealant is cured by the water vapor in the air, and a vapor of acetic acid (vinegar-like odor) is released during curing time. If you still smell a vinegar-like odor, allow for a longer cure time.

6. Allow adhesive to cure for 24 hours at room temperature with at least a 50% relative humidity before operating machine.

Remove and Install Rear Window

1. Remove spring clip (A), pin, and wave washer (B) from both sides of rear window.

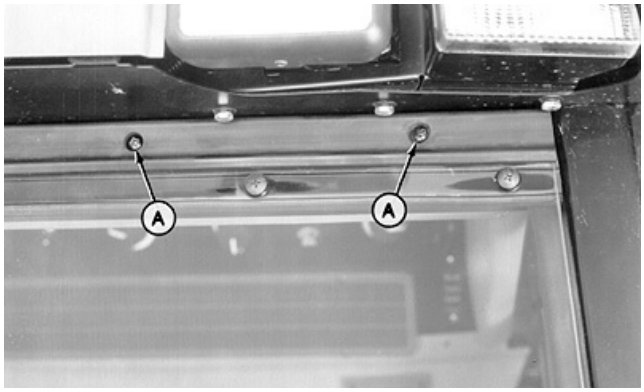
A—Spring Clip
B—Wave Washer



AG,OUO1085,222 –19–17JUL02–1/3

2. While supporting rear window, remove four screws (A). Remove rear window assembly.
3. Position window assembly against frame and install four screws (A).

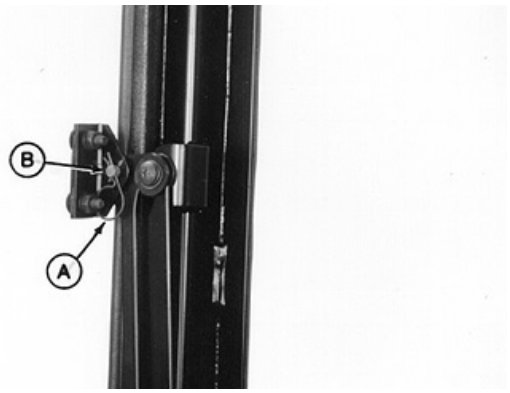
A—Screw (4 used)



AG,OUO1085,222 –19–17JUL02–2/3

4. Install pin and wave washer (B) and spring clip (A) on both sides of window.

A—Spring Clip
B—Wave Washer

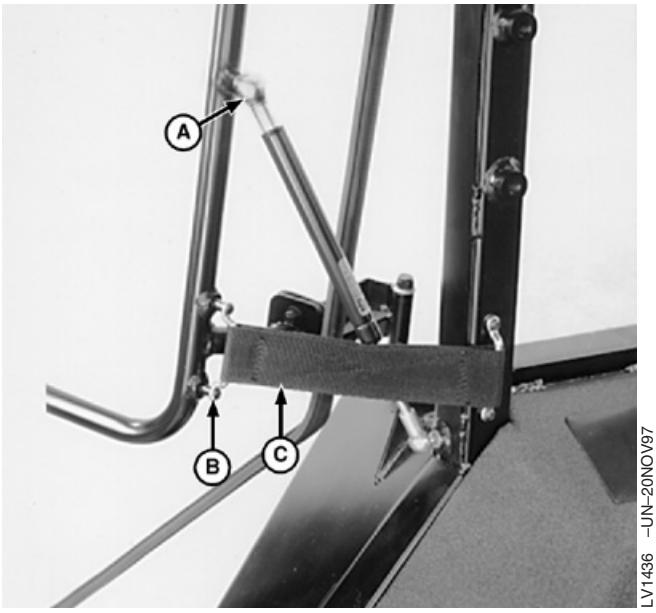


AG,OUO1085,222 –19–17JUL02–3/3

Remove and Install Cab Doors

1. Disconnect cylinder (A) from door.
2. Remove two screws (B) and disconnect strap (C) from door.

A—Cylinder
B—Screw (2 used)
C—Strap



LV1436 –UN–20NOV97

AG,OUO1085,223 –19–17JUL02–1/3

3. Attach a suitable hoist to cab door. Weight of door is approximately 23 kg (51 lbs).
4. Remove four screws, nuts, and washers from hinges (A). Remove door.
5. Repair or replace door as necessary.
6. Position door and align hinges (A). Install four screws, nuts, and washers.
7. Gently close cab door and check alignment of door latch and seal. Align if necessary.
8. Tighten hinge mounting screws to specification.

Specification

Cab Door Hinge Mounting Screws—Torque	27 N•m (20 lb-ft)

A—Hinge

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Continued on next page

AG,OUO1085,223 –19–17JUL02–2/3

9. Connect cylinder (A) to cab door.

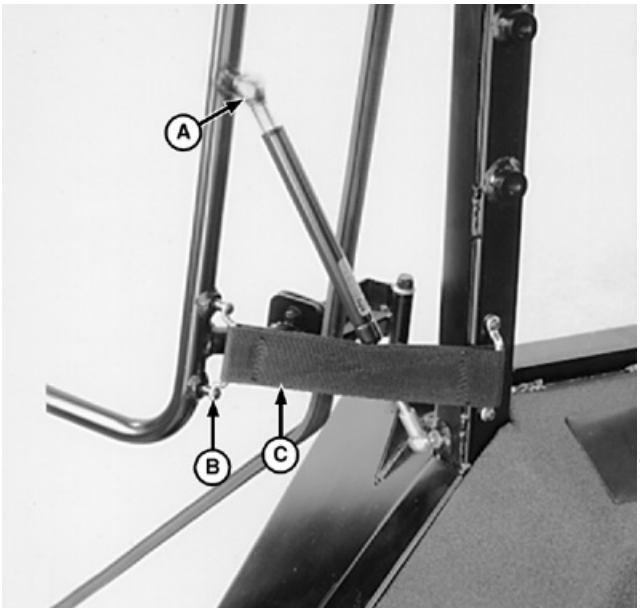
NOTE: Be sure door strap is installed between door and door cylinder.

10. Install bracket through loop on strap (C).

11. Install screws (B) and tighten securely.

12. Verify smooth operation of door and door latch. Adjust hinges if necessary.

A—Cylinder
B—Screw (2 used)
C—Strap



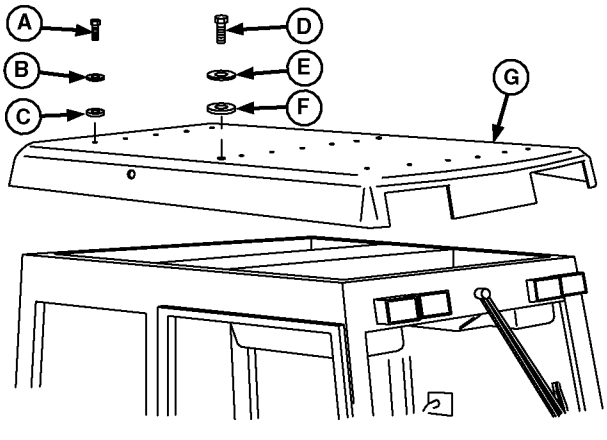
AG,OUO1085,223 –19–17JUL02–3/3

Remove and Install Cab Roof

1. Remove antenna. (See Replace Antenna in Section 40, Group 10.)
2. Remove twenty-eight cap screws (A) with lock washers (B) and flat washers (C).
3. Remove two bolts (D) with lock washers (E) and flat washers (F). Remove roof (G).

NOTE: Apply clear silicone adhesive sealant inside all tapped holes on cab roof. Purpose of sealant is to prevent leakage of pressurized air inside cab roof chamber.

4. Apply a bead of silicone adhesive sealant around circumference of roof and across all cross-members.
5. Install roof. Be sure antenna hole is on correct side, and that lower edges of roof overlap tabs on cab roof frame.
6. Install twenty-eight cap screws (A) with lock washers (B) and flat washers (C).
7. Install two bolts (D) with lock washers (E) and flat washers (F). Tighten all hardware securely.
8. Install antenna. (See Replace Antenna in Section 40, Group 10.)



A—Cap Screw (28 used)
B—Lock Washer (28 used)
C—Flat Washer (28 used)
D—Bolt (2 used)
E—Lock Washer (2 used)
F—Flat Washer (2 used)
G—Cab Roof

AG,OUO1085,224 –19–06SEP00–1/1

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Remove and Install Right-Side Control Console and Panel—Tractors With Cab

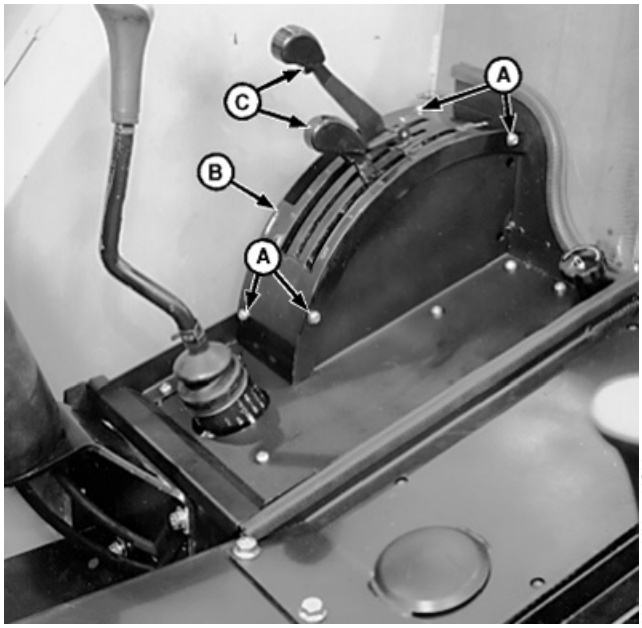
NOTE: It is not necessary to remove support plate under seat.

1. Remove seat. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)

NOTE: Avoid removing knobs from rockshaft control levers to prevent damage to knobs. Remove knobs only if necessary.

2. Remove four screws (A). Lift cover (B) up to access rockshaft control levers mounting hardware (not shown). Remove levers (C) and cover (B).

A—Screw (4 used)
B—Cover
C—Lever



LV2386 –UN–20NOV97

AG,OUO1085,227 –19–17JUL02–1/3

NOTE: To avoid damage to cab upholstery during installation and removal, place thin rigid cardboard or plastic panel between inside cab walls and control panel.

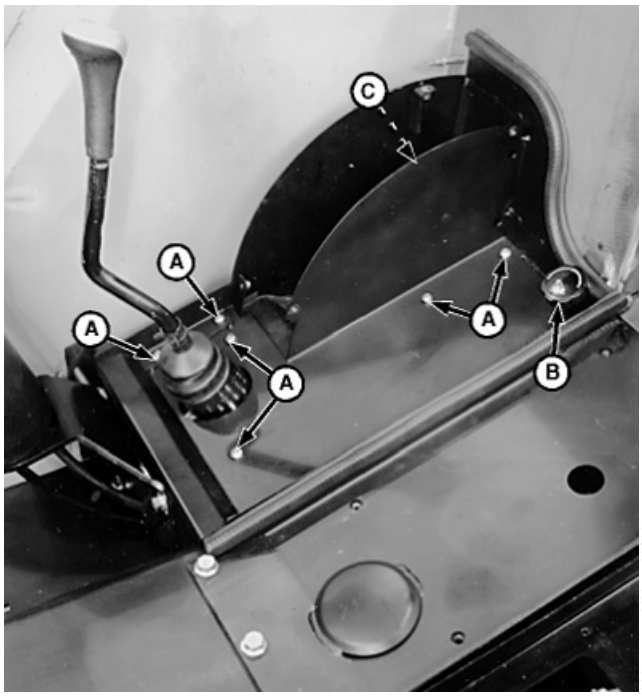
3. Remove six screws (A) and knob (B).

4. Remove screw and plastic tub (C).

5. Remove right-side control console. Make repairs as necessary.

NOTE: To aid during installation of plastic tub under right-side control console, tie or tape in place under control console.

6. Install right-side control console and plastic tub (C) with screws (A).



LV2387 –UN–20NOV97

A—Screw (6 used)
B—Knob
C—Plastic Tub

Continued on next page

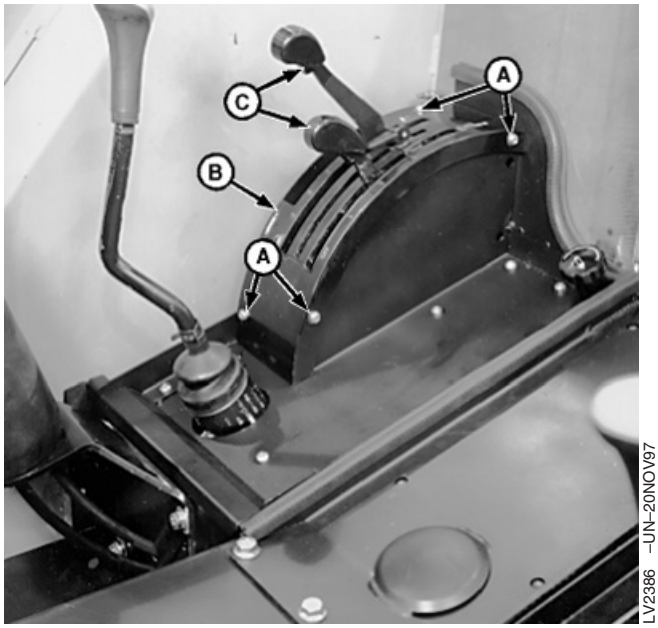
AG,OUO1085,227 –19–17JUL02–2/3

7. Place levers (C) through cover (B) and install levers to controls using four cap screws.

8. Install screws (A).

9. Install seat. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)

A—Screw (4 used)
B—Cover
C—Lever



LV2386 –UN–20NOV97

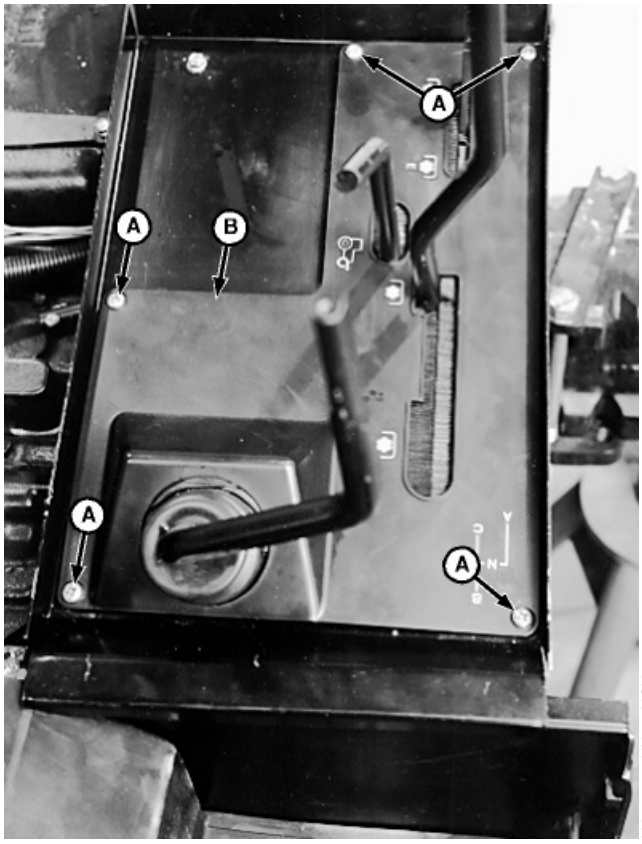
AG,OUO1085,227 –19–17JUL02–3/3

Remove and Install Left-Side Control Console—Tractors With Cab

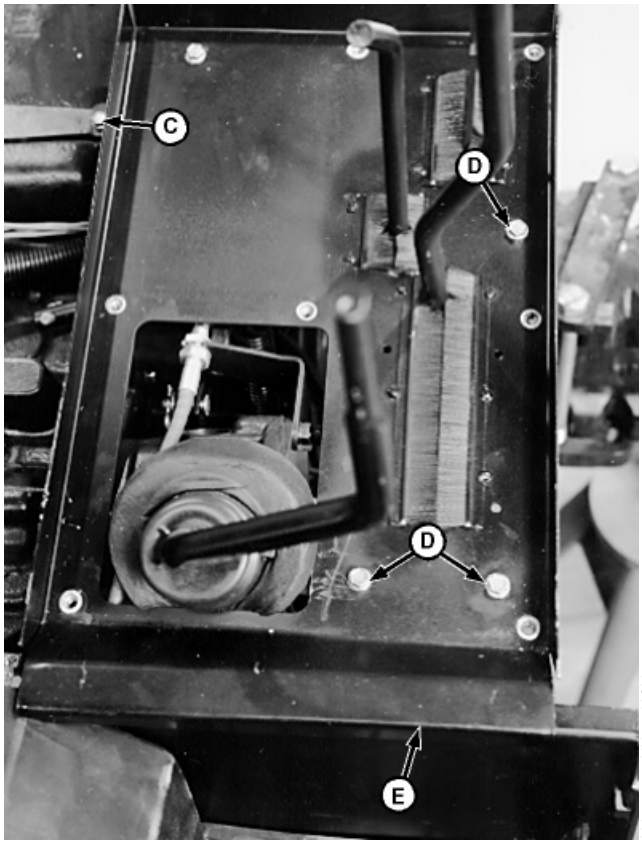
NOTE: To avoid damage to cab upholstery during installation and removal, place thin rigid cardboard or plastic panel between inside cab wall and control panel.

1. Remove seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)
2. Remove knobs from all control levers on left-side control console.
3. Remove five screws (A) and control console (B).
4. Remove screws (C and D) and left-side panel (E). Make repairs as necessary.
5. Install panel (E) using screws (C and D).
6. Install console (B), screws (A), and control knobs.
7. Install seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)

A—Screw (5 used)
B—Control Console
C—Screw
D—Cap Screw (3 used)
E—Control Panel



LV2388 –UN–21NOV97

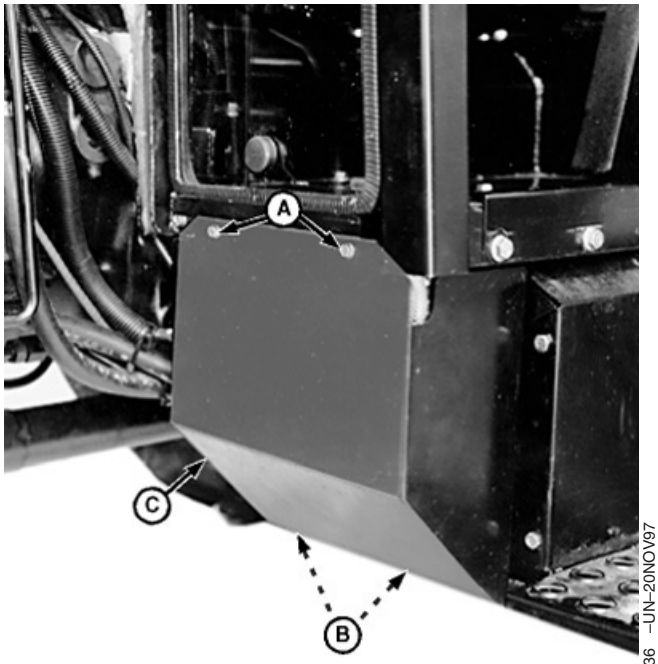


LV2389 –UN–21NOV97

AG,OUO1085,230 –19–06SEP00–1/1

Cab Remove and Install

1. Disconnect battery, negative (–) cable first. Remove battery.
2. Drain fuel tank and radiator.
3. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in Group 20.)
4. Remove rear wheels and support tractor on suitable jack stands.
5. Remove two screws (A) and screws and nuts (B) securing crop guard (C) to cab. Remove crop guard.
6. Remove battery box.
7. Remove mid-mount coupler bracket, if equipped.



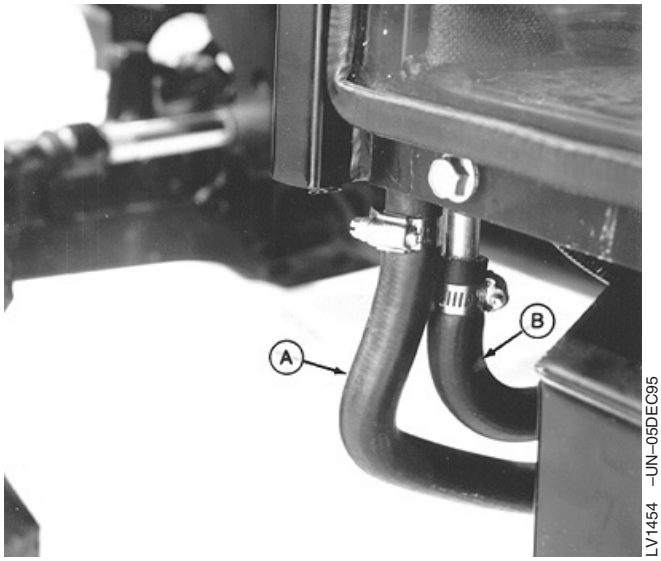
LV2336 –UN–20NOV97

A—Screw (2 used)
B—Screw and Nut
C—Crop Guard

AG,OUO1085,231 –19–17JUL02–1/20

NOTE: Close all openings using caps and plugs.

8. Disconnect two coolant hoses (A and B) at left front corner of cab. Tag hoses for identification to aid during installation. Cap or plug hoses and tubes.



LV1454 –UN–05DEC95

A—Coolant Hose
B—Coolant Hose

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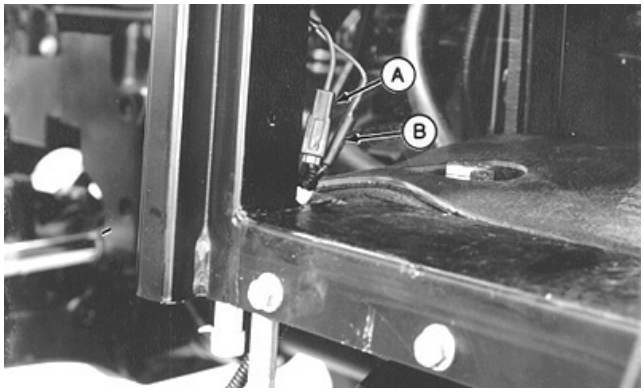
AG,OUO1085,231 –19–17JUL02–2/20

NOTE: Cut all wiring tie straps as necessary.

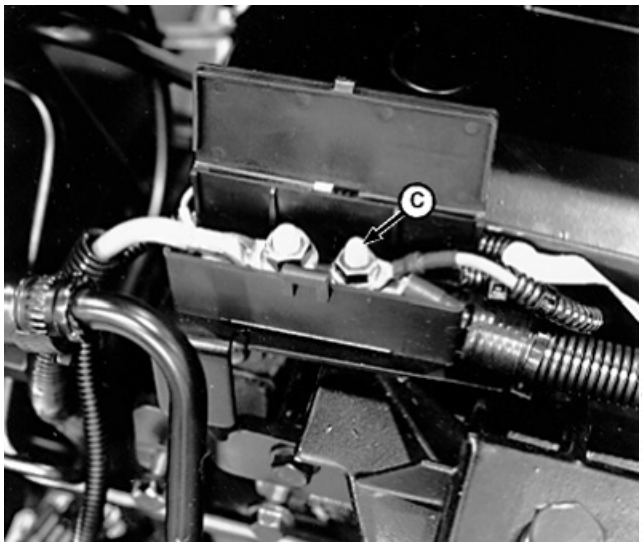
9. Remove lower trim strip from inside of left front cab post. Disconnect two wiring connectors (A and B). Pull wires through bottom of cab post.

10. Follow remaining red wire lead 002C from left cab post to fuse link junction block on right side of engine and remove red wire lead 002C from right post (C). Pull wire lead away from tractor.

A—Wiring Connector
B—Wiring Connector
C—Right Post



LV1455 –UN–05DEC95



LV2337 –UN–20NOV97

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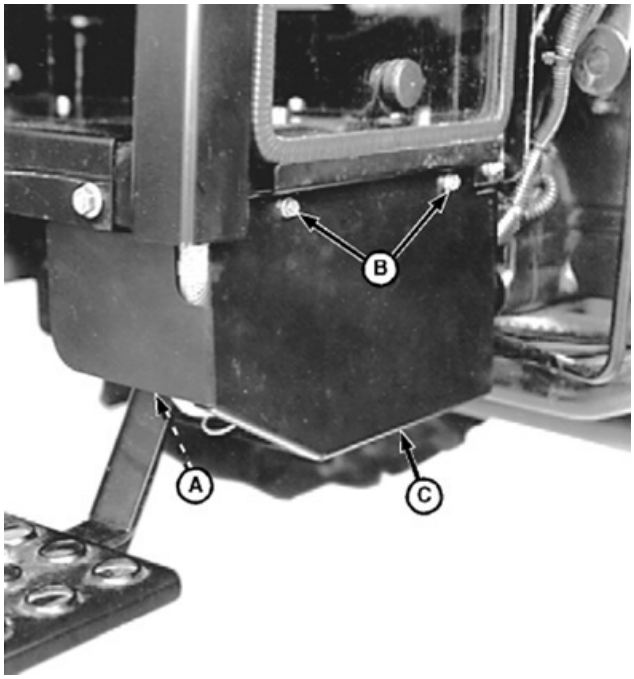
AG,OUO1085,231 –19–17JUL02–3/20

11. Remove three cap screws and nuts (A) and two cap screws (B) securing crop guard (C) to cab. Remove crop guard.

A—Cap Screw and Nut (3 used)
B—Cap Screw (2 used)
C—Crop Guard



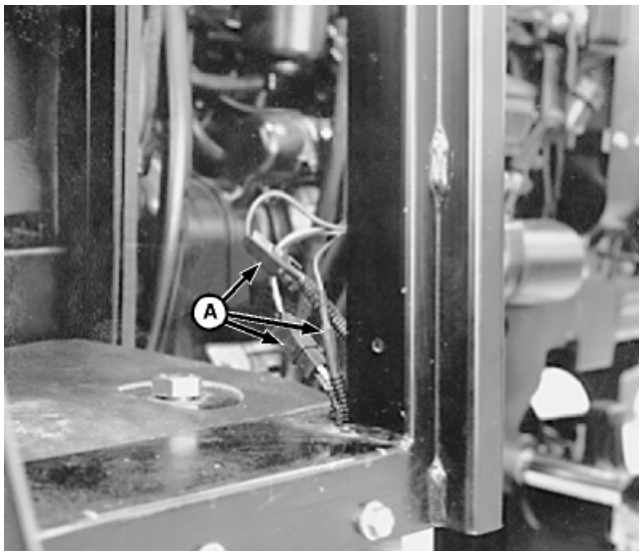
LV2338 –UN–20NOV97

AG,OUO1085,231 –19–17JUL02–4/20

NOTE: Cut all wiring tie straps as necessary.

12. Remove lower trim strip from inside of right front cab post. Disconnect wiring connectors (A). Pull wires through bottom of cab post.

A—Wiring Connector



LV2339 –UN–16DEC97

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AG,OUO1085,231 –19–17JUL02–5/20

13. Disconnect A/C Tubing (A). Cap tube ends to prevent contamination.

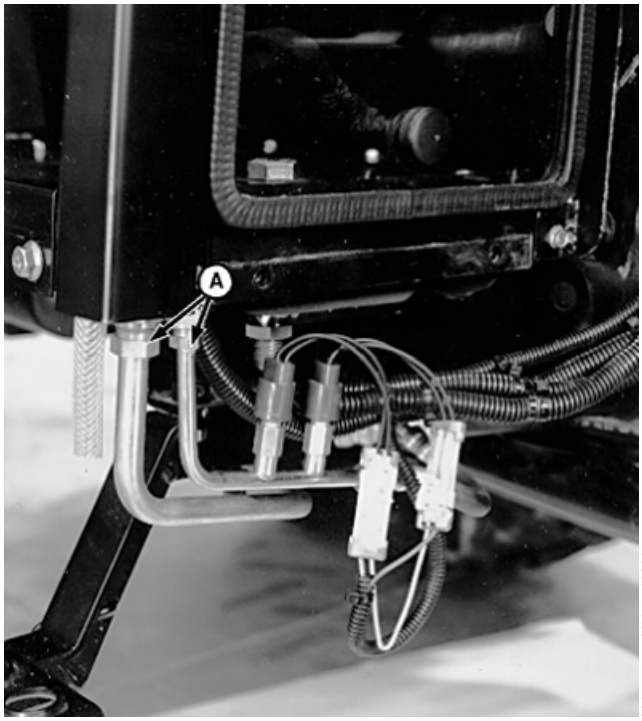
14. At location in front of left rear axle:

    - Disconnect fuel supply line and fuel return line going to fuel tank. Cap or plug all openings.
    - Disconnect wire #118A (cab rear tail lights circuit).
    - Cut all tie straps as necessary.

15. At location in front of right rear axle:

    - Disconnect fuel level sender wiring connector.
    - Cut all tie straps as necessary.

A—A/C Tubing



LV2340 –UN–20NOV97

AG,OUO1085,231 –19–17JUL02–6/20

16. Remove five cap screws and nuts (A), and two screws (B). Repeat this procedure for opposite side of cab.

A—Cap Screw and Nut (5 used)
B—Screw (2 used)

LV2341 –UN–20NOV97

Continued on next page

AG,OUO1085,231 –19–17JUL02–7/20

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17. Remove two screws (A). Repeat this procedure for opposite side of cab.

18. Remove left- and right-side lower front cab windows. (See Remove and Install Lower Front Windows in this group.)

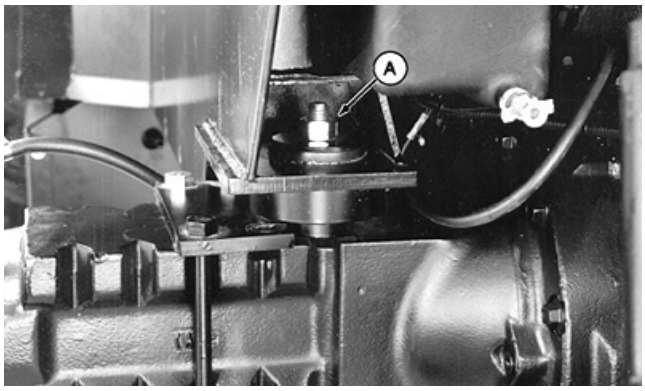
A—Screw (2 used)

AG,OUO1085,231 –19–17JUL02–8/20

19. Remove nut (A), flat washer, and rubber washer from left and right rear cab mounts.

20. Position draft and center lift links fully downward for clearance during cab removal.

A—Nut



Left Rear Cab Mount Shown

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19

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AG,OUO1085,231 –19–17JUL02–9/20

21. Install JDG1580 Cab Lifting Bar (A) to a suitable hoist.

22. Remove retaining lock pin (B) and eye bolt (C) from cab lifting bar (A). Repeat this step on opposite end of cab lifting bar.

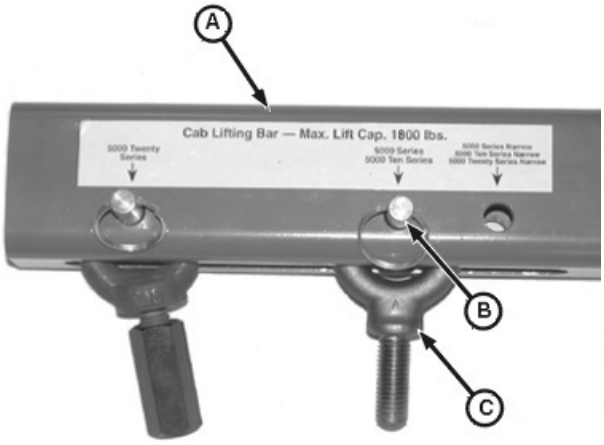
IMPORTANT: Make sure not to crack or damage cab outer roof when installing eye bolt.

23. Remove two large cap screws located on cab roof and install two 5/8 in. eye bolts (C) in cab roof. Make sure not to crack or damage cab outer roof when installing eye bolt.

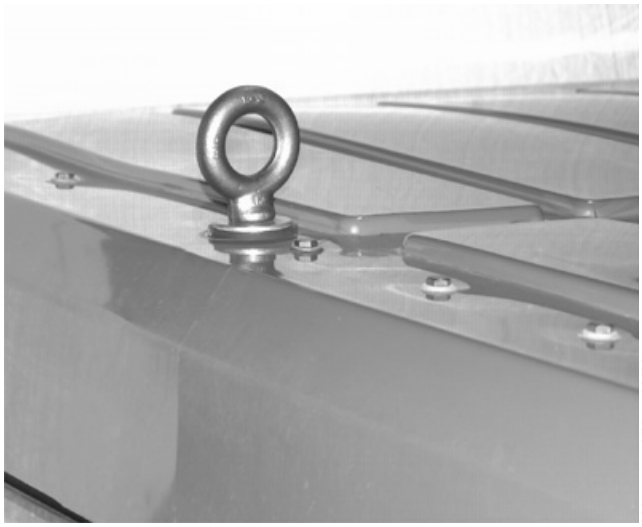
A—Cab Lifting Bar JDG1580
B—Retaining Lock Pin
C—Eye Bolt (5/8 in.)

LV7556 –UN–26OCT01

Cab Lifting Bar JDG1580



LV7930 –UN–22MAY02



LV7927 –UN–22MAY02

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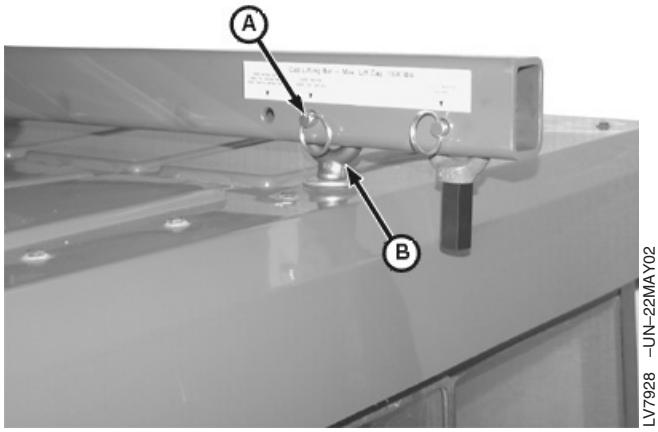
AG,OUO1085,231 –19–17JUL02–10/20

24. Position hoist and cab lifting bar over tractor.

25. Attach middle holes in cab lifting bar to both 5/8 in. eye bolts (B) using retaining pins (A) as shown. Repeat this step for opposite side of cab.

A—Retaining Lock Pin (2 used)
B—Eye Bolt (5/8 in.) (2 used)



LV7928 –UN–22MAY02

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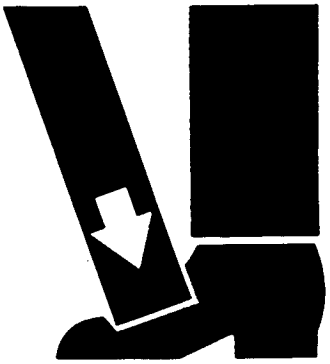
AG,OUO1085,231 –19–17JUL02–11/20

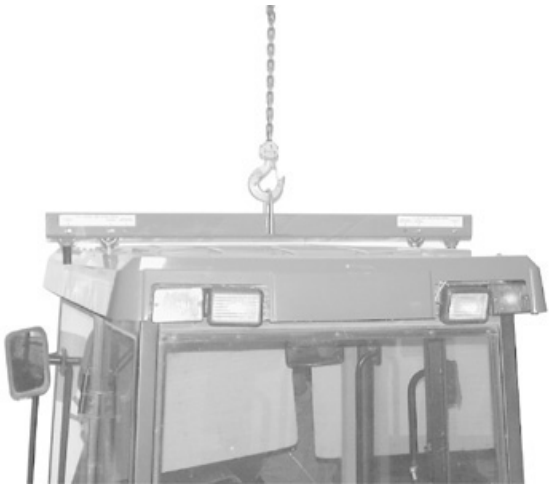
CAUTION: Use proper lifting equipment. Lifting the cab from this tractor without using the essential cab lifting bar in this procedure can cause severe injury or damage to cab.

IMPORTANT: Cab must be removed rearward from the tractor.

Lift cab slowly! Check all disconnect points to ensure all hoses, tubes, and wires have been disconnected and that there is no binding. Be careful not to tear cab upholstery on control levers. Ensure that rear of cab does not catch on tub under right-side control console.



TS226 –UN–23AUG88



LV7929 –UN–22MAY02

26. Raise cab slowly and remove from tractor.
27. Lower cab to rest on jack stands or blocks of wood.
28. Make sure rear rubber cab grommets do not stay inside rear cups of cab mounts. Remove rubber grommets from rear cup mounts.
29. With cab off, make repairs to cab or tractor as necessary.

NOTE: If necessary, remove cab floor plates. (See Cab Floor Plates Remove and Install—Early Model Tractors or Cab Floor Plate Remove and Install—Later Model Tractors in this group.)

Continued on next page

AG,OUO1085,231 –19–17JUL02–12/20

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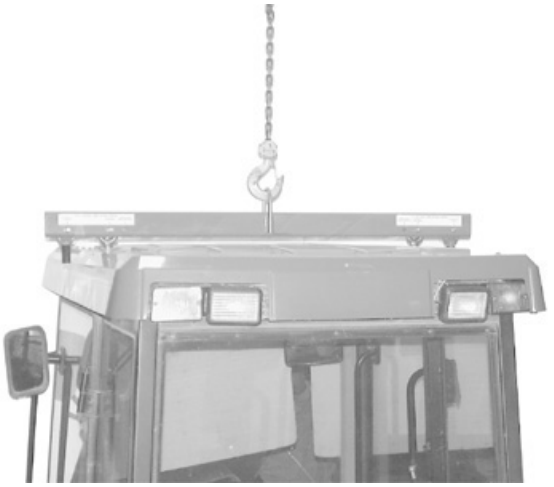
NOTE: Place thin rigid cardboard or plastic panels against inside cab walls to prevent control levers and console from tearing upholstery when cab is lowered.

Do not pinch or bind wires, cables, or hoses when installing cab.

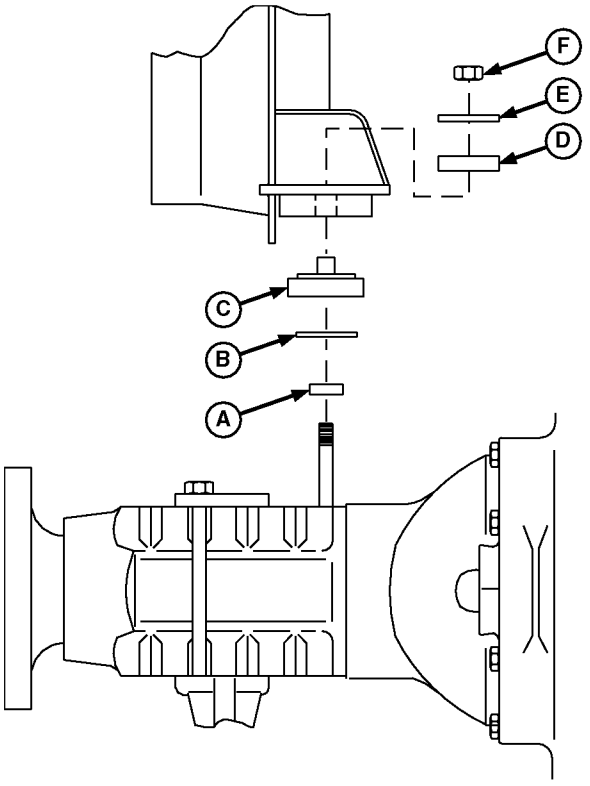
30. Install spacer (A) and washer (B) on chassis. Install rubber mount (C) into cup on bottom of cab. Repeat this procedure for opposite side of cab.

31. Carefully lower cab onto chassis. Install rubber washer (D), flat washer (E), and nut (F), but do not tighten nut at this time. Repeat this procedure for opposite side of cab.

A—Spacer
B—Washer
C—Rubber Mount
D—Rubber Washer
E—Washer
F—Nut



LV7929 –UN–22MAY02



LV1627 –UN–13FEB96

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AG,OUO1085,231 –19–17JUL02–13/20

NOTE: Use a floor jack under floor plate to raise or lower floor plate to aid during installation of cab to floor plate mounting hardware.

32. Install the five cap screws and nuts (A) and two screws (B). Repeat this procedure for opposite side of cab. Tighten screws and nuts securely.

33. Tighten nuts for rear cab mounts (previously installed) to specification.

Specification

Rear Cab Mount Nuts—Torque ..... 203 N•m (150 lb-ft)

34. At location in front of left rear axle:

    - Connect fuel supply line and fuel return line going to fuel tank.
    - Connect wire #118A (cab rear tail lights circuit).
    - Install tie straps as necessary.

35. At location in front of right rear axle:

    - Connect fuel level sender wiring connector.
    - Install tie straps as necessary.

LV2341 –UN–20NOV97

A—Cap Screw and Nut (5 used)
B—Screw (2 used)

Continued on next page

AG,OUO1085,231 –19–17JUL02–14/20

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36. Install lower front cab windows on both sides of cab. (See Remove and Install Lower Front Windows in this group.)

37. Install two cap screws (A); the longer of the two screws installs in upper inside corner. Repeat this procedure for opposite side of cab.

A—Cap Screw (2 used)

AG,OUO1085,231 –19–17JUL02–15/20

38. Route wiring harness through right-side cab post and connect wiring connectors (A).

39. Install lower right-side trim strip on interior cab post.

A—Wiring Connector

Continued on next page

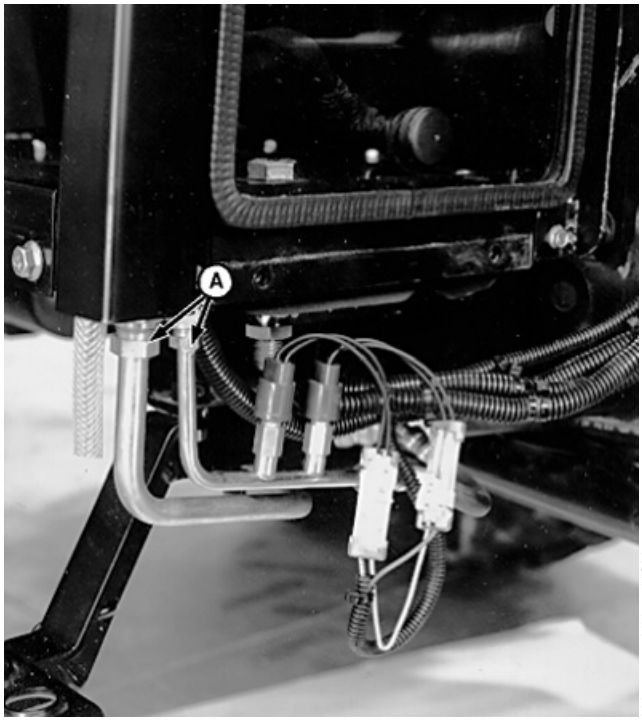
AG,OUO1085,231 –19–17JUL02–16/20

NOTE: Install new O-rings in A/C tubing. Used or damaged O-rings and seals will leak.

40. Connect A/C tubing (A) at right front corner of cab. Install tie straps as necessary.

41. Install right-side crop guard to front of cab.

A—A/C Tubing



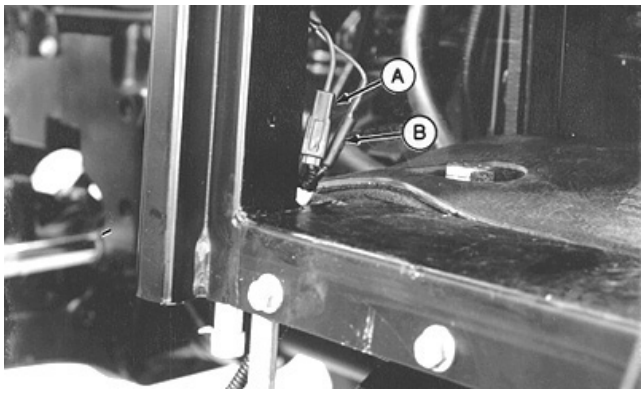
LV2340 –UN–20NOV97

AG,OUO1085,231 –19–17JUL02–17/20

42. Route wiring harness through left-side cab post. Connect wiring connectors (A and B) at left front cab post.

43. Install lower trim strip on interior cab post.

A—Wiring Connector
B—Wiring Connector



LV1455 –UN–05DEC95

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AG,OUO1085,231 –19–17JUL02–18/20

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44. Connect coolant hoses (A and B) at left front corner of cab using tags for identification added during removal.

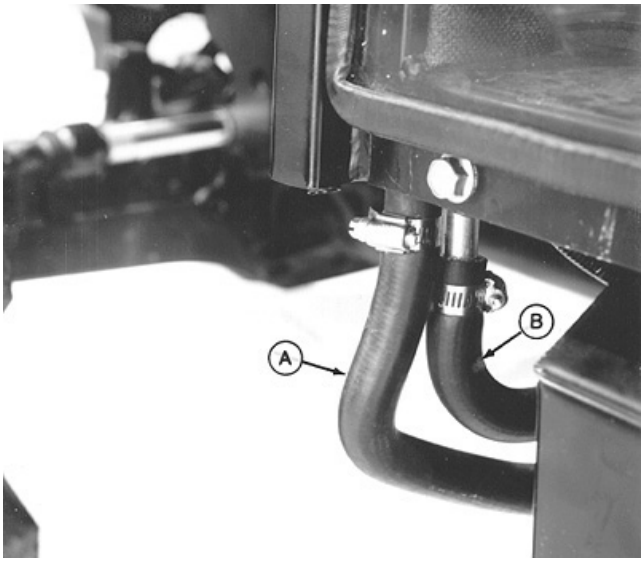
45. Connect red wire lead 002D/E from left cab post to right post (C) of fuse link junction block on right side of engine.

46. Install tie straps as necessary.

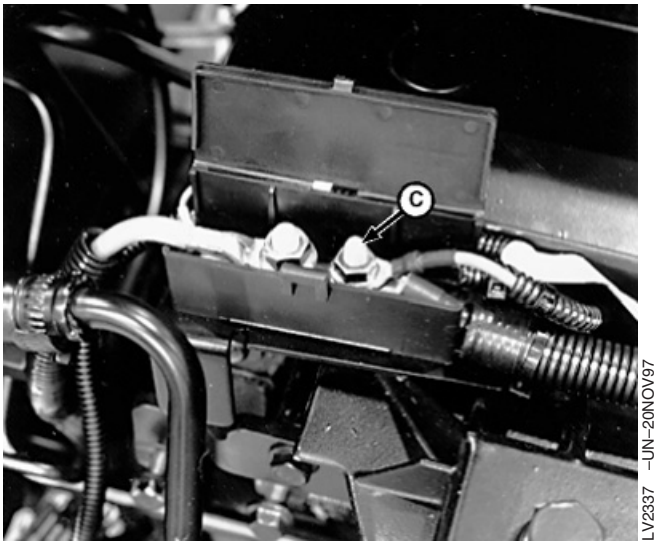
47. Install battery box and battery.

48. Install mid-mount coupler bracket, if removed.

A—Coolant Hose
B—Coolant Hose
C—Right Post



LV1454 –UN–05DEC95



LV2337 –UN–20NOV97

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AG,OUO1085,231 –19–17JUL02–19/20

49. Install crop guard (C) on front of cab using cap screws (A) and screws and nuts (B).

50. Install rear wheels. Tighten cap screws to specification.

Specification

Rear Wheel Cap Screws—Torque..... 175 N•m (130 lb-ft)

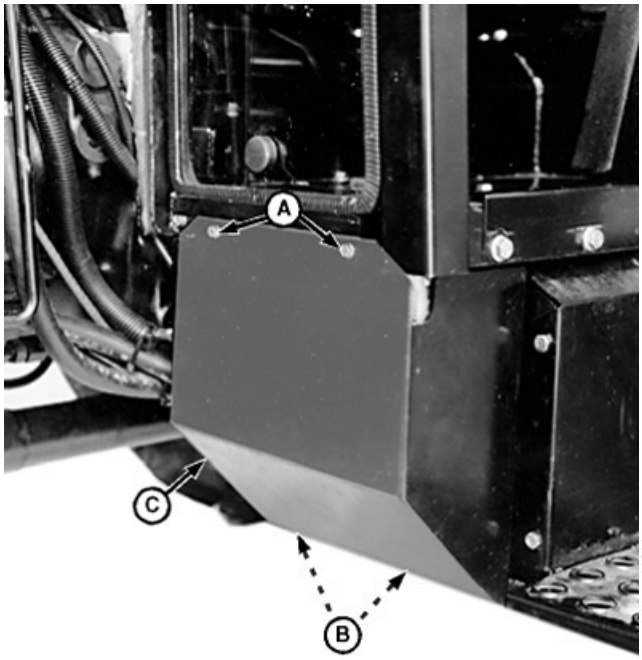
51. Connect battery, positive (+) cable first.

52. Fill fuel tank and radiator.

53. Evacuate and charge air conditioning system. (See Evacuate Air Conditioning System and Charge Air Conditioning System in Group 20.)

54. Start engine and allow it to reach proper operating temperature. Check coolant level in radiator and add coolant as necessary. See Operator's Manual for coolant recommendations.

55. Perform Operational Checkout Procedures. See Section 210, Group 10 of this manual and also Operator's Manual.



LV2336 –UN–20NOV97

A—Cap Screw
B—Screw and Nut
C—Crop Guard

AG,OUO1085,231 –19–17JUL02–20/20

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Cab Floor Plate Remove and Install—Later Model Tractors

1. Remove cab. (See Cab Remove and Install in this group.)
2. Remove seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in this group.)
3. Remove floor mat and sound suppression mat from cab floor.
4. Remove left- and right-side control consoles and panels. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in this group.)
5. Remove battery. (See Remove and Install Battery—Tractors With Cab in Section 40, Group 05.)

Continued on next page

AG,OUO1085,232 –19–17JUL02–1/7

6. Remove nut, cap screw, flat washer, and rubber washer (A). Repeat this step for opposite side of tractor.

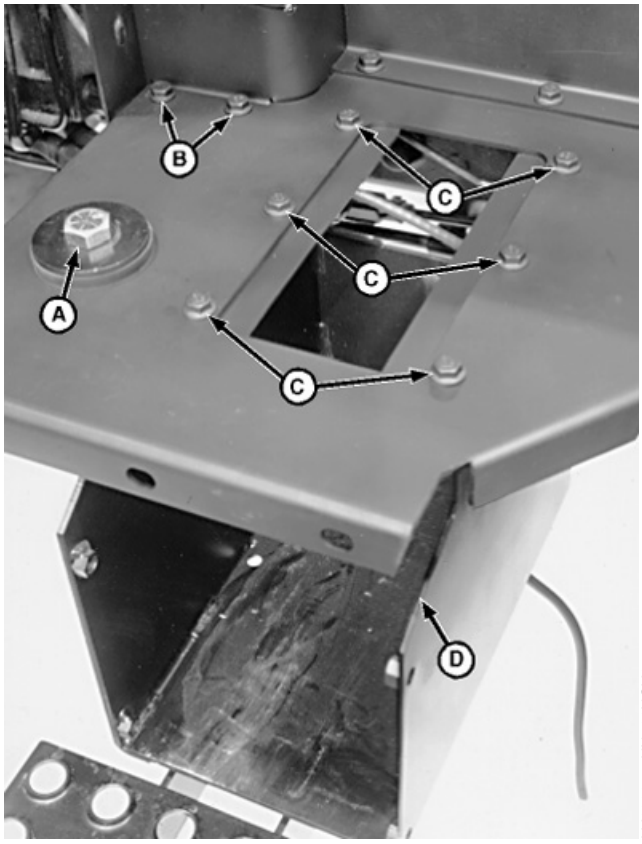
7. Remove two cap screws (B). Repeat this step for opposite side of tractor.

NOTE: Install a floor jack under battery box to support battery box during removal.

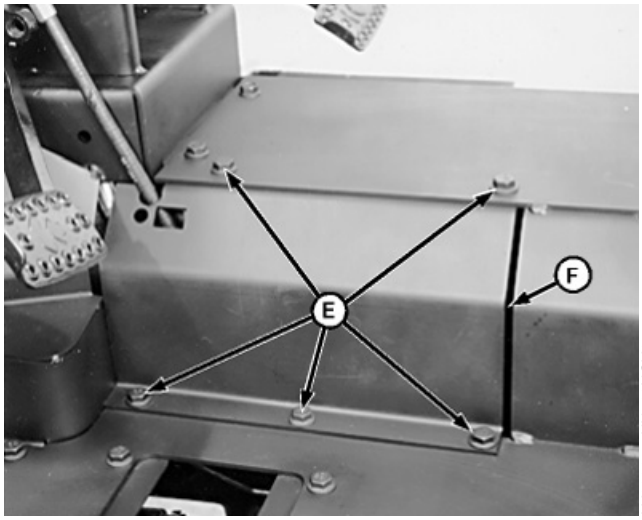
8. Install a floor jack under battery box and remove six cap screws (C) and battery box (D).

9. Remove five cap screws (E) and cover plate (F).

A—Nut, Cap Screw, Flat Washer, and Rubber Washer (2 used)
B—Cap Screw (4 used)
C—Cap Screw (6 used)
D—Battery Box
E—Cap Screw (5 used)
F—Cover Plate



LV2390 –UN–20NOV97



LV2391 –UN–20NOV97

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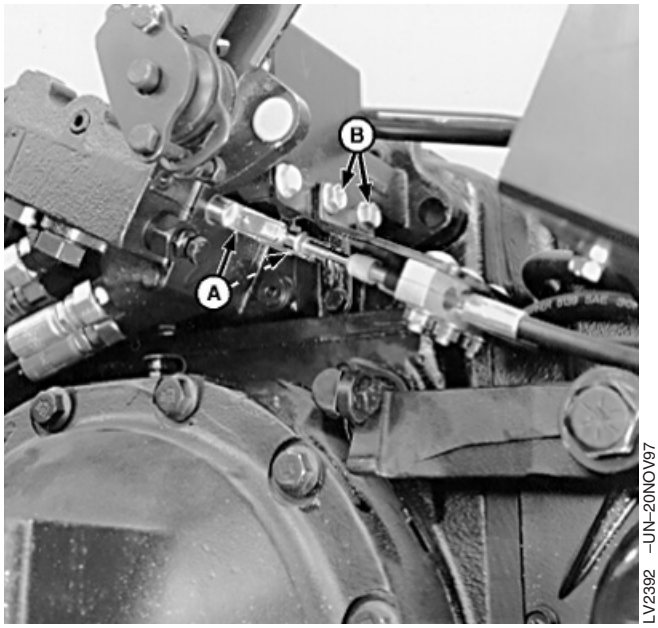
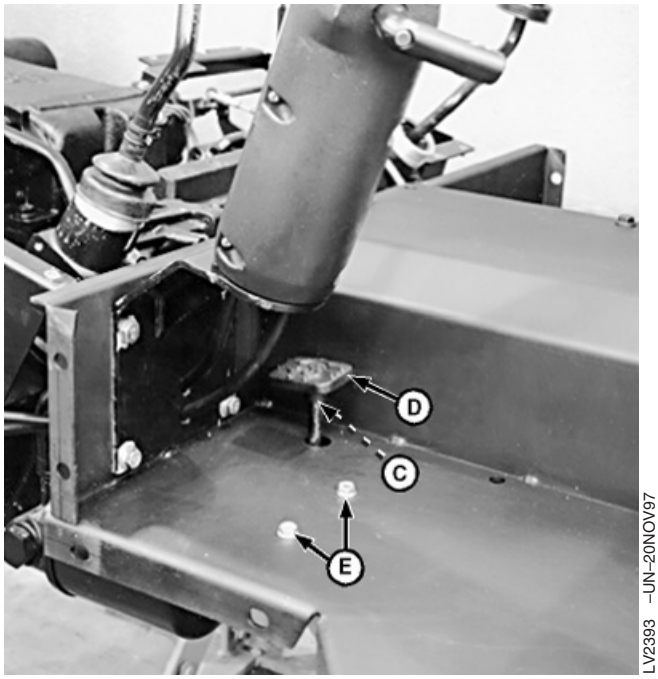
AG,OUO1085,232 –19–17JUL02–2/7

10. Disconnect joystick control cables (A) and remove two cap screws (B).
11. Remove split pin (C) using a punch and hammer.
12. Remove differential lock pedal (D) from lever.
13. Remove receiver-dryer support bracket cap screws (E).

A—Joystick Control Cables
B—Cap Screw (2 used)
C—Split Pin
D—Differential Lock Pedal
E—Cap Screw (2 used)



LV2392 –UN–20NOV97



LV2393 –UN–20NOV97

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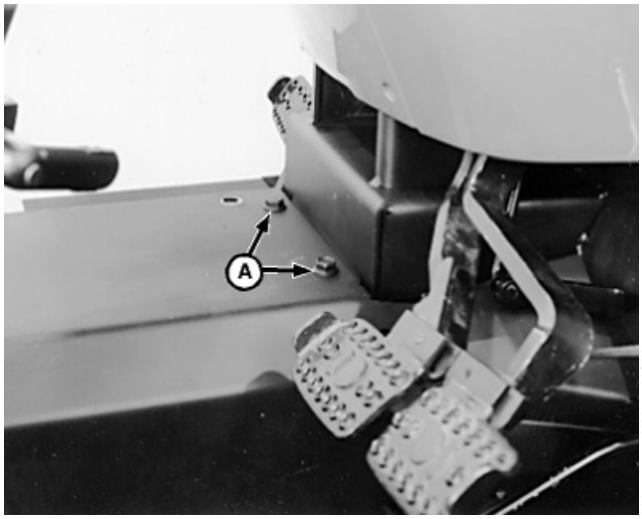
AG,OUO1085,232 –19–17JUL02–3/7

14. Remove two cap screws (A) and throttle pedal. Remove floor plate. Make repairs as necessary.

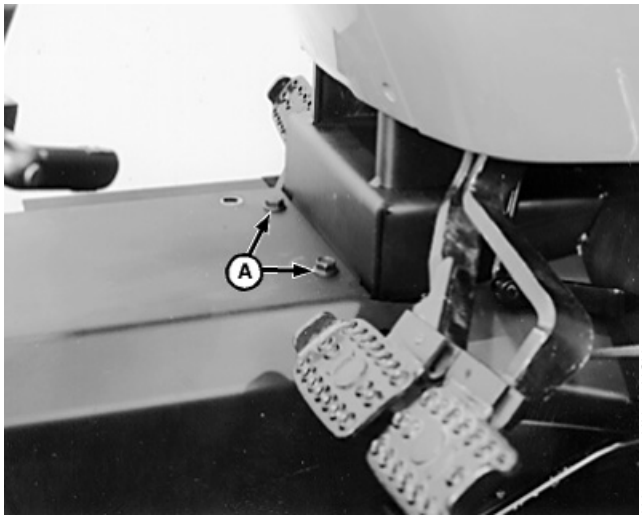
A—Cap Screw (2 used)



AG,OUO1085,232 –19–17JUL02–4/7

15. Install cab floor plate, two cap screws (A), and throttle pedal.

A—Cap Screw (2 used)



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AG,OUO1085,232 –19–17JUL02–5/7

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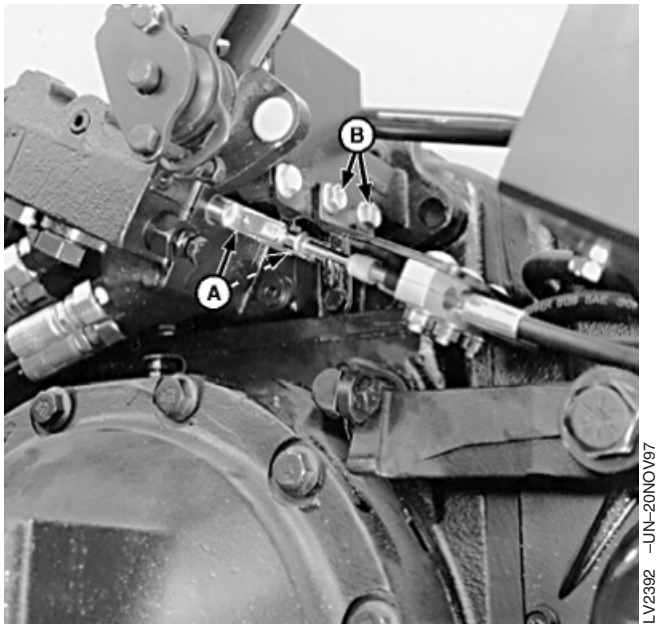
32

16. Connect joystick control cables (A) and install cap screws (B) securing control cable bracket.

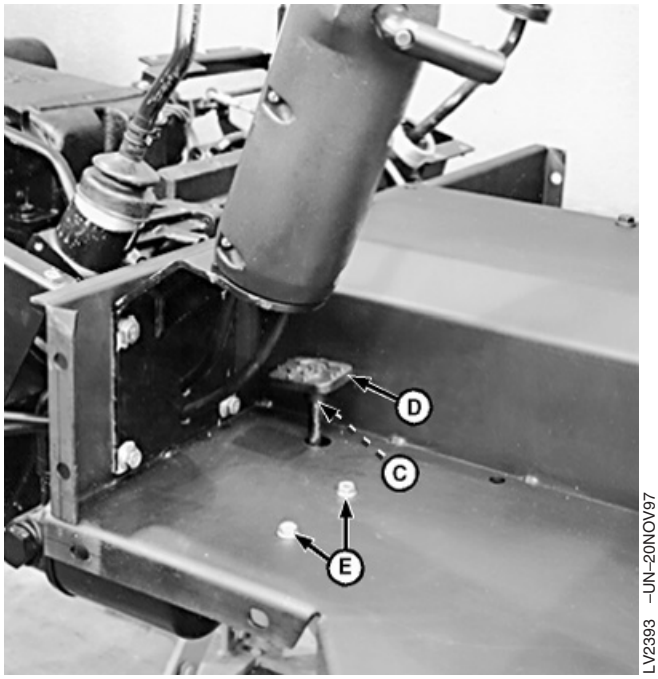
17. Install pedal (D) and split pin (C).

18. Position receiver-dryer support bracket under floor plate and install cap screws (E).

A—Joystick Control Cables
B—Cap Screw (2 used)
C—Split Pin
D—Differential Lock Pedal
E—Cap Screw (2 used)



LV2392 –UN–20NOV97



LV2393 –UN–20NOV97

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AG,OUO1085,232 –19–17JUL02–6/7

19. Install cap screw, flat washer, rubber washer, and nut (A). Repeat this step for opposite side of tractor.

20. Install two cap screws (B). Repeat this step for opposite side of tractor.

NOTE: Use a floor jack under battery box to support battery box during installation.

21. Install battery box (D) and six cap screws (C).

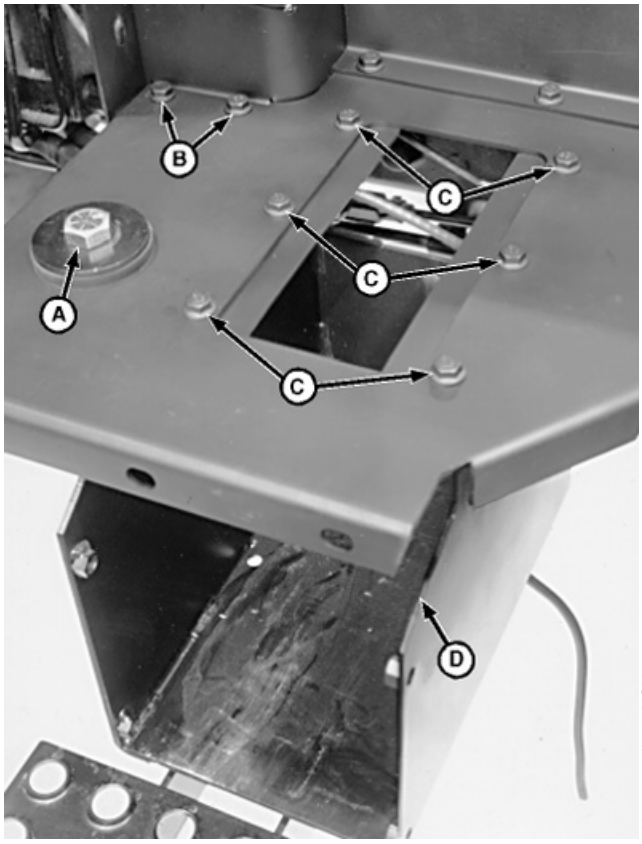
22. Install cover plate (F) and cap screws (E).

23. Install sound suppression and floor mat on cab floor.

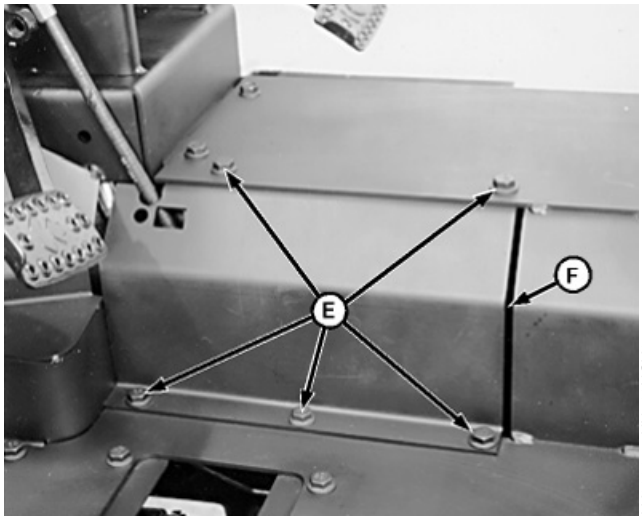
24. Install left- and right-side control consoles and panels. (See Remove and Install Left-Side Control Console—Tractors With Cab and Remove and Install Right-Side Control Console and Panel—Tractors With Cab in this group.)

25. Install seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)

26. Install cab. (See Cab Remove and Install in this group.)



LV2390 –UN–20NOV97



LV2391 –UN–20NOV97

A—Nut, Cap Screw, Flat Washer, and Rubber Washer (2 used)
B—Cap Screw (4 used)
C—Cap Screw (6 used)
D—Battery Box
E—Cap Screw (5 used)
F—Cover Plate

AG,OUO1085,232 –19–17JUL02–7/7

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34

Cab Floor Plates Remove and Install—Early Model Tractors

1. Remove cab. (See Cab Remove and Install in this group.)
2. Remove seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)
3. Remove floor mat and sound suppression mat from cab floor.
4. Remove left- and right-side control consoles and panels. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab and Remove and Install Left-Side Control Console—Tractors With Cab in this group.)
5. Remove battery. (See Remove and Install Battery—Tractors With Cab in Section 40, Group 05.)

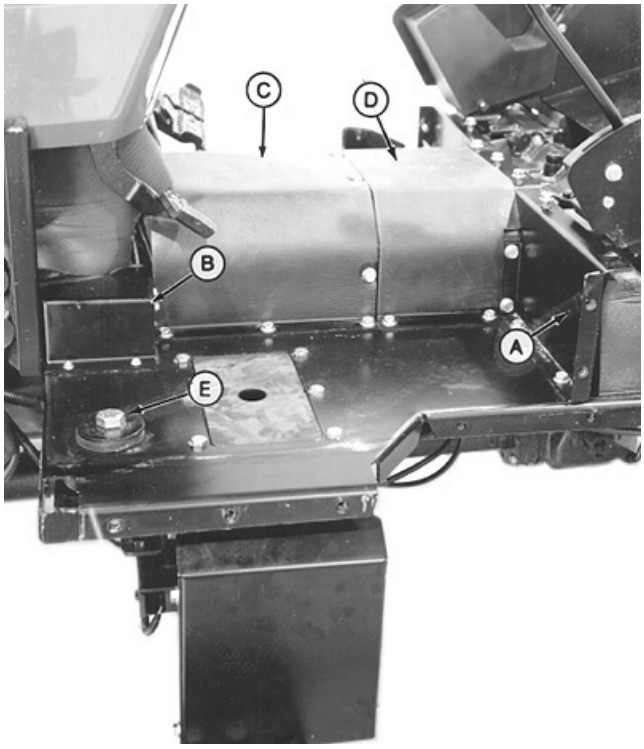
Continued on next page

AG,OUO1085,233 –19–08SEP00–1/3

6. Remove foot throttle lever.
7. Remove heel plate (A). Repeat for opposite side.
8. Remove lower cowl sealing bracket (B). Repeat for opposite side.
9. Remove front transmission cover (C).

CAUTION: Support cab floor plates with a hoist or stands before removing rear transmission cover.

10. With cab floor plates adequately supported, remove rear transmission cover (D).
11. Remove bolt (E) with flat washer and rubber washer. Repeat for opposite side of tractor.
12. Remove floor plates. Make repairs as necessary.



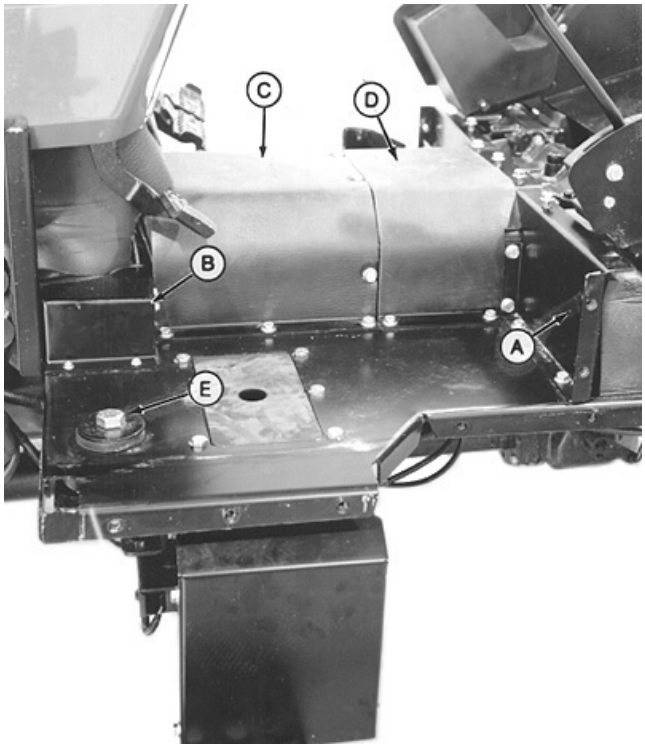
LV1462 –UN–05DEC95

A—Heel Plate (2 used)
B—Sealing Bracket
C—Front Transmission Cover
D—Rear Transmission Cover
E—Bolt (2 used)

Continued on next page

AG,OUO1085,233 –19–08SEP00–2/3

13. Install floor plates.
14. Install bolt (E) with flat washer and rubber washer. Repeat for opposite side of tractor.
15. Install rear transmission cover (D).
16. Install front transmission cover (C).
17. Install lower cowl sealing bracket (B). Repeat for opposite side.
18. Install heel plate (A). Repeat for opposite side.
19. Install foot throttle lever.
20. Install battery. (See Remove and Install Battery—Tractors With Cab in Section 40, Group 05.)
21. Install left- and right-side control consoles and panels. (See Remove and Install Left-Side Control Console—Tractors With Cab and Remove and Install Right-Side Control Console and Panel—Tractors With Cab in this group.)
22. Install floor mat and sound suppression mat from cab floor.
23. Install seat and support. (See Remove and Install Seat and Support Plate—Tractors With Cab in Group 05.)
24. Install cab. (See Cab Remove and Install in this group.)



LV1462 –UN–05DEC95

A—Heel Plate (2 used)
B—Sealing Bracket
C—Front Transmission Cover
D—Rear Transmission Cover
E—Bolt (2 used)

AG,OUO1085,233 –19–08SEP00–3/3

Essential Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

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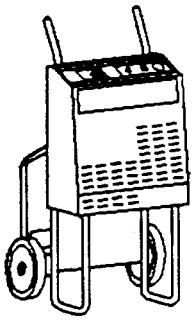
OUO1080,000026F –19–02JUL02–1/12

Recovery and Recycling Station . . . . . JT02050[1]

Servicing air conditioning system using R134a refrigerant.



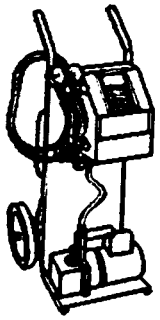
RW21613 –UN–17AUG92

[1]Used with JT02046 Charging Station. JT02047 Recovery, Recycling, and Recharging Station can be substituted for JT02046 and JT02050.

OUO1080,000026F –19–02JUL02–2/12

Charging Station . . . . . JT02046[1]

Servicing air conditioning system using R134a refrigerant.



RW21595 –UN–17AUG92

[1]Used with JT02050 Recovery and Recycling Station. JT02047 Recovery, Recycling, and Recharging Station can be substituted for JT02046 and JT02050.

OUO1080,000026F –19–02JUL02–3/12

RW19932 –UN–19MAY92

A/C Compressor Clutch Spanner JDG747

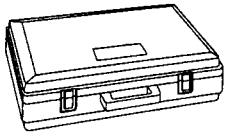
Remove compressor clutch.

OUO1080,000026F –19–02JUL02–4/12

RW40022 –UN–08SEP93

Pulley Remover D05277ST

Remove compressor pulley.



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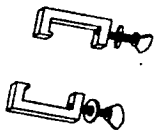
OUO1080,000026F –19–02JUL02–5/12

RW19935 –UN–19MAY92

Jaws JDG748

Removing compressor pulley (used with D05277ST Puller).



OUO1080,000026F –19–02JUL02–6/12

RW21598 –UN–17AUG92

Forcing Screw Pilot. JDG771

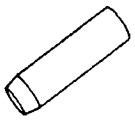
Removing compressor clutch.

OUO1080,000026F –19–02JUL02–7/12

RW19943 –UN–19MAY92

Compressor Seal Protector JDG746

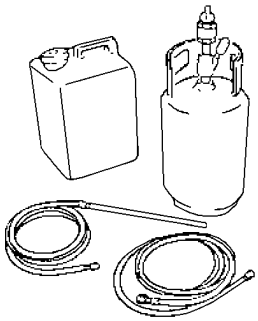
Install seal on compressor.



OUO1080,000026F –19–02JUL02–8/12

Air Conditioning Flushing Unit JT02075

Flush air conditioning system.



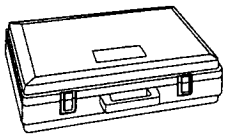
RW25566 –UN–16DEC96

OUO1080,000026F –19–02JUL02–9/12

RW40022 –UN–08SEP93

Flushing Attachment Kit. JT02078

Flush air conditioning system.



OUO1080,000026F –19–02JUL02–10/12

RW40022 –UN–08SEP93

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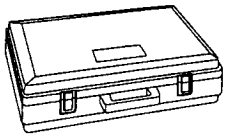
Air Conditioning R12/134a Fitting Unit JT02098

Connect flushing, purging, and pressure equipment.



OUO1080,000026F –19–02JUL02–11/12

Recovery, Recycling, and Charging Station JT02047

Servicing air conditioning system using R134a refrigerant

OUO1080,000026F –19–02JUL02–12/12

Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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OUO1080,0000270 –19–02JUL02–1/4

Electronic Leak Detector JT02081

Detect refrigerant leaks

OUO1080,0000270 –19–02JUL02–2/4

Compressor Holding Fixture . . . . . .DFRW20[1]

Hold compressor during repair

[1]*Dealer Fabricated Tool—See Section 299*

OUO1080,0000270 –19–02JUL02–3/4

Manifold Pressure Gauge Assembly JT02051

Test air conditioning system

OUO1080,0000270 –19–02JUL02–4/4

Other Material

Number	Name	Use
TY15949 (12 oz) (U.S.) TY15950 (15 lb) (U.S.) TY15951 (30 lb) (U.S.)	Refrigerant R134a	Charge the system.
TY22025 (8.5 oz.) (U.S.)	R134a Compressor Oil	Lubricate the system
2004 (U.S.)	Genesolv Solvent	Flushing air conditioning systems
JT02077 (U.S.)	ART338 A/C Flushing Solvent	Flushing air conditioning systems
673 (U.S.)	Naphtha Parts Solvent	Flushing air conditioning systems
TY16134 (U.S.)	R134a Flushing Solvent	Flush system

OUO1080,0000271 –19–02JUL02–1/1

Specifications

Item	Measurement	Specification
Compressor Shaft Bolt	Torque	14 N•m (10 lb-ft)
Compressor Through Bolts	Torque	26 N•m (19 lb-ft)
Compressor Pulley-to-Clutch Hub	Clearance	0.35—0.65 mm (0.014—0.026 in)
Compressor Relief Valve	Torque	12—16 N•m (9—12 lb-ft)
Manifold-to-Compressor Cap Screws	Torque	26 N•m (19 lb-ft)
Evacuating System	Vacuum	94.4 kPa (0.9 bar) (28.6 in. Hg) required at sea level
Flushing Solvent—Suction Port	Volume	240 ml (8 fl oz)
Flushing Solvent—Discharge Port	Volume	120 ml (4 fl oz)
Clutch Coil	Current Draw	2.6 amps at 12 volts, 20° C (68°F)
Clutch Coil	Resistance	3.5—4.0 ohms at 20° C (68°F)
Compressor Discharge Line	Torque	32—40 N•m (24—29 lb-ft)
Compressor Suction Line	Torque	34—42 N•m (25—31 lb-ft)

OUO1080,0000272 –19–02JUL02–1/1

Service Parts Kits

The following kits are available through your parts catalog:

- Compressor Shaft Seal Kit
- Compressor Clutch Hub and Pulley Kit
- Compressor Clutch Coil Kit
- Compressor Hardware Kit

AG,OUO1085,234 –19–08SEP00–1/1

Hose and Tubing O-Ring Connector Torques

Metal Tube Outside Diameter	Thread and Fitting Size	Torque	
1/4	7/16	14—20 N•m	10—15 lb-ft
3/8	5/8	14—20 N•m	10—15 lb-ft
1/2	3/4	33—39 N•m	24—29 lb-ft
5/8	7/8	35—42 N•m	26—31 lb-ft
3/4	1-1/16	41—47 N•m	30—35 lb-ft

AG,OUO1085,295 –19–17JUL02–1/1

Recover/Recycle Air Conditioning Refrigerant

Operate the air conditioning system for 10 minutes with engine at 2000 rpm if the compressor is operable. Set temperature control for maximum cooling and blower switch at high. This allows the refrigerant oil to be circulated through the system and indicates the quantity of oil in the compressor.

Stop the engine and use the following procedure to recover and recycle the A/C refrigerant.

IMPORTANT: Use only R134a Refrigerant Recovery, Recycling, and Charging machines. Do not mix R134a equipment, refrigerant, and refrigerant oils with R-12 systems to prevent compressor damage.

1. Connect JT020 R134a Refrigerant Recovery and Recycling Unit to a JT02046 HFC134a Refrigerant Charging Unit.

NOTE: JT02047 R134a Refrigerant Recovery, Recycling, and Charging Unit can be substituted for the JT02046 and JT02050.

2. Connect low-side hose (blue) from the charging unit to suction fitting (A) on the compressor. Connect high-side hose (red) to the discharge fitting (B) on the compressor.

3. Follow the manufacturer's instructions and discharge the system. Cap the fittings to prevent contamination from entering the system.

A—Suction Fitting (Low Side)
B—Discharge Fitting (High Side)

AG,OUO1085,235 –19–08SEP00–1/1

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Replace Air Conditioning Receiver-Dryer

NOTE: The receiver-dryer is not serviceable. If malfunction is suspected, install new receiver-dryer.

If the air conditioning system is discharged for servicing and the receiver-dryer is two years old or older, it should be replaced. If receiver-dryer is less than two years old, it should be replaced only if the system was contaminated.

1. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in this group.)

NOTE: Receiver-dryer is located under right-side cab floor.

2. Remove right-side crop guard.

NOTE: Cap or plug all lines to prevent contamination.

3. Disconnect lines (A and B) from receiver-dryer. Cap or plug all lines to prevent contamination

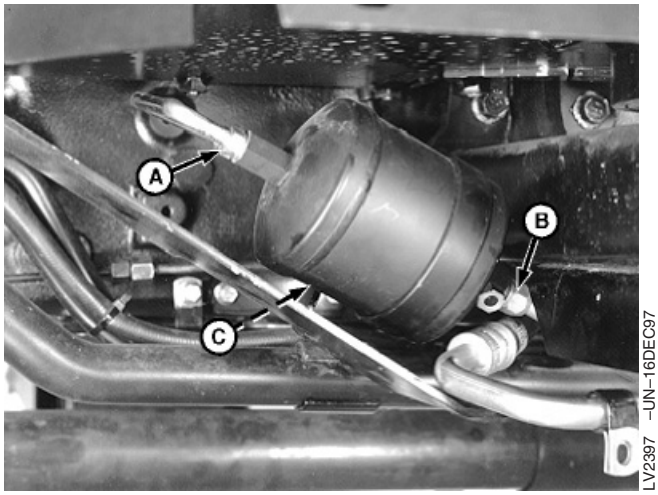
4. Remove nut and cap screw (C) located between receiver-dryer and transmission housing. Replace receiver-dryer.

NOTE: When a new receiver-dryer is installed and there were no leaks found in the system, add 15 ml (0.5 oz) of R134a refrigerant oil. If leaks are evident in the system, follow procedure for checking and adding refrigerant oil. (See Determine Correct Refrigerant Oil Charge in this group.)

5. Install receiver-dryer marked (TOP) in up position. Tighten lines (A and B).

6. Install and tighten cap screw and nut (C).

7. Evacuate and charge the system. (See Evacuate Air Conditioning System and Charge Air Conditioning System in this group.)



LV2397 –UN–16DEC97

A—Line
B—Line
C—Cap Screw and Nut

AG,OUO1085,236 –19–17JUL02–1/1

Remove, Inspect, and Install Air Conditioning Condenser

1. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in this group.)
2. Remove right and left side grille panels.

NOTE: Cap or plug all lines to prevent contamination.

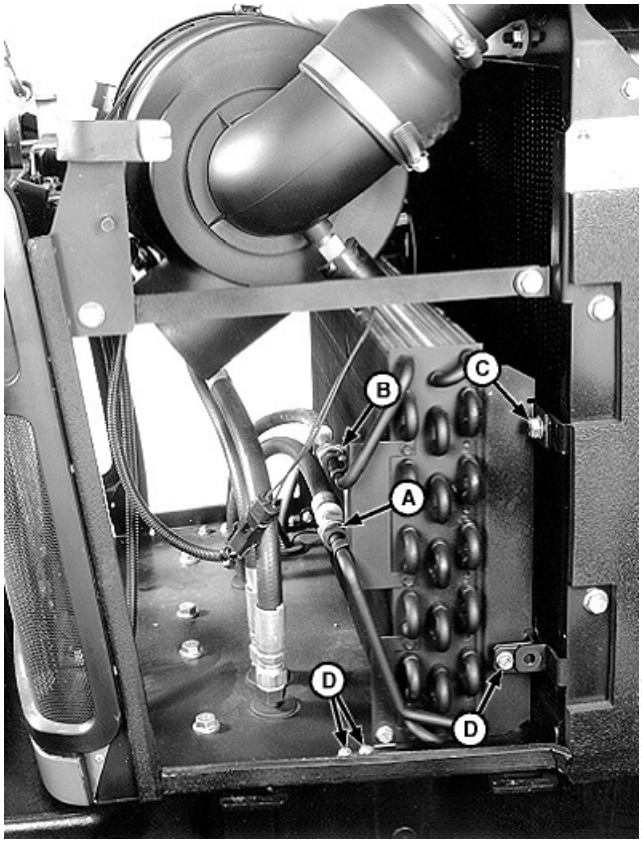
3. Disconnect condenser outlet line (A) and inlet line (B). Cap or plug all lines to prevent contamination
4. Remove nut (C) from each side of condenser.
5. Remove cap screws and nuts (D) from each side of condenser.
6. Remove and inspect condenser.

CAUTION: Reduce compressed air to less than 210 kPa (2 bar) (30 psi) when using for cleaning purposes between fins. Clear area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

7. Check condenser for debris lodged in fins. Clean condenser using compressed air or pressure washer.
8. Inspect condenser for bent fins, cracks, and damaged seams. Repair as necessary.
9. Test condenser for leaks by spraying the surface using a 50-50 mixture of liquid soap and water.
10. Cap or plug the outlet tube on the condenser.
11. Apply 689 kPa (68.9 bar) (100 psi) of air pressure to the inlet tube and check for leaks.

NOTE: Minor leaks may be repaired, but condenser should be replaced if there is a major leak or restriction.

12. Repair or replace condenser unit as required.



A—Condenser Outlet Line
B—Condenser Inlet Line
C—Nut (2 used)
D—Cap Screw and Nut (6 used)

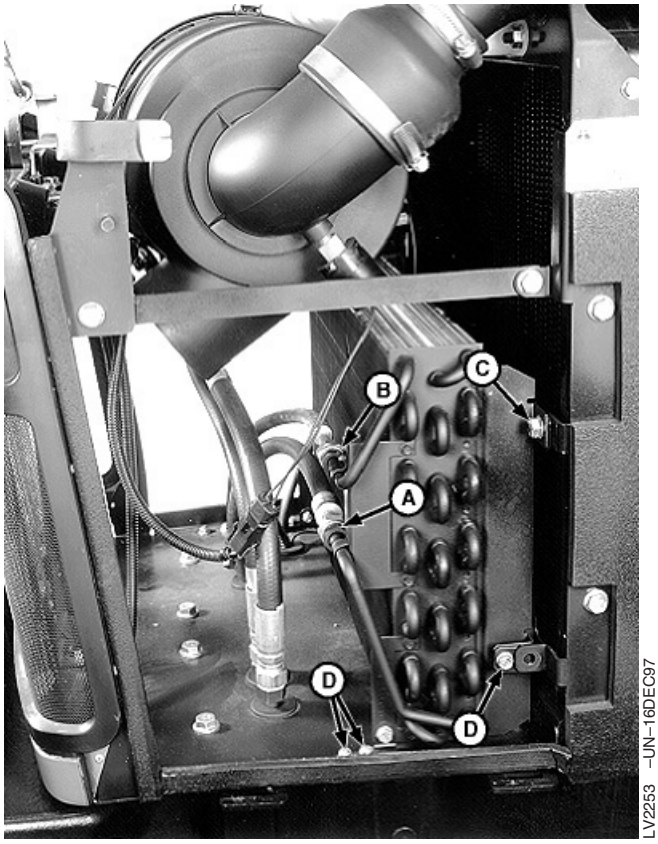
Continued on next page

AG,OUO1085,237 –19–08SEP00–1/2

IMPORTANT: Always use new O-rings and seals. Damaged or used O-rings and seals will leak.

13. Flush the air conditioning condenser if condenser was tested for leaks using air pressure. (See Flush Air Conditioning System in this group.)
14. Install air conditioning condenser.
15. Install cap screws and nuts (D) on each side of condenser.
16. Install nuts (C) on each side of condenser.
17. Connect condenser outlet line (A) and inlet line (B).
18. Install right and left side grille panels.
19. Evacuate and charge air conditioning system. (See Evacuate Air Conditioning System and Charge Air Conditioning System in this group.)

A—Condenser Outlet Line
B—Condenser Inlet Line
C—Nut (2 used)
D—Cap Screw and Nut (6 used)



LV2253 –UN–16DEC97

AG,OUO1085,237 –19–08SEP00–2/2

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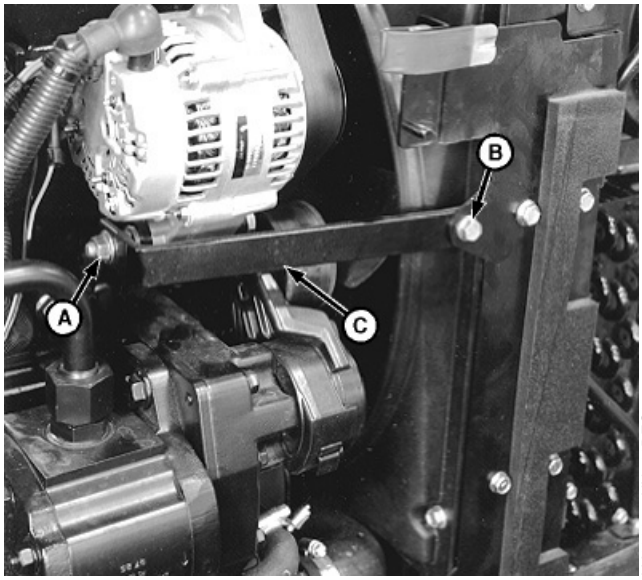
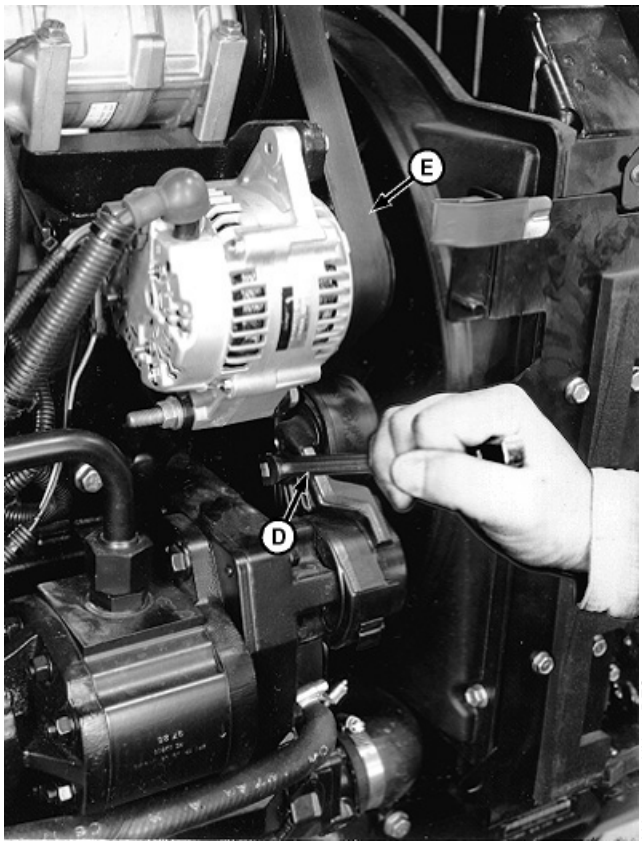
Remove, Inspect, and Install Air Conditioning Compressor

1. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in this group.)
2. Remove right and left side grille panels.
3. Remove nut (A), cap screw (B), and bracket (C).
4. Release tension on belt tensioner (D) and remove belt (E) off compressor pulley.

A—Nut
B—Cap Screw
C—Radiator Support Bracket
D—Belt Tensioner
E—Drive Belt



LV2398 –UN–16DEC97



LV2399 –UN–18DEC97

Continued on next page
AG,OUO1085,238 –19–08SEP00–1/2

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5. Disconnect clutch coil wire connector (A).

NOTE: Cap all lines and fittings to prevent contamination.

6. Disconnect suction line (B) and discharge line (C) from compressor. Cap all lines and fittings to prevent contamination.

7. Remove three cap screws (D) and ground wire (E). Remove compressor.

8. Repair or replace compressor if necessary.

9. Flush the complete system if the compressor failed internally due to damaged parts or seizure. (See Flush Air Conditioning System in this group.)

10. Determine correct compressor oil charge. (See Determine Correct Refrigerant Oil Charge in this group.)

11. Position compressor on mounting bracket. Install three cap screws (D) and ground wire (E).

12. Connect suction (B) and discharge (C) lines to compressor.

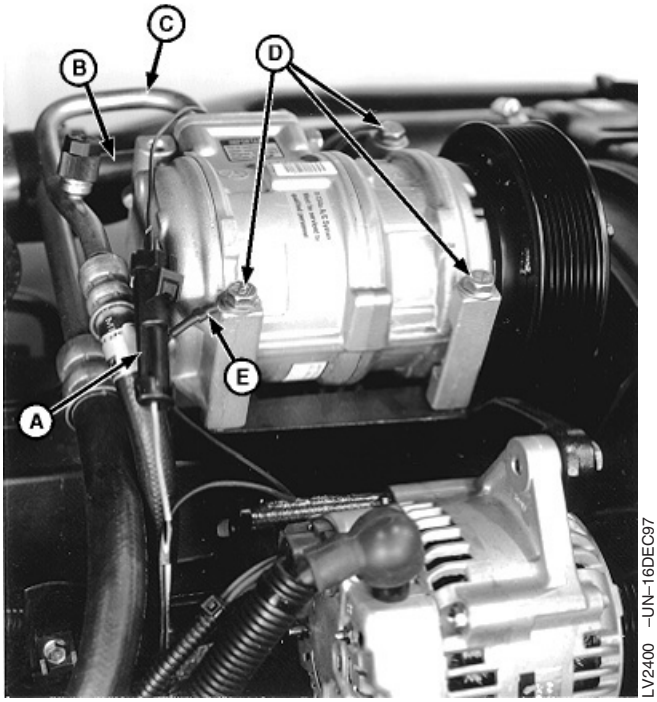
13. Connect clutch coil wire connector (A).

14. Install drive belt on compressor pulley.

15. Install radiator support bracket and side grille panels.

16. Evacuate and recharge system. (See Evacuate Air Conditioning System and Charge Air Conditioning System in this group.)

IMPORTANT: If new compressor clutch was installed, turn compressor on and off (with engine running) in one second intervals for five seconds (cycle five times in five seconds). This will burnish clutch and hub drive surfaces.



A—Wire Connector
B—Suction Line
C—Discharge Line
D—Cap Screw (3 used)
E—Ground Wire)

AG,OUO1085,238 –19–08SEP00–2/2

Test Volumetric Efficiency of Compressor

1. Drain oil from compressor and record amount.
2. Remove front cover from compressor pulley and rotate drive shaft using a speed wrench and 10 mm socket, 30 turns.
3. Drain remaining oil from compressor and record amount.

   If oil was drained in steps 1 and 3, go to step 4.

   If no oil was drained, add two ounces of R134a refrigerant oil in suction port and slowly roll compressor in each direction at least two times. Repeat steps 1, 2, and 3.
4. Secure compressor in a vise with ports upward.
5. Install JT02099 Adapter in suction port with JT03194 Cap.
6. Connect suction hose coupler of gauge set to suction test port (A) on manifold.
7. Close discharge side valve of gauge set and open valve on suction side of gauge set.
8. Rotate compressor drive shaft with speed wrench to obtain peak vacuum on low-side gauge. Check for even suction (no pulsing) while turning wrench at a slow rate to maintain peak vacuum (25 in. Hg minimum).
9. Stop rotating shaft and check leak-down time. Compressor should hold peak vacuum for three seconds minimum.

   If compressor does not hold peak vacuum for three seconds, inspect compressor valve plates and cylinder walls for damage. Repair compressor.
10. Open suction port of compressor to atmosphere.

LV1463 –UN–05DEC95

A—Suction Test Port

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Continued on next page

AG,OUO1085,239 –19–17JUL02–1/2

11. Connect gauge set suction hose to discharge port (A) using Adapters JT02100 and JT02121, and JT02109 Hose.

12. Close gauge set suction side valve.

13. Rotate drive shaft no faster than two turns per second for six turns.

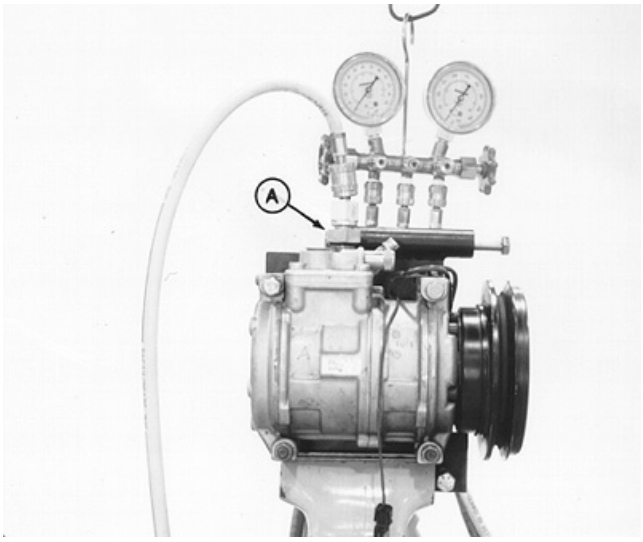
14. Record pressure after six complete turns. Pressure should be 380 kPa (3.8 bar) (55 psi) minimum.

NOTE: Pressure normally leaks down when rotation stops.

15. Continue to rotate compressor at a uniform speed to obtain peak pressure. Compression pressure should increase smoothly and should not vary more than 34 kPa (0.34 bar) (5 psi) at peak pressure. Bleed off pressure and repeat steps 12, 13, 14, and 15 four times.

NOTE: Pressure varying more than 34 kPa (0.34 bar) (5 psi) indicates a leaking reed valve or piston seal. Inspect compressor valve plates and cylinder walls for damage. Repair compressor.

16. Leak test compressor. (See Test Compressor Shaft Seal Leakage in this group.)



LV1464 –UN–05DEC95

A—Discharge Port

AG,OUO1085,239 –19–17JUL02–2/2

Test Compressor Shaft Seal Leakage


LV1465 –UN–05DEC95

1. Remove front plate from compressor pulley.
2. Remove clutch hub and screw.

IMPORTANT: Do not lose inner clutch hub shims.

3. Install JT02099 Adapter in suction port and JT02100 in discharge port. Cap discharge port adapter using JT03194.
4. Connect gauge set and/or container of R134a refrigerant to suction port of compressor as shown in photo.
5. Open valves to pressurize compressor.

IMPORTANT: Do not exceed range of low pressure gauge.

6. Check the following for leaks using leak detector or 50-50 mix of soap and water:

   - Shaft seal
   - Manifold seal
   - Housing seals at front, rear, and midsection of compressor body
   - Relief valve
   - Suction coupler Schrader valve

   Leakage should not exist. Repair compressor if required, and repeat test.

7. Assemble compressor and add required oil. (See Determine Correct Refrigerant Oil Charge in this group.)

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AG,OUO1085,240 –19–08SEP00–1/1

Disassemble and Assemble Compressor Clutch

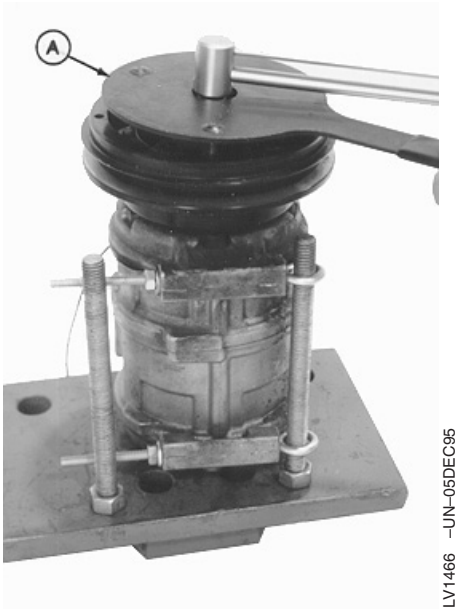
1. Mount compressor on DFRW20 Compressor Holding Fixture using two 6 in. x 1/4 in. eye bolts with nuts as illustrated. (See DFRW20—Compressor Holding Fixture in Section 299.)
2. Remove dust cover.
3. Hold clutch hub using JDG747 Compressor Clutch Spanner (A) and remove clutch shaft bolt (B).
4. Remove clutch hub (C). Remove shims (H) from clutch hub and save for installation.
5. Remove and discard snap ring (D). Remove pulley (E) using a plastic hammer or D05277ST Puller, JDG748 Jaws, and JDG771 Forcing Screw Pilot.
6. Disconnect clutch coil lead wire. Remove and discard snap ring (F) and remove the clutch coil (G).

NOTE: The bearing in the pulley is NOT serviceable.

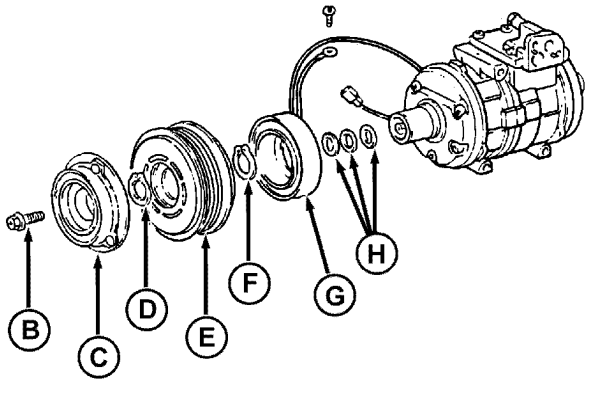
7. Check pulley bearing operation. Replace pulley and bearing as required.
8. Install clutch coil (G) and new snap ring (F) with flat side of snap ring down. Connect clutch coil lead wire.
9. Install Pulley (E) and new snap ring (D) with flat side of snap ring down. Apply grease to shims (H) and install to clutch hub (C).
10. Install clutch hub (C) and shaft bolt (B) and tighten to specification. Install dust cover.

Specification

Compressor Shaft Bolt—Torque ..... 14 N•m (10 lb-ft)



LV1466 –UN–05DEC95



RW21158 –UN–29JUL98

A—JDG747 Compressor Clutch Spanner
B—Clutch Shaft Bolt
C—Clutch Hub
D—Pulley Snap Ring
E—Pulley
F—Clutch Coil Snap Ring
G—Clutch Coil
H—Shim

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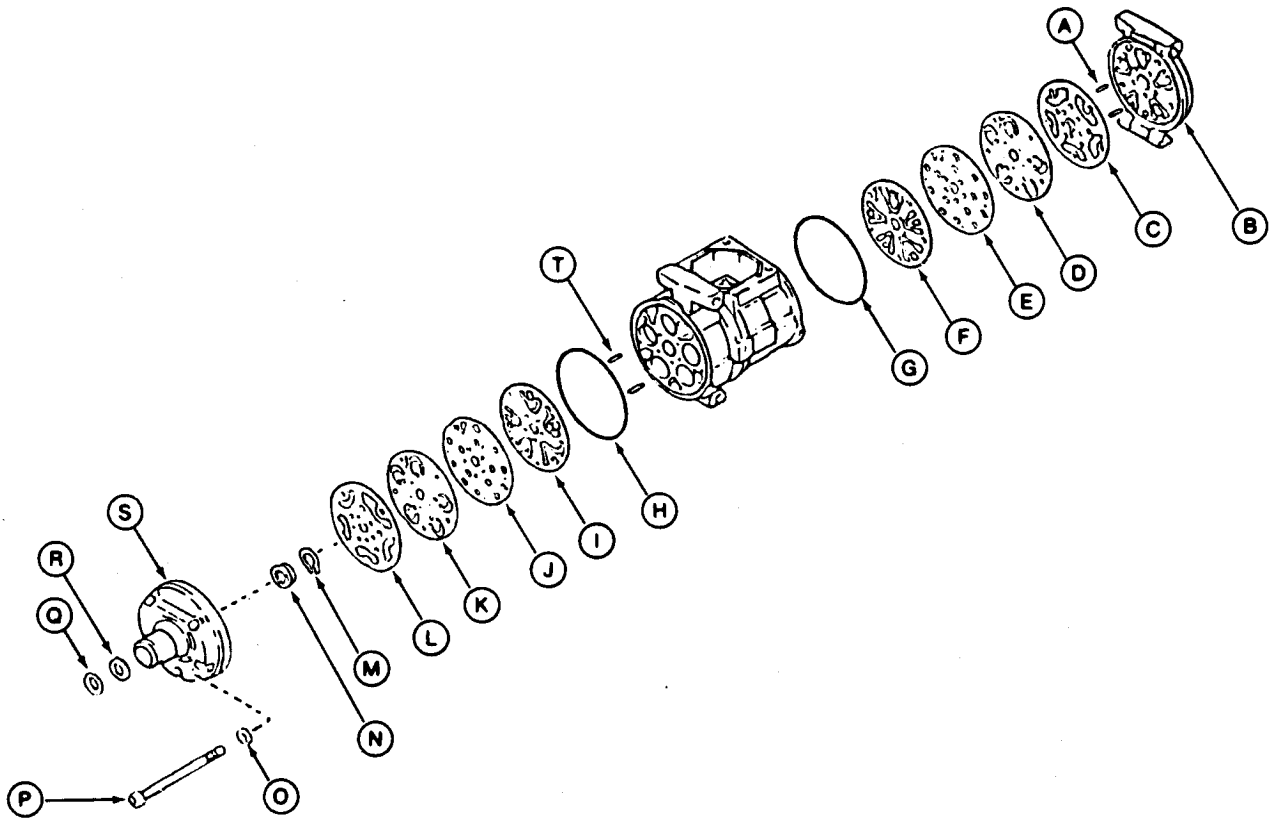
AG,OUO1085,241 –19–17JUL02–1/1

Disassemble, Inspect, and Assemble Compressor



RW21161 –UN–24JUN92

A—Rear Pins
B—Rear Housing
C—Rear Gasket
D—Rear Discharge Reed Valve
E—Rear Valve Plate
F—Rear Suction Reed Valve
G—Rear O-Ring
H—Front O-Ring
I—Front Suction Reed Valve
J—Front Valve Plate
K—Front Discharge Reed Valve
L—Front Gasket
M—Snap Ring
N—Lip Seal
O—Washer
P—Through Bolt
Q—Felt Holder
R—Felt
S—Front Housing
T—Front Pins

1. Clean compressor using solvent before disassembly. Mount compressor on holding fixture and remove clutch. (See Disassemble and Assemble Compressor Clutch this group.)

IMPORTANT: When removing front and rear housing, be careful NOT to damage sealing surfaces.

2. Disassemble compressor as illustrated and discard O-rings, gaskets, lip seal, snap ring, and through bolt washers. Replace parts.

NOTE: Valve plates, reed valves, cylinders, and cylinder housing are NOT serviceable. Some cylinder scuffing (light scratches) is normal.

3. Inspect valves for an even wear pattern, and cylinders for scoring or excessive wear. Replace compressor as required.

4. Remove shaft seal snap ring (M). Turn housing over and remove felt holder (Q) and felt (R) from front housing (S).

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Continued on next page

AG,OUO1085,242 –19–17JUL02–1/4

5. Remove shaft lip seal (N) from front housing (S) using a small tool with 5/8 in. OD.
6. Wash all parts in clean solvent and dry using moisture-free compressed air before assembly.

Continued on next page

AG,OUO1085,242 –19–17JUL02–2/4

IMPORTANT: Lubricate O-rings, gaskets, and lip seal using only TY22025 (R134a) refrigerant oil during assembly. Other oils could damage the compressor.

7. Apply R134a oil to the bore of the front housing and install new lip seal (N) to the bottom of the bore using a socket. Install new snap ring (M) flat side down.

IMPORTANT: Bushing spacer (U) must be in position before assembling the compressor.

8. Install pins (A) and new O-ring (G) in the rear cylinder.

NOTE: The rear valve plate is marked with an "R" and is installed face up.

9. Install parts (F—D) over the pins on the rear cylinder.

10. Install a new gasket (C) flat side down and the rear housing (B) on the rear cylinder. Mount the compressor onto the holding fixture.

11. Install pins (T) and new O-ring (H) in the front cylinder.

NOTE: The front valve plate is marked with an "F" and is installed face up.

12. Install parts (I—K) over the pins on the front cylinder.

13. Install a new gasket (L) flat side down. Put JDG746 lip seal protector on the shaft and lubricate with R134a oil.

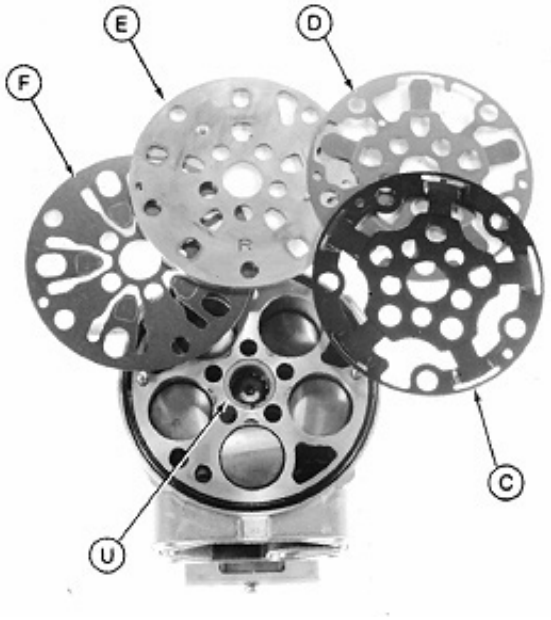
14. Install the front housing (S) on the front cylinder and remove the lip seal protector. Install through bolts (P) and new washers (O).

15. Partially tighten the through bolts and then tighten to specification.

Specification	
Compressor Through Bolts— Torque	26 N•m (19 lb-ft)

16. Install the felt (R) and felt holder (Q) using the clutch hub.

RW21162 –UN–24JUN92



RW21163 –UN–24JUN92

C—Rear Gasket
D—Rear Discharge Reed Valve
E—Rear Valve Plate
F—Rear Suction Reed Valve
U—Bushing Spacer

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Continued on next page

17. Install the pulley-clutch hub and check clearance. (See Disassemble and Assemble Compressor Clutch in this group.)

AG,OUO1085,242 –19–17JUL02–4/4

Check Compressor Clutch Hub Clearance

NOTE: The clutch coil is NOT polarity sensitive.

1. Check pulley-to-clutch hub clearance using a dial indicator. Mount the gauge to the pulley as illustrated and connect a set of jumper wires from the compressor to a 12V battery.

2. Rotate the pulley and check clearance in three equally spaced locations around the clutch hub. Add or remove shims as required to meet specification.

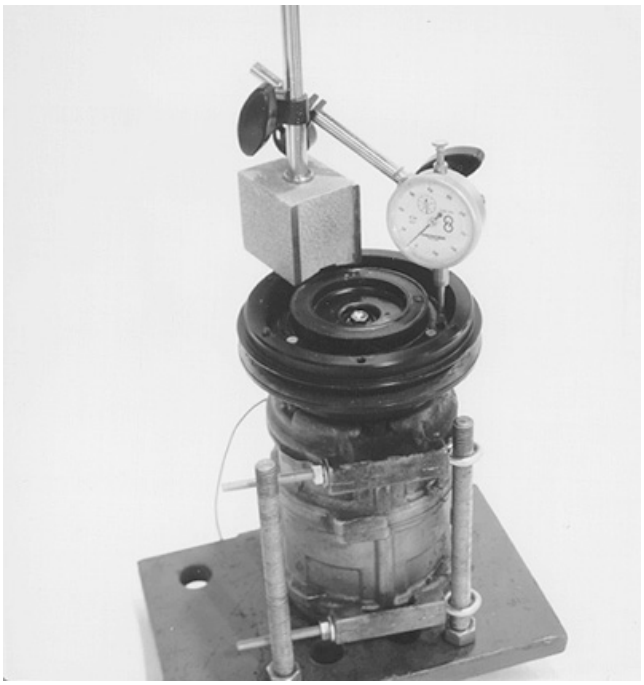
Specification

Compressor Pulley-to-Clutch Hub—Clearance ..... 0.35—0.65 mm (0.014—0.026 in)

3. Tighten clutch shaft bolt to specification after correct clearance is obtained.

Specification

Compressor Shaft Bolt—Torque ..... 14 N•m (10 lb-ft)



LV1467 –UN–05DEC95

AG,OUO1085,243 –19–17JUL02–1/1

Inspect Compressor Manifold

1. Remove cap screws (A) and the manifold (B).

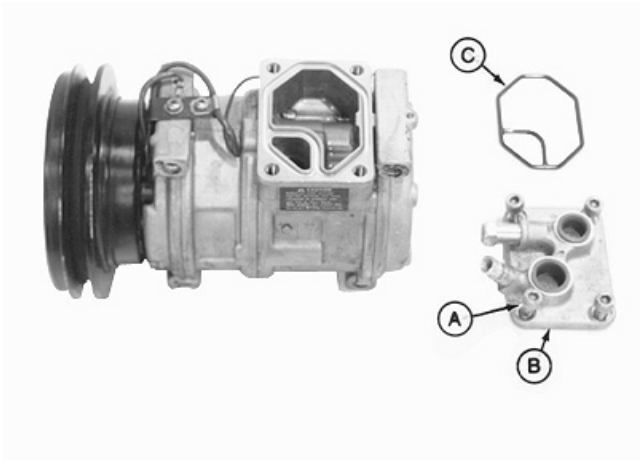
2. Remove and discard seal (C). Inspect porting surfaces.

3. Lubricate and install a new seal (C).

4. Install manifold (B) and tighten cap screws (A) to specification.

Specification

Compressor Through Bolts—Torque ..... 26 N•m (19 lb-ft)



LV1468 –UN–05DEC95

A—Manifold Cap Screw
B—Manifold
C—Manifold Seal

AG,OUO1085,244 –19–17JUL02–1/1

Remove and Install Compressor Relief Valve

CAUTION: High pressure may exist at the discharge fitting. If this pressure is released too rapidly, there may be considerable discharge of refrigerant and oil.

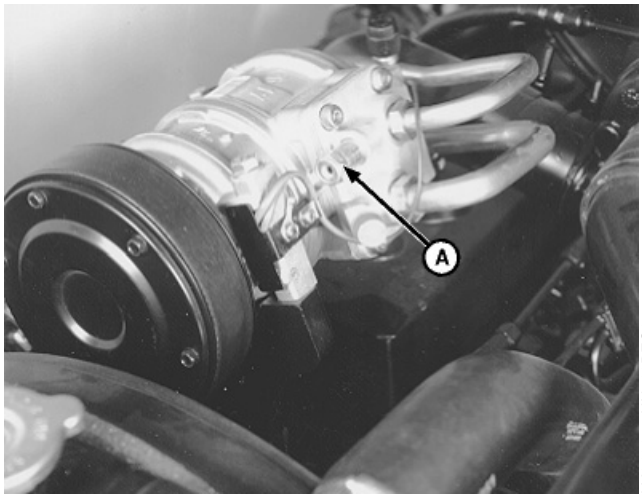
1. Recover/recycle air conditioning refrigerant. (See Recover/Recycle Air Conditioning Refrigerant in this group.)
2. Slowly remove relief valve (A) from compressor.

NOTE: The relief valve is not serviceable. Replace valve as required.

3. Install relief valve (A) and tighten to specification.

Specification	
Compressor Relief Valve—Torque	12—16 N•m (9—12 lb-ft)

4. Charge the system. (See Charge Air Conditioning System in this group.)



LV2401 –UN–16DEC97

A—Relief Valve

AG,OUO1085,245 –19–17JUL02–1/1

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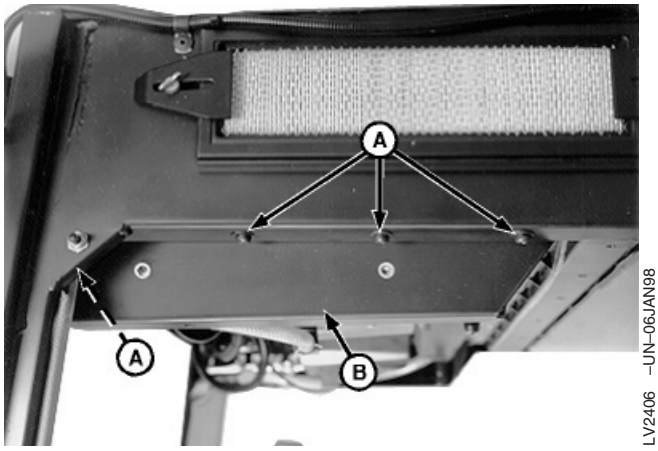
Remove and Install Evaporator/Heater Core Housing Cover

1. Remove cab roof. (See Remove and Install Cab Roof in Group 15.)
2. Remove front headliner. (See Remove and Install Front Headliner in Group 15.)
3. Remove four screws (A) and headliner support bracket (B). Repeat procedure for opposite side of cab. Cut tie straps as necessary.
4. Remove two screws (C) retaining lower leg of housing cover. Repeat procedure for opposite side of cab.

NOTE: During removal of evaporator/heater core housing cover, move wiring harnesses in cab roof away from cover.

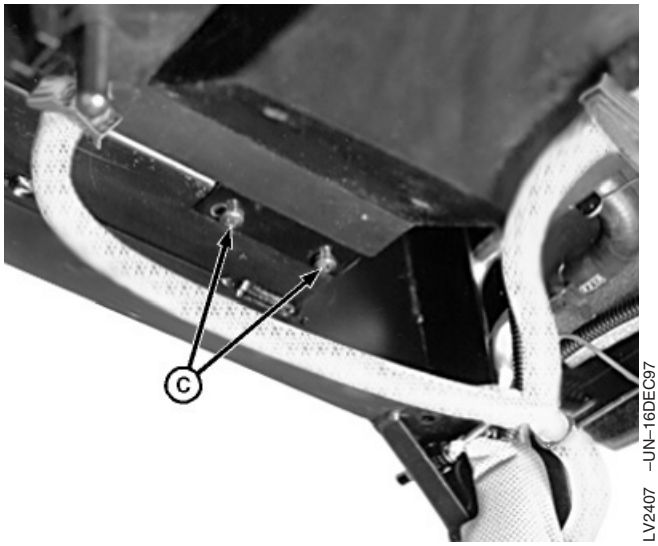
5. Remove thirteen screws (D). Slide cover (E) toward front of cab and remove cover. Make repairs as necessary.

A—Screw (8 used)
B—Headliner Support Bracket
C—Screw (14 used)
D—Screw (13 used)
E—Evaporator/Heater Core Housing Cover

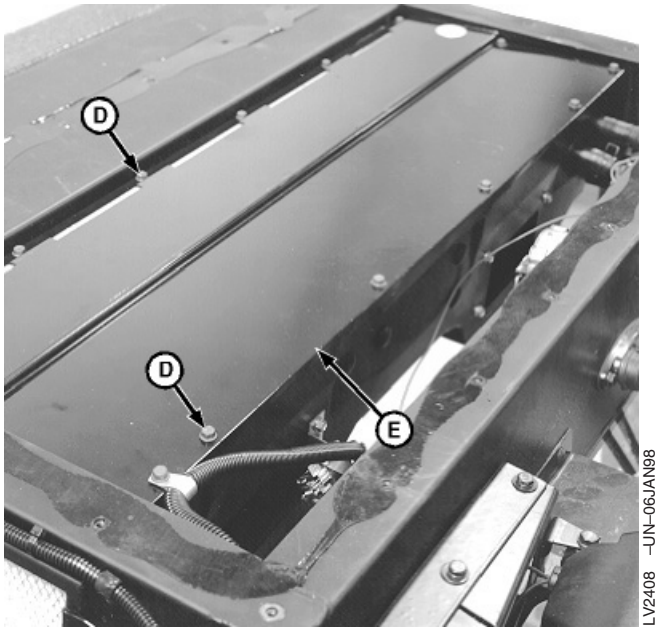


LV2406 –UN–06JAN98

Headliner Support Bracket Left Side



LV2407 –UN–16DEC97



LV2408 –UN–06JAN98

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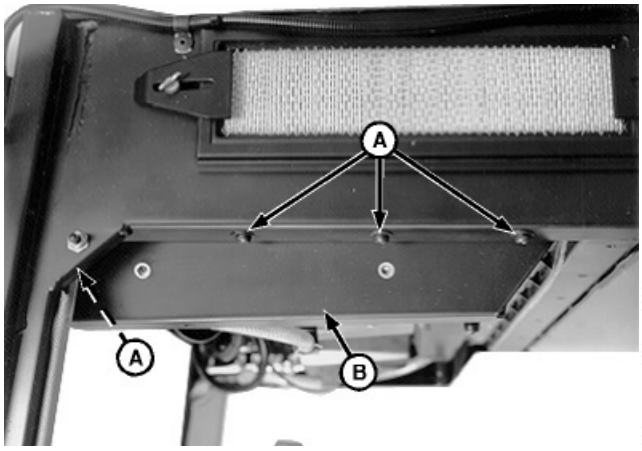
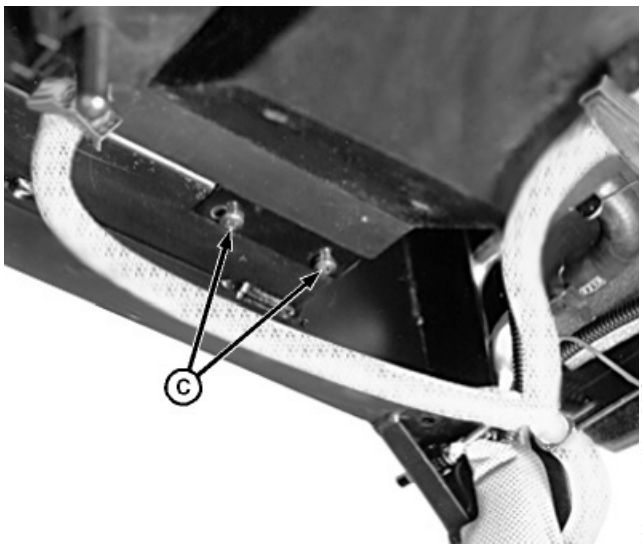
6. Install housing cover (E) and thirteen screws (D).
7. Install screws (C) securing housing cover lower leg to cab frame. Repeat procedure for opposite side of cab.
8. Install headliner support bracket (B) and screws (A). Secure drain tubes using tie straps as necessary. Repeat procedure for opposite side of cab.
9. Install front headliner. (See Remove and Install Front Headliner in Group 15.)
10. Install cab roof. (See Remove and Install Cab Roof in Group 15.)

A—Screw (8 used)
B—Headliner Support Bracket
C—Screw (14 used)
D—Screw (13 used)
E—Evaporator/Heater Core Housing Cover

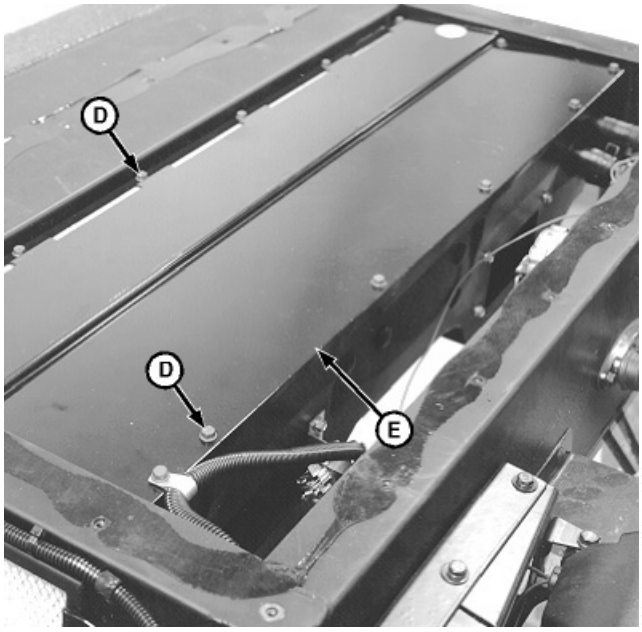


LV2406 –UN–06JAN98

Headliner Support Bracket Left Side



LV2407 –UN–16DEC97



LV2408 –UN–06JAN98

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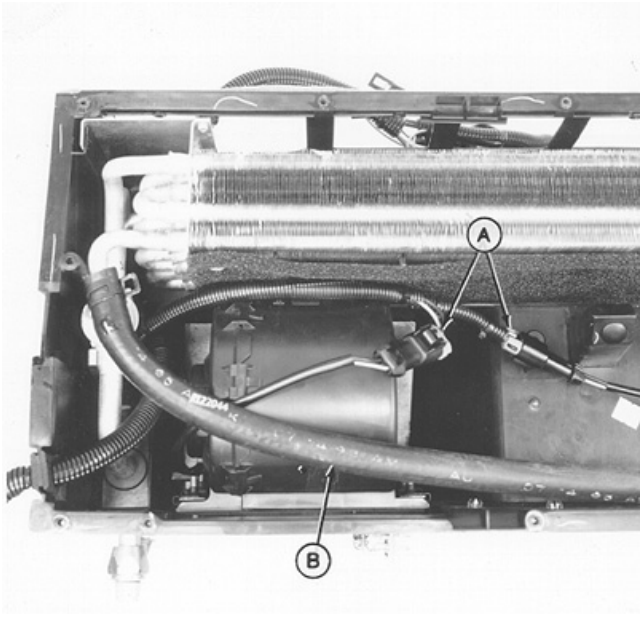
AG,OUO1085,246 –19–08SEP00–2/2

Remove Blower Motors

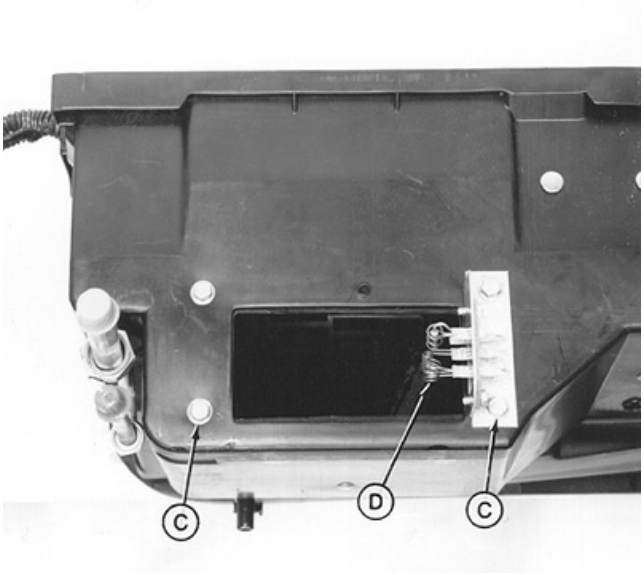
NOTE: Evaporator/heater core housing shown removed from cab for clarity of photos only. It is not necessary to remove housing.

1. Remove evaporator/heater core housing cover. (See Remove and Install Evaporator/Heater Core Housing Cover in this group.)
2. Disconnect blower motor wiring connectors (A).
3. Remove clamp securing hose (B) to housing.
4. Remove four screws (C) and remove blower motor. Repeat this procedure for left-side blower motor if removal is necessary.
5. When installing motor, be sure resistor assembly (D) is installed in air flow of right-side blower motor as shown.

A—Wiring Connectors
B—Hose
C—Screws
D—Resistor Assembly



LV1446 –UN–05DEC95



LV1447 –UN–05DEC95

AG,OUO1085,247 –19–08SEP00–1/1

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Remove Evaporator/Heater Core

1. Remove evaporator/heater core housing cover. (See Remove and Install Evaporator/Heater Core Housing Cover in this group.)

NOTE: Remove right-side blower motor to aid during removal of ALLEN HEAD® screw (B).

2. Remove right-side blower motor only. (See Remove Blower Motors in this group.)

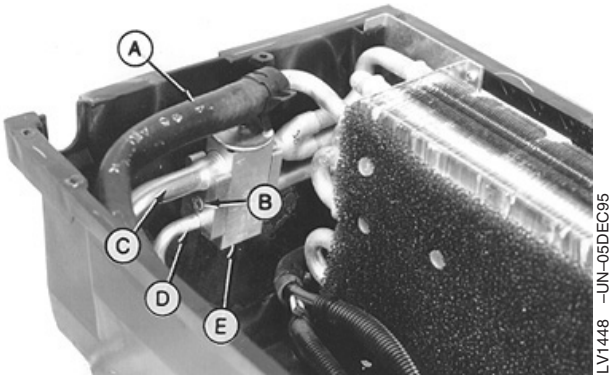
3. Disconnect coolant inlet hose (A) and outlet hose from heater core tubes.

4. Remove ALLEN HEAD® screw (B) and clamping plate. Remove tubes (C and D). Cap all openings to prevent contamination.

NOTE: Take note of routing and position of wiring harness and grommets (F and G).

5. Lift evaporator/heater core and expansion valve from housing as a unit.

6. Disconnect expansion valve (E) from core. Cap all lines and fittings to prevent contamination.



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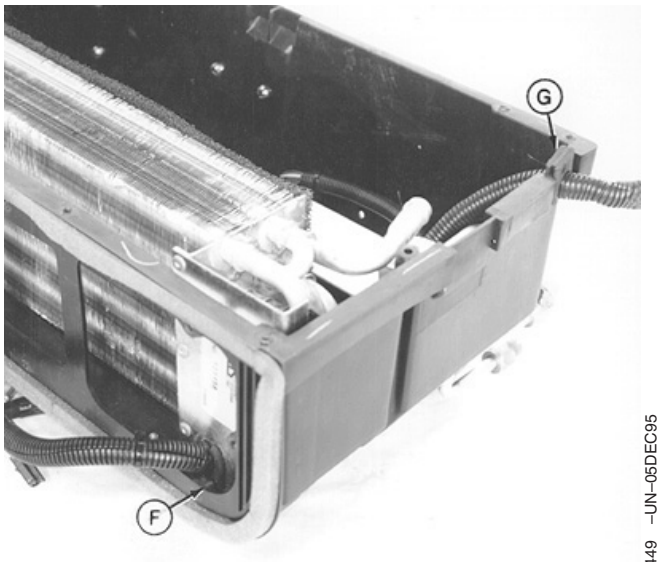

LV1449 –UN–05DEC95

A—Inlet Hose
B—ALLEN HEAD® Screw
C—Tube
D—Tube
E—Expansion Valve
F—Grommet
G—Grommet

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Leak Test Evaporator/Heater Core

1. Install JT02106 Test Block using JT02124 and JT02123 Plates, JT02126 and JT02125 Screws, and JT02105 and JT02103 Adapters. Cap one adapter with JT03094. Connect shop air to other adapter.

2. Apply shop air pressure and spray surface using 50-50 mixture of liquid soap and water to check for leaks.

NOTE: Minor leaks may be repaired, but evaporator/heater core should be replaced if there is a major leak or restriction.

3. Repair or replace evaporator/heater core as required.

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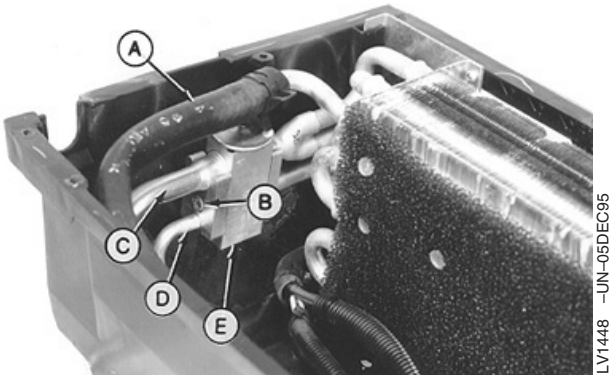
Install Evaporator/Heater Core

1. Check condenser tray (directly under evaporator/heater core) to make sure drain outlets are not plugged.
2. Flush evaporator core if evaporator was air tested.
3. If evaporator was completely flushed or replaced with a new unit, and no major system leaks were found, add 60 ml (2.0 oz) of refrigerant oil before installation. If leaks are found in the system, check refrigerant oil charge. (See Determine Correct Refrigerant Oil Charge in this group.)

NOTE: Install new O-rings at all A/C connections during assembly. Used or damaged O-rings will leak.

4. Assemble the expansion valve (E) to the evaporator core and install the evaporator/heater core in the housing. Route wire harness through housing and install grommets (F and G) as shown.
5. Connect tubes (C and D) to expansion valve (E) and install clamping plate with ALLEN HEAD® screw (B).
6. Connect coolant inlet hose (A) and outlet hose to heater core tubes.
7. Install right-side blower motors. (See Remove Blower Motors in this group.)
8. Install evaporator/heater core housing cover. (See Remove and Install Evaporator/Heater Core Housing Cover in this group.)



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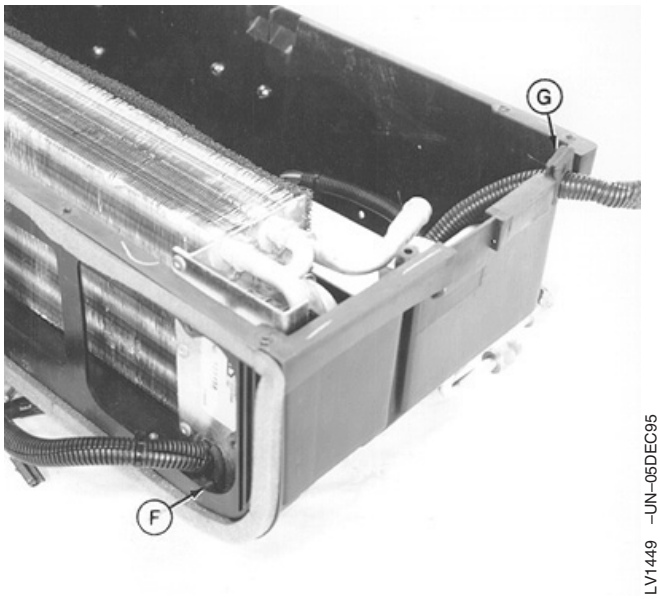

LV1449 –UN–05DEC95

A—Inlet Hose
B—ALLEN HEAD® Screw
C—Tube
D—Tube
E—Expansion Valve
F—Grommet
G—Grommet

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Service Expansion Valve

NOTE: The expansion valve is assembled to the evaporator/heater core prior to installation and is removed as a unit from the HVAC box.

1. Remove expansion valve. (See Remove Evaporator/Heater Core this group.)
2. Test expansion valve. (See Expansion Valve Bench Test—Diagram and Expansion Valve Bench Test in this group.)
3. Replace expansion valve as required and assemble to evaporator/heater core.
4. Install expansion valve and evaporator/heater core as a unit in the HVAC box. (See Install Evaporator/Heater Core in this group.)

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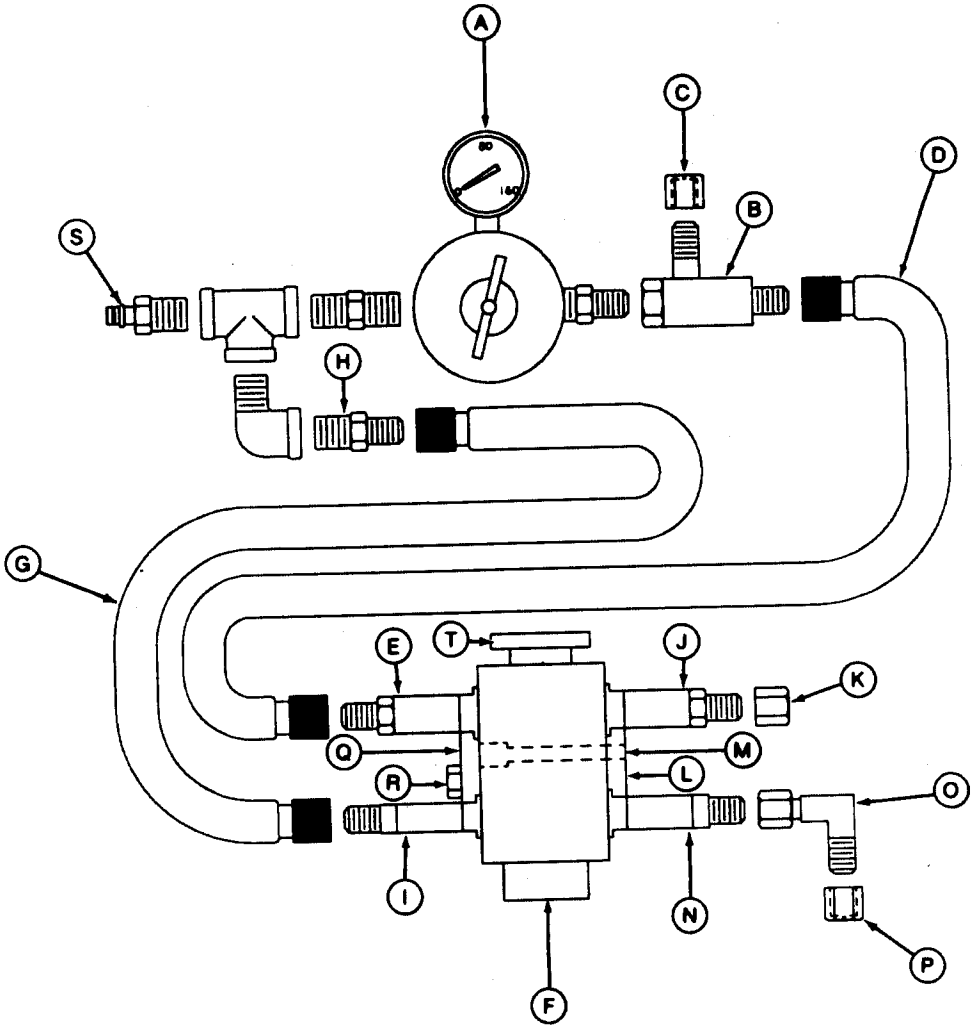
Expansion Valve Bench Test—Diagram



A—Regulator
B—Tee (JT03191)
C—Orifice Cap (JT02111)
D—Hose (JT02109)
E—Tube (JT02105)
F—Expansion Valve
G—Hose (JT02108)
H—Regulator Inlet (#218887)
I—Tube (JT02103)
J—Tube (JT02105)
K—Cap (JT03194)
L—Plate (R115927/JT02123)
M—Screw (AT127259/JT02125)
N—Tube (JT02109)
O—Elbow (JT05483)
P—Orifice Cap (JT02111)
Q—Plate (L77942/JT02124)
R—Screw (M67175/JT02126)
S—Air Inlet Tee Assembly (JT02112)
T—Power Head

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Expansion Valve Bench Test

1. Connect expansion valve to regulator (A) capable of 820 kPa (8.2 bar) (120 psi).

   - Install tee (B) with 0.020 in. orifice cap (C) at regulator outlet.
   - Connect blue hose (D) between tee (B) and tube (E) on inlet side of expansion valve (F).
   - Connect red hose (G) between elbow at inlet of regulator (H) and tube (I) at inlet of expansion valve.
   - Install tube (J) with cap (without orifice) (K) on expansion valve outlet. Secure tubes with plate (L) and screws (M).
   - Install tube (N) with 90° elbow (O) and orifice cap (P) on expansion valve outlet. Secure tubes with plate (Q) and screw (R).

NOTE: Both orifice caps used must have a 0.020 in. orifice. Any other size will produce false results.

2. Fill container with ice water.

3. Attach regulator assembly to air supply (S) of 620 kPa (6.2 bar) (90 psi) minimum.

4. Adjust regulator unit until air flowing from outlet side of expansion valve (P) is shut off. Air should stop flowing at 520—590 kPa (5.2—5.9 bar) (75—85 psi).

5. Adjust regulator to approximately 70 kPa (0.7 bar) (10 psi). Hold power head of expansion valve (T) in ice water and slowly adjust regulator to increase pressure. Air flow from orifice (P) should stop at 170—240 kPa (1.7—2.4 bar) (25—35 psi).

6. Adjust regulator to 280 kPa (2.8 bar) (40 psi). Valve should close when power head of expansion valve is dipped in ice water. Valve should open after removing valve from water and warming power head.

7. Repeat step 6, adjusting regulator to 480 kPa (4.8 bar) (70 psi).

8. Replace valve if any test failed. Install valve.

Continued on next page

9. Perform diagnostic checks. (See Operation and Test TM—Section 290, Group 10.)

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Refrigerant Oil Information

CAUTION: New compressors are charged with a mixture of nitrogen, R134a refrigerant, and TY22025 (R134a) refrigerant oil. Wear safety goggles and discharge compressor slowly to avoid possible injury.

New compressors contain 230—255 ml (7.7—8.5 fl oz) of new oil. The oil level visible through the suction port is normally below the drive shaft. The amount of trapped oil is 81 ml (2.7 fl oz). Approximately 60 ml (2.0 fl oz) will seep into the cylinders during shipping and storage.

Typically 21 ml (0.7 fl oz) of oil covers internal surfaces of the compressor exposed to refrigerant gas and cannot be drained.

The oil level will be above the drive shaft when 255 ml (8.5 fl oz) is put in a dry compressor.

The normal operating oil level of a used compressor is 30—45 ml (1.0—1.5 fl oz) and cannot be seen through the suction port.

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Check Compressor Oil Charge

1. Remove compressor. (See Remove, Inspect, and Install Air Conditioning Compressor in this group.)

2. Remove manifold caps and drain oil. Record amount.

NOTE: Save oil if compressor is new.

3. If **more** than 6 ml (0.2 fl oz) of oil was drained and appears normal, or any other components were replaced or flushed, see Determine Correct Refrigerant Oil Charge in this group.

   If **less** than 6 ml (0.2 fl oz) of oil was drained or appears very black, perform the following:

- Perform a volumetric efficiency test on compressor to determine serviceable condition. Flush with solvent to internally wash out oil if compressor is serviceable. (See Test Volumetric Efficiency of Compressor in this group.)
- Remove, clean, and bench test expansion valve, but do not disassemble valve. (See Expansion Valve Bench Test—Diagram and Expansion Valve Bench Test in this group.)
- Remove and discard receiver-dryer. (See Replace Air Conditioning Receiver-Dryer in this group.)
- Install a new receiver-dryer.
- Flush complete system. (See Flush Air Conditioning System in this group.)
- Install required oil. (See Determine Correct Refrigerant Oil Charge in this group.)
- Connect all components.
- Purge, evacuate, and charge system. (See Flush Air Conditioning System, Evacuate Air Conditioning System and Charge Air Conditioning System in this group.)

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Determine Correct Refrigerant Oil Charge

NOTE: Determine amount of oil charge for system prior to installation of compressor.

Compressors are divided into three categories when determining correct oil charge.

- New compressor
- Used compressor, not flushed
- Used compressor, flushed

1. If complete system, lines, and components were flushed, add correct amount of oil:

   - New compressor contains correct amount of new oil, 255 ml (8.5 fl oz).
   - Used compressor (drained) —
     Not Flushed: add 230 ml (7.7 fl oz) of new oil
     Flushed: add 255 ml (8.5 fl oz) of new oil

2. If complete system was not flushed, add correct amount of oil for compressor plus amount of oil for each component serviced:

   - New compressor contains 255 ml (8.5 fl oz) of new oil. Connect battery to clutch coil and rotate drive shaft to remove all oil. Return 45 ml (1.5 fl oz) of oil to compressor.
   - Used compressor (drained) —
     Not Flushed: add 45 ml (1.5 fl oz) of new oil
     Flushed: add 60 ml (2.0 fl oz) of new oil

IMPORTANT: Use care in checking and adding oil. Too much oil will reduce cooling capacity. Too little oil will result in poor lubrication of the compressor, leading to early failure.

Remove compressor to determine correct oil charge if any components listed below have been removed, drained, and flushed.

Use the following chart as a guide for adding oil:

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Continued on next page

NOTE: If the complete system was purged with all components in place, the amount of oil lost is negligible.

Adding Oil—Refrigerant Oil Charge	
Evaporator	60 ml (2.0 fl oz)
Condenser	60 ml (2.0 fl oz)
Receiver-Dryer	15 ml (0.5 fl oz)
Compressor	60 ml (2.0 fl oz)
Hoses	60 ml (2.0 fl oz)

NOTE: Hoses = 3 ml per 30 cm (0.1 fl oz per ft). Approximate total length equals 600 cm (20 ft).

If any section of hose is removed and flushed or replaced, measure length of hose and use the formula to determine correct amount of oil to be added.

IMPORTANT: DO NOT leave the system or R134a compressor oil containers open. Oil easily absorbs moisture.

DO NOT spill R134a compressor oil on acrylic or ABS plastic. Oil will deteriorate these materials rapidly.

Identify R134a oil containers and measures to eliminate accidental mixing of different oils.

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Add Refrigerant Oil to System

1. Add approximately 170 ml (5.6 fl oz) of oil through compressor suction port and 85 ml (2.9 fl oz) into discharge port when system has been completely flushed.

IMPORTANT: Use only TY22025 (R134a) refrigerant oil.

NOTE: Some oil may have to be added through compressor line and fitting.

2. Install manifold to compressor, if removed. Tighten cap screws to specification.

Specification	
Manifold-to-Compressor Cap Screws—Torque	26 N•m (19 lb-ft)

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System Information

Flushing:

Flushing the system or a component is a cleaning process using a liquid solvent to wash out oil and debris. Purging is always necessary after flushing to remove solvent from the system or component.

Purging:

Purging the system or a component is a cleaning process using a gas to force liquid from the system. Purging alone will not force refrigerant oil out of the system.

Evacuating:

Evacuating the system is a process to draw air and moisture from the system with a vacuum.

Specification	
Evacuating System—Vacuum	94.4 kPa (0.9 bar) (28.6 in. Hg) required at sea level

When to flush an air conditioning system:

- The compressor has an internal failure
- No oil remains in used compressor
- Oil drained from compressor appears or smells overheated
- System was contaminated with a mixture of refrigerant oils
- System was left open to the atmosphere long enough for dirt, moisture, or debris to enter the tubing or components
- System has an internal blockage

When to purge an air conditioning system:

- After flushing system with solvent, to prevent oil dilution
- System was contaminated with nitrogen or two refrigerants
- System was left open to the atmosphere and flushing could not be performed
- A repair required installation of new lines, condenser, or evaporator

Solvents

Continued on next page

The following three solvents are recommended for flushing air conditioning systems. Each adequately dissolves oil and sludge but at a different rate. Use only solvents with an equivalent MSDS.

1. Genesolv 2004 Solvent
2. ART338 A/C Flushing Solvent (JT02077)
3. Naphtha 673 Parts Solvent

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Flush Air Conditioning System

Review air conditioning system diagram showing adapters used at each hose and component connection.

Add flushing solvent to system with JT02075 Flusher and JT02078 Attachment Kit. Use JT02098 Fitting Kit.

1. Discharge system. (See Recover/Recycle Air Conditioning Refrigerant in this group.)

2. Remove compressor and measure oil drained from both manifold ports.

3. Clean compressor as follows:

   - Pour 240 ml (8 fl oz) of flushing solvent into suction port and 120 ml (4 fl oz) into discharge port. Plug both ports in compressor manifold, using JT02099 and JT02100 with JT03194 caps.

Specification	
Flushing Solvent—Suction Port—Volume	240 ml (8 fl oz)
Flushing Solvent—Discharge Port—Volume	120 ml (4 fl oz)

   - Turn compressor end for end and roll it side to side.
   - Remove both plugs from manifold ports and drain solvent from compressor.
   - Connect battery power to compressor clutch coil. Rotate pulley at least five revolutions to move solvent out of cylinders.

Specification	
Clutch Coil—Current Draw	2.6 amps at 12 volts, 20° C (68°F)
Clutch Coil—Resistance	3.5—4.0 ohms at 20° C (68°F)

   - Invert compressor, roll to all sides, and drain thoroughly.
   - Let compressor sit inverted for three to five minutes.
   - Repeat previous steps at least three times.

4. Remove and discard receiver-dryer.

Continued on next page

5. Flushing can be performed on tractor. Divide system into two circuits:

   - Condenser, including inlet and outlet hoses. (Steps 6 through 13.)
   - Evaporator, including inlet and outlet hoses. (Steps 14 through 30.)

IMPORTANT: DO NOT attempt to flush through compressor or receiver-dryer. Flushing through expansion valve or an orifice tube is acceptable if refrigerant oil has a normal odor and appearance.

Flush/Purge condenser:

6. Connect flusher outlet hose to inlet connection of compressor discharge line (3) using JT02102 Adapter to flush condenser.

Specification	
Compressor Discharge Line— Torque	32—40 N•m (24—29 lb-ft)

7. Attach a return hose and aerator nozzle to connection of receiver-dryer inlet line (8) using JT03197 Adapter. Put nozzle in container to collect flushing solvent.

8. Fill flusher tank with 4 L (1 gal) of solvent and fasten all connections.

NOTE: Air pressure must be at least 620 kPa (6.2 bar) (90 psi) for flushing and purging.

9. Connect a line of moisture-free compressed air or dry nitrogen to flusher air valve.

10. Open air valve to force flushing solvent into condenser circuit. Flusher tank is empty when hose pulsing stops. Additional flushing cycles are required if system is heavily contaminated with burned oil or metal particles.

11. Purging the condenser circuit takes 10—12 minutes to thoroughly remove solvent.

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Continued on next page

12. Disconnect hose form aeration nozzle to check circuit for solvent. Hod hose close to a piece of cardboard; continue purging until discharge air on cardboard is dry.

13. Go to Step 27 if evaporator does not require flushing.

    Flush evaporator:

    Remove expansion valve to flush evaporator (go to Step 14) if system is contaminated with burned refrigerant oil or debris.

    Go to Step 23 to flush evaporator through expansion valve if oil appears normal.

14. Remove operator seat and operator cover to access expansion valve. Drain 5 gal (19 L) of coolant from engine and radiator to prevent spillage into evaporator housing.

15. Install JT02106 Flushing Block in place of expansion valve.

16. Connect flusher outlet hose to compressor suction line (22) using JT02101 Adapter.

Specification	
Compressor Suction Line—Torque	34—42 N•m (25—31 lb-ft)

17. Attach a hose and aerator nozzle to receiver-dryer outlet line (11) connector using JT03188 Adapter. Put nozzle in container to collect flushing solvent.

18. Repeat Steps 8, 9, and 10 to flush evaporator.

19. Purging the evaporator circuit takes 12—15 minutes to thoroughly remove solvent.

20. Disconnect hose from aeration nozzle to check circuit for solvent. Hold hose close to a piece of cardboard; continue purging until discharge air on cardboard is dry.

Continued on next page

21. Reinstall expansion valve and reconnect heater coolant tubing. Clean up spilled anti-freeze in evaporator housing and return coolant to radiator. Install operator seat.

22. Go to Step 27.

Flush evaporator through expansion valve:

23. Connect flusher outlet hose to connection of receiver-dryer outlet line (11) using JT03188 Adapter.

24. Attach a hose and aerator nozzle to connection of compressor suction line (22) using JT02101 Adapter. Put nozzle in a container to collect solvent.

25. Repeat Steps 8,9, and 10 to flush evaporator.

26. Repeat Steps 19 and 20 to purge evaporator.

27. Install a new receiver-dryer compatible with R134a refrigerant. Fasten connections and mounting brackets.

28. Add required oil. (See Determine Correct Refrigerant Oil Charge in this group.)

29. Install compressor and connect refrigerant lines to manifold.

30. Connect clutch coil wire and install drive belt.

31. Purge system. (See Flush Air Conditioning System in this group.)

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Evacuate Air Conditioning System

IMPORTANT: Use only R134a Refrigerant Recovery, Recycling, and Charging machines. Do not mix R134a equipment, refrigerant, and refrigerant oils with R-12 systems to prevent compressor damage.

1. Connect JT02046 R134a Refrigerant Charging Unit.

NOTE: A JT02047 R134a Refrigerant Recovery, Recycling, and Charging Unit can be substituted for the JT02046.

Pump must be capable of pulling at least 28.6 in. Hg vacuum (sea level). Deduct 1 in. Hg from 29.9 in. for each 300 m (100 ft) elevation above sea level.

2. Connect low-side hose (blue) from charging unit to suction fitting (A) on compressor. Connect high-side hose (red) to discharge fitting (B) on condenser.

IMPORTANT: Do not operate compressor during evacuation.

3. Follow manufacturer's instructions and evacuate system. Evacuate system for 15 minutes if ambient temperature is below 30° C (85° F), to remove nitrogen and air.

   Evacuate system for 30 minutes if ambient temperature is above 30° C (85° F).

4. Charge system. (See Charge Air Conditioning System in this group.)

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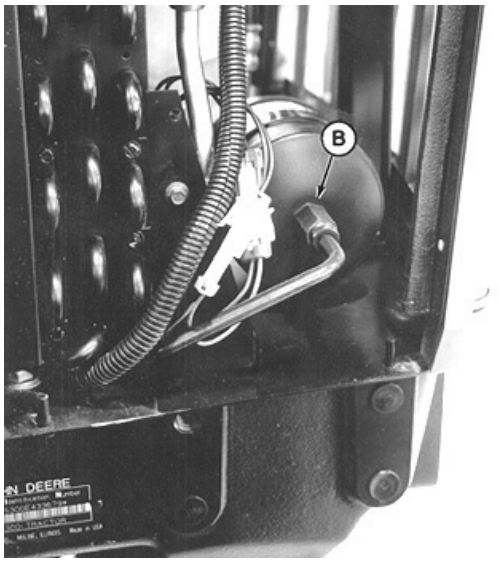

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A—Suction Fitting
B—Discharge Fitting

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Charge Air Conditioning System

NOTE: Bubbles may appear in sight glass when charging below 18° C (65° F) ambient temperature. Bubbles will disappear when temperature rises.

1. Evacuate system. (See Evacuate Air Conditioning System in this group.)

IMPORTANT: Use only R134a Refrigerant Recovery, Recycling, and Charging machines. Do not mix R134a equipment, refrigerant, and refrigerant oils with R-12 systems to prevent compressor damage.

2. Connect JT02047 R134a Refrigerant Recovery, Recycling, and Charging Station to charge system.

NOTE: JT02046 HFC134a Refrigerant Charging Unit can be substituted for JT02047.

3. Connect low-side hose (blue) to suction fitting on compressor. Connect high-side hose (red) to discharge fitting on compressor.

IMPORTANT: Do not run engine. System must hold a minimum vacuum of 28.6 in. Hg. Deduct 1 in. Hg from 29.9 in. for each 300 m (1000 ft) elevation above sea level.

4. Follow manufacturer's instructions and charge system.

5. Weigh refrigerant supply tank and invert so refrigerant enters system as a liquid.

6. Begin charging through discharge port first. As suction pressure nearly equals discharge pressure, open suction valve.

IMPORTANT: Close discharge valve on gauge manifold before starting engine and compressor to prevent over-pressurizing refrigerant container.

7. Continue charging system until 1.4—1.6 kg (3.0—3.5 lb) is installed. Start engine to complete charging system if a heated cylinder is not being used.

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Continued on next page

NOTE: Add 0.45 kg (1.0 lb) after bubbles disappear from sight glass.

8. Close both gauge manifold valves and perform a system operational check as follows:

   - Engine at 2000 rpm. Close door and all windows.
   - Compressor operating with temperature control at maximum cooling, and blower at Purge.
   - Check ambient air temperature, cab air duct temperature, suction, and discharge pressures. Compare to the temperature-pressure chart and temperature drop specifications in Operation and Test TM—Section 290, Group 15.

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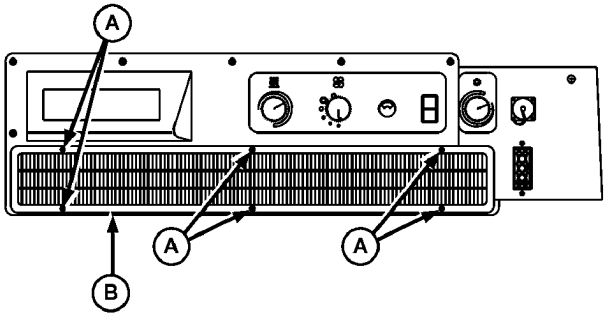
Replace Heater Temperature Control and Cable

1. Disconnect battery negative (–) cable.
2. Loosen six screws (A) and remove air recirculating intake cover and filter (B).

A—Screw (6 used)
B—Filter



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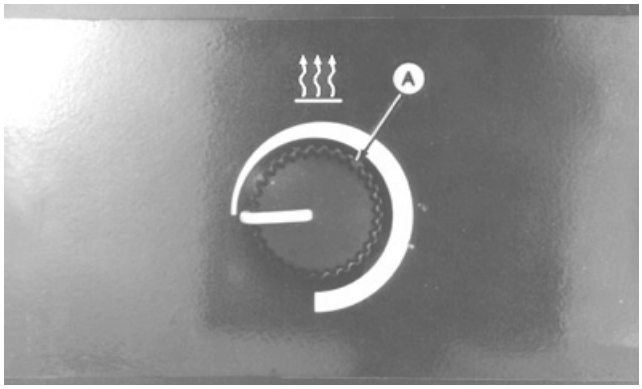
3. Remove control knob (A).

A—Control Knob



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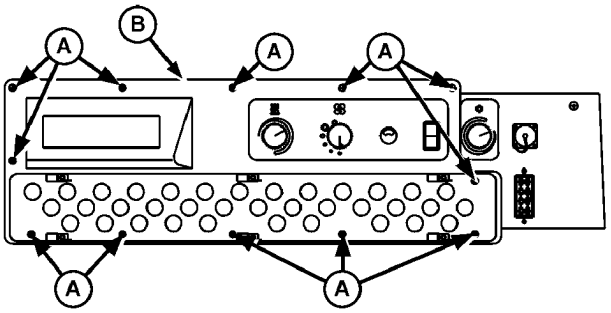
NOTE: Support control panel (B) using wire or rope to prevent weight of panel from pulling on wiring connectors and leads during removal of heater control and cable.

4. Remove twelve screws (A) and control panel (B). Support weight of control panel using wire or rope.
5. Remove nut (C).
6. Disconnect control cable (D).
7. Replace heater control.

A—Screw (12 used)
B—Control Panel
C—Nut
D—Control Cable



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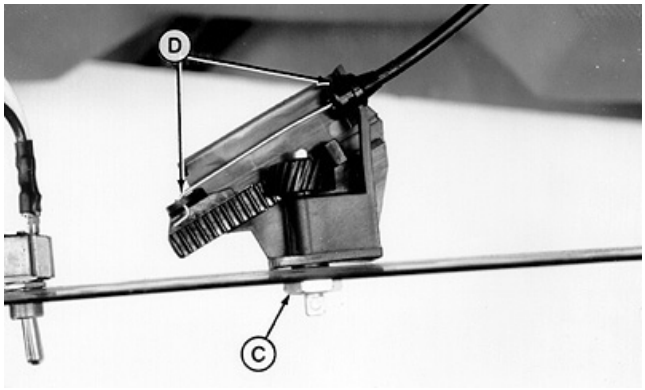

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8. Remove cab roof. (See Remove and Install Cab Roof in Group 15.)

9. Disconnect hoses (A and B).

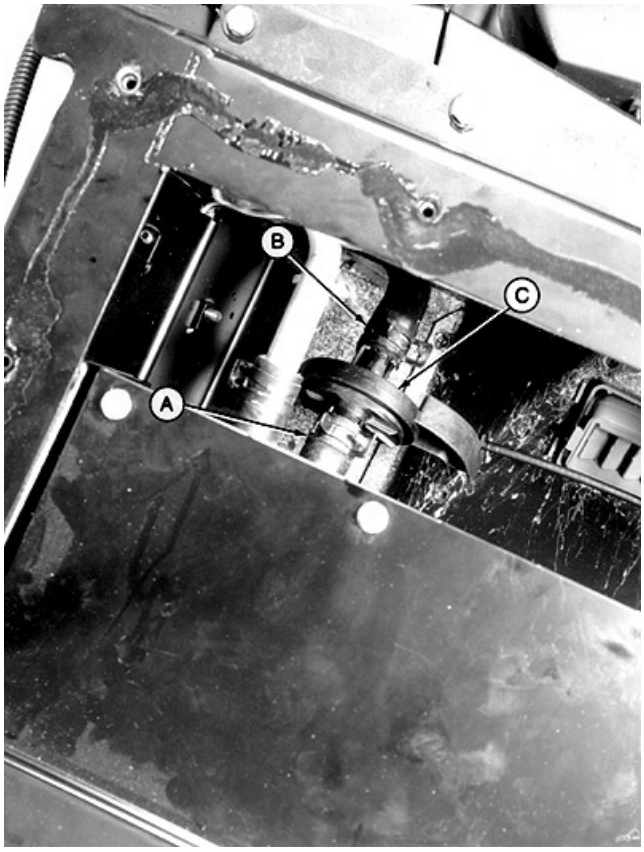
10. Remove heater control valve (C).

11. Remove cable retaining clip (D) and disconnect control cable (E) from valve.

NOTE: Follow routing path of control cable (E) before removing to aid during installation.

12. Replace heater control cable (E).

A—Heater Valve Outlet Hose
B—Heater Valve Inlet Hose
C—Heater Control Valve
D—Clip
E—Control Cable



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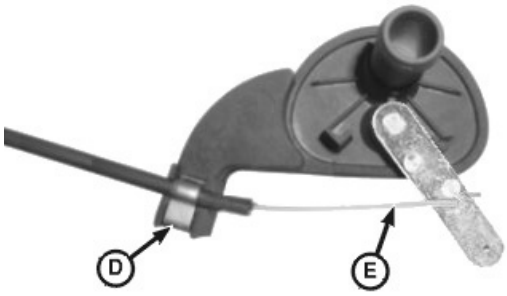
Top Left Side of Cab Roof Shown



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Closed Position

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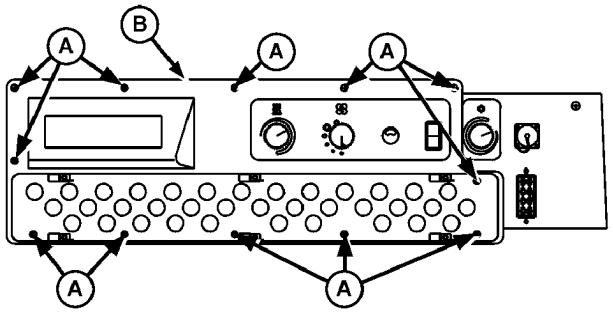
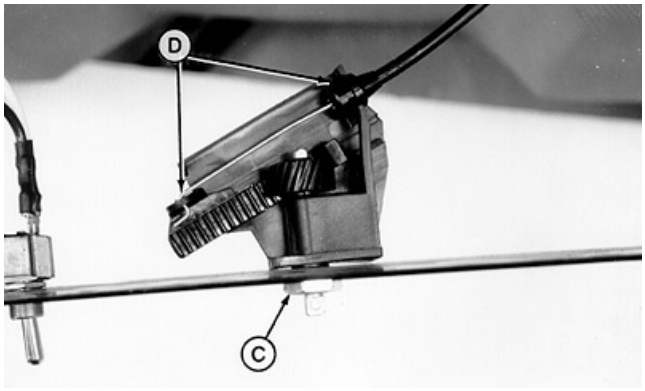
13. Connect cable (D) and tighten nut (C).
14. Install control panel (B) and screws (A).
15. Install heater control knob.

A—Screw (12 used)
B—Control Panel
C—Nut
D—Control Cable



LV1401 –UN–08AUG97

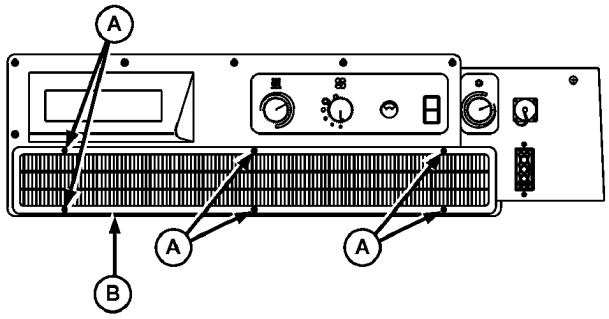


LV1405 –UN–10NOV95

AG,OUO1085,263 –19–17JUL02–5/7

16. Install recirculating air intake cover and filter (B). Tighten screws (A).
17. Adjust heater control cable. (See Adjust Heater Temperature Control Cable in Section 290, Group, 15.)

A—Screw (6 used)
B—Filter



LV1398 –UN–08AUG97

Continued on next page

AG,OUO1085,263 –19–17JUL02–6/7

NOTE: Make sure the heater control knob and the heater control valve are in the closed position as shown below before installing clip (D).

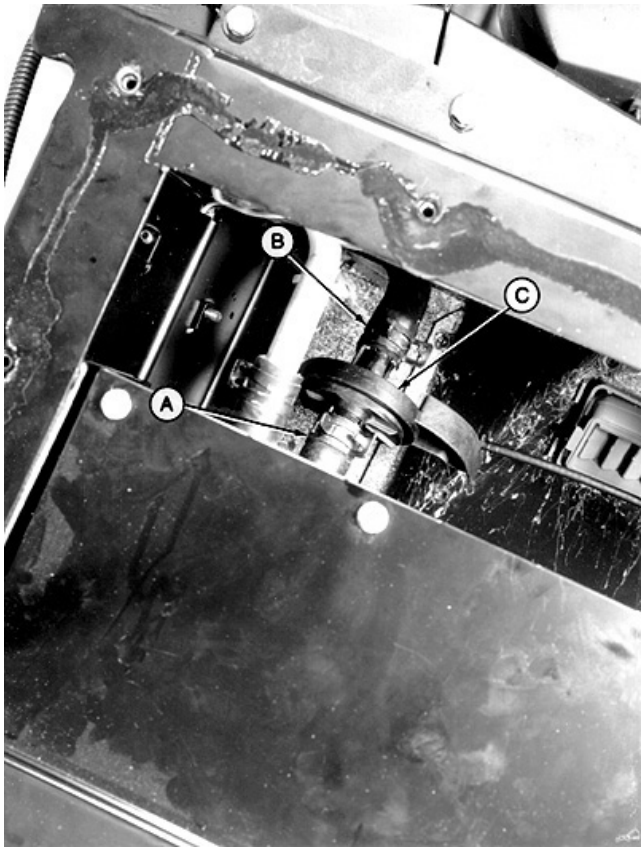
18. Connect cable (E) and install clip (D).

19. Install heater control valve (C) and connect hoses (A and B).

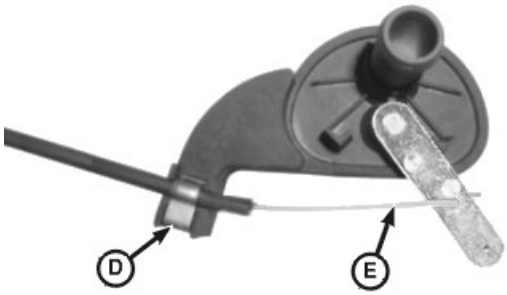
20. Install cab roof. (See Remove and Install Cab Roof in Group 15.)

21. Connect battery negative (–) cable.

A—Heater Valve Outlet Hose
B—Heater Valve Inlet Hose
C—Heater Control Valve
D—Clip
E—Control Cable



LV1406 –UN–10NOV95



LV1407 –UN–19APR01

Closed Position

AG,OUO1085,263 –19–17JUL02–7/7

90
25
4

Remove, Test, and Install Heater Control Valve

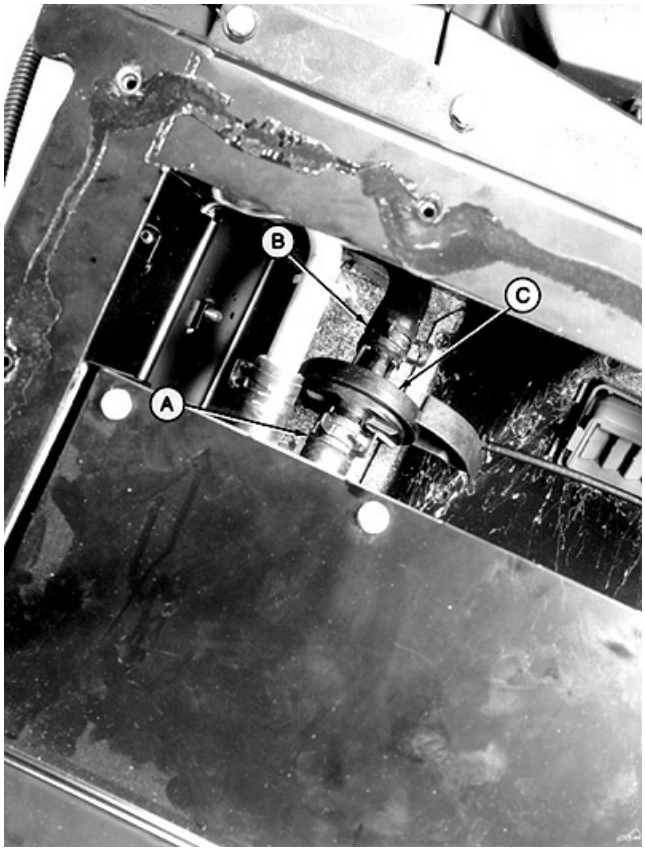
1. Remove cab roof. (See Remove and Install Cab Roof in Group 15.)

NOTE: A small amount of coolant will leak out of valve and heater core.

2. Disconnect hoses (A and B) and remove valve (C).

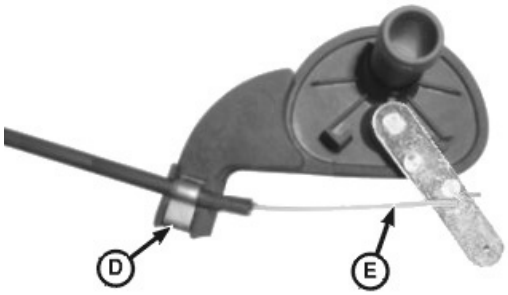
3. Remove clip (D) and disconnect cable (E).

A—Heater Valve Outlet Hose
B—Heater Valve Inlet Hose
C—Heater Valve
D—Clip
E—Control Cable



LV1406 –UN–10NOV95

Top Left Corner of Cab Roof Shown



LV1407 –UN–19APR01

AG,OUO1085,264 –19–17JUL02–1/1

Leak Test Heater Control Valve

1. Connect water pressure hose to control valve inlet and turn the valve arm to closed position.
2. Turn water pressure on and check for leakage from the valve outlet.

NOTE: The heater control valve is not serviceable.

3. Replace valve as required.

AG,OUO1085,265 –19–12SEP00–1/1

Install Heater Control Valve

1. Inspect heater hoses and replace as necessary.

NOTE: Make sure the heater control knob and the heater control valve are in the closed position before connecting cable.

2. Install heater control valve and connect control cable and hoses.
3. Adjust heater control cable. (See Adjust Heater Temperature Control Cable in Section 290, Group 15.)
4. Add coolant to radiator if necessary. Start engine and run the heating system to check for leaks.
5. Install cab roof. (See Remove and Install Cab Roof in Group 15.)

AG,OUO1085,266 –19–12SEP00–1/1

Section 210
Operational Checkout Procedures

Contents

Operational Checkout Procedure Information

The procedures covered in this group are used to give a quick checkout of all the systems and components on the unit. These checkouts should be run to insure proper operation after any extended storage, when the unit comes in for service, and after repairs have been made on the unit. They can also be helpful in determining the value of the unit at trade-in time. The unit should be placed on a level surface to run the checkouts. All the checkouts should be done and all of the steps of each checkout should be followed.

Each checkout lists:

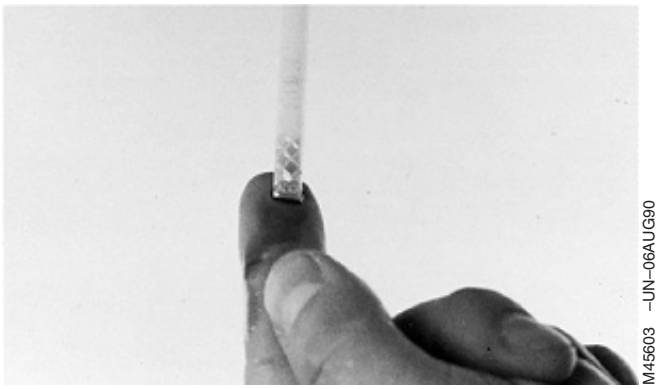
- Conditions—How the unit should be set up for the checkout.
- Procedure—The specific action to be done.
- Normal—What should happen or be heard or be seen.
- If Not Normal—Where to go if other tests or adjustments are needed.

When performing the checkout, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The “Normal” paragraph gives the result that should happen when performing the checkout. If the results are not normal, go to the Section and Group listed in the “If Not Normal” paragraph to determine the cause and repair the malfunction.

The photograph that accompanies each checkout procedure is included to help conduct the checkout.

MX,21010HE,1A –19–12SEP00–1/1

Engine Oil Level and Condition Check


M45603 –UN–06AUG90

CONDITIONS:

- Machine parked on level surface.
- Key switch in off position.
- Transmission in park position.
- Engine not run for at least five minutes.

PROCEDURE:

- Clean dirt from area around dipstick opening.
- Remove and wipe off dipstick.
- Install dipstick until seated in tube.
- Remove dipstick and check level and condition of oil.

NORMAL:

- Oil level between full and add marks of dipstick.
- Oil not excessively thick or thin.
- No fuel odor in oil.
- No visible foreign material in oil.

IF NOT NORMAL:

- Add proper oil to full mark on dipstick. Go to Diesel Engine Oil Section 10, Group 20.
- Replace contaminated oil and filter.
- Go to Diagnosis, Tests, and Adjustments Section 220, Group 15 for engine diagnosis, tests and adjustments.

AG,OUO1023,327 –19–12SEP00–1/1

Coolant Level and Condition Check

CONDITIONS:

- Key switch in OFF position.
- Machine parked on level surface.

PROCEDURE:

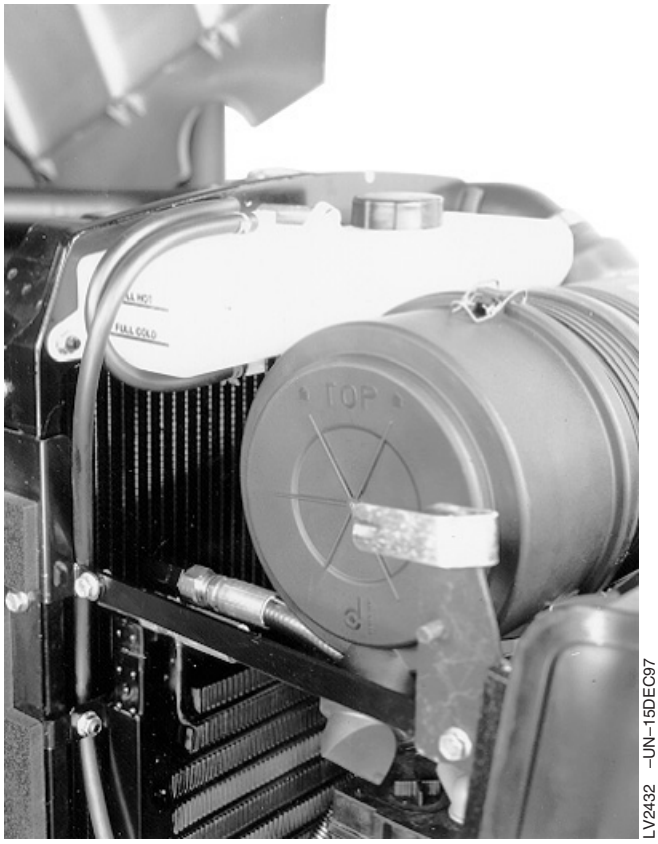
- Observe level of coolant in recovery tank.
- Check condition of recovery tank and tank-to-radiator hose.

NORMAL:

- Recovery tank and hose in good condition, no holes or cracks.
- Coolant at full mark if engine at operating temperature.
- Coolant clean; no oil, rust-like discoloration or foreign material in fluid.

IF NOT NORMAL:

- Replace recovery tank or hose, add coolant, and recheck level after operation.
- Add coolant to proper mark on tank.
- Check radiator-to-tank hose and recovery tank for holes or cracks.
- Change coolant and flush cooling system.
- Go to Diagnosis, Tests, and Adjustments Section 220, Group 15 for diagnosis, tests and adjustments.



LV2432 –UN–15DEC97

AG,OUO1085,267 –19–12SEP00–1/1

Transmission and Hydraulic Oil Check

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Transmission in park position.

PROCEDURE:

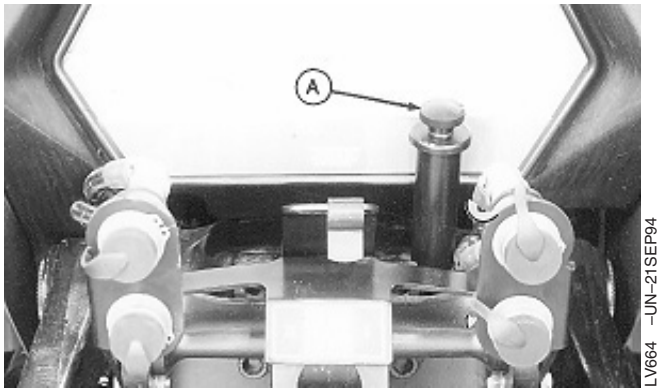
- Clean dirt from area around dipstick (A) opening.
- Remove and wipe off dipstick.
- Install dipstick until seated in tube.
- Remove dipstick and check level and condition of oil.

NORMAL:

- Oil level between full and add marks of dipstick.
- Oil not excessively thick or thin.
- No visible foreign material in oil.

IF NOT NORMAL:

- Add proper oil to full mark on dipstick.
- Replace contaminated oil and filter.
- Go to Sections 250, 260, or 270, Group 15 for transmission and hydraulic system diagnosis, tests and adjustments.

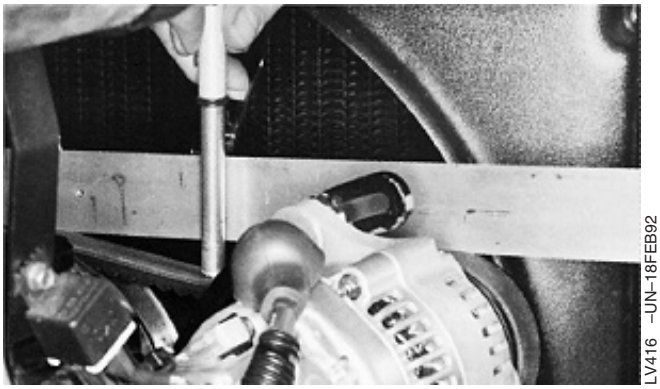


LV664 –UN–21SEP94

A—Dipstick

AG,OUO1023,335 –19–12SEP00–1/1

Fan and V-Belt Check—5210 and 5310


LV416 –UN–18FEB92

CONDITIONS:

- Key switch in OFF position.
- Engine not run for at least 15 min.
- Transmission in park position.

PROCEDURE:

- Inspect fan and V-belt for damage.
- Check belt tension. (See Fan/Alternator V-Belt Adjustment (5210 and 5310) in Section 220, Group 15.)

NORMAL:

- Fan undamaged; no cracks or bent blades.
- Belt not cracked, frayed or glazed.
- Belt does not “squeal” during operation.

IF NOT NORMAL:

- Replace damaged fan or belt.
- Adjust belt tension. Go to Fan/Alternator V-Belt Adjustment (5210 and 5310) in Section 220, Group 15.

AG,OUO1085,292 –19–12SEP00–1/1

Fan and Serpentine Belt Check—5410 and 5510

CONDITIONS:

- Key switch in OFF position.
- Engine not run for at least 15 min.
- Transmission in park position.

PROCEDURE:

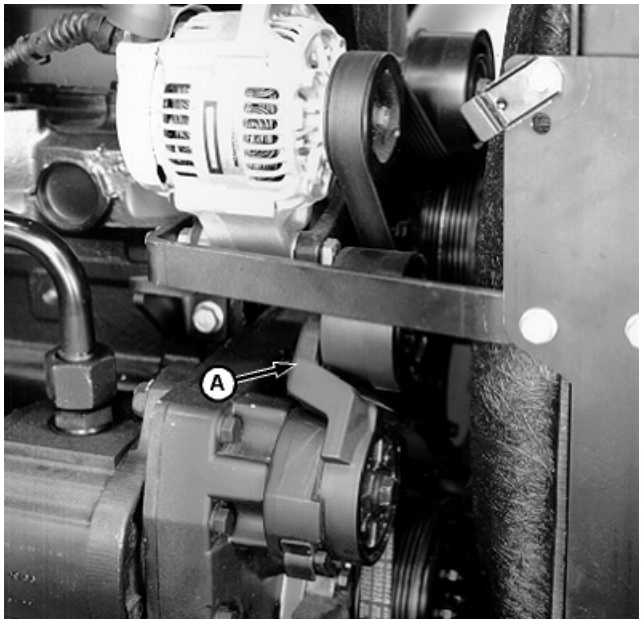
- Inspect fan and serpentine belt for damage.
- Check belt tensioner (A) spring tension. (See Inspect and Replace Belt Tensioner—Models 5410 and 5510 in Section 20, Group 10.)

NORMAL:

- Fan undamaged; no cracks or bent blades.
- Belt not cracked, frayed or glazed.
- Belt does not “squeal” during operation.

IF NOT NORMAL:

- Replace damaged fan or serpentine belt.
- Adjust belt tensioner. Go to Inspect and Replace Belt Tensioner—Models 5410 and 5510 in Section 20, Group 10.



A—Belt Tensioner

AG,OUO1085,293 –19–12SEP00–1/1

Compressor Belt Check

NOTE: Four cylinder tractor shown. Some procedures for the three cylinder tractor are slightly different, see specifics below.

CONDITIONS:

- Key switch in OFF position.
- Engine not run for at least 15 min.
- Transmission in park position.

PROCEDURE:

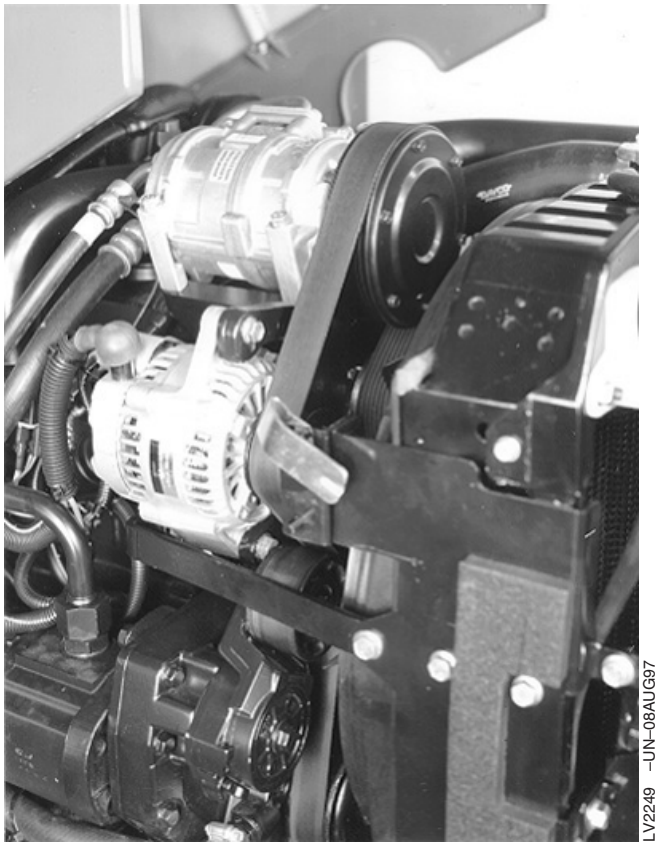
- Inspect belt for damage.
- 3-cylinder engines check belt tension. (See Fan/Alternator V-Belt Adjustment (5210 and 5310) in Section 220, Group 15.)
- 4-cylinder engines inspect belt tensioner and spring tension. (See Inspect and Replace Belt Tensioner—Models 5410 and 5510 in Section 20, Group 10.)

NORMAL:

- Belt not cracked, frayed or glazed.
- Belt does not “squeal” during operation.

IF NOT NORMAL:

- Replace damaged compressor belt.
- 3-cylinder engines adjust belt tension. Go to Fan/Alternator V-Belt Adjustment (5210 and 5310) in Section 220, Group 15.
- 4-cylinder engines replace belt tensioner. Go to Inspect and Replace Belt Tensioner—Models 5410 and 5510 in Section 20, Group 10.



LV2249 –UN–08AUG97

AG,OUO1085,299 –19–13SEP00–1/1

Fuel System Check

CONDITIONS:

- Key switch in OFF position.
- Transmission in park position.
- Fuel drain valves (A) closed.
- Fuel shut-off valve (B) open.

PROCEDURE:

- Observe fuel level and condition.
- Check fuel tank cap and seal condition.
- Check filter condition.
- Check fuel tank, fuel drain valve, lines, and hoses for kinks, leaks, or damage.

NORMAL:

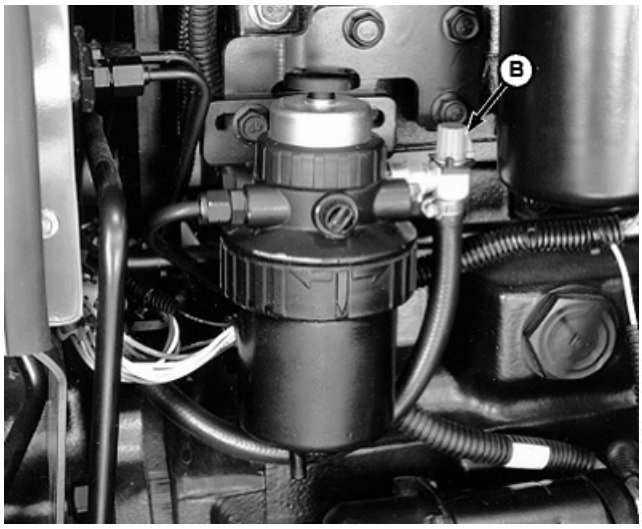
- Fuel level OK.
- Correct type and grade of clean fuel.
- Fuel tank overflow hose and vent valve in good condition. (No pressure or vacuum observed in fuel tank when cap is removed.)
- No leaks in system.
- No water or sediment in fuel filter bowl.

IF NOT NORMAL:

- Add correct type and grade of clean fuel. Go to Diesel Fuel Specifications in Section 10, Group 20.
- Clean contaminated fuel tank, filter, or lines.
- Repair or replace damaged fuel tank, cap, drain valve, filter, or lines.
  Go to Fuel System Section 30, Group 05 for fuel system repair.

A—Fuel Drain Valve
B—Fuel Shut-off Valve

Fuel Tank



Fuel Filter

AG,OUO1085,300 –19–13SEP00–1/1

210
10
8

Air Intake System Check

CONDITIONS:

- Key switch OFF.
- Transmission in park position.

PROCEDURE:

- Observe condition of air filter elements.
- Check condition of air intake hose, tube, or turbocharger.
- Observe air cleaner restriction indicator on dash. (Engine running.)

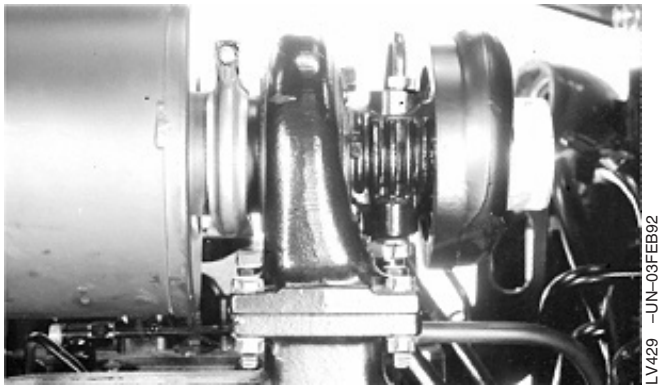
NORMAL:

- Air intake and elements free of debris.
- Air intake hoses and tube in good condition. Hose clamps tight. Intake tube gasket intact.
- Air cleaner unloader valve not plugged.
- Air cleaner housing sealed.
- Air cleaner restriction indicator light off.
- 5310 or 5510: turbocharger operates with no grinding or bearing noise.

IF NOT NORMAL:

- Clean, repair or replace as required.
- 5310 or 5510: repair damaged turbocharger, if equipped.
- Go to Diagnosis, Tests, and Adjustments Section 220, Group 15 for air intake system diagnosis, tests and, adjustments.
- Go to Air Intake System Section 30, Group 10 for inspection and repair.

Air Filter (5310 Shown)



Turbocharger (5310 Shown)

AG,OUO1023,331 –19–21OCT99–1/1

Electrical System Check

CONDITIONS:

- Key switch in OFF position.
- Transmission in park position.

PROCEDURE:

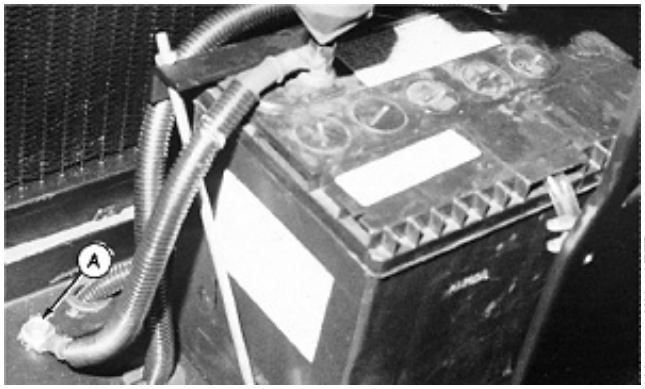
- Check battery electrolyte level.
- Check battery cable condition.
- Check ground cable connection (A).
- Check condition of starter and alternator connections.
- Check fuses; located below key switch panel.

NORMAL:

- Battery electrolyte between full and add indicators.
- All electrical connections clean and tight.
- Fuses good and of correct rating.

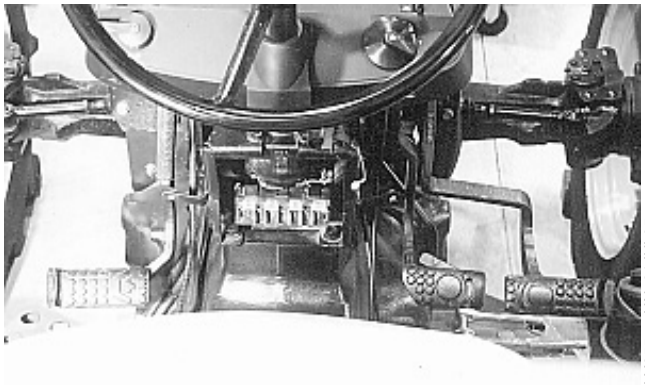
IF NOT NORMAL:

- Add distilled water to battery to bring electrolyte to proper level.
- Clean and tighten electrical connections.
- Replace fuses as required. Determine reason for blown fuses. Go to Diagnosis, Test and Adjust Section 240, Group 15 for electrical system diagnosis, tests, and adjustments.



LV430 –UN–03FEB92

Battery



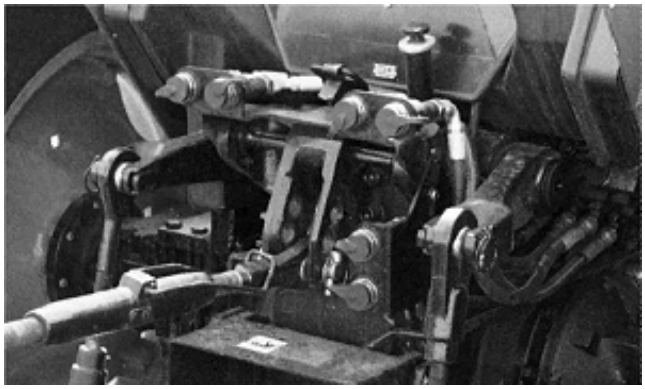
LV855 –UN–21JUL95

Fuses

A—Ground Cable Connection

AG,OUO1085,301 –19–13SEP00–1/1

Hydraulic System Check


LV432 –UN–03FEB92

CONDITIONS:

- Engine running.
- Hydraulic oil at operating temperature.
- Transmission in park position.

PROCEDURE:

- Check on and under machine for signs of hydraulic oil leakage. (Engine not running.)
- Operate all hydraulic controls.

NORMAL:

- No oil leakage.
- Hydraulic controls operate smoothly through entire range of function.

IF NOT NORMAL:

- Repair oil leaks.
- Replace damaged oil lines.
- Repair hydraulic components as required.
- Go to Diagnosis Section 270, Group 15 for diagnosis, tests, and adjustments.
- Go to Hydraulic System Section 70 for component repair or replacement.

AG,OUO1085,302 –19–13SEP00–1/1

MFWD Oil Check

CONDITIONS:

- Machine parked on level ground.
- OIL LEVEL arrow (A) parallel to ground.
- Transmission in park position.
- Key switch in off position.

PROCEDURE:

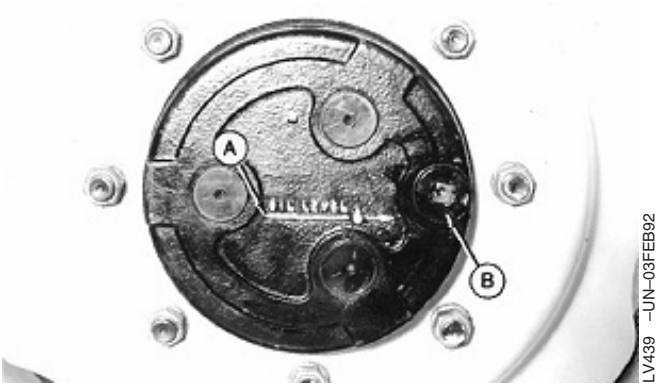
- Remove filler plug (B).
- Observe level of oil.

NORMAL:

- Oil level even with bottom of filler plug hole.

IF NOT NORMAL:

- Drain excess oil or add oil to proper level.



A—Oil Level Arrow
B—Filler Plug

AG,OUO1023,336 –19–27OCT99–1/1

Indicator Lamps Check

NOTE: Steering wheel removed for clarity of photo.

CONDITIONS:

- Key switch in ON position.

PROCEDURE:

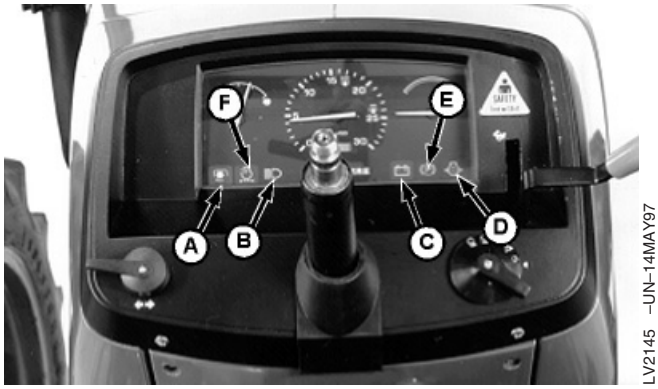
- Turn light switch to “H1” (High Beam) position.
- Push PTO control lever forward to PTO engage position.

NORMAL:

- Indicator lamps (A—D) should light. [Lamp (C) will light with key switch in OFF position.]
- Lamps (C and D) should be off when engine is running.
- Lamp (F) will light when key is advanced to “START” position.
- Lamp (E) will light when key is advanced to “START” position.

IF NOT NORMAL:

- Check lamps and wiring circuit.
- Go to Diagnosis, Test and Adjust Section 240, Group 15 for electrical diagnosis, tests, and adjustments.
- If lamps (D or F) remain on when engine is running, stop engine. Go to Diagnosis, Tests, and Adjustments Section 220, Group 15 for engine diagnosis, tests, and adjustments.



LV2145 –UN–14MAY97

A—PTO Engaged Indicator
B—High Beam Indicator
C—Charging System Indicator
D—Engine Oil Pressure Indicator
E—Park Brake Indicator
F—Air Cleaner Restriction Indicator

AG,OUO1085,303 –19–13SEP00–1/1

210
10
13

Cab Blower Motor Check

CONDITIONS:

- Cab 30-amp fuses F13 and F15 removed.

PROCEDURE:

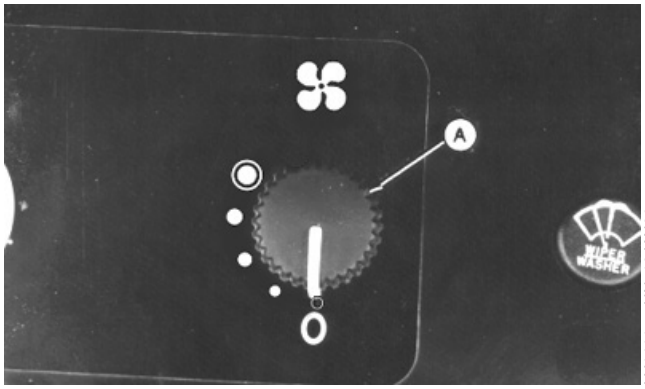
- Turn key switch on but do NOT start engine.
- Turn blower motor switch (A) to PURGE position (fully clockwise).
- Both blower motors should be off.

NORMAL:

- The left-hand blower motor should operate when fuse F13 is TEMPORARILY installed.
- The right-hand blower motor should operate when fuse F15 is TEMPORARILY installed.
- Reinstall both fuses.
- Both blower motors should operate with the blower motor switch in the LOW, MEDIUM, HIGH, and PURGE positions, and not operate when switch is off.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments Section 240 for electrical system operation, tests, and adjustments.



LV1411 –UN–12JAN96

A—Blower Motor Switch

AG,OUO1085,304 –19–13SEP00–1/1

210
10
14

A/C Compressor Clutch Check

CONDITIONS:

- Cab door open.
- A/C compressor switch (A) ON.
- Engine off.

PROCEDURE:

- Turn key switch on but do NOT start engine.
- Operate blower motor switch from OFF to LOW several times while listening for click indicating compressor clutch engagement at engine.

NORMAL:

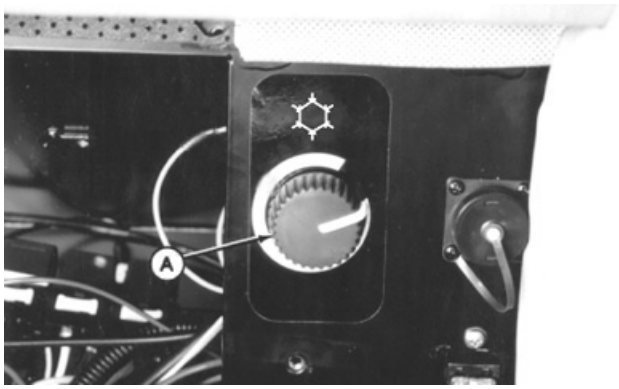
- Compressor clutch engages and disengages when blower switch motor is turned ON and OFF.

NOTE: The evaporator temperature must be above 3°C (37°F) so contacts of temperature control switch will be closed.

System must also be charged with 300—400 kPa (3—4 bar) (45—60 psi) so the A/C low pressure switch will be closed.

IF NOT NORMAL:

- Go to Diagnosis, Tests and Adjustments Section 240, Group 15 for Electrical System Operation, Tests and Adjustments and/or Diagnosis, Tests, and Adjustments Section 290, Group 10 for A/C system diagnosis, tests, and adjustments.



LV2246 –UN–15JUL97

A—A/C Compressor Switch

AG,OUO1085,305 –19–13SEP00–1/1

Engine Start Check

CONDITIONS:

- PTO lever in disengaged position.
- Transmission in park or neutral position.
- Cold weather starting aids used, if necessary.

PROCEDURE:

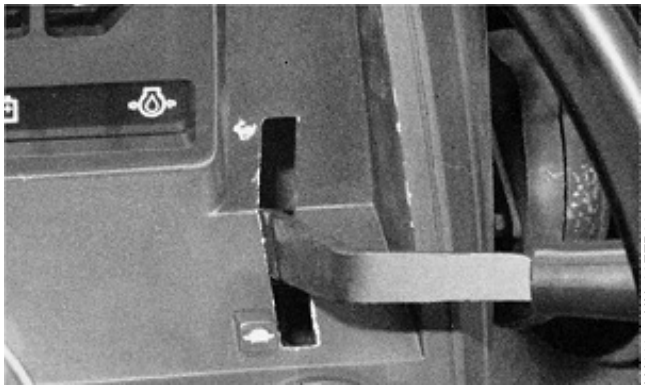
- Push throttle lever forward about one-third of travel.
- Turn key clockwise.
- Release key when engine starts.

NORMAL:

- Engine starts within 20 seconds.

IF NOT NORMAL:

- Wait 2 minutes for starter to cool.
- Try to start engine again.
- Repeat start procedure two more times, if necessary.
- Go to Diagnosis, Tests, and Adjustments Section 220, Group 15 for engine diagnosis, tests, and adjustments.



LV441 –UN–03FEB92

LV442 –UN–03FEB92

AG,OUO1085,306 –19–13SEP00–1/1

Transmission Neutral Start Check

CONDITIONS:

- PTO lever (A) in disengaged position.
- Transmission gear shift lever (B) in forward or reverse gear.
- Tractors equipped with PowrReverser™ transmission: place selector lever (C) in forward or reverse.
- Operator on seat.

PROCEDURE:

- Turn key switch to START position.

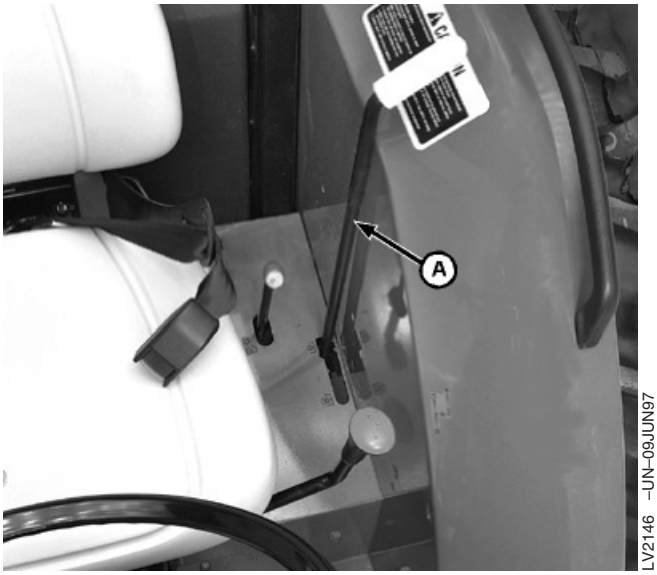
NORMAL:

- Starter should not crank engine.

IF NOT NORMAL:

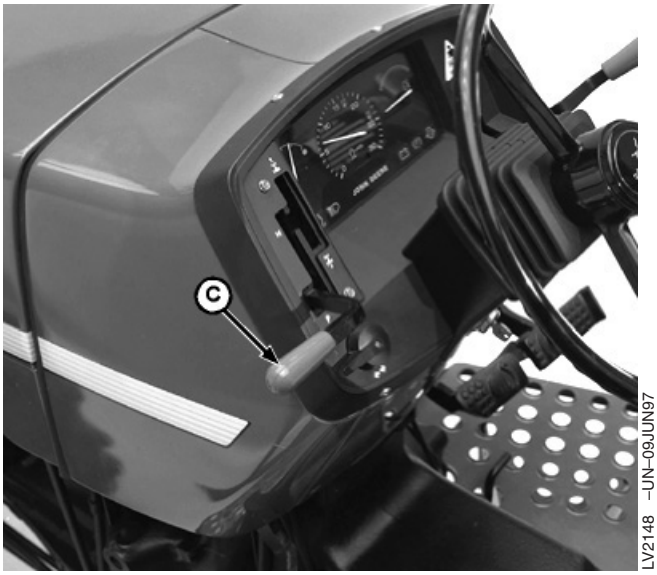
- Go to Diagnosis, Test and Adjust Section 240, Group 15 for electrical diagnosis, tests, and adjustments.

A—PTO Lever
B—Transmission Gear Shift Lever
C—Selector Lever



LV2146 –UN–09JUN97

LV2147 –UN–09JUN97



LV2148 –UN–09JUN97

AG,OUO1085,307 –19–25JUL02–1/1

PTO Neutral Start Check

CONDITIONS:

- Transmission in park or neutral position.
- PTO lever (A) pushed to forward (engaged) position.
- Operator on seat.

PROCEDURE:

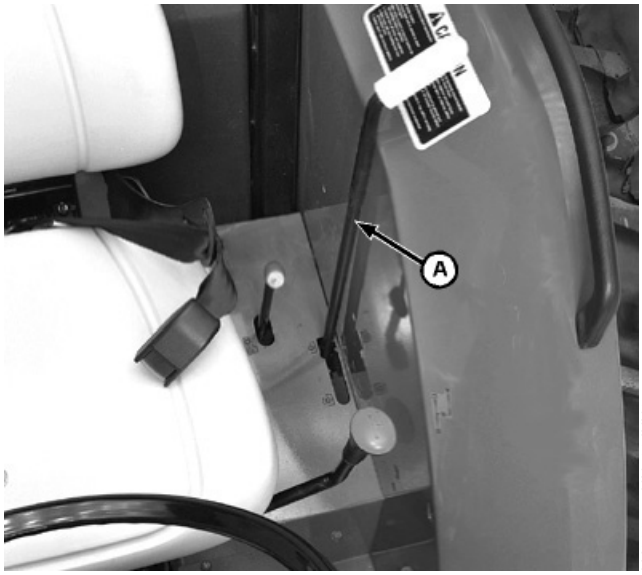
- Turn key switch to START position.

NORMAL:

- Starter should not crank engine.

IF NOT NORMAL:

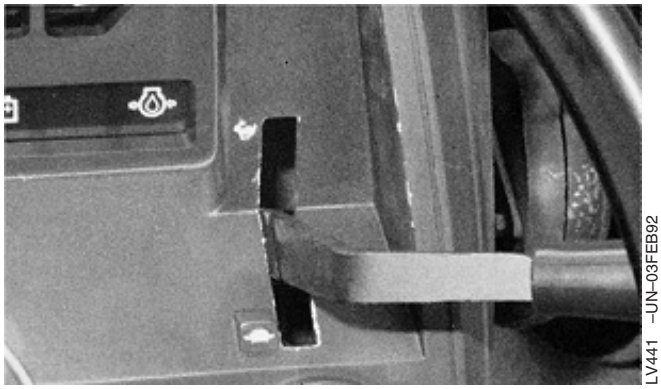
- Go to Diagnosis, Test and Adjust Section 240, Group 15 for electrical diagnosis, tests and adjustments.



A—PTO Lever

AG,OUO1085,308 –19–13SEP00–1/1

Engine Fast and Slow Idle Operation


LV441 –UN–03FEB92

CONDITIONS:

- Transmission in park position.
- Operator on seat.

PROCEDURE:

- Start engine and warm up for several minutes between 1500 and 1900 rpm.
- Move throttle lever from slow to fast idle several times slowly and rapidly.

NORMAL:

- Engine runs smoothly at all throttle settings.
- Engine accelerates and decelerates smoothly without misfiring or stumbling.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments Section 220, Group 15 for engine diagnosis, tests, and adjustments.

AG,OUO1085,309 –19–13SEP00–1/1

Power Steering Check

CONDITIONS:

- Operator on seat.
- Transmission in neutral position.
- Engine running.

PROCEDURE:

- Turn steering wheel from full left to full right and back.

NORMAL:

- Tires move from stop-to-stop.
- Wheel moves smoothly in both directions.
- Wheel stops turning when released.

IF NOT NORMAL:

- Go to Diagnosis, Tests and Adjustments Section 260, Group 15 for steering diagnosis, tests, and adjustments.

AG,OUO1085,310 –19–13SEP00–1/1

Differential Lock Check

CONDITIONS:

- Operator on seat.
- Transmission in forward gear.
- Engine running at slow idle.

PROCEDURE:

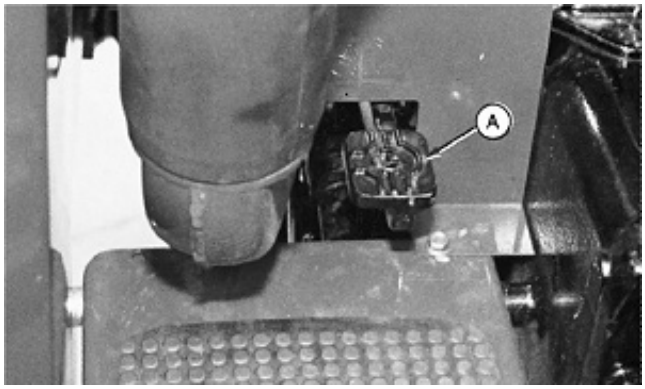
- Depress differential pedal (A).
- Briefly turn steering wheel left or right.

NORMAL:

- Machine must try to go straight forward when steering wheel is turned.
- Differential operates quietly.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments—CS/SS Transmissions or Diagnosis, Tests, and Adjustments—PowrReverser™ Section 250, Groups 15 or 16 for differential diagnosis, tests, and adjustments.



A—Differential Pedal

AG,OUO1085,311 –19–13SEP00–1/1

PTO Engagement Check

CONDITIONS:

- Operator on seat.
- Engine running.

PROCEDURE:

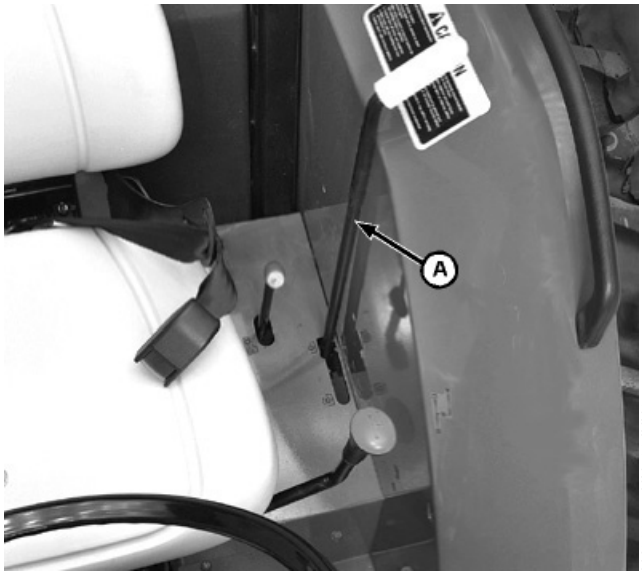
- Move PTO lever (A) forward into the engaged position.
- Move PTO lever (A) rearward into the disengage position.
- Operator rise off seat while PTO lever is in engage position.

NORMAL:

- PTO engages and disengages with lever movement.
- Warning horn sounds if operator rises off seat while PTO lever is in engage position.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments—CS/SS Transmissions or Diagnosis, Tests, and Adjustments—PowrReverser™ Section 250, Groups 15 or 16 for PTO diagnosis, tests, and adjustments.
- Go to Diagnosis, Test and Adjust Section 240, Group 15 for electrical diagnosis, tests, and adjustments.



A—PTO Lever

AG,OUO1085,312 –19–14SEP00–1/1

Clutch Check

CONDITIONS:

- Operator on seat.
- Engine running.

PROCEDURE:

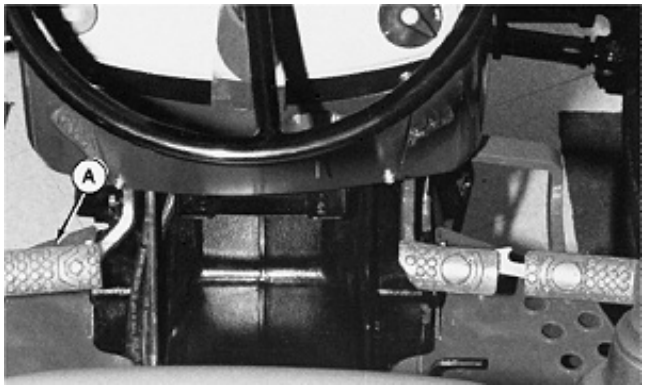
- Depress clutch pedal (A).
- Move shift lever to any forward gear. If equipped with hydraulic reverser selector lever, move lever into forward position.
- Slowly release clutch pedal.

NORMAL:

- Clutch engages smoothly and machine moves forward smoothly.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments— CS/SS Transmissions or Diagnosis, Tests, and Adjustments— PowrReverser™ Section 250, Groups 15 or 16 for clutch diagnosis, tests, and adjustments.



LV447 –UN–03FEB92

A—Clutch Pedal

AG,OUO1085,313 –19–14SEP00–1/1

Transmission Shift Check

CONDITIONS:

- Operator on seat.
- Engine running.

PROCEDURE:

- Depress clutch pedal.
- Put transmission shift lever (A) in first gear. Put PowrReverser™ selector lever in forward, if equipped.
- Release clutch pedal and move machine in gear.
- Depress clutch pedal and stop machine.
- Repeat above procedure with remaining forward gears and reverse.
- Move transmission shift lever to neutral and park.

NORMAL:

- Machine moves in appropriate direction but does not move in neutral or park.
- Transmission stays in gear selected.
- Gears do not clash excessively when engaged.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments—CS/SS Transmissions or Diagnosis, Tests, and Adjustments—PowrReverser™ Section 250, Groups 15 or 16 for transmission diagnosis, tests, and adjustments.

A—Transmission Shift Lever

AG,OUO1085,314 –19–25JUL02–1/1

Range Lever Shift Check

CONDITIONS:

- Operator on seat.
- Engine running at specific rpm.

PROCEDURE:

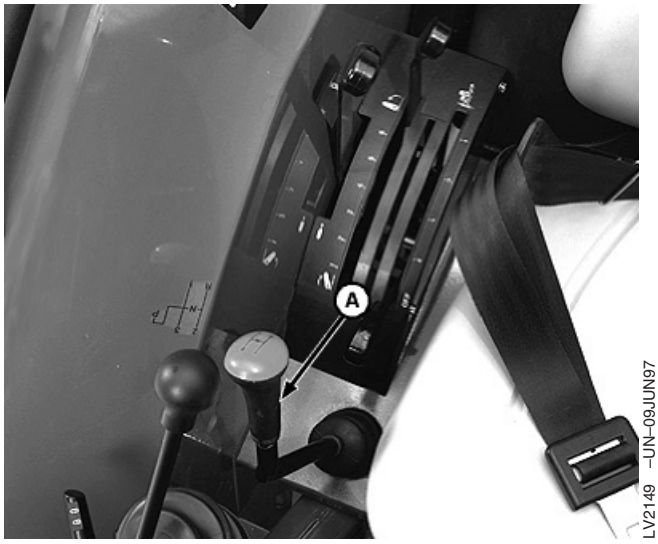
- Depress clutch pedal.
- Put transmission shift lever (A) in gear.
- Put range shift lever (B) in speed range A. Put PowrReverser™ selector lever, if equipped, in forward position.
- Release clutch pedal and move machine in gear.
- Depress clutch pedal and stop machine.
- Repeat above procedure with remaining speed ranges.

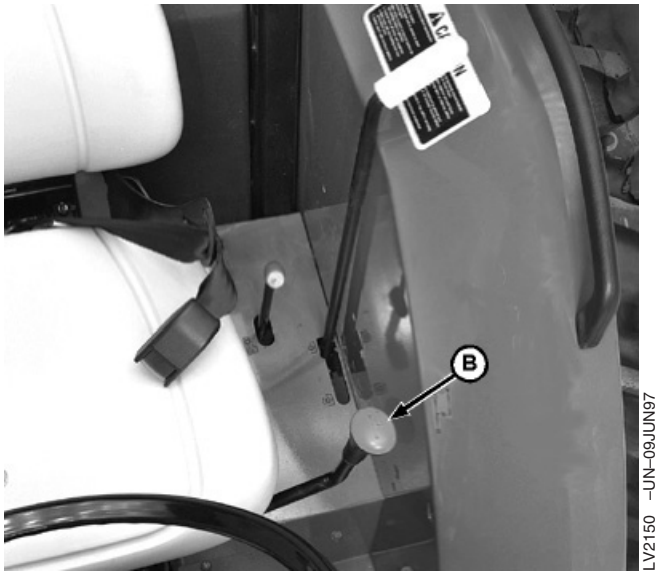
NORMAL:

- Machine moves smoothly. Ground speed increases as higher gears and speed range are selected.
- Range shift stays in range selected.
- No excessive gear noise.

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments—CS/SS Transmissions or Diagnosis, Tests, and Adjustments—PowrReverser™ Section 250, Groups 15 or 16 for diagnosis, tests, and adjustments.





A—Transmission Shift Lever
B—Range Shift Lever

AG,OUO1085,315 –19–25JUL02–1/1

MFWD Drive Check

CONDITIONS:

- Machine on slippery surface.
- Engine running.

PROCEDURE:

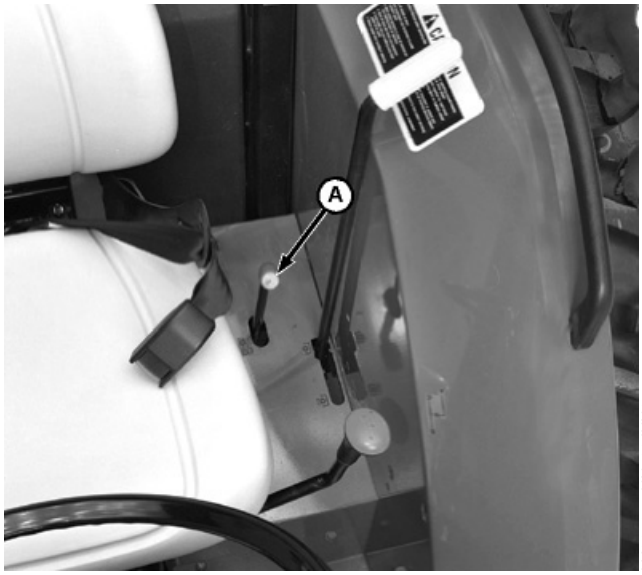
- Depress clutch pedal.
- Push MFWD lever (A) forward to engage.
- Put PowrReverser™ selector lever, if equipped, in forward position.
- Put transmission in gear, release clutch, and move machine forward.

NORMAL:

- Machine moves with increased traction.
- No excessive noise.
- MFWD lever stays in position.

IF NOT NORMAL:

- Check MFWD oil level.
- Go to Diagnosis, Tests, and Adjustments— CS/SS Transmissions or Diagnosis, Tests, and Adjustments— PowrReverser™ Section 250, Groups 15 or 16 for diagnosis, tests, and adjustments.



A—MFWD Lever

AG,OUO1085,316 –19–25JUL02–1/1

Brake Check

CONDITIONS:

- Operator on seat.
- Engine running.
- Transmission in gear.

PROCEDURE:

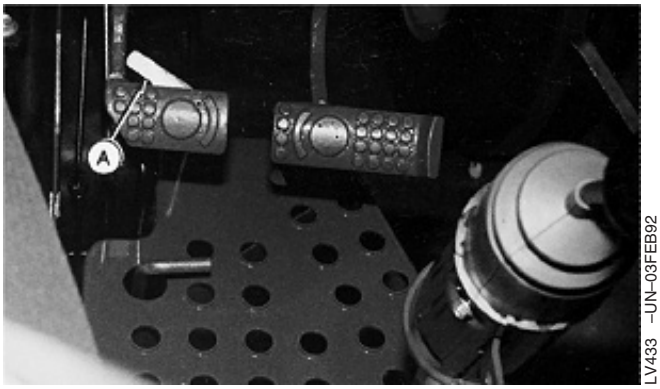
- Disengage brake pedal Lock (A).
- Operate brake pedals individually.
- Hold brake pedal to limit of travel for 15 seconds.
- Engage pedal bar.
- Operate brake pedals together.

NORMAL:

- Machine turns toward side with brake engaged when pedals operated individually.
- Machine stops evenly when pedals operated together.
- Pedal remains firm and does not sink when held.
- Brakes operate smoothly and quietly.

IF NOT NORMAL:

- Bleed brake system.
- Repair or replace parts as required.
- Go to Diagnosis, Tests and Adjustments Section 260, Group 15 for brake system diagnosis, tests, and adjustments.
- Go to Brake Repair Section 60, Group 10 for brake repair.



A—Brake Pedal Lock

AG,OUO1085,317 –19–14SEP00–1/1

Rockshaft Check

CONDITIONS:

- Engine running.
- Hydraulic oil at operating temperature.
- Transmission in park position.

PROCEDURE:

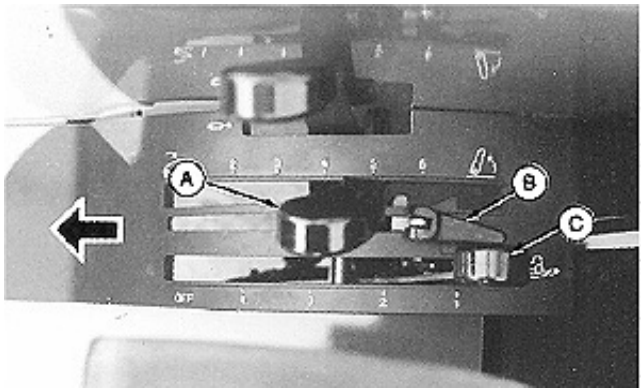
- Move control lever stop (B) to forward position (arrow).
- Move draft control lever (C) to forward position.
- Move position control lever (A) to forward position.
- Move position control lever (A) to rearward position.
- Observe the rate-of-drop with implement attached.

NORMAL:

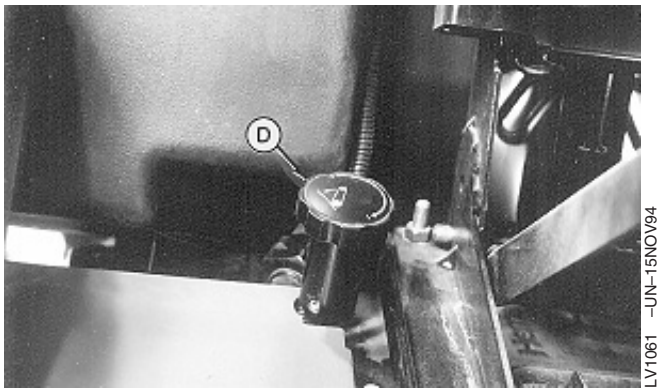
- Hitch should raise fully when lever (A) is pulled rearward, and lower when lever is pushed forward.
- Rockshaft rate-of-drop should be adjustable to a minimum of 2 seconds by turning rockshaft rate-of-drop knob (D).

IF NOT NORMAL:

- Go to Diagnosis Section 270, Group 15 for rockshaft diagnosis, tests, and adjustments.



LV434 –UN–02AUG94



LV1061 –UN–15NOV94

A—Position Control Lever
B—Control Lever Stop
C—Draft Control Lever
D—Rate-of-Drop Knob

AG,OUO1085,319 –19–14SEP00–1/1

Selective Control Valve Check

CONDITIONS:

- Engine running.
- Hydraulic oil at operating temperature.
- Transmission in park position.

PROCEDURE:

- Move control lever (A) forward and rearward.
- Move control lever (A) from side to side.
- Move control lever (B) forward and rearward.

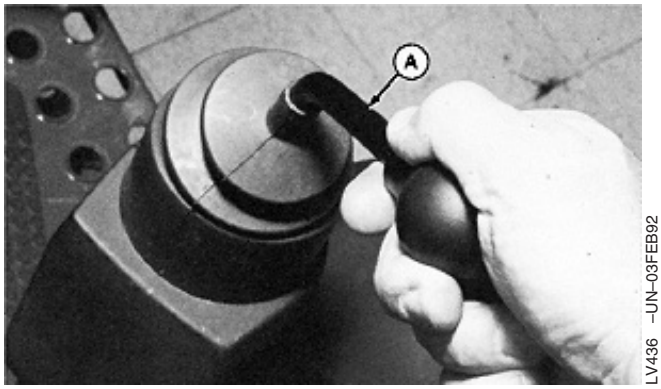
NORMAL:

- Moving control lever (A) forward and rearward should extend and retract a cylinder attached to outlets (C).
- Moving control lever (A) from side to side should extend and retract a cylinder attached to outlets (D).
- Moving control lever (B) should extend and retract a cylinder attached to outlets (E).
- Levers should return to neutral (centered) position when released. Lever (A) will not return to neutral when in float position (lever fully forward).

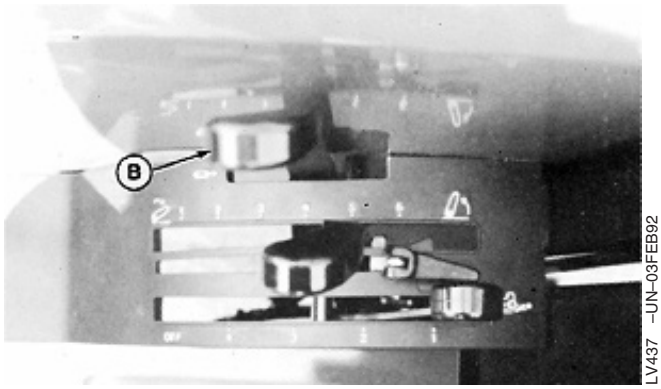
IF NOT NORMAL:

- Go to Diagnosis Section 270, Group 15 for hydraulic diagnosis, tests, and adjustments.

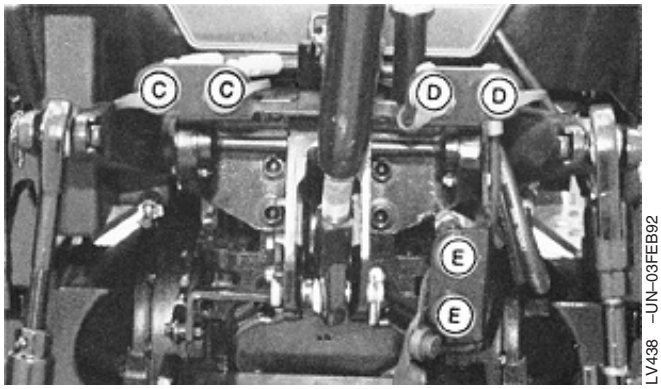
A—Joystick Control Lever
B—Control Lever
C—Hydraulic Outlets
D—Hydraulic Outlets
E—Hydraulic Outlets



Dual SCV Joystick



Single SCV Lever



Hydraulic Outlets

AG,OUO1085,320 –19–14SEP00–1/1

A/C System Operational Check

CONDITIONS:

- Engine running at 2000 rpm.
- Doors and windows closed.

PROCEDURE:

- Set A/C control for maximum cooling.
- Turn blower motor switch to HIGH position (fully clockwise).
- Air from air ducts should be cold after approximately six minutes of operation.
- Check ambient outside air temperature (in shade) and check air temperature at air duct outlet in cab headliner after approximately 15 minutes of operation. Compare temperature difference to following chart:

Ambient Temperature	Minimum Temperature Difference
Below 24°C (75°F)	12°C (20°F)
Between 24—32°C (75—90°F)	14°C (25°F)
Above 32°C (90°F)	16°C (30°F)

IF NOT NORMAL:

- Go to Diagnosis, Tests, and Adjustments Section 290, Group 10 for air conditioning system diagnosis, tests, and adjustments.

AG,OUO1085,321 –19–14SEP00–1/1

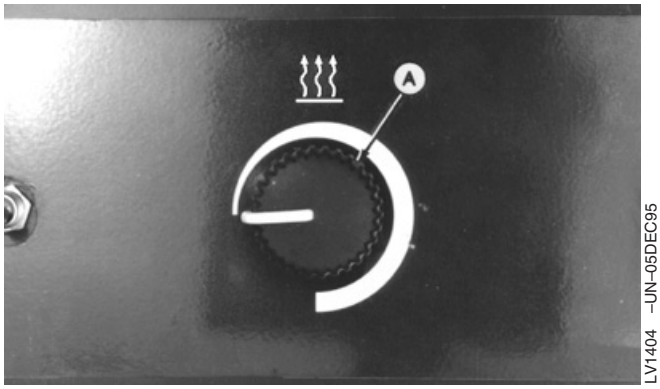
Cab Heater Valve Check

CONDITIONS:

- Engine running at 2000 rpm and fully warmed up.

PROCEDURE:

- Turn heater control (A) clockwise approximately halfway. Air from air ducts should begin to warm up within two minutes.
- Turn heater control fully counterclockwise. Air from air ducts should become cool within 2 or 3 minutes.



LV1404 –UN–05DEC95

A—Cab Heater Control

AG,OUO1085,322 –19–14SEP00–1/1

Miscellaneous Checks

CONDITIONS:

- Key switch in OFF position.
- Transmission in park position.

NORMAL:

- Tires in good condition, properly inflated.
- Seat and safety belt in good condition.
- Directional lights functional.
- ROPS securely fastened.
- Wheel cap screws and nuts tight.
- 3-point hitch in good condition.

IF NOT NORMAL:

- Replace or tighten hardware.
- Repair, replace, or adjust as necessary.
- Go to Diagnosis, Test and Adjust Section 240, Group 15 for electrical diagnosis, tests, and adjustments.

AG,OUO1023,366 –19–02NOV99–1/1

Section 220
Engine Operation, Tests, and Adjustments

Contents

Component Location Information

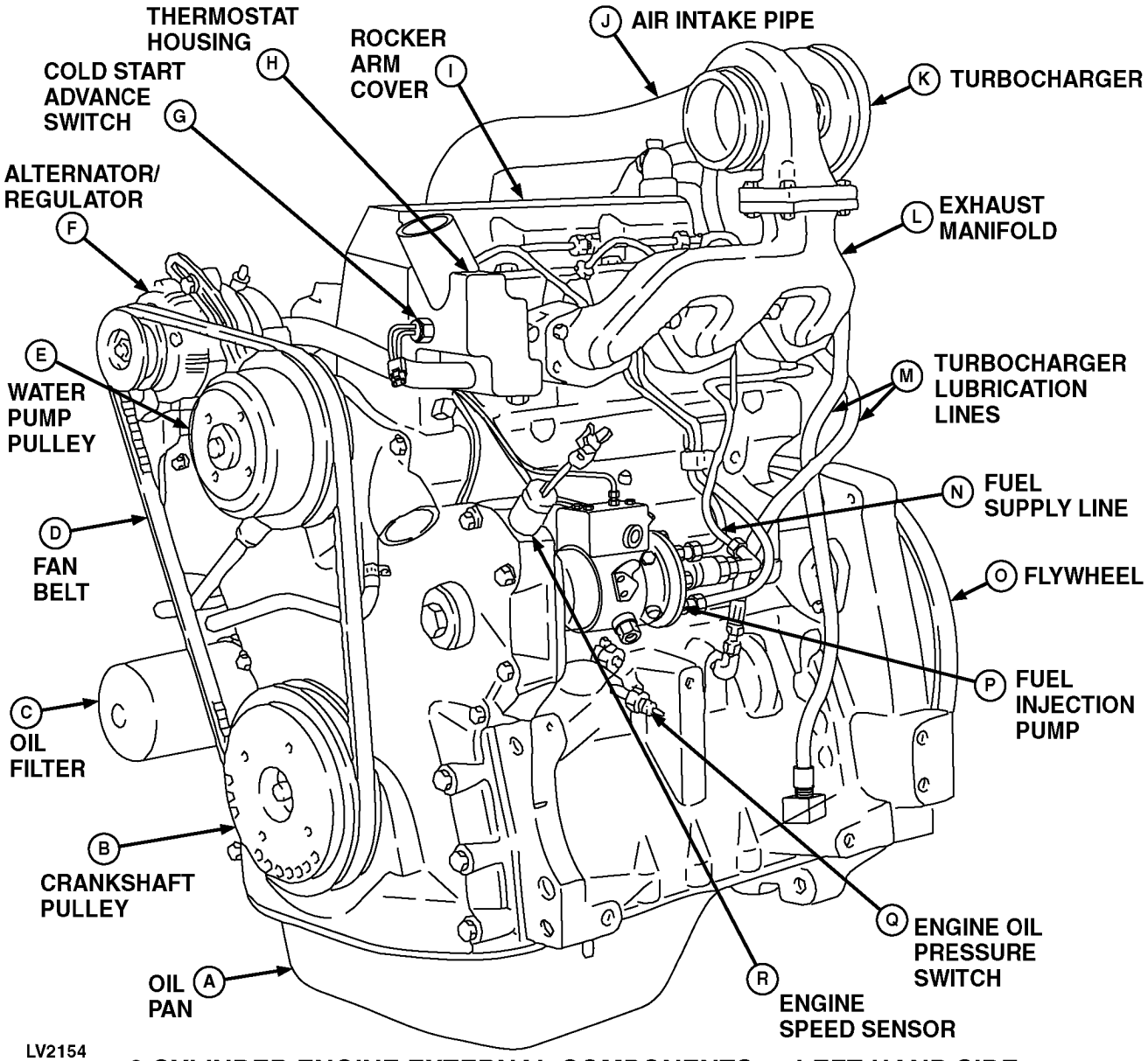
This group contains component location drawings for the following engine system components:

- 3- and 4-Cylinder Engine External Components
  - Left-Hand Side
  - Right-Hand Side

Use the drawings when diagnosing an engine problem to help locate the components to be tested.

LV,22005HA,A1 –19–04JUN96–1/1

Engine External Components—Left-Hand Side



3 CYLINDER ENGINE EXTERNAL COMPONENTS — LEFT-HAND SIDE

LV2154 –UN–23APR98

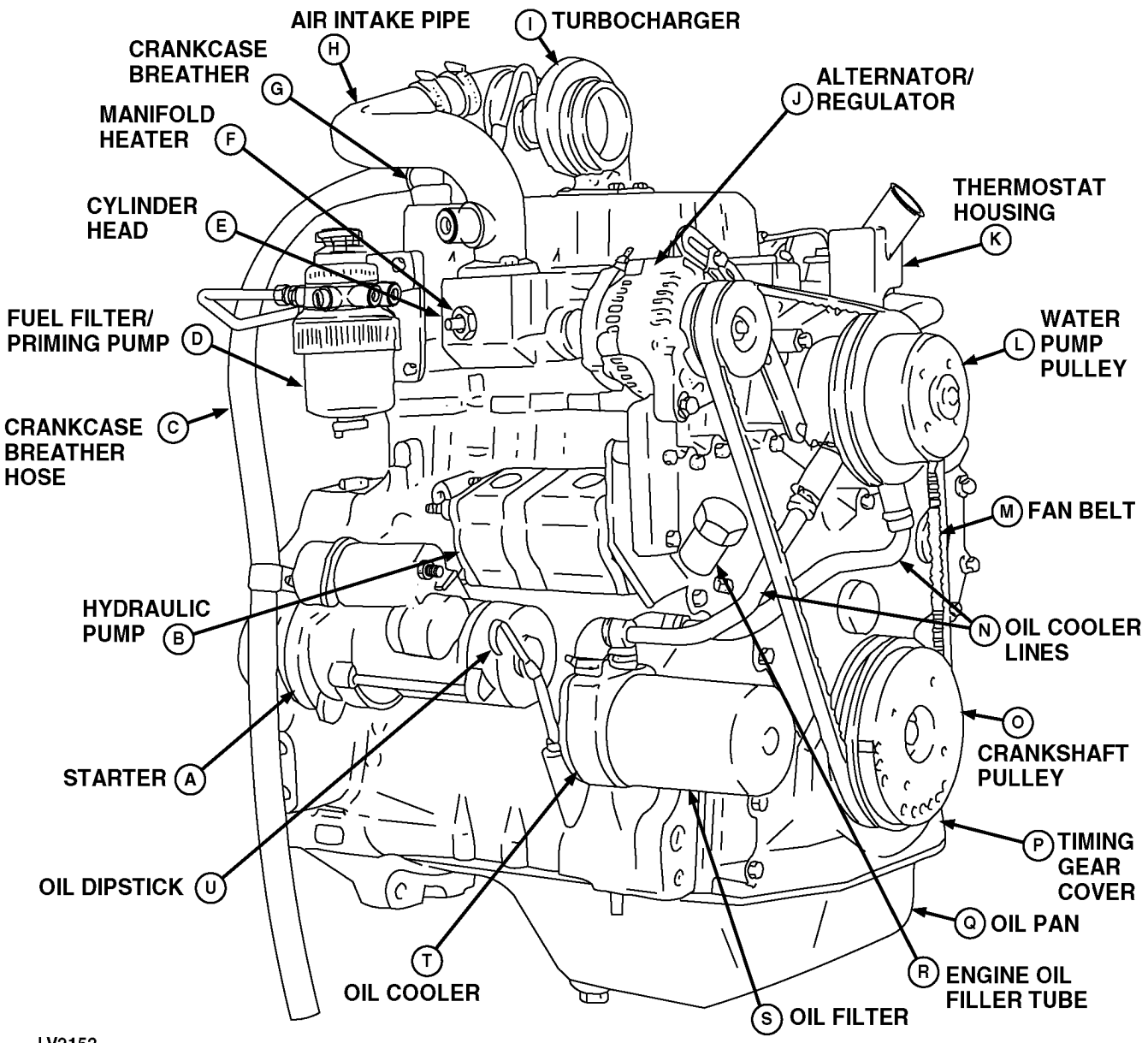
A—Oil Pan
B—Crankshaft Pulley
C—Oil Filter
D—Fan Belt
E—Water Pump Pulley
F—Alternator/Regulator
G—Thermostat Housing
H—Rocker Arm Cover
I—Air Intake Pipe (5310 only)
J—Turbocharger (5310)
K—Exhaust Manifold
L—Turbocharger Lubrication Lines (5310 only)
M—Fuel Supply Line
N—Flywheel
O—Fuel Injection Pump
P—Engine Oil Pressure Switch
Q—Engine Speed Sensor

NOTE: 5210 is a naturally aspirated engine. 5310 is turbocharged.

Engine without cab air conditioning compressor shown.

AG,OUO1085,323 –19–14SEP00–1/1

Engine External Components—Right-Hand Side



3 CYLINDER ENGINE EXTERNAL COMPONENTS — RIGHT-HAND SIDE

LV2153 –UN–23APR98

A—Starter
B—Hydraulic Pump
C—Crankcase Breather Hose
D—Fuel Filter/Priming Pump
E—Cylinder Head
F—Manifold Heater
G—Crankcase Breather
H—Air Intake Pipe (5310 only)
I—Turbocharger (5310 only)
J—Alternator/Regulator
K—Thermostat Housing
L—Water Pump Pulley
M—Fan Belt
N—Oil Cooler Lines
O—Crankshaft Pulley
P—Timing Gear Cover
Q—Oil Pan
R—Engine Oil Filler Tube
S—Oil Filter
T—Oil Cooler
U—Oil Dipstick

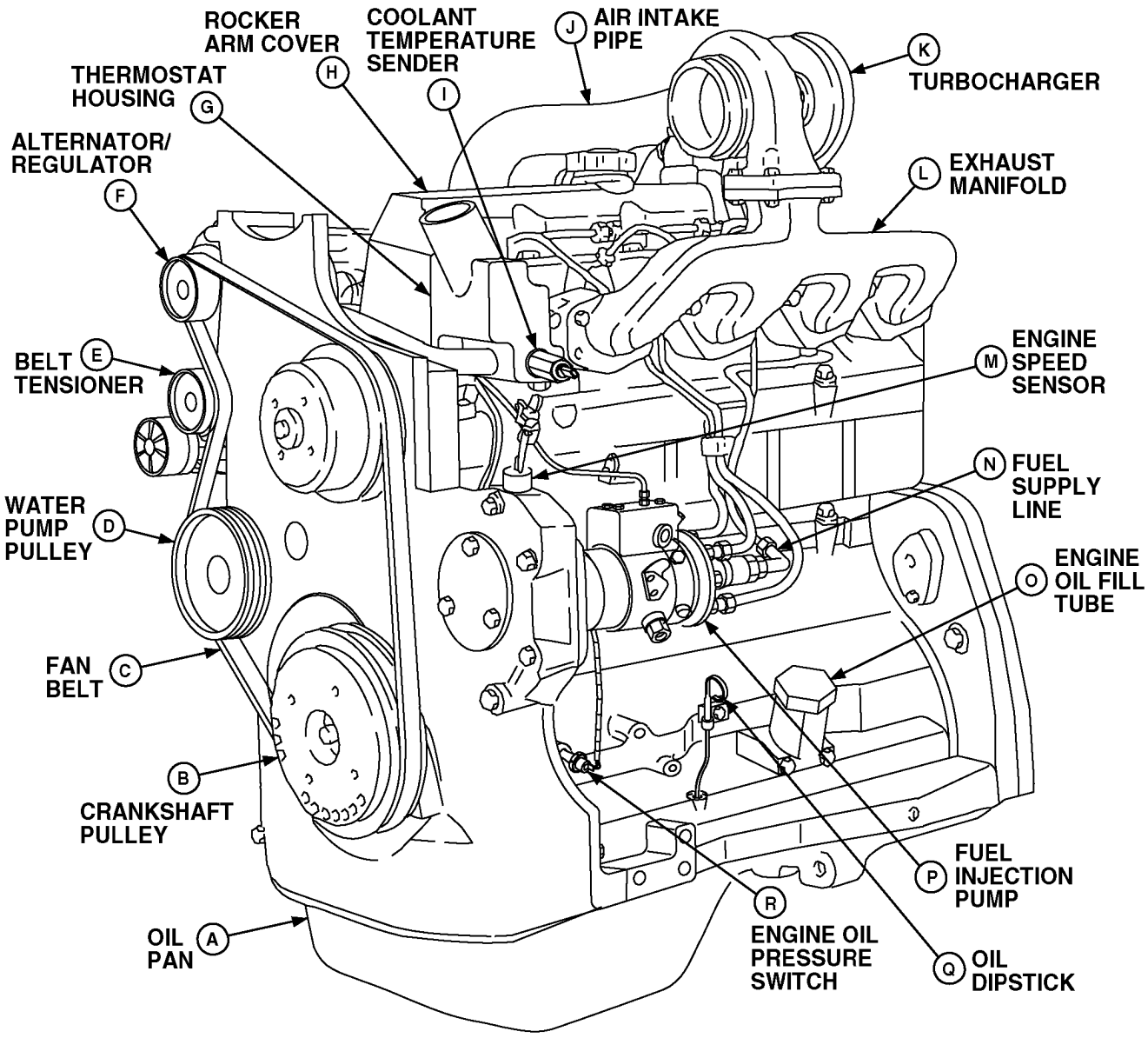
NOTE: 5210 is a naturally aspirated engine. 5310 is turbocharged.

Engine without cab air conditioning compressor shown.

AG,OUO1085,324 –19–14SEP00–1/1

4-Cylinder Engine External Components—Left-Hand Side

220
05
4



LV2156

4 CYLINDER ENGINE EXTERNAL COMPONENTS — LEFT-HAND SIDE

LV2156 –UN–23APR98

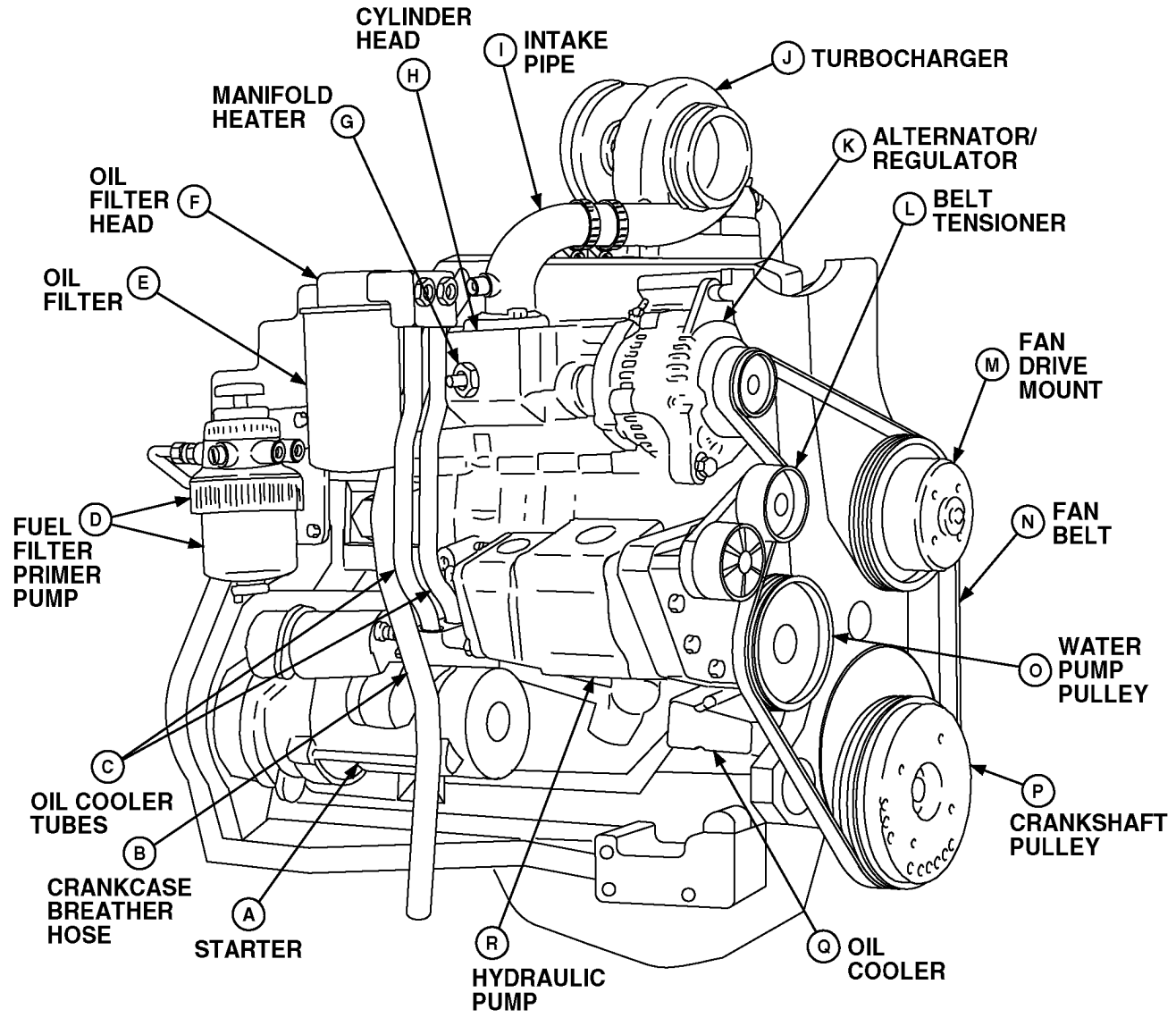
A—Oil Pan
B—Crankshaft Pulley
C—Fan Belt
D—Water Pump Pulley
E—Belt Tensioner
F—Alternator/Regulator
G—Thermostat Housing
H—Rocker Arm Cover
I—Air Intake Pipe (5510 only)
J—Turbocharger (5510 only)
K—Exhaust Manifold
L—Engine Speed Sensor
M—Fuel Supply Line
N—Engine Oil Filler Tube
O—Fuel Injection Pump
P—Oil Dipstick
Q—Engine Oil Pressure Switch

NOTE: 5410 is a naturally aspirated engine. 5510 is turbocharged.

Engine without air conditioning compressor shown.

AG,OUO1085,325 –19–14SEP00–1/1

4-Cylinder Engine External Components—Right-Hand Side



LV2155

4 CYLINDER ENGINE EXTERNAL COMPONENTS — RIGHT-HAND SIDE

LV2155 –UN–23APR98

A—Starter
B—Crankcase Breather Hose
C—Oil Cooler Tubes
D—Fuel Filter/Priming Pump
E—Oil Filter
F—Oil Filter Head
G—Manifold Heater
H—Cylinder Head
I—Intake Pipe (5510 only)
J—Turbocharger (5510 only)
K—Alternator/Regulator
L—Belt Tensioner
M—Fan Drive Mount
N—Fan Belt
O—Water Pump Pulley
P—Crankshaft Pulley
Q—Oil Cooler
R—Hydraulic Pump

NOTE: 5410 is a naturally aspirated engine. 5510 is turbocharged.

Engine without cab air conditioning compressor shown.

AG,OUO1085,326 –19–14SEP00–1/1

Theory of Operation Information

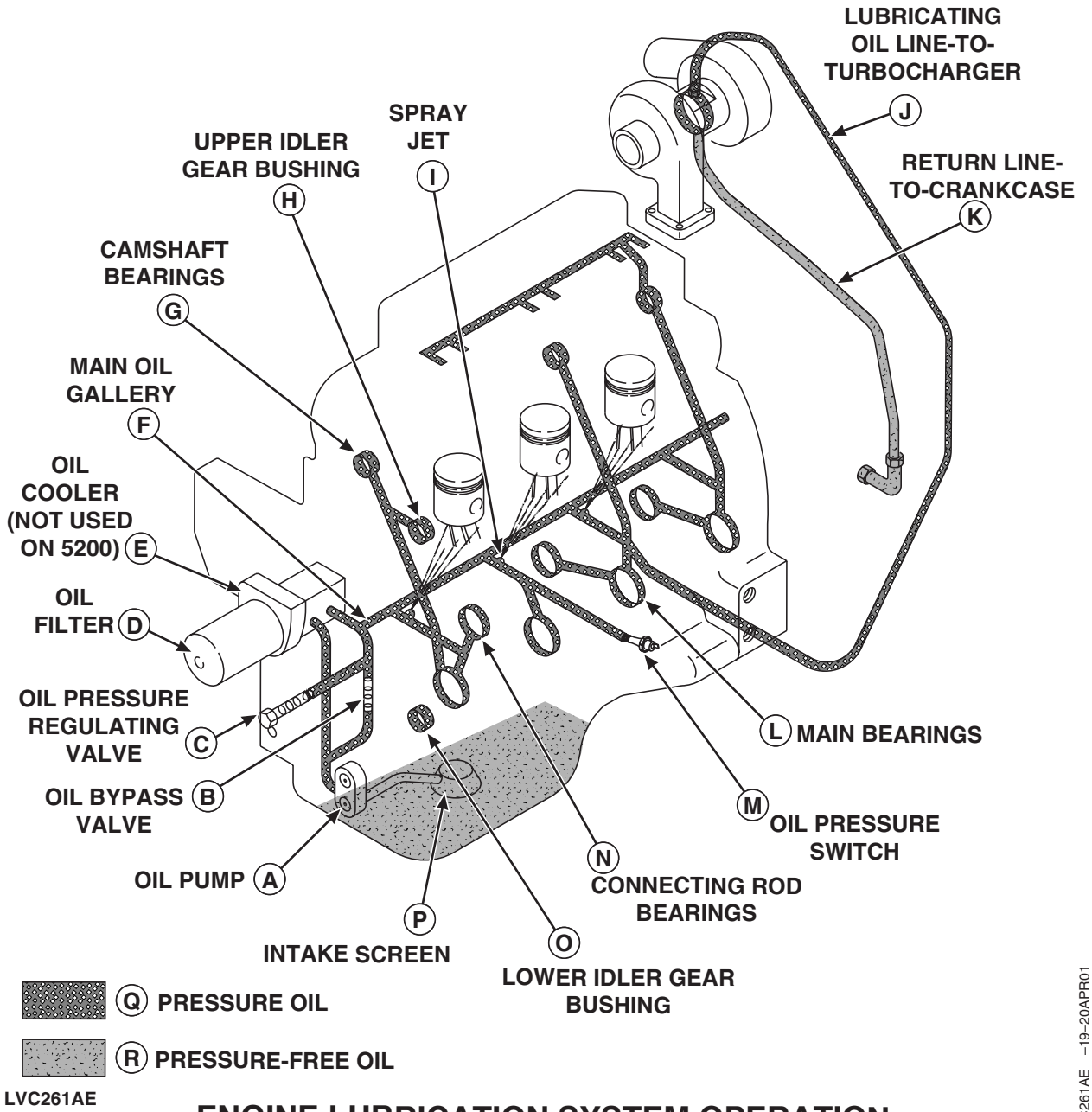
This group divides the engine system into individual components or systems by function. The story contains information on function, component identification, and theory of operation.

The following systems or components are covered:

- Lubrication System
- Cooling System

LV,22010HA,A1 –19–25JUL02–1/1

Engine Lubrication System Operation



LVC261AE –19–20APR01

ENGINE LUBRICATION SYSTEM OPERATION

A—Oil Pump
B—Oil Bypass Valve
C—Oil Pressure Regulating Valve
D—Oil Filter
E—Oil Cooler
F—Main Oil Gallery
G—Camshaft Bearings
H—Upper Idler Gear Bushing
I—Spray Jet (3 used)
J—Lubricating Oil Line-to-Turbocharger (5310 and 5510)
K—Return Line-to-Crankcase (5310 and 5510)
L—Main Bearings
M—Oil Pressure Switch
N—Connecting Rod Bearings
O—Lower Idler Gear Bushing
P—Intake Screen
Q—Engine Pressure Oil
R—Pressure-Free Oil

FUNCTION:

Continued on next page

AG,OUO1085,327 –19–03JUL02–1/2

A full pressure system lubricates engine parts with clean oil.

MAJOR COMPONENTS:

- Cylinder Head
- Engine Block
- Gear Case
- Rocker Arms
- Rocker Arm Shaft
- Crankshaft Main Bearings
- Camshaft Bearings
- Idler Gear Bushings
- Oil Pump
- Intake Screen
- Oil Bypass Valve
- Oil Cooler
- Oil Filter
- Pressure Regulating Valve
- Oil Pressure Switch

THEORY OF OPERATION:

The pressure lubrication system consists of a positive displacement gear-driven pump (A), filter strainer in the suction pipe, full flow oil filter (D), oil cooler (E), oil pressure regulating valve (C), oil bypass valve (B) and an electrical pressure warning switch (M). Additionally, the oil cooler and oil filter have their own bypass valve.

The pump draws lubrication oil from the crankcase through a strainer and a suction line. The oil is then pumped through an oil line to the oil cooler, oil filter and through the main oil gallery (F) of the cylinder block.

From the oil gallery, oil is forwarded under pressure to the main bearings (L) and spray jets (I) to cool the pistons. Drilled cross-passages in the crankshaft distribute oil from the main bearings to connecting rod bearings (N).

Lube oil holes in numbers 1, 3, and 4 main bearing oil grooves are provided to direct oil to the camshaft bearings (G).

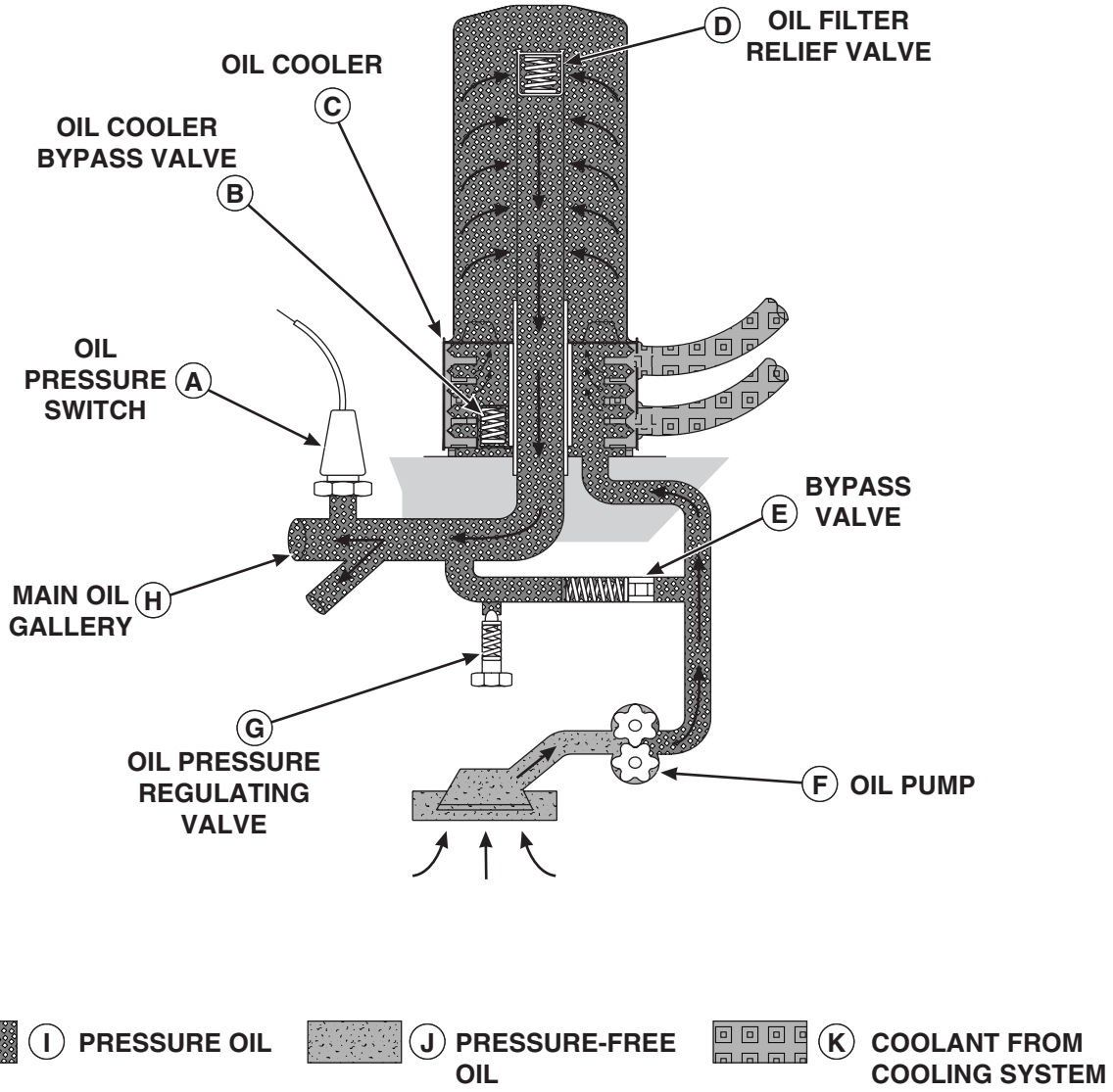
A drilled passage from the rear camshaft bearings through the cylinder block and cylinder head supplies lubricating oil to the rocker arm shaft.

5310 and 5510: Oil passages direct from the main oil gallery through external line provide lubricating oil to the shaft of the turbocharger.

Oil pressure switch (M) activates an indicator light to alert the operator to shut down the engine if oil pressure drops below 100 kPa (1.0 bar) (15 psi).

AG,OUO1085,327 –19–03JUL02–2/2

Engine Lubrication System Operation—Continued



LVC262AE

ENGINE LUBRICATION SYSTEM OPERATION — CONTINUED

LVC262AE –19–08AUG97

A—Oil Pressure Switch
B—Oil Cooler Bypass Valve
C—Oil Cooler
D—Oil Filter Relief Valve
E—Bypass Valve
F—Oil Pump
G—Oil Pressure Regulating Valve
H—Main Oil Gallery
I—Pressure Oil
J—Pressure-Free Oil
K—Coolant from Cooling System

THEORY OF OPERATION—CONTINUED:

Continued on next page

An externally non-adjustable pressure regulating valve is located at the front cylinder block in the oil gallery (H). It controls the oil pressure and provides constant pressure in the main gallery and in the complete lubrication system.

The valve consists of a valve cone held against a seat by a spring and plug. If oil pressure exceeds spring pressure, the valve cone is raised from the seat, permitting oil to bypass to the crankcase and maintain constant pressure.

An oil bypass valve (E) is located in the cylinder block behind the front plate and near the oil pressure regulating valve (G). Should the difference between the pressure in the main oil gallery and oil pump (F) become excessive, this valve would open and let oil bypass the filter and oil cooler to reach the main gallery faster. This valve has a permanent setting which cannot be changed.

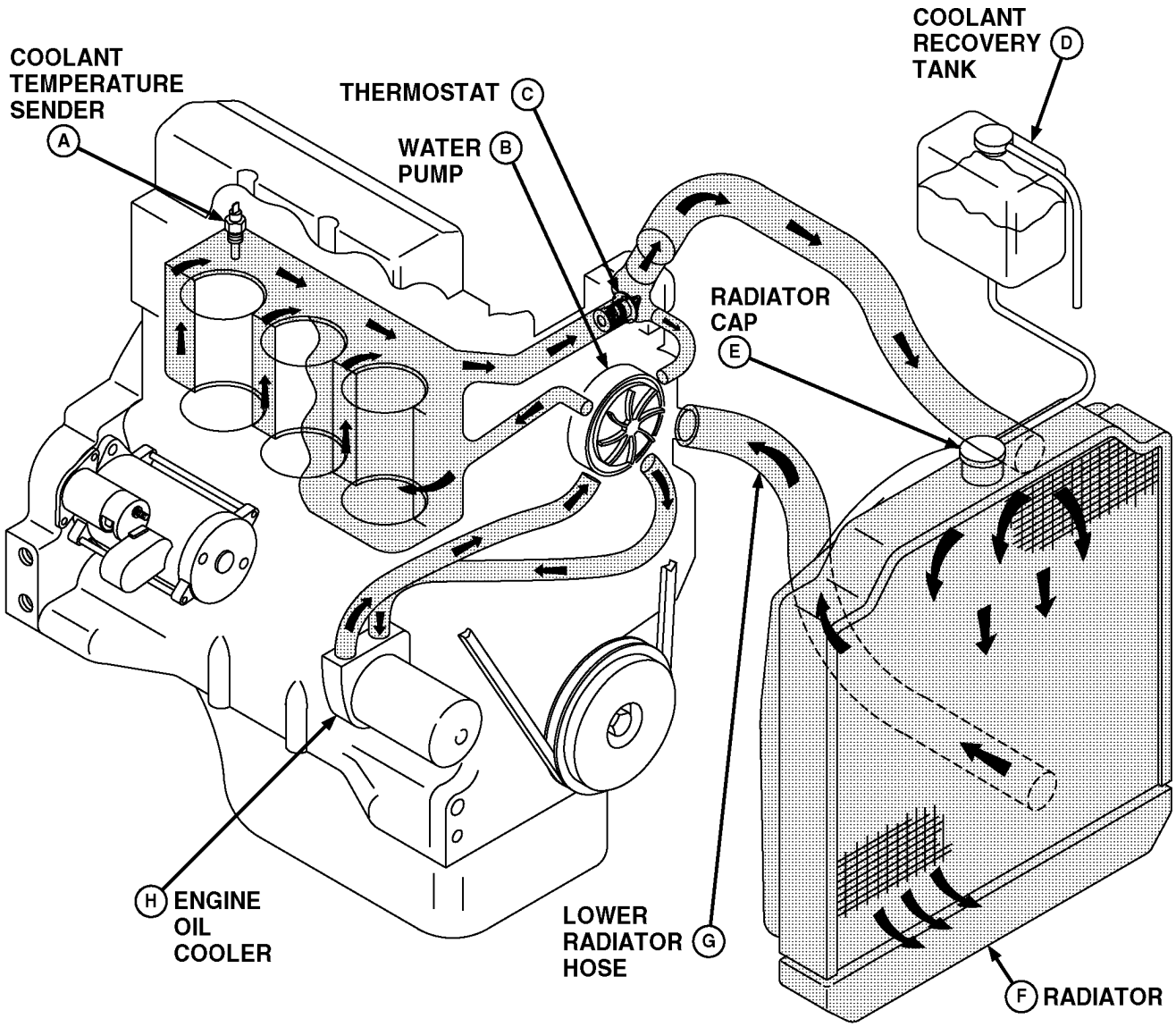
The oil filter is mounted on the right-hand side of the engine. It is a full-flow type with a spin-on type replacement element. If the filter clogs, a relief valve (D) in the element opens to keep a full flow of the oil to vital engine parts.

Oil cooler (C) is used to help reduce the temperature of engine oil. Pressurized oil enters the oil cooler and passes through a network of tubing surrounded by engine coolant. Prior to entering the oil cooler, the engine coolant passes through the radiator, which transfers much of the coolant's heat into the surrounding air. The coolant, its temperature now reduced, enters the oil cooler and passes over the warmer tubing. Heat transfers from the oil to the coolant, thus reducing oil temperature.

AG,OUO1085,328 –19–14SEP00–2/2

Engine Cooling System Operation—3-Cylinder

220
10
6



LV2247

ENGINE COOLING SYSTEM OPERATION — 3 CYLINDER

A—Coolant Temperature Sender
B—Water Pump
C—Thermostat
D—Coolant Recovery Tank
E—Radiator Cap
F—Radiator
G—Lower Radiator Hose
H—Engine Oil Cooler

FUNCTION:

The water pump circulates coolant through the cooling system, drawing hot coolant from the engine block, circulating it through the radiator for cooling.

MAJOR COMPONENTS:

- Radiator
- Coolant Hoses
- Water Pump

Continued on next page

- Cooling Fan
- Fan Belt
- Engine Block
- Cylinder Head
- Thermostat
- Coolant Temperature Sender
- Coolant Recovery Tank
- Pressure Cap
- Engine Oil Cooler

THEORY OF OPERATION:

The pressurized cooling system includes the radiator, water pump, fan and thermostat.

During the warm-up period, thermostat (C) remains closed and coolant is directed through a bypass passage to suction side of water pump (B). The coolant then circulates through the cylinder block providing a fast warm-up period.

Once the engine has reached operating temperature, the thermostat opens and coolant is pumped from the bottom of radiator (F) via the lower radiator hose (G) into the cylinder block. Here it circulates through the block and around the cylinder liners. From the block, coolant is then directed through the cylinder head, and into thermostat housing. With the thermostat open, 82°C (180°F), warm engine coolant passes through the housing into the top of radiator where it is circulated to dissipate heat.

When coolant system pressure exceeds 48 kPa (0.48 bar) (7 psi), a valve in the radiator cap (E) opens to allow coolant to discharge into the coolant recovery tank (D).

When temperature is reduced, a vacuum is produced in the radiator and coolant is drawn back out of the coolant recovery tank through a valve in the radiator cap.

Oil cooler (H) is used to help reduce the temperature of engine oil. Pressurized oil enters the oil cooler and passes through a network of tubing surrounded by engine coolant. Prior to entering the oil cooler, the engine coolant passes through the radiator, which transfers much of the coolant's heat into the surrounding air. The coolant, its temperature now reduced, enters the oil cooler and passes over the warmer tubing. Heat transfers from the oil to the coolant, thus reducing oil temperature.

Coolant temperature sender (A) senses critical coolant temperature and sends a signal to a gauge in the instrument panel.

AG,OUO1032,3296 –19–31MAY00–2/2

Engine Cooling System Operation—4-Cylinder

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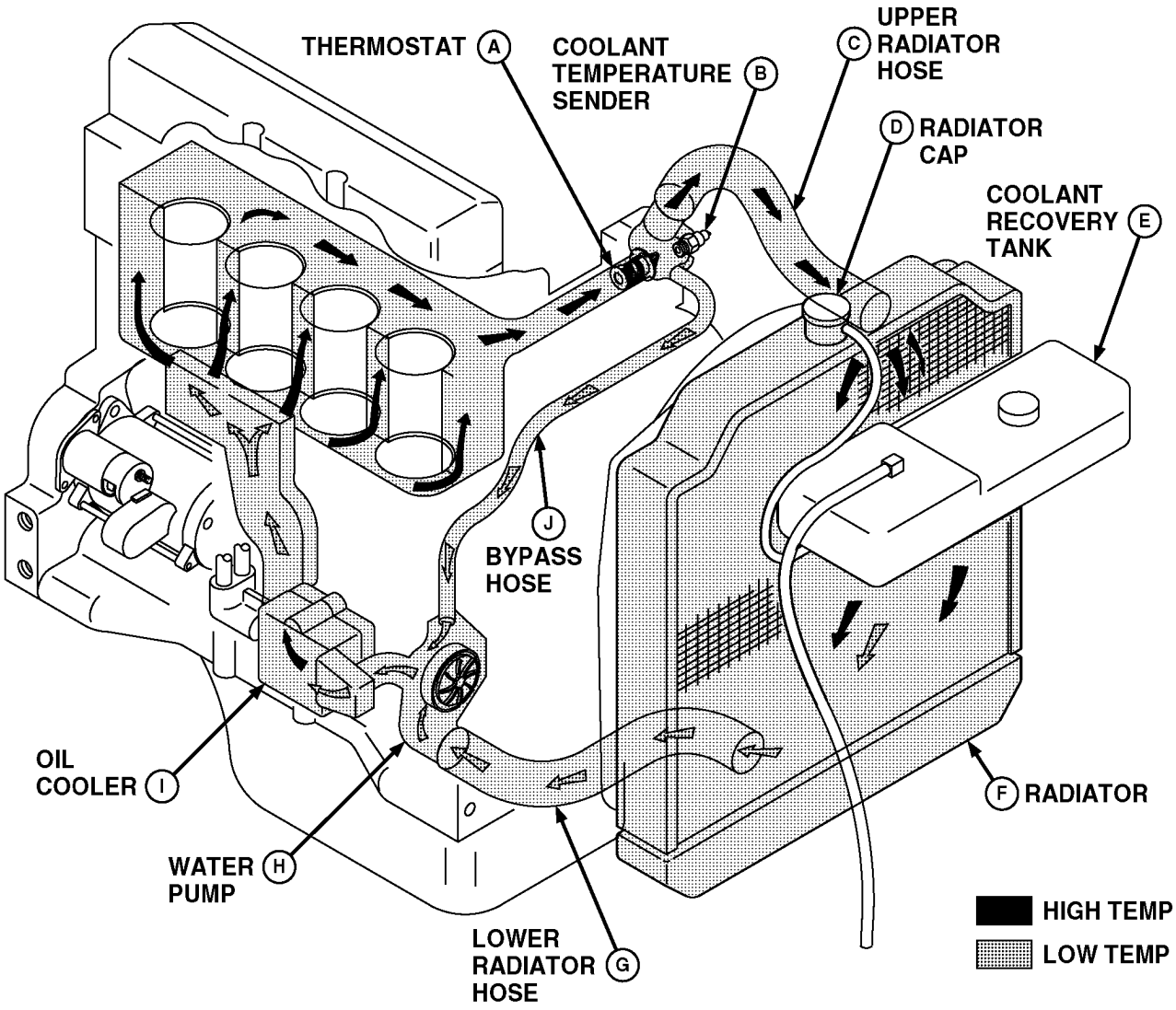
10
8



LV2252

ENGINE COOLING SYSTEM OPERATION — 4 CYLINDER

LV2252 –UN–21NOV97

A—Thermostat
B—Coolant Temperature Sender
C—Upper Radiator Hose
D—Radiator Cap
E—Coolant Recovery Tank
F—Radiator
G—Lower Radiator Hose
H—Water Pump
I—Oil Cooler
J—Bypass Hose

FUNCTION:

The water pump circulates coolant through the cooling system, drawing hot coolant from the engine block, circulating it through the radiator for cooling.

MAJOR COMPONENTS:

- Radiator
- Coolant Hoses
- Water Pump

Continued on next page

AG,OUO1085,329 –19–14SEP00–1/2

- Cooling Fan
- Fan Belt
- Engine Block
- Cylinder Head
- Thermostat
- Coolant Temperature Sender
- Coolant Recovery Tank
- Pressure Cap
- Engine Oil Cooler

THEORY OF OPERATION:

The pressurized cooling system includes the radiator, water pump, fan, and thermostat.

During the warm-up period, thermostat (A) remains closed and coolant is directed through a bypass hose (J) to suction side of water pump (H). The coolant then circulates through the cylinder block providing a fast warm-up period.

Once the engine has reached operating temperature, the thermostat opens and coolant is pumped from the bottom of radiator (F) via the lower radiator hose (G) into the cylinder block. Here it circulates through the block and around the cylinder liners. From the block, coolant is then directed through the cylinder head, and into thermostat housing. With the thermostat open, 82°C (180°F), warm engine coolant passes through the housing into the top of radiator where it is circulated to dissipate heat.

When coolant system pressure exceeds 48 kPa (0.48 bar) (7 psi), a valve in the radiator cap (D) opens to allow coolant to discharge into the coolant recovery tank (E).

When temperature is reduced, a vacuum is produced in the radiator and coolant is drawn back out of the coolant recovery tank through a valve in the radiator cap.

Oil cooler (I) is used to help reduce the temperature of engine oil. Pressurized oil enters the coil cooler and passes through a network of tubing surrounded by engine coolant. Prior to entering the oil cooler, the engine coolant passes through the radiator, which transfers much of the coolant's heat into the surrounding air. The coolant, its temperature now reduced, enters the oil cooler and passes over the warmer tubing. Heat transfers from the oil to the coolant, thus reducing oil temperature.

Coolant temperature sender (B) senses critical coolant temperature and sends a signal to a gauge in the instrument panel.

AG,OUO1085,329 –19–14SEP00–2/2

Diagnostic Information

The diagnostic information in this group is used to test components related to a specific problem. Select the appropriate symptom from the list that best matches your problem and follow the test procedures under that heading. The symptom headings are:

- Engine turns over but will not start or starts hard
- Engine runs irregularly or stalls frequently
- Engine runs rough
- Engine has low power
- Engine smokes—black or grey
- Engine smokes excessively—white
- Engine uses excess fuel
- Engine has excess noise or vibration
- Engine uses excess oil or smokes blue
- Engine has low oil pressure
- Engine coolant operating temperature incorrect
- Oil in coolant or coolant in oil

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “Normal” column gives the specification or condition that should be obtained when performing the test or check. If the results are not normal, perform the test, check, or adjustment listed in the third “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located at the end of this group.

LV,22015HA,A1 –19–04JUN96–1/1

Engine Turns Over But Will Not Start or Starts Hard

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine and fuel system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.
- Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Fuel tank caps.	No pressure or vacuum when removed from tank.	Replace tank vent or hose.
2. Fuel tank.	Diesel fuel of correct grade for ambient temperature.	Replace with correct fuel.
3. Fuel shut-off solenoid.	Opens to allow fuel flow when key switch is turned on.	Reset solenoid by turning key switch off, then on.
4. Fuel filter.	Fuel flows at outlet when primer pump operated.	Drain water and sediment. Replace element. Bleed air from supply line.
5. Fuel leak-off line.	Small amount of fuel flows when engine running.	Clean or replace line.
6. Starter (not shown).	Turns engine over easily at 90 rpm minimum when engine is cranked.	Check starter and starting circuit.
7. Injection pump.	Delivers fuel to injection nozzles when engine is cranked (lines loosened at nozzles). Injection properly timed.	Adjust injection pump timing. Repair pump.
8. Injection nozzles.	Correct spray pattern when tested. See CTM104 or CTM125.	Check fuel lines for obstruction. Clean, repair, adjust or replace as necessary.
9. Valves.	Intake clearance: 0.35 mm (0.014 in.) Exhaust clearance: 0.45 mm (0.018 in.)	Adjust.
10. Manifold heater (not shown).	Element heats when key switch is pushed in.	Check element and circuit.
11. Crankcase oil.	Flows easily.	Replace with correct viscosity.

AG,OUO1085,330 –19–14SEP00–1/1

Engine Runs Irregularly or Stalls Frequently

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine and fuel/air system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.
- Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Fuel tank cap.	No pressure or vacuum when removed from tank.	Replace tank vent or hose.
2. Fuel tank.	Clean diesel fuel of correct grade.	Replace with correct fuel.
3. Air cleaner.	No excessive restriction in elements.	Clean or replace elements.
4. Fuel filter.	Fuel flows at outlet when primer pump operated.	Drain water and sediment. Replace element. Bleed air from supply line.
5. Fuel shut-off solenoid.	Opens to allow fuel flow when key switch turned on.	Check electrical circuit.
6. Temperature gauge.	Gauge reads in green band.	See Engine Coolant Operating Temperature Incorrect in this group.
7. Valves.	Intake clearance: 0.35 mm (0.014 in.) Exhaust clearance: 0.45 mm (0.018 in.)	Adjust.
8. Exhaust system (not shown).	Low restriction. (Operate briefly without muffler to check.)	Replace parts as required.
9. Cylinders.	Minimum pressure of 2400 kPa (24 bar) (350 psi). No more than 350 kPa (3.50 bar) (50 psi) difference between highest and lowest cylinder readings.	Check piston rings, valves, cylinder head, and gasket.
10. Injection nozzles.	Opening pressure and spray pattern tests normal. See CTM104 or CTM125.	Clean, adjust, repair, or replace as required.

AG,OUO1085,331 –19–14SEP00–1/1

Engine Runs Rough

220
15
4

CONDITIONS:

- Transmission in park.
- Key switch OFF.
- Engine and fuel/air system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.

Test Location	Normal	If Not Normal
1. Fuel filter.	Fuel flows at outlet when primer pump operated.	Drain water and sediment. Replace element.
2. Fuel leak-off line.	Small amount of fuel flow to tank when engine is running.	Clean or replace.
3. Injection nozzles.	Opening pressure and spray tests normal. See CTM104 or CTM125.	Clean, adjust, repair or replace as required.
4. Valves.	Intake clearance: 0.35 mm (0.014 in.) Exhaust clearance: 0.45 mm (0.018 in.)	Adjust.
5. Cylinders.	Minimum compression of 2400 kPa (24 bar) (350 psi). No more than 350 kPa (3.50 bar) (50 psi) difference between highest and lowest cylinder readings.	Check piston rings, valves, cylinder head and gasket.
6. Temperature gauge.	Reads in green band.	See Engine Coolant Operating Temperature Incorrect in this group.
7. Injection pump.	Delivers fuel to injectors when engine is cranked (lines slightly open at nozzles). Injection properly timed.	Adjust injection pump timing. Repair pump.
8. Injection lines.	Tight, free from leaks.	Tighten or replace injection lines.

AG,OUO1085,332 –19–14SEP00–1/1

Engine Has Low Power

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine and fuel/air system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.
- Ignition and electrical tests in Section 240, Group 15.

Continued on next page

AG,OUO1085,333 –19–14SEP00–1/2

Test Location	Normal	If Not Normal
1. Tachometer.	Reads rated rpm of 2400 at full load.	Load excessive—reduce load or shift to lower gear. Check fast idle speed. Adjust speed control linkage.
2. Temperature gauge.	Gauge reads in green band.	See Engine Coolant Operating Temperature Incorrect in this group.
3. Tires (not shown).	Slippage 10—15% 2-WD, 8—12% MFWD with transmission in gear and engine running.	Adjust amount of ballast. Reduce excess load.
4. Implement (not shown).	Properly adjusted.	Adjust for proper operation.
5. Air cleaner.	No excessive restriction.	Clean or replace air cleaner elements.
6. Fuel tank.	Correct grade of clean diesel fuel.	Drain and replace fuel.
7. Fuel filter.	Fuel flows at outlet when primer pump operated. Element not restricted.	Drain water and sediment. Replace element.
8. Fuel leak-off line.	Small amount of fuel flows when engine running.	Clean or replace line.
9. Fuel shut-off solenoid.	Opens to allow fuel flow when key switch is turned on.	Check electric circuit.
10. Injection nozzles.	Correct spray pattern/opening pressure when tested. See CTM104 or CTM125.	Clean, repair, adjust or replace as required.
11. Valves.	Intake clearance: 0.35 mm (0.014 in.) Exhaust clearance: 0.45 mm (0.018 in.)	Adjust.
12. Cylinders.	Minimum compression of 2400 kPa (24 bar) (350 psi). No more than 350 kPa (3.50 bar) (50 psi) difference between highest and lowest cylinder readings.	Check piston rings, valves, cylinder head and gasket.
13. Hydraulic system (not shown).	No load with valves in neutral.	See Section 270.
14. Muffler.	Low restriction (operate briefly without muffler to check).	Replace muffler if significant improvement when operated without.
15. Injection pump.	Delivers fuel to nozzles when engine cranked (lines loosened at nozzles). Injection properly timed.	Adjust pump timing. Service pump.
16. Turbocharger (5310 and 5510).	Operates smoothly. Boost pressure correct. See this group.	Repair turbocharger.
17. Exhaust manifold.	No leaks at gaskets.	Check for manifold warpage. Replace gaskets.
18. Hydraulic dipstick.	Oil level up to marks.	Add oil as needed.

AG,OUO1085,333 –19–14SEP00–2/2

Engine Smokes—Black or Grey

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Fuel/air system repair in CTM104 or CTM125.
- Fuel/air tests and adjustments found in this group.

Test Location	Normal	If Not Normal
1. Air cleaner.	No excessive restriction.	Service.
2. Fuel tank.	Diesel fuel of correct grade.	Replace with fuel of correct specifications.
3. Injection nozzles.	Correct spray pattern/opening pressure when tested. See CTM104 or CTM125.	Clean, repair, adjust or replace as necessary.
4. Injection pump/governor.	Delivers correct amount of fuel for load with engine running. Pump timed correctly.	Reduce load or shift to lower gear. Adjust pump timing. Service pump.
5. Turbocharger (5310 and 5510).	Delivers correct volume of air for fuel delivered with engine running.	Check turbocharger boost pressure. Check condition of turbocharger sealing rings.

AG,OUO1085,334 –19–14SEP00–1/1

Engine Smokes Excessively—White

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine and fuel/air system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.
- Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Temperature gauge.	Reads in green band. (Engine operating at normal operating temperature.)	Allow engine to warm up. See Engine Coolant Operating Temperature Incorrect in this group.
2. Fuel tank.	Correct grade of clean diesel fuel.	Replace with higher octane rated fuel.
3. Starter (not shown).	Starter turns engine easily at 90 rpm minimum when engine is cranked.	Check starter and circuits.
4. Manifold heater (not shown).	Element heats when key switch is pushed in.	Check element and circuit.
5. Injection pump.	Delivers fuel properly timed when engine is cranked.	Adjust pump timing. Service pump.
6. Injection nozzles.	Correct spray pattern/opening pressure when tested. See CTM104 or CTM125.	Clean, repair, adjust or replace as required.
7. Cylinders.	Minimum compression of 2400 kPa (24 bar) (350 psi). No more than 350 kPa (3.50 bar) (50 psi) difference between highest and lowest cylinder readings.	Check piston rings, valves, cylinder head and gasket.

AG,OUO1085,335 –19–14SEP00–1/1

Engine Uses Excess Fuel

220
15
8

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Fuel/air system repair in CTM104 or CTM125.
- Fuel/air tests and adjustments found in this group.

Test Location	Normal	If Not Normal
1. Air cleaner.	No excess restriction in elements.	Clean or replace elements.
2. Fuel tank.	Correct grade of clean diesel fuel.	Replace with correct fuel.
3. Fuel system.	No leaks in lines, tank, filter or fittings.	Repair or replace defective parts.
4. Turbocharger (5310 and 5510).	Operates smoothly.	Check vanes and bearings. Check clearances.
5. Injection nozzles.	Correct spray pattern/opening pressure when tested. See CTM104 or CTM125.	Clean, repair, adjust, or replace as required.
6. Injection pump.	Properly timed.	Adjust pump timing.
7. Load or implement (not shown).	Within horsepower range of tractor.	Reduce load. Adjust implement.

AG,OUO1085,336 –19–14SEP00–1/1

Engine Has Excess Noise or Vibration

CONDITIONS:

- Forward/reverse selector in neutral.
- Park brake engaged.
- PTO disengaged.
- Key switch OFF.
- Engine and fuel/air system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.
- Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Crankcase.	Correct quantity and viscosity of oil.	Add oil. Replace incorrect, dirty or contaminated oil.
2. Oil pressure switch port.	Oil pressure within specifications. See this group.	Low oil pressure: Check oil level and viscosity. Replace pressure regulating valve. Test oil pressure switch. Check oil pump and screen. 5310 and 5510—check turbocharger oil seal. Repair excessive external oil leaks. Repair excessive bearing clearances or cracks in block or oil galleries.
3. Valves.	Intake clearance: 0.35 mm (0.014 in.) Exhaust clearance: 0.45 mm (0.018 in.)	Adjust valves.
4. Injection pump.	Correctly timed.	Adjust pump timing.
5. Front pulley and flywheel.	Matched unbalanced front pulley and flywheel.	Replace with correct matched unbalanced three-cylinder pulley and flywheel.
6. Turbocharger (5310 and 5510).	Smooth operation of compressor wheel.	Check clearances. Check bearings.
7. Engine and fan.	Clearances and parts within specifications.	Repair parts as necessary. Replace damaged fan.

AG,OUO1085,337 –19–14SEP00–1/1

Engine Uses Excess Oil or Smokes Blue

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine repair in CTM104 or CTM125.
- Engine tests found in this group.

Test Location	Normal	If Not Normal
1. Engine gaskets and seals.	No external leaks.	Replace.
2. Crankcase breather.	No restrictions.	Clean or replace elements.
3. Crankcase.	Correct viscosity oil for ambient temperature.	Replace with correct viscosity oil.
4. Oil pressure switch port.	Oil pressure of 483 kPa (4.83 bar) (70 psi) MAX. at 2575 rpm.	Replace regulating valve.
5. Valve seals.	No cracks, controls oil.	Replace seals.
6. Engine internal parts.	Within wear limits and piston rings not stuck. See CTM104 or CTM125.	Replace defective parts.

AG,OUO1085,330 –19–14SEP00–1/1

Engine Has Low Oil Pressure

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine repair in CTM104 or CTM125.
- Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Crankcase dipstick.	Level between marks.	Add to correct level.
2. Crankcase.	Correct viscosity oil for ambient temperature.	Drain and replace with correct oil.
3. Oil pressure indicator.	Light on at less than 100 kPa (1 bar) (15 psi).	See Section 240.
4. Oil pressure regulating valve.	Valve free in bore.	Replace valve.
5. Oil pump intake screen.	Screen clear.	Clean or replace.
6. Oil pump.	Clearances within specifications. See CTM104 or CTM125.	Replace worn parts.
7. Bearings (not shown).	Clearance within specification. See CTM104 or CTM125.	Replace worn parts.

AG,OUO1085,331 –19–14SEP00–1/1

Engine Coolant Operating Temperature Incorrect

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine fuel/air system repair in CTM104 or CTM125.
- Engine and fuel/air tests and adjustments found in this group.
- Electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Coolant recovery tank.	Level between lines of recovery tank.	Fill to correct level.
2. Fan/alternator drive belt.	Belt deflection within specifications. See this group. Correct fan installed properly.	Adjust fan belt. Replace damaged or incorrect fan. Install fan correctly.
3. Radiator.	Free of dirt/trash in radiator fins. No leaks. No bubbles in coolant.	Clean and pressure test radiator. Check cylinder head, cylinders and head gasket for cracks.
4. Shroud.	Correct undamaged shroud.	Replace shroud.
5. Radiator cap.	Operating within range. Not leaking.	Replace cap.
6. Temperature gauge.	Reads in green band.	Test circuit.
7. Thermostat.	Starts to open at 71°C (160°F) full open 95°C (202°F).	Replace.
8. Cooling system.	Passages clear.	Flush radiator and engine block.
9. Hoses.	Hoses flexible with no cracks, swelling or spongy feel. Clamps tight.	Replace hoses. Tighten loose clamps.
10. Water pump.	Clearance within specifications. No “play” in bearing.	Repair or replace pump.
11. Load applied (not shown).	Within horsepower available.	Reduce load/shift to lower gear.
12. Crankcase.	Correct capacity and viscosity of oil.	Add or replace oil.
13. Fuel tank (not shown).	Correct grade of fuel.	Replace with correct fuel.
14. Injection pump (not shown).	Properly timed pump.	Time pump.
15. Pistons.	No scoring.	Replace.

AG,OUO1085,332 –19–14SEP00–1/1

Oil In Coolant or Coolant in Oil

CONDITIONS:

- Transmission in park.
- PTO disengaged.
- Key switch OFF.
- Engine repair in CTM104 or CTM125.

Test Location	Normal	If Not Normal
1. Oil cooler.	No cracks.	Replace.
2. Head gasket.	Complete seal.	Check head and block for flatness.
3. Block/head.	No cracks.	Replace.
4. Cylinder liners.	No cracks. Liner seals in good condition.	Check cylinder liners for cracks or leaking seals.

AG,OUO1085,333 –19–14SEP00–1/1

Radiator Bubble Test

NOTE: 5210 and 5310 tractors shown. 5410 and 5510 tractors are similar.

REASON:

To determine if compression pressure is leaking from cylinder.

EQUIPMENT:

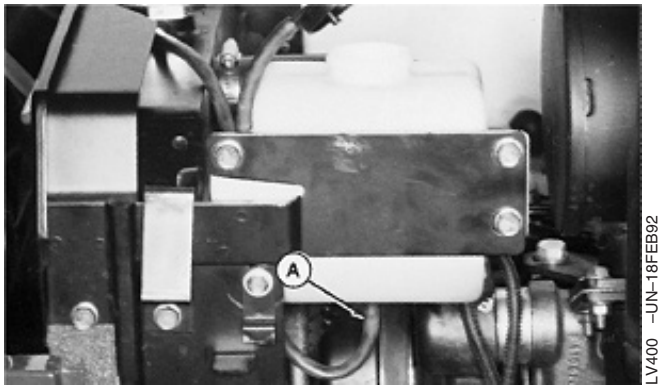
- JT01679 Adapter
- JT02017 Clamp

PROCEDURE:

1. With coolant at proper level and radiator cap tight, run engine to operating temperature.
2. Remove cap from coolant recovery tank.
3. Check for bubbles coming from hose (A) at bottom of recovery tank.
4. Isolate source of compression leak: Remove injector nozzles.
5. Install JT01679 Adapter (B) and JT02017 Clamp (C) in injector port of cylinder to be tested.
6. Move piston to bottom of stroke with intake and exhaust valves closed.
7. Connect hose from compressed air source (2400 kPa) (24 bar) (350 psi) maximum) to adapter.
8. Check for bubbles in recovery tank or air escaping from exhaust pipe, air cleaner or oil fill opening.
9. Repeat steps (5—8) for each cylinder.

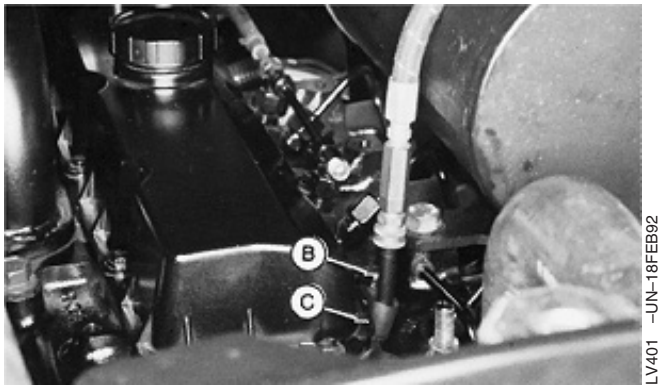
NOTE: Cylinder being tested when bubbles appear or air escapes is usually the defective cylinder.

RESULTS:



LV400 –UN–18FEB92

3-Cylinder Recovery Tank



LV401 –UN–18FEB92

Injection Port

A—Hose
B—JT01679 Adapter
C—JT02017 Clamp

Continued on next page

- If bubbles are present, check for cracks in cylinder head, cylinder liner, and block. Check for damaged head gasket.
- If air escapes from exhaust pipe, check for worn exhaust valve.
- If air escapes from air cleaner, check for worn intake valve.
- If air escapes from engine oil fill, check for worn piston rings.
- Go to CTM104 or CTM125 and service as needed.

AG,OUO1085,334 –19–14SEP00–2/2

Cooling System Test

REASON:

Inspect cooling system for leaks.

EQUIPMENT:

- D05104ST Cooling System Pressure Pump

CONNECTIONS:

1. Remove cap and connect pressure pump to radiator.

PROCEDURE:

1. Apply 120 kPa (1.20 bar) (18 psi) maximum pressure.

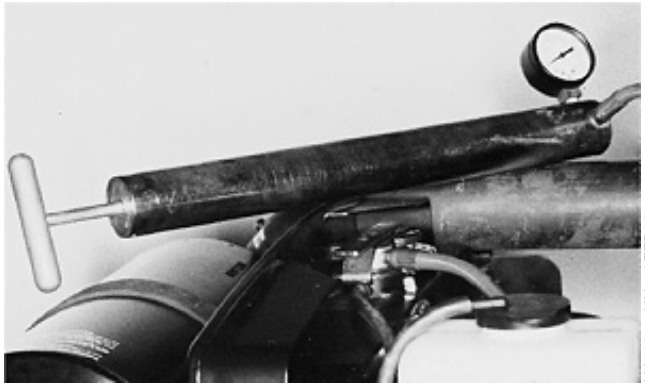
2. Check for leaks throughout cooling system.

SPECIFICATIONS:

- Minimum pressure after 15 seconds: 90 kPa (0.90 bar) (13 psi).

RESULTS:

- Pressure should hold to specifications. If pressure decreases, check for leaks. Go to Section 20 and service as needed.
- If pressure test still indicates leakage and all external leaks have been stopped, a defective head gasket, cracked block, cylinder head or oil cooler may be the cause. (Go to Radiator Bubble Test in this group.)



Pressure Pump

AG,OUO1085,336 –19–14SEP00–1/1

Radiator Cap Pressure Test

REASON:

Test radiator cap for operating in correct pressure range.

EQUIPMENT:

- D05104ST Cooling System Pressure Pump

CONNECTIONS:

1. Install radiator cap on pressure pump.

PROCEDURE:

1. Apply pressure and observe when pressure valve in cap relieves.

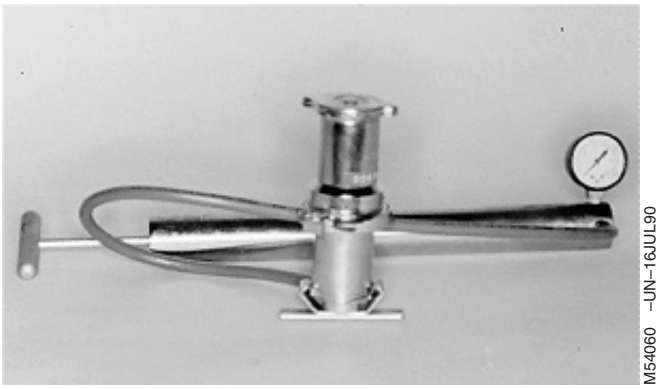
SPECIFICATIONS:

Opening pressure should be within the following specifications:

	Specification
Radiator Cap Pressure Valve—	
Opening Pressure	43—53 kPa (0.43—0.53 bar) (6.25—7.75 psi)

RESULTS:

- If cap leaks, retighten and test again. Replace cap if pressure is not within specifications.



M54060 –UN–16JUL90

Pressure Pump

AG,OUO1085,339 –19–14SEP00–1/1

Engine Oil Pressure Test

220
15
16

NOTE: 4-cylinder tractor shown. 3-cylinder tractor is similar.

REASON:

To determine if bearings or lubrication system components are worn.

EQUIPMENT:

- JDG465 Special Socket
- JT05577 Pressure Gauge Assembly
- JT03017 Hose Assembly
- JT05487 Connector (From JT01767 Kit)
- JDG282 Temperature Gauge

CONNECTIONS:

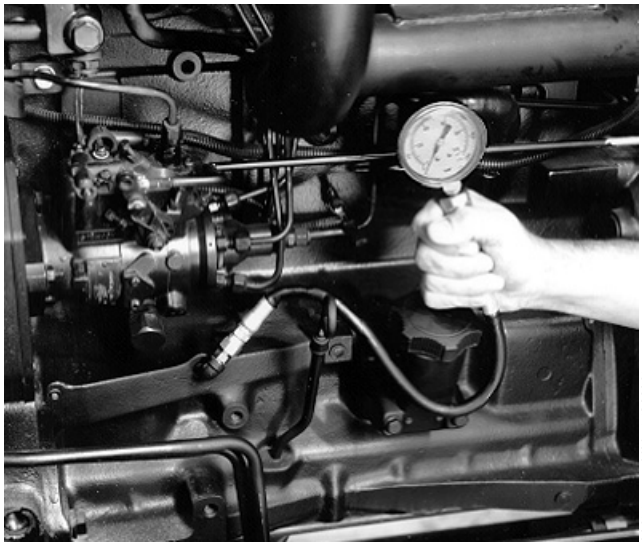
1. Remove oil pressure sender (JDG465 Socket may be used).

NOTE: Thread is 1/8" M NPT, use JT05487 Connector, hose and 0-700 kPa (0—6.9 bar) (0—100 psi) gauge.

2. Install JT05487 Connector.

3. Connect JT05577 Pressure Gauge Assembly and JT03017 Hose Assembly.

PROCEDURE:



LV2157 –UN–14MAY97

Continued on next page

AG,OUO1085,340 –19–22NOV02–1/2

IMPORTANT: If pressure reading is below 72 kPa (0.72 bar) (10.5 psi), STOP ENGINE.

NOTE: 5210 and 5310 engine oil filter shown. 5410 and 5510 are similar.

1. Install JDG282 Temperature Gauge (A) on engine oil filter.

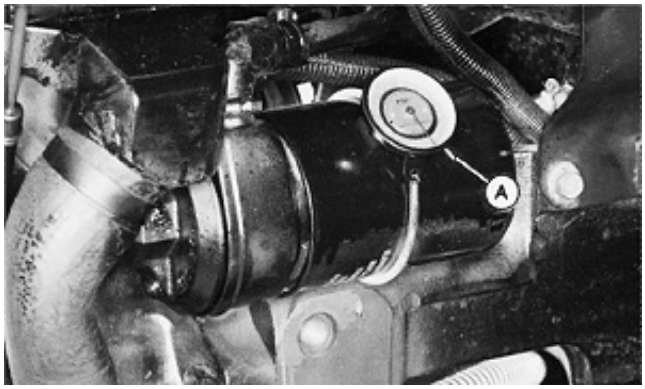
NOTE: Tolerance extremes in engine and gauge can result in the gauge reading up to 582 kPa (5.82 bar) (85 psi). This is not detrimental to the engine.

2. Run engine approximately 5 minutes to heat oil to specifications, then check oil pressure.

Specification	
Engine Oil Temperature at 850 rpm Engine Speed—Temperature	93°C (200°F)
Engine Oil Temperature at 1600—2400 rpm Engine Speed—Temperature	105°C (220°F)
Minimum Oil Pressure at 850 rpm Engine Speed—Pressure	100 kPa (1 bar) (15 psi)
Minimum Oil Pressure at 1600—2400 rpm Engine Speed—Pressure	277—483 kPa (2.77—4.83 bar) (40—70 psi)

RESULTS:

- If oil pressure is not within specifications, inspect oil pressure regulating valve for broken or worn spring, stuck or damaged valve. (Go to CTM104 or CTM125 and service as needed.)
- If pressure does not increase, go to Engine Has Low Oil Pressure in this group and service as needed.



A—JDG282 Temperature Gauge

AG,OUO1085,340 –19–22NOV02–2/2

Cylinder Compression Pressure Test

220
15
18

REASON:

To determine the condition of the pistons, rings, cylinder walls and valves.

EQUIPMENT:

- JT01682 Compression Gauge Assembly
- JT01679 Adapter
- JT02017 Clamp

CONNECTIONS:

1. Run engine for 10—15 minutes to bring to operating temperature. Shut off engine.
2. Remove injection nozzles.
3. Install JT01682 Compression Gauge Assembly, JT01679 Adapter and JT02017 Clamp.

PROCEDURE:

1. Disconnect fuel shut-off solenoid wiring lead (A).

IMPORTANT: DO NOT overheat starting motor during test.

2. Crank engine for five seconds with starter.
3. Record pressure reading for each cylinder.
4. After test is completed, bleed the fuel system. (See this group.)

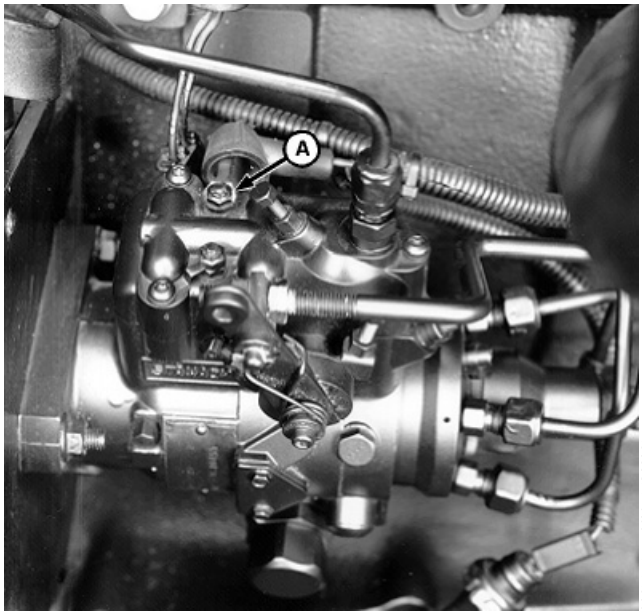
Cylinder—Specification

Cylinder—Pressure	2400 kPa (24 bar) (350 psi) Minimum
Maximum Difference Between Cylinders—Pressure	350 kPa (3.50 bar) (50 psi)

RESULTS:

- If pressure reading is below specification, squirt approximately 2 teaspoons of clean engine oil into cylinders through injector ports and repeat test.


LV405 –UN–18FEB92



LV2158 –UN–14MAY97

A—Solenoid Wiring Lead

Continued on next page

- If pressure increases significantly, check piston, rings, and cylinder walls for wear or damage. Go to CTM104 or CTM125 and service as needed.
- If pressure does not increase significantly after retest, check for leaking valves, valve seats or cylinder head gasket. Go to CTM104 or CTM125 and service as needed.

AG,OUO1085,343 –19–14SEP00–2/2

Fuel Shut-Off Solenoid Check

REASON:

To ensure proper operation of control solenoid.

CONNECTIONS:

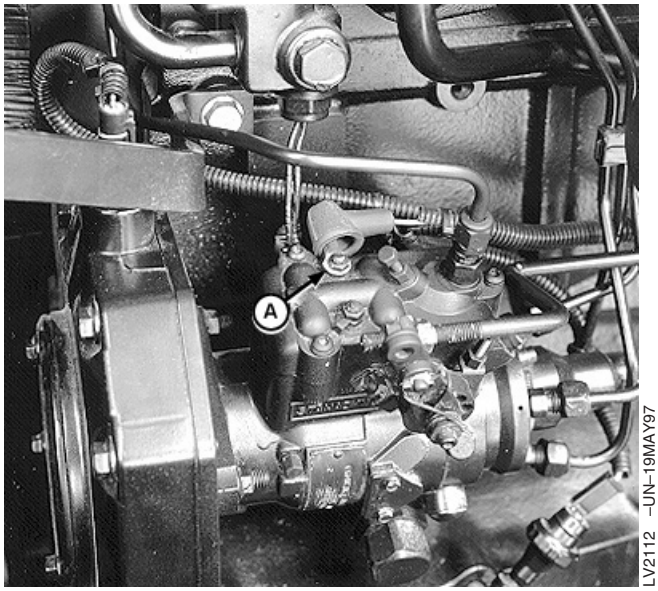
1. Check for clean tight connection at terminal (A).

PROCEDURE:

1. Turn key switch to ON position. Solenoid plunger should pull in fully with an audible “click”.

RESULTS:

- If “click” is not heard, connect jumper wire from battery positive terminal to solenoid terminal screw.
- If solenoid “clicks” when connected to battery, check wiring circuit to solenoid. Go to Section 240.
- If solenoid does not “click” when connected to battery, replace solenoid.



LV2112 –UN–19MAY97

A—Terminal

AG,OUO1085,344 –19–14SEP00–1/1

Throttle Lever Adjustment

220
15
20

REASON:

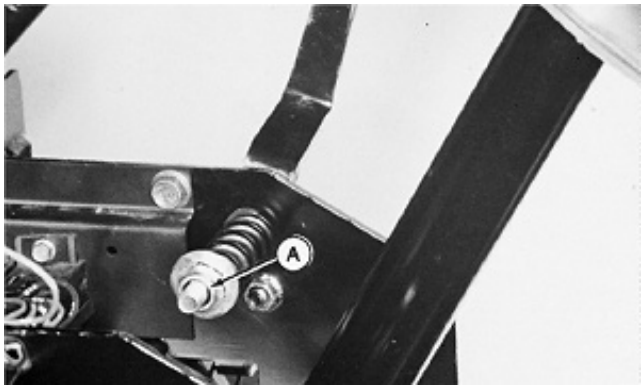
To achieve smooth throttle lever movement with a slight drag.

PROCEDURE:

NOTE: Instrument panel removed for clarity.

1. Remove key switch panel.

2. Adjust spring tension by loosening or tightening lock nut (A) until throttle lever movement is smooth throughout range of travel with only slight drag.



LV407 –UN–18FEB92

A—Lock Nut

AG,OUO1085,345 –19–14SEP00–1/1

Slow Idle Adjustment

REASON:

To achieve correct slow idle rpm.

EQUIPMENT:

- JT05719 Hand Held Digital Tachometer

CONNECTIONS:

1. Attach reflective tape to crankshaft sheave (A).

PROCEDURE:

1. Run engine to normal operating temperature.
2. Pull throttle lever back (toward turtle) until it stops.
3. Check rpm.

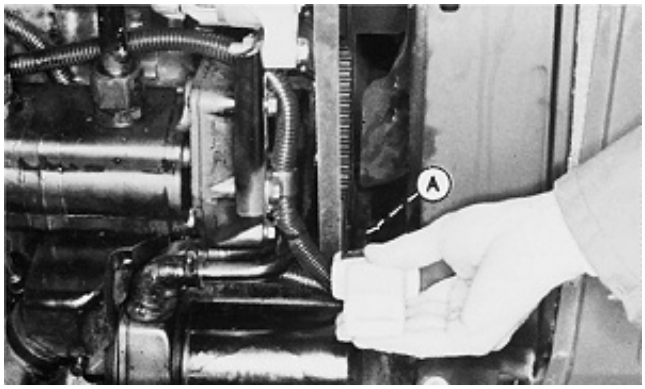
Specification

Engine—Slow Idle—Speed ..... 825 ± 25 rpm

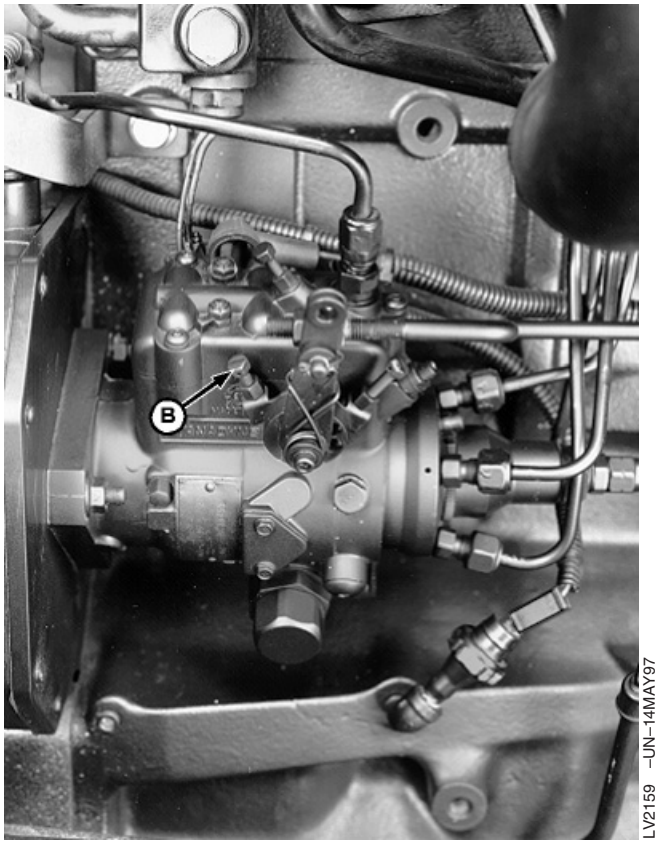
RESULTS:

- If rpm is not within specifications, adjust screw (B) until correct slow idle rpm is obtained.
- If correct slow idle rpm cannot be obtained, go to Fast Idle Adjustment in this group.

A—Crankshaft Sheave
B—Screw



Crankshaft Sheave



Slow Idle Adjustment Screw

AG,OUO1085,346 –19–14SEP00–1/1

Fast Idle Adjustment

220
15
22

REASON:

To achieve correct fast idle rpm.

EQUIPMENT:

- JT05719 Hand Held Digital Tachometer

CONNECTIONS:

1. Attach reflective tape to crankshaft sheave (A).

PROCEDURE:

1. Run engine to normal operating temperature.
2. Loosen nuts (D).
3. Push throttle lever fully forward (toward rabbit) until linkage plate (B) contacts bracket (C).
4. Check rpm using tachometer.
5. Push lever (E) until screw (F) touches fast idle screw stop. Adjust screw to fast idle specifications.
6. Tighten nuts (D) while holding lever (E) against screw stop.
7. Check rpm.

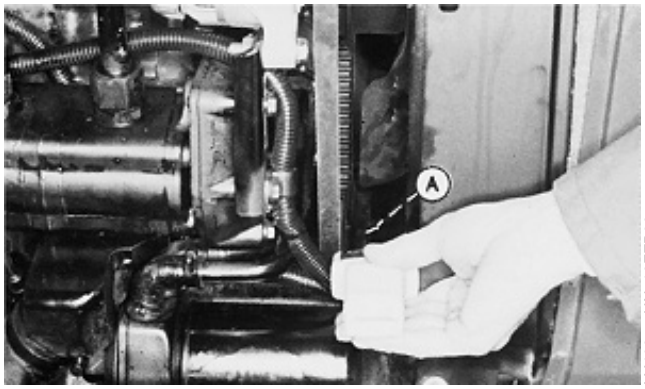
Specification

Engine—Fast Idle—Speed ..... 2625 ± 25 rpm

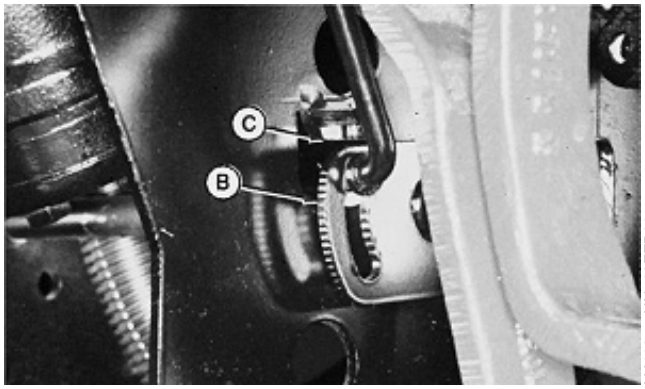
RESULTS:

- If rpm cannot be brought to specifications, go to Engine Has Low Power in this group.

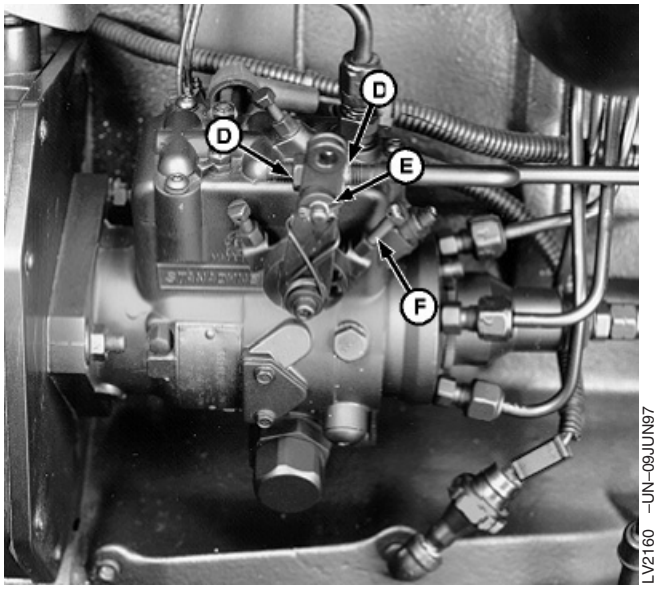
A—Crankshaft Sheave
B—Linkage Plate
C—Stop Bracket
D—Nuts
E—Lever
F—Idle Screw



Crankshaft Sheave



Linkage plate and Stop Bracket



Fast Idle Adjustment Screw

AG,OUO1085,347 –19–14SEP00–1/1

Injection Pump Timing Adjustment

NOTE: This procedure is used if pump timing was disturbed, or a new pump is installed. If a new front plate (without a timing mark) has been installed, see instructions to transfer fuel injection pump timing mark to new front plate in CTM104 or CTM125.

REASON:
To correctly set injection pump timing for proper engine operation.

PROCEDURE:

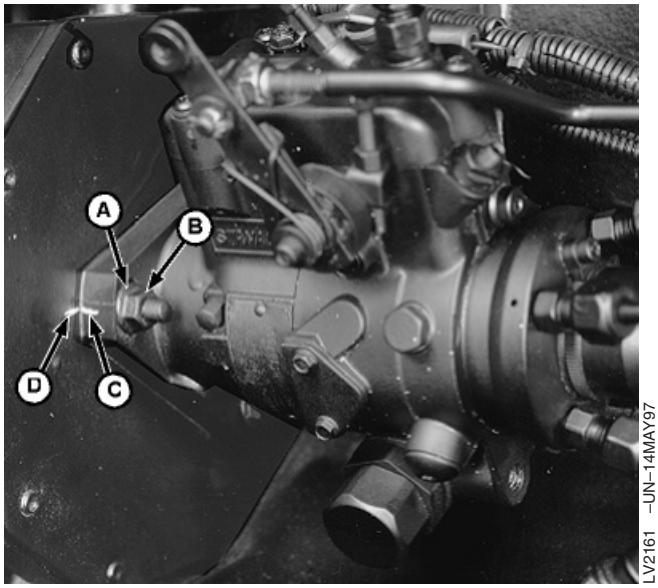
1. Loosen nut (B) on the three mounting studs.
2. Pivot injection pump away from engine as far as slots (A) will allow.
3. Pivot injection pump toward engine to exactly align timing marks (C and D).
4. Tighten nuts (B) to specification.

Specification

Fuel Injection Pump Mounting Nuts—Torque ..... 25 N•m (216 lb-in.)

RESULTS:

- Injection pump is properly timed for beginning of injection.



LV2161 –UN–14MAY97

A—Adjustment Slot
B—Nut
C—Pump Housing Alignment Mark
D—Front Cover Alignment Mark

AG,OUO1085,349 –19–14SEP00–1/1

Check and Adjust Valve Clearance

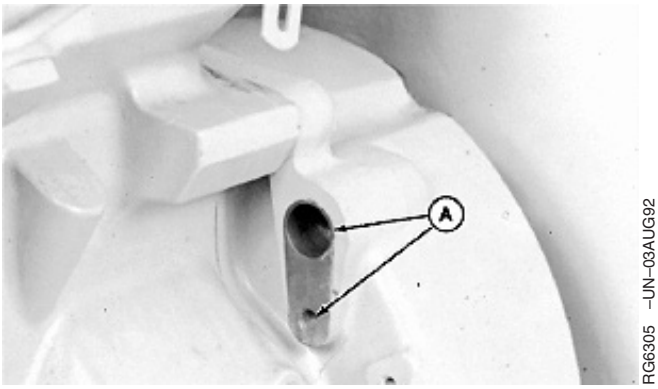
Insufficient valve clearance forces valves out of time. Valves open too early and close too late. Hot combustion gases rush past valves, causing the valves to overheat. Overheating lengthens valve stems preventing proper valve seating. Valves seat so briefly or poorly that normal heat transfer to the valve seat and cooling system does not have time to take place, resulting in burned valves and low power.

Excessive valve clearance produces a lag in valve timing resulting in engine valve train imbalance. The air-fuel mixtures enters cylinders late during the intake stroke. The exhaust valve closes early and prevents waste gases from being completely removed from the cylinders. Also, the valves close with a great deal of force, which may crack or break the valves and scuff the camshaft and followers.

NOTE: Valve clearance MUST BE checked with engine cold.

1. Remove rocker arm cover and ventilator tube.

2. Remove plugs or cover plate from engine timing holes (A).



RG6305 –UN–03AUG92

A—Engine Timing Holes

Continued on next page

AG,OUO1085,350 –19–14SEP00–1/4

3. Using engine rotation tool and timing pin, rotate engine in running direction (clockwise viewed from front) until No. 1 cylinder is at TDC compression stroke.

   If No. 1 cylinder rocker arms are loose, the engine is at No. 1 TDC compression. If No. 1 cylinder rocker arms are not loose, rotate engine one full revolution (360°) to No. 1 TDC compression.

NOTE: Some engines are equipped with flywheel housing which do not allow use of an engine rotation tool.

4. Check and adjust valve clearance to specifications, as directed in the following procedures for 3, 4, or 6-cylinder engines.

Valve Clearance (Rocker Arm-to-Valve Tip)—Specification

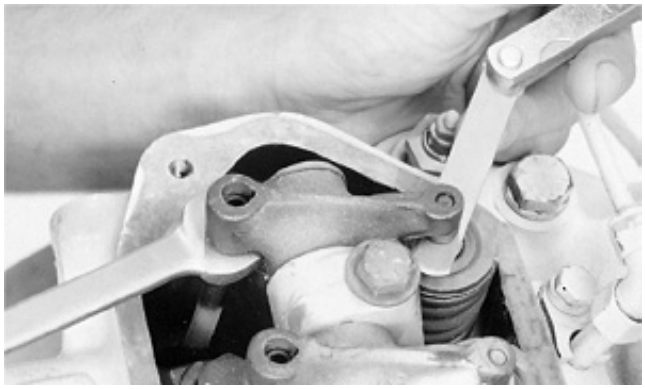
Intake Valve—Clearance	0.35 mm (0.014 in.)
Exhaust Valve—Clearance	0.45 mm (0.018 in.)

5. If rocker arm is equipped with adjusting screw and jam nut (A), tighten jam nut to specification after adjusting valve clearance.

Specification

Rocker Arm Jam Nut—Torque	27 N•m (20 lb-ft)

A—Jam Nut



T81224 –UN–07NOV88

No. 1 Cylinder

RG6307 –UN–03AUG92

Jam Nut

AG,OUO1085,350 –19–14SEP00–2/4

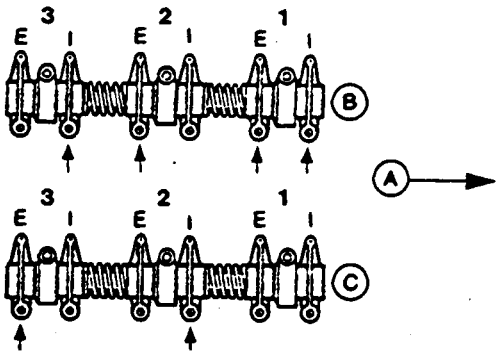
NOTE: Firing order is 1—2—3.

a. 3-CYLINDER ENGINE: Lock No. 1 piston at TDC compression stroke (B).

b. Adjust valve clearance on No. 1 and 2 exhaust valves and No. 1 and 3 intake valves.

c. Turn crankshaft 360° and lock No. 1 piston at TDC exhaust stroke (C).

d. Adjust valve clearance on No. 3 exhaust valve and No. 2 intake valve.



RG4775 –UN–06DEC88

A—Front of Engine
B—No. 1 Piston at TDC Compression Stroke
C—No. 1 Piston at TDC Exhaust Stroke
E—Exhaust Valve
I—Intake Valve

Continued on next page

AG,OUO1085,350 –19–14SEP00–3/4

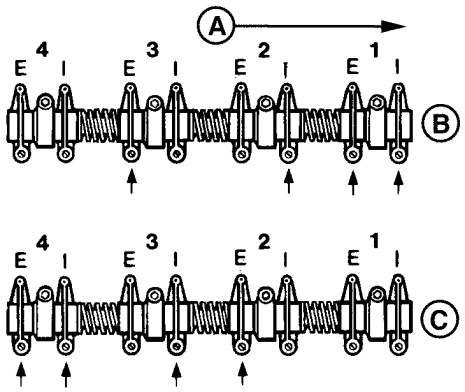
NOTE: Firing order is 1—3—4—2.

a. 4-CYLINDER ENGINE: Lock No. 1 piston at TDC compression stroke (B).

b. Adjust valve clearance on No. 1 and 3 exhaust valves and No. 1 and 2 intake valves.

c. Turn crankshaft 360°. Lock No. 4 piston at TDC compression stroke (C).

d. Adjust valve clearance on No. 2 and 4 exhaust valve and No. 3 and 4 intake valves.



RG4776 –UN–31OCT97

A—Front of Engine
B—No. 1 Piston at TDC Compression Stroke
C—No. 4 Piston at TDC Compression Stroke
E—Exhaust Valve
I—Intake Valve

AG,OUO1085,350 –19–14SEP00–4/4

Fan/Alternator V-Belt Adjustment (5210 and 5310)

REASON:

To keep proper tension on belt to drive water pump and alternator. To prevent shortened belt and bearing life.

EQUIPMENT:

- JDG529, JDST28, or JT05975 Belt Tension Gauge
- Straight edge

PROCEDURE:

NOTE: Run engine for five minutes to warm a cold belt. Let hot belt cool for 15 minutes before adjustment.

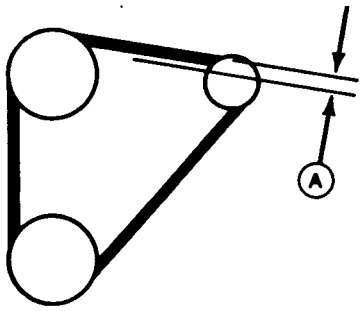
1. Check belt tension using appropriate gauge: JDG529 or JDST28 gauge for standard V-belt, JT05975 or JDST28 gauge for poly V-belt.
2. Loosen both alternator mounting cap screws.

IMPORTANT: Do not pry against alternator rear frame when adjusting belt. Alternator can be damaged.

3. Apply outward pressure to alternator front frame until belt tension is to specifications.
4. Tighten cap screws.
5. Run engine for 10 minutes.
6. Check belt tension. If not within used belt specifications, wait 10 minutes to cool belt and adjust belt to used belt tension.

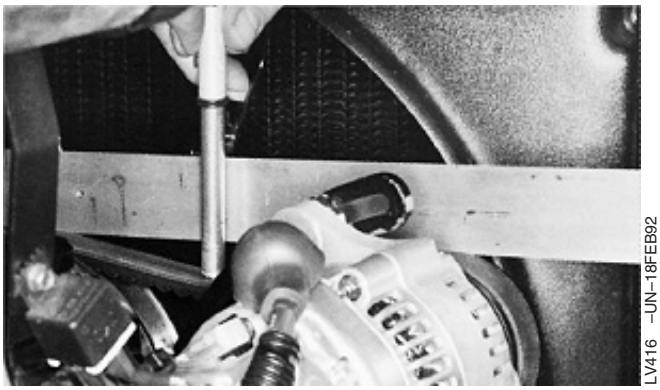
Specification

New Standard V-Belt—JDG529	
Gauge Method—Tension	578—622 N (130—140 lb-force)
Used Standard V-Belt—JDG529	
Gauge Method—Tension	378—423 N (85—94 lb-force)
Standard V-Belt—JDST28	
Gauge/Straight Edge Method—Belt Deflection at 89 N (20 lb-force)	19 mm (0.750 in.)
New Poly V-Belt—JT05975	
Gauge Method—Tension	890—1068 N (200—240 lb-force)



M54014

M54014 –19–27AUG90



LV416 –UN–18FEB92

A—Belt Deflection

Continued on next page

	Specification
Used Poly V-Belt—JT05975	
Gauge Method—Tension	800—979 N (180—220 lb-force)
Poly V-Belt—JDST28	
Gauge/Straight Edge Method—Belt Deflection at 130 N (30 lb-force)	13 mm (0.500 in.)

220
15
28

AG,OUO1085,351 –19–15SEP00–2/2

Compressor Drive Belt Adjustment—3-Cylinder

REASON:

To keep proper tension on belt to drive air conditioning compressor. To prevent shortened belt and bearing life.

EQUIPMENT:

- JDG529 or JDST28 Belt Tension Gauge
- Straight edge

PROCEDURE:

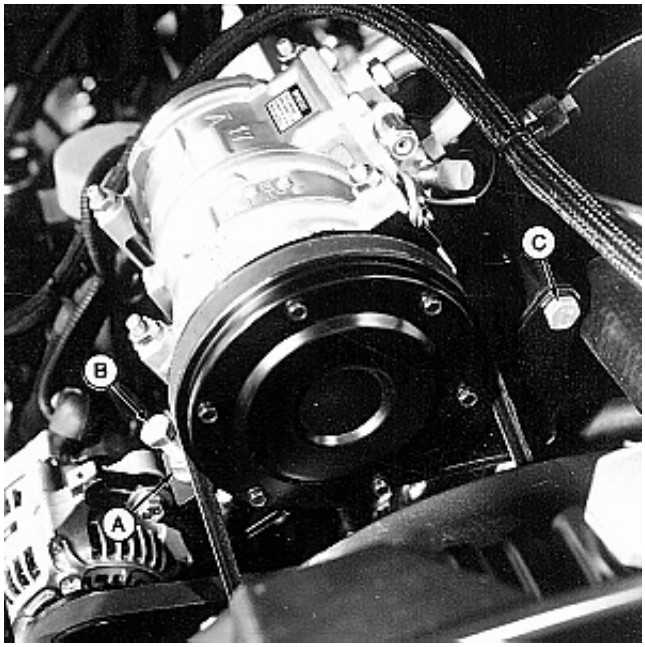
NOTE: Run engine for five minutes to warm a cold belt. Let hot belt cool for 15 minutes before adjustment.

1. Check belt tension using appropriate gauge: JDG529 or JDST28 Gauge for standard V-belt.
2. Loosen compressor mounting cap screw (C) and jam nut (A).
3. Turn adjustment screw (B) clockwise until belt tension is to specifications.

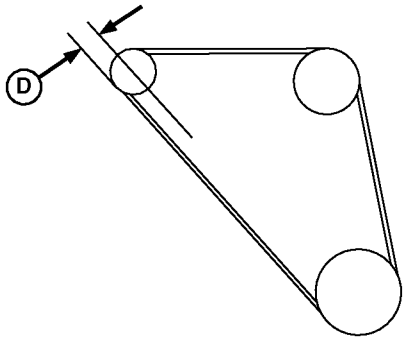
Specification

New Standard V-Belt—JDG529	
Gauge Method—Tension	578—622 N (130—140 lb-force)
Used Standard V-Belt—JDG529	
Gauge Method—Tension	378—423 N (85—94 lb-force)
Standard V-Belt—JDST28	
Gauge/Straight Edge Method—Belt Deflection at 89 N (20 lb-force)	19 mm (0.750 in.)

4. Tighten jam nut and cap screws.
5. Run engine for 10 minutes.
6. Check belt tension. If not within used belt specifications, wait 10 minutes to cool belt and adjust belt to used belt tension.



LV885 –UN–21DEC95



LV1613 –UN–02FEB96

A—Jam Nut
B—Adjustment Screw
C—Cap Screw
D—Belt Deflection

AG,OUO1032,3321 –19–31MAY00–1/1

Turbocharger Boost Pressure Test—5310 and 5510


LV417 –UN–18FEB92

REASON:

To determine if turbocharger is operating properly within specifications.

EQUIPMENT:

- JT03470 Fitting
- JDE147 Kit

CONNECTIONS:

1. Remove manifold heater from intake manifold.
2. Install JT03470 Fitting in manifold.
3. Connect hose and gauge from JDE147 kit and follow procedures on next page.

PROCEDURE:

1. Run engine until lubricating oil reaches operating temperature of 105°C (220°F).

IMPORTANT: Engine speed and load should be stabilized before taking readings on gauge. Be sure that gauge works properly.

Pressure checks are only a guide to determine if there is an engine problem (valve leakage, defective nozzles, etc.). Low readings are not a valid reason for increasing injection pump fuel delivery. Pump adjustment should be within specification as established by an authorized pump repair station.

2. Observe gauge. Reading should be within specifications at specified load speed.

Specification	
Load—Speed	2400 rpm

Continued on next page

Specification	
3029T—Minimum Turbocharger Boost—Pressure	69 kPa (0.69 bar) (10 psi)
4045T—Minimum Turbocharger Boost—Pressure	117 kPa (1.20 bar) (17 psi)

RESULTS:

If boost pressure is too high, check for:

- Excessive fuel injection pump pressure.
- Low injection nozzle opening pressure.
- Excessive injection nozzle valve lift.
- Injection nozzle seat leakage.
  – Go to CTM104 or CTM125 and service as needed.

If boost pressure is too low, check for:

- Restricted air filter.
- Restricted fuel filter or lines.
  – Go to Section 30 and service as needed.
- Incorrect fast idle adjustment.
- Incorrect injection pump timing.
- Low compression pressure.
  – Go to Section 220 and service as needed.
- Exhaust manifold leaks.
- Intake manifold leaks.
- Faulty fuel injection nozzles.
- Carbon build-up in turbocharger.
- Turbocharger compressor or turbine wheel rubbing housing.
- Low fuel injection pump delivery.
  – Go to CTM104 or CTM125 and service as needed.

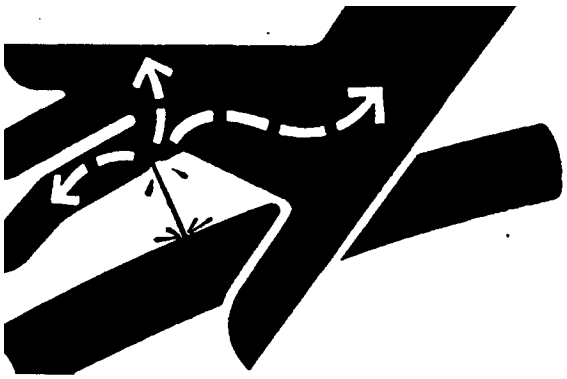
AG,OUO1085,352 –19–22NOV02–2/2

Bleed Fuel System

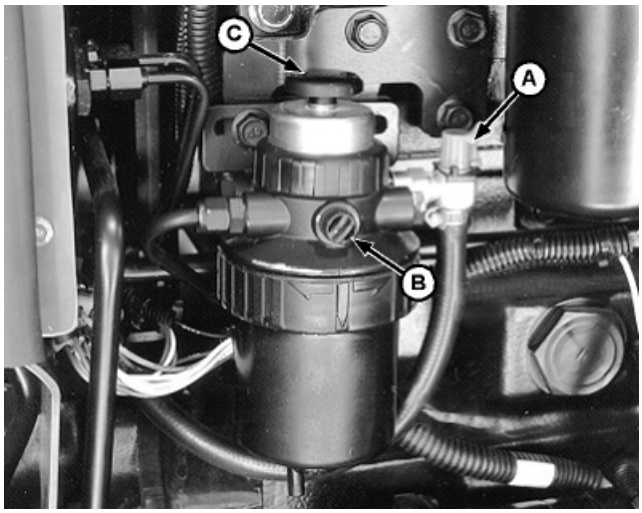
220
15
32

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



X9811 –UN–23AUG88



LV2167 –UN–14MAY97

A—Fuel Shut-Off Valve
B—Filter Bleed Plug
C—Fuel Pump Primer

REASON:

If the fuel system has been serviced (lines disconnected or filter removed), it will be necessary to bleed air from the system.

IMPORTANT: Do not attempt to start engine while bleeding fuel system. Injection pump can be damaged.

PROCEDURE:

1. Check that fuel level in tank is adequate.
2. Open fuel shut-off valve (A) at fuel filter.
3. Open filter bleed plug (B).
4. Operate supply pump primer (C) until air-free fuel flows from plug. Tighten plug (B) securely.
5. Start engine and check for leakage. If engine will not start, it may be necessary to bleed air from fuel system at fuel injection pump or injection nozzles as explained next.

Continued on next page

AG,OUO1032,3323 –19–31MAY00–1/2

6. Slightly loosen fuel line (A) at fuel injection pump.

7. Operate primer on fuel filter until air-free fuel flows from line (A). Tighten line to specification.

Specification

Fuel Injection pump line—Torque ..... 16 N•m (12 lb-ft)

8. Move the speed control lever to half throttle position.

9. Loosen fuel line connection (B) at injection nozzle.

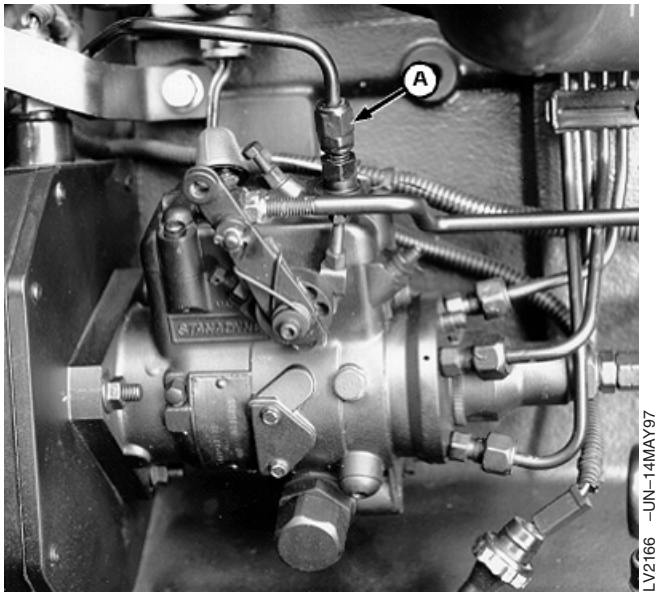
10. Crank engine with starter motor (but do not start engine), until air-free fuel flows from connection. Tighten fuel line connection (B) to specification.

Specification

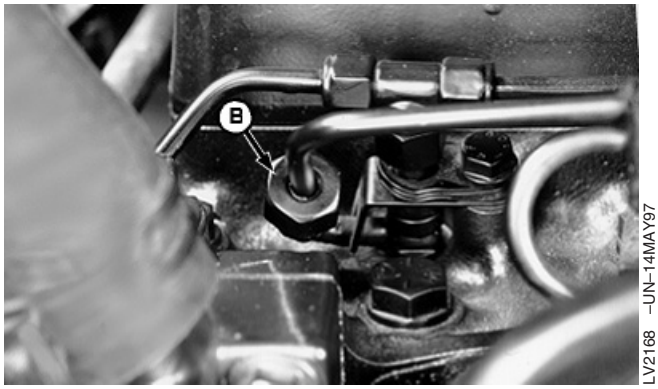
Fuel Injection Nozzle Line Nuts—
Torque ..... 27 N•m (20 lb-ft)

11. Repeat this procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.

A—Fuel Line
B—Fuel Line Connection



LV2166 –UN–14MAY97



LV2168 –UN–14MAY97

AG,OUO1032,3323 –19–31MAY00–2/2

Section 230
Fuel/Air Operation, Tests, and Adjustments

Contents

Component Location Information

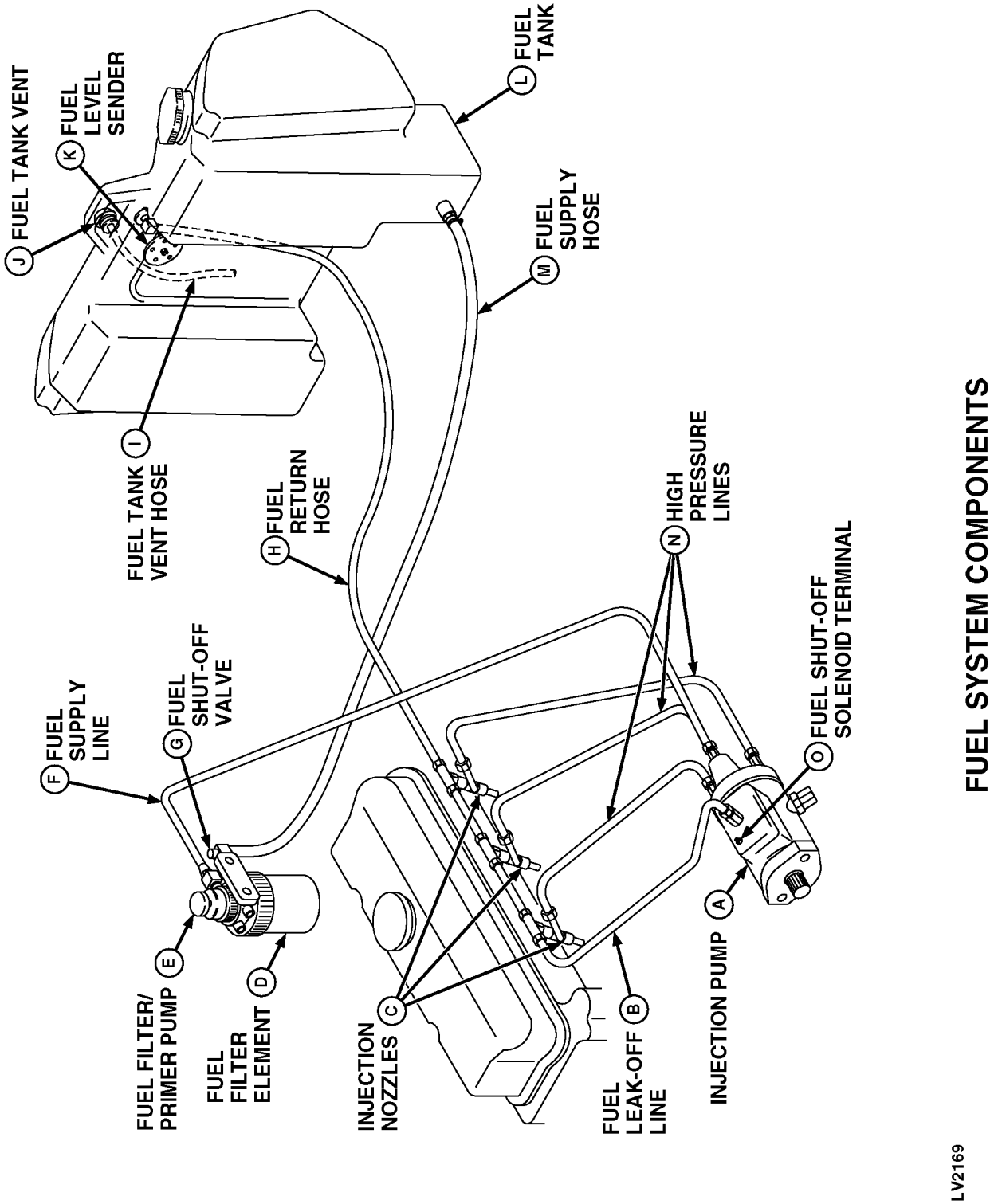
This group contains component location drawings for the following fuel/air system components:

- Fuel System
- Air Intake System
  - With Turbocharger
  - Without Turbocharger

Use the drawings when diagnosing a fuel/air problem and to help locate the components to be tested.

AG,OUO1085,355 –19–15SEP00–1/1

Fuel System Components



Continued on next page

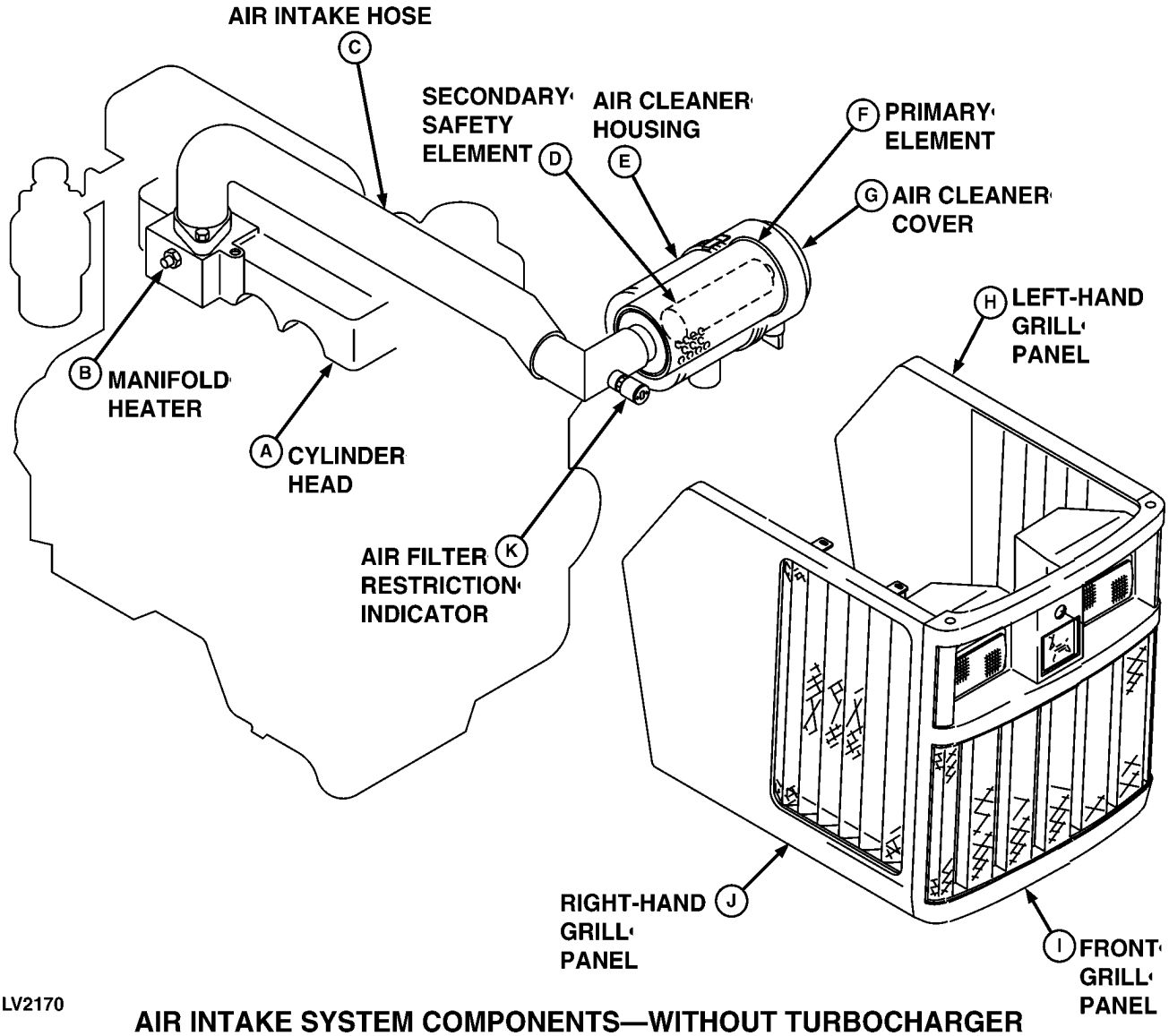
AG,OUO1085,356 –19–15SEP00–1/2

A—Injection Pump
B—Fuel Leak-Off Line
C—Injection Nozzles
D—Fuel Filter Element
E—Fuel Filter/Primer Pump
F—Fuel Supply Line
G—Fuel Shut-Off Valve
H—Fuel Return Hose
I—Fuel Tank Vent Hose
J—Fuel Tank Vent
K—Fuel Level Sender
L—Fuel Tank
M—Fuel Supply Hose
N—High Pressure Lines
O—Fuel Shut-Off Solenoid Terminal

NOTE: Three-cylinder engine shown; four-cylinder engine uses same components.

AG,OUO1085,356 –19–15SEP00–2/2

Air Intake System Components—Without Turbocharger



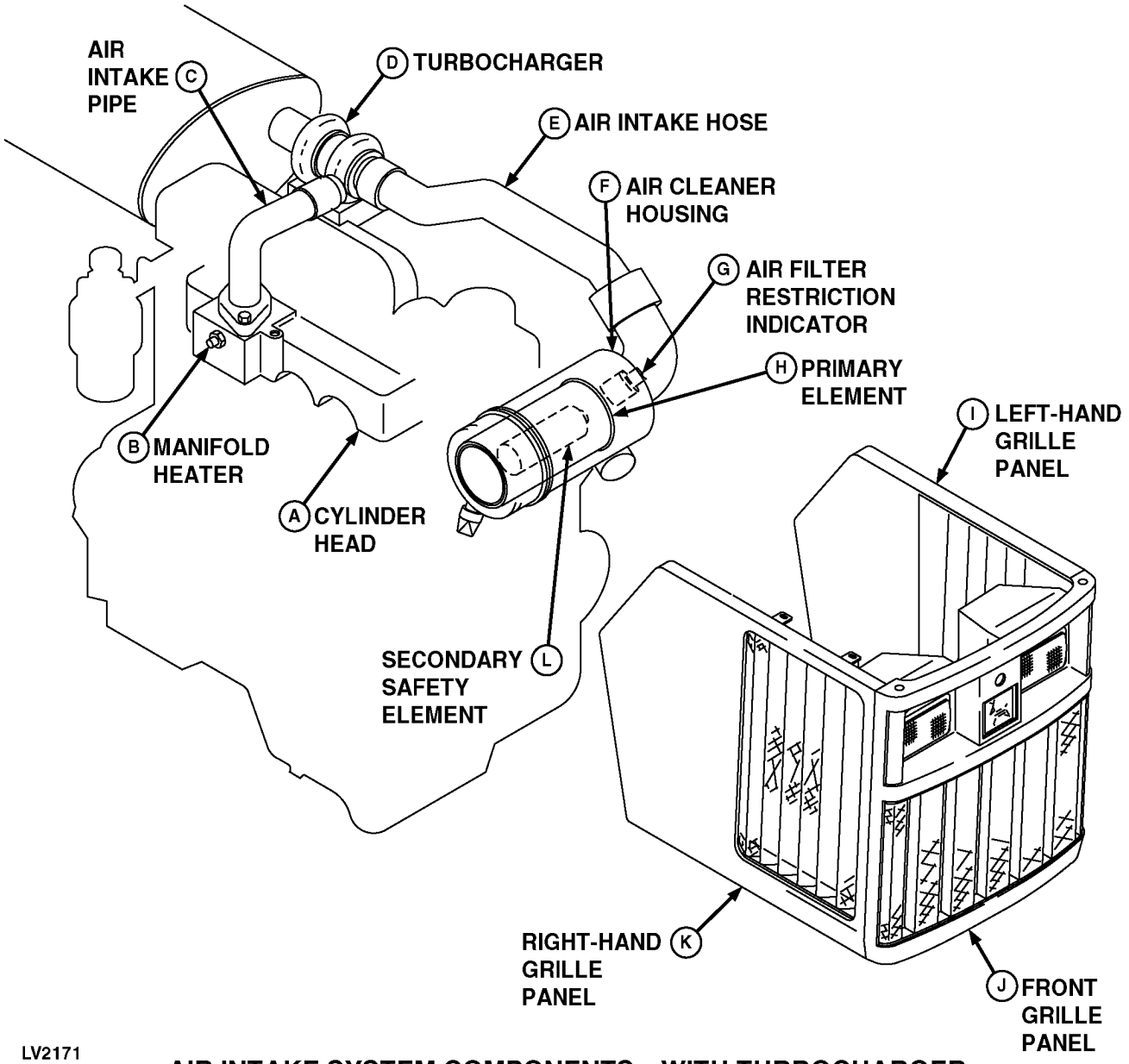
AIR INTAKE SYSTEM COMPONENTS—WITHOUT TURBOCHARGER

A—Cylinder Head
B—Manifold Heater
C—Air Intake Hose
D—Secondary Safety Element
E—Air Cleaning Housing
F—Primary Element
G—Air Cleaner Cover
H—Left-Hand Grille Panel
I—Front Grille Panel
J—Right-Hand Grille Panel
K—Air Filter Restriction Indicator

NOTE: Three-cylinder engine without turbocharger shown; four-cylinder engine without turbocharger is similar.

AG,OUO1085,357 –19–15SEP00–1/1

Air Intake System Components—With Turbocharger



AIR INTAKE SYSTEM COMPONENTS—WITH TURBOCHARGER

A—Cylinder Head
B—Manifold Heater
C—Air Intake Pipe
D—Turbocharger
E—Air Intake Hose
F—Air Cleaner Housing
G—Air Filter Restriction Indicator
H—Primary Element
I—Left-Hand Grille Panel
J—Front Grille Panel
K—Right-Hand Grille Panel
L—Secondary Safety Element

NOTE: Four-cylinder engine with turbocharger shown; three-cylinder engine with turbocharger is similar.

AG,OUO1085,358 –19–15SEP00–1/1

Theory of Operation Information

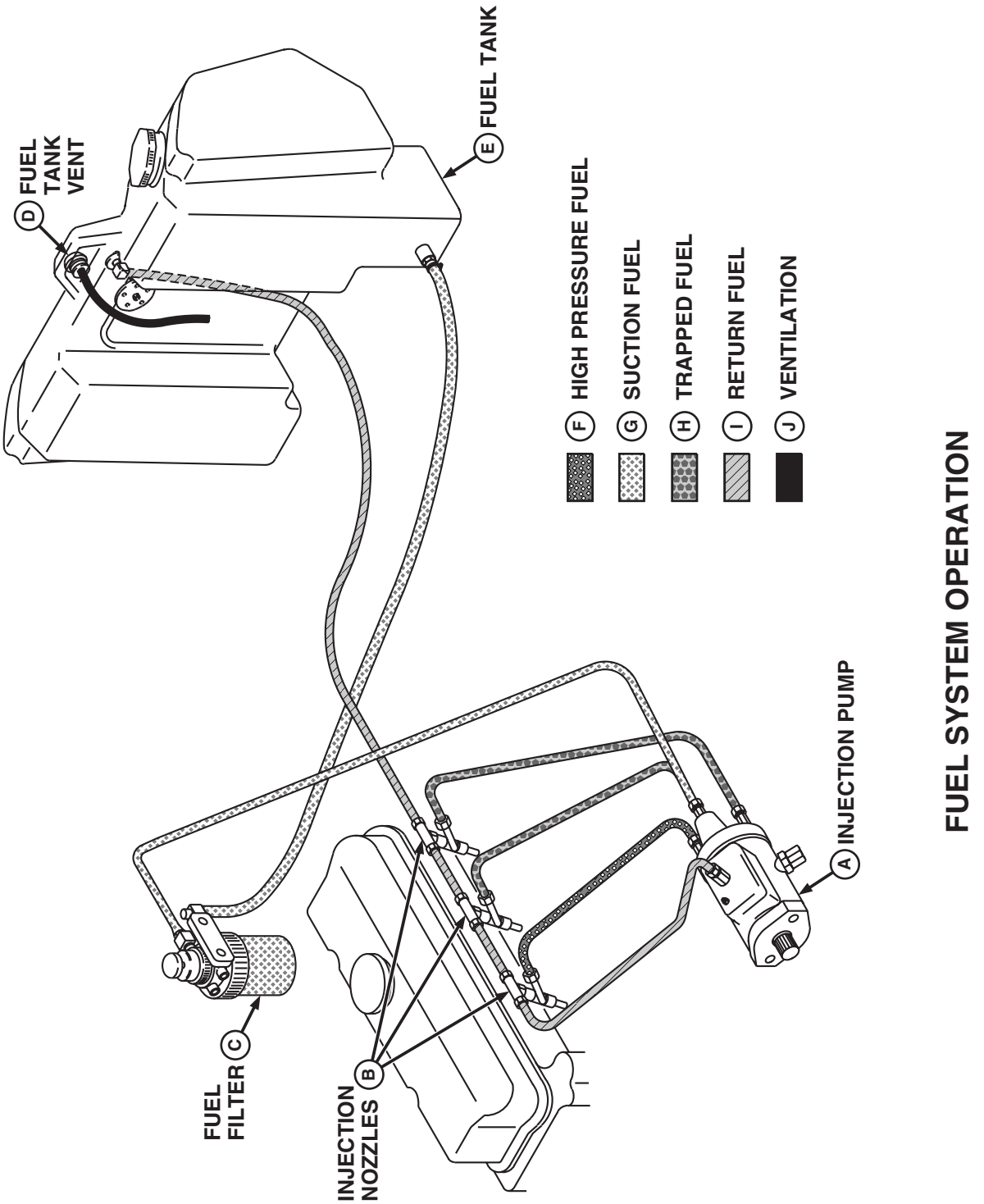
This group divides the fuel/air system into individual components or sub-systems by function. The story contains information on function, component or sub-system identification, and theory of operation.

The following systems or components are covered:

- Fuel System
- Fuel Filter/Priming Pump
- Fuel Injection Pump
- Injection Nozzle
- Air Intake System
- Turbocharger

AG,OUO1085,359 –19–15SEP00–1/1

Fuel System Operation



LVC2172 –UN–10JUN97

Continued on next page

AG,OUO1085,360 –19–15SEP00–1/2

A—Injection Pump
B—Injection Nozzles
C—Fuel Filter
D—Fuel Tank Vent
E—Fuel Tank
F—High Pressure Fuel
G—Suction Fuel
H—Trapped Fuel
I—Return Fuel
J—Ventilation

FUNCTION:

Fuel system supplies fuel to injector nozzles.

MAJOR COMPONENTS:

- Fuel Tank
- Fuel Tank Vent
- Fuel Filter/Primer Pump
- Injection Pump
- Injection Nozzles
- Supply Hose and Line
- High Pressure Lines
- Return Line and Hoses

NOTE: Three-cylinder engine shown; four-cylinder engine uses same components.

THEORY OF OPERATION:

Suction fuel (G) flows from tank (E) to filter (C) to injection pump (A). The injection pump meters fuel as determined by its internal governor and throttle position, and delivers the fuel (F) at high pressure to the injection nozzles (B). The injector nozzle prevents flow until sufficiently high pressure is reached, opening the valve and spraying atomized fuel into the combustion chamber. Injection lines have trapped fuel (H) whenever injection is not taking place.

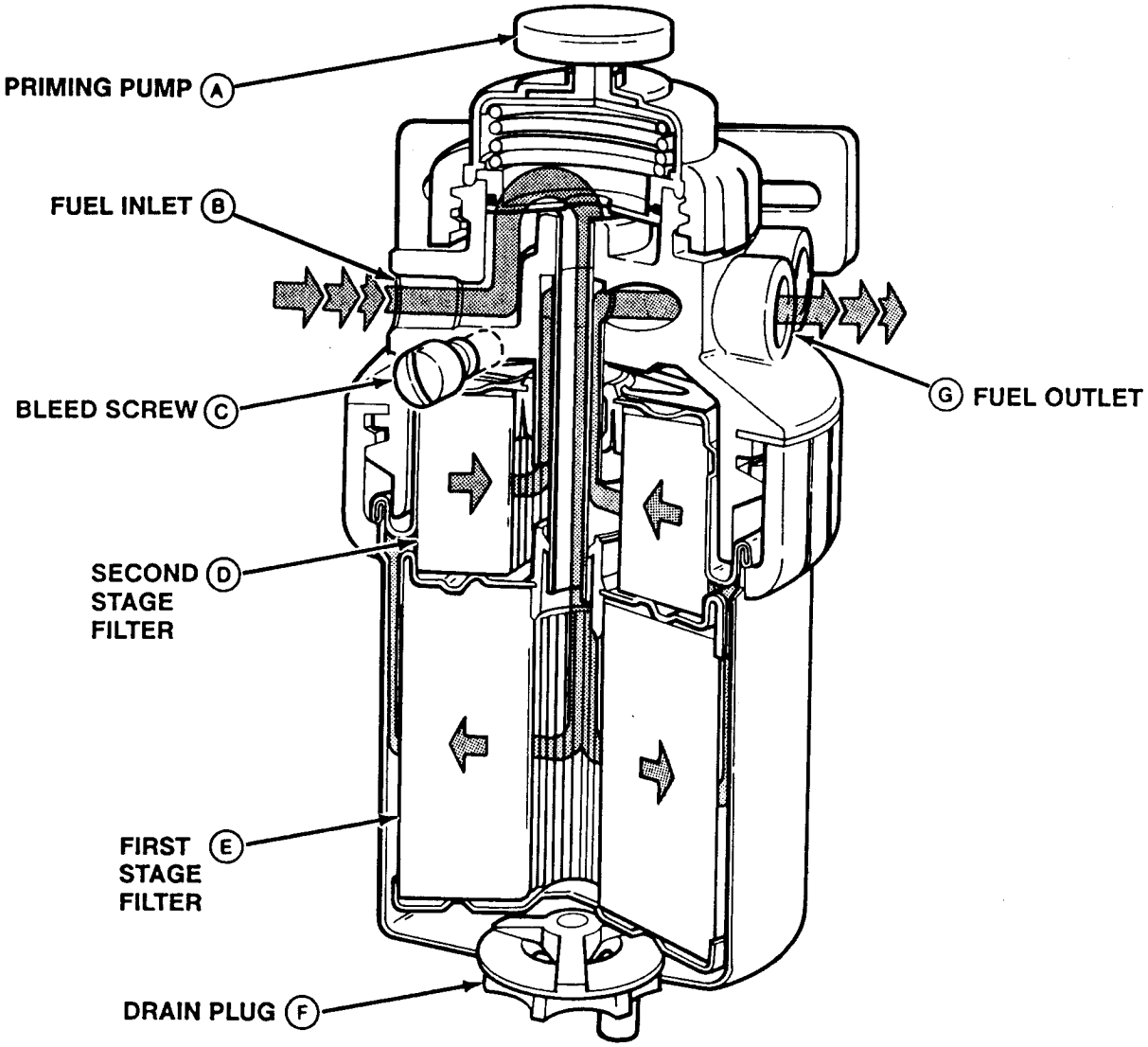
Vent (D) will open to permit air to escape if fuel tank becomes pressurized. Vent will also open to permit air to enter tank if sufficient vacuum is created, to allow suction fuel (G) to supply system.

Any air in the system is bled out with return fuel (I) to the fuel tank. Manual bleeding of fuel system is usually necessary only after servicing components of fuel system.

More fuel is routed through the system than is required for injection. Excess fuel serves to cool and lubricate the injection pump and nozzles, and warm the fuel in the fuel tank.

AG,OUO1085,360 –19–15SEP00–2/2

Fuel Filter/Priming Pump Operation



LV248A

LV248A –19–27JAN92

FUEL FILTER/PRIMING PUMP OPERATION

A—Priming Pump
B—Fuel Inlet
C—Bleed Screw
D—Second Stage Filter
E—First Stage Filter
F—Drain Plug
G—Fuel Outlet

FUNCTION:

Fuel filter provides clean, moisture free fuel for the injection process. The priming pump aids in the removal of excess air from the filter and lines so the injection pump can then draw fuel from the tank.

MAJOR COMPONENTS:

- Fuel Filter Base
- Fuel Filter Element
- Priming Pump
- Bleed Screw

Continued on next page

LV,23010HA,A5 –19–19FEB92–1/2

- Drain Plug

THEORY OF OPERATION:

Fuel enters the filter at inlet (B) and flows through a first stage filter (E) and a second stage filter (D) before flowing through outlet (G) to the fuel injection pump. The filter elements are housed in a sediment bowl attached to the base with a threaded ring.

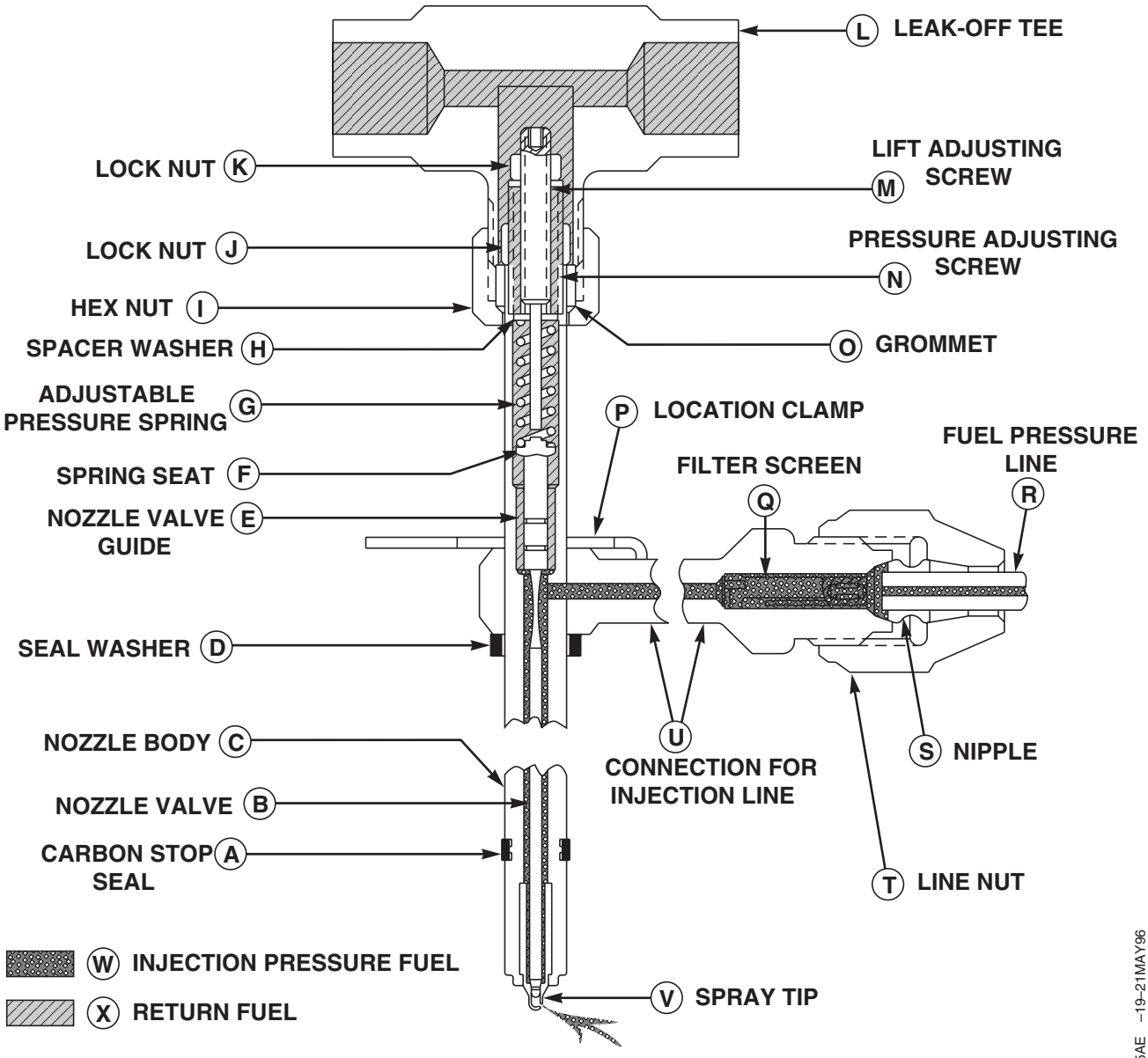
Since water and contaminants settle at the bottom of the sediment bowl, a drain plug (F) is provided.

Air in the system can be expelled through the air vent when the bleed screw (C) is loosened.

Priming pump (A) draws fuel from the fuel tank to fill the filter bowl in the event of a filter change. Priming pump also supplies fuel from the filter to the injection pump.

LV,23010HA,A5 –19–19FEB92–2/2

Fuel Injection Nozzle Operation



LVC265AE –19–21MAY96

FUEL INJECTION NOZZLE OPERATION

Fuel Injection Nozzle Operation

A—Carbon Stop Seal
B—Nozzle Valve
C—Nozzle Body
D—Seal Washer
E—Nozzle Valve Guide
F—Spring Seat
G—Adjustable Pressure Spring
H—Spacer Washer
I—Hex Nut
J—Lock Nut
K—Lock Nut
L—Leak-Off Tee
M—Lift Adjusting Screw
N—Pressure Adjusting Screw
O—Grommet
P—Location Clamp
Q—Filter Screen
R—Fuel Pressure Line
S—Nipple
T—Line Nut
U—Connection For Injection Line
V—Spray Tip
W—Injection Pressure Fuel
X—Return Fuel

FUNCTION:

Continued on next page

LV,23010HA,A9 –19–22MAY96–1/2

The fuel injection nozzle sprays fuel in an atomized form directly into cylinder.

MAJOR COMPONENTS:

- Spray Tip
- Nozzle Valve
- Nozzle Body
- Nozzle Valve Guide
- Adjustable Pressure Spring
- Lift Adjusting Screw
- Leak-Off Tee
- Pressure Adjusting Screw

THEORY OF OPERATION:

The spring and valve type injection nozzles, located in the engine cylinder head, are hydraulically operated by the fuel delivered from the injection pump.

A location clamp (P) positions the nozzle assembly in the cylinder head. The nozzle is sealed at the lower end by a seal washer (D). A carbon stop seal (A), located on the lower end of the nozzle body, prevents carbon from collecting around the nozzle in the cylinder head.

Enclosed in the nozzle body (C) are nozzle valve (B), adjustable pressure spring (G), and spring seat (F).

Nozzle operating pressure is controlled by pressure adjusting screw (N) in the upper end of the nozzle body. Valve lift is adjusted by lift adjusting screw (M) located in the pressure adjusting screw. The spray tip (V) is pressed into the nozzle body and cannot be separated.

A leak-off tee (L) is attached to the upper end of injection nozzle, secured by a grommet (O) and hex nut (I).

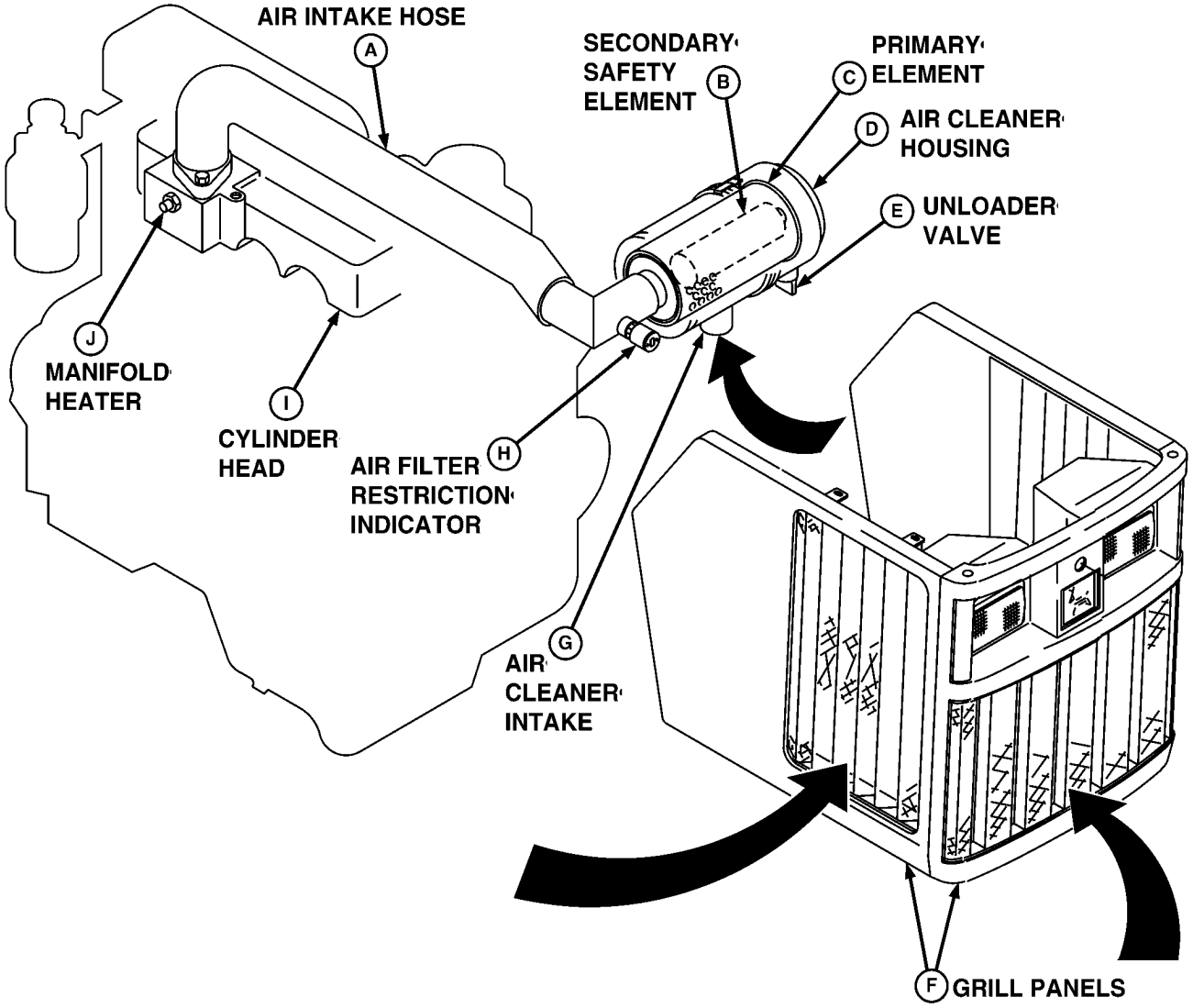
Metered fuel, under high pressure, is delivered by the injection pump through the nozzle inlet on the valve body into the area surrounding the valve. When fuel pressure reaches nozzle opening pressure, the valve is forced from its seat against the pressure of the spring, permitting a measured amount of fuel to enter the combustion chamber through four small holes in the spray tip.

After fuel has been injected, the spring closes the valve. In actual operation, the valve opens and closes very rapidly, providing a distinct chatter.

A small amount of fuel leaks past the valve into the spring area to provide lubrication for the nozzle working parts. The excess fuel is removed from the nozzle at the top by means of a leak-off line connected to the fuel tank.

LV,23010HA,A9 –19–22MAY96–2/2

Air Intake System Operation—Without Turbocharger



LV2173

AIR INTAKE SYSTEM OPERATION—WITHOUT TURBOCHARGER

LV2173 –UN–27FEB98

A—Air Intake Hose
B—Secondary Safety Element
C—Primary Element
D—Air Cleaner Housing
E—Unloader Valve
F—Grille Panels
G—Air Cleaner Intake
H—Air Filter Restriction Indicator
I—Cylinder Head
J—Manifold Heater

NOTE: Three-cylinder engine without turbocharger shown; four-cylinder engine without turbocharger is similar.

FUNCTION:

Air intake system filters air needed for combustion.

MAJOR COMPONENTS:

- Grille Panels

Continued on next page

- Air Cleaner Housing
- Primary Element
- Secondary Element
- Air Intake Hose
- Cylinder Head
- Manifold Heater
- Air Filter Restriction Indicator

THEORY OF OPERATION:

Air enters through grille panels and into the air cleaner intake (G) located under air cleaner housing (E).

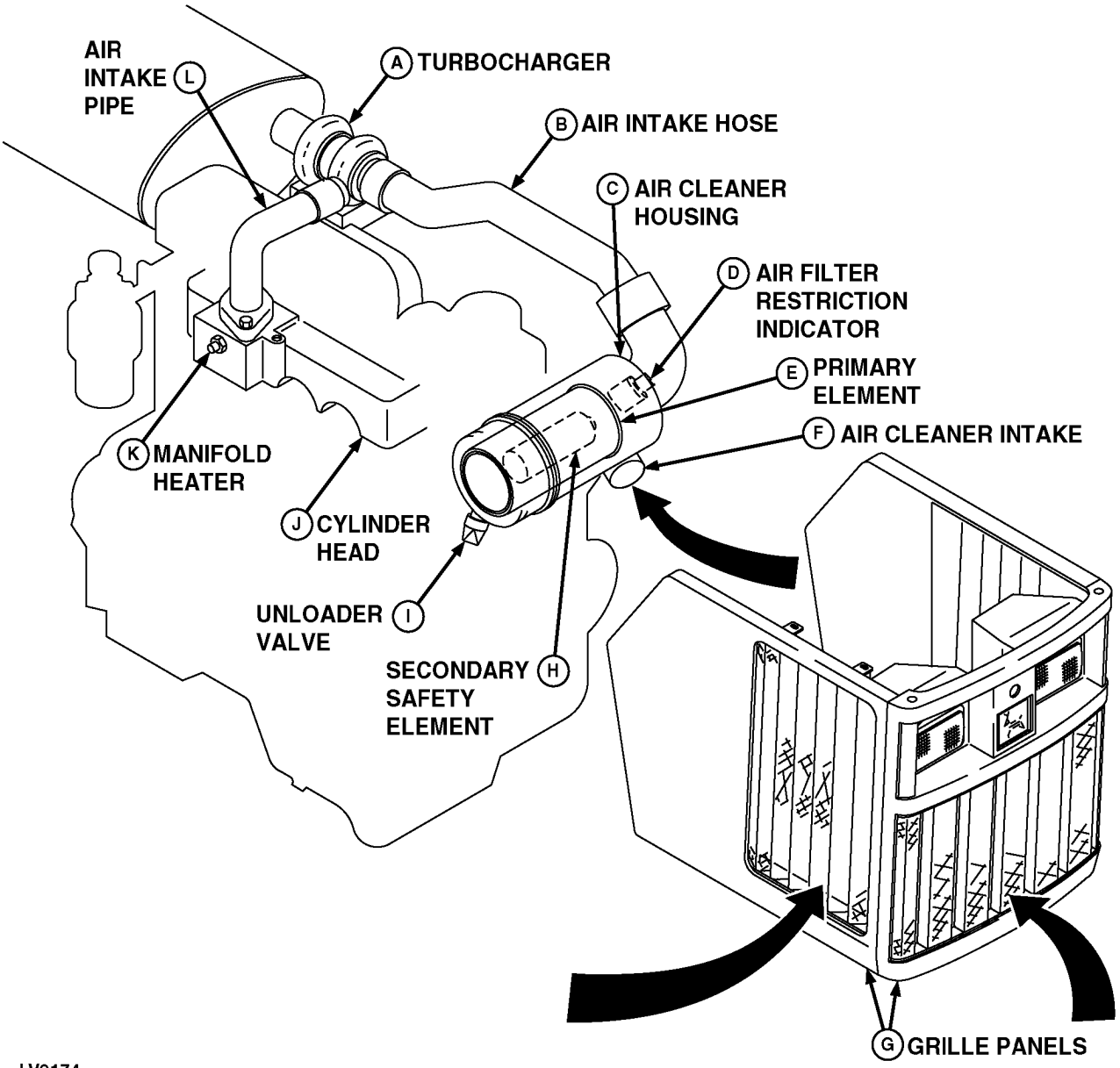
Directing air around primary element (C) in a circular motion, throwing larger particles to the unloader valve (E). Air is then directed through a secondary element (B) through hose (A) to cylinder head (I).

An electronic air filter restriction indicator (H) is located at air cleaner outlet to indicate clogged or restricted air cleaner elements. An indicator in dash will light.

An electric manifold heater (J) warms intake air, by heating coils or metal strips as air passes through them, to aid in cold starting.

AG,OUO1085,361 –19–15SEP00–2/2

Air Intake System Operation—With Turbocharger



AIR INTAKE SYSTEM OPERATION—WITH TURBOCHARGER

LV2174 –UN–18MAR98

A—Turbocharger
B—Air Intake Hose
C—Air Cleaner Housing
D—Air Filter Restriction Indicator
E—Primary Element
F—Air Cleaner Intake
G—Grille Panels
H—Secondary Safety Element
I—Unloader Valve
J—Cylinder Head
K—Manifold Heater
L—Air Intake Pipe

NOTE: Four-cylinder engine with turbocharger shown; three-cylinder engine with turbocharger is similar.

FUNCTION:

Air intake system filters air needed for combustion.

Continued on next page

Turbocharger provides extra air to the combustion chamber, allowing more fuel to be burned for increased engine power.

MAJOR COMPONENTS:

- Grille Panels
- Air Cleaner Housing
- Primary Element
- Secondary Element
- Air Intake Hose
- Air Intake Pipe
- Cylinder Head
- Manifold Heater
- Air Filter Restriction Indicator
- Turbocharger

THEORY OF OPERATION:

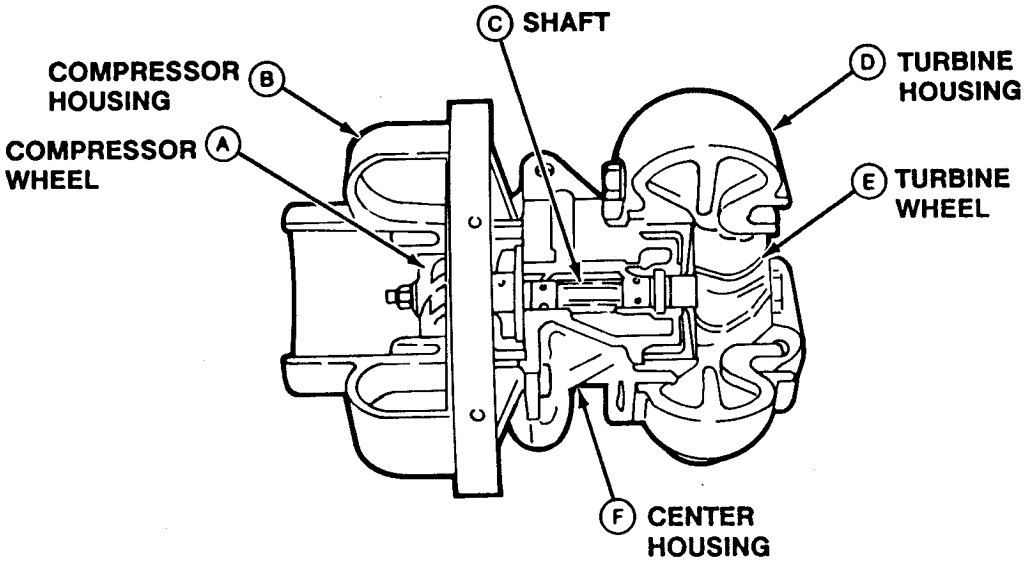
Air enters through grille panels (G) and into the air cleaner intake (F) and into the air cleaner intake (F) and air cleaner housing (C), through primary element (E) depositing larger particles to the unloader valve (I). Air is then directed through a secondary safety element (H), through hose (B) to turbocharger (A). The turbocharger forces filtered air through pipe (L) and into cylinder head (J).

An electronic air filter restriction indicator (D) is located at air cleaner outlet to indicate clogged or restricted air cleaner elements. An indicator in dash will light.

An electric manifold heater (K) warms intake air, by warm coils or metal strips as air passes through them, to aid in cold starting.

AG,OUO1085,362 –19–15SEP00–2/2

Turbocharger Operation—5310 and 5510



LV251A

TURBOCHARGER OPERATION

LV251A –19–18MAR92

A—Compressor Wheel
B—Compressor Housing
C—Shaft
D—Turbine Housing
E—Turbine Wheel
F—Center Housing

FUNCTION:

To force more air into the engine cylinders to allow the engine to efficiently burn more fuel, thereby producing more power.

MAJOR COMPONENTS:

- Turbine Wheel
- Turbine Housing
- Compressor Wheel
- Compressor Housing
- Center Housing
- Shaft Assembly

THEORY OF OPERATION:

The turbine wheel (E) is driven by engine exhaust gases flowing through the turbine housing (D). The rotary motion of the turbine wheel causes the shaft (C) to spin the compressor wheel (A). The compressor wheel draws filtered air from the air cleaner, compresses and forces it into the engine cylinders.

Because a greater volume of air is being forced into the cylinders, a greater amount of fuel can be injected also. This increase of air and fuel results in increased power.

Because turbine speed is controlled by exhaust energy, the turbocharger delivers a volume of air based on engine load and power output.

AG,OUO1085,363 –19–18SEP00–1/1

Diagnostic Information

The diagnostic information is used to test components related to a specific problem or system. Select a symptom or system from the list and follow the test procedures under that heading.

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “Normal” column gives the reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the test, check, or adjustment listed in the third “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located at the end of this group.

MX,23015HE,A1A –19–13DEC94–1/1

Fuel/Air Diagnosis, Tests and Adjustments

For this product, all diagnosis, tests and adjustments for the fuel/air system are discussed in Section 220, Group 15. This is done since many engine complaints can be caused by the fuel/air system and diagnosing them separately is difficult.

MX,23015HE,1A –19–04DEC92–1/1

Section 240
Electrical System Operation, Tests & Adjust

Contents

Continued on next page

Page

Component Location Information

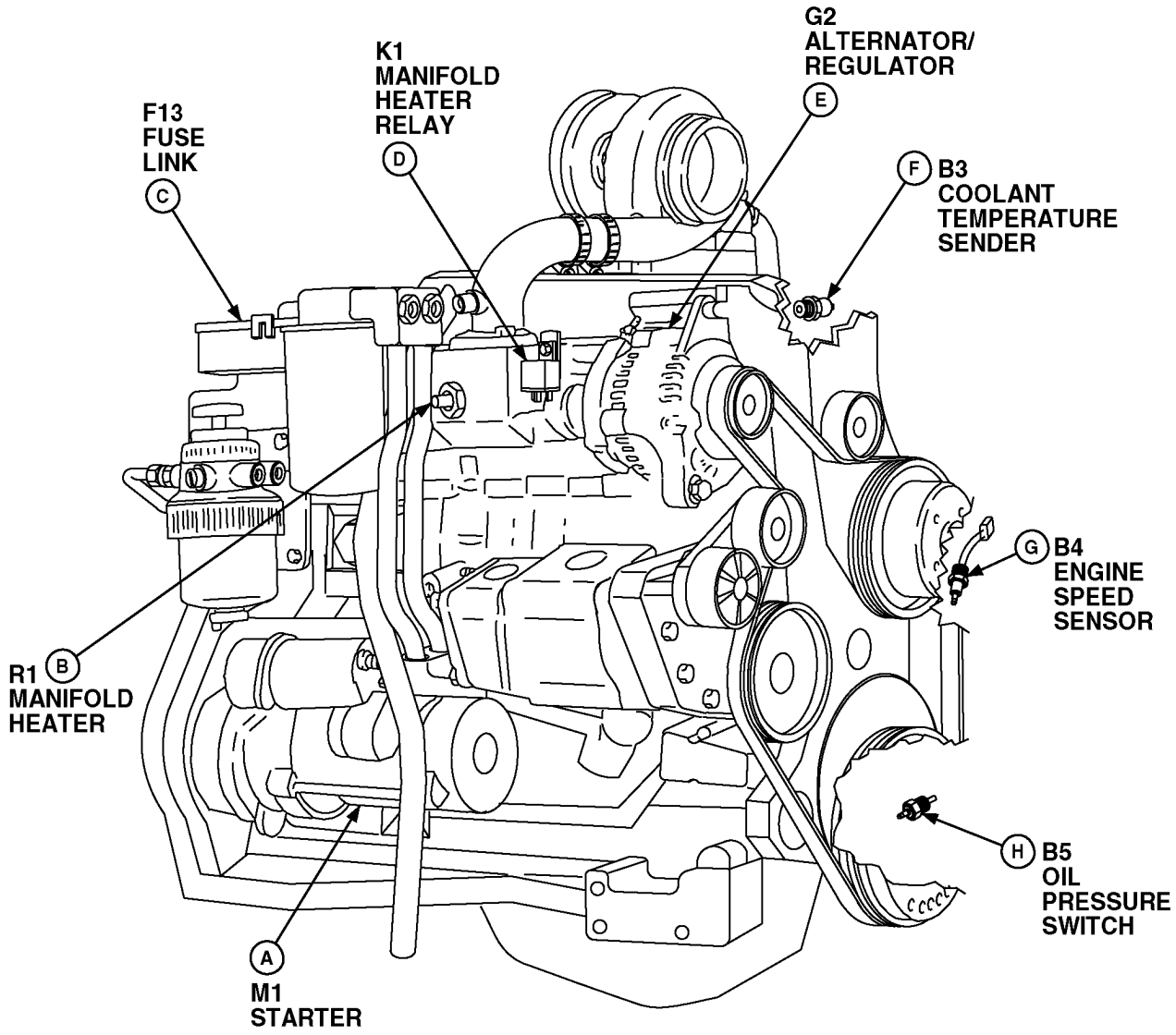
This group contains component location drawings for the following electrical components:

- Engine Components
- Dash Components
- Machine Components

Use the drawings when troubleshooting an electrical problem to help locate the components to be tested.

AG,OUO1023,585 –19–03MAR00–1/1

Engine Electrical Components—4-Cylinder



LV2175

ENGINE ELECTRICAL COMPONENTS — 4 CYLINDER

LV2175 –UN–26NOV97

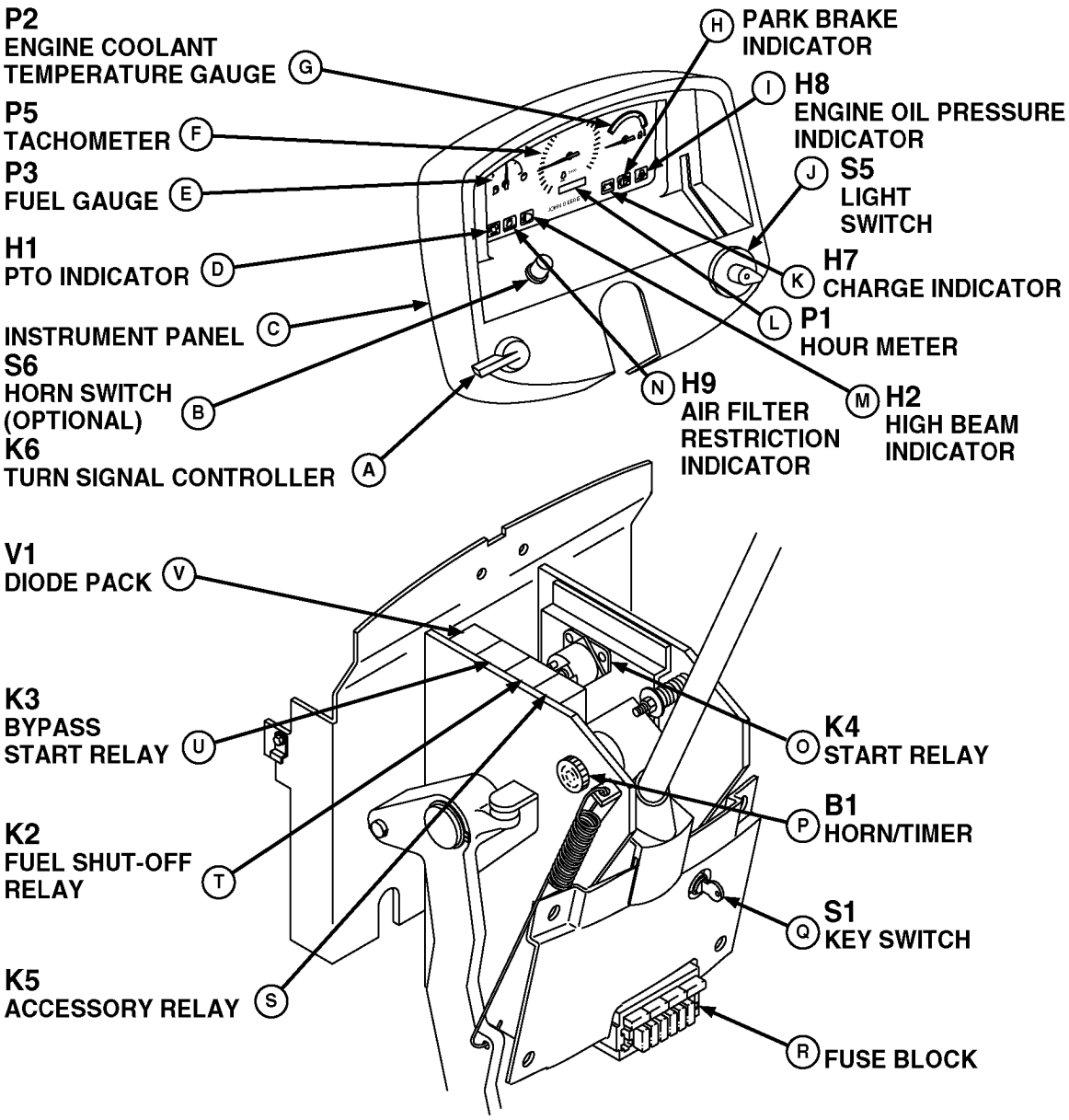
A—M1 Starter
B—R1 Manifold Heater
C—F13 Fuse Link
D—K1 Manifold Heater Relay
E—G2 Alternator/Regulator
F—B3 Coolant Temperature Sender
G—B4 Engine Speed Sensor
H—B5 Oil Pressure Switch

NOTE: 4-cylinder engine shown, 3-cylinder is similar.

Engine without cab air conditioning compressor shown.

AG,OUO1085,364 –19–18SEP00–1/1

Dash Electrical Components



DASH ELECTRICAL COMPONENTS

LV2176 –UN–09JUN97

A—K6 Turn Signal Controller
B—S6 Horn Switch (Optional)
C—Instrument Panel
D—H1 PTO Indicator
E—P3 Fuel Gauge
F—P5 Tachometer
G—P2 Engine Coolant Temperature Gauge
H—Park Brake Indicator
I—H8 Engine Oil Pressure Indicator
J—S5 Light Switch
K—H7 Charge Indicator
L—P1 Hourmeter
M—H2 High Beam Indicator
N—H9 Air Filter Restriction Indicator
O—K4 Start Relay
P—B1 Horn/Timer
Q—S1 Key Switch
R—Fuse Block
S—K5 Accessory Relay
T—K2 Fuel Shut-Off Relay
U—K3 Bypass Start Relay
V—V1 Diode Pack

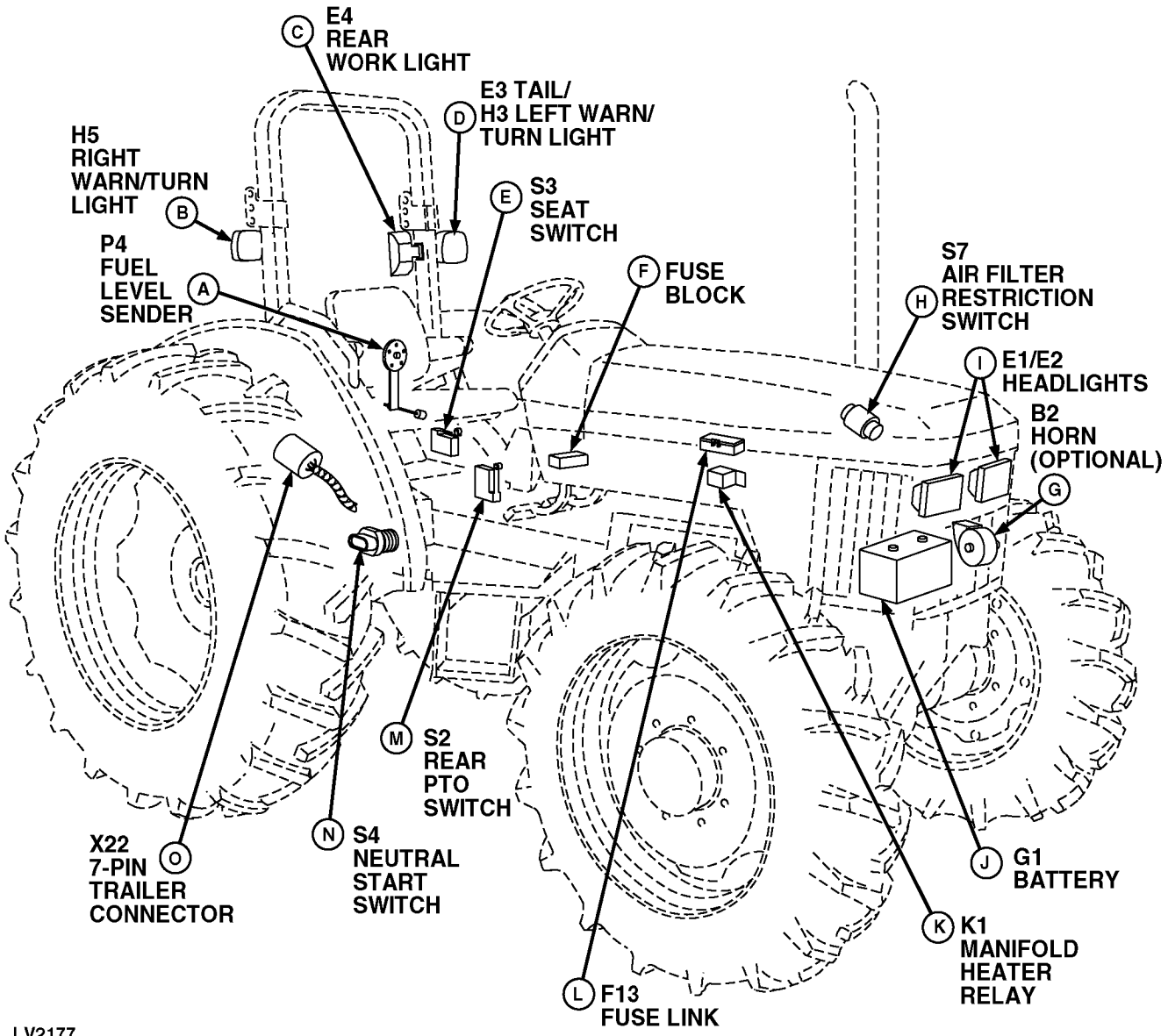
Continued on next page

AG,OUO1085,365 –19–18SEP00–1/2

NOTE: Manifold heater relay is mounted on right side of engine, near manifold heater. (See Machine Electrical Components in this group.)

AG,OUO1085,365 –19–18SEP00–2/2

Machine Electrical Components—5210—5410 Without Cab



MACHINE ELECTRICAL COMPONENTS – 5210-5410 W/O CAB

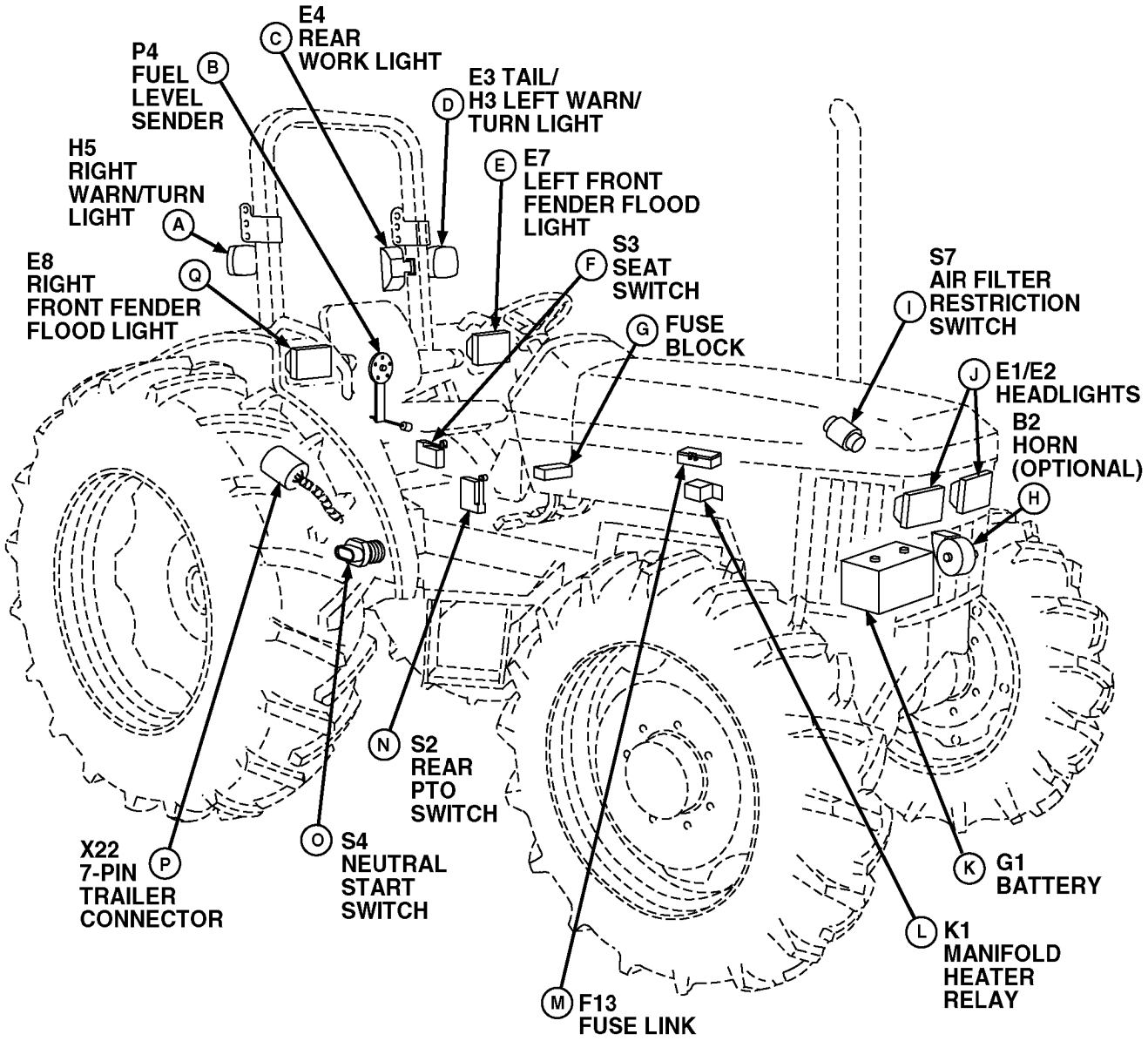
LV2177 –UN–16DEC97

A—P4 Fuel Level Sender
B—H5 Right Warn/Turn Light
C—E4 Rear Work Light
D—E3 Tail/H3 Left Warn/Turn Light
E—S3 Seat Switch
F—Fuse Block
G—B2 Horn (Optional)
H—S7 Air Filter Restriction Switch
I—E1/E2 Headlights
J—G1 Battery
K—K1 Manifold Heater Relay
L—F13 Fuse Link
M—S2 Rear PTO Switch
N—S4 Neutral Start Switch
O—X22 7-Pin Trailer Connector

NOTE: Unit with Collar Shift/SyncShuttle™ transmission shown. On units with PowrReverser™ transmission, neutral start switch (N) is located on PowrReverser™ control valve on left side of transmission housing.

AG,OUO1085,366 –19–18SEP00–1/1

Machine Electrical Components—5510 Without Cab



LV2178

MACHINE ELECTRICAL COMPONENTS – 5510 W/O CAB

LV2178 –UN–16DEC97

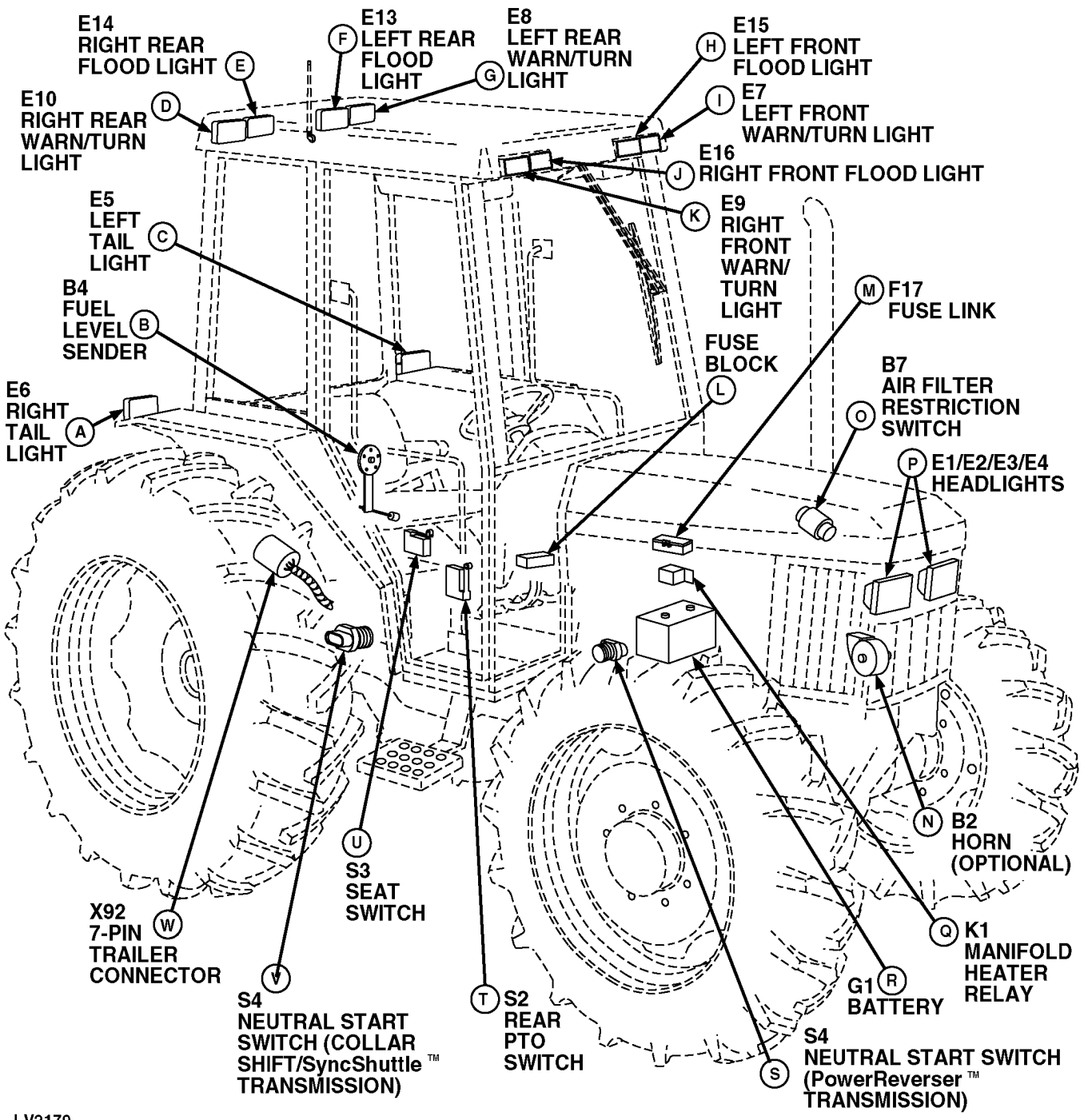
A—H5 Right Warn/Turn Light
B—P4 Fuel Level Sender
C—E4 Rear Work Light
D—E3 Tail/H3 Left Warn/Turn Light
E—E7 Left Front Fender Flood Light
F—S3 Seat Switch
G—Fuse Block
H—B2 Horn (Optional)
I—S7 Air Filter Restriction Switch
J—E1/E2 Headlights
K—G1 Battery
L—K1 Manifold Heater Relay
M—F13 Fuse Link
N—S2 Rear PTO Switch
O—S4 Neutral Start Switch
P—X22 7-Pin Trailer Connector
Q—E8 Right Front Fender Flood Light

Continued on next page
AG,OUO1085,367 –19–18SEP00–1/2

NOTE: Unit with Collar Shift/SyncShuttle™ transmission shown. On units with PowrReverser™ transmission, neutral start switch (O) is located on PowrReverser™ control valve on left side of transmission housing.

AG,OUO1085,367 –19–18SEP00–2/2

Machine Electrical Components—5210—5510 With Cab



MACHINE ELECTRICAL COMPONENTS—WITH CAB

Continued on next page

AG,OUO1085,368 –19–18SEP00–1/2

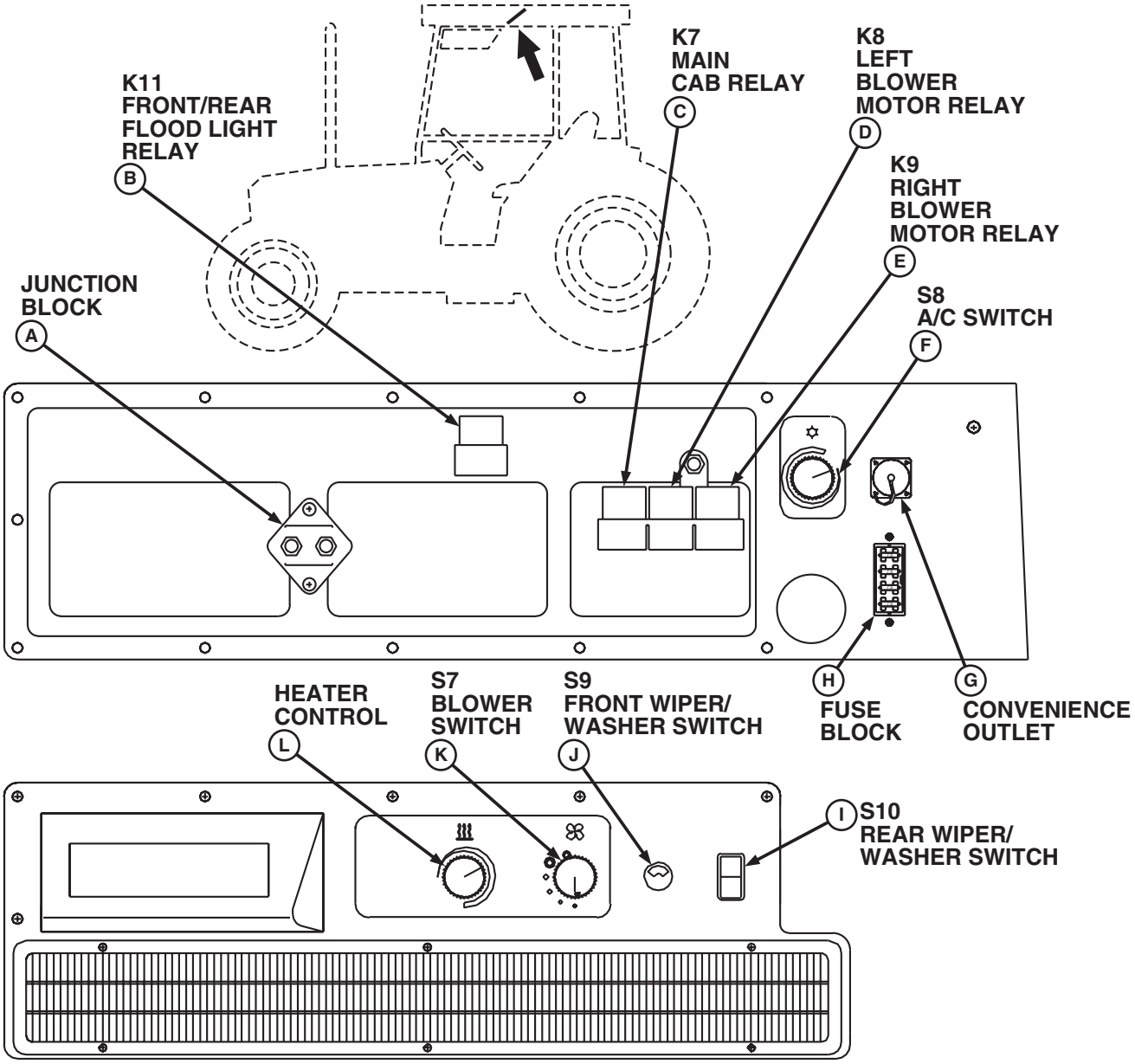
A—E6 Right Tail Light
B—B4 Fuel Level Sender
C—E5 Left Tail Light
D—E10 Right Rear Warn/Turn Light
E—E14 Right Rear Flood Light
F—E13 Left Rear Flood Light
G—E8 Left Rear Warn/Turn Light
H—E15 Left Front Flood Light
I—E7 Left Front Warn/Turn Light
J—E16 Right Front Flood Light
K—E9 Right Front Warn/Turn Light
L—Fuse Block
M—F17 Fuse Link
N—B2 Horn (Optional)
O—B7 Air Filter Restriction Switch
P—E1, E2, E3, and E4 Headlights
Q—K1 Manifold Heater Relay
R—G1 Battery
S—S4 Neutral Start Switch (PowrReverser™ transmission)
T—S2 Rear PTO Switch
U—S3 Seat Switch
V—S4 Neutral Start Switch (Collar Shift/SyncShuttle™ transmission)
W—X92 7-Pin Trailer Connector

NOTE: On units with Collar Shift/SyncShuttle™ transmission, the neutral start switch (V) is located on the right side of transmission housing. On units with PowrReverser™ transmission, neutral start switch (S) is located on PowrReverser™ control valve on left side of transmission housing.

240
05
9

AG,OUO1085,368 –19–18SEP00–2/2

Cab Control Panel and Electrical Components



LV1632

LV1632 –19–23APR01

A—Junction Block
B—K11 Front/Rear Flood Light Relay
C—K7 Main Cab Relay
D—K8 Left Blower Motor Relay
E—K9 Right Blower Motor Relay
F—S8 Air Condition Switch
G—Convenience Outlet
H—Fuse Block
I—S10 Rear/Wiper Washer Switch
J—S9 Front Wiper/Washer Switch
K—S7 Blower Switch
L—Heater Control

AG,OUO1085,369 –19–18SEP00–1/1

Theory of Operation Information

This group divides the electrical system into individual circuits by function. Each circuit has been isolated from the main wiring schematic and only shows the components that are used in that circuit. The theory of operation story explains: function of the circuit, operating conditions, components used, and current flow.

The circuit schematic that accompanies each theory story shows the operating condition with the battery or power circuit on top and the ground circuit on the bottom. COLOR IS USED TO IDENTIFY DIFFERENT SUB-CIRCUITS. THE COLOR USED DOES NOT NECESSARILY INDICATE COLOR OF THE WIRE.

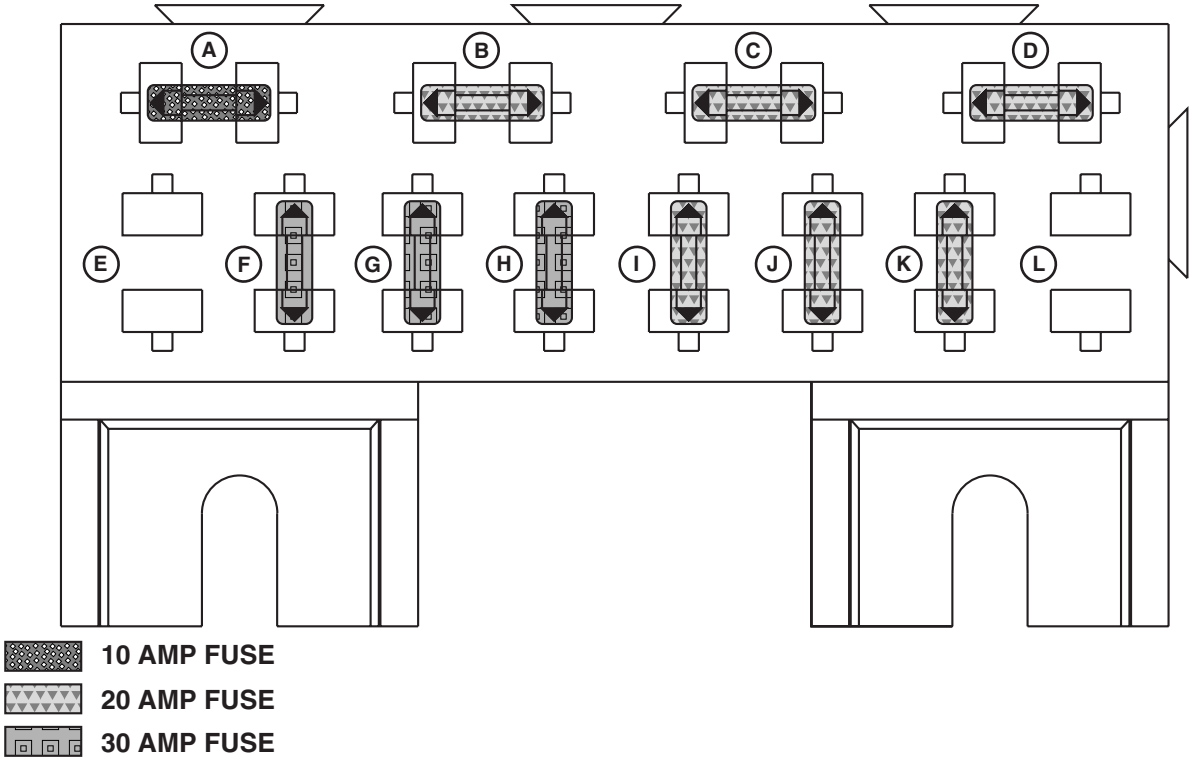
The circuit numbers used in the schematics represent entire circuit sections using the same number. Actual circuits may have letter suffixes added to indicate specific portions of the circuit. For the exact designation, refer to Group 15 in this section or to the tractor wiring harness.

The following systems or components are covered:

- Fuse Block
- Relays
- Starting Systems
  - Normal Operation
  - Bypass Operation
- Manifold Heater System
- Charging System
- Lighting System
  - Turn Signals
  - Warning Lights
  - Tail Light
  - Headlights
  - Instrument Lights
  - Rear Work Light
  - Accessory Relay and Trailer Connector
- Instrument Panel System
  - Fuel Gauge
  - Temperature Gauge
  - Hourmeter
- PTO Warning System
- Air Filter Restriction Indicator
- Cab-Related Circuits
  - Blower Motors
  - A/C Compressor
  - Front Wiper/Washer
  - Rear Wiper/Washer
  - Dome Light
- Optional Equipment
  - Dual Horns

AG,OUO1085,370 –19–18SEP00–1/1

Fuse Block and Fuses—Without Cab



FUSE BLOCK AND FUSES—WITHOUT CAB

LVC2180 –UN–10JUN97

A—F1	**D—F4**	**G—F7**	**J—F10**
B—F2	**E—F5 (not used)**	**H—F8**	**K—F11**
C—F3	**F—F6**	**I—F9**	**L—F12 (not used)**

FUNCTION:

Protect circuits from electrical overload.

MAJOR COMPONENTS:

- Fuse Block
- Fuses

THEORY OF OPERATION:

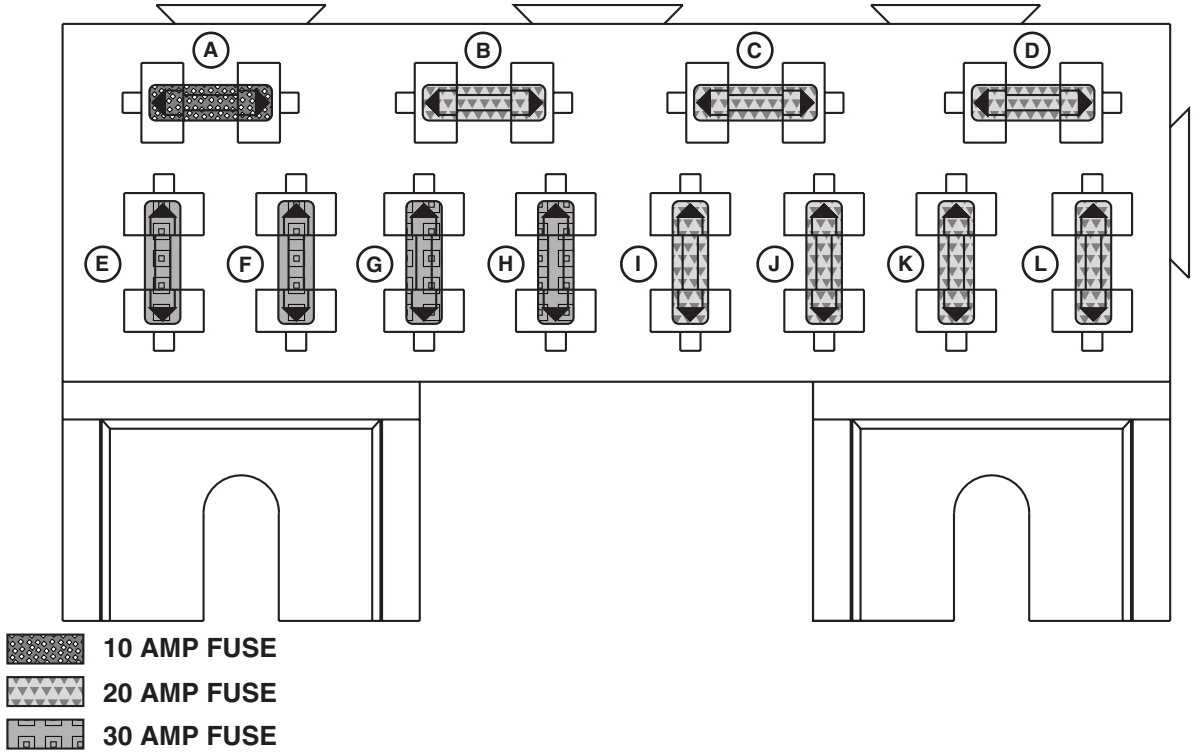
Fuse block uses push-in, blade-type fuses to limit current flow in their respective circuits. When flow exceeds rating on fuse, its conductor melts, thus preventing circuit damage.

A total of twelve fuses may be used. Fuse locations (E and L) may be empty as these fuses are used only to protect auxiliary circuits. Fuse ratings and the circuits they protect are as follows:

- F1, 10-Amp: Alternator, instruments and engine-related warning indicators.
- F2, 20-Amp: Fuel shut-off solenoid.
- F3, 20-Amp: Warning lights (flashers) and turn indicators.
- F4, 20-Amp: Rear work light.
- F5, 30-Amp: Auxiliary circuit (power from battery).
- F6, 30-Amp: Key switch, starting circuit, PTO warning circuit, manifold heater circuit.
- F7, 30-Amp: Horn, lights, turn signals.
- F8, 30-Amp: Accessory relay.
- F9, 20-Amp: Tail lights.
- F10, 20-Amp: High-beam headlights and indicator.
- F11, 20-Amp: Low-beam headlights.
- F12, 20-Amp: Auxiliary circuit (key activated).

AG,OUO1085,371 –19–18SEP00–1/1

Fuse Block and Fuses—With Cab



LVC2181

FUSE BLOCK AND FUSES—CAB TRACTORS

LVC2181 –UN–10JUN97

A—F1	D—F4	G—F7	J—F10
B—F2	E—F5	H—F8	K—F11
C—F3	F—F6	I—F9	L—F12

FUNCTION:

Protect circuits from electrical overload.

MAJOR COMPONENTS:

- Fuse Block
- Fuses

THEORY OF OPERATION:

Fuse block uses push-in, blade-type fuses to limit current flow in their respective circuits. When flow exceeds rating on fuse, its conductor melts, thus preventing circuit damage.

A total of twelve fuses may be used. Fuse locations (E) and (L) may be empty as these fuses are used only to protect auxiliary circuits. Fuse ratings and the circuits they protect are as follows:

- F1, 10-Amp: Alternator, instruments and engine-related warning indicators.
- F2, 20-Amp: Fuel shut-off solenoid.
- F3, 20-Amp: Warning lights and turn indicators.
- F4, 20-Amp: Flood lights.
- F5, 30-Amp: Radio, dome light, and convenience outlet.
- F6, 30-Amp: Key switch, starting circuit, PTO warning circuit, manifold heater circuit.
- F7, 30-Amp: Horn, lights, turn signals.
- F8, 30-Amp: Accessory relay.
- F9, 20-Amp: Tail lights.
- F10, 20-Amp: High-beam headlights and indicator.
- F11, 20-Amp: Low-beam headlights.

Continued on next page

- F12, 20-Amp: Radio, convenience outlet, front and rear wiper/washer (key activated).

AG,OUO1085,372 –19–18SEP00–2/2

Cab Fuse Block and Fuses

FUNCTION:

Protect cab circuits from electrical overload.

MAJOR COMPONENTS:

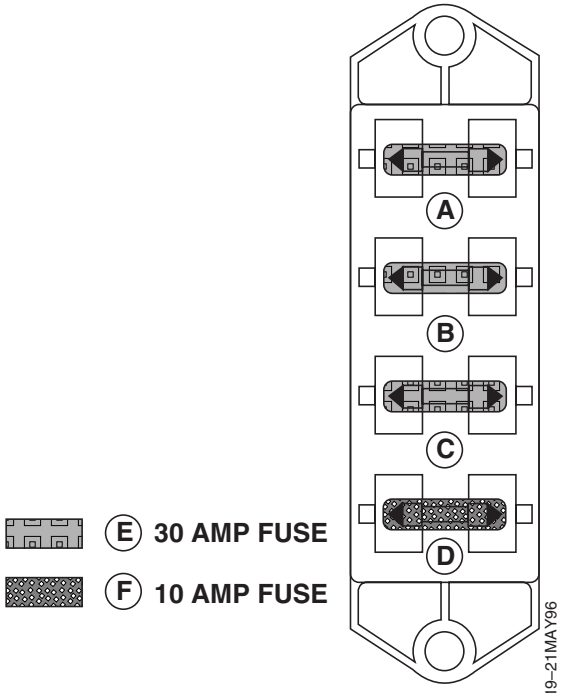
- Fuse Block
- Fuses

THEORY OF OPERATION:

Fuse block uses push-in, blade-type fuses to limit current flow in their respective circuits. When flow exceeds rating on fuse, its conductor melts, thus preventing circuit damage.

Cab fuse block is located on right side of overhead control panel. Four fuses are used. Fuse ratings and the circuits they protect are as follows:

- F13, 30-Amp: Blower switch and left blower motor circuit.
- F14, 30-Amp: Flood light circuits.
- F15, 30-Amp: Right side blower motor circuit.
- F16, 10-Amp: A/C compressor clutch coil circuit.



CAB FUSE BLOCK AND FUSES

LVC1601

A—F13
B—F14
C—F15
D—F16
E—30 Amp Fuse
F—10 Amp Fuse

AG,OUO1085,373 –19–18SEP00–1/1

Relays

FUNCTION:

Control current flow through circuits with high current loads.

MAJOR COMPONENTS:

- Manifold Heater Relay, K1 (Mounted on Engine Intake Manifold)
- Fuel Shut-Off Relay, K2
- Bypass Start Relay, K3
- Start Relay, K4
- Accessory Relay, K5
- Turn Signal Controller, K6
- Cab Relays:
  - HVAC Relay, K7
  - Blower Motor Relays, K8 and K9
  - Flood Light Relay, K10

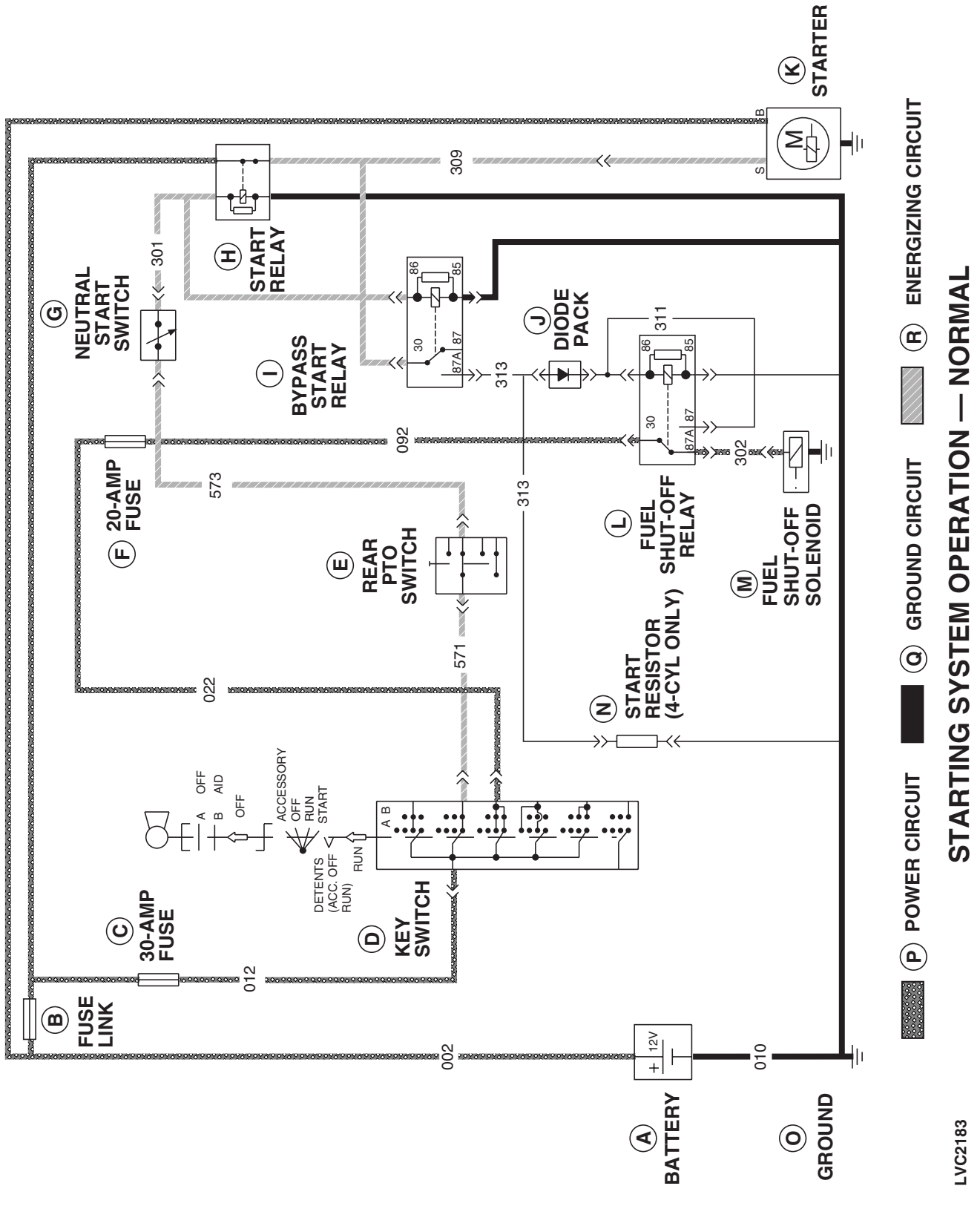
THEORY OF OPERATION:

Relays vary slightly in configuration and terminals, but work the same way. As current passes through relay windings, a magnetic field develops which draws contacts together. This activates controlled circuit and reduces current flow through system switches.

NOTE: Specific operation of each relay is covered in theory of operation for that circuit.

AG,OUO1085,374 –19–18SEP00–1/1

Starting System Operation—Normal



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AG,OUO1085,375 –19–18SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—Rear PTO Switch
F—20-Amp Fuse
G—Neutral Start Switch
H—Start Relay
I—Bypass Start Relay
J—Diode Pack
K—Starter
L—Fuel Shut-Off Relay
M—Fuel Shut-Off Solenoid
N—Start Resistor (4-Cyl Only)
O—Ground
P—Power Circuit
Q—Ground Circuit
R—Energizing Circuit

FUNCTION:

The starting system converts electrical energy into the mechanical force necessary to crank the engine. A safety interlock system composed of switches and relays prevents bypass starting.

MAJOR COMPONENTS:

- 30-Amp Fuse
- 20-Amp Fuse
- Key Switch
- Rear PTO Switch
- Neutral Start Switch
- Start Relay
- Bypass Start Relay
- Fuel Shut-Off Relay
- Fuel Shut-Off Solenoid
- Starter
- Starter Resistor (4-Cyl Only)

THEORY OF OPERATION:

When key switch (D) is turned to START position, current flows through 30-amp fuse (C), through contacts of key switch and out circuit 571. Current then flows through rear PTO switch (E), circuit 573, and through neutral start switch (G). Current leaving the neutral start switch travels on circuit 301 to both the start (H) and bypass start (I) relays.

Current passing through start relay windings creates a magnetic field, which closes relay contacts. This connects circuit 002 to 309, providing a current path to the starter S terminal. The starter (K) then cranks the engine.

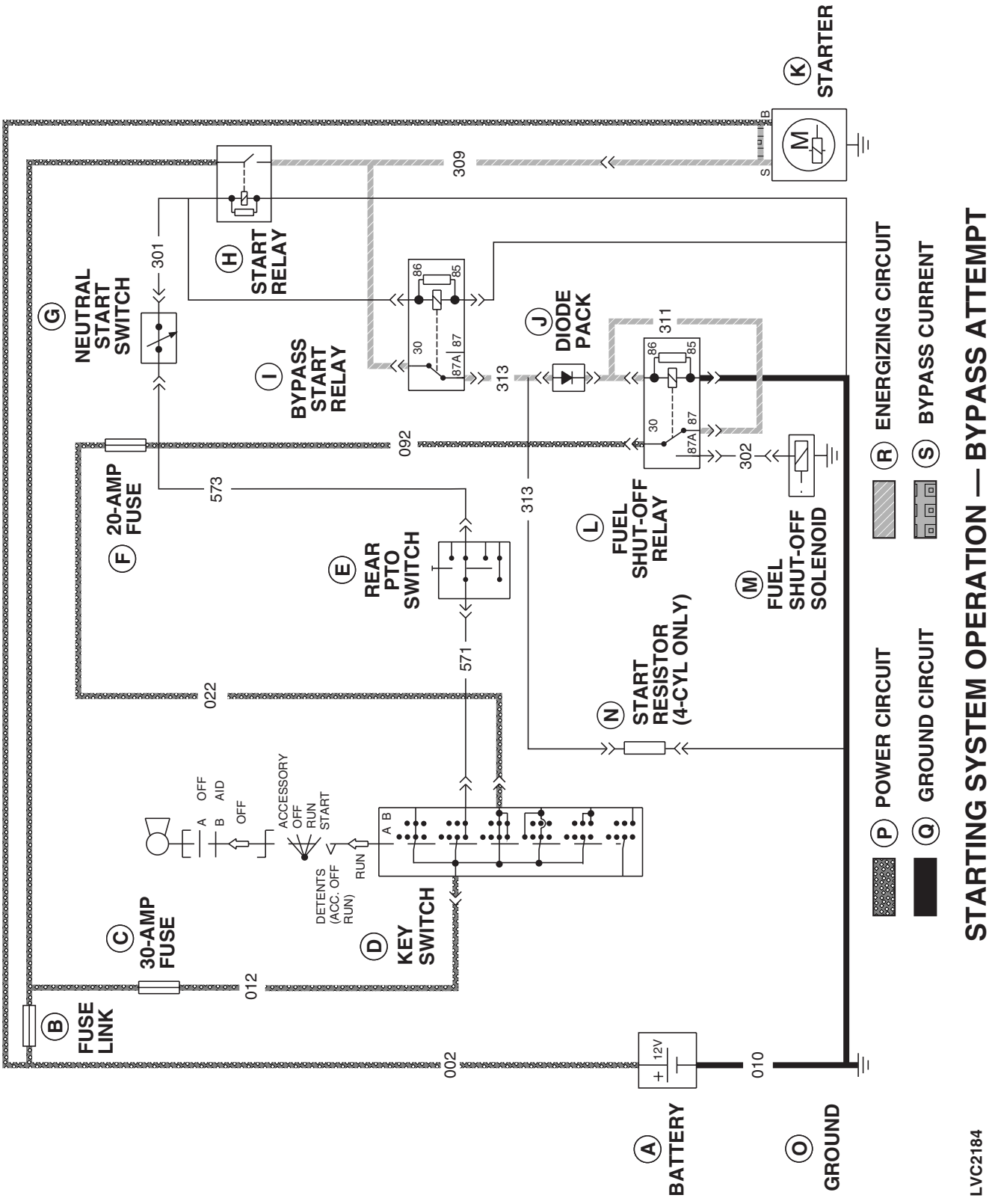
At the same time, current travels to the bypass start relay on circuits 301 and 309. Current through circuit 301 creates a magnetic field in the windings of the bypass start relay which pulls its relay blade into contact with terminal 87. Current flow then stops on circuit 309 because of an open circuit between relay terminals 30 and 87A.

During normal operation, fuel shut-off relay (L) remains inactive. However, circuits 302 and 092 are connected through normally-closed relay contacts between terminals 30 and 87A. This energizes the fuel shut-off solenoid (M) and allows fuel flow through the fuel injection pump.

On 4-cylinder tractors, a small amount of voltage can be created at the end of a start cycle. This undesired voltage results when the starter does not immediately disengage when the key switch is released from the START position, thus causing the engine to turn the starter. When this happens, the starter acts as a generator, creating approximately 0.7—1.5 volts that backfeeds through the starter solenoid and the normally closed contacts of the bypass start relay to the coil of fuel shut-off relay (L). This voltage may be enough to energize the fuel shut-off relay, thus stopping fuel flowing to the fuel injection pump. To prevent this from occurring, start resistor (N) is provided to take this unwanted voltage to ground.

AG,OUO1085,375 –19–18SEP00–2/2

Starting System Operation—Bypass Attempt



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AG,OUO1085,376 –19–18SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—Rear PTO Switch
F—20-Amp Fuse
G—Neutral Start Switch
H—Start Relay
I—Bypass Start Relay
J—Diode Pack
K—Starter
L—Fuel Shut-Off Relay
M—Fuel Shut-Off Solenoid
N—Start Resistor (4-Cyl Only)
O—Ground
P—Power Circuit
Q—Ground Circuit
R—Energizing Circuit
S—Bypass Circuit

FUNCTION:

Prevents the engine from starting in the event starting circuit is bypassed.

MAJOR COMPONENTS:

- 30-Amp Fuse
- 20-Amp Fuse
- Key Switch
- Rear PTO Switch
- Neutral Start Switch
- Start Relay
- Bypass Start Relay
- Fuel Shut-Off Relay
- Fuel Shut-Off Solenoid
- Starter

THEORY OF OPERATION:

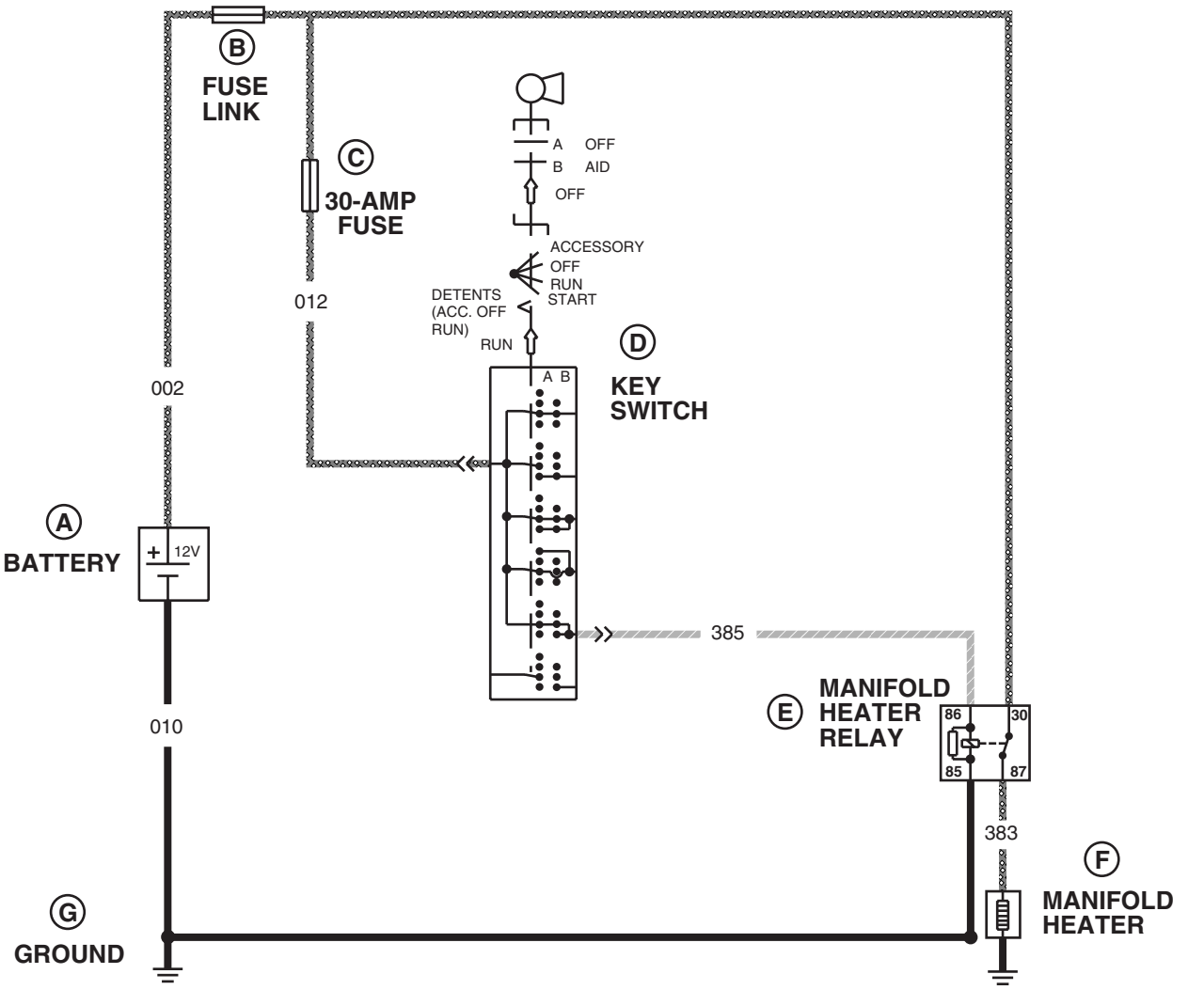
When starting circuit is bypassed by jumping terminals S and B at starter (K), current flows on circuit 309 to bypass start relay (I). Current travels across normally-closed contacts of relay between terminals 30 and 87A and out to circuit 313. Current continues to flow through diode pack (J) and circuit 311 to terminals 86 and 87 of fuel shut-off relay (L).

After entering terminal 86, current flow creates a magnetic field in the relay windings which draws relay blade into contact with terminal 87. This interrupts current flow between circuits 092 and 302 that normally occurs with key switch (D) in the RUN position. At this time, the fuel shut-off solenoid (M) disengages and stops fuel flow through the injection pump, preventing engine starting.

A jumper circuit connected to terminal 87 and circuit 311 locks the relay in this position as long as key switch is in the on position. Diode pack prevents current from returning and engaging starter.

AG,OUO1085,376 –19–18SEP00–2/2

Manifold Heater System Operation



LVC2185 –UN–21JUN97

LVC2185

MANIFOLD HEATER SYSTEM OPERATION

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—Manifold Heater Relay
F—Manifold Heater
G—Ground
H—Power Circuit
I—Ground Circuit
J—Energizing Circuit

FUNCTION:

Heats air entering engine to aid cold-weather starting.

MAJOR COMPONENTS:

- 30-Amp Fuse
- Key Switch
- Manifold Heater Relay
- Manifold Heater

Continued on next page

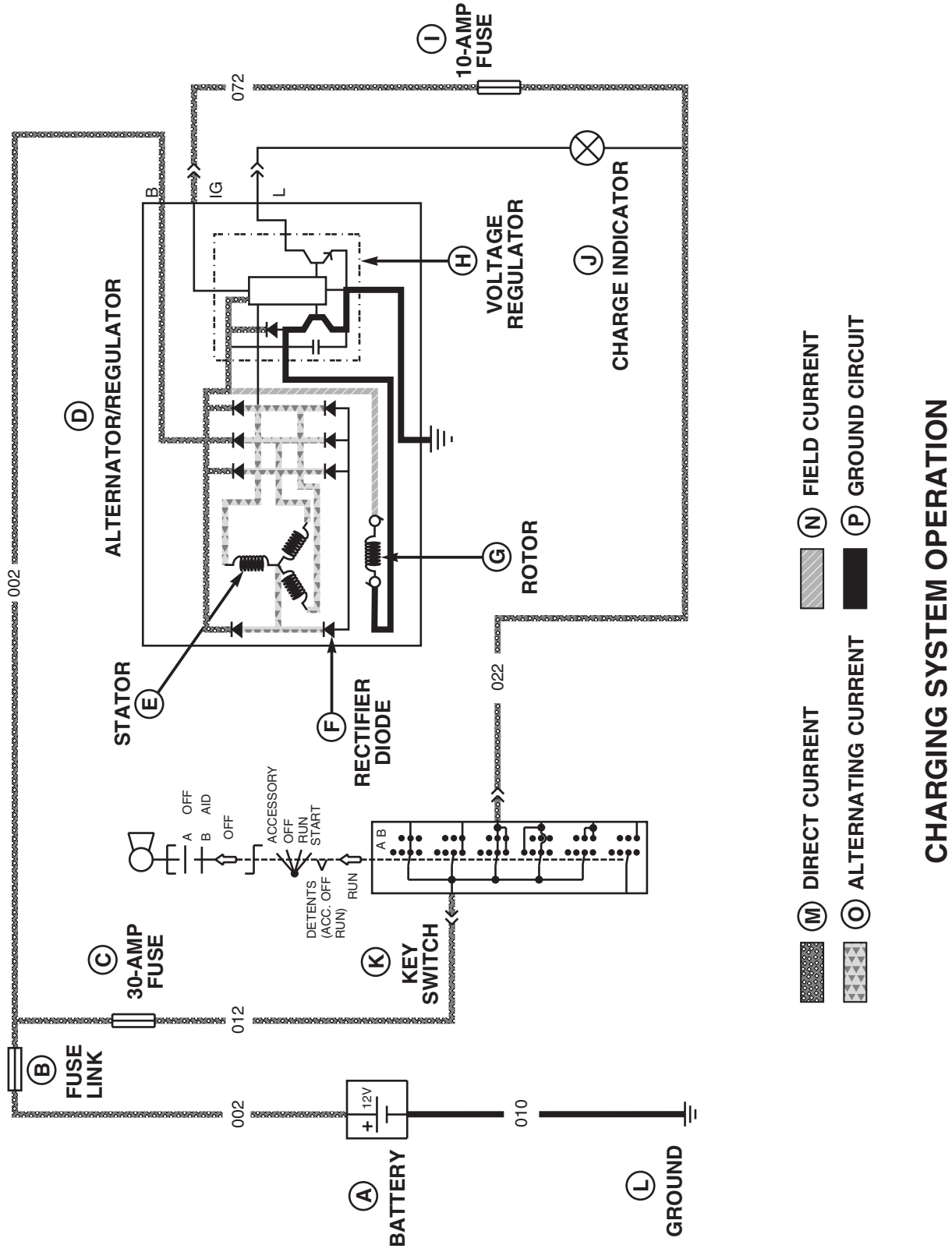
AG,OUO1085,377 –19–18SEP00–1/2

THEORY OF OPERATION:

System is controlled by operator only. No automatic control is used. When operator pushes in on key in RUN or START position, current flows through 30-amp fuse (C) and across starting aid contacts of key switch (D). Current exits key switch on circuit 385 and travels to terminal 86 of manifold heater relay (E). As current passes through windings of relay, a magnetic field develops which pulls relay contacts and connects terminals 30 and 87. Current then passes from battery through circuit 002 and to manifold heater (F).

AG,OUO1085,377 –19–18SEP00–2/2

Charging System Operation



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AG,OUO1023,372 –19–09NOV99–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Alternator/Regulator
E—Stator
F—Rectifier Diode
G—Rotor
H—Voltage Regulator
I—10-Amp Fuse
J—Charge Indicator
K—Key Switch
L—Ground
M—Direct Current
N—Field Current
O—Alternating Current
P—Ground Circuit

FUNCTION:

Recharges battery after discharge from starter or other electrical load. Also supplies current for electrical accessories with tractor running.

MAJOR COMPONENTS:

- Battery
- Alternator
- Voltage Regulator

THEORY OF OPERATION:

Alternator stator (E) consists of three separate sets of windings connected in a Y configuration. Field current passes from voltage regulator (H) to rotor (G). Rotor spins inside stator windings, inducing an alternating current into the stator.

Alternating current cannot be used for charging battery or operating accessories. Rectifier diodes (F) change alternating current to direct current. Current flows through rectifier diodes to terminal B of alternator (D) and to battery.

Voltage regulator controls ground side of rotor as a means of limiting field current flow. Increasing the duration of field current flow boosts alternator output. Decreasing the duration of field current flow reduces alternator output. Voltage regulator controls field current based on system voltage.

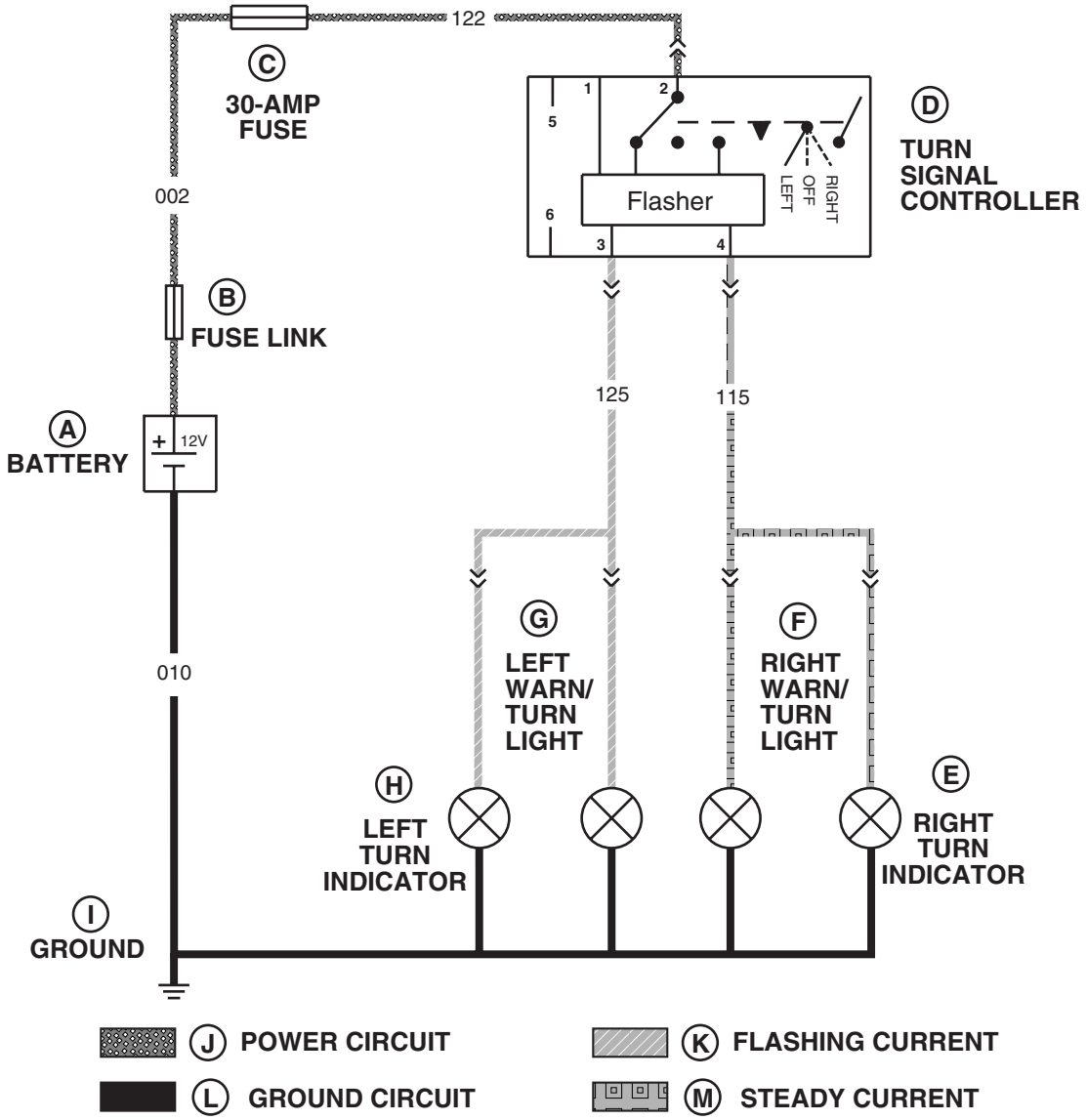
Regulator is a non-adjustable, integrated-circuit type located inside alternator. Voltage is regulated at 14.2—14.8 volts at 25°C (77°F), 5000 rpm and 10 amps, but varies depending on a number of factors.

Charge indicator (J) alerts operator of low or no charging system output. Under normal conditions, voltage at both sides of indicator is the same. No current flows through light; therefore, light stays off.

When no or low charging system output occurs, voltage on one side of light drops. This causes current to flow through light, thus causing it to come on.

AG,OUO1023,372 –19–09NOV99–2/2

Lighting System Operation—Turn Signals



LVC2186 –UN–21JUN97

LVC2186

LIGHTING SYSTEM OPERATION — TURN SIGNALS

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Turn Signal Controller
E—Right Turn Indicator
F—Right Warn/Turn Light
G—Left Warn/Turn Light
H—Left Turn Indicator
I—Ground
J—Power Circuit
K—Flashing Current
L—Ground Circuit
M—Steady Current

FUNCTION:

Alerts approaching traffic of operator's intent to turn.

MAJOR COMPONENTS:

- 30-Amp Fuse
- Turn Signal Controller
- Right Warn/Turn Light
- Left Warn/Turn Light
- Right Turn Indicator

Continued on next page

AG,OUO1085,378 –19–18SEP00–1/2

- Left Turn Indicator

THEORY OF OPERATION:

Unswitched power from battery (A) is available at terminal 2 of turn signal controller (D). Because of this, the turn signals will operate whenever the turn signal controller is moved to the left-turn or right-turn positions regardless of position of the key switch.

When the turn signal lever is moved to the left-turn position, current flows from battery (A), through fuse link (B), circuit 002, and 30-amp fuse (C). From fuse (C), current flows through circuit 122 to terminal 2 of the turn signal controller.

A flasher unit, located inside the turn signal controller, converts the battery's steady DC current into a flashing (or pulsing) DC current. The pulsing DC current flows out circuit 125 to left warn/turn light (G) and left turn indicator (H) (located on the instrument panel), causing these lights to flash.

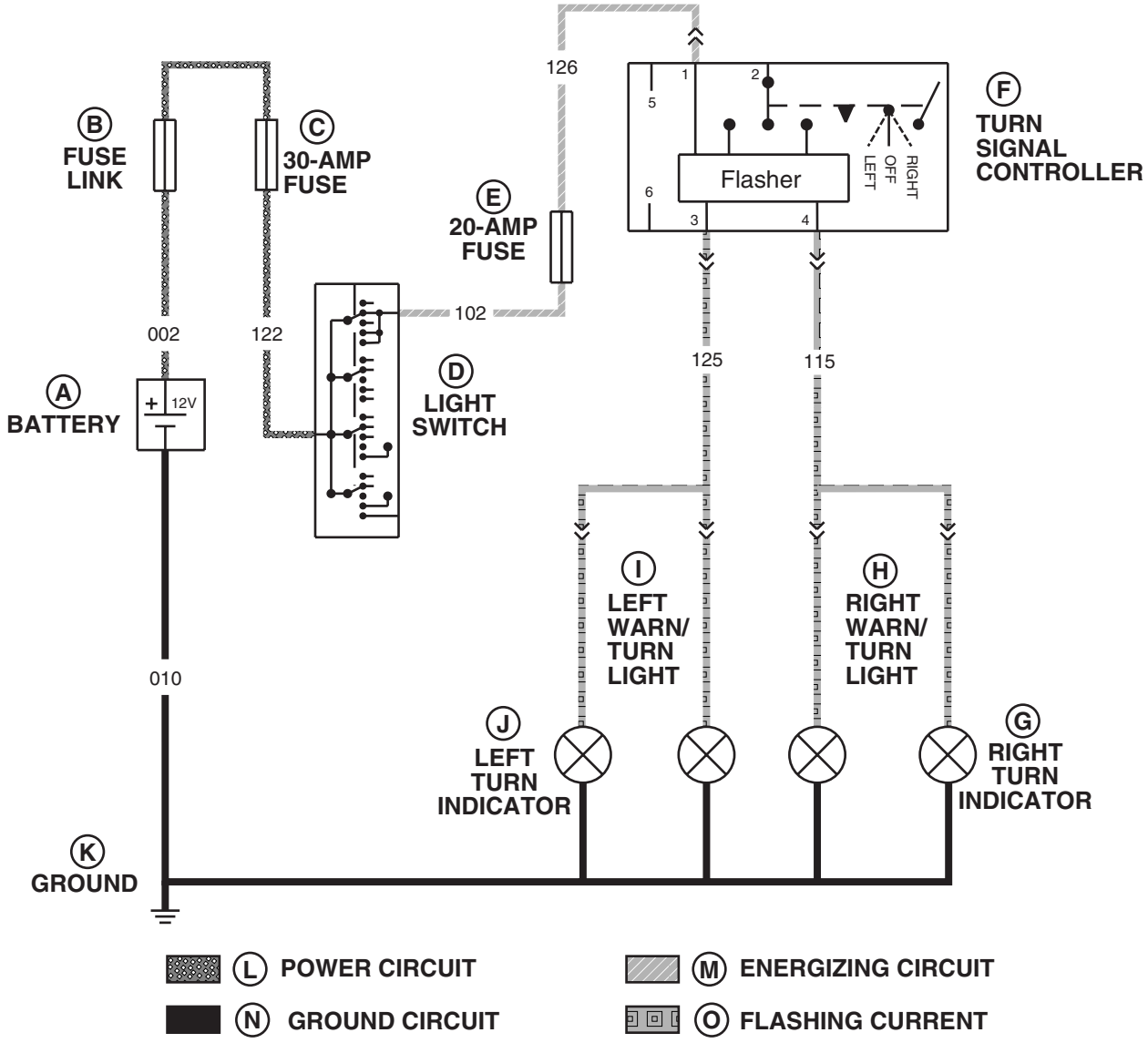
At the same time, the turn signal controller supplies a steady DC current through circuit 115 to right warn/turn light (F) and right turn indicator (E) (located on the instrument panel), causing these lights to stay on steady.

Right-turn signal operation is similar to left-turn signal operation except that pulsing DC current flows through circuit 115 and steady DC current flows through circuit 125.

NOTE: Tractors with cab have four warn/turn lights located at front and rear end of cab roof.

AG,OUO1085,378 –19–18SEP00–2/2

Lighting System Operation—Warning Lights



LVC2187

LVC2187 –UN–27JUN02

LIGHTING SYSTEM OPERATION — WARNING LIGHTS

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Light Switch
E—20-Amp Fuse
F—Turn Signal Controller
G—Right Turn Indicator
H—Right Warn/Turn Light
I—Left Warn/Turn Light
J—Left Turn Indicator
K—Ground
L—Power Circuit
M—Energizing Circuit
N—Ground Circuit
O—Flashing Circuit

FUNCTION:

Alerts approaching traffic of tractor's presence.

MAJOR COMPONENTS:

- 30-Amp Fuse
- 20-Amp Fuse
- Light Switch
- Turn Signal Controller
- Right Warn/Turn Light

Continued on next page

AG,OUO1085,379 –19–18SEP00–1/2

- Left Warn/Turn Light
- Right Turn Indicator
- Left Turn Indicator

THEORY OF OPERATION:

Unswitched power from battery (A) is available at light switch (D). Because of this, the warning lights will operate whenever the light switch is turned from OFF position to position 1 (WARNING), position 3 (HD1; high beam), or position 4 (HD2; low beam) regardless of position of the key switch.

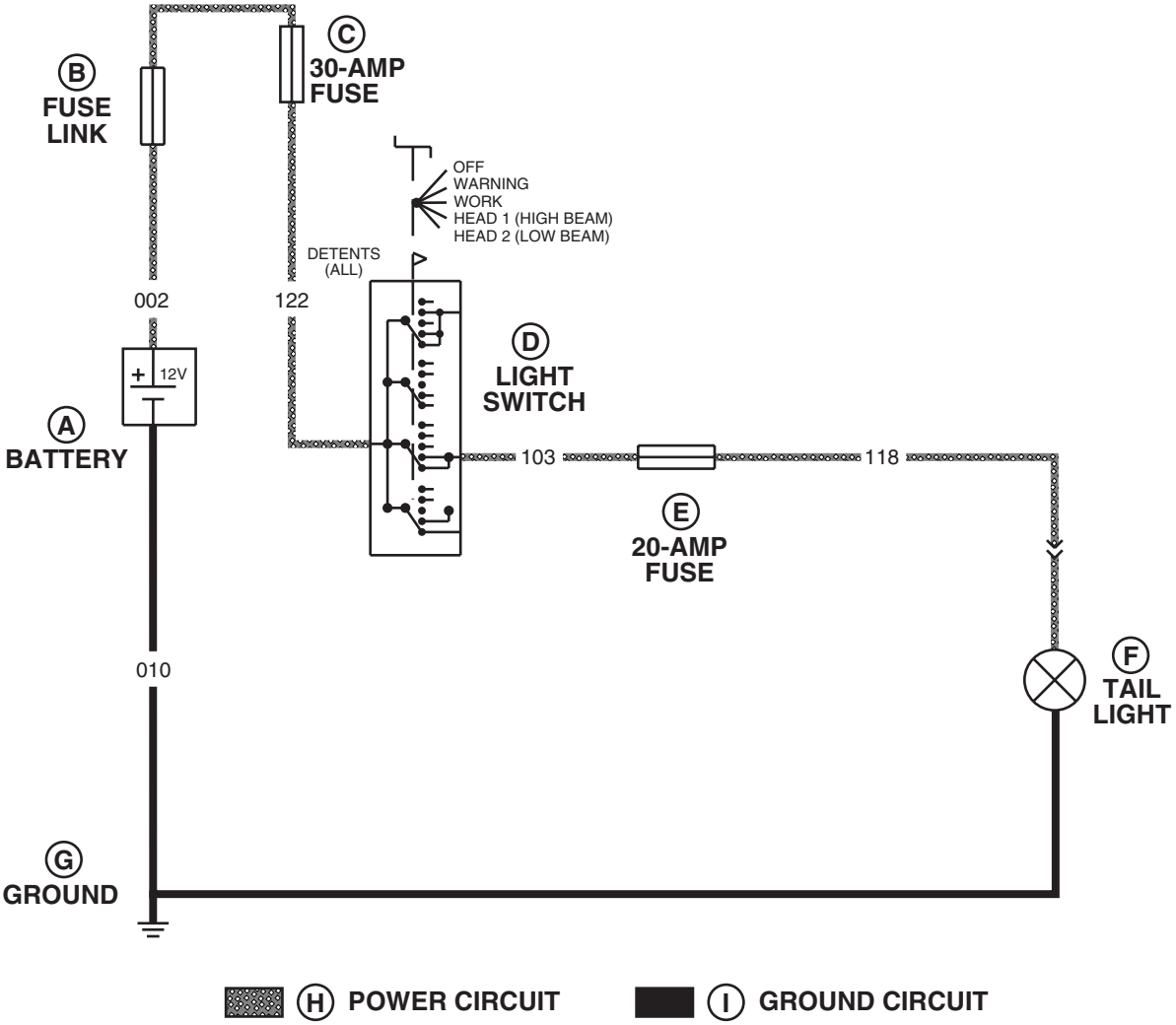
When the light switch is turned to positions 1, 3, or 4, current flows from battery (A), through fuse link (B), circuit 002, 30-amp fuse (C), and circuit 122, to light switch (D). From the light switch, current flows through circuit 102 to 20-amp fuse (E). From fuse (E), current flows through circuit 126 to terminal 1 of turn signal controller (F).

A flasher unit, located inside the turn signal controller, converts the battery's steady DC current into a flashing (or pulsing) DC current. The pulsing DC current flows out circuits 115 and 125 to both right and left warn/turn lights (H and I) and both right and left turn indicators (G and J) (located on the instrument panel), causing all these lights to flash.

NOTE: Tractors with cab have four warn/turn lights located at front and rear of cab roof.

AG,OUO1085,379 –19–18SEP00–2/2

Lighting System Operation—Tail Light



LVC2188 –UN–27JUN02

LVC2188

LIGHTING SYSTEM OPERATION — TAIL LIGHT

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Light Switch
E—20-Amp Fuse
F—Tail Light
G—Ground
H—Power Circuit
I—Ground Circuit

FUNCTION:

Alerts approaching traffic of tractor's presence.

MAJOR COMPONENTS:

- 30-Amp Fuse
- 20-Amp Fuse
- Light Switch
- Tail Light

THEORY OF OPERATION:

Continued on next page

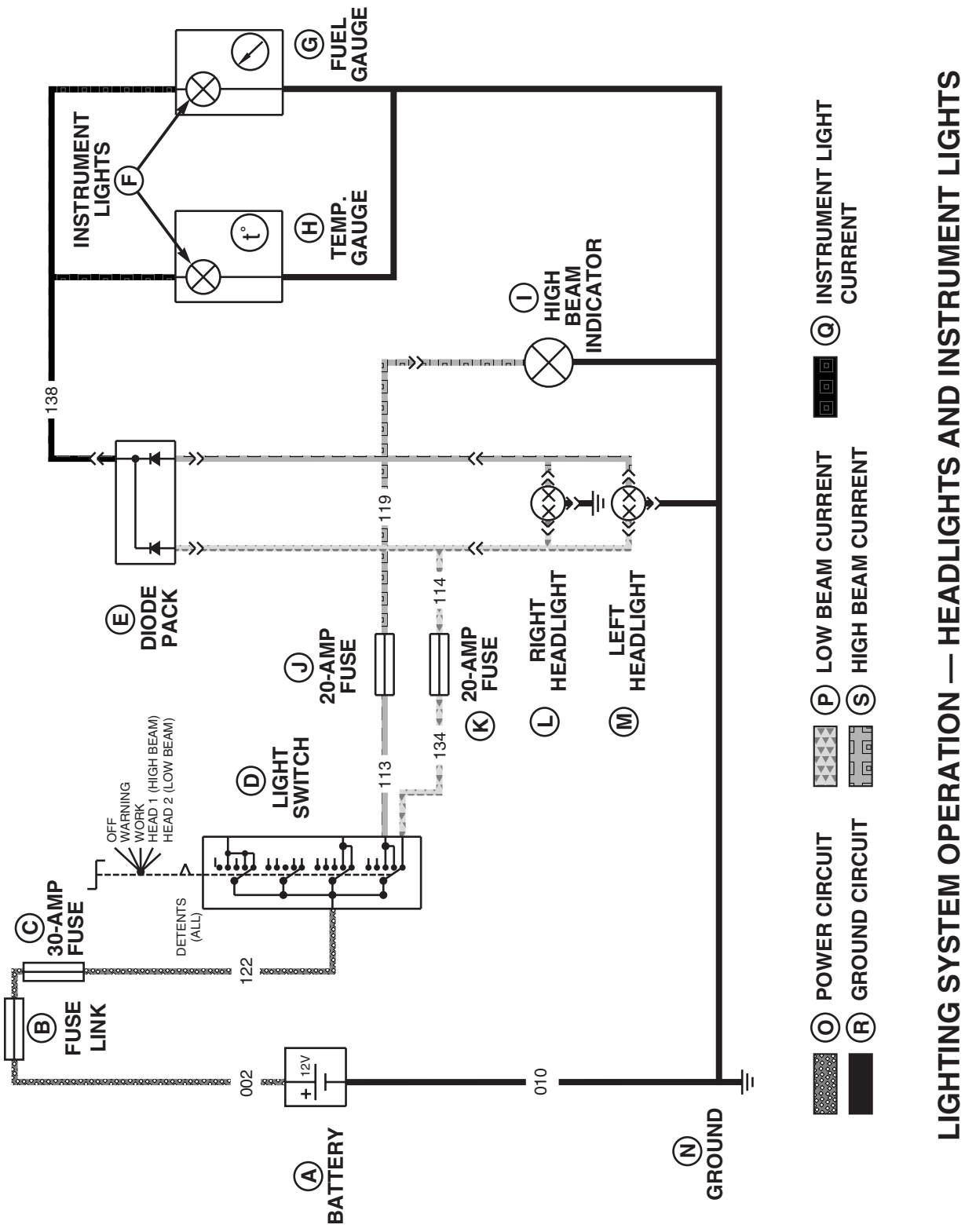
NOTE: Illustration shows tail light circuit of tractor without cab. Tractors with cab use two tail lights.

Tractors without cab use a single tail light located on the left side of the tractor. Tractors with cab use two tail lights both mounted at rear of cab. The tail light(s) come on whenever the light switch is turned from the OFF position to position 3 (HD1; high beam), or position 4 (HD2; low beam).

When the light switch is turned to positions 3 or 4, current from battery (A) flows through circuit 002, fuse link (B), 30-amp fuse (C), and circuit 122, to light switch (D). From the light switch, current flows through circuit 103, 20-amp fuse (E), circuit 118, to tail light(s) (F) (located inside left warn/turn lamp assembly), causing the light(s) to come on.

AG,OUO1085,380 –19–18SEP00–2/2

Lighting System Operation—Headlights and Instrument Lights



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AG,OUO1085,381 –19–18SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Light Switch
E—Diode Pack
F—Instrument Lights
G—Fuel Gauge
H—Temperature Gauge
I—High Beam Indicator
J—20-Amp Fuse
K—20-Amp Fuse
L—Right Headlight
M—Left Headlight
N—Ground
O—Power Circuit
P—Low Beam Current
Q—Instrument Light Current
R—Ground Circuit
S—High Beam Current

FUNCTION:

Provide low and high beam illumination for visibility at night. Also provide illumination for gauges in instrument panel.

MAJOR COMPONENTS:

- 30-Amp Fuse
- 20-Amp Fuses
- Light Switch
- Diode Pack
- Right Headlight
- Left Headlight
- Instrument Lights

THEORY OF OPERATION:

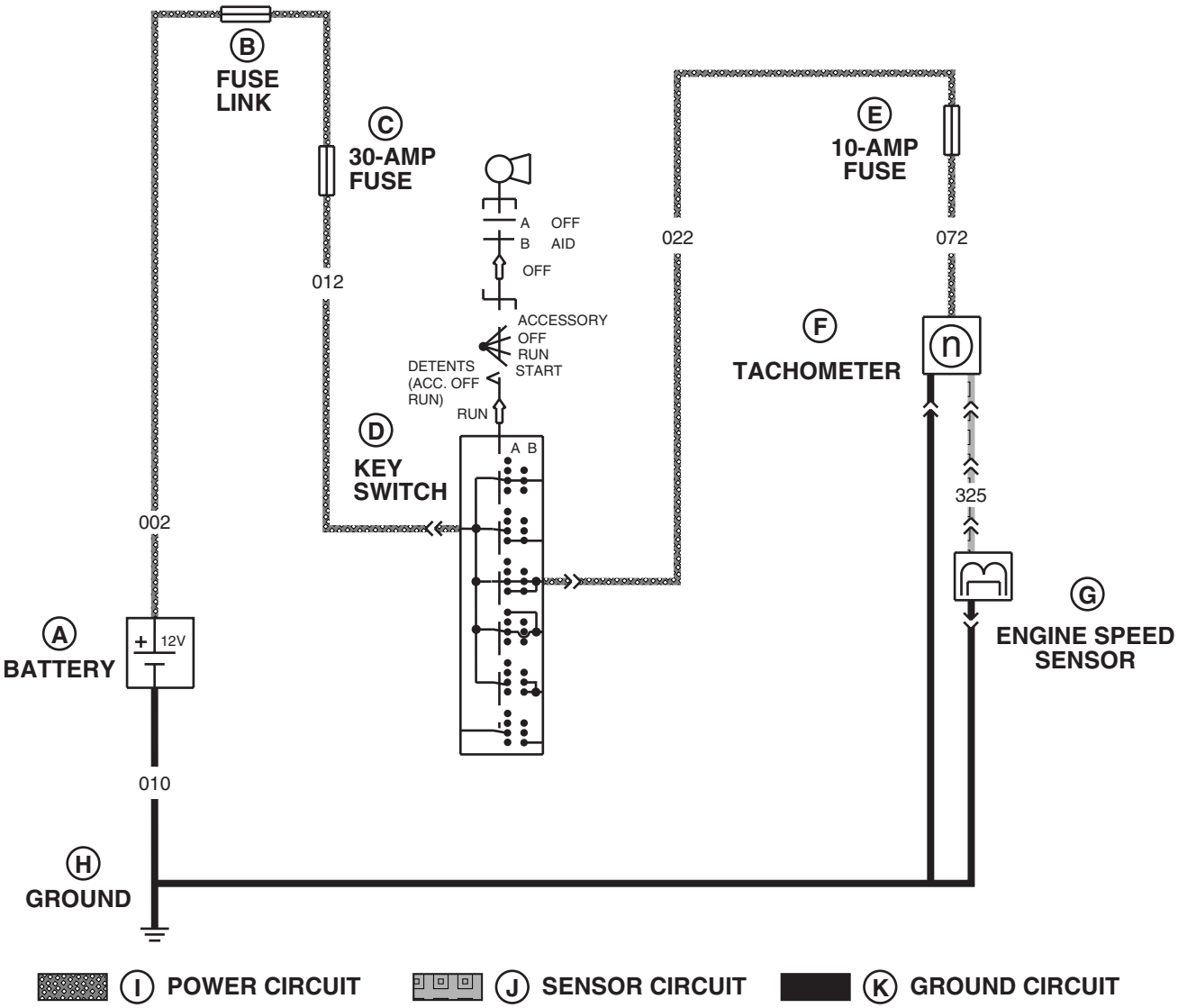
When light switch is moved to fourth position from off, current flows on circuit 002 from battery, through 30-amp fuse (C), then through switch contacts and out circuit 134. Flow continues through 20-amp fuse (K) to circuit 114 and the low beam filament of the headlight bulbs. Current also flows through one diode of diode pack (E) to instrument lights (F). Remaining diode blocks current from passing into high beam circuit.

When light switch is moved to third position from off, current passes from switch on circuit 113 and passes through 20-amp fuse (J). Current moves on circuit 119 to high beam filament of both headlight bulbs and high beam indicator (I) light.

Light switch operates instrument lights (F) in either headlight position. Depending on switch position, current will flow out of switch on circuit 134 or 113 and through its respective fuse. Flow continues through diode pack to circuit 138 and on to instrument lights. Diode pack also blocks current flow from feeding back across one headlight circuit to the other.

AG,OUO1085,381 –19–18SEP00–2/2

Instrument Panel System Operation—Tachometer



LVC2190 –UN–21JUN97

LVC2190 INSTRUMENT PANEL SYSTEM OPERATION — TACHOMETER

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—10-Amp Fuse
F—Tachometer
G—Engine Speed Sensor
H—Ground
I—Power Circuit
J—Sensor Circuit
K—Ground Circuit

FUNCTION:

Informs operator of engine speed.

MAJOR COMPONENTS:

- 10-Amp Fuse
- Tachometer
- Engine Speed Sensor
- Key Switch

Continued on next page

AG,OUO1085,382 –19–18SEP00–1/2

THEORY OF OPERATION:

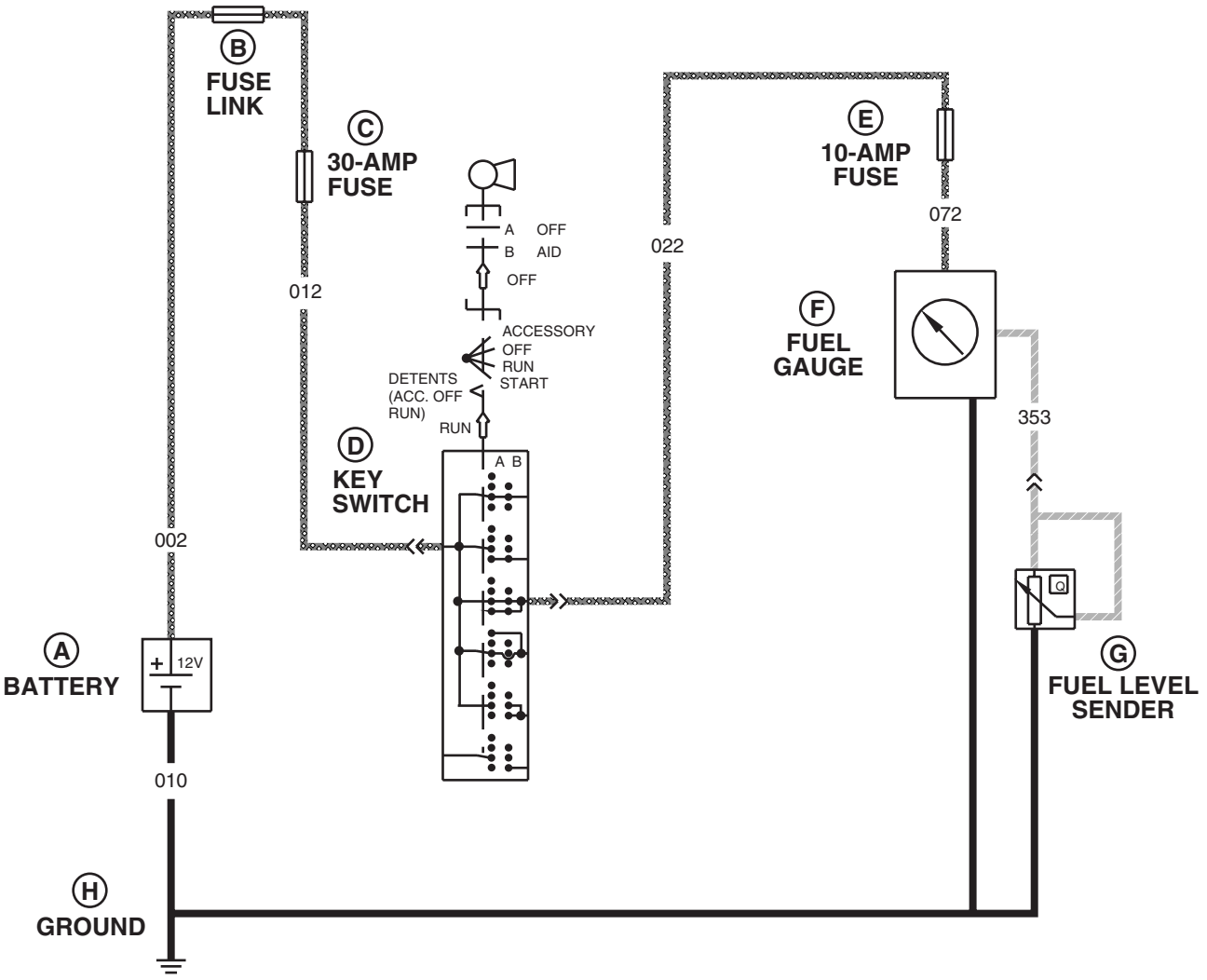
Current passes through closed contacts of key switch (D) to circuit 022, then through 10-amp fuse (E) to circuit 072 and into tachometer (F).

Engine speed sensor (G) contains a permanent magnet and a set of windings. The sensor is mounted close to the gear teeth of fuel injection pump. As gear turns, its moving teeth induce a small amount of alternating current in the sensor. Voltage leaving sensor travels through circuit 325 to tachometer and 010 to ground.

Sensor output voltage depends on engine rpm. Low rpm produces low voltage. As engine rpm increases, voltage output increases accordingly. Tachometer reads frequence of voltage signal and displays it as rpm.

AG,OUO1085,382 –19–18SEP00–2/2

Instrument Panel System Operation—Fuel Gauge



LVC2191 –UN–21JUN97

LVC2191 INSTRUMENT PANEL SYSTEM OPERATION — FUEL GAUGE

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—10-Amp Fuse
F—Fuel Gauge
G—Fuel Level Sender
H—Ground
I—Power Circuit
J—Sensing Circuit
K—Ground Circuit

FUNCTION:

Informs operator of fuel level.

MAJOR COMPONENTS:

- 10-Amp Fuse
- Fuel Gauge
- Fuel Gauge Sender

THEORY OF OPERATION:

Continued on next page

AG,OUO1023,378 –19–15NOV99–1/2

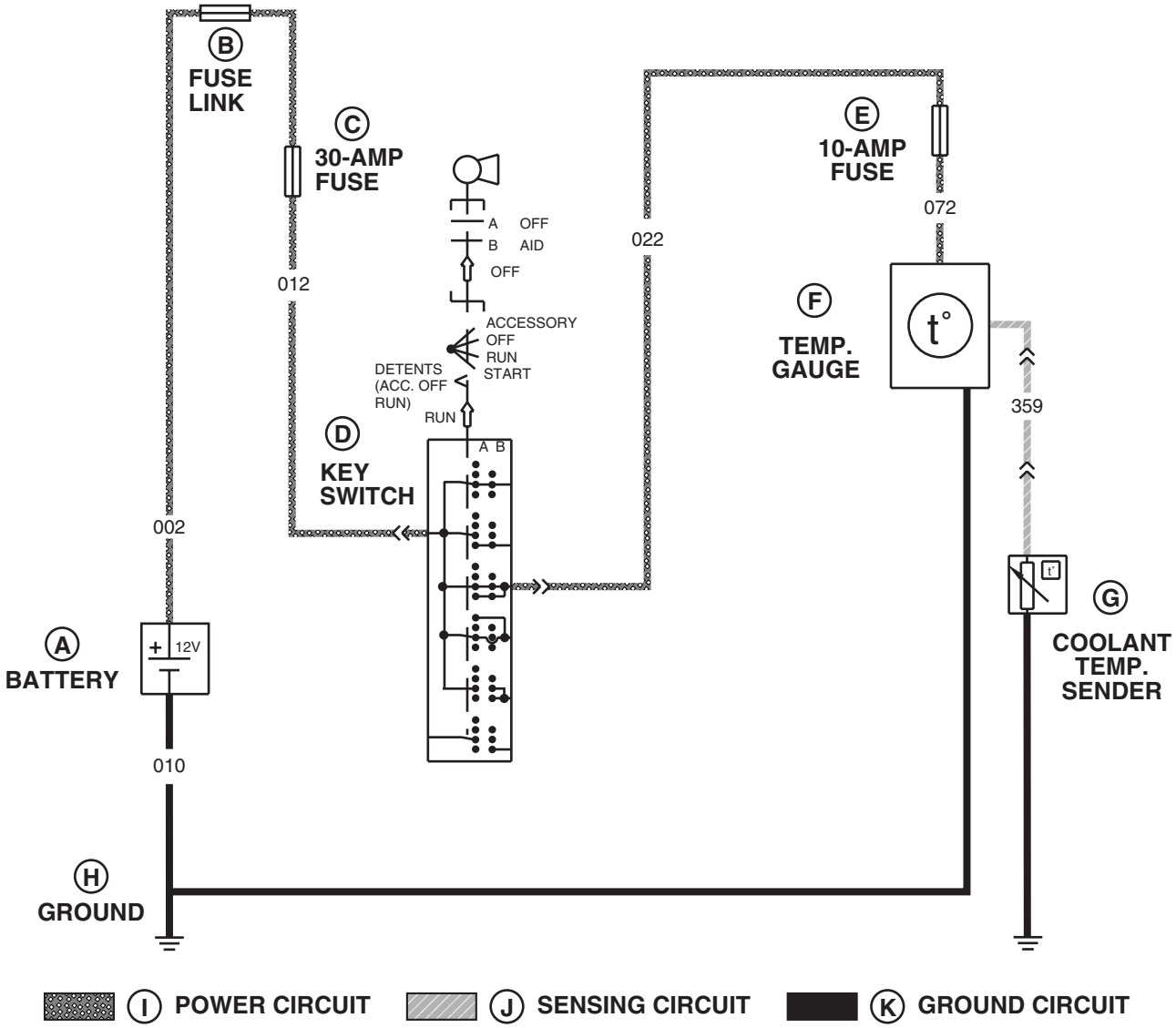
Current passes through closed contacts of key switch (D) to circuit 022, then through 10-amp fuse (E) to circuit 072 and into fuel gauge (F). Sensing terminal of gauge connects to fuel level sender (G) through circuit 353.

Sender assembly consists of a movable float mounted to a variable resistor (potentiometer). Resistance of potentiometer on gauge sensing circuit controls the fuel level shown on gauge.

As float moves up or down with changes in fuel level, electrical resistance of potentiometer changes accordingly. When tank is full, resistance is low and gauge needle moves to full position. When tank is empty, resistance is high, and gauge needle moves to empty position. Potentiometer resistance between these two positions varies in direct proportion to changes in fuel level. This allows gauge to accurately display quantity of fuel in tank regardless of its level.

AG,OUO1023,378 –19–15NOV99–2/2

Instrument Panel System Operation—Temperature Gauge



LVC2192 –UN–21JUN97

INSTRUMENT PANEL SYSTEM OPERATION — TEMPERATURE GAUGE

LVC2192

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—10-Amp Fuse
F—Temperature Gauge
G—Coolant Temperature Sender
H—Ground
I—Power Circuit
J—Sensing Circuit
K—Ground Circuit

FUNCTION:

Informs operator of engine coolant temperature.

MAJOR COMPONENTS:

- 10-Amp Fuse
- Temperature Gauge
- Coolant Temperature Sender

THEORY OF OPERATION:

Continued on next page

AG,OUO1023,379 –19–15NOV99–1/2

Current passes through closed contacts of key switch (D) to circuit 022, then through 10-amp fuse (E) to circuit 072 and into temperature gauge (F). Sensing terminal of gauge connects to coolant temperature sender (G) through circuit 359.

Temperature sender is a variable resistor that responds to changes in coolant temperature. Low coolant temperatures cause high resistance. High temperatures cause low resistance.

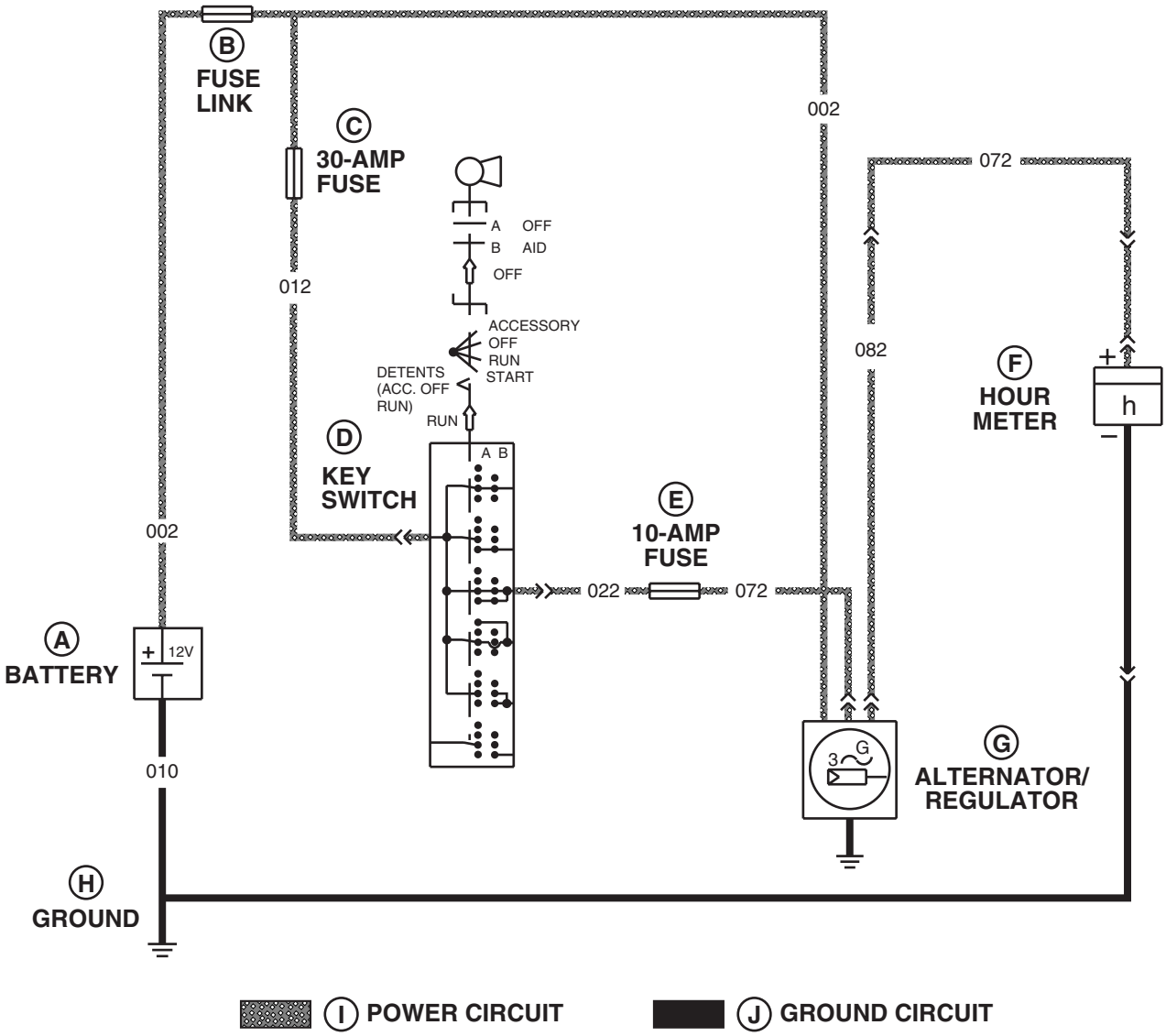
Current attempts to flow back to ground from gauge on circuit 359. If resistance of sender is high (low temperatures), only a slight amount of current passes to ground. This results in little or no movement of the gauge needle. A low temperature reading results.

If resistance of sender is low (high temperatures), current flows readily through sensor back to ground. Needle movement increases and the gauge displays a reading that corresponds with the warmer temperature.

Sensor resistance between these two positions varies in proportion to changes in coolant temperature. Therefore, gauge can display accurate reading for any engine temperature.

AG,OUO1023,379 –19–15NOV99–2/2

Instrument Panel System Operation—Hourmeter



LVC2193 –UN–21JUN97

LVC2193 **INSTRUMENT PANEL SYSTEM OPERATION — HOURMETER**

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—10-Amp Fuse
F—Hourmeter
G—Alternator/Regulator
H—Ground
I—Power Circuit
J—Ground Circuit

FUNCTION:

Displays operating hours.

MAJOR COMPONENTS:

- 10-Amp Fuse
- Hourmeter

Continued on next page

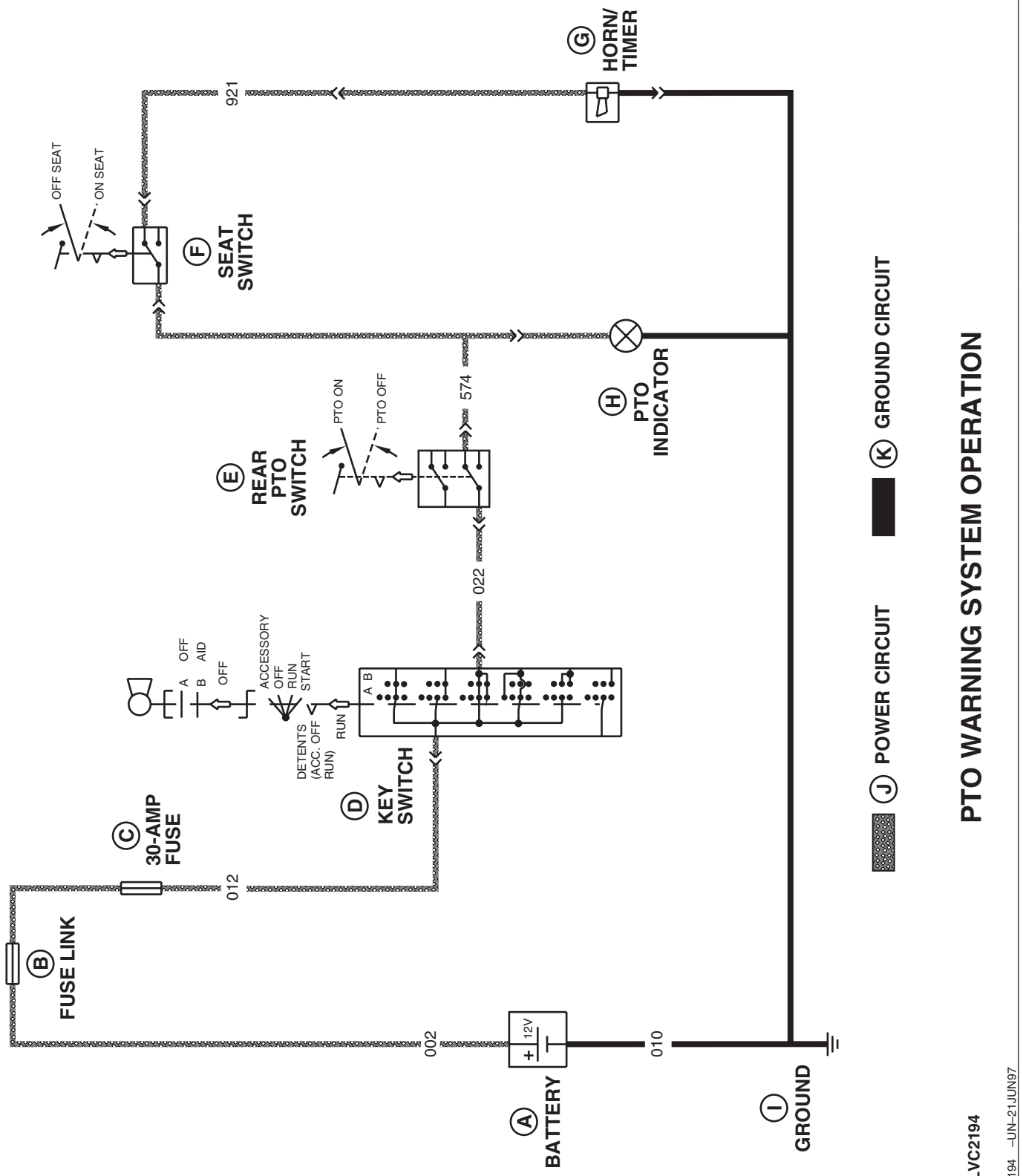
AG,OUO1085,383 –19–18SEP00–1/2

Current flows from battery (A), across closed contacts or key switch (D) and out circuit 022. Flow continues through 10-amp fuse (E) to circuit 072 and to alternator/regulator (G) hourmeter positive side.

Negative side of hourmeter (F) connects to ground through circuit 010. Hourmeter runs whenever engine is running.

AG,OUO1085,383 –19–18SEP00–2/2

PTO Warning System Operation



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AG,OUO1023,380 –19–15NOV99–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—Rear PTO Switch
F—Seat Switch
G—Horn/Timer
H—PTO Indicator
I—Ground
J—Power Circuit
K—Ground Circuit

FUNCTION:

Alerts operator by sight and sound that PTO is engaged.

MAJOR COMPONENTS:

- 30-Amp Fuse
- Key Switch
- Rear PTO Switch
- Seat Switch
- Horn/Timer
- PTO Indicator Light

THEORY OF OPERATION:

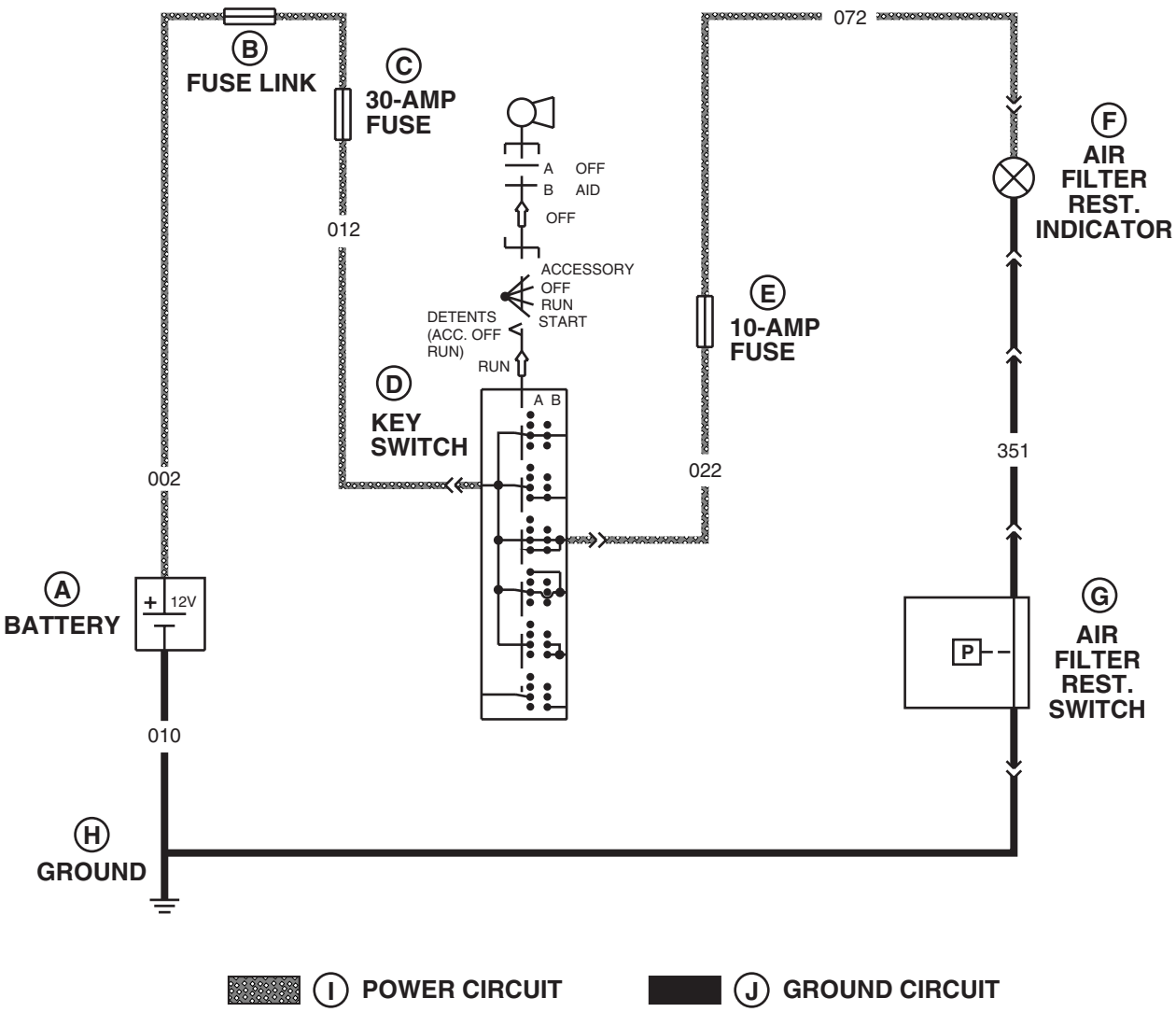
When PTO is engaged and key switch (D) is in the RUN or START position, current travels through 30-amp fuse (C), key switch contacts, and one side of rear PTO switch (E).

PTO indicator (H) lights as current continues to flow through circuit 574, through bulb, then to ground.

The horn/timer (G) also uses the seat switch (F) for control. The switch is closed when the operator is off the seat. Current passes through circuit 574, then across contacts of the seat switch to horn/timer. Horn/timer will buzz for about 6 to 8 seconds. Each time the operator rises from seat with PTO engaged, horn/timer buzzes for another 6 to 8 seconds after a 2-second delay.

AG,OUO1023,380 –19–15NOV99–2/2

Air Filter Restriction Indicator Operation



LVC2195 –UN–21JUN97

AIR FILTER RESTRICTION INDICATOR OPERATION

LVC2195

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—10-Amp Fuse
F—Air Filter Restriction Indicator
G—Air Filter Restriction Switch
H—Ground
I—Power Circuit
J—Ground Circuit

FUNCTION:

Alerts operator of the need to service air filter.

MAJOR COMPONENTS:

- Air Filter Restriction Switch
- Restriction Indicator Light
- 30-Amp Fuse
- 10-Amp Fuse

Continued on next page

AG,OUO1023,381 –19–15NOV99–1/2

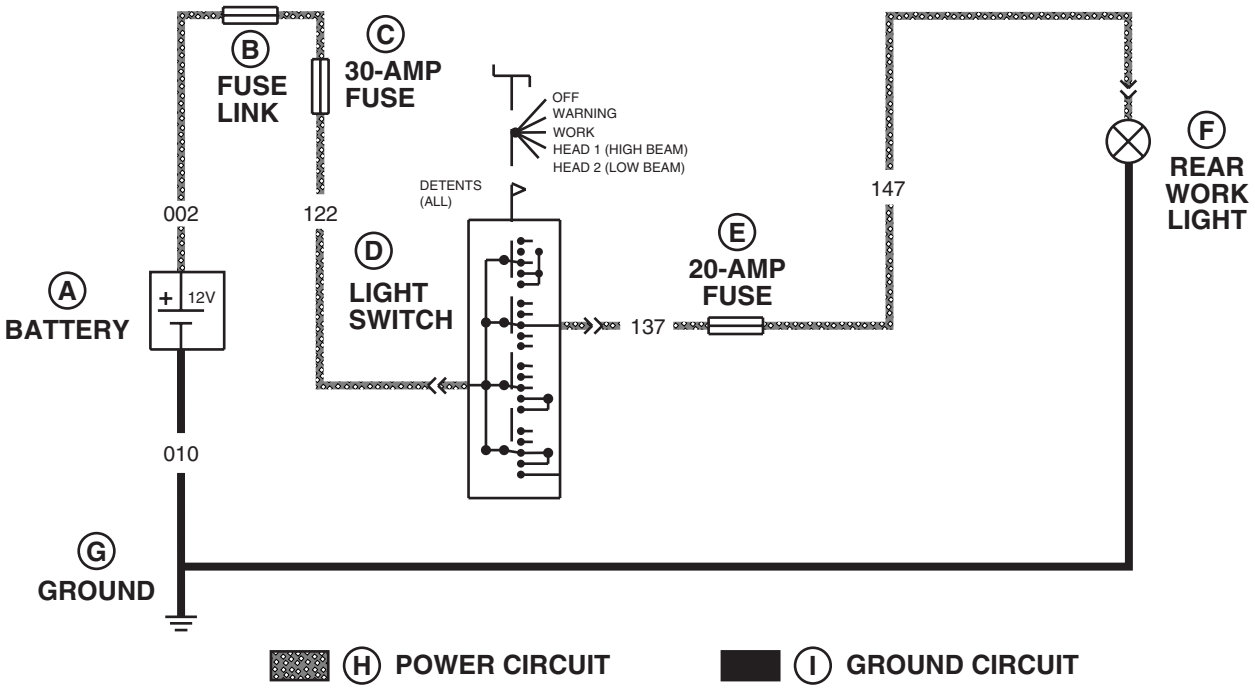
THEORY OF OPERATION:

Voltage is applied to one side of air filter restriction indicator (F) at all times when key switch is on. Supply path from battery includes circuit 002, 30-amp fuse (C), key switch (D), circuit 022, 10-amp fuse (E), and circuit 072.

Air filter restriction switch (G) contains a set of normally-open, vacuum-activated contacts. One contact connects to other side of restriction indicator light. Other contact connects with ground. During normal operation, contacts remain open and indicator light stays off. When air filter becomes restricted, vacuum builds in air filter housing. This causes contacts to close and current flows through light.

AG,OUO1023,381 –19–15NOV99–2/2

Rear Work Light Operation—Without Cab



LVC2196

LVC2196 –UN–27JUN02

REAR WORK LIGHT OPERATION TRACTORS WITHOUT CAB

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Light Switch
E—20-Amp Fuse
F—Rear Work Light
G—Ground
H—Power Circuit
I—Ground Circuit

FUNCTION:

Lights work area at rear of tractor.

MAJOR COMPONENTS:

- 30-Amp Fuse
- 20-Amp Fuse
- Light Switch
- Rear Work Light

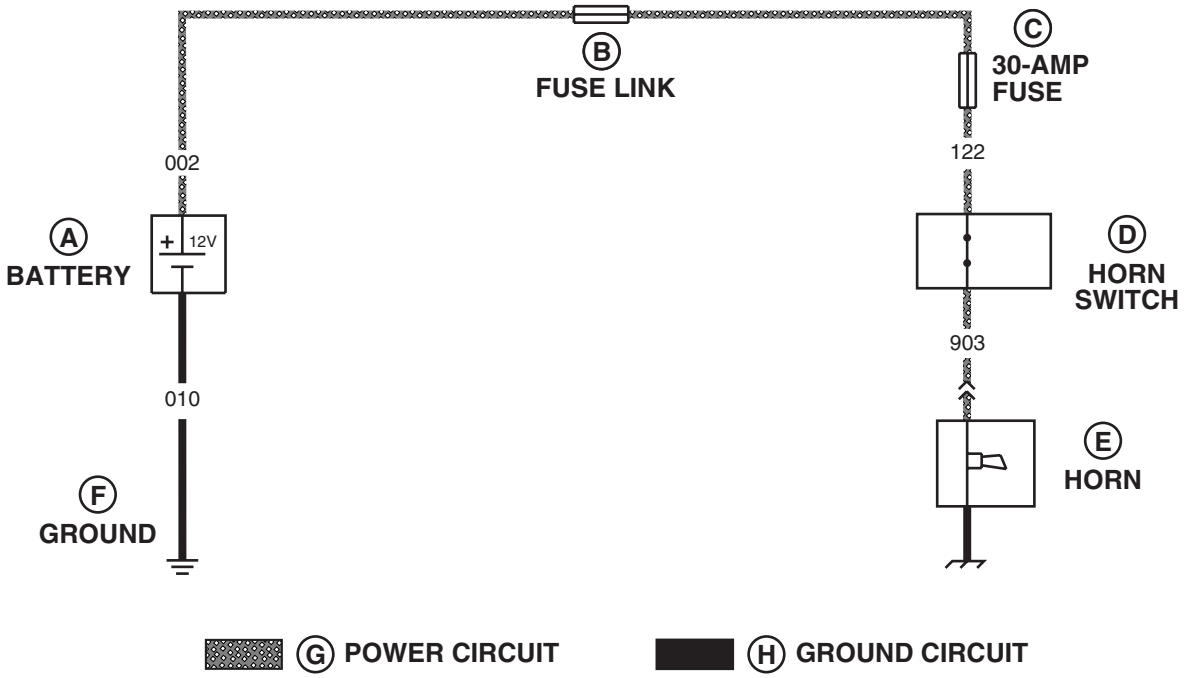
THEORY OF OPERATION:

When light switch (D) in the second position from off, current flows from battery (A) through circuit 002, then through 30-amp fuse (C) and circuit 122 to light switch. Current passes across switch contacts, out circuit 137, through 20-amp fuse (E) to circuit 147 and on to rear work light (F).

Current also flows to high beam headlights with light switch in the same position. Refer to LIGHTING SYSTEM OPERATION—HEADLIGHTS AND INSTRUMENT LIGHTS earlier in this group.

AG,OUO1085,384 –19–18SEP00–1/1

Optional Horn Operation



LVC2197 –UN–21JUN97

LVC2197

OPTIONAL HORN OPERATION

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Horn Switch
E—Horn
F—Ground
G—Power Circuit
H—Ground Circuit

FUNCTION:

Operates as a warning device to traffic and bystanders.

MAJOR COMPONENTS:

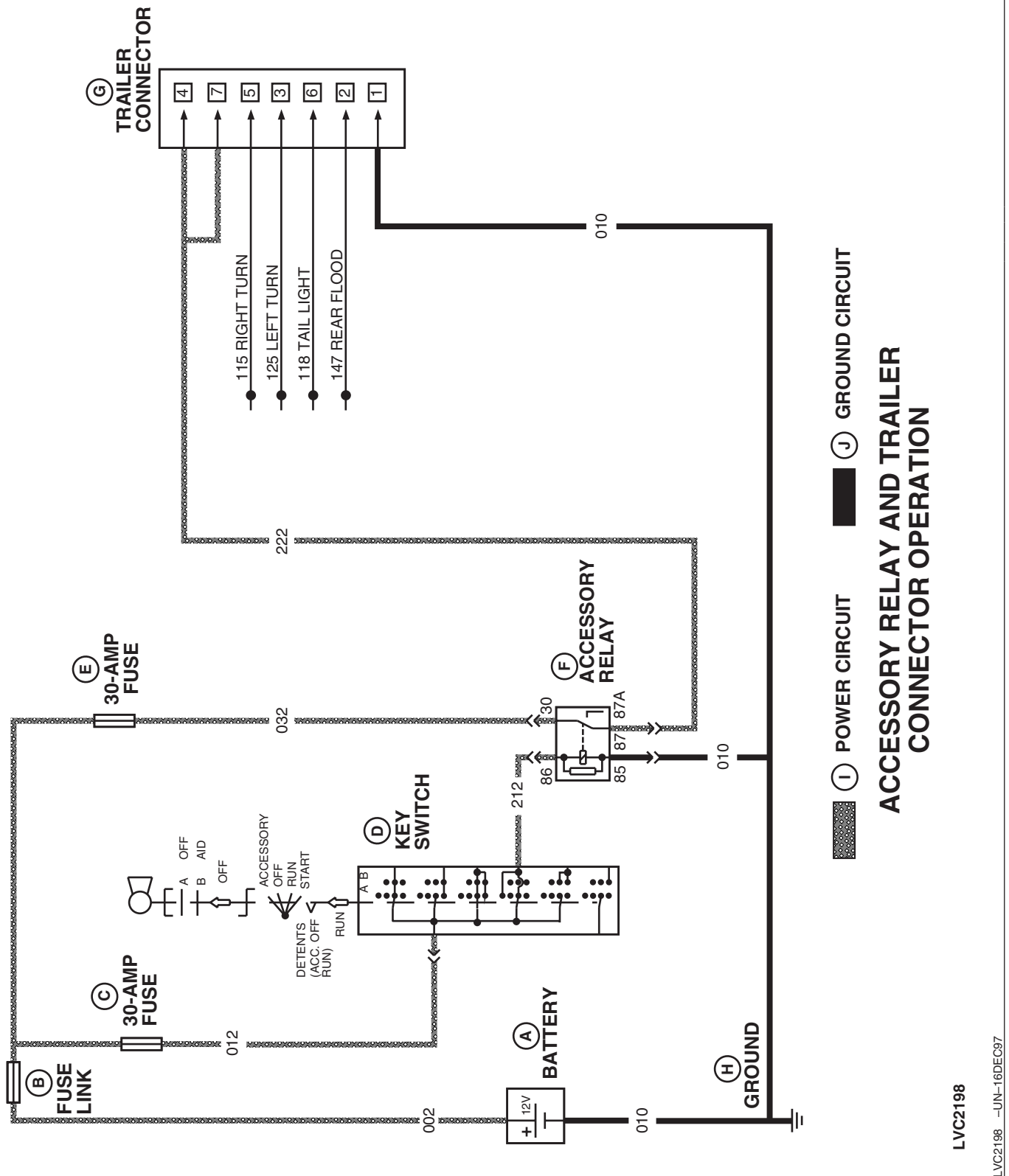
- 30-Amp Fuse
- Horn
- Horn Switch

THEORY OF OPERATION:

When operator pushes horn switch (D), current flows from battery (A) on circuit 002 to 30-amp fuse (C). Flow continues on circuit 122 to horn switch and to horn (E). Horn mounting brackets complete the horn circuit by providing a connection with chassis ground. Since horn circuit connects directly to battery, horns will work regardless of key switch position.

AG,OUO1023,382 –19–15NOV99–1/1

Accessory Relay and Trailer Connector Operation



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AG,OUO1085,385 –19–18SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—30-Amp Fuse
F—Accessory Relay
G—Trailer Connector
H—Ground
I—Power Circuit
J—Ground Circuit

FUNCTION:

Provides light and accessory power connections for trailer.

MAJOR COMPONENTS:

- 30-Amp Fuses
- Key Switch
- Accessory Relay
- 7-Pin Trailer Connector

THEORY OF OPERATION:

When key switch (D) is in ACCESSORY or RUN position, current passes through contacts of key switch and through circuit 212 to accessory relay (F). Current passing through windings of accessory relay creates a magnetic field which closes the relay contacts.

With relay contacts closed, current passes through 30-amp fuse (E), through accessory relay, and through circuit 222 to accessory terminals 4 and 7 of trailer connector (G) which can be used for auxiliary equipment.

Remainder of trailer connector terminals are connected as follows:

No. 1—Ground, circuit 010.

No. 2—Rear flood light, circuit 147.

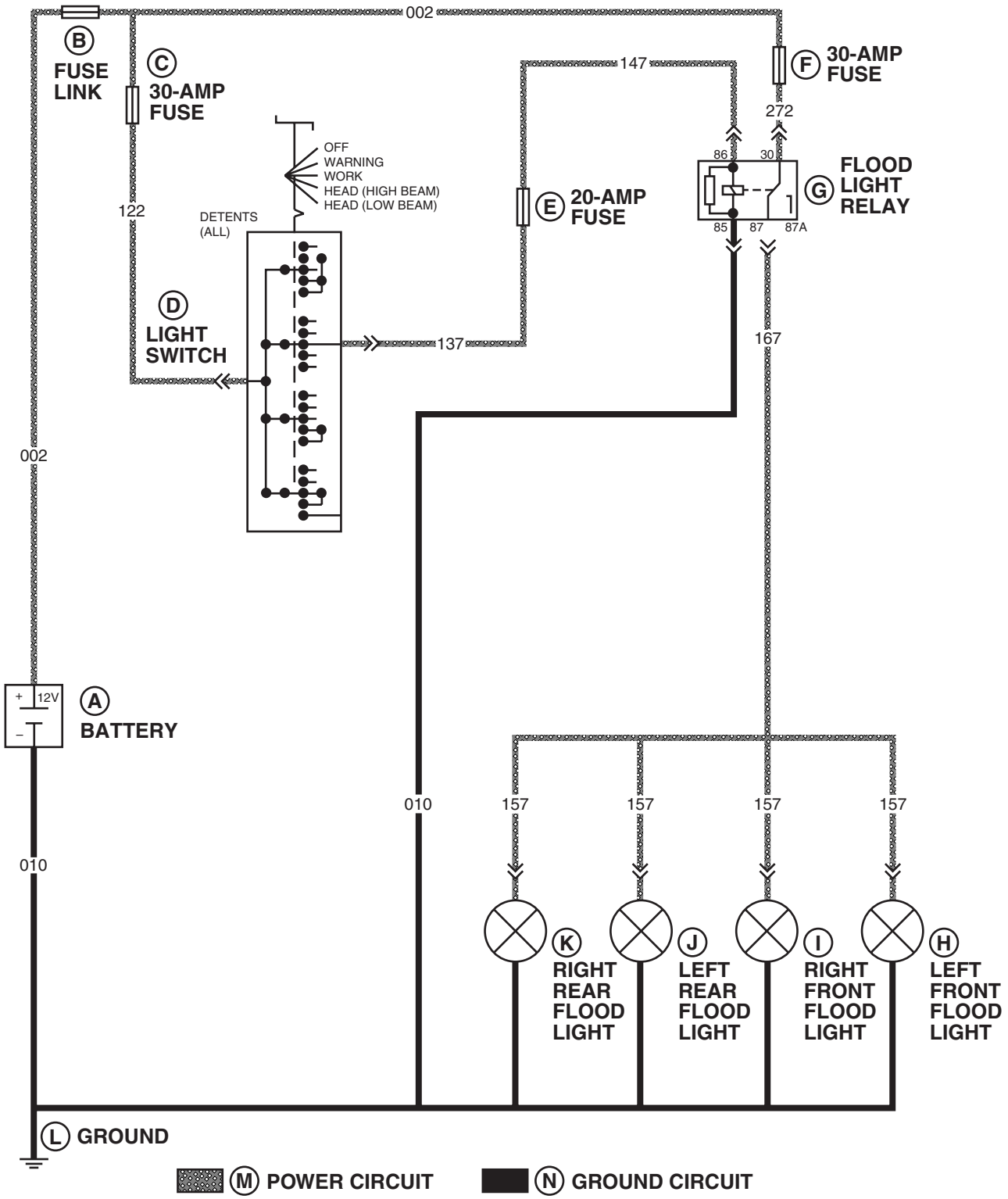
No. 3— Left turn, circuit 125.

No. 5—Right turn, circuit 115.

No. 6—Tail light, circuit 118.

AG,OUO1085,385 –19–18SEP00–2/2

Flood Light Operation—With Cab



LVC2199

FLOOD LIGHT OPERATION — CAB TRACTORS ONLY

LVC2199 –UN–27JUN02

Continued on next page

AG,OUO1085,386 –19–19SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Light Switch
E—20-Amp Fuse
F—30-Amp Fuse
G—Flood Light Relay
H—Left Front Flood Light
I—Right Front Flood Light
J—Left Rear Flood Light
K—Right Rear Flood Light
L—Ground
M—Power Circuit
N—Ground Circuit

FUNCTION:

Illuminates work area at front and rear of tractor.

MAJOR COMPONENTS:

- 30-Amp Fuses
- 20-Amp Fuse
- Light Switch
- Flood Light Relay

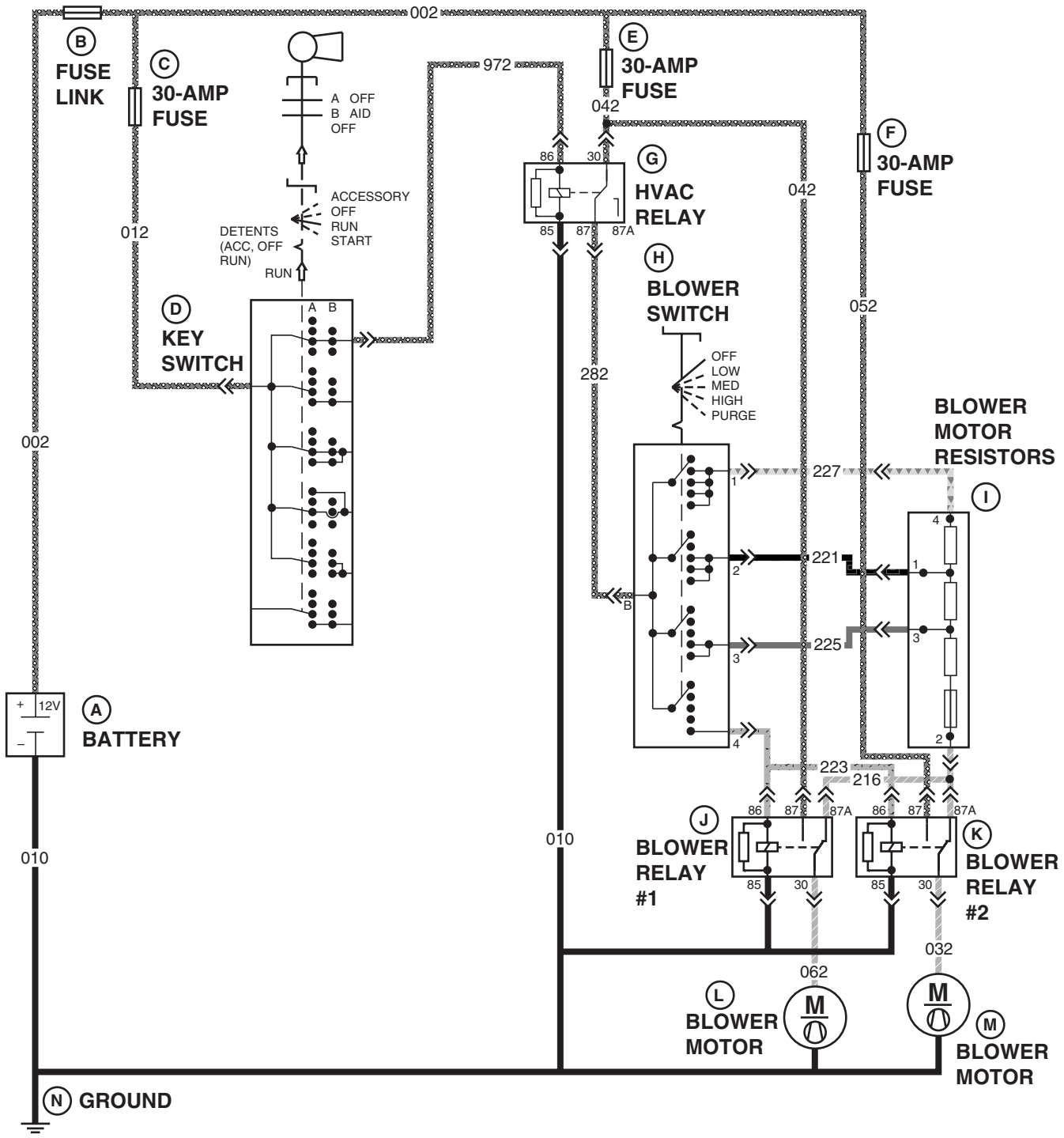
THEORY OF OPERATION:

With light switch (D) in second position from off, current flows from battery (A) through circuit 002 and fuse link (B), then through 30-amp fuse (C) and circuit 122 to light switch. Current passes across switch contacts and through circuit 137, then through 20-amp fuse (E) and circuit 147 to flood light relay (G).

Current passing through flood light relay windings creates a magnetic field which closes the relay contacts. This connects circuit 272 to circuit 167 providing a current path to the front and rear flood lights (H—K).

AG,OUO1085,386 –19–19SEP00–2/2

Blower Motor Operation—With Cab



LVC1496

BLOWER MOTOR OPERATION — CAB TRACTORS ONLY

LVC1496 –19–20APR01

Continued on next page

AG,OUO1085,387 –19–19SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—30-Amp Fuse
F—30-Amp Fuse
G—HVAC Relay
H—Blower Switch
I—Blower Motor Resistors
J—Blower Motor Relay #1
K—Blower Motor Relay #2
L—Blower Motor
M—Blower Motor
N—Ground
O—Power Circuit
P—Low Speed Circuit
Q—High Speed Circuit
R—Ground Circuit
S—Medium Speed Circuit
T—Purge Speed Circuit
U—Blower Motor Circuit

FUNCTION:

The blower motors are located in the evaporator/heater core housing mounted in the cab roof. They force cooled or heated air from the evaporator/heater core housing through the vents in the cab headliner to heat or cool the cab.

MAJOR COMPONENTS:

- Key Switch
- HVAC Relay
- Blower Switch
- Blower Motor Resistors
- Blower Relays
- Blower Motors

THEORY OF OPERATION:

When key switch (D) is in RUN position, current flows from battery (A) through fuse link (B), 30-amp fuse (C), and across key switch contacts to circuit 972. Current then flows through circuit 972 to energize the coil windings of HVAC relay (G).

When HVAC relay is energized, the relay blade contacts terminal 87 and current from battery flows through circuit 002, through 30-amp fuse (E) and circuit 282 to terminal B of blower switch (H).

The blower switch provides four operating speeds for the blower motors: low, medium, high, and purge.

When low, medium, or high speeds are selected, current flows through circuit 227, 221, or 225 to blower motor resistors (I); through circuit 216 to terminal 87A of the blower motor relays (J and K); and through the relays to the blower motors (L and M).

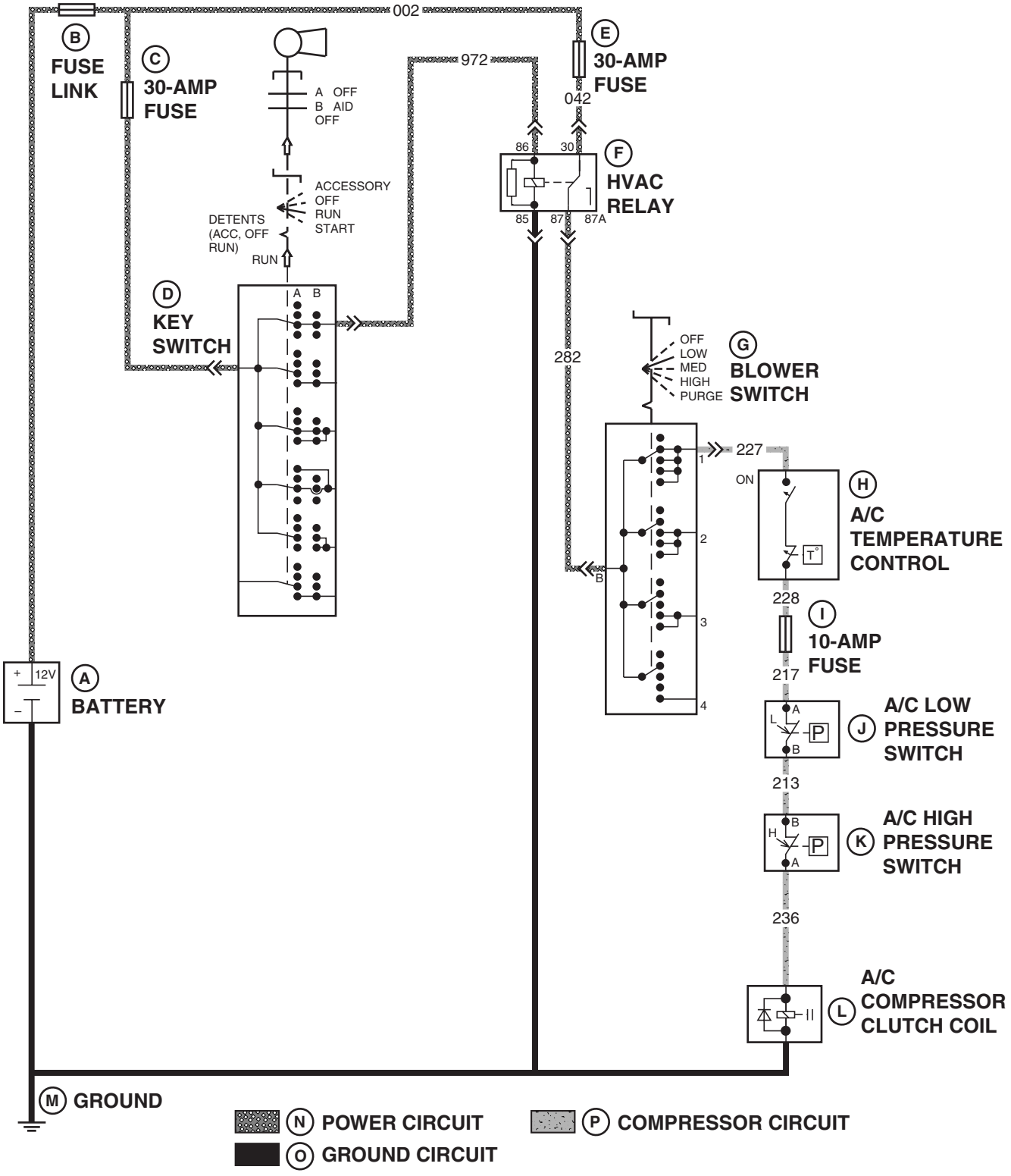
The speed of the blower motors is affected by the number of resistors in the circuit. Current from circuit 227 flows through four resistors; the current to the blower motors is low and the blower speed is low. Current from circuit 225 flows through only two resistors, thus the current drop is less and the blower speed is higher.

When PURGE speed is selected, current flows through circuit 223 and energizes the coil windings of the blower motor relays. When the relays are energized, the relay blade shifts to terminal 87 and current flows from circuits 042 and 052 to the blower motors. The current is not affected by the blower motor resistor, thus the blower motors turn at their highest speed.

30-amp fuses (E and F) protect the blower motor circuits from overload.

AG,OUO1085,387 –19–19SEP00–2/2

A/C Compressor Operation—Cab Only



LVC1497

A/C COMPRESSOR — CAB TRACTORS ONLY

LVC1497 –19–27JUN02

Continued on next page

AG,OUO1085,388 –19–19SEP00–1/2

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—30-Amp Fuse
F—HVAC Relay
G—Blower Switch
H—A/C Temperature Control
I—10-Amp Fuse
J—A/C Low Pressure Switch
K—A/C High Pressure Switch
L—A/C Compressor Clutch Coil
M—Ground
N—Power Circuit
O—Ground Circuit
P—Compressor Circuit

FUNCTION:

The A/C compressor circuit controls the air conditioning function for the operator's station.

MAJOR COMPONENTS:

- Key Switch
- HVAC Relay
- Blower Switch
- A/C Temperature Control
- A/C Low Pressure Switch
- A/C High Pressure Switch
- A/C Compressor Clutch

THEORY OF OPERATION:

The air conditioning compressor clutch (L) is controlled by the blower switch (G), the A/C temperature control (H) and the low and high pressure switches (J and K).

When key switch (D) is in RUN position, current flows from battery (A) through fuse link (B), 30-amp fuse (C) and across key switch contacts to circuit 972. Current then flows through circuit 972 to energize the coil windings of HVAC relay (F).

When HVAC relay is energized, the relay blade contacts terminal 87 and current from battery flows through circuit 002 through 30-amp fuse (E), through circuit 042 and through HVAC relay and circuit 282 to terminal B of blower switch (G).

When the blower switch is turned to any of the four operating positions (low, medium, high, or purge), current flows through circuit 227 to the A/C temperature control.

The A/C temperature control is a rotary switch with a gas-filled temperature sensing tube that is inserted into the evaporator core. The switch end of the sensing tube uses a diaphragm switch wired to the compressor clutch circuit. The A/C temperature control also has a mechanical on/off feature; the switch is open when fully turned counterclockwise.

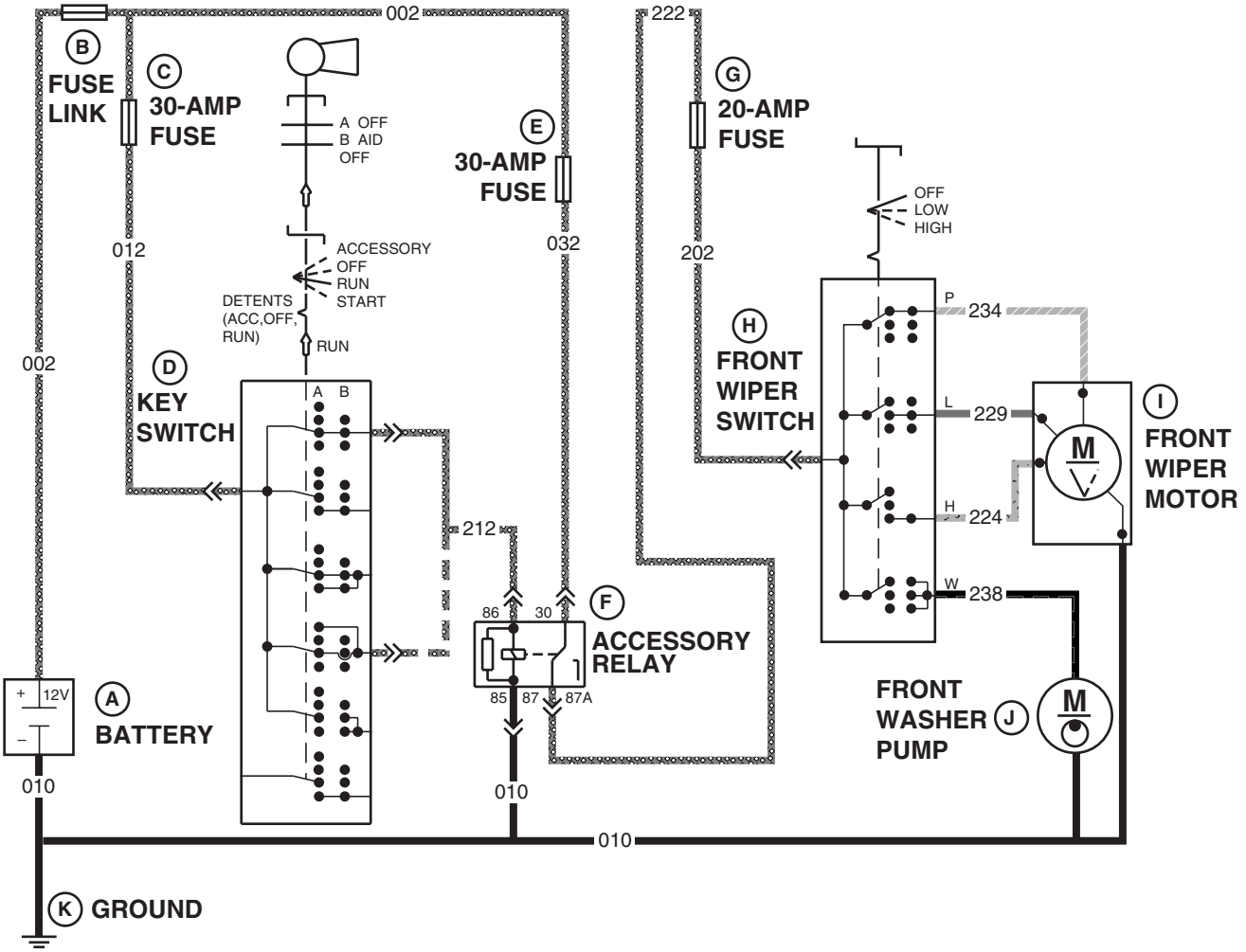
When the A/C temperature control switch is turned clockwise past the OFF position, the gas in the sensing tube either opens or closes the diaphragm switch (depending on the temperature in the evaporator core and the setting of the temperature control). This either completes or interrupts the circuit through the switch. When the switch is closed, current flows through 10-amp fuse (I) and the low and high pressure switches to the compressor clutch coil.

The A/C compressor drive shaft is pulley-driven by the engine and is turning whenever the engine is running. When the compressor clutch coil is energized, the compressor electro-magnetic clutch engages and high pressure gas is sent to the condensor.

When the temperature in the evaporator core reaches the temperature selected by the A/C temperature control, the diaphragm switch opens and current flow to the compressor clutch coil is interrupted and the compressor clutch disengages.

The high and low pressure switches are located in the condensor line. If the pressure in the condensor line drops below the setting of the low pressure switch or rises above the setting of the high pressure switch, the switch opens and current flow to the compressor clutch coil is interrupted.

Front Wiper/Washer Operation—Cab Only



L POWER CIRCUIT
N PARK CIRCUIT
P HIGH SPEED CIRCUIT
M GROUND CIRCUIT
O LOW SPEED CIRCUIT
Q WASHER CIRCUIT

LVC1498 –19–20APR01

LVC1498

FRONT WIPER/WASHER OPERATION — CAB TRACTORS ONLY

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—30-Amp Fuse
F—Accessory Relay
G—20-Amp Fuse
H—Front Wiper Switch
I—Front Wiper Motor
J—Front Washer Pump
K—Ground
L—Power Circuit
M—Ground Circuit
N—Park Circuit
O—Low Speed Circuit
P—High Speed Circuit
Q—Washer Circuit

FUNCTION:

Controls operation of front windshield wiper and washer pump.

MAJOR COMPONENTS:

- Accessory Relay
- Front Wiper Switch

Continued on next page

AG,OUO1085,389 –19–19SEP00–1/2

- Front Wiper Motor
- Front Washer Pump
- Key Switch

THEORY OF OPERATION:

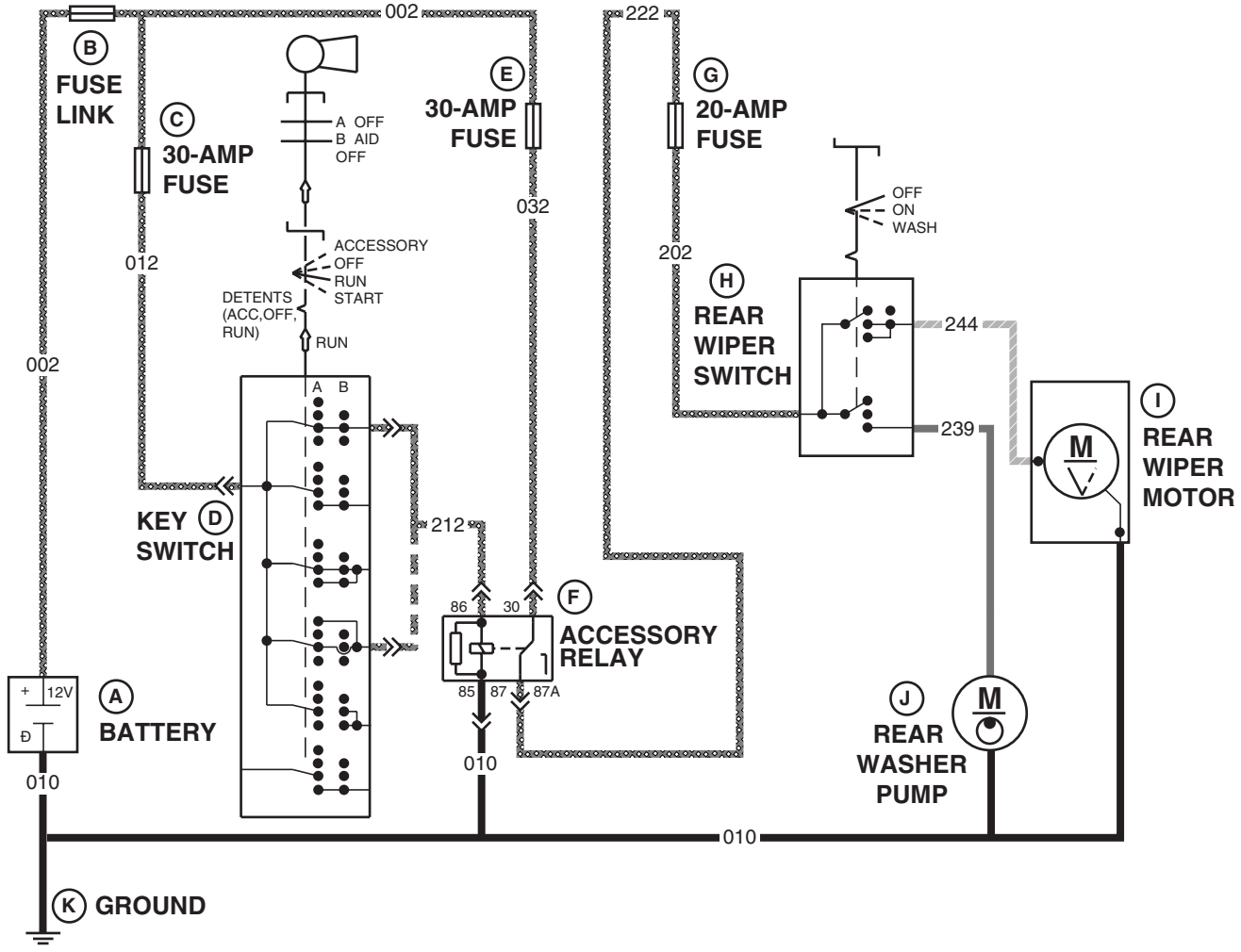
Current from the battery (A) flows through fuse link (B), 30-amp fuse (C), and circuit 012 to the key switch (D). When key switch is in ACCESSORY or RUN position current flows through circuit 212 and energized accessory relay (F). When the relay is energized current flows from circuit 002, through 30-amp fuse (E), accessory relay (F), through circuit 222 to 20-amp fuse (G). From 20-amp fuse (G) current flows through circuit 202 to front wiper switch position, current flows through circuit 234 to the front wiper motor (I) and the wiper blade is reset to its “park” position.

When the front wiper switch is rotated to the first detent, current flows through circuit 229 and the windshield wiper runs at low speed. When the front wiper switch is rotated to the second detent, current flows through circuit 224 and the windshield wiper runs at high speed.

When the front wiper switch knob is pressed, current flows through circuit 238 and activates the front washer pump (J).

AG,OUO1085,389 –19–19SEP00–2/2

Rear Wiper/Washer Operation—Cab Only



LVC1499

REAR WIPER/WASHER OPERATION — CAB TRACTORS ONLY

Rear Wiper/Washer Circuit Schematic

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Key Switch
E—30-Amp Fuse
F—Accessory Relay
G—20-Amp Fuse
H—Rear Wiper Switch
I—Rear Wiper Motor
J—Rear Washer Pump
K—Ground
L—Power Circuit
M—Ground Circuit
N—Wiper Circuit
O—Washer Circuit

FUNCTION:

Continued on next page

Controls operation of rear windshield wiper and washer pump.

MAJOR COMPONENTS:

- Accessory Relay
- Key Switch
- Rear Wiper Switch
- Rear Wiper Motor
- Rear Washer Pump

THEORY OF OPERATION:

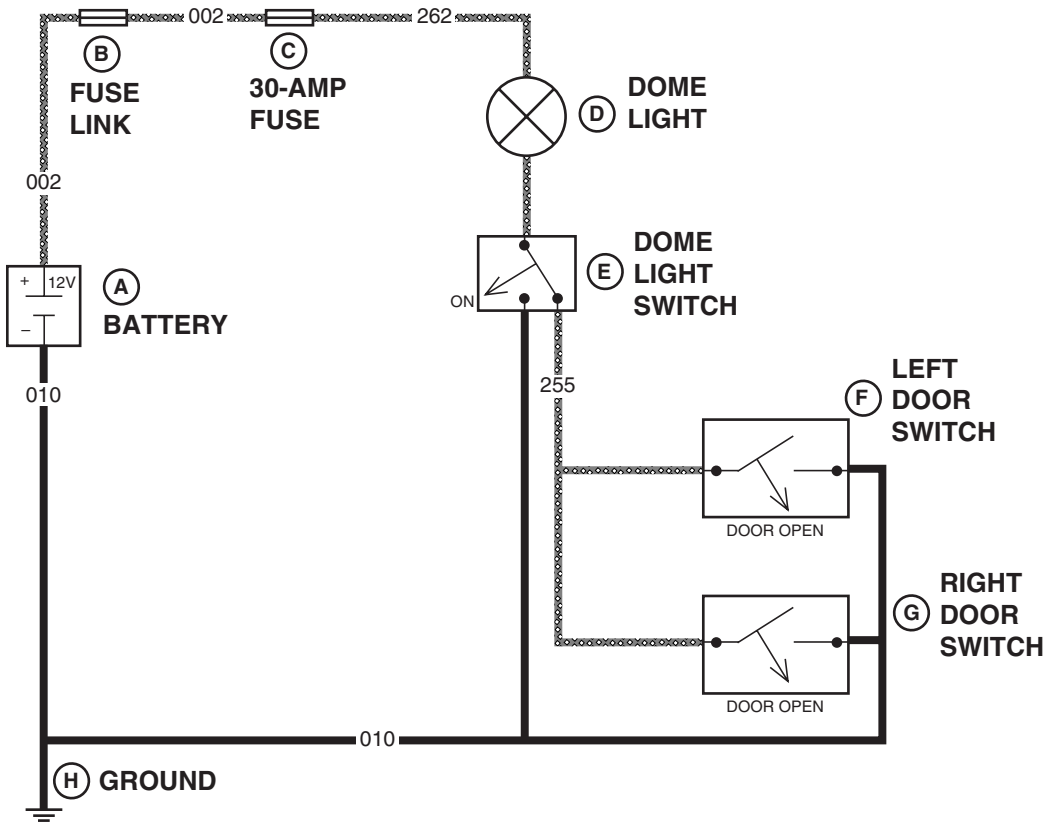
Current from the battery (A) flows through fuse link (B), 30-amp fuse (C), and circuit 012 to the key switch (D).

When key switch is in ACCESSORY or RUN position current flows through circuit 212 and energizes accessory relay (F). When the relay is energized current flows from circuit 002, through 30-amp fuse (E), accessory relay (F), and circuit 222 to 20-amp fuse (G). From 20-amp fuse (G) current flows through circuit 202 to rear wiper switch (H). When the rear wiper switch is pressed to the first detent, current flows through circuit 224 and activates the rear wiper motor (I).

When the rear wiper switch is pressed in the WASHER position, current flows through circuit 239 and activates rear washer pump (J).

AG,OUO1085,390 –19–19SEP00–2/2

Dome Light Operation—Cab Only



DOME LIGHT OPERATION — CAB TRACTORS ONLY

LVC1600 –19–21MAY96

LVC1600

A—Battery
B—Fuse Link
C—30-Amp Fuse
D—Dome Light
E—Dome Light Switch
F—Left Door Switch
G—Right Door Switch
H—Ground
I—Power Circuit
J—Ground Circuit

FUNCTION:

Dome light illuminates interior of cab.

MAJOR COMPONENTS:

- Dome Light Switch
- Left and Right Door Switches
- Dome Light

THEORY OF OPERATION:

Current from battery (A) flows on circuit 002 through fuse link (B), 30-amp fuse (C) and circuit 262 to dome light (D).

Dome light switches (F and G) are normally-closed switches. Closing the doors opens the switches. When dome light switch (E) is on the OFF position and both doors are closed, current flowing through circuit 255 to the left and right door switches is interrupted and the dome light is off. If either door is open, the switch closes and the circuit to ground is completed. The dome light will illuminate.

When the dome light switch is in the ON position, current flows through to ground and the dome light illuminates regardless of door position.

AG,OUO1085,391 –19–19SEP00–1/1

Diagnostic Information

The diagnostic information in this group is used to test components related to a specific problem or system. Select a symptom or system from the list and follow the test procedures under that heading. The symptom or system headings are:

- Starting System—Normal Operation
- Starting System—Bypass Attempt
- Manifold Heater

- Charging System
- Lighting System—Turn Signals Without Cab)
- Lighting System—Turn Signals (With Cab)
- Lighting System—Warning Lights (All Tractors)
- Lighting System—Rear Work Light (Without Cab)
- Lighting System—Flood Lights (With Cab)
- Lighting System—Tail Light (Without Cab)
- Lighting System—Tail Light (With Cab)
- Lighting System—Headlights and Instrument Lights
- Dome Light (With Cab)
- Instrument Panel System—Tachometer
- Instrument Panel System—Fuel Gauge
- Instrument Panel System—Temperature Gauge
- Instrument Panel System—Hourmeter
- Instrument Panel System—Oil Pressure
- PTO Warning System
- Air Filter Restriction
- Optional Dual Horn
- Accessory Relay and Trailer Connector
- Blower Motor (With Cab)
- A/C Compressor Clutch Coil (With Cab)
- Front Wiper/Washer (With Cab)
- Rear Wiper/Washer (With Cab)

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “Normal” column gives the reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the test, check, or adjustment listed in the third “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located at the end of this group.

The system diagram that accompanies each test procedure is drawn to resemble machine components. The key number on the art matches the number in the “Test Location” column and the arrow points to the exact test point.

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Wire Color Chart

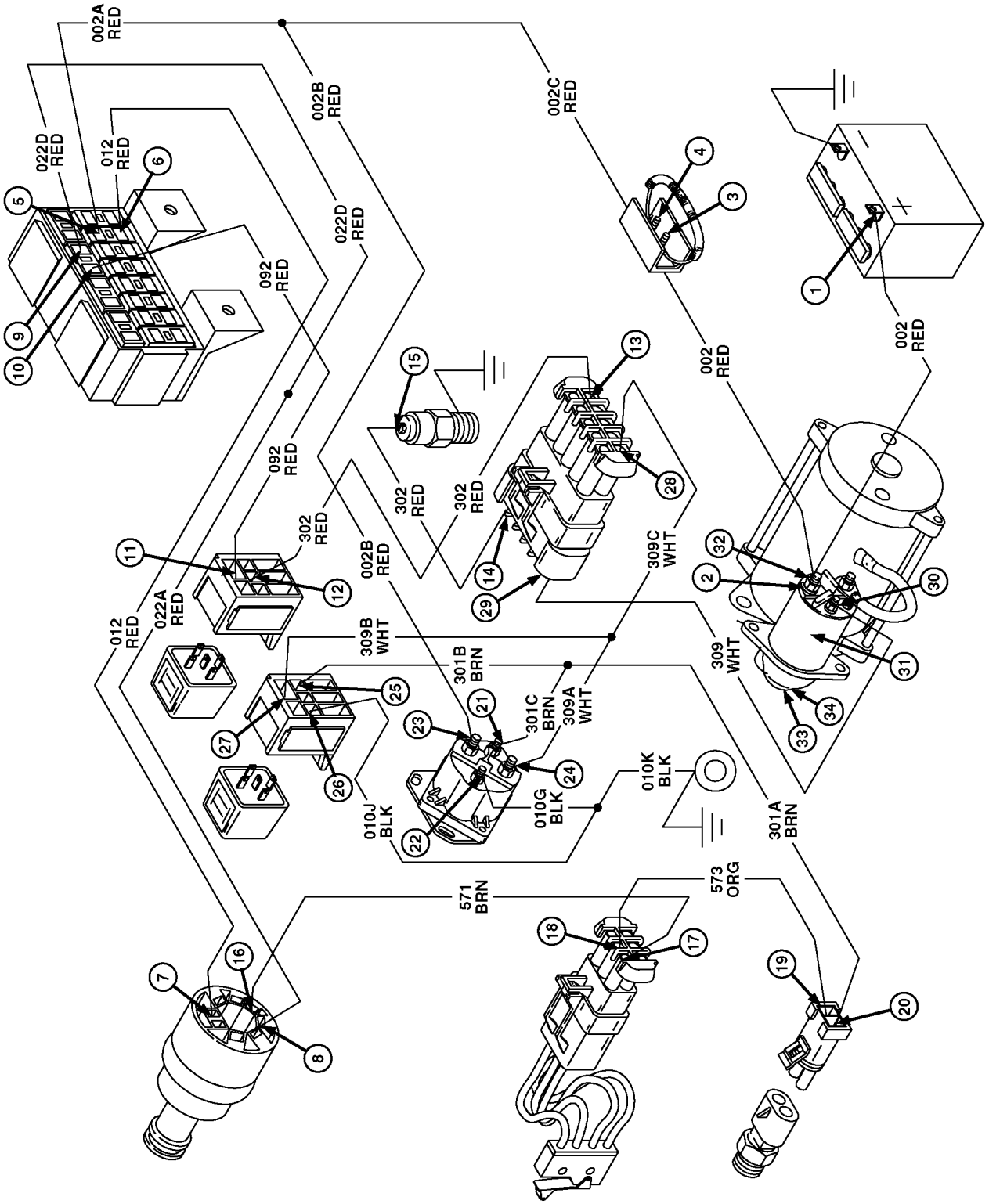
WIRE COLOR ABBREVIATION	WIRE COLOR
Blu	Blue
Blu/Blk	Blue/Black
Blu/Red	Blue/Red
Blk	Black
Blk/Wht	Black/White
Blk/Yel	Black/Yellow
Brn	Brown
Brn/Wht	Brown/White
Brn/Yel	Brown/Yellow
Clr	Clear
Dk Blu	Dark Blue
Dk Brn/Lt Grn	Dark Brown/Light Green
Dk Brn/Red	Dark Brown/Red
Dk Brn/Yel	Dark Brown/Yellow
Dk Grn	Dark Green
Grn	Green
Grn/Wht	Green/White
Gry	Gray
Lt Blu	Light Blue
Lt Grn	Light Green
Org	Orange
Org/Wht	Orange/White
Pnk	Pink
Pur	Purple
Pur/Blk	Purple/Black
Pur/Wht	Purple/White
Red	Red
Red/Blk	Red/Black
Red/Blu	Red/Blue
Red/Wht	Red/White
Red/Yel	Red/Yellow
Tan	Tan
Wht	White
Wht/Blk	White/Black
Wht/Blu	White/Blue
Wht/Red	White/Red
Yel	Yellow
Yel/Blk	Yellow/Black

Continued on next page

WIRE COLOR ABBREVIATION	WIRE COLOR
Yel/Red	Yellow/Red
Yel/Wht	Yellow/White

MX,24010HE,2 –19–27SEP91–2/2

Starting System Test Points—Normal Operation



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AG,OUO1085,394 –19–19SEP00–1/4

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link and fuse, F6.
6. Bottom terminal B of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F2.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse F2.
10. Left terminal of fuse, F2.	Battery voltage.	Check for failed fuse, F2. If fuse is good, check for corroded or loose terminals.
11. Terminal 30 of fuel shut-off relay.	Battery voltage.	Check for corroded connections or break in wire between fuse block and fuel shut-off relay.
12. Terminal 87A of fuel shut-off relay.	Battery voltage.	Test fuel shut-off relay. If relay is good, check for corroded or loose terminals.
13. Terminal A of male pin side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in wire between fuel shut-off relay and 10-pin connector.
14. Terminal A of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Fuel shut-off solenoid terminal.	Battery voltage.	Check for corroded connections or break in wire between 10-pin connector and fuel shut-off solenoid.

CONDITIONS:

- White wire disconnected from starter solenoid terminal S.
- Hold key switch in START position.

Continued on next page

Test Location	Normal	If Not Normal
16. Terminal ST of key switch.	Battery voltage.	Test key switch.
17. Terminal D of rear PTO switch.	Battery voltage.	Check for corroded connections or break in wire between key switch and rear PTO switch.
18. Terminal E of rear PTO switch.	Battery voltage.	Check switch position. If switch is positioned properly, test switch and replace if necessary.
19. Terminal A of neutral start switch.	Battery voltage.	Check for corroded connections or break in wire between rear PTO switch and neutral start switch.
20. Terminal B of neutral start switch.	Battery voltage.	Check for corroded or loose connections. Test neutral start switch, replace if necessary.
21. Terminal 86 of start relay.	Battery voltage.	Check for corroded connections or break in wire between neutral start switch and start relay.
22. Terminal 85 of start relay.	Less than 0.2 volt.	Check continuity to ground of black wire Nos. 010G and 010K. If black wires are good to ground, test start relay.
23. Terminal 30 of start relay.	Battery voltage.	Check for corroded connections or break in splice or wire between start relay and starter.
24. Terminal 87 of start relay.	Battery voltage.	Check for corroded or loose terminals. Test start relay.
25. Terminal 86 of bypass start relay.	Battery voltage.	Check for corroded connections or break in splice or wire between start relay and bypass start relay.
26. Terminal 85 of bypass start relay.	Less than 0.2 volt.	Check continuity to ground of black wire Nos. 010J and 010K. If black wires are good to ground, test bypass start relay.
27. Terminal 30 of bypass start relay.	Battery voltage.	Check for corroded connections or break in splice or wire between start relay and bypass start relay.
28. Terminal E of male pin side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in splice or wire between start relay and 10-pin connector.
29. Terminal E of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace coupler.
30. Wire disconnected from starter terminal S.	Battery voltage.	Check for corroded connections or break in wire between 10-pin connector and starter end of wire.

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CONDITIONS:

- Connect white wire to starter solenoid terminal S.
- Red wire disconnected from fuel shut-off solenoid at injection pump.
- Hold key switch in START position.

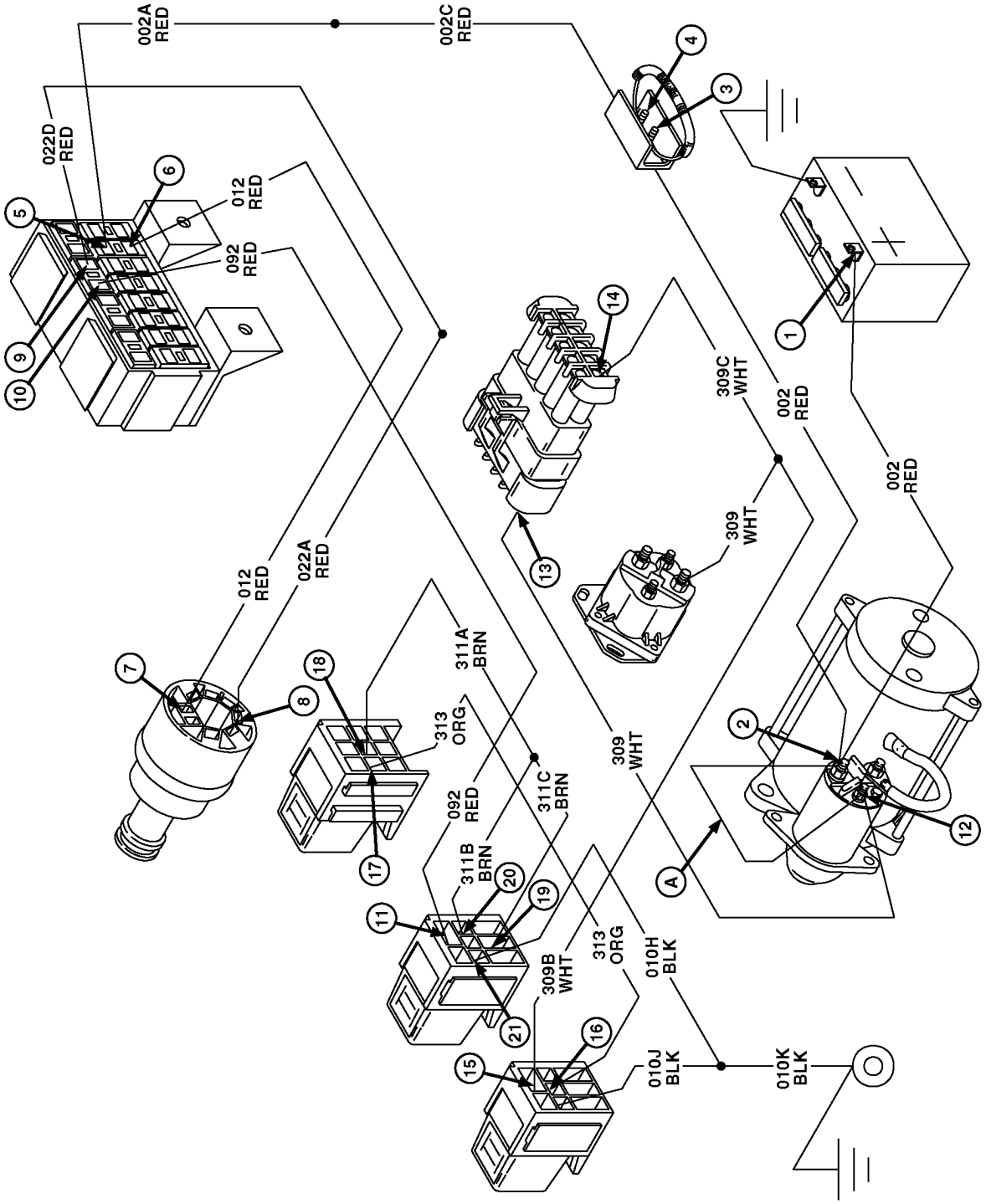
Continued on next page

AG,OUO1085,394 –19–19SEP00–3/4

Test Location	Normal	If Not Normal
31. Starter solenoid.	Engages and remains engaged.	Replace solenoid.
32. Test voltage drop between test points 1 and 2.	Less than 0.5 volt.	Check battery-to-starter cable and connections.
33. Test starter amp draw/rpm.	Less than 275 amps at 240 rpm.	Check that engine is not locked up.
34. Remove starter and perform no-load amp/rpm test. (See this group.)	190 amp maximum and 3600 rpm minimum.	Replace starter.

AG,OUO1085,394 –19–19SEP00–4/4

Starting System Test Points—Bypass Attempt



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AG,OUO1085,395 –19–19SEP00–1/3

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical test and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F2.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse, F2.
10. Left terminal of fuse, F2.	Battery voltage.	Check for failed fuse, F2. If fuse is good, check for corroded or loose terminals.
11. Terminal 30 of fuel shut-off relay.	Battery voltage.	Check for corroded connections or break in wire between middle fuse block and fuel shut-off relay.

CONDITIONS:

- Connect jumper wire (A) between starter solenoid terminals S and M.

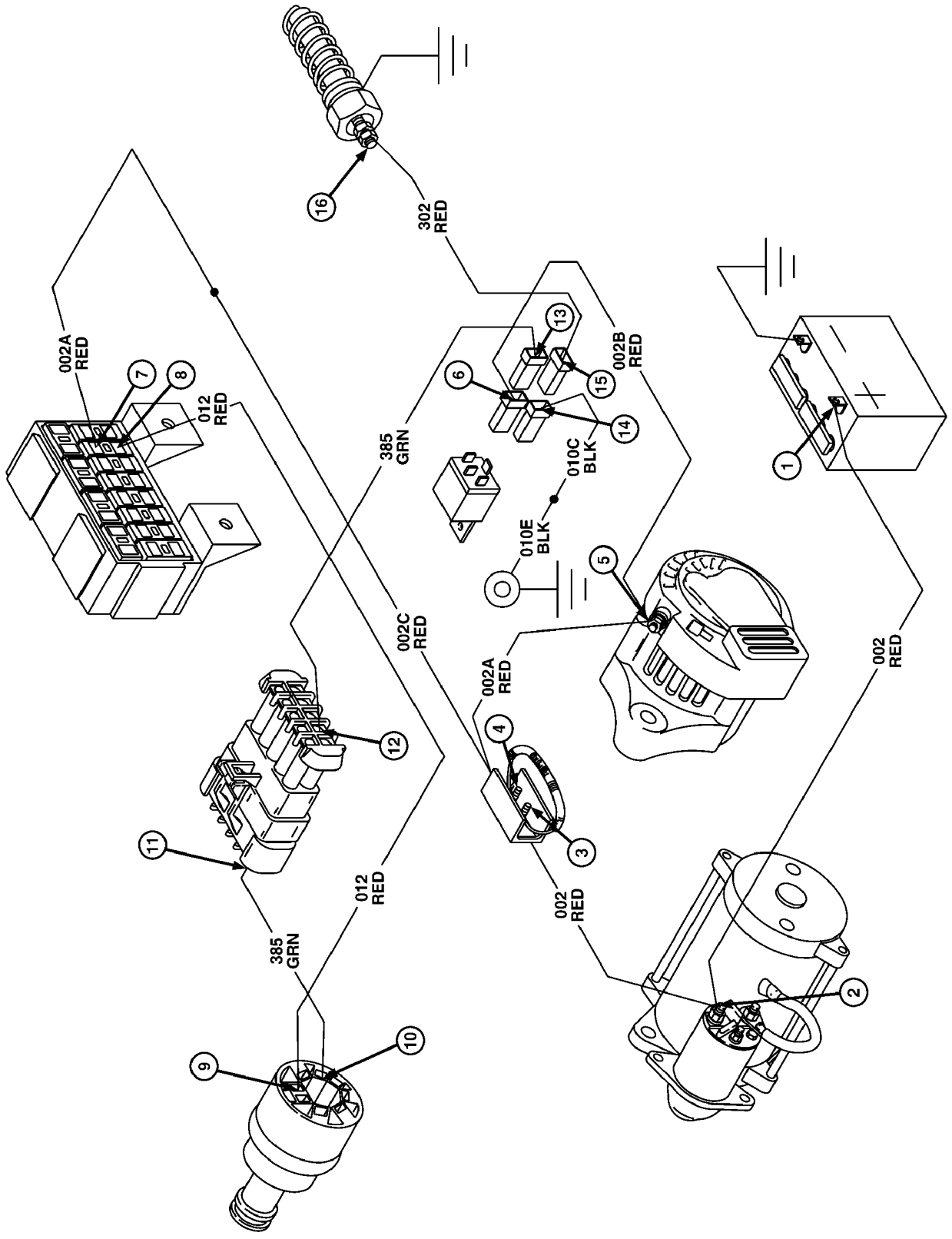
Continued on next page

IMPORTANT: Operate starter in 20-second intervals. Allow starter to cool between intervals to prevent starter damage.

Test Location	Normal	If Not Normal
12. Terminal S of starter solenoid.	Battery voltage.	Poor connection or bad jumper wire.
13. Terminal E of female socket side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in wire between starter solenoid and 10-pin connector.
14. Terminal E of male pin side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Terminal 30 of bypass start relay.	Battery voltage.	Check for corroded connections or break in splice or wire between 10-pin connector and bypass relay.
16. Terminal 87A of bypass start relay.	Battery voltage.	Test bypass start relay. If relay is good, check for corroded or loose terminals.
17. Terminal 4 of diode pack.	Battery voltage.	Check for corroded connections or break in wire between bypass start relay and diode pack.
18. Terminal 5 of diode pack.	Battery voltage.	Check for corroded or loose terminals. Test diode pack.
19. Terminal 87 of fuel shut-off relay.	Battery voltage.	Check for corroded connections or break in splice or wire between diode pack and fuel shut-off relay.
20. Terminal 86 of fuel shut-off relay.	Battery voltage.	Check for corroded connections or break in splice or wire between diode pack and fuel shut-off relay.
21. Terminal 85 of fuel shut-off relay.	Less than 0.2 volt.	Check continuity to ground of black wire Nos. 010H and 010K. If black wires are good to ground, test fuel shut-off relay.

AG,OUO1085,395 –19–19SEP00–3/3

Manifold Heater Test Points



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AG,OUO1085,396 –19–19SEP00–1/3

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

NOTE: Test points will give same results when key switch is in START position.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction box.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. B terminal of alternator.	Battery voltage.	Check for corroded connections or break in wire between starter and alternator.
6. Terminal 30 of manifold heater relay.	Battery voltage.	Check for corroded connections or break in wire between alternator and manifold heater relay.
7. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction box and 30-amp fuse, F6.
8. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
9. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.

CONDITIONS:

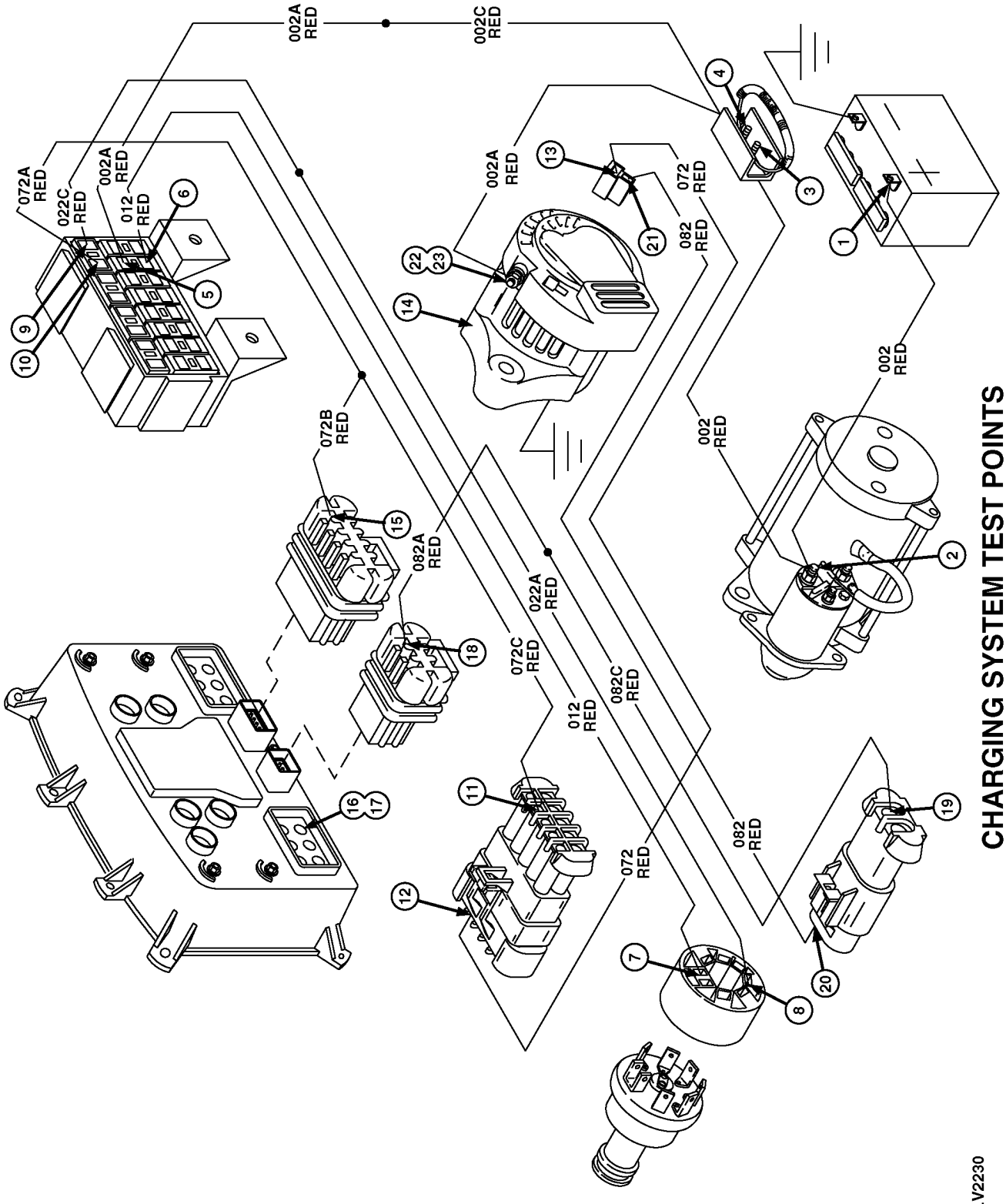
- Key switch pushed in.

Continued on next page

Test Location	Normal	If Not Normal
10. AID terminal of key switch.	Battery voltage.	Check that key switch is in the RUN or START position and pushed in. If switch is in RUN or START and pushed in, switch is bad. Replace.
11. Terminal D of female socket side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in wire between key switch and 10-pin connector.
12. Terminal D of male pin side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace coupler.
13. Terminal 86 of manifold heater relay.	Battery voltage.	Check for corroded connections or break in wire between 10-pin coupler and manifold heater relay.
14. Terminal 85 of manifold heater relay.	Less than 0.2 volts.	Check continuity to ground of black wire Nos. 010D and 010E. If black wires are good to ground, test manifold heater relay.
15. Terminal 87 of manifold heater relay.	Battery voltage.	Check for corroded or loose terminals. Test manifold heater relay.
16. Manifold heater terminal.	Battery voltage.	Check for corroded connections or break in wire between heater relay and heater.

AG,OUO1085,396 –19–19SEP00–3/3

Charging System Test Points



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AG,OUO1085,397 –19–19SEP00–1/4

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Continued on next page

AG,OUO1085,397 –19–19SEP00–2/4

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in the RUN position. If key switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F1.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse, F1.
10. Left terminal of fuse, F1.	Battery voltage.	Check for failed fuse, F1. If fuse is good, check for corroded or loose terminals.
11. Terminal J of male pin side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
12. Terminal J of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
13. Upper terminal of alternator connector.	Battery voltage.	Check for corroded connections or break in wire between 10-pin connector and alternator.
14. Alternator case.	Less than 0.2 volt.	Check alternator mounts for good ground contact to engine.
15. Terminal A of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector.
16. Top terminal of charge indicator bulb.	Battery voltage.	Check for corroded bulb socket or circuit board connections.
17. Green/blue wire terminal of charge indicator bulb.	Less than 0.2 volt.	Check or replace bulb. Check indicator circuit from alternator using test points 17—21.
18. Terminal A of instrument panel connector.	Less than 0.2 volt.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.

240
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16

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AG,OUO1085,397 –19–19SEP00–3/4

Test Location	Normal	If Not Normal
19. Terminal A of male pin side of 2-pin connector.	Less than 0.2 volt.	Check for corroded connections or break in splice or wire between instrument panel connector and 2-pin connector.
20. Terminal A of female socket side of 2-pin connector.	Less than 0.2 volt.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
21. Lower terminal of alternator connector.	Less than 0.2 volt.	Check for corroded connections or break in wire between 2-pin connector and alternator connector.
22. Output terminal of alternator.	Battery voltage.	Check for corroded connections or break in cable between starter and alternator.

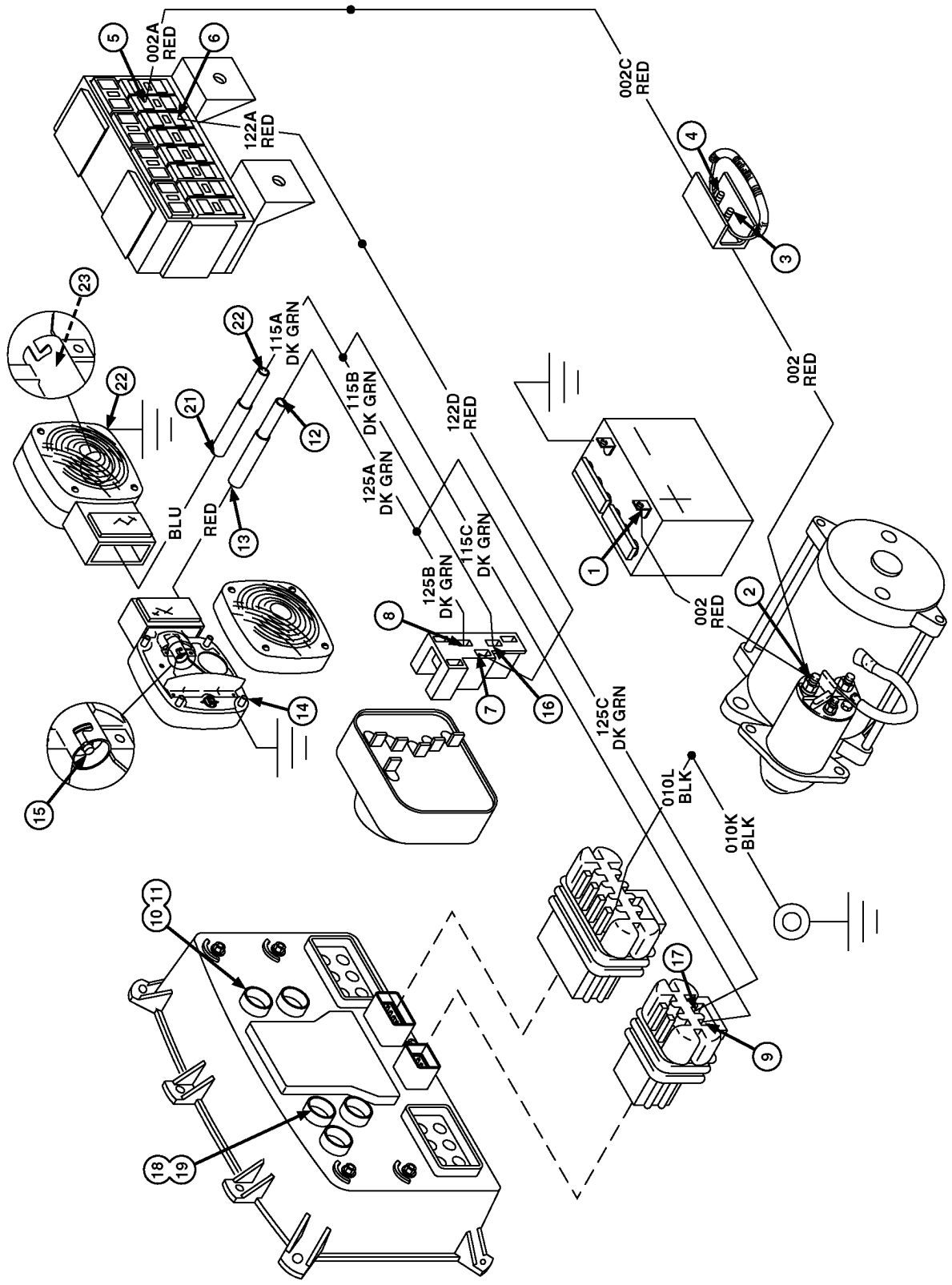
CONDITIONS:

- Start engine and operate at fast idle.

Test Location	Normal	If Not Normal
23. Output terminal of alternator.	14.2—14.8 volts.	Check belt tension. Test alternator.

AG,OUO1085,397 –19–19SEP00–4/4

Lighting System Test Points—Turn Signals (Tractors Without Cab)



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AG,OUO1085,398 –19–20SEP00–1/3

CONDITIONS:

- Key switch off.
- Transmission in P, park position.
- Meter positive lead (red) on the numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and fuse, F6.
6. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
7. Terminal 2 of turn signal controller.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and turn signal controller.

CONDITIONS:

- Turn signal controller moved to left turn position.

Test Location	Normal	If Not Normal
8. Terminal 3 of turn signal connector.	Battery voltage (pulsing).	Replace turn signal controller.
9. Terminal D of instrument connector.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between turn signal controller and instrument panel connector.
10. Top terminal of left turn indicator socket.	Battery voltage (pulsing).	Check for corroded connections between instrument panel circuit board and left turn indicator socket.
11. Bottom terminal of left turn indicator socket.	Less than 0.2 volt.	Check or replace bulb. Check ground connections of black wire, circuit No. 010, from turn indicator socket through instrument panel to ground connection on center control console.
12. Male end of bullet connector for green wire of left turn light.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between turn signal controller and bullet connector.
13. Female end of bullet connector for green wire of left turn light.	Battery voltage (pulsing).	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
14. Left turn light lens mounting screw.	Less than 0.2 volt.	Check or replace bulb. Check for good ground from base of turn light to ROPS through the mounting bolts.

Continued on next page

CONDITIONS:

- Remove left rear lens and turn signal bulb.

Test Location	Normal	If Not Normal
15. Center terminal of left turn bulb socket.	Battery voltage (pulsing).	Check for corroded connections or break in wire between bullet connector and left turn signal.
16. Terminal 4 of turn signal controller.	Battery voltage.	Replace turn signal controller.
17.Terminal D of female terminal side of instrument panel controller.	Battery voltage.	Check for corroded connections or break in splice or wire between turn signal controller and instrument panel connector.
18. Top terminal of right turn indicator socket.	Battery voltage.	Check for corroded connections between instrument panel circuit board and right turn indicator socket.
19. Bottom terminal of right turn indicator socket.	Less than 0.2 volt.	Check or replace bulb. Check ground connections of black wire circuit No. 010, from turn indicator socket through instrument panel connector to ground connection on center control console.
20. Male end of bullet connector of right turn light.	Battery voltage.	Check for corroded connections or break in splice or wire between turn signal controller and bullet connector.
21. Female end of bullet connector of right turn light.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
22. Right turn lens mounting screw.	Less than 0.2 volt.	Check or replace bulb. Check for good ground from base of turn light to ROPS, through the mounting bolts.

240
15
20

CONDITIONS:

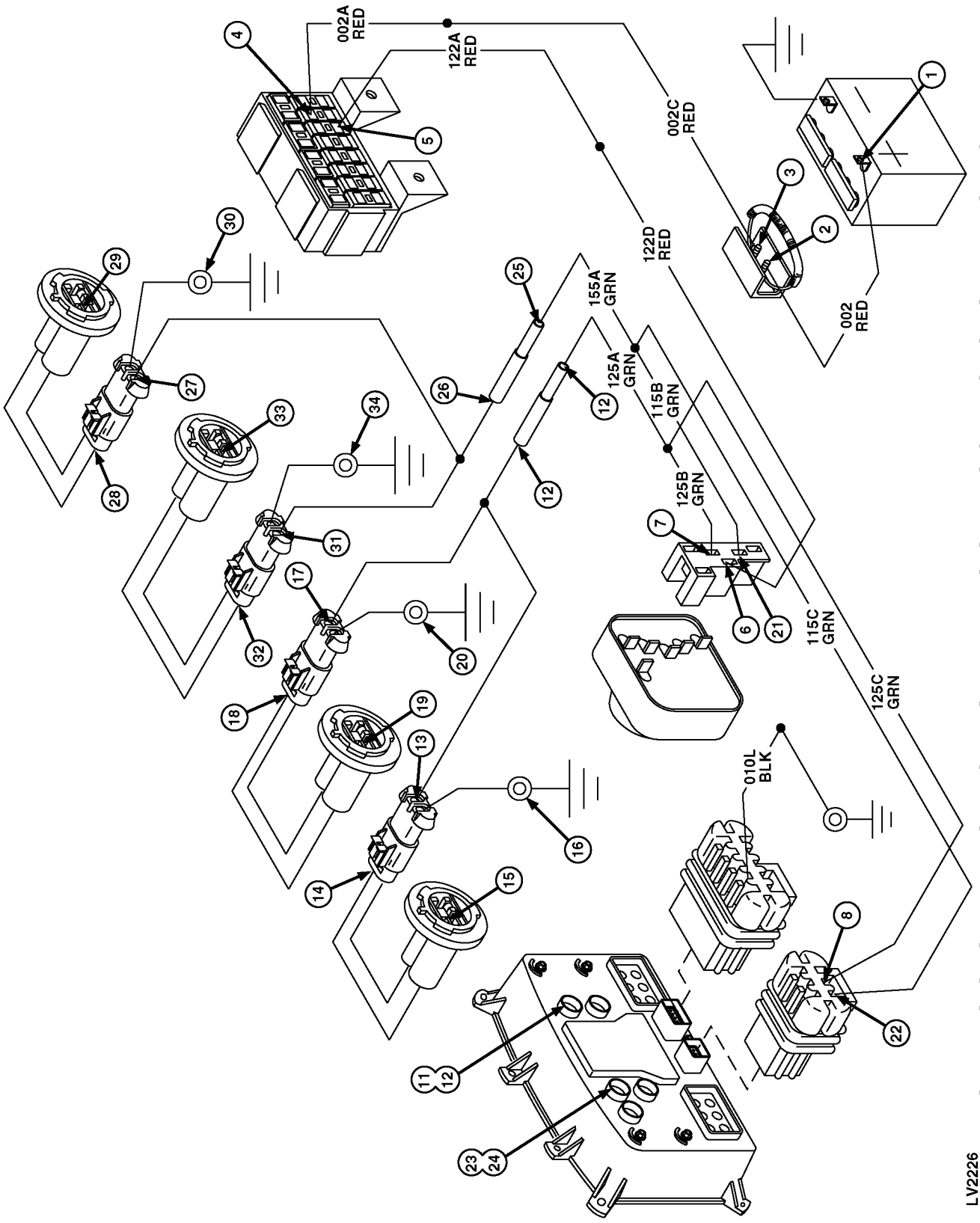
- Remove right lens and turn signal bulb.

Test Location	Normal	If Not Normal
23. Center terminal of right turn bulb socket.	Battery voltage.	Check for corroded connections or break in wire between bullet connector and left turn socket.

NOTE: To check right turn circuit, move turn signal controller to right turn position, and repeat test locations 8 through 23. Pulsing voltage will be in the right circuit, No. 115.

AG,OUO1085,398 –19–20SEP00–3/3

Lighting System Test Points—Turn Signals (Tractors With Cab)



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AG,OUO1085,399 –19–20SEP00–1/5

CONDITIONS:

- Key switch off.
- Transmission in P, park position.
- Meter positive lead (red) on the numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between battery and fuse link junction block.
3. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
4. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and fuse, F6.
5. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
6. Terminal 2 of turn signal controller.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and turn signal controller.

240
15
22

CONDITIONS:

- Turn signal controller moved to left turn position.

Continued on next page

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Test Location	Normal	If Not Normal
7. Terminal 3 of turn signal connector.	Battery voltage (pulsing).	Replace turn signal controller.
8. Terminal E of female terminal side of instrument panel connector.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between turn signal controller and instrument panel connector.
9. Top terminal of left turn indicator socket.	Battery voltage (pulsing).	Check for corroded connections between instrument panel circuit board and left turn indicator socket.
10. Bottom terminal of left turn indicator socket.	Less than 0.2 volt.	Check or replace bulb. Check ground connections of black wire, circuit No. 010, from turn indicator socket through instrument panel connector to ground connection on center control console.
11. Female end of bullet connector for green wire at bottom of left front cab post.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between turn signal controller and bullet connector.
12. Male end of bullet connector for green wire at bottom of left front cab post.	Battery voltage (pulsing).	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
13. Terminal A of female terminal side of 2-pin connector for left front warn/turn light.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between bullet connector and 2-pin connector.
14. Terminal A of male terminal side of 2-pin connector for left front warn/turn light.	Battery voltage (pulsing).	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Ground connection for left front warn/turn bulb.	Less than 0.2 volt.	Check or replace bulb. Check for corroded connections or broken ground wire between ground screw and bulb socket.

240
15
23

CONDITIONS:

- Remove left front warn/turn bulb.

Test Location	Normal	If Not Normal
16. Terminal A of left front warn/turn bulb socket.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between 2-pin connector and bulb socket.
17. Terminal A of female terminal side of 2-pin connector for left rear warn/turn light.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between bullet connector and 2-pin connector.
18. Terminal A of male terminal side of 2-pin connector for left rear warn/turn light.	Battery voltage (pulsing).	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
19. Ground connection for left rear warn/turn bulb.	Less than 0.2 volt.	Check or replace bulb. Check for corroded connections or broken ground wire between ground screw and bulb socket.

CONDITIONS:

- Remove left rear warn/turn bulb.

Continued on next page

Test Location	Normal	If Not Normal
20. Terminal A of left rear warn/turn bulb socket.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between 2-pin connector and bulb socket.
21. Terminal 4 of turn signal controller.	Battery voltage.	Replace turn signal controller.
22. Terminal D of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between turn signal controller and instrument panel connector.
23. Top terminal of right turn indicator socket.	Battery voltage.	Check for corroded connections between instrument panel circuit board and right turn indicator socket.
24. Bottom terminal of right turn indicator socket.	Less than 0.2 volt.	Check or replace bulb. Check ground connections of black wire circuit No. 010, from turn indicator socket through instrument panel connector to ground connection on tractor frame behind instrument panel.
25. Female end of bullet connector at bottom of right front cab post.	Battery voltage.	Check for corroded connections or break in splice or wire between turn signal controller and bullet connector.
26. Male end of bullet connector at bottom of right front cab post.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
27. Terminal A of female terminal side of 2-pin connector for right front warn/turn light.	Battery voltage.	Check for corroded connections or break in splice or wire between bullet connector and 2-pin connector.
28. Terminal A of male terminal side of 2-pin connector for right front warn/turn light.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
29. Ground connection for right front warn/turn bulb.	Less than 0.2 volt.	Check or replace bulb. Check for corroded connections or broken ground wire between ground screw and bulb socket.

240
15
24

CONDITIONS:

- Remove right front warn/turn bulb.

Test Location	Normal	If Not Normal
30. Terminal A of right front warn/turn bulb socket.	Battery voltage.	Check for corroded connections or break in splice or wire between 2-pin connector and bulb socket.
31. Terminal A of female terminal side of 2-pin connector for right rear warn/turn light.	Battery voltage.	Check for corroded connections or break in splice or wire between bullet connector and 2-pin connector.
32. Terminal A of male terminal side of 2-pin connector for right rear warn/turn light.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
33. Ground connection for right rear warn/turn bulb.	Less than 0.2 volt.	Check or replace bulb. Check for corroded connections or broken ground wire between ground screw and bulb socket.

Continued on next page

CONDITIONS: Remove right rear warn/turn bulb.

Test Location	Normal	If Not Normal
34. Terminal A of right rear warn/turn bulb socket.	Battery voltage.	Check for corroded connections or break in splice or wire between 2-pin connector and bulb socket.

NOTE: To check right turn circuit, move turn signal controller to right turn position and repeat test locations 8 through 34. Pulsing voltage will be in the right circuit, no. 115.

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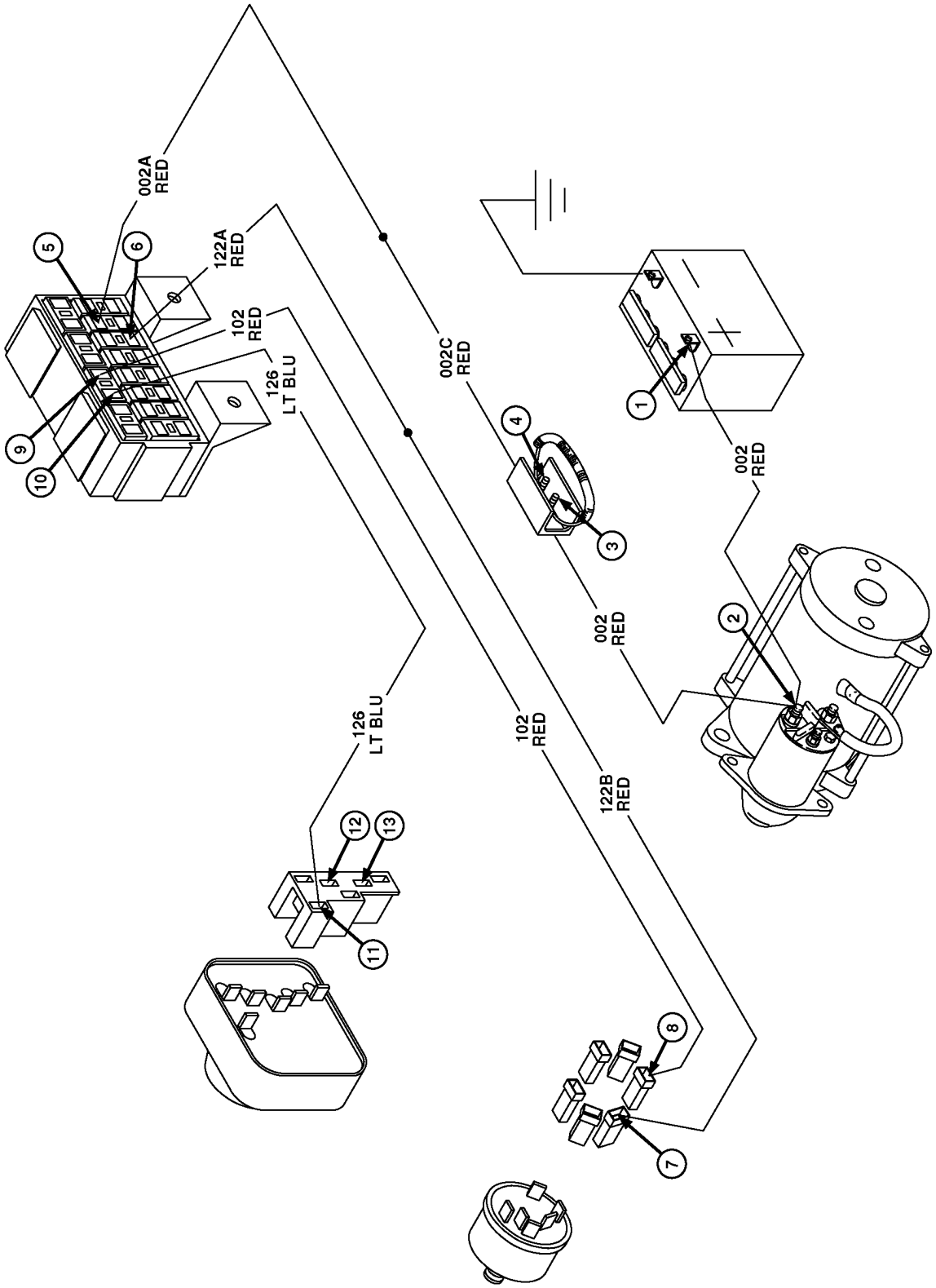
240
15
25

Lighting System Test Points—Warning Lights (All Tractors)



LIGHTING SYSTEM TEST POINTS – WARNING LIGHTS (ALL TRACTORS)

LV2232

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Continued on next page

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CONDITIONS:

- Key switch off.
- Transmission in P, park position.
- Park brake engaged.
- Meter positive lead (red) on the numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between battery and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and fuse, F6.
6. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
7. Terminal B of light switch.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and light switch.

CONDITIONS:

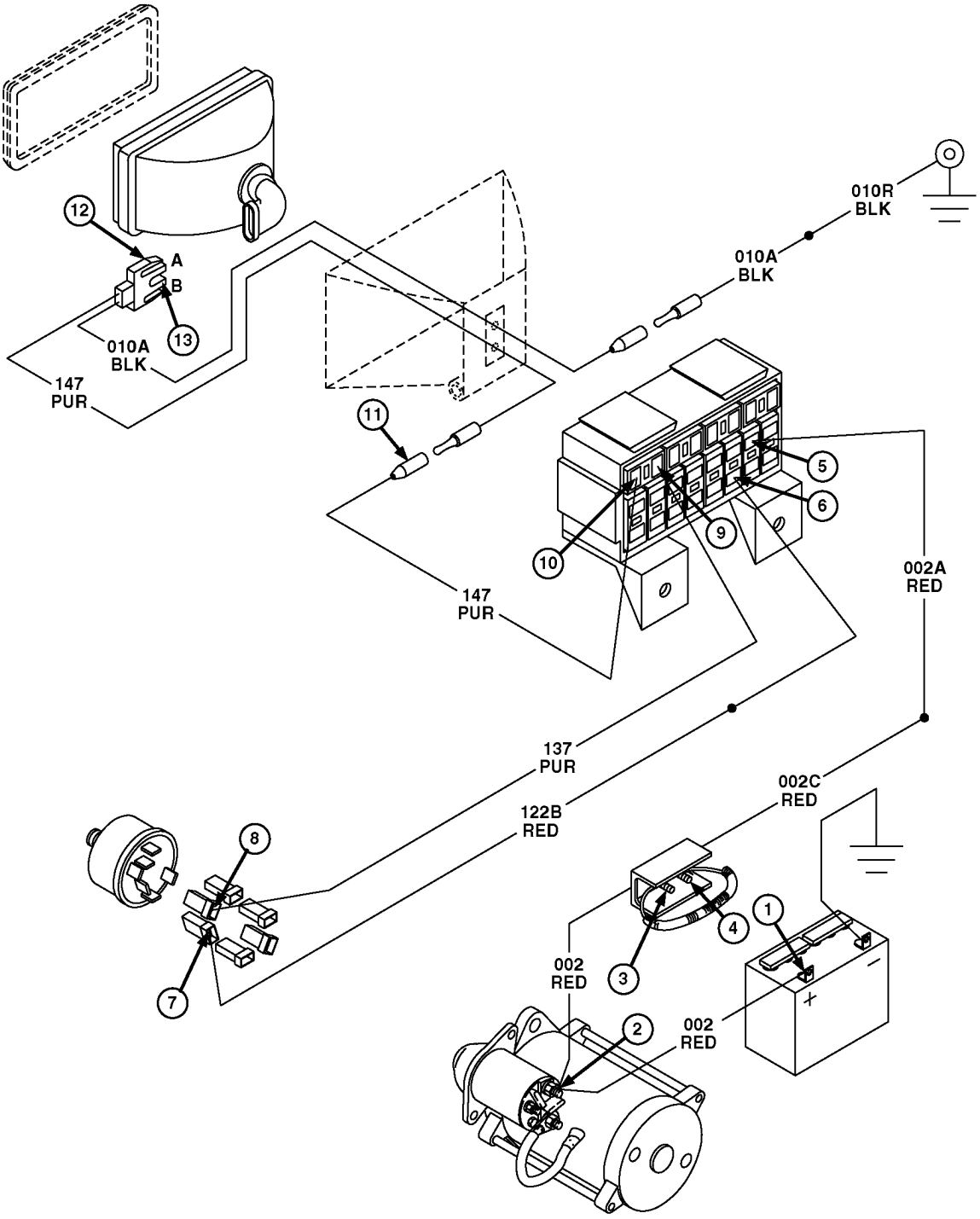
NOTE: Warning lights operate in three light switch positions, W, H_1, and H_2.

Turn light switch to W, H_1, or H_2.

Test Location	Normal	If Not Normal
8. Terminal W of light switch.	Battery voltage.	Check that light switch is in W, H_1 or H_2 position. If switch is in proper position, switch is bad. Replace.
9. Right terminal of fuse, F3.	Battery voltage.	Check for corroded connections or break in wire between light switch and fuse, F3.
10. Left terminal of fuse, F3.	Battery voltage.	Check for failed fuse, F3. If fuse is good, check for corroded or loose terminals.
11. Terminal 1 of turn signal controller.	Battery voltage.	Check for corroded connections or break in wire between fuse block and turn signal controller.
12. Terminal 3 of turn signal controller.	Battery voltage (pulsing).	Replace turn signal controller.
13. Terminal 4 of turn signal controller.	Battery voltage (pulsing).	Replace turn signal controller.

NOTE: The remaining indicators and lights are the same as turn signal circuit. Refer to turn signal diagnosis if further diagnosis is required. In procedures for tractors without cab, perform steps 7—21. For tractors with cab, perform steps 9—34. When warning lights function, both right and left sides flash.

Lighting System Test Points—Rear Work Light (Tractors Without Cab)



LV2241

LIGHTING SYSTEM TEST POINTS – REAR WORK LIGHT

LV2241 –UN–26NOV97

Continued on next page

AG,OUO1085,401 –19–20SEP00–1/3

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between battery and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and fuse, F6.
6. Bottom terminal B of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
7. Terminal B of light switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and light switch.

240
15
29

CONDITIONS:

NOTE: High beam headlights will also come on.

Turn light switch to F position.

Test Location	Normal	If Not Normal
8. Terminal FL of light switch.	Battery voltage.	Check that light switch is in F position. If switch is in F position, switch is bad. Replace.
9. Right terminal of fuse, F4.	Battery voltage.	Check for corroded connections or break in wire between light switch and fuse, F4.
10. Left terminal of fuse, F4.	Battery voltage.	Check for failed fuse, F4. If fuse is good, check for corroded or loose terminals.

Continued on next page

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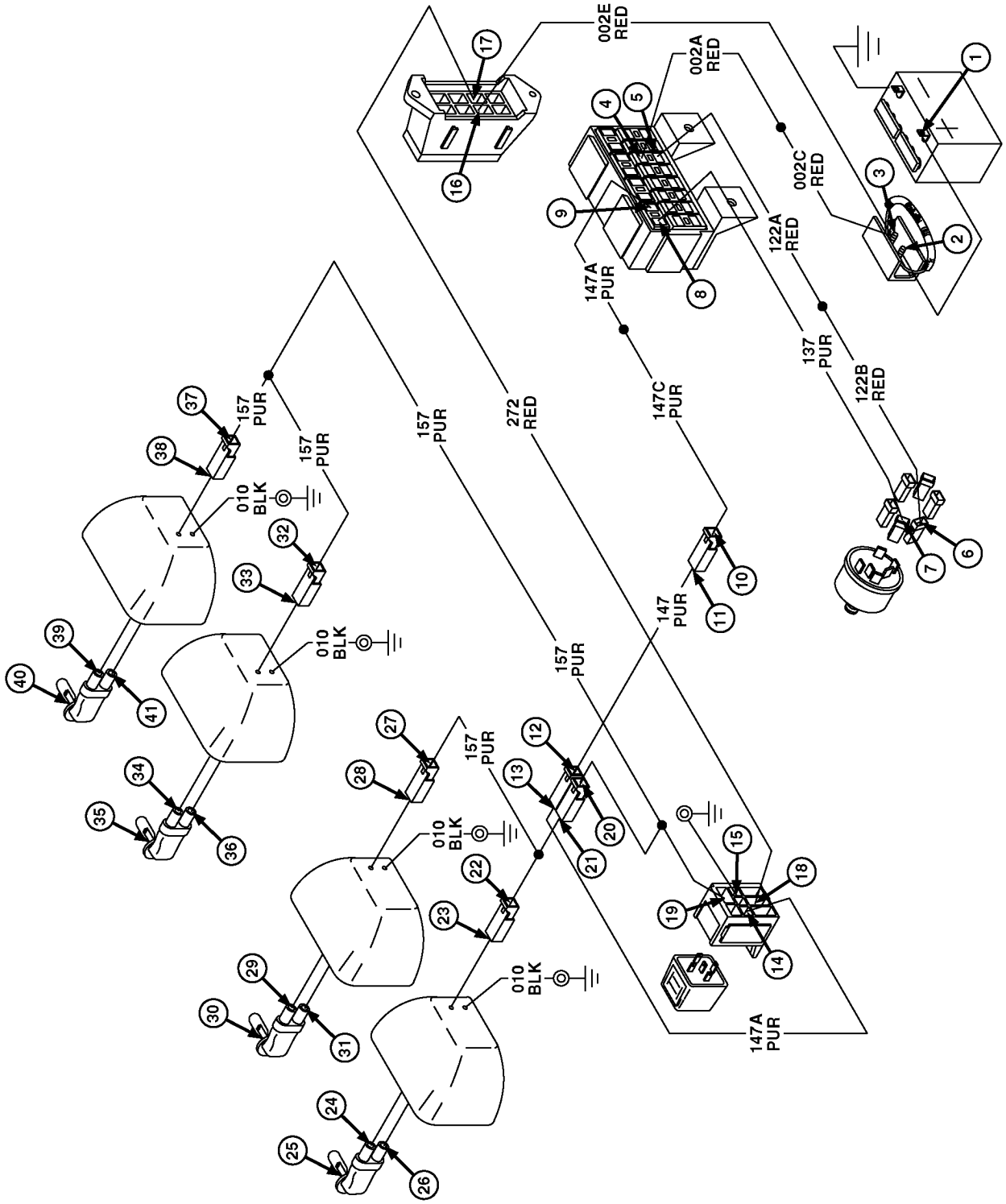
NOTE: Illustration shows the rear work light connectors disconnected for identification purposes only. Disconnect connector(s) only if test requires it.

Test Location	Normal	If Not Normal
11. Female end of purple wire bullet connector located below left support of ROPS. (Disconnect bullet connector.)	Battery voltage.	Check for corroded connections or break in wire between bullet connector and fuse block.
12. Terminal A of female socket side of rear work light connector.	Battery voltage.	Check for corroded connections or break in wire between fuse block and work light connector.
13. Terminal B of female socket side of rear work light connector.	Less than 0.2 volt.	Check or replace bulb. Check continuity of black wires Nos. 010R-010A through bullet connector to cap screw (ground) on rockshaft cover.

240
15
30

AG,OUO1085,401 –19–20SEP00–3/3

Lighting System Test Points—Flood Lights (Tractors With Cab)



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CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link.	Battery voltage.	Check for loose or corroded terminal or break in wire between battery and fuse link.
3. Right post of fuse link.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
4. Top terminal of 30-amp fuse, F7.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse link and fuse, F7.
5. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for loose or corroded terminals.
6. Terminal B of light switch.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and light switch.

240
15
32

CONDITIONS:

- Turn light switch to F position.

Continued on next page

AG,OUO1085,402 –19–20SEP00–2/6

NOTE: High beam headlights will also come on.

Test Location	Normal	If Not Normal
7. Terminal FL of light switch.	Battery voltage.	Check that light switch is in F position. If switch is in F position, switch is bad. Replace.
8. Left terminal of fuse, F4.	Battery voltage.	Check for corroded connections or break in splice or wire between light switch and fuse block.
9. Right terminal of fuse, F4.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for loose or corroded terminals.
10. Female side of rear harness-to-cab connector at bottom of left front cab post.	Battery voltage.	Check for loose or corroded connections or break in splice or wire between fuse block and connector.
11. Male side of rear harness-to-cab harness connector at bottom of left front cab post.	Battery voltage.	Be sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
12. Terminal A of female side of 2-wire connector at left front corner of cab roof.	Battery voltage.	Check for loose or corroded connection or break in wire between cab harness connector and 2-wire connector.
13. Terminal A of male side of 2-wire connector at left front corner of cab roof.	Battery voltage.	Be sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
14. Terminal 86 of flood light relay (located behind cab overhead control panel).	Battery voltage.	Check for loose or corroded connection or break in wire between 2-wire connector and relay.
15. Terminal 85 of flood light relay.	Battery voltage.	Check for continuity to ground of black wire No. 010M, or test flood light relay.
16. Left terminal of fuse F14 (red wire No. 002E) in overhead control panel.	Battery voltage.	Check for loose or corroded connection or break in wire between 2-wire connector and relay.
17. Right terminal of fuse, F14.	Battery voltage.	Check for failed fuse, F14. If fuse is good, check for loose or corroded connections.
18. Terminal 30 of flood light relay.	Battery voltage.	Check for loose or corroded connections or break in wire between cab fuse block and flood light relay.
19. Terminal 87 of flood light relay.	Battery voltage.	Check for loose or corroded connections. Test flood light relay.
20. Terminal B of female side of 2-wire connector at left front corner of cab roof.	Battery voltage.	Check for loose or corroded connections or break in splice or wire. 2-wire connector and flood relay.
21. Terminal B of male side of 2-wire connector at left front corner of cab roof.	Battery voltage.	Be sure connector is fully pushed together. check for corroded or damaged terminals. Repair or replace connector.

240
15
33

Continued on next page

Test Location	Normal	If Not Normal
22. Female side of left rear flood light connector.	Battery voltage.	Check for loose or corroded connections or break in wire between 2-wire connector and flood light connector.
23. Male side of left rear flood light connector.	Battery voltage.	Be sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.

CONDITIONS:

- Flood light lens removed. Bulb socket removed from lens.

240
15
34

Test Location	Normal	If Not Normal
24. Terminal A of flood light bulb socket.	Battery voltage.	Check for loose or corroded connection or break in wire between flood light connector and bulb socket.
25. Bulb terminal corresponding to terminal A of bulb socket.	Battery voltage.	Make sure bulb is fully seated in connector. Check for corroded or damaged terminals. Repair or replace connector.
26. Terminal B of flood light bulb socket.	Less than 0.2 volt.	Check or replace bulb. Check for continuity to ground between terminal B and ground screw.
27. Female side of right rear flood light connector.	Battery voltage.	Check for loose or corroded connections or break in wire between 2-wire connector and flood light connector.
28. Male side of right rear flood light connector.	Battery voltage.	Be sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.

CONDITIONS:

- Flood light lens removed. Bulb socket removed from lens.

Continued on next page

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Test Location	Normal	If Not Normal
29. Terminal A of flood light bulb socket.	Battery voltage.	Check for loose or corroded connection or break in wire between flood light connector and bulb socket.
30. Bulb terminal corresponding to terminal A of bulb socket.	Battery voltage.	Make sure bulb is fully seated in connector. Check for corroded or damaged terminals. Repair or replace connector.
31. Terminal B of flood light bulb socket.	Less than 0.2 volt.	Check or replace bulb. Check for continuity to ground between terminal B and ground screw.
32. Female side of left front flood light connector.	Battery voltage.	Check for loose or corroded connections or break in wire between 2-wire connector and flood light switch.
33. Male side of left front flood light connector.	Battery voltage.	Be sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.

CONDITIONS:

- Flood light lens removed. Bulb socket removed from lens.

Test Location	Normal	If Not Normal
34. Terminal A of flood light bulb socket.	Battery voltage.	Check for loose or corroded connection or break in wire between flood light connector and bulb socket.
35. Bulb terminal corresponding to terminal A of bulb socket.	Battery voltage.	Make sure bulb is fully seated in connector. Check for corroded or damaged terminals. Repair or replace connector.
36. Terminal B of flood light bulb socket.	Less than 0.2 volt.	Check or replace bulb. Check for continuity to ground between terminal B and ground screw.
37. Female side of right front flood light connector.	Battery voltage.	Check for loose or corroded connections or break in splice or wire between 2-wire connector and flood light relay.
38. Male side of right front flood light connector.	Battery voltage.	Be sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.

CONDITIONS:

- Flood light lens removed. Bulb socket removed from lens.

Continued on next page

Test Location	Normal	If Not Normal
39. Terminal A of flood light bulb socket.	Battery voltage.	Check for loose or corroded connection or break in wire between flood light connector and bulb socket.
40. Bulb terminal corresponding to terminal A of bulb socket.	Battery voltage.	Make sure bulb is fully seated in connector. Check for corroded or damaged terminals. Repair or replace connector.
41. Terminal B of flood light bulb socket.	Less than 0.2 volt.	Check or replace bulb. Check for continuity to ground between terminal B and ground screw.

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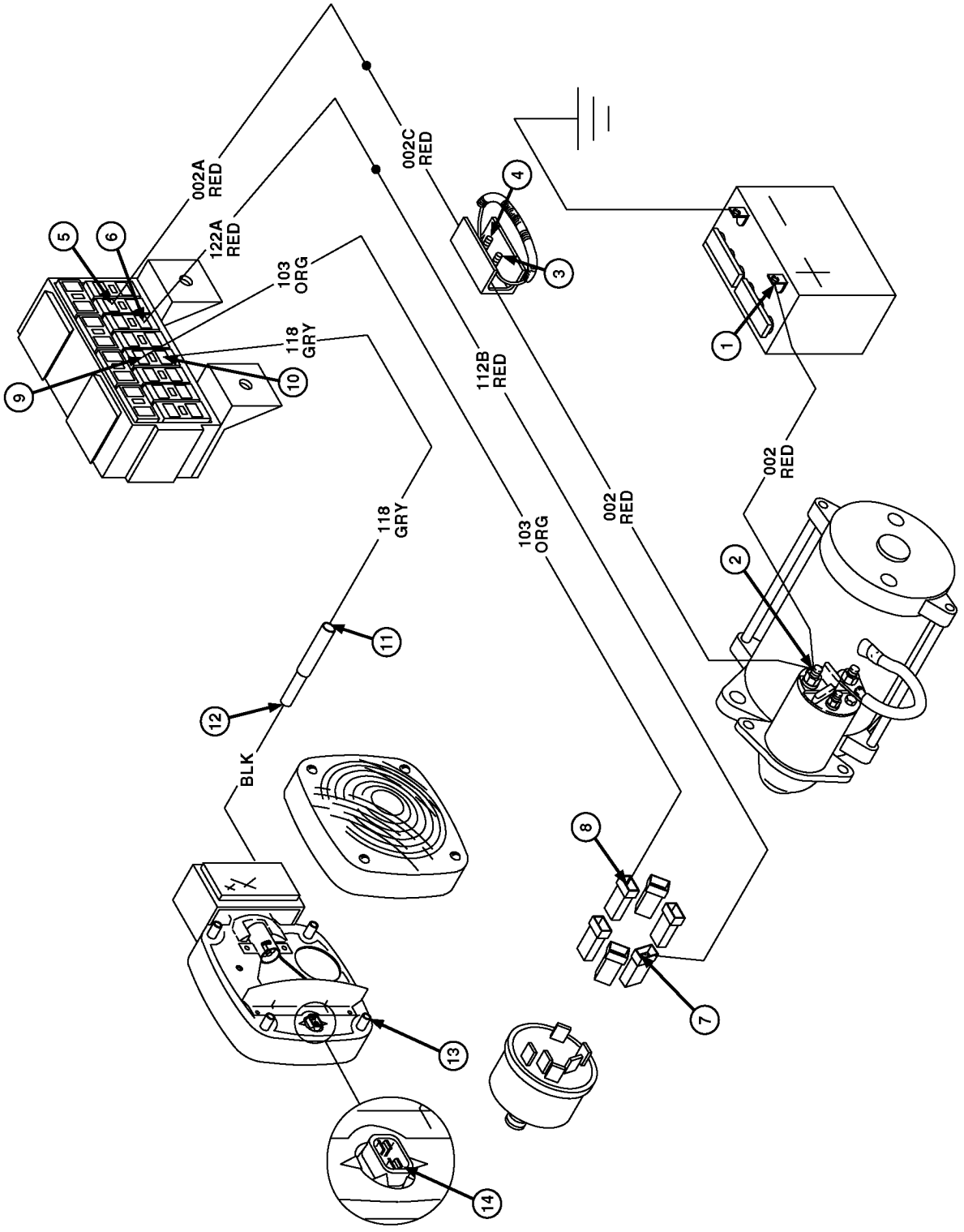
Lighting System Test Points—Tail Lights (Tractors Without Cab)



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OUO1085,0000193 –19–21SEP00–1/3

CONDITIONS:

- Key switch off.
- Transmission in P, park position.
- Light switch in H_1 or H_2 position.
- Meter positive lead (red) on the numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

NOTE: Tail light is on when light switch is in H_1 or H_2 position.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery or starter.
3. Left post of fuse link.	Battery voltage.	Check for loose or corroded terminal or break in wire between battery and fuse link junction block.
4. Right post of fuse link.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and fuse, F6.
6. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
7. Terminal B of light switch.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and light switch.
8. Terminal TL of light switch.	Battery voltage.	Check that light switch is in H_1 or H_2 position. If switch is in proper position, switch is bad. Replace.
9. Top terminal of fuse, F9.	Battery voltage.	Check for corroded connections or break in wire between light switch and fuse, F9.
10. Bottom terminal of fuse, F9.	Battery voltage.	Check for failed fuse, F9. If fuse is good, check for corroded or loose terminals.
11. Female end of bullet connector for gray wire of tail light.	Battery voltage.	Check for corroded connections or break in wire between fuse block and bullet connector.
12. Male end of bullet connector for black wire of tail light.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminal. Repair or replace connector.
13. Left turn lens mounting screw.	Less than 0.2 volt.	Check or replace bulb. Check for good ground from base of turn light to ROPS through the mounting bolts.

CONDITIONS:

- Remove left rear lens and turn signal bulb.

Continued on next page

Test Location	Normal	If Not Normal
14. Outer terminal of tail light socket.	Battery voltage.	Check for corroded connections or break in wire between bullet connector and tail light socket terminal.

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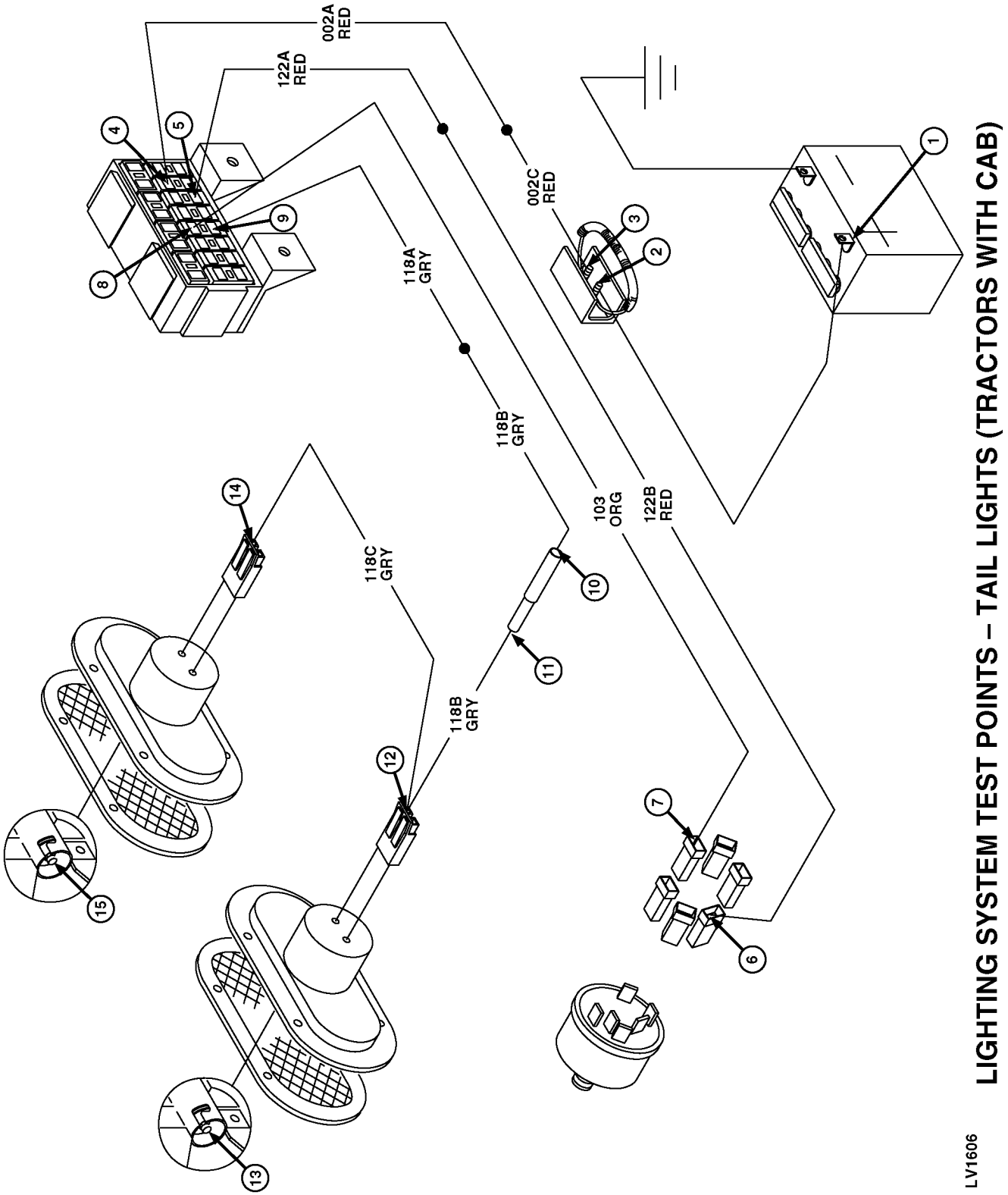
Lighting System Test Points—Tail Lights (Tractors With Cab)



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OUO1085,0000194 –19–21SEP00–1/3

CONDITIONS:

- Key switch off.
- Transmission in P, park position.
- Light switch in H_1 or H_2 position.
- Meter positive lead (red) on the numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

NOTE: Tail lights are on when light switch is in H_1 or H_2 position.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between battery and fuse link.
3. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
4. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link and fuse block.
5. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
6. Terminal B of light switch.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and light switch.
7. Terminal TL of light switch.	Battery voltage.	Check that light switch is in H_1 or H_2 position. If switch is in proper position, switch is bad. Replace.
8. Top terminal of fuse, F9.	Battery voltage.	Check for corroded connections or break in wire between light switch and fuse, F9.
9. Bottom terminal of fuse, F9.	Battery voltage.	Check for failed fuse, F9. If fuse is good, check for corroded or loose terminals.
10. Female end of bullet connector for tail light harness.	Battery voltage.	Check for corroded connections or break in wire between fuse block and bullet connector.
11. Male end of bullet connector for tail light harness.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminal. Repair or replace connector.

CONDITIONS:

- Left tail light lens removed.

Test Location	Normal	If Not Normal
12. Male terminal of left tail light connector.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between bullet connector and tail light connector.

CONDITIONS:

- Left tail light bulb removed.

Continued on next page

Test Location	Normal	If Not Normal
13. Center terminal of left tail bulb socket.	Battery voltage.	Check for corroded connections or break in wire between tail light connector and tail light socket.

CONDITIONS:

- Right tail light lens removed.

Test Location	Normal	If Not Normal
14. Male terminal of right tail light connector.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between bullet connector and tail light connector.

CONDITIONS:

- Right tail light bulb removed.

240
15
42

Test Location	Normal	If Not Normal
15. Center terminal of right tail bulb socket.	Battery voltage.	Check for corroded connections or break in wire between tail light connector and tail light socket.

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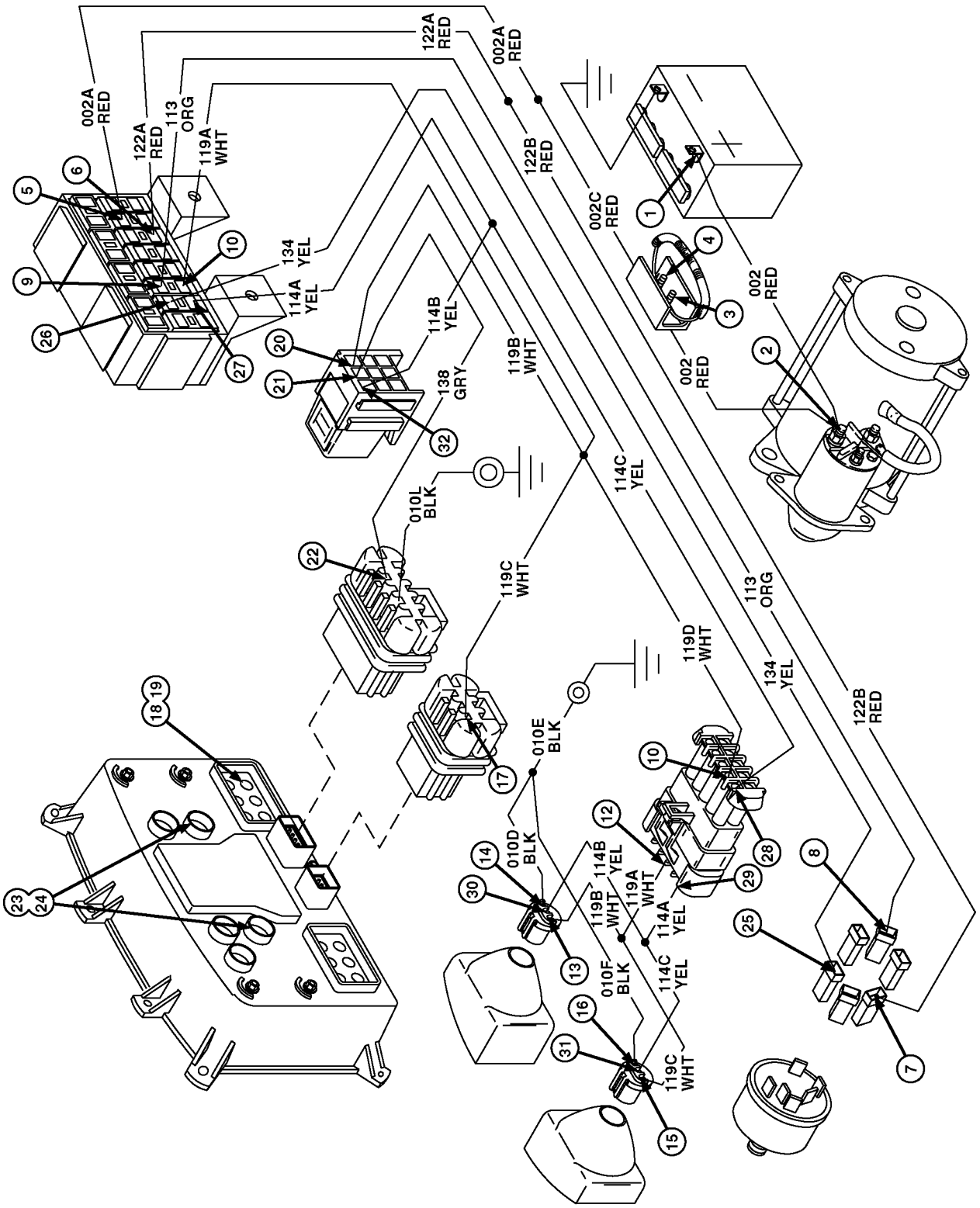
Lighting System Test Points—Headlights and Instrument Lights



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CONDITIONS:

- Key switch off.
- Transmission in P, park position.
- Light switch in H_1 position.
- Meter positive lead (red) on the numbered test point.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

240
15
44

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OUO1085,0000196 –19–22SEP00–2/5

Test Location	Normal	If Not Normal
HIGH BEAM HEADLIGHT CIRCUIT		
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link junction block and fuse, F6.
6. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
7. Terminal B of light switch.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and light switch.
8. Terminal HD1 of light switch.	Battery voltage.	Check that light switch is in H_1 position. If switch is in H_1, switch is bad. Replace.
9. Top terminal of fuse, F10.	Battery voltage.	Check for corroded connections or break in wire between light switch and fuse, F10.
10. Bottom terminal of fuse, F10.	Battery voltage.	Check for failed fuse, F10. If fuse is good, check for corroded or loose terminals.
11. Terminal G of male pin side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and 10-pin connector.
12. Terminal G of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
13. Terminal A of right headlight connector	Battery voltage.	Check for corroded connections or break in splice or wire between 10-pin connector and headlight.
14. Terminal C of right headlight connector.	Less than 0.2 volt.	Check or replace bulb. Check continuity to ground of black wire Nos. 010D and 010E to tractor frame on left side near battery.
15. Terminal A of left headlight connector.	Battery voltage.	Check for corroded connections or break in splice or wire between 10-pin connector and headlight.
16. Terminal C of left headlight connector.	Less than 0.2 volt.	Check or replace bulb. Check continuity to ground of black wire Nos. 010F and 010E to tractor frame on left side near battery.
17. Terminal C of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector.
18. Top terminal of high beam indicator socket.	Battery voltage.	Check for corroded connections or break in wire between instrument panel connector and high beam indicator socket.

Continued on next page

Test Location	Normal	If Not Normal
19. Bottom terminal of high beam indicator socket.	Less than 0.2 volts.	Check or replace bulb. Check ground continuity of black wire circuit No. 010, from indicator socket through instrument panel connector to ground connection on tractor frame behind instrument panel.
INSTRUMENT LIGHTS CIRCUIT		
20. Terminal 3 of diode pack.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and diode pack.
21. Terminal 2 of diode pack.	Battery voltage.	Check for corroded or loose terminals. Test diode pack.
22. Terminal B of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in wire between diode pack and instrument panel connector.
23. Red/white terminal of each instrument light bulb socket.	Battery voltage.	Check for corroded connections or break in splice or wire between instrument panel connector and each light socket.
24. Black wire terminal of each instrument light bulb socket.	Less than 0.2 volt.	Check or replace bulb(s). Check ground continuity of black wire circuit No. 010, from each light socket through instrument panel connector to ground connection on tractor frame behind instrument panel.

240
15
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CONDITIONS:

- Turn light switch to H_2 position.

Continued on next page

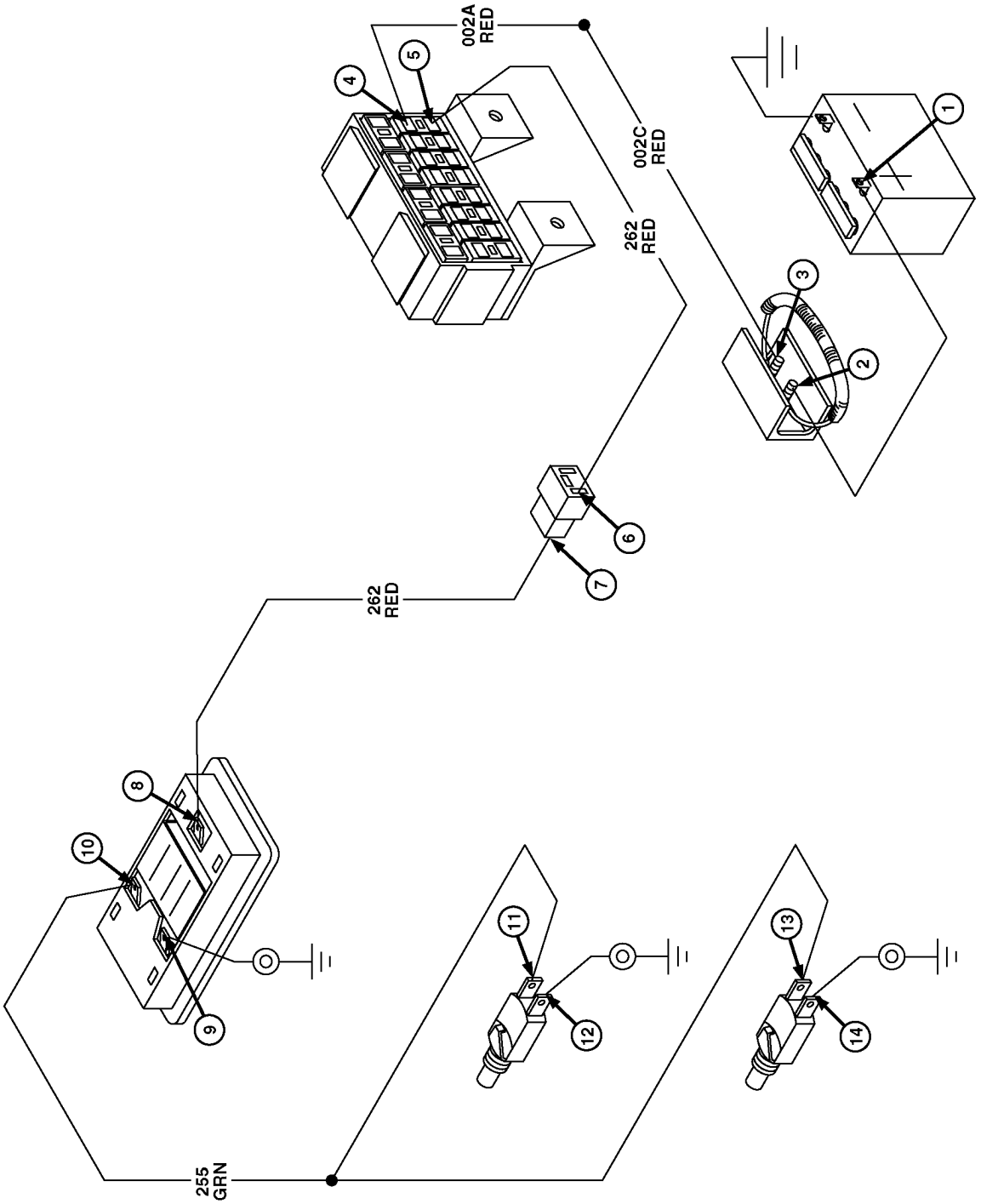
Test Location	Normal	If Not Normal
LOW BEAM HEADLIGHT CIRCUIT		
25. Terminal H_2 of light switch.	Battery voltage.	Check that light switch is in H_2 position. If switch is in H_2, switch is bad. Replace.
26. Top terminal of fuse, F11.	Battery voltage.	Check for corroded connections or break in splice or wire between light switch and fuse block.
27. Bottom terminal of fuse, F11.	Battery voltage.	Check for failed fuse, F11. If fuse is good, check for corroded or loose terminals.
28. Terminal F of male pin side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and 10-pin connector.
29. Terminal F of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
30. Terminal B of right headlight connector.	Battery voltage.	Check for corroded connections or break in splice or wire between 10-pin connector and headlight.
31. Terminal B of left headlight connector.	Battery voltage.	Check for corroded connections or break in splice or wire between 10-pin connector and headlight.
32. Terminal 1 of diode pack.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and diode pack.

NOTE: Terminal 2 of diode pack allows power from terminals 1 and 3 to flow to the instrument panel lights.

Repeat test points 21 through 24 if instrument lights are not on when light switch is in H_2 position.

OUO1085,0000196 –19–22SEP00–5/5

Lighting System Test Points—Dome Light (Tractors With Cab)



LV1609 –19–15DEC97

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OUO1085,0000197 –19–22SEP00–1/3

CONDITIONS:

- Transmission in P, park position.
- PTO Disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on the numbered test points.
- Cab doors closed.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link.	Battery voltage.	Check for loose or corroded terminal, or break in wire between battery and fuse link.
3. Right post of fuse link.	Battery voltage.	Check for loose or corroded terminal, or replace fuse link.
4. Top terminal of 30-amp fuse, F5.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse link and fuse, F5.
5. Bottom terminal of fuse, F5.	Battery voltage.	Check for failed fuse, F5. If fuse is good, check for corroded or loose terminals.
6. Terminal A of female side of 3-wire connector at bottom of right front cab post.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse block and connector.
7. Terminal A of male side of 3-wire connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
8. Dome light terminal for red wire No. 262.	Battery voltage.	Check for loose or corroded connection or break in wire between 3-wire connector and dome light.
9. Dome light terminal for black wire No. 010.	Less than 0.2 volt.	Check or replace bulb. Check for continuity to ground through black wire No. 010.

CONDITIONS:

- Dome light switched to OFF position.
- Left door open.

Test Location	Normal	If Not Normal
10. Dome light terminal for green wire No. 255.	Less than 0.02 volt.	Check or replace bulb. Test dome light switch.
11. Left door switch terminal for green wire No. 255.	Less than 0.02 volt.	Check for loose or corroded connection or break in splice or wire between dome light and door switch.
12. Left door switch terminal for black wire No. 010.	Less than 0.2 volt.	Check for continuity to ground through black wire. Test door switch.

CONDITIONS:

- Dome light switched to OFF position.
- Right door open.

Continued on next page

Test Location	Normal	If Not Normal
13. Right door switch terminal for green wire No. 255.	Less than 0.02 volt.	Check for loose or corroded connection or break in splice or wire between dome light and door switch.
14. Right door switch terminal for black wire No. 010.	Less than 0.2 volt.	Check for continuity to ground through black wire. Test door switch.

OUO1085,0000197 –19–22SEP00–3/3

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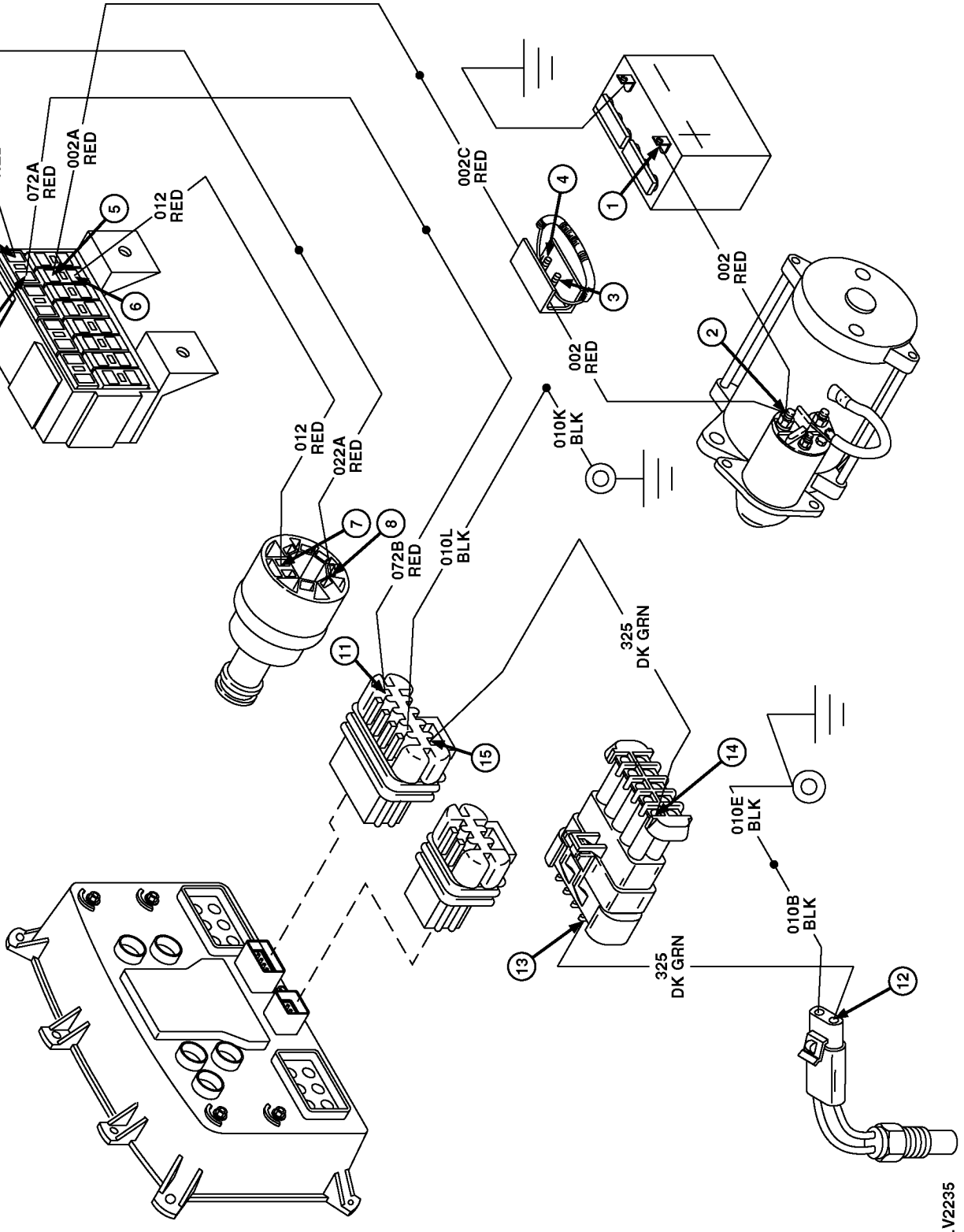
Instrument Panel System Test Points—Tachometer/Hourmeter



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AG,OUO1023,481 –19–24JAN00–1/3

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F1.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse F1.
10. Left terminal of fuse, F1.	Battery voltage.	Check for failed fuse, F1. If fuse is good, check for corroded or loose terminals.
11. Terminal A of instrument panel wiring harness connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector. Check continuity to ground of black wires Nos. 010L and 010K. If connections and wires are good to ground, replace hourmeter and tachometer by replacing instrument panel.

CONDITIONS:

- Engine operating at slow idle.
- Meter on AC volts.

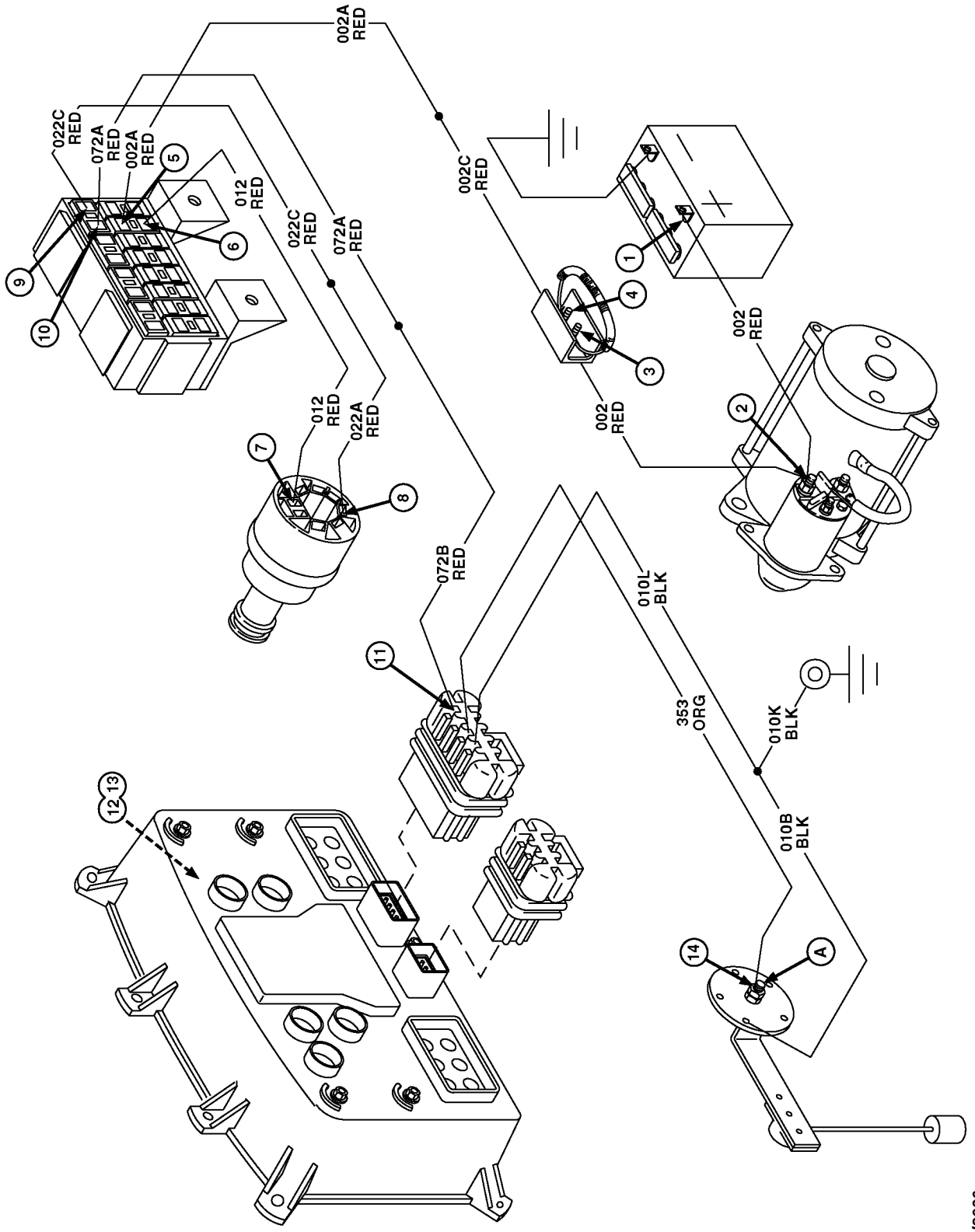
Continued on next page

AG,OUO1023,481 –19–24JAN00–2/3

Test Location	Normal	If Not Normal
12. Green wire terminal of magnetic pickup sensor.	Sensor output voltage (1 VAC minimum).	Check continuity to ground of black wire Nos. 010B and 010E. If black wires are good to ground, check or replace magnetic pickup sensor.
13. Terminal K of female socket side of 10-pin connector.	Sensor output voltage.	Check for corroded connections or break in wire between pickup sensor and 10-pin connector.
14. Terminal K of male pin side of 10-pin connector.	Sensor output voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Terminal D of female terminal side of instrument panel connector.	Sensor output voltage.	Check for corroded connection or break in wire between 10-pin connector and instrument panel connector. If hourmeter and tachometer does not function, replace hourmeter and tachometer by replacing instrument panel.

AG,OUO1023,481 –19–24JAN00–3/3

Instrument Panel System Test Points—Fuel Gauge



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CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F1.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse, F1.
10. Left terminal of fuse, F1.	Battery voltage.	Check for failed fuse, F1. If fuse is good, check for corroded or loose terminals.
11. Terminal A of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector.

CONDITIONS:

- Remove wire from center terminal (A) of fuel gauge sender.

Test Location	Normal	If Not Normal
12. Fuel gauge.	Gauge indicates EMPTY.	Replace instrument panel.

CONDITIONS:

- Connect wire from center terminal (A) to black wire on sender plate.

Continued on next page

Test Location	Normal	If Not Normal
13. Fuel gauge.	Gauge indicates FULL.	Check for corroded connections or break in orange wire between sender and instrument panel connector. Check for continuity to ground through black wire Nos. 010B and 010K to cap screw on rockshaft cover. Replace instrument panel.

CONDITIONS:

- Key switch in off position.
- Use a long wire to raise and lower sender float.

Test Location	Normal	If Not Normal
14. Fuel gauge sender.	Resistance smoothly increases/decreases between 4.5—97.5 ohms as float is raised and lowered.	Replace front gauge sender.

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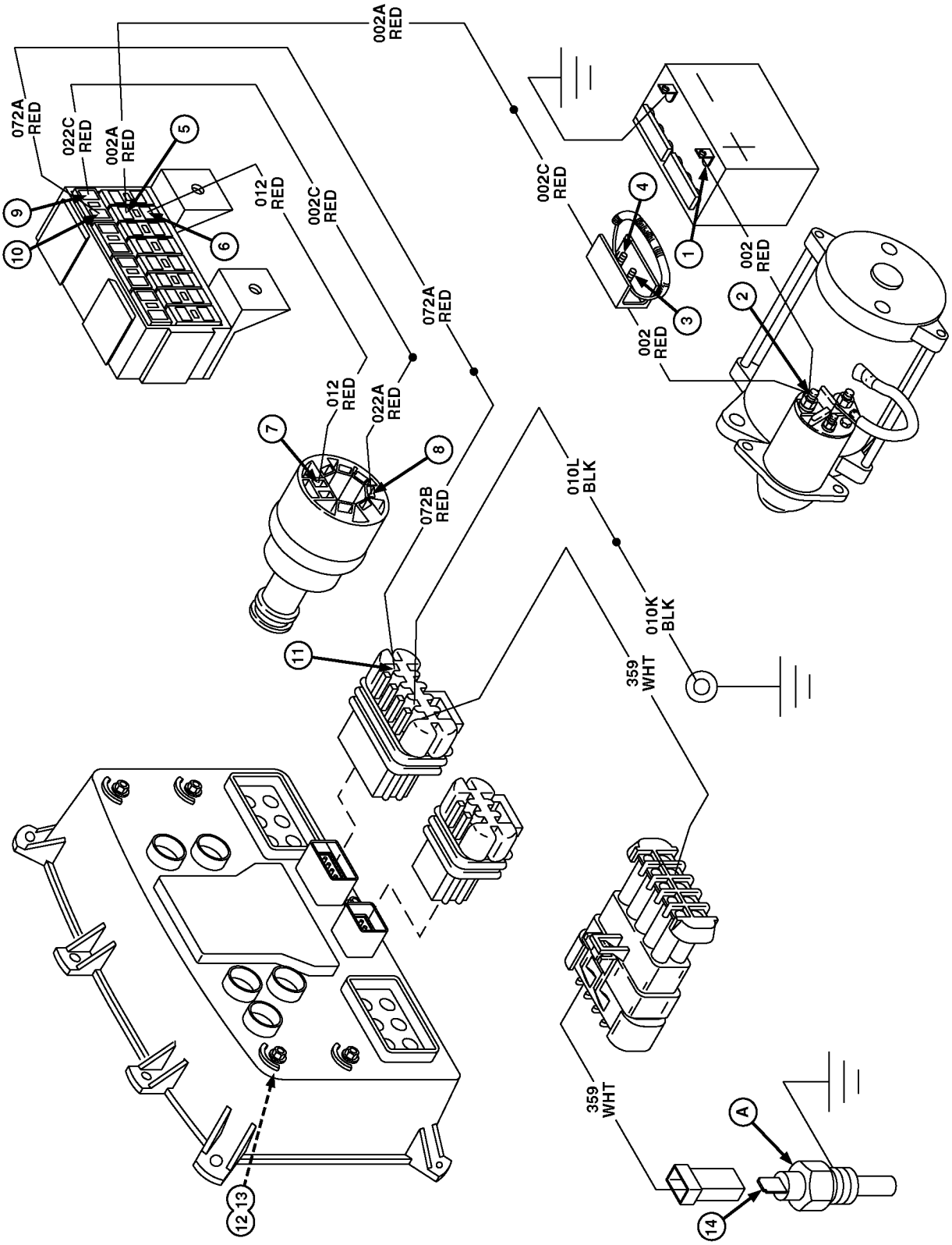
OUO1085,0000198 –19–22SEP00–3/3

Instrument Panel System Test Points—Temperature Gauge



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CONDITIONS:

- Range shift lever in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between battery and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F1.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse, F1.
10. Left terminal of fuse, F1.	Battery voltage.	Check for failed fuse, F1. If fuse is good, check for corroded or loose terminals.
11. Terminal A of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector.

CONDITIONS:

- Remove wire from temperature sender (A).

Test Location	Normal	If Not Normal
12. Temperature gauge.	Gauge indicates COLD.	Replace instrument panel.

CONDITIONS:

- Connect wire from temperature sender (A) to ground using a jumper wire.

Continued on next page

Test Location	Normal	If Not Normal
13. Temperature gauge.	Gauge indicates HOT.	Check for corroded connections or break in white wires between temperature sender and 10-pin connector or between 10-pin connector and instrument panel connector. Replace instrument panel.

CONDITIONS:

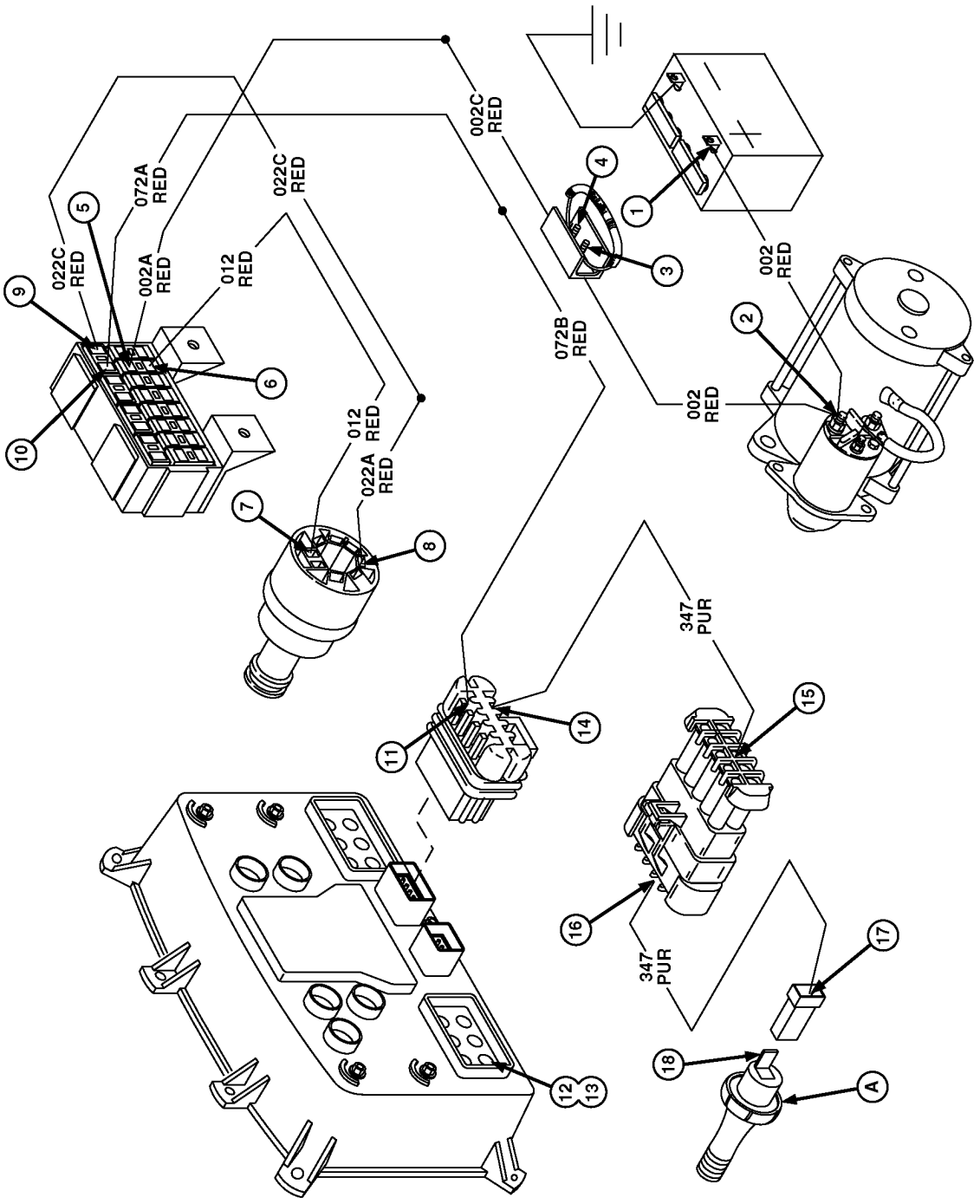
- Wire removed from temperature sender.
- Meter on ohm scale.

NOTE: Remove temperature sender to check resistance at various temperatures. Put in water heated to a specified temperature.

Test Location	Normal	If Not Normal
14. Temperature sender.	60°C (140°F) 134 ± 13.5 ohms 90°C (194°F) 51.2 ± 4.3 ohms 100°C (212°F) 38.5 ± 3.0 ohms	Replace temperature sender.

OUO1085,0000199 –19–22SEP00–3/3

Instrument Panel System Test Points—Oil Pressure



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OUO1085,000019A –19–22SEP00–1/4

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Connector removed from oil pressure switch (A).
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Continued on next page

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F1.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse, F1.
10. Left terminal of fuse, F1.	Battery voltage.	Check for failed fuse, F1. If fuse is good, check for corroded or loose terminals.
11. Terminal A of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector.
12. Top terminal of oil pressure indicator socket.	Battery voltage.	Check for corroded connections between circuit board and oil pressure indicator bulb socket.
13. Bottom terminal of oil pressure indicator socket.	Battery voltage.	Check for bad indicator bulb, socket, or corroded terminals.
14. Terminal 8 of female terminal side of instrument panel connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Terminal C of male pin side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in wire between instrument panel connector and 10-pin connector.
16. Terminal C of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
17. Pressure switch connector.	Battery voltage.	Check for corroded connections or break in wire between 10-pin connector and engine oil pressure switch connector.

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CONDITIONS:

- Meter on 1X ohm scale.

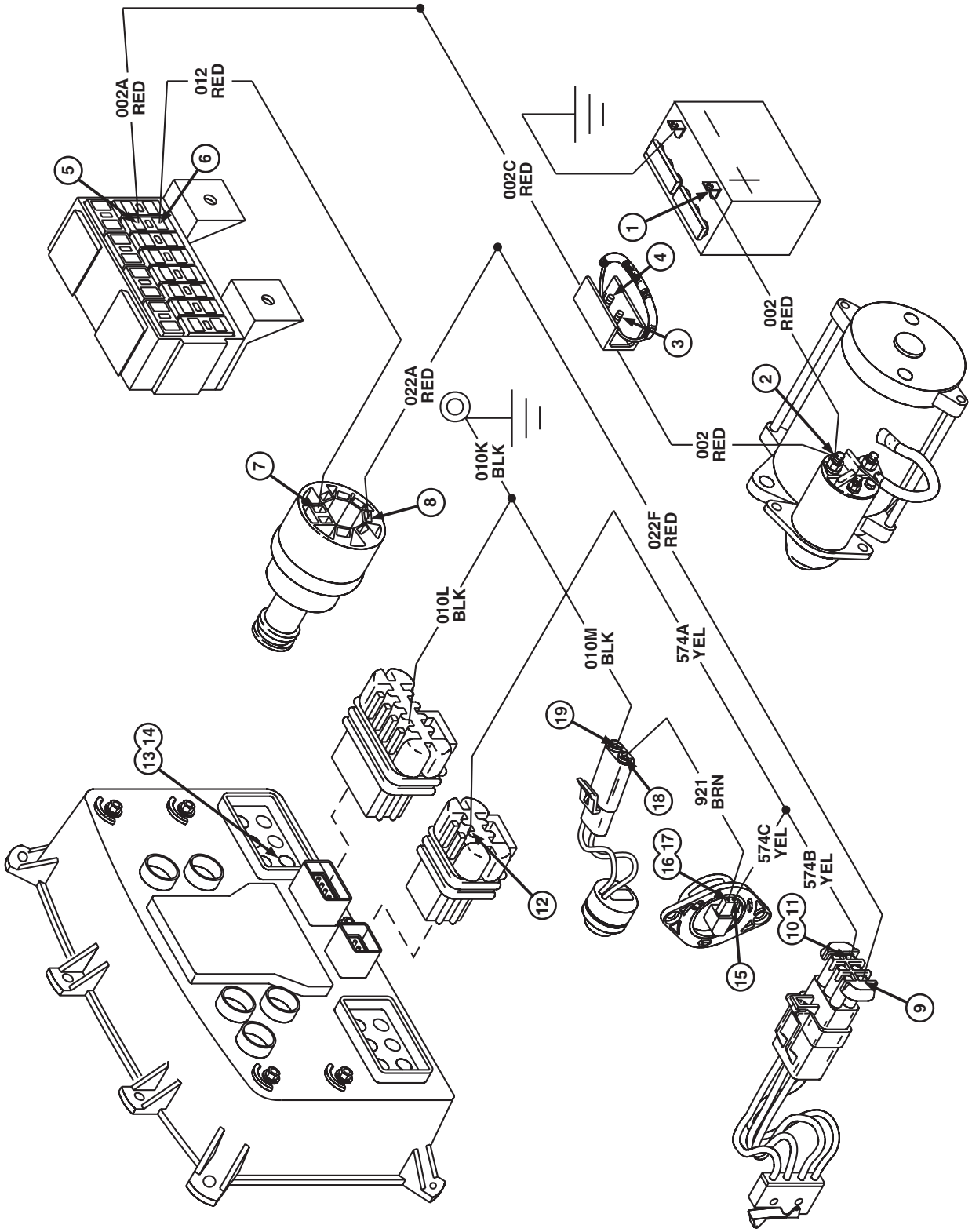
Continued on next page

Test Location	Normal	If Not Normal
18. Terminal of pressure switch.	Maximum 0.5 ohm resistance. (Switch contacts closed.)	Replace oil pressure switch.

NOTE: Oil pressure switch contacts open when engine oil pressure reaches 38—72 kPa (5.5—10.5 psi) (.38—.72 bar).

OUO1085,000019A –19–22SEP00–4/4

PTO Warning System Test Points



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CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in the RUN position. If switch is in RUN, switch is bad. Replace switch.
9. Terminal C of PTO switch.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and PTO switch.
10. Terminal A of PTO switch.	No voltage.	Make sure connector is fully pushed together and PTO lever is in disengaged position. Check for corroded or damaged terminals. Replace switch if damaged or defective.

CONDITIONS:

- Operator on seat.
- Move PTO lever to engaged position.

Continued on next page

Test Location	Normal	If Not Normal
11. Terminal A of PTO switch.	Battery voltage.	Make sure connector is fully pushed together and PTO lever is in engaged position. Check for corroded or damaged terminals. Replace switch if damaged or defective.
12. Terminal B of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between PTO switch and instrument panel connector.
13. Top terminal of PTO indicator socket.	Battery voltage.	Check for corroded connections or break in wire between instrument panel connector and indicator socket.
14. Bottom terminal of PTO indicator socket.	Less than 0.2 volt.	Check or replace bulb. Check ground connections of black wire, circuit No. 010, from PTO indicator socket through instrument panel connector to ground connection on tractor frame, behind instrument panel.
15. Terminal C of seat switch.	Battery voltage.	Check for corroded connections or break in splice or wire between PTO switch and seat switch.
16. Terminal A of seat switch.	No voltage.	Make sure connector is fully pushed together and seat has moved switch lever down. Check for corroded or damaged terminals. Replace switch if damaged or defective.

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CONDITIONS:

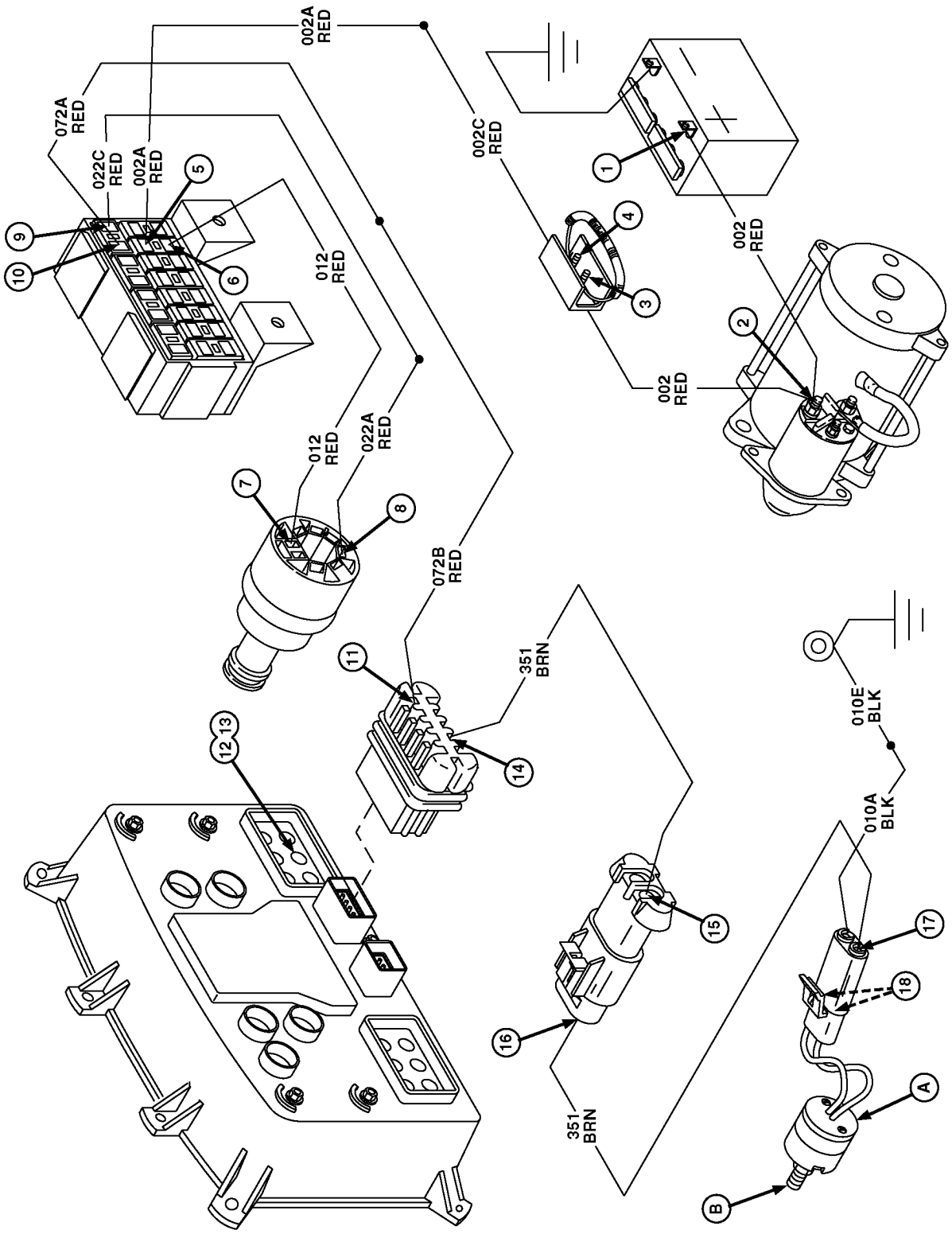
NOTE: Horn/timer will sound for approximately 6—8 seconds.

- Operator off seat.

Test Location	Normal	If Not Normal
17. Terminal A of seat switch.	Battery voltage	Make sure connector is fully pushed together and seat has moved switch lever down. Check for corroded or damaged terminals. Replace switch if damaged or defective.
18. Terminal A of horn/timer.	Battery voltage.	Check for corroded connections or break in wire between seat switch and horn/timer.
19. Terminal B of horn/timer.	Less than 0.2 volt.	Check for continuity to ground through black wire Nos. 010M and 010K to ground connection on tractor frame, behind instrument panel. Replace horn/timer.

OUO1085,000019B –19–26JUN02–3/3

Air Filter Restriction Test Points



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OUO1085,000019C –19–22SEP00–1/4

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustment in this section and group.

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Continued on next page

OUO1085,000019C –19–22SEP00–2/4

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery Voltage	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F6.	Battery voltage	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Right terminal of fuse, F1.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and fuse, F1.
10. Left terminal of fuse, F1.	Battery voltage.	Check for failed fuse, F1. If fuse is good, check for corroded or loose terminals.
11. Terminal A of female terminal side of instrument panel connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and instrument panel connector.
12. Top terminal of air restriction indicator socket.	Battery voltage.	Check for corroded connections or break in splice or wire between instrument panel connector and air restriction indicator.
13. Bottom terminal of air restriction indicator socket.	Battery voltage.	Check for bad indicator bulb, socket, or corroded terminals.
14. Terminal G of female terminal side of instrument panel connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Terminal B of male pin side of 2-pin connector.	Battery voltage.	Check for corroded connections or break in wire between instrument panel connector and 2-pin connector.
16. Terminal B of female socket side of 2-pin connector.	Battery voltage.	Make sure the connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
17. Terminal A of air restriction switch.	Battery voltage.	Check for corroded connections or break in wire between 2-pin connector and air restriction switch.

240
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CONDITIONS:

- Remove connector from air restriction switch (A).
- Meter on 1X ohm scale.
- Meter test leads on terminals of air restriction switch.

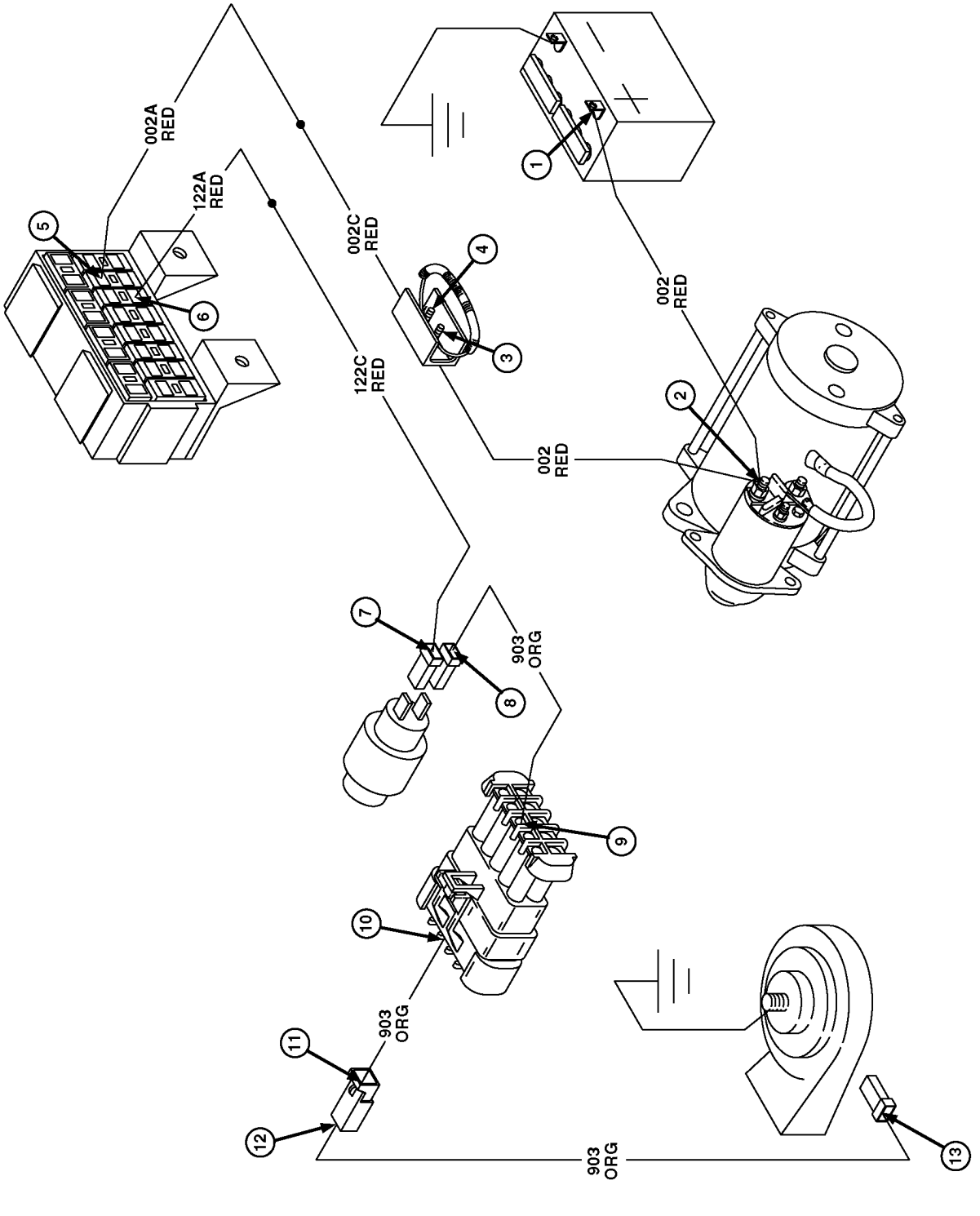
Continued on next page

Test Location	Normal	If Not Normal
18. Air restriction switch terminals.	No continuity. (Switch contacts are open.)	Replace switch.

NOTE: Air restriction switch contacts close when a vacuum of 4.98—7.48 kPa (20—30 in. H_20) is present at switch port (B).

OUO1085,000019C –19–22SEP00–4/4

Optional Horn Test Points



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CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Remove connector from horn (A).
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

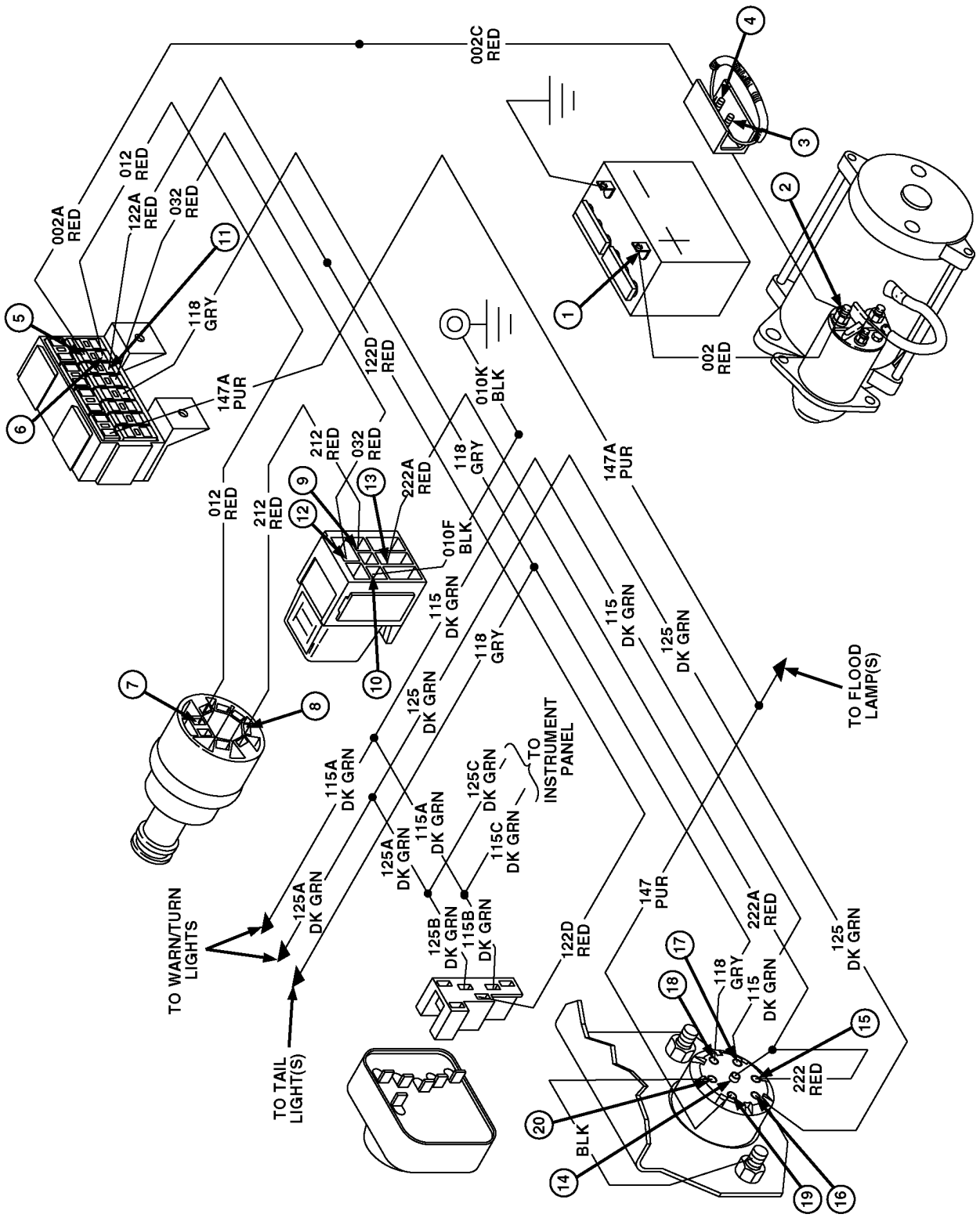
Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse, F6.
6. Bottom terminal of fuse, F7.	Battery voltage.	Check for failed fuse, F7. If fuse is good, check for corroded or loose terminals.
7. Red wire terminal of horn switch.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and horn switch.

CONDITIONS:

- Push horn button and hold.

Test Location	Normal	If Not Normal
8. Orange wire terminal of horn switch.	Battery voltage.	Check for corroded or loose terminals. Replace horn switch.
9. Terminal H of male pin side of 10-pin connector.	Battery voltage.	Check for corroded connections or break in wire between horn switch and 10-pin connector.
10. Terminal H of female socket side of 10-pin connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
11. Horn harness connector, female side.	Battery voltage.	Check for corroded connections or break in wire between 10-pin connector and horn harness connector.
12. Horn harness connector, blade side.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
13. Horn connector.	Battery voltage.	Check for corroded connections or break in wire between horn harness connector and horn. If wire and connectors are good, replace horn.

Accessory Relay and Trailer Connector Test Points



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CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Starter battery terminal.	Battery voltage.	Check for corroded connections or break in wire between battery and starter.
3. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between starter and fuse link junction block.
4. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
5. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in wire or splice between fuse link junction block and 30-amp fuse F6.
6. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
7. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
8. IGN terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace.
9. Terminal 86 of accessory relay.	Battery voltage.	Check for corroded connections or break in splice or wire between key switch and accessory relay.
10. Terminal 85 of accessory relay.	Less than 0.2 volt.	Check continuity to ground of black wire Nos. 010F and 010K. If black wires are good to ground, test accessory relay.
11. Bottom terminal of fuse, F8.	Battery voltage.	Check for failed fuse, F8. If fuse is good, check for corroded or loose terminals.
12. Terminal 30 of accessory relay.	Battery voltage.	Check for corroded connections or break in wire between fuse block and accessory relay.
13. Terminal 87 of accessory relay.	Battery voltage.	Check for corroded or loose terminals. Test accessory relay.
14. Terminal 7 (center) of trailer connector.	Battery voltage.	Check for corroded connections or break in splice or wire between accessory relay and trailer connector.
15. Terminal 4 of trailer connector.	Battery voltage.	Check for corroded connections or break in splice or wire between accessory relay and trailer connector.

CONDITIONS:

- Move turn signal knob to left turn position.

Continued on next page

Test Location	Normal	If Not Normal
16. Terminal 3 of trailer connector.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between turn signal terminal 3 and trailer connector terminal 3.

CONDITIONS:

- Move turn signal knob to right turn position.

Test Location	Normal	If Not Normal
17. Terminal 5 of trailer connector.	Battery voltage (pulsing).	Check for corroded connections or break in splice or wire between turn signal terminal 4 and trailer connector terminal 5.

CONDITIONS:

- Move light switch to H_1 position.

Test Location	Normal	If Not Normal
18. Terminal 6 of trailer connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and trailer connector terminal 6.

CONDITIONS:

- Move light switch to F position.

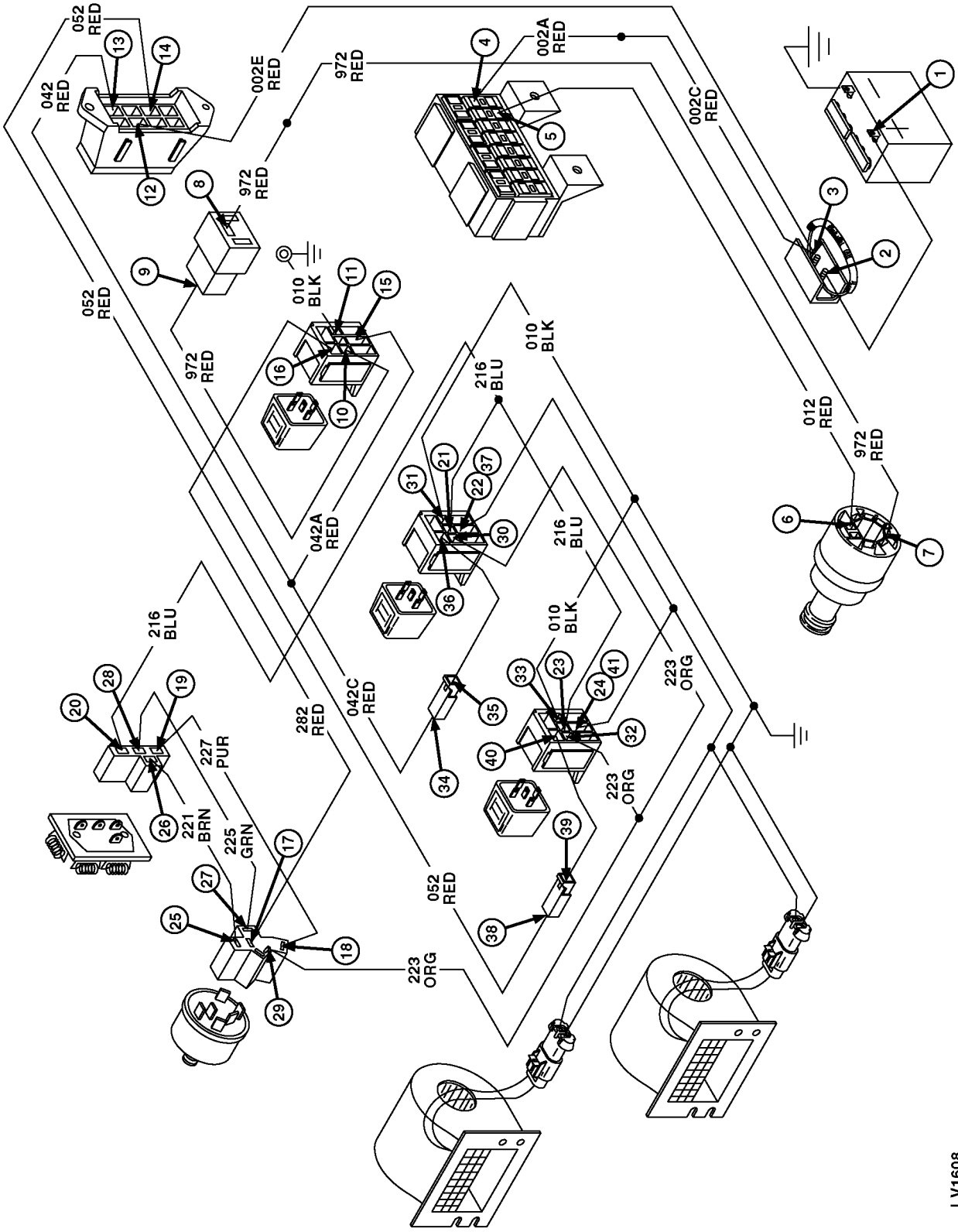
Test Location	Normal	If Not Normal
19. Terminal 2 of trailer connector.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse block and trailer connector terminal 2.

CONDITIONS:

- Meter on 1X ohms scale.

Test Location	Normal	If Not Normal
20. Terminal 1 of trailer connector.	Maximum 0.5 ohm resistance.	Check for corroded connections or break in wire between trailer connector terminal 1 and connector mounting hardware. Check battery-to-frame ground cable and connections.

Blower Motor Test Points (Tractors With Cab)



LV1608 –19–15DEC97

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OUO1085,00001A0 –19–25SEP00–1/5

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

Continued on next page

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link junction block.	Battery voltage.	Check for corroded terminal or break in wire between battery and fuse link.
3. Right post of fuse link junction block.	Battery voltage.	Check for loose or corroded terminal or replace fuse link.
4. Top terminal of fuse, F6.	Battery voltage.	Check for corroded connections or break in splice or wire between fuse link and fuse, F6.
5. Bottom terminal of fuse, F6.	Battery voltage.	Check for failed fuse, F6. If fuse is good, check for corroded or loose terminals.
6. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
7. ELX terminal of key switch.	Battery voltage.	Check that key switch is in RUN position. If switch is in RUN, switch is bad. Replace switch.
8. Terminal B of female side of 3-wire connector at bottom of right front cab post.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse block and connector.
9. Terminal B of male side of 3-wire connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
10. Terminal 86 of HVAC relay.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between 3-way connector and HVAC relay.
11. Terminal 85 of HVAC relay.	Less than 0.2 volt.	Check for continuity to ground of black wire No. 010. Test HVAC relay.
12. Left terminal of fuse, F13 (red wire No. 002) in overhead control panel.	Battery voltage.	Check for loose or corroded connection or break in wire between fuse link and fuse block.
13. Right terminal of fuse, F13 (red wire No. 042).	Battery voltage.	Check for failed fuse, F13. If fuse is good, check for loose or corroded terminals.
14. Right terminal of fuse, F15 (red wire No. 052).	Battery voltage.	Check for failed fuse, F15. If fuse is good, check for loose or corroded terminals.
15. Terminal 30 of HVAC relay.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between fuse, F13 and HVAC relay.
16. Terminal 87 of HVAC relay.	Battery voltage.	Check for loose or corroded terminals. Test HVAC relay.
17. Terminal B of blower switch.	Battery voltage.	Check for loose or corroded connection or break in wire between HVAC relay and blower switch.

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CONDITIONS:

- Blower switch in LOW position.

Continued on next page

Test Location	Normal	If Not Normal
18. Terminal 1 of blower switch.	Battery voltage.	Check for loose or corroded terminals. Test blower switch.

CONDITIONS:

- Cab front headliner removed.

Test Location	Normal	If Not Normal
19. Terminal 4 of blower motor resistor.	Battery voltage.	Check for loose or corroded connection or break in wire between blower switch and blower motor resistor.
20. Terminal 2 of blower motor resistor.	Lower than battery voltage.	Check for loose or corroded terminals. Test blower motor resistor.
21. Terminal 87A of right blower motor relay.	Lower than battery voltage.	Check for loose or corroded connection or break in splice or wire between blower motor resistor and right blower motor relay.
22. Terminal 30 of right blower motor relay.	Lower than battery voltage.	Check for loose or corroded terminals. Test right blower motor relay.
23. Terminal 87A of left blower motor relay.	Lower than battery voltage.	Check for loose or corroded connection or break in splice or wire between blower motor resistor and left blower motor relay.
24. Terminal 30 of left blower motor relay.	Lower than battery voltage.	Check for loose or corroded terminals. Test left blower motor relay.

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CONDITIONS:

- Blower switch in MED position.

Test Location	Normal	If Not Normal
25. Terminal 2 of blower switch.	Battery voltage.	Check for loose or corroded terminals. Test blower switch.
26. Terminal 1 of blower motor resistor.	Battery voltage.	Check for loose or corroded terminals. Test blower motor resistor.

CONDITIONS:

- Blower switch in HIGH position.

Test Location	Normal	If Not Normal
27. Terminal 3 of blower switch.	Battery voltage.	Check for loose or corroded terminals. Test blower switch.
28. Terminal 3 of blower motor resistor.	Battery voltage.	Check for loose or corroded terminals or break in wire between blower switch and blower motor resistor.

CONDITIONS:

- Blower switch in PURGE position.

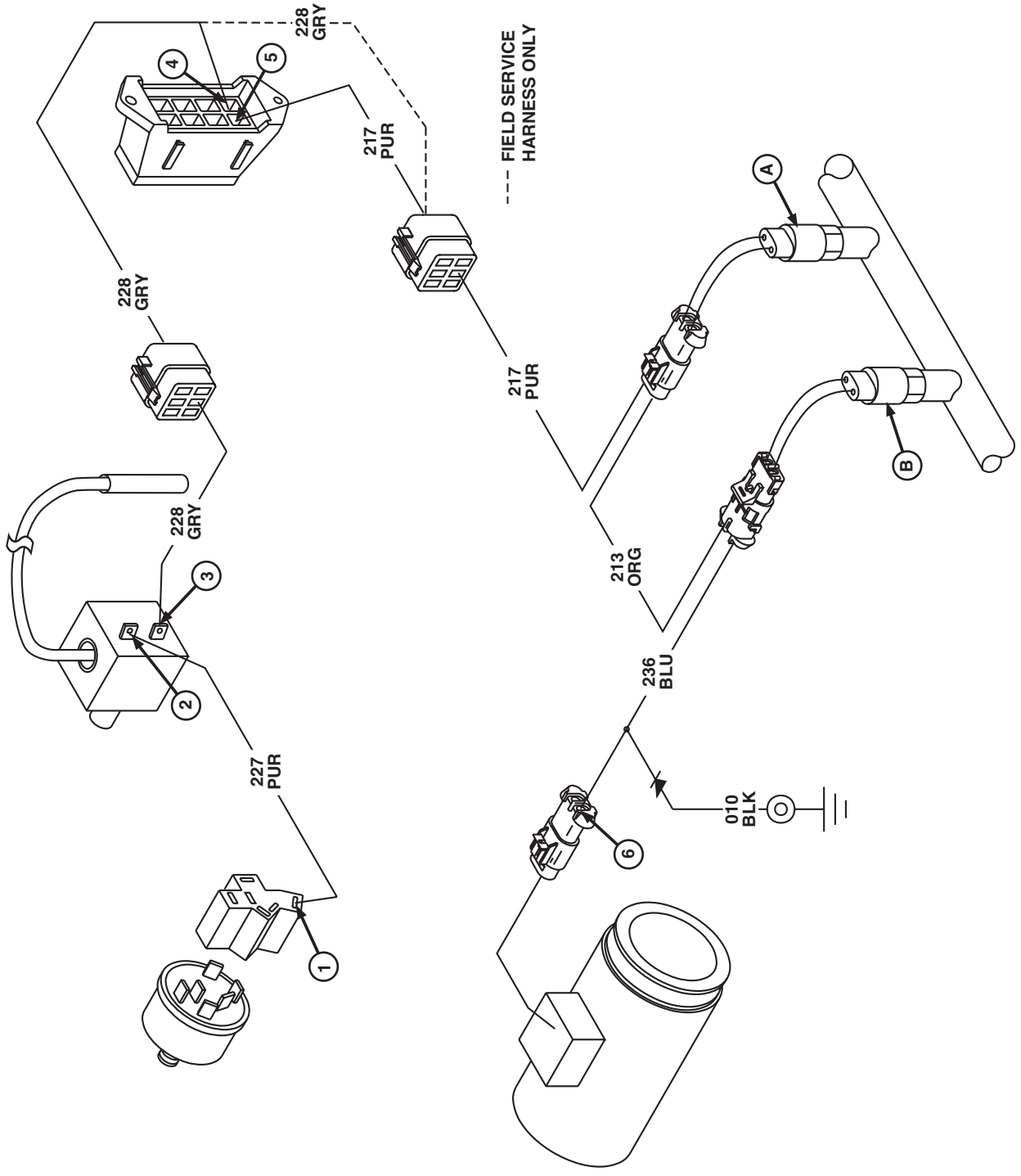
Continued on next page

Test Location	Normal	If Not Normal
29. Terminal 4 of blower switch.	Battery voltage.	Check for loose or corroded terminals. Test blower switch.
30. Terminal 86 of right blower motor relay.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between blower switch and relay.
31. Terminal 85 of right blower motor relay.	Less than 0.2 volt.	Check for continuity to ground of black wire No. 010. Test HVAC relay.
32. Terminal 86 of left blower motor relay.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between blower switch and relay.
33. Terminal 85 of left blower motor relay.	Less than 0.2 volt.	Check for continuity to ground of black wire No. 010. Test HVAC relay.
34. Male side of single-wire connector between fuse, F13 and right blower motor relay.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between fuse, F13 and connector.
35. Female side of single-wire connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
36. Terminal 87 of right blower motor relay.	Battery voltage.	Check for loose or corroded connection or break in wire connector and relay.
37. Terminal 30 of right blower motor relay.	Battery voltage.	Check for loose or corroded terminals. Test right motor blower relay.
38. Male side of single-wire connector between fuse, F13 and right motor blower relay.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between fuse, F13, and connector.
39. Female side of single-wire connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
40. Terminal 87 of left blower motor relay.	Battery voltage.	Check for loose or corroded connection or break in wire between connector and relay.
41. Terminal 30 of left blower motor relay.	Battery voltage.	Check for loose or corroded terminals. Test left blower motor relay.

NOTE: If necessary to check circuit further, remove evaporator/heater core housing and remove cover from housing. Test blower motors individually with battery voltage. If blower motors are good, check continuity of red wires Nos. 062 and 032 and ground wires. Check connectors inside housing for loose or corroded terminals. Repair or replace wires or connectors as necessary.

OUO1085,00001A0 –19–25SEP00–5/5

A/C Compressor Clutch Coil Test Points (Tractors With Cab)



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CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Engine running.
- A/C temperature control switch in MAX position (fully clockwise).
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.
- Blower switch in LOW position.
- Ambient air temperature above 3°C (37°F).

NOTE: Perform steps 1 through 19 of BLOWER MOTOR TEST POINTS to verify circuits between battery and blower switch terminal B are functioning properly.

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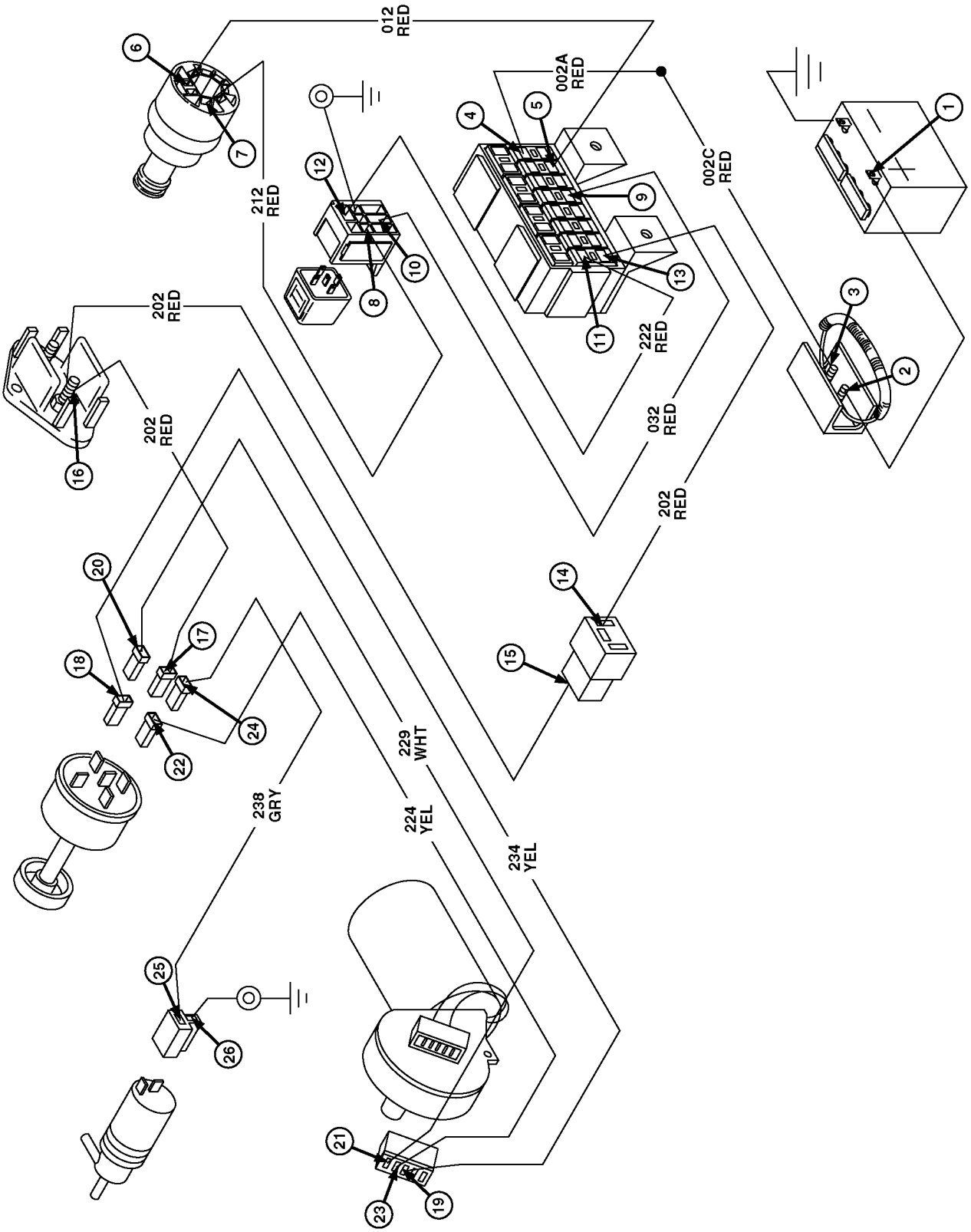
Test Location	Normal	If Not Normal
1. Terminal 1 of blower switch.	Battery voltage.	Check for loose or corroded connection. Test blower switch.
2. A/C temperature control switch terminal for purple wire No. 227.	Battery voltage.	Check for loose or corroded connection or break in splice or wire between blower switch and A/C temperature control switch.
3. A/C temperature control switch terminal for gray wire No. 228.	Battery voltage.	Check for loose or corroded connection. Test A/C temperature control switch.
4. Left terminal of fuse, F16 (gray wire No. 228).	Battery voltage.	Check for corroded connection or break in wire between A/C temperature control switch and fuse block.
5. Right terminal of fuse, F16 (purple wire No. 217).	Battery voltage.	Check for failed fuse, F16. If fuse is good, check for corroded or damaged terminals.
6. Male pin side of single-wire connector for A/C compressor clutch.	Battery voltage.	Test A/C compressor clutch coil. If good, test A/C high and low pressure switches (A and B). (See procedures in Section 290, Group 15 steps 37 and 38). If good, check continuity of wires and connectors between compressor clutch coil and fuse, F16. Check connections for loose, corroded, or damaged terminals.

OUO1085,00001A1 –19–25SEP00–2/2

Front Wiper/Washer Test Points (Tractors With Cab)



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OUO1085,00001A2 –19–25SEP00–1/4

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

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OUO1085,00001A2 –19–25SEP00–2/4

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link.	Battery voltage.	Check for loose or corroded terminal, or break in wire between battery and fuse link.
3. Right post of fuse link.	Battery voltage.	Check for loose or corroded terminal, or replace fuse link.
4. Top terminal of 30-amp fuse, F5.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse link and fuse, F5.
5. Bottom terminal of fuse, F5.	Battery voltage.	Check for failed fuse, F5. If fuse is good, check for loose or corroded terminals.
6. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
7. ACC terminal of key switch.	Battery voltage.	Check that key switch is in the ACCESSORY or RUN position. If switch is in ACCESSORY or RUN, switch is bad. Replace.
8. Terminal 86 of accessory relay.	Battery voltage.	Check for loose or corroded connection or break in wire between relay and key switch.
9. Bottom terminal of fuse, F8.	Battery voltage.	Check for failed fuse, F8. If fuse is good, check for corroded or loose terminals.
10. Terminal 30 of accessory relay.	Battery voltage.	Check for loose or corroded connections or break in wire between relay and fuse block.
11. top terminal of fuse, F12.	Battery voltage.	Check for failed fuse, F12. If fuse is good, check for corroded or loose terminals.
12. Terminal 87 of accessory relay.	Battery voltage.	Check for loose or corroded connections or break in wire between relay fuse and fuse block.
13. Bottom terminal of fuse, F12.	Battery voltage.	Check for failed fuse, F12. If fuse is good, check for corroded or loose terminals.
14. Terminal A of female side of 3-wire connector at bottom of right front cab post.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse block and connector.
15. Terminal A of male side of 3-wire connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
16. Left post of cab junction block (located behind overhead control panel).	Battery voltage.	Check for loose or corroded connection or break in wire between 3-wire connector and junction block.
17. Terminal B of front wiper/washer switch.	Battery voltage.	Check for loose or corroded connection or break in wire between junction block and wiper/washer switch.

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Test Location	Normal	If Not Normal
18. Terminal P of front wiper/washer switch.	Battery voltage.	Check for loose or corroded connections. Test switch.
19. Terminal P of front wiper motor.	Battery voltage.	Check for loose or corroded connection or break in wire between wiper switch and wiper motor.

CONDITIONS:

- Front wiper switch in LOW position.

Test Location	Normal	If Not Normal
20. Terminal L of front wiper/washer switch.	Battery voltage.	Check for loose or corroded connection. Test switch.
21. Terminal L of front wiper motor.	Battery voltage.	Check for loose or corroded connection or break in wire between wiper switch and wiper motor.

CONDITIONS:

- Front wiper switch in HIGH position.

Test Location	Normal	If Not Normal
22. Terminal H of front wiper/washer switch.	Battery voltage.	Check for loose or corroded connection. Test switch.
23. Terminal H of front wiper motor.	Battery voltage.	Check for loose or corroded connection or break in wire between wiper switch and wiper motor.

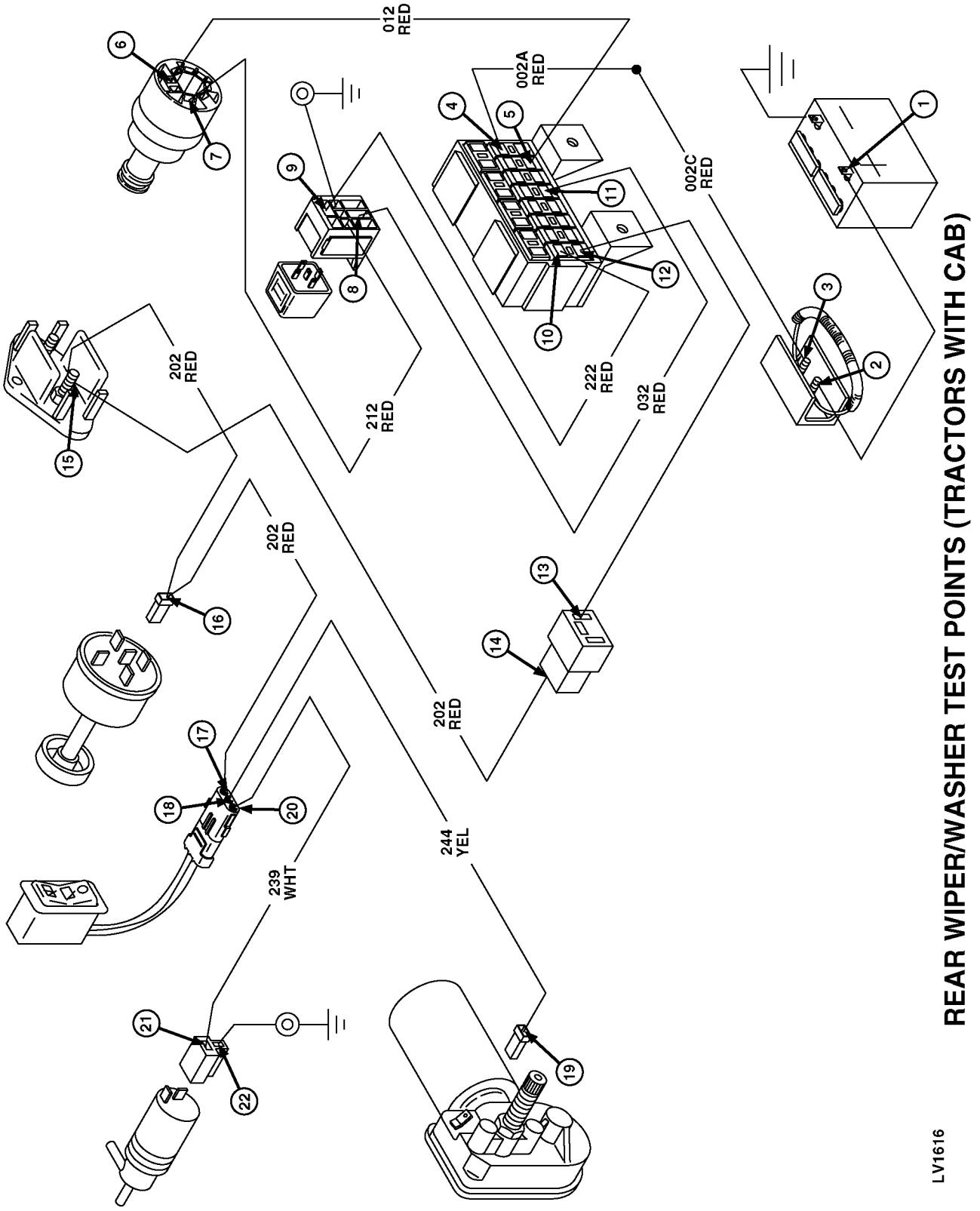
CONDITIONS:

- Push front wiper switch knob in and hold in WASHER position.

Test Location	Normal	If Not Normal
24. Terminal W of front wiper/washer switch.	Battery voltage.	Check for loose or corroded connection. Test switch.
25. Positive (+) terminal of front washer pump.	Battery voltage.	Check for loose or corroded connection or break in wire between wiper/washer switch and front washer pump.
26. Negative (–) terminal of front washer pump.	Less than 0.2 volt.	Check for loose or corroded connection. Check for continuity to ground through black wire. Test washer pump.

OUO1085,00001A2 –19–25SEP00–4/4

Rear Wiper/Washer Test Points (Tractors With Cab)



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OUO1085,00001A3 –19–25SEP00–1/4

CONDITIONS:

- Transmission in P, park position.
- PTO disengaged.
- Key switch in RUN position.
- Meter positive lead (red) on numbered test points.
- Meter negative lead (black) on battery negative (–) post.
- Meter on DC volts.
- Electrical tests and adjustments in this section and group.

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OUO1085,00001A3 –19–25SEP00–2/4

Test Location	Normal	If Not Normal
1. Battery positive post.	Minimum 11.8 VDC.	Test battery and charge if good. Replace bad battery.
2. Left post of fuse link.	Battery voltage.	Check for loose or corroded terminal, or break in wire between battery and fuse link.
3. Right post of fuse link.	Battery voltage.	Check for loose or corroded terminal, or replace fuse link.
4. Top terminal of 30-amp fuse, F5.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse link and fuse, F5.
5. Bottom terminal of fuse, F5.	Battery voltage.	Check for failed fuse, F5. If fuse is good, check for loose or corroded terminals.
6. BAT terminal of key switch.	Battery voltage.	Check for corroded connections or break in wire between fuse block and key switch.
7. ACC terminal of key switch.	Battery voltage.	Check that key switch is in the ACCESSORY or RUN position. If switch is in ACCESSORY or RUN, switch is bad. Replace key switch.
8. Terminal 86 of accessory relay.	Battery voltage.	Check for loose or corroded connection or break in wire between relay and key switch.
9. Terminal 87 of accessory relay.	Battery voltage.	Check for loose or corroded connection or break in wire between relay and fuse block.
10. Top terminal of fuse, F12.	Battery voltage.	Check for failed fuse, F12. If fuse is good, check for corroded or loose terminals.
11. Bottom terminal of fuse, F8.	Battery voltage.	Check for failed fuse, F8. If fuse is good, check for corroded or loose terminals.
12. Bottom terminal of fuse, F12.	Battery voltage.	Check for failed fuse, F12. If fuse is good, check for corroded or loose terminals.
13. Terminal A of female side of 3-wire connector at bottom of right front cab post.	Battery voltage.	Check for loose or corroded terminal or break in splice or wire between fuse block and connector.
14. Terminal A of male side of 3-wire connector.	Battery voltage.	Make sure connector is fully pushed together. Check for corroded or damaged terminals. Repair or replace connector.
15. Left post of cab junction block (located behind overhead control panel).	Battery voltage.	Check for loose or corroded connection or break in wire between 3-wire connector and junction block.
16. Terminal B of front wiper/washer switch.	Battery voltage.	Check for loose or corroded connection or break in wire between junction block and front wiper/washer switch.
17. Terminal A of 3-wire connector for rear wiper/washer switch.	Battery voltage.	Check for loose or corroded connection or break in wire between front wiper/washer switch and rear wiper/washer switch.

CONDITIONS:

- Rear wiper/washer switch in ON position.

Continued on next page

Test Location	Normal	If Not Normal
18. Terminal B of 3-wire connector for rear wiper/washer switch.	Battery voltage.	Check for loose or corroded connection. Test rear wiper/washer switch.
19. Terminal at rear wiper motor.	Battery voltage.	Check for loose or corroded connection or break in wire between rear wiper/washer switch and rear wiper motor. Test motor.

CONDITIONS:

- Hold rear wiper/washer switch in WASHER position.

Test Location	Normal	If Not Normal
20. Terminal C of 3-wire connector for rear wiper/washer switch.	Battery voltage.	Check for loose or corroded connection. Test rear wiper/washer switch.
21. Positive (+) terminal of rear washer pump.	Battery voltage.	Check for loose or corroded connection or break in wire between wiper/washer switch and rear washer pump.
22. Negative (–) terminal of rear washer pump.	Less than 0.2 volt.	Check for loose or corroded connection. Check for continuity to ground through black wire. Test washer pump.

OUO1085,00001A3 –19–25SEP00–4/4

Battery Voltage and Specific Gravity Tests

REASON:

To determine condition of battery.

EQUIPMENT:

- Voltmeter or JT05685 Load Tester
- Hydrometer

PROCEDURE:

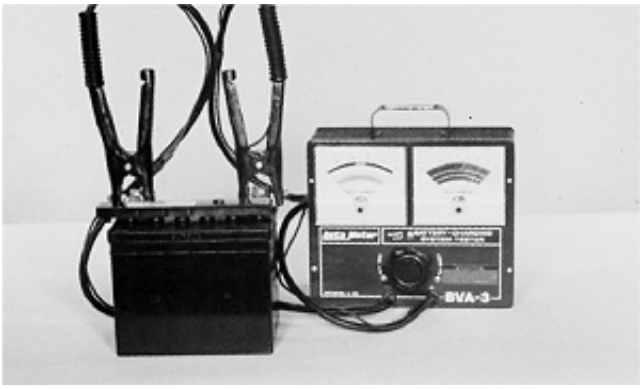
1. Clean battery terminals and top of battery.
2. Inspect battery terminals and case for breakage or cracks.
3. Check electrolyte level in each battery cell. Add clean, soft water as needed. If water is added, charge battery for 20 minutes at 10 amps.
4. If battery has been charged, remove surface charge by turning load knob of tester clockwise until ammeter reads 100 amps. Hold for 15 seconds then turn load knob to off.
5. Check battery voltage with voltmeter or Load Tester.
6. Check and record specific gravity of each cell with a hydrometer.

Specification

Battery—Minimum Voltage	12.4 volts
Minimum Specific Gravity	1.225 with less than 50-point variation

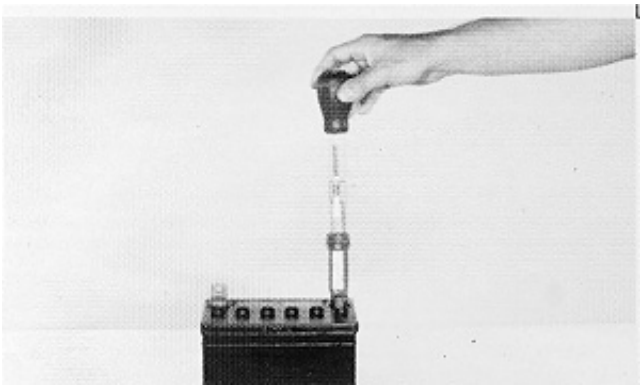
RESULTS:

- Battery voltage less than 12.4 VDC, charge battery and test again. See Charge Battery in this group.
- Battery voltage more than 12.4 VDC, load test battery. See Battery Load Test in this group.
- All cells less than 1.225 with less than 50-point variation, charge battery at 10-amp rate and test again. See Charge Battery in this group.
- All cells more than 1.225 with less than 50-point variation, load test battery. See Battery Load Test in this group.



M49595 –UN–18SEP90

Checking Battery Voltage Using Load Tester



M49596 –UN–18SEP90

Checking Specific Gravity Using an Hydrometer

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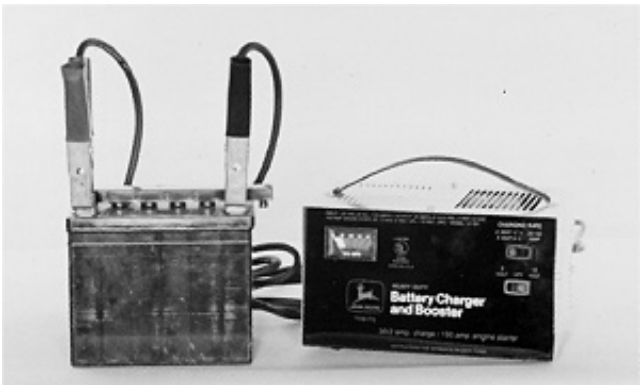
- More than 50-point variation: replace battery.
- If battery fails voltage or specific gravity test after charging, replace battery.

OUO1085,000019F –19–25SEP00–2/2

Charge Battery



M49598 –UN–25SEP90

REASON:

To increase battery charge after battery has been discharged.

EQUIPMENT:

Battery charger (variable rate)

NOTE: See Battery Voltage and Specific Gravity Tests in this group before charging battery.

PROCEDURE:

1. Connect variable rate charger to battery.
2. Start charger at slow rate. Increase charge rate one setting at a time. Check charger ammeter after one minute at each setting. Maintain 10-amp charge rate.
3. Check if battery is accepting a 10-amp charge after 10 minutes.

   Battery will not accept 10-amp charge after 10 minutes: replace battery.

   Battery is accepting 10-amp charge after 10 minutes, and battery did not need water: go to steps 6 and 7.

   Battery is accepting 10-amp charge after 10 minutes, but battery needed water or all cells were below 1.225: go to steps 4 and 5.
4. Set charger at 15—25 amps.

IMPORTANT: Decrease charge rate if battery gases or bubbles excessively or becomes too warm to touch.

5. Check specific gravity after 30 minutes (60 minutes for maintenance-free battery).

   More than 50-point variation between cells: replace battery.

Continued on next page

Less than 50-point variation between cells: go to steps 6 and 7.

NOTE: If battery was discharged at a slow or unknown rate, charge at 10—15 amps for 6—12 hours. (Maintenance-free battery: 12—24 hours.) If battery was discharged at fast rate, charge at 20—25 amps for 2—4 hours. (Maintenance-free battery: 4—8 hours.)

6. Continue charging battery until specific gravity is 1.225—1.265 points.

240
15
94

7. Load test battery. See Battery Load Test in this group.

OUO1085,00001A4 –19–25SEP00–2/2

Battery Load Test

REASON:

To determine battery's ability to withstand a load.

EQUIPMENT:

JT05685 Load Tester

CONNECTIONS:

1. Turn load knob (A) of tester counterclockwise to OFF.
2. Connect tester red cable (B) to battery positive post.
3. Connect tester black cable (C) to battery negative (–) post.

PROCEDURE:

1. Make sure battery passes voltage and specific gravity tests before load testing. See Battery Voltage and Specific Gravity Tests in this group.

IMPORTANT: If using another battery tester without a blue, cold cranking rating scale, turn load knob until amperage is equal to HALF the battery cold cranking amperage (CCA) rating.

2. Turn load knob of tester clockwise until amperage reading (D) is equal to:
   a. Cold cranking amperage rating (blue scale).

      —OR—

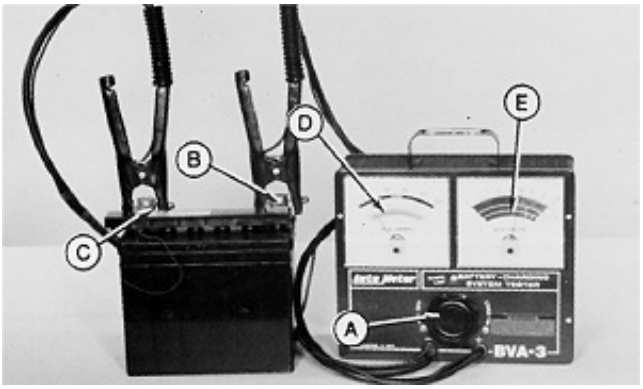
   b. Three times ampere hour rating (black scale).
3. Hold for 15 seconds, then note voltage reading and turn load knob of tester to off.

Specification

Battery—Minimum Voltage..... 9.6 volts under load

RESULTS:

- If the battery passes the test, battery is good.



M49597 –UN–18SEP90

A—Tester Load Knob
B—Tester Red Cable
C—Tester Black Cable
D—Amperage
E—Voltage

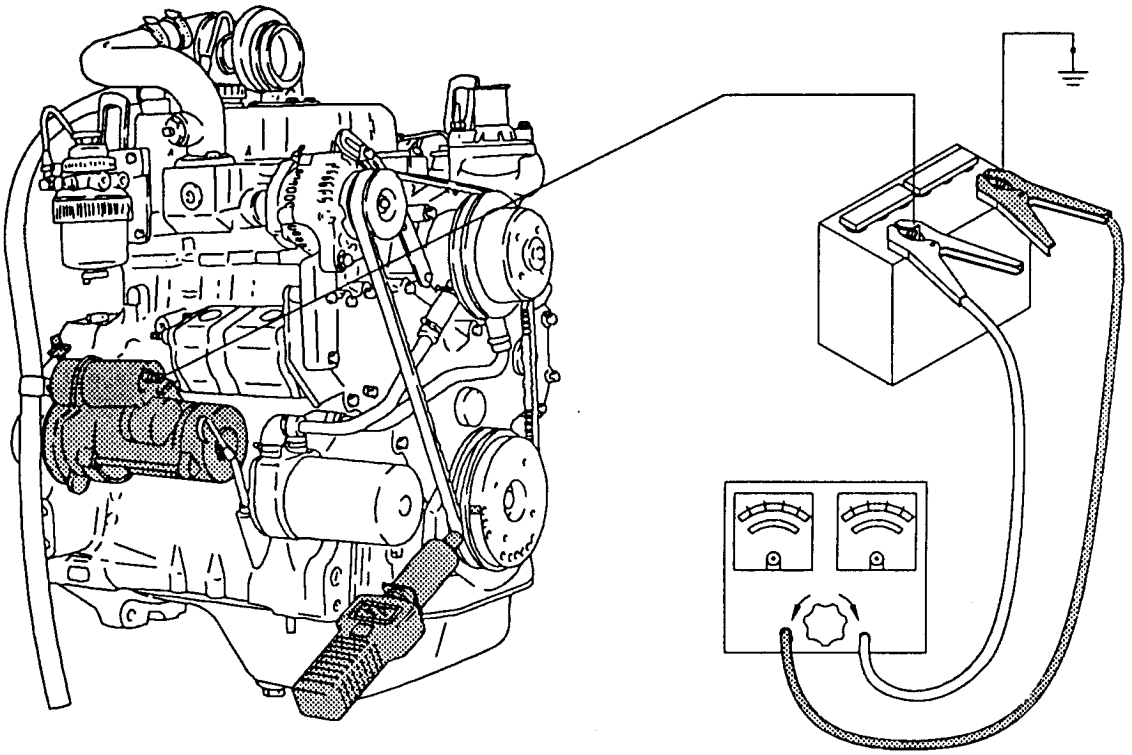
240
15
95

Continued on next page

- If the battery does not pass the test, replace battery.

OUO1085,00001A5 –19–26SEP00–2/2

Starter Amp Draw/RPM Test



LV065AE

STARTER AMP DRAW/RPM TEST

LV065AE –19–24FEB92

REASON:

To determine condition of starter.

EQUIPMENT:

- JT05685 Load Tester
- JT05719 Tachometer

CAUTION: Disconnect fuel shut off solenoid wiring to prevent engine from starting.

IMPORTANT: Turn load knob fully counterclockwise before making connections.

NOTE: Engine should be at normal operating temperature when performing this test.

CONNECTIONS:

1. Turn load knob fully counterclockwise.
2. Connect load tester red cable to positive (+) terminal on battery.
3. Connect load tester black cable to negative (–) terminal.
4. Disconnect fuel shut-off solenoid wire from pump.

PROCEDURE:

1. Check system ground connections. Be sure battery is fully charged.
2. Crank engine. Read and record voltage at meter.
3. Use tachometer to read and record cranking rpm.
4. Turn key switch OFF. Adjust load knob until battery voltage is the same as when engine is cranking. Read and record amperage on meter.

Continued on next page

Specification

Starter Draw—Amperage ..... 275 amps at 240 rpm.

5. Turn load knob fully counterclockwise.

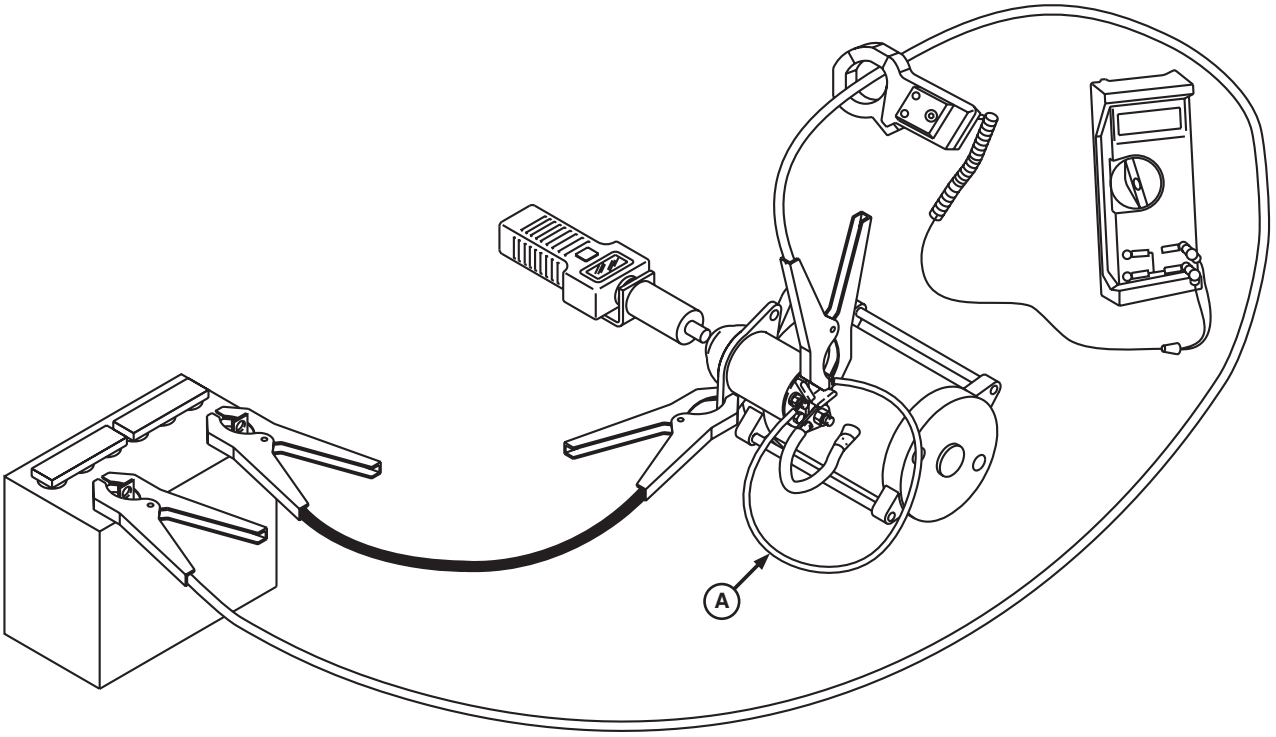
RESULTS:

- If amp reading is not to specification or to specification but rpm is low, remove starter and perform Starter No-Load Amp Draw RPM Test. (See Starter No-Load Amp Draw/RPM Test in this group.)

OUO1085,00001A6 –19–26SEP00–2/2

240
15
98

Starter No-Load Amp Draw/RPM Test



LV6141 –UN–31JAN01

A—Jumper Wire

REASON:

To determine condition of starter.

EQUIPMENT:

- JT02153 Current Clamp-On Probe or Equivalent
- JT05719 Tachometer

CONNECTIONS:

1. Disconnect battery negative (–) cable and remove starter from engine.

NOTE: Check that battery is fully charged to ensure accuracy of test.

2. Connect positive (+) cable to positive (battery) terminal on starter.
3. Connect negative (–) cable to starter body.
4. Connect jumper cables to battery.
5. Attach current probe to positive cable.

PROCEDURE:

IMPORTANT: Complete this test in 20 seconds or less to prevent starter damage.

1. Use jumper wire (A) to briefly connect positive (+) starter terminal to solenoid terminal “S”.
2. Read and record starter amperage and rpm.

Starter—Specification

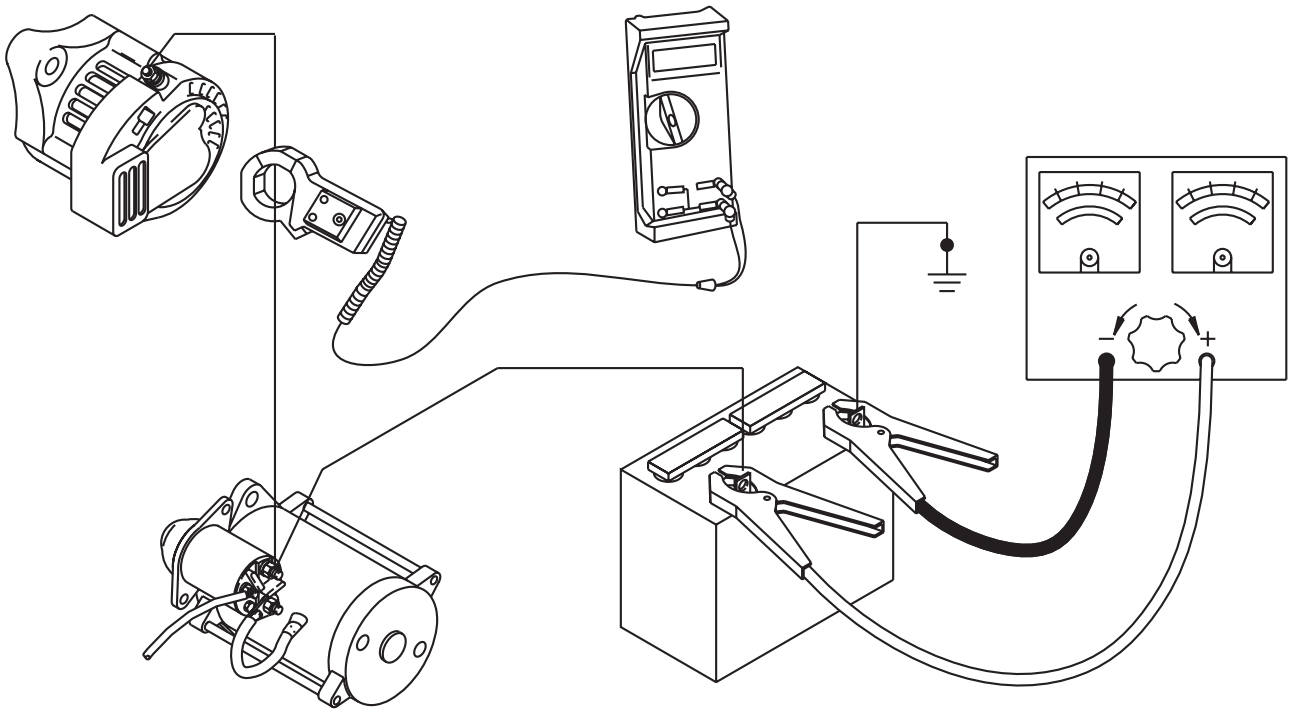
No-Load Draw Maximum—	
Amperage	190 amp at 5600 rpm
No-Load Draw Minimum—	
Amperage	135 amp at 3600 rpm

RESULTS:

- If starter amps or rpm are not to specification, repair or replace starter.

LV,24015HA,A42 –19–26JUN02–1/1

Alternator/Regulator Test



LV6142 –UN–31JAN01

240
15
,100

REASON:

To determine condition of alternator/regulator.

EQUIPMENT:

- JT05685 Load Tester
- JT02153 Current Clamp-On Probe or equivalent

CONNECTIONS:

1. Transmission in P, park position.
2. Be sure battery is fully charged and all tractor accessories are off.
3. Turn load knob of battery tester off (fully counterclockwise).
4. Connect red battery tester clamp to positive (+) post of battery.
5. Connect black battery tester clamp to negative (–) post of battery.
6. Attach current probe to large red cable between alternator and starter as shown.

PROCEDURE:

1. Start and operate engine 2400 rpm.

IMPORTANT: Perform this test as quickly as possible to prevent damage to the electrical system components.

2. Slowly turn load knob clockwise until current gun displays maximum current output. Record reading.

IMPORTANT: Load system only as necessary to obtain maximum current output. Do not reduce system voltage any lower than 11 volts.

3. Turn load knob off (fully counterclockwise).
4. Let engine run and watch when current gun reading is 10 amps or less.

Continued on next page

5. Read and record meter voltage.

Alternator/Regulator—Specification

Current Output—Amperage..... 10 Amps Minimum at 2400 rpm
Regulated Voltage—Voltage ..... 14.2—14.8 VDC at 2400 rpm

RESULTS:

- If alternator current output or regulated voltage is not to specifications, replace alternator.

OUO1085,00001A7 –19–26JUN02–2/2

240
15
,101

Starter Solenoid Test

REASON:

To determine condition of starter solenoid.

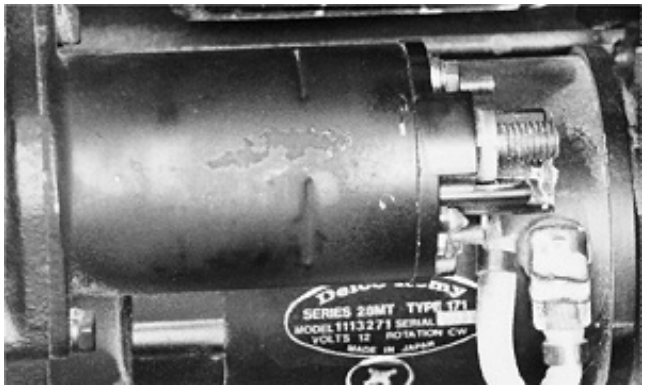
PROCEDURE:

1. Test starting system to ensure voltage at solenoid. (See Starting System Test Points—Normal Operation in this group.)

2. Turn key to START and listen that solenoid engages and stays engaged.

RESULTS:

- If solenoid does not engage, chatter or click, check the ground cable near battery or replace solenoid.



LV067 –UN–24FEB92

AG,OUO1023,409 –19–26SEP00–1/1

Starter Relay Test

REASON:

To check operation of starter relay.

EQUIPMENT:

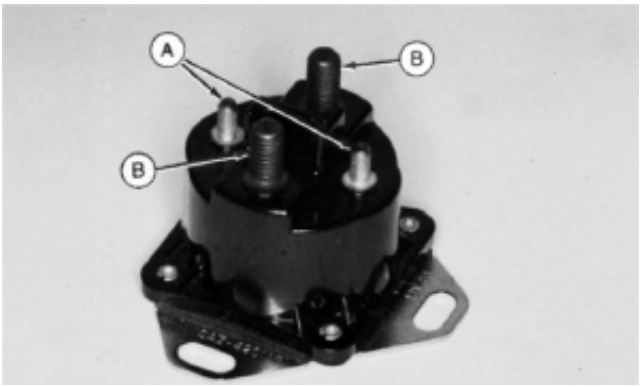
- Ohmmeter or continuity tester

PROCEDURE:

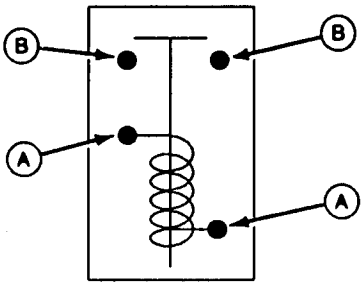
1. Disconnect wires from relay.
2. Check for continuity between two smaller terminals (A).
3. Check for no continuity between two larger terminals (B).
4. Connect a jumper wire from battery positive (+) post to one small terminal. Connect a jumper wire from the other small terminal to negative (–) post. Continuity should now exist between two larger terminals.

RESULTS:

- If continuity is not correct, replace starter relay.



LV068 –UN–24FEB92



LV069AE –UN–24FEB92

A—Smaller Terminal (2 used)
B—Larger Terminal (2 used)

LV,24015HA,A44 –19–26SEP00–1/1

Key Switch Test

REASON:

To check operation of key switch.

EQUIPMENT:

- Ohmmeter or continuity tester

PROCEDURE:

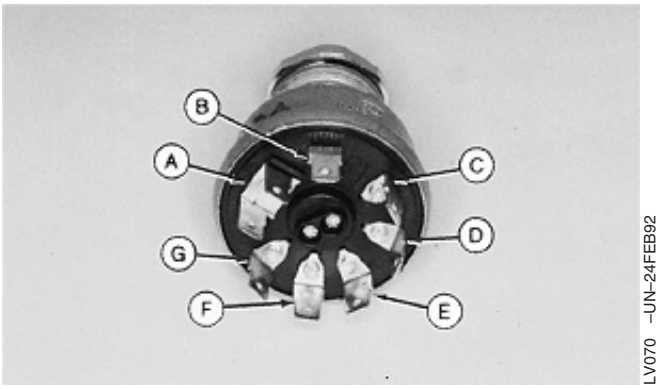
1. Disconnect key switch connector.

2. Use ohmmeter to check continuity between switch terminals (A—G) in OFF, RUN, START, ACCESSORY and AID positions:

KEY SWITCH CONTINUITY	
Switch Position	**Continuity Between Terminals**
OFF	None
RUN	BAT-IGN-ACC
START	BAT-ST-IGN
ACCESSORY	BAT-ACC
AID-RUN	BAT-AID-IGN-ACC
AID-START	BAT-AID-ST-IGN

RESULTS:

- If continuity is not present between terminals listed for each switch position, replace key switch.
- If continuity exists between terminals not listed for each switch position, replace switch.



LV070 –UN–24FEB92

A—BAT Terminal (Battery)
B—GND Terminal (Not Used)
C—AID Terminal (Aid)
D—ST Terminal (Start)
E—IGN Terminal (Ignition)
F—ELX Terminal (HVAC Relay[1])
G—ACC Terminal (Accessory[1])

240
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,103

[1]Used on cab tractors only.

AG,OUO1023,410 –19–01DEC99–1/1

Plug-In Relay Test

NOTE: Manifold heater relay does not have terminal 87A. Heater relay can be tested using this test.

REASON: To check operation of modular relay.

EQUIPMENT:

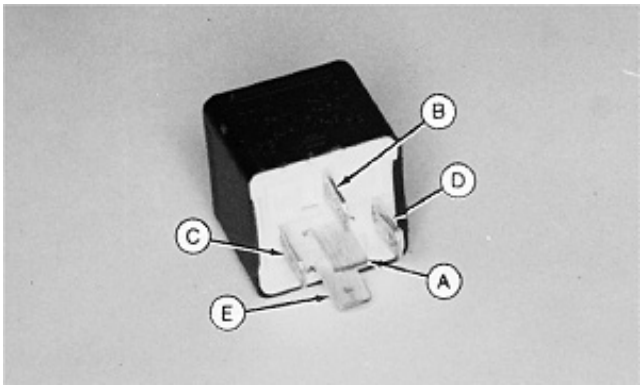
- Ohmmeter or continuity tester

PROCEDURE:

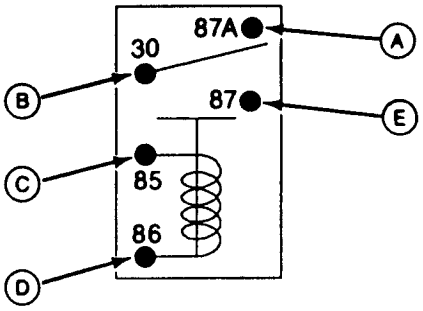
1. Remove relay from connector.
2. Use ohmmeter or continuity tester to check continuity between relay terminals 87A and 30 (A and B); 85 and 86 (C and D).
3. Check for no continuity between terminals 30 and 87 (B and E).
4. Connect a jumper wire from battery positive (+) post to relay terminal 85. Connect a jumper wire from relay terminal 86 to ground (–). Continuity should now exist between terminals 30 and 87; no continuity between 30 and 87A.

RESULTS:

- If continuity is not correct, replace relay.



LV061 –UN–24FEB92

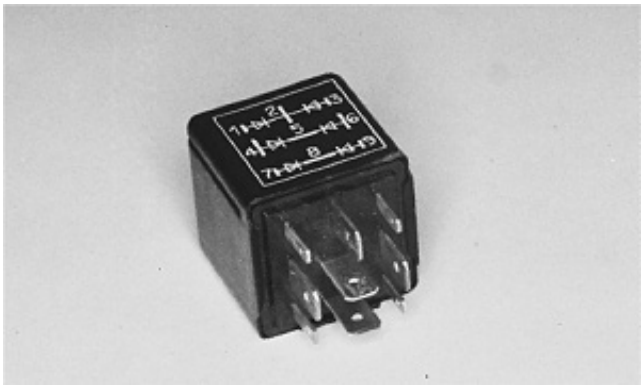


LV079AE –UN–24FEB92

A—Terminal 87A
B—Terminal 30
C—Terminal 85
D—Terminal 86
E—Terminal 87

LV,24015HA,A46 –19–26SEP00–1/1

Diode Pack Test



REASON:

To determine condition of diode pack.

EQUIPMENT:

- Diode tester

PROCEDURE:

NOTE: Terminal positions are indicated on diode pack.

Not all terminals and diodes of diode pack are used for this tractor. Procedure will discuss only the terminals used.

Connect meter or tester to each pair of terminals for diodes as indicated in table.

Diode Terminals		Continuity
Black Test Lead	Red Test Lead	
(–)	(+)	
1	2	Yes
2	1	No
2	3	No
3	2	Yes
4	5	Yes
5	4	No
6	5	Yes
5	6	No
7	8	Yes
8	7	No
9	8	Yes
8	9	No

RESULTS:

- Each diode should have continuity in one direction only.
- If a diode has no continuity or has continuity in both directions, replace diode pack.

240
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,105

OUO1085,00001A8 –19–26SEP00–1/1

Fuse Test

REASON:

To determine if fuse has failed.

EQUIPMENT:

- Ohmmeter

1. Set ohmmeter to 1X ohms scale.

NOTE: On analog (swing needle) ohmmeters, set zero point before every test.

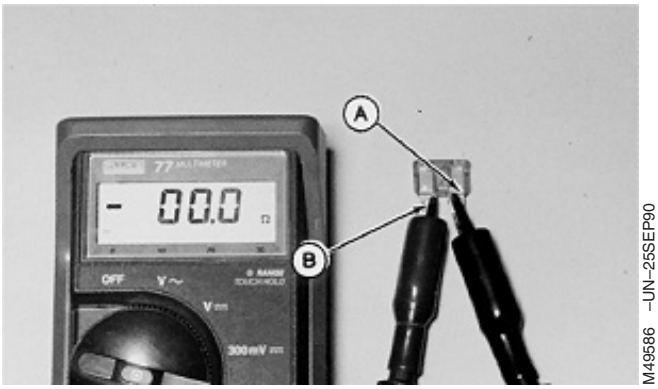
2. Connect one meter lead to one post (A) of fuse.

3. Connect other meter lead to other post (B) of fuse.

4. Read meter.

RESULTS:

- If there is no continuity between posts, replace fuse.



M49586 –UN–25SEP90

A—Fuse Post
B—Fuse Post

240 15 ,106

LV,24015HA,A48 –19–26SEP00–1/1

Neutral Start Switch Test

REASON:

To check operation of neutral start switch.

EQUIPMENT:

- Ohmmeter or continuity tester

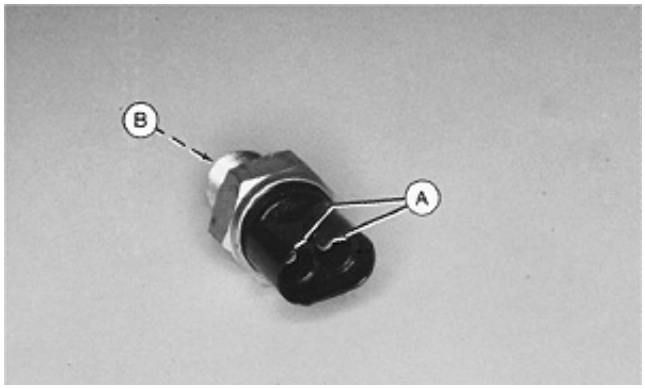
PROCEDURE:

NOTE: Test can be performed while switch is installed in transmission. Make sure shift lever is in N (neutral) or P (park) position and key switch is OFF. Plunger can be depressed by moving shift lever into neutral position.

1. Connect test leads to switch terminals (A).
2. Check for no continuity or open switch.
3. Depress switch plunger (B) and check for continuity or closed switch.

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check installation of switch or shifter linkage of transmission.



LV073 –UN–24FEB92

A—Switch Terminal
B—Switch Plunger

240
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,107

AG,OUO1023,412 –19–26SEP00–1/1

PTO Switch Test

REASON:

To check operation of PTO switch.

EQUIPMENT:

- Ohmmeter or continuity tester

PROCEDURE:

1. Disconnect switch connector.

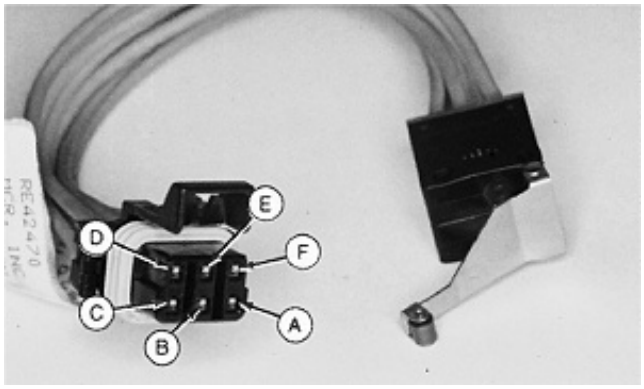
NOTE: Only terminals A, C, D, and E are used for this tractor.

2. Check continuity between pair of terminals A and C and terminals D and E with switch lever released and depressed.

Terminals	Switch Arm Position	
	Released	Depressed
A—C	Continuity	No Continuity
D—E	No Continuity	Continuity

RESULTS:

- If continuity is not correct replace switch.
- If continuity is correct, check for proper installation or bent switch arm.



LV074 –UN–24FEB92

A—Terminal A
B—Terminal B
C—Terminal C
D—Terminal D
E—Terminal E
F—Terminal F (Not Used)

OUO1085,00001A9 –19–26SEP00–1/1

PTO Seat Switch Test

REASON:

To check operation of seat switch.

EQUIPMENT:

- Ohmmeter or continuity tester

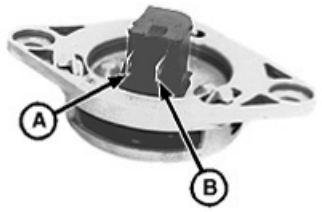
PROCEDURE:

1. Disconnect switch wiring connector.
2. Check continuity between terminals A and B with switch lever released and depressed.

Terminals	Switch Arm Position	
	Released	Depressed
A—B	No Continuity	Continuity

RESULTS:

- If continuity is not correct, replace switch.



LV2335 –UN–20NOV97

A—Terminal A
B—Terminal B

240
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,109

OUO1085,00001AA –19–26SEP00–1/1

Light Switch Test

REASON:

To check operation of light switch.

EQUIPMENT:

- Ohmmeter or continuity tester

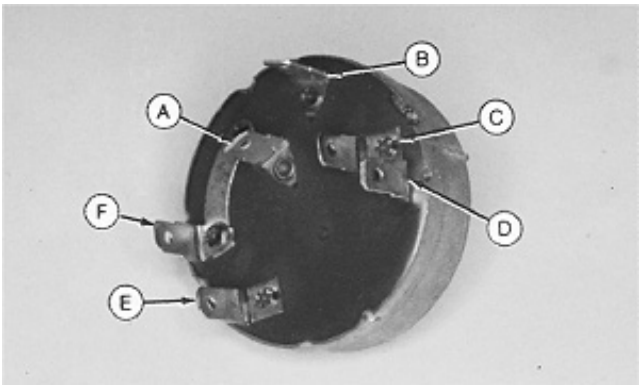
PROCEDURE:

1. Disconnect light switch connector.
2. Check continuity between terminals as shown in table. Move switch knob to indicated position when making checks.

Switch Position	Terminals in Continuity
OFF	None
W (Warning)	B-W
F (Work)	B-FL-HD1
H_1 (High Beam)	B-W-HD1-TL
H_2 (Low Beam)	B-W-HD2-TL

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.

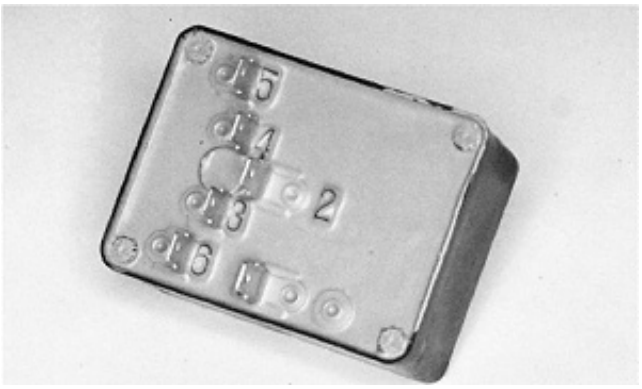


LV076 –UN–24FEB92

A—B Terminal (Battery)
B—FL Terminal (Work Light)
C—HD2 Terminal (High Beam)
D—TL Terminal (Tail Light)
E—HD1 Terminal (Low Beam)
F—W Terminal (Warning)

LV,24015HA,A52 –19–26SEP00–1/1

Turn Signal Controller Test



LV077 –UN–24FEB92

REASON:

To check operation of turn signal controller.

EQUIPMENT:

- Ohmmeter or continuity tester

PROCEDURE:

1. Disconnect turn signal controller connector.
2. Check continuity between terminals as shown in table. Move switch knob to indicated position when making checks.

Switch Position	Terminals in Continuity
Off	1-3-4 (through flasher)
Left Turn	1-3-6 (through flasher) 1-2-4 (not through flasher)
Right Turn	1-4-5 (through flasher) 1-2-3 (not through flasher)

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections. If necessary, apply power to terminal 1 or 2 and a load to terminals 3 and 4 to check actual controller operation.

LV,25015HA,A53 –19–26SEP00–1/1

240
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,111

Fuel Shut-Off Solenoid Test

REASON:

To check operation of fuel shut-off solenoid.

EQUIPMENT:

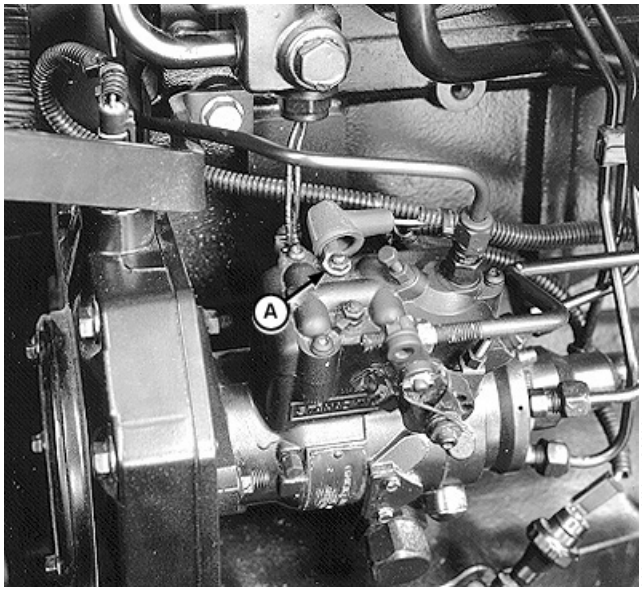
- Jumper wire

PROCEDURE:

1. Turn key switch off.
2. Connect jumper wire to battery positive (+) terminal.
3. Touch jumper wire to fuel shut-off solenoid terminal (A). Listen for the solenoid to “click”.
4. Remove jumper wire from fuel shut-off solenoid terminal. Listen for solenoid to “click” again.

RESULTS:

- If solenoid does not “click”, service fuel injection pump.



A—Fuel Shut-Off Solenoid Terminal

OUO1085,00001AB –19–26SEP00–1/1

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,112

Blower Switch Test

REASON:

To check operation of blower switch.

EQUIPMENT:

- Ohmmeter or continuity tester.

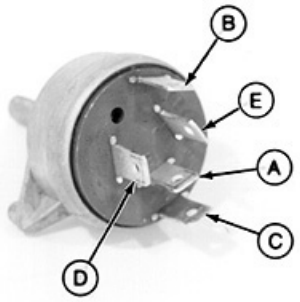
PROCEDURE:

1. Disconnect blower switch connector.
2. Check continuity between terminals as shown in table. Rotate switch knob to indicated position when making checks.

Switch Position	Terminals in Continuity
OFF	None
LOW	B-1-2-3-4
MEDIUM	B-2-3-4
HIGH	B-3-4
PURGE	B-4

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.



LV1618 –UN–12FEB96

Blower Switch Terminals Identification

A—Terminal B
B—Terminal #1
C—Terminal #2
D—Terminal #3
E—Terminal #4
F—W Terminal (Warning)

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,113

OUO1085,00001AC –19–26SEP00–1/1

Blower Motor Resistors

LV1625 –UN–12FEB96

REASON:

To check for proper resistance of blower motor resistors.

EQUIPMENT:

- Ohmmeter

PROCEDURE:

240
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,114

1. Disconnect connector from blower motor resistors.
2. Check resistance between terminals as shown in table.

Terminals	Resistance (Ohms)
0—1	0.400
0—2	0.000[a]
0—3	0.175
0—4	0.840
1—2	0.400
1—3	0.225
1—4	0.440
2—3	0.175
2—4	0.840
3—4	0.665

[a]A thermal fuse is located between terminals 0 and 2. If meter reads an open circuit, replace the resistors.

RESULTS:

- If resistance is not correct, or if an open circuit is detected between terminals 0 and 2, replace the resistors.
- If resistance is correct, check for proper wire connections.

OUO1085,00001AD –19–26SEP00–1/1

A/C Thermostatic Control Switch Test

LV1619 –UN–12FEB96

REASON:

To check operation of thermostatic control switch.

EQUIPMENT:

- Ohmmeter or continuity tester
- Ice and salt water solution
- Thermometer

PROCEDURE:

1. Tag and disconnect wires from switch.

2. Carefully remove capillary tube from evaporator/heater core.

3. Connect ohmmeter across switch terminals.

4. Warm end of capillary tube between hands. There should be less than 0.5 ohms across switch terminals when capillary tube is warmed by hand.

5. Insert capillary tube into ice and salt water solution. Switch contacts should be open at minus 1°C (30°F) and close at 3°C (37°F).

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.

OUO1085,00001AE –19–26SEP00–1/1

Front Wiper/Washer Switch Test

REASON:

To check operation of front wiper/washer switch.

EQUIPMENT:

- Ohmmeter or continuity tester

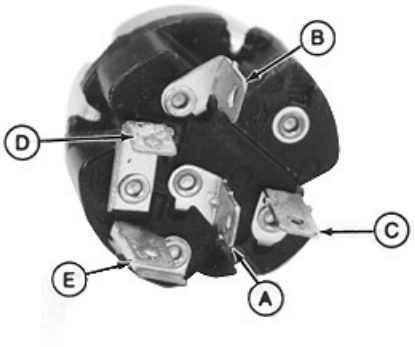
PROCEDURE:

1. Tag and disconnect wire from switch.
2. Check continuity between terminals as shown in table. Rotate switch knob to indicated position when making checks. Push switch knob in to test WASHER position.

Switch Position	Terminals in Continuity
OFF	B-P
LOW	B-L
HIGH	B-H
WASHER	B-L-H-W

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.



LV1620 –UN–12FEB96

A—Terminal B
B—Terminal P
C—Terminal L
D—Terminal H
E—Terminal W

OUO1085,00001AF –19–26SEP00–1/1

Rear Wiper/Washer Switch Test

REASON:

To check operation of rear wiper/washer switch.

EQUIPMENT:

- Ohmmeter or continuity tester

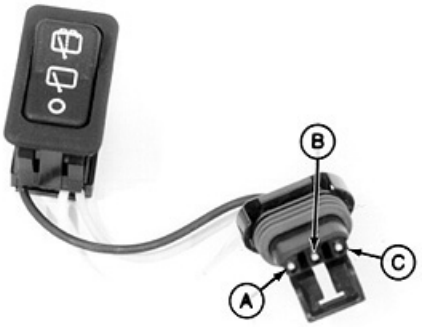
PROCEDURE:

1. Disconnect wire connector from switch.
2. Check continuity between terminals as shown in table. Move switch to indicated position when making checks.

Switch Position	Terminals in Continuity
OFF	NONE
LOW	A-B
HIGH	A-C

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.



LV1621 –UN–12FEB96

A—Terminal A
B—Terminal B
C—Terminal C

OUO1085,00001B0 –19–26SEP00–1/1

240
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,117

Door Switch Test

LV1624 –UN–12FEB96

REASON:

To check operation of door switches.

EQUIPMENT:

- Ohmmeter or continuity tester

PROCEDURE:

1. Tag and disconnect wires from switch.
2. Check continuity between terminals with switch in both positions. There should be no continuity with switch in the pressed position (cab door closed). There should be continuity with switch not pressed (cab door open).

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.

240
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,118

OUO1085,00001B1 –19–26SEP00–1/1

Dome Light Switch Test

REASON:

To check operation of dome light switch.

EQUIPMENT:

- Ohmmeter or continuity tester

PROCEDURE:

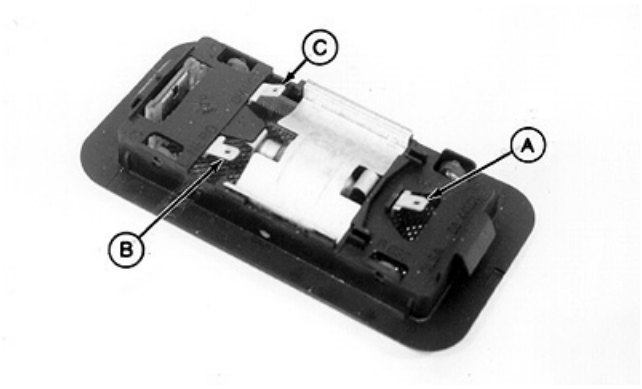
1. Tag and disconnect wires from dome light.

NOTE: Test dome light switch with a bulb known to be good. If condition of bulb is not known, test continuity across bulb terminals with switch ON.

2. Check continuity between ground terminal and dome light switch terminal with dome light switch in both ON positions. There should be continuity with switch in either of its two ON positions.

RESULTS:

- If continuity is not correct, replace switch.
- If continuity is correct, check for proper wire connections.



LV1623 –UN–12FEB96

A—Dome Light Switch Terminal
B—Ground Terminal
C—Door Switch Terminal

240
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,119

OUO1085,00001B2 –19–26SEP00–1/1

Schematic Information

The wiring schematics are drawn with the battery positive circuit across the top and the ground, or battery negative, circuit across the bottom. The flow is then, as much as possible, from top to bottom through each circuit and component. All components are shown in their normal (de-energized) position.

The circuit numbers used in the schematics represent entire circuit sections using the same number. Actual circuits may have letter suffixes added to indicate specific portions of the circuit. For the exact designation, refer to Group 15 in this section or to the tractor wiring harness.

LV,24020HA,A0 –19–04JUN96–1/1

Component Identification Table

Each component (electrical device) and main connector will have an identification letter assigned to it. A number is added to the letter to separate and indicate the total components within that letter group.

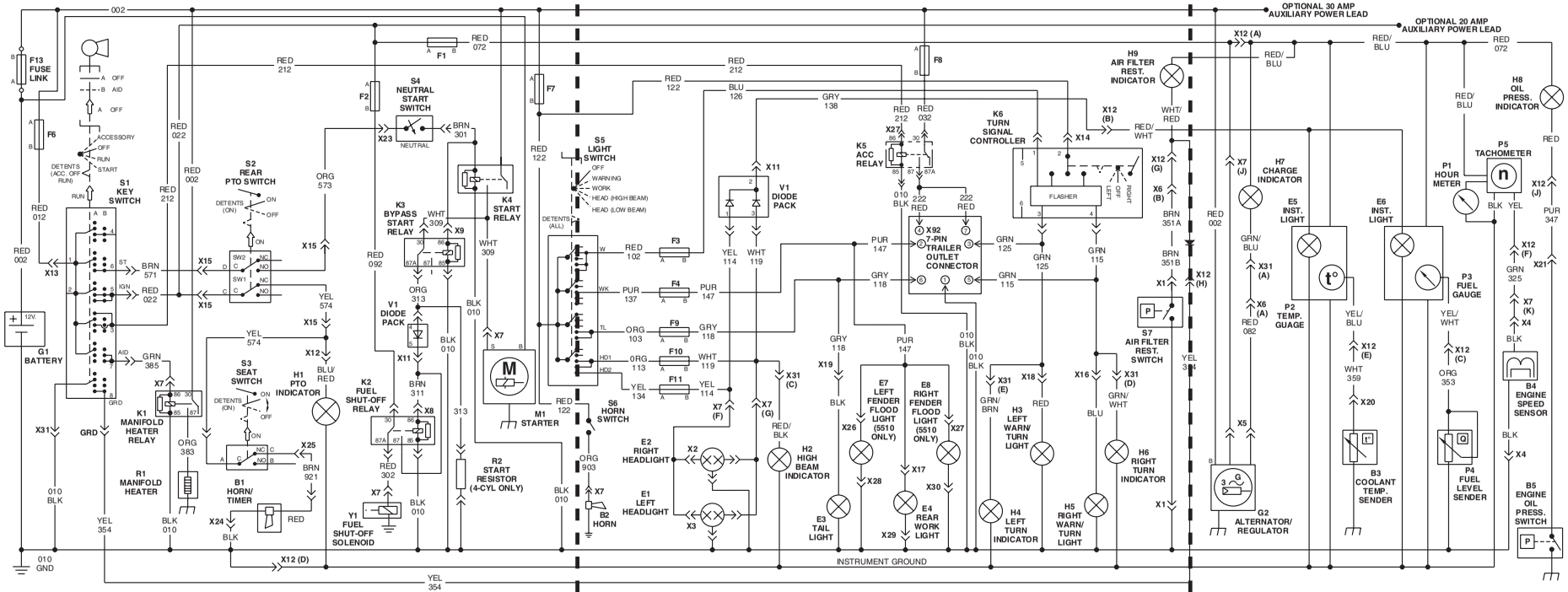
Continued on next page

TX,901505,QQ383 –19–26SEP00–1/2

Identification Letter	Type	Examples
A	System, subassembly, parts group	Control units, trigger boxes, two-way radios, logic module, FNR logic module
B	Transducer for conversion of non-electrical variables to electrical and vice versa	Speed sensors, pressure sensors, pressure switches, horns, sensors, pickups, limit-value sensors, pulse generators, loudspeakers, inductive pickups, probes, air-flow sensors, oil-pressure switches, temperature sensors, ignition-voltage pickups
C	Condenser, capacitor	Condensers and capacitors, general
D	Binary device, memory	Digital devices, integrated circuits, pulse counters, magnetic tape recorders
E	Various devices and equipment	Heating devices, air conditioners, light, headlights, spark plugs, ignition distributors
F	Protection device	Release mechanisms, polarity protection devices, fuses, current protection circuits
G	Power supply, generator	Batteries, generators, alternators, charging units
H	Monitor, alarm, signalling device	Audible alarms, indicator lights, turn-signal lights, brake lights, alarms, warning lights, buzzers
K	Relay	Battery relays, turn-signal relays, solenoid switches, starting relays, warning flashers
L	Inductor	Choke coils, coils, windings
M	Motor	Blower motors, fan motors, starter motors
N	Regulator, amplifier	Regulators (electronic or electromechanical), voltage stabilizers
P	Measuring instrument	Ammeter, diagnostic connectors, tachometers, fuel gauge, pressure gauges, measuring points, test points, speedometers
R	Resistor	Flame glow plugs, sheathed-element flame glow plugs, glow plugs, heating resistors, NTC resistors, PTC resistors, potentiometers, regulating resistors
S	Switch	Switches and pushbuttons, general key switch, light switch, horn switch, flasher switch
T	Transformer	Ignition coil, ignition transformer
U	Modulator, converter	DC transformers
V	Semiconductor, electron tubes	Transistors, diodes, electron tubes, rectifiers, semiconductors, thyristors, zener diodes
W	Transmission path, conductor, antenna	Antennas, shielding components, shielded conductors, cable harnesses, conductors, ground conductors
X	Terminal, plug, plug and socket connection	Terminal studs, electrical connections, connectors electrical line couplers, line connectors, sockets, plugs, terminals, plug-and-socket connections
Y	Electrically actuated mechanical device	Permanent magnets, (solenoid-operated) injection valves, electromagnetic clutches and brakes, air valves, fuel pumps, solenoids, switching valves, start valves, locking systems
Z	Electrical filter	Interference suppression filters

5210—5510 Electrical Schematics and Legend (Tractors Without Cab)

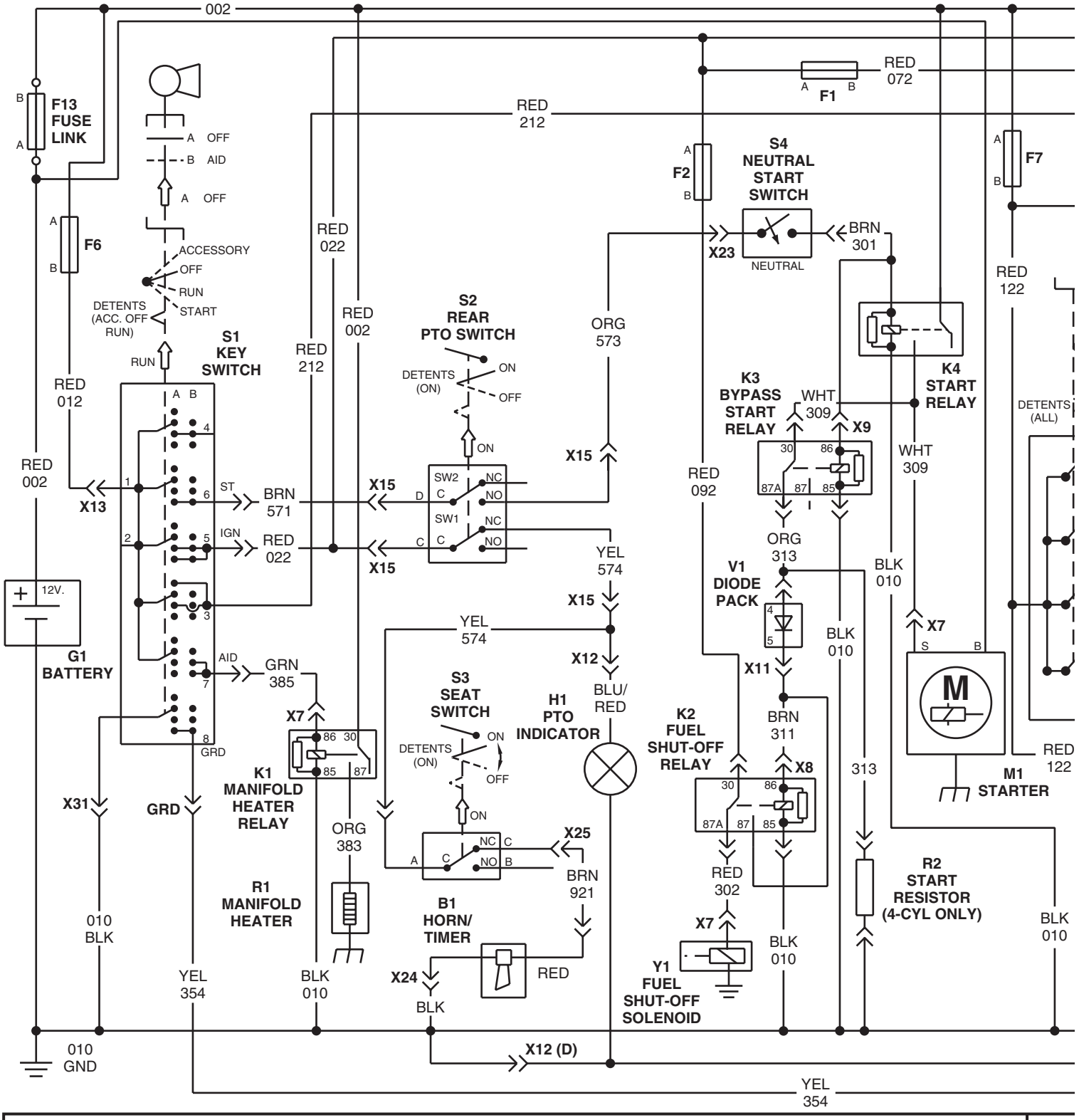
LV222D –UN–10JUL02



See Page 240-20-4 A

See Page 240-20-4 B

See Page 240-20-4 C



SE1 – POWER AND STARTING CIRCUIT

LV2220

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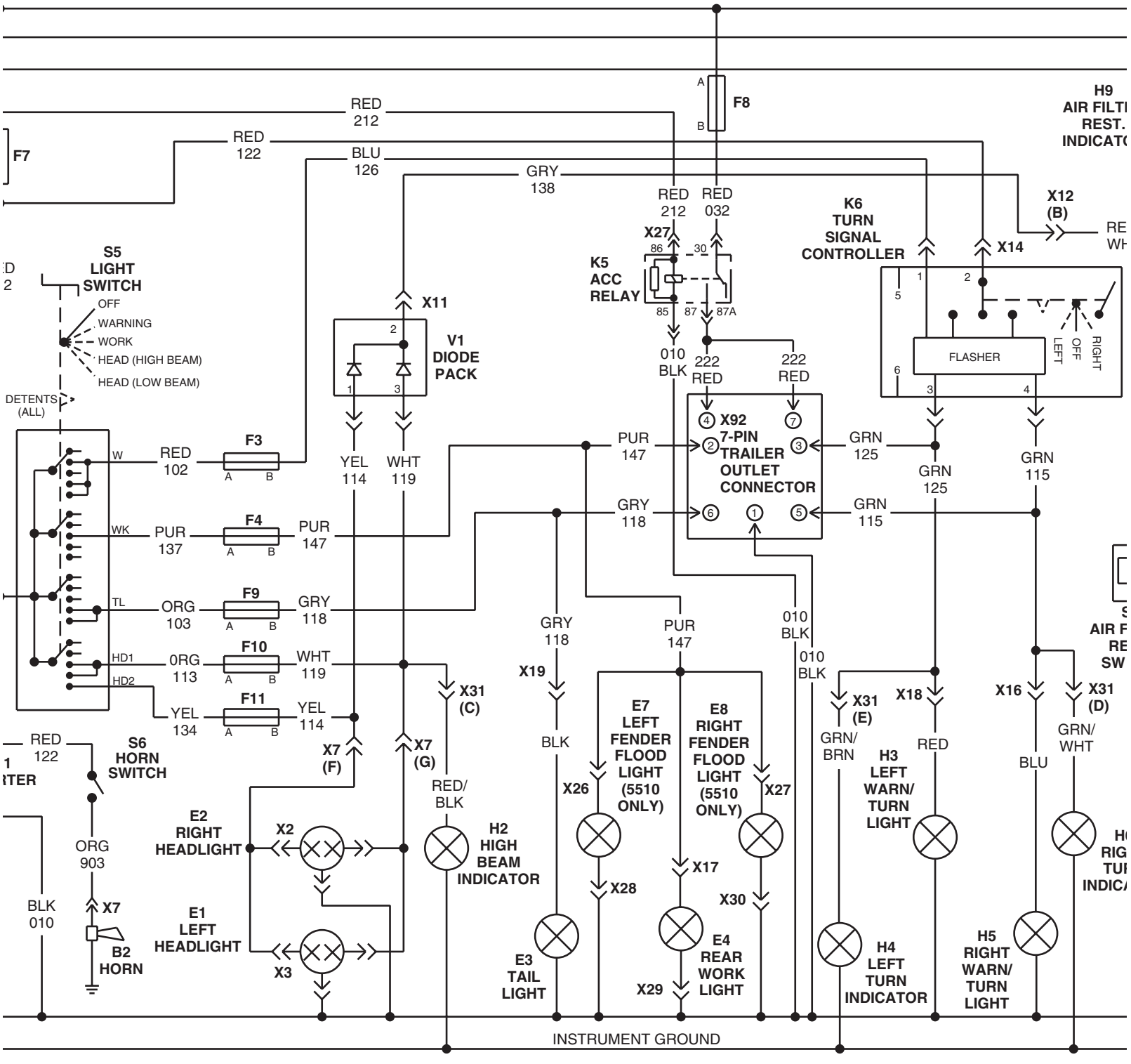

SE2 – LIGHTING AND ACCESSORY CIRCUITS

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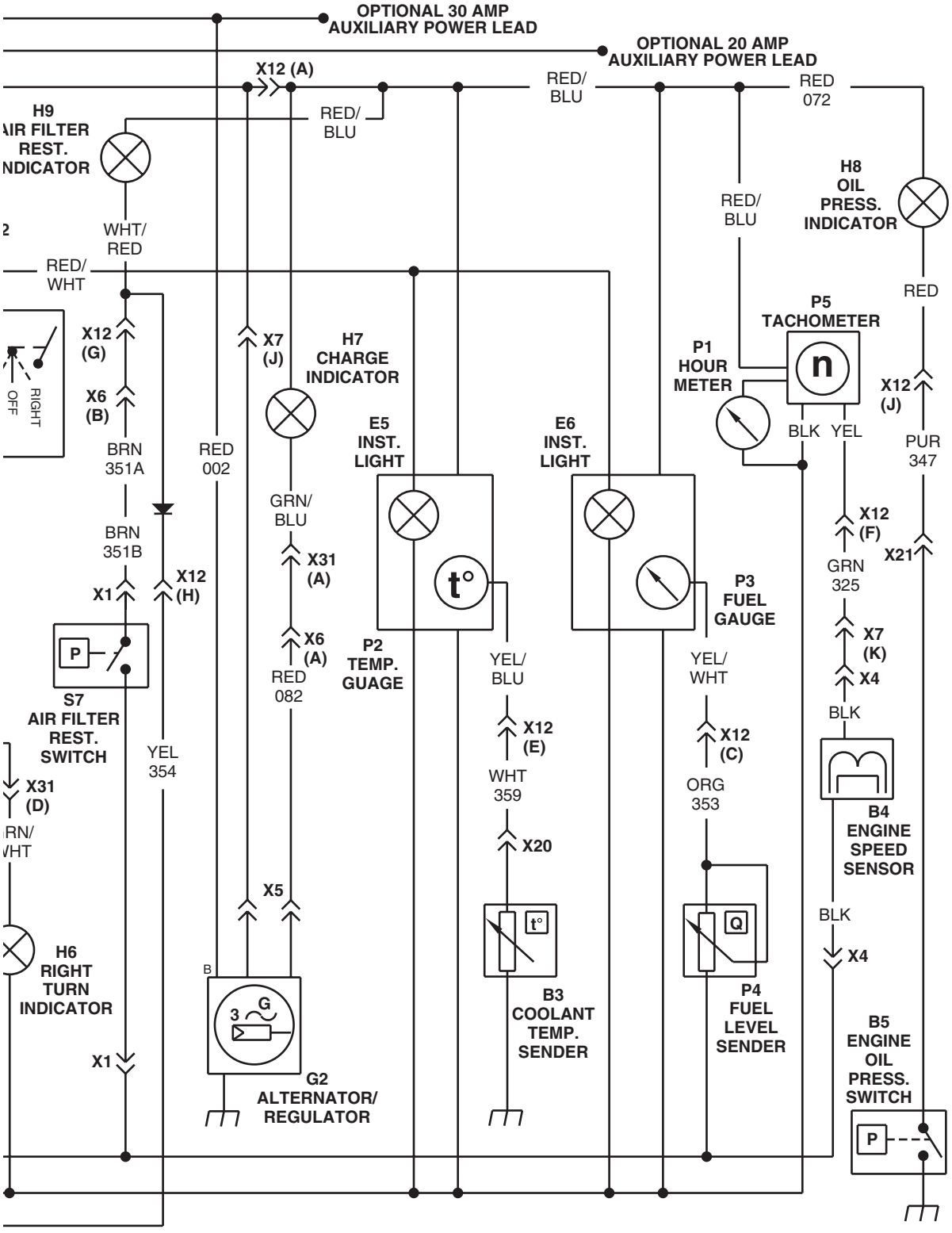
5210, 5310, 5410, 5510 Electrical Schematics and Legend (Tractors Without Cab)

I–10JUL02



SE3 – CHARGING AND INSTRUMENT CIRCUITS

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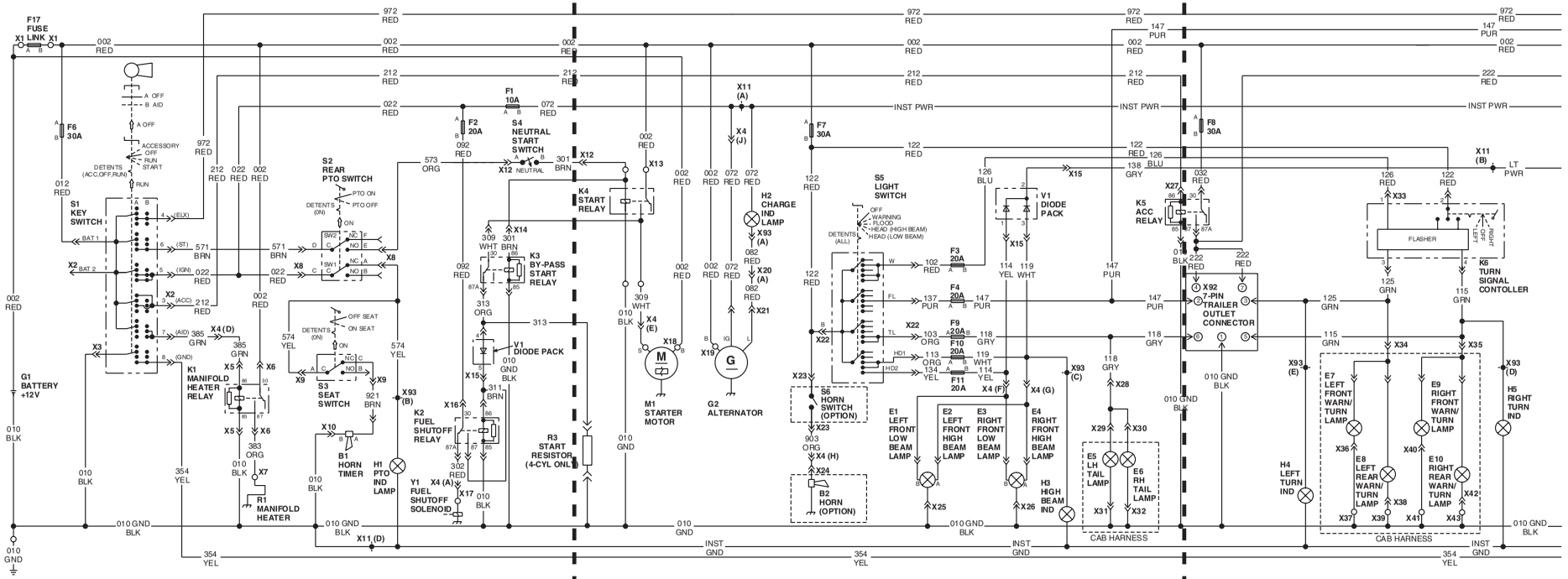
B1—Horn/Timer
B2—Horn (optional)
B3—Coolant Temp Sender
B4—Engine Speed Sensor
B5—Engine Oil Pressure Switch
E1—Left Headlight
E2—Left Headlight
E3—Tail Light
E4—Rear Work Light
E5—Instrument Light
E6—Instrument Light
E7—Left Fender Flood Light[1]
E8—Right Fender Flood Light[1]
F1—10-Amp Fuse
F2—20-Amp Fuse
F3—20-Amp Fuse
F4—20-Amp Fuse
F5—Optional 30-Amp Auxiliary Power Lead
F6—30-Amp Fuse
F7—30-Amp Fuse
F8—30-Amp Fuse
F9—20-Amp Fuse
F10—20-Amp Fuse
F11—20-Amp Fuse
F12—Optional 20-Amp Auxiliary Power Lead
F13—Fuse Link
G1—12-Volt Battery
G2—Alternator/Regulator
H1—PTO Indicator
H2—High Beam Indicator
H3—Left Warn/Turn Light
H4—Left Turn Indicator
H5—Right Warn/Turn Light
H6—Right Turn Indicator
H7—Charge Indicator
H8—Oil Pressure Indicator
H9—Air Filter Restriction Indicator
K1—Manifold Heater Relay
K2—Fuel Shut-Off Relay
K3—Bypass Start Relay
K4—Start Relay
K5—Accessory Relay
K6—Turn Signal Controller
M1—Starter
P1—Hourmeter
P2—Temperature Gauge
P3—Fuel Gauge
P4—Fuel Level Sender
P5—Tachometer
R1—Manifold Heater
S1—Key Switch
S2—Rear PTO Switch
S3—Seat Safety Switch
S4—Neutral Start Switch
S5—Light Switch
S6—Horn Switch (Optional)
S7—Air Filter Restriction Switch
V1—Diode Pack
X1—2-Wire Weather Pack Connector at Air Filter Restriction Switch
X2—3-Wire Connector, Right Headlight
X3—3-Wire Connector, Left Headlight
X4—2-Wire Metripack Connector, Engine Speed Sensor
X5—2-Wire Connector, at Alternator
X6—2-Wire Metripack Connector, at Rear of Engine
X7—10-Wire Metripack Connector, at Rear of Engine
X8—4-Wire Connector, at Fuel Shut-Off Relay
X9—4-Wire Connector, at Bypass Start Relay
X10—5-Wire Connector, at Diode Pack
X11—4-Wire Connector, to Accessory Relay
X12—10-Wire Connector, Instrument Panel
X13—4-Wire Connector at Key Switch
X14—4-Wire Connector at Turn Signal Controller
X15—4-Wire Metripack Connector, PTO Switch to Main Harness
X16—1-Wire Bullet Connector, Right Turn Feed to ROPS Lead
X17—1-Wire Bullet Connector, Rear Work Light (+)
X18—1-Wire Bullet Connector, Left Turn Feed to ROPS Lead
X19—1-Wire Bullet Connector, Chassis to Tail Light
X20—1-Wire Bullet Connector, Coolant Temperature Sender
X21—1-Wire Bullet Connector, Engine Oil Pressure Switch
X22—7-Wire Connector to Trailer Harness
X23—2-Wire Weather Pack Connector at Neutral Start Switch
X24—2-Wire Metripack Connector at Horn/Timer
X25—2-Wire Weather Pack Connector at Seat Switch
X26—1-Wire Bullet Connector, Left Fender Flood Light (+)[1]
X27—1-Wire Bullet Connector, Right Fender Flood Light (+)[1]
X28—1-Wire Bullet Connector, Left Fender Flood Light (–)[1]
X29—1-Wire Bullet Connector, Rear Work Light (–)
X30—1-Wire Bullet Connector, Right Fender Flood Light (–)[1]
X31—6-Wire Connector at Instrument Panel
Y1—Fuel Shut-Off Solenoid

[1]5510 without cab only

OUO1085,00001B3 –19–26SEP00–2/2

5210—5510 Electrical Schematic and Legend (Tractors With Cab)

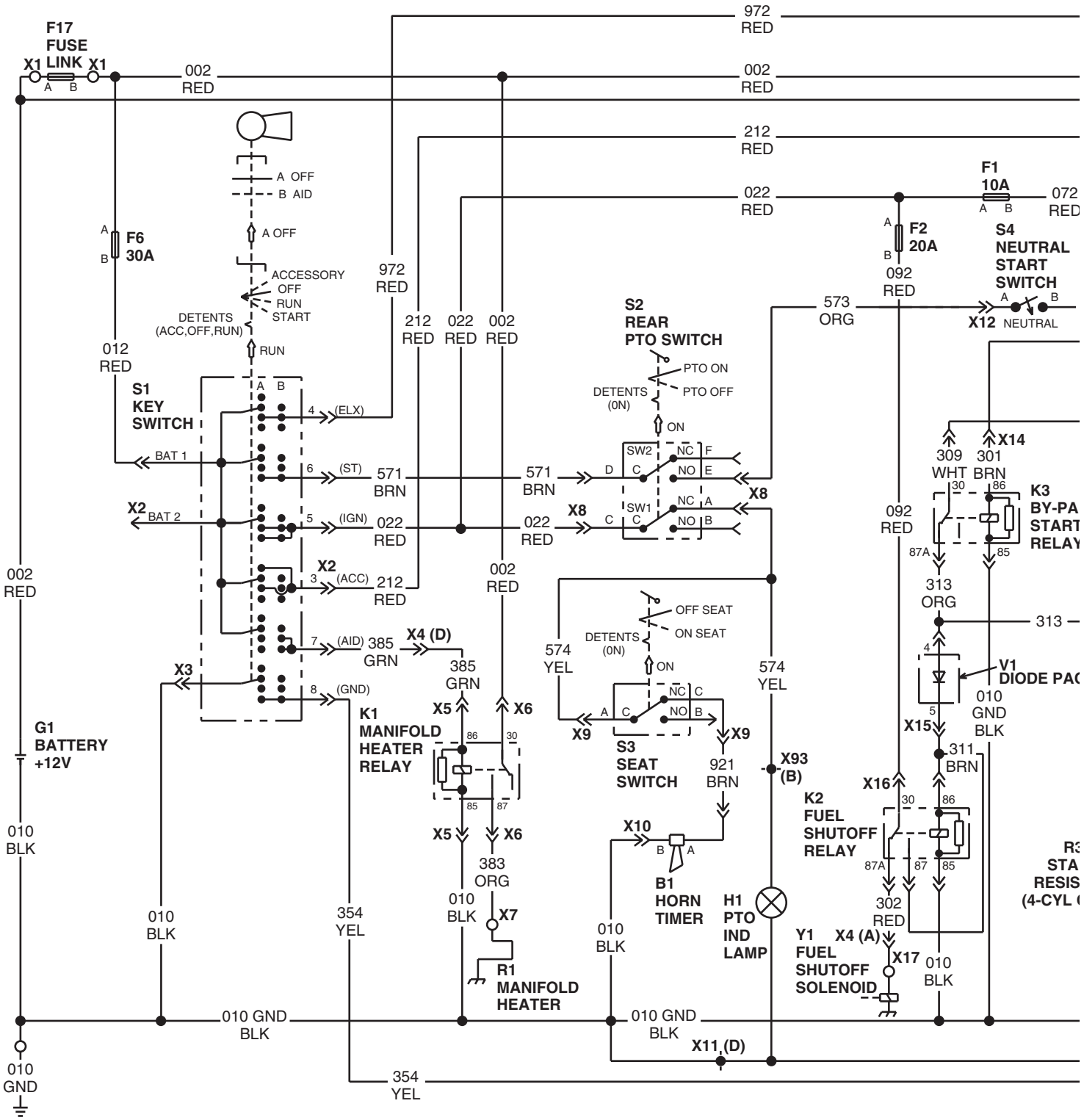
LV2222 –UN–10JUL02



See Page 240-20-6 A

See Page 240-20-6 B

See Page 240-20-6 C



LV2222

SE1 – POWER SUPPLY, STARTING AND CHARGING

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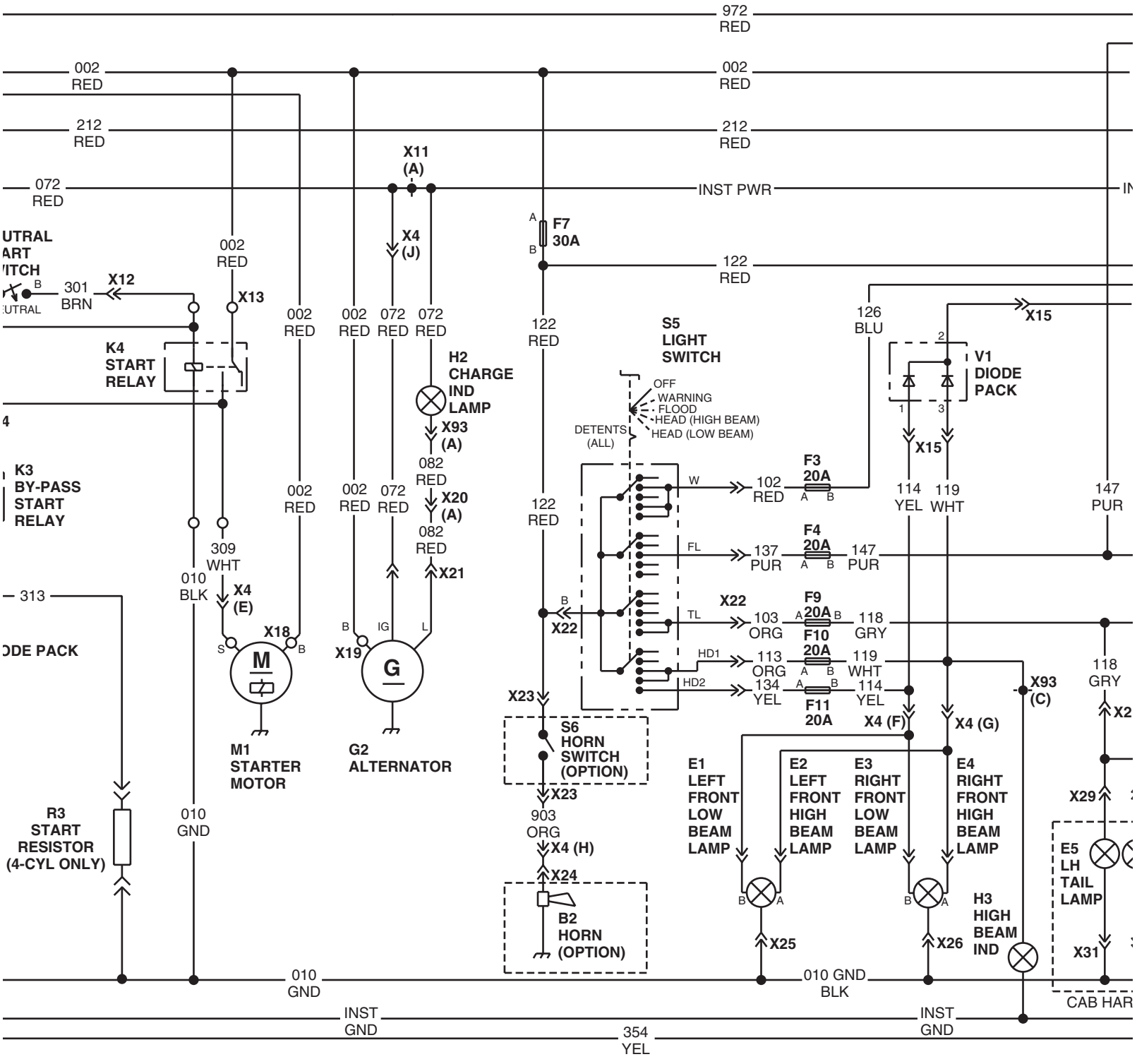

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SE2 – LIGH

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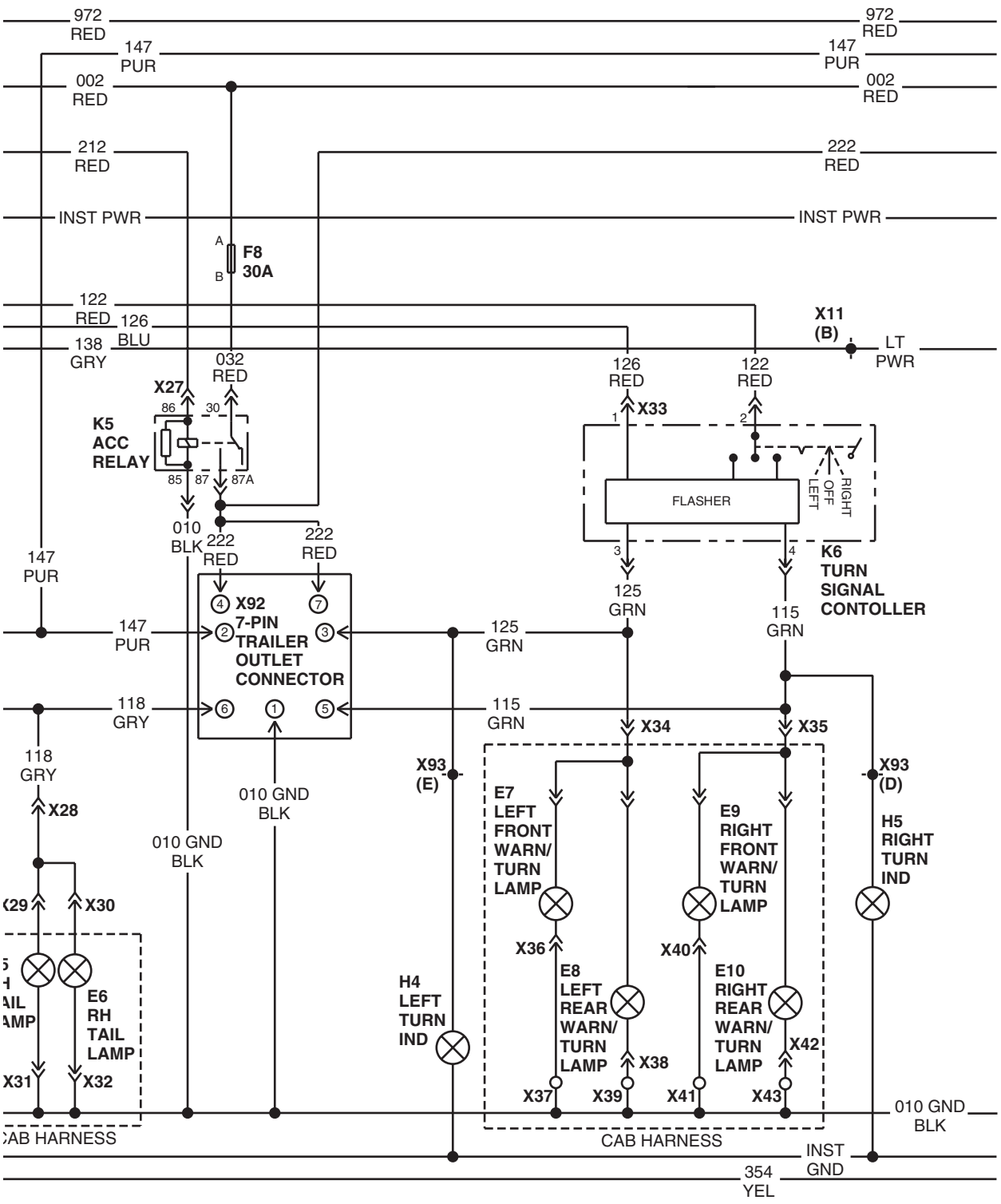
)—5510 Electrical Schematic and Legend (Tractors With Cab)

–UN–10JUL02



LIGHTING AND ACCESSORIES

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B1 — Horn Timer
B2 — Horn (optional)
B3 — Coolant Temperature Sender
B4 — Fuel Level Sender
B5 — Engine Speed Magnetic Pickup
B6 — Engine Oil Pressure Sender
B7 — Air Filter Restriction Switch
B8 — A/C Low Pressure Switch
B9 — A/C High Pressure Switch
E1 — Left Front Low Beam Light
E2 — Left Front High Beam Light
E3 — Right Front Low Beam Light
E4 — Right Front High Beam Light
E5 — Left Tail Light
E6 — Right Tail Light
E7 — Left Front Warn/Turn Light
E8 — Left Rear Warn/Turn Light
E9 — Right Front Warn/Turn Light
E10 — Right Rear Warn/Turn Light
E11 — Instrument Light
E12 — Instrument Light
E13 — Left Rear Flood Light
E14 — Right Rear Flood Light
E15 — Left Front Flood Light
E16 — Right Front Flood Light
E17 — Dome Light
F1 — 10-Amp Fuse for Instrument Panel
F2 — 20-Amp Fuse for Ignition Circuits
F3 — 20-Amp Fuse for Warn/Turn Lights
F4 — 20-Amp Fuse for Flood Light Relay
F5 — 30-Amp Fuse for Dome Light and Convenience Outlet
F6 — 30-Amp Fuse for Key Switch
F7 — 30-Amp Fuse for Light Switch
F8 — 30-Amp Fuse for Accessories
F9 — 20-Amp Fuse for Tail Lights
F10 — 20-Amp Fuse for High Beam Head Lights
F11 — 20-Amp Fuse for Low Beam Head Lights
F12 — 20-Amp Fuse for Radio and Wipers
F13 — 30-Amp Fuse for Blower Switch and Left Blower Motor
F14 — 30-Amp Fuse for Flood Lights
F15 — 30-Amp Fuse for Right Blower Motor
F16 — 10-Amp Fuse for A/C Compressor Clutch
F17 — Fuse Link
G1 — Battery
G2 — Alternator/Regulator
H1 — PTO Indicator Light
H2 — Charge Indicator Light
H3 — High Beam Indicator
H4 — Left Turn Indicator
H5 — Right Turn Indicator
H6 — Oil Pressure Indicator Light
H7 — Air Filter Restriction Indicator Light
K1 — Manifold Heater Relay
K2 — Fuel Shutoff Relay
K3 — Bypass Start Relay
K4 — Start Relay
K5 — Accessory Relay
K6 — Turn Signal Controller
K7 — HVAC Relay
K8 — Blower Motor Relay #1
K9 — Blower Motor Relay #2
K10 — Flood Light Relay
M1 — Starter Motor
M2 — Left Blower Motor
M3 — Right Blower Motor
M4 — Front Wiper Motor
M5 — Front Washer Pump
M6 — Rear Wiper Motor
M7 — Rear Washer Pump
P1 — Hour Meter
P2 — Temperature Gauge
P3 — Fuel Gauge
P4 — Tachometer
R1 — Manifold Heater
R2 — Blower Motor Resistor
S1 — Key Switch
S2 — Rear PTO Switch
S3 — Seat Switch
S4 — Neutral Start Switch
S5 — Light Switch
S6 — Horn Switch (optional)
S7 — Blower Switch
S8 — A/C Thermostatic Control
S9 — Front Wiper/Washer Switch
S10 — Rear Wiper/Washer Switch
S12 — Dome Light Switch
S13 — Left Door Switch
S14 — Right Door Switch
V1 — Diode Pack
X1 — Ring Terminals at Fuse Link (2 used)

Continued on next page

X2 — 8-Wire Connector at Key Switch
X3 — 1-Wire Connector for Key Switch Ground
X4 — 10-Wire Connector, Rear Harness-to-Front Harness
X5 — Single Wire Connectors at Manifold Heater Relay (2 used)
X6 — Single Wire Connectors at Manifold Heater Relay (2 used)
X7 — Ring Terminal at Manifold Heater
X8 — 6-Wire Connector at Rear PTO Switch
X9 — 3-Wire Connector at Seat Switch
X10 — 2-Wire Connector at Horn Timer
X11 — 10-Wire Connector at Instrument Panel
X12 — 2-Wire Connector at Neutral Start Switch
X13 — Ring Terminal at Start Relay (4 used)
X14 — 5-Wire Connector at Bypass Start Relay #1
X15 — 9-Wire Connector at Diode Pack
X16 — 5-Wire Connector at Bypass Start Relay #2
X17 — Ring Terminal at Fuel Shut-Off Solenoid
X18 — Ring Terminal at Starter Motor (2 used)
X19 — Ring Terminal at Alternator
X20 — 2-Wire Connector, Rear Harness-to-Front Harness
X21 — 2-Wire Connector at Alternator
X22 — 1-Wire Connector at Light Switch (6 used)
X23 — 1-Wire Connector at Horn Switch (2 used)
X24 — 1-Wire Connector at Horn
X25 — 3-Wire Connector at Left Headlight
X26 — 3-Wire Connector at Right Headlight
X27 — 5-Wire Connector at Accessory Relay
X28 — 1-Wire Connector, Rear Harness-to-Tail Light Harness
X29 — 1-Wire Connector at Left Tail Light
X30 — 1-Wire Connector at Right Tail Light (—)
X31 — 1-Wire Connector at Left Tail Light Ground
X32 — 1-Wire Connector at Right Tail Light Ground
X33 — 6-Wire Connector at Turn Signal Controller
X34 — 1-Wire Connector, Rear Harness-to-Cab Harness, Left Cab Post
X35 — 1-Wire Connector, Rear Harness-to-Cab Harness, Right Cab Post
X36 — 2-Wire Connector at Left Front Warn/Turn Light
X37 — Ring Terminal at Left Front Warn/Turn Light Ground
X38 — 2-Wire Connector at Left Rear Warn/Turn Light
X39 — Ring Terminal at Left Rear Warn/Turn Light Ground
X40 — 2-Wire Connector at Right Front Warn/Turn Light
X41 — Ring Terminal at Right Front Warn/Turn Light Ground
X42 — 2-Wire Connector at Right Rear Warn/Turn Light
X43 — Ring Terminal at Right Rear Warn/Turn Light Ground
X44 — 1-Wire Connector at Water Temperature Sender
X45 — Ring Terminals at Fuel Gauge Sender (2 used)
X46 — 2-Wire Connector at Engine Speed Magnetic Pickup
X47 — 1-Wire Connector at Engine Oil Pressure Sender
X48 — 2-Wire Connector at Air Filter Restriction Switch
X49 — 3-Wire Connector, Rear Harness-to-Cab Harness, Right Cab Post
X50 — 1-Wire Connector, Rear Harness-to-Cab Harness, Left Cab Post
X51 — 5-Wire Connector at HVAC Relay
X52 — Ring Terminal at HVAC Relay Ground
X53 — 5-Wire Connector at Blower Switch
X54 — 1-Wire Connector at Left Blower Relay
X55 — 1-Wire Connector at Right Blower Relay
X56 — 5-Wire Connector at Left Blower Relay
X57 — 5-Wire Connector at Right Blower Relay
X58 — 2-Wire Connector at Left Blower Motor
X59 — 2-Wire Connector at Right Blower Motor
X60 — 4-Wire Connector at Blower Motor Resistors
X61 — 1-Wire Connector at A/C Temperature Control
X62 — 1-Wire Connector at A/C Temperature Control
X63 — 1-Wire Connector, Rear Harness-to-Cab Harness, Right Cab Post
X64 — 1-Wire Connector, Rear Harness-to-Front Harness
X65 — 2-Wire Connector at A/C Low Pressure Switch
X66 — 2-Wire Connector at A/C High Pressure Switch
X67 — 1-Wire Connector at A/C Compressor Clutch
X68 — 1-Wire Connector at Front Wiper Switch (5 used)
X69 — 3-Wire Connector at Front Wiper Motor
X70 — 2-Wire Connector at Front Washer Pump

Continued on next page

X71 — Ring Terminal at Front Washer Pump Ground
X72 — 3-Wire Connector at Rear Wiper Switch
X73 — 1-Wire Connector at Rear Wiper Motor
X74 — 2-Wire Connector Rear Washer Pump
X75 — Ring Terminal at Rear Washer Pump Ground
X77 — 5-Wire Connector at Flood Light Relay
X80 — 1-Wire Connector at Left Rear Flood Light
X81 — 1-Wire Connector at Right Rear Flood Light
X82 — 1-Wire Connector at Left Front Flood Light
X83 — 1-Wire Connector at Right Front Flood Light
X84 — Ring Terminal at Radio (3 used)
X85 — 2-Wire Connector at Right Speaker
X86 — 2-Wire Connector at Left Speaker
X87 — 1-Wire Connector at Dome Light
X88 — 1-Wire Connector at Left Door Switch
X89 — Ring Terminal at Left Door Switch Ground
X90 — 1-Wire Connector at Right Door Switch
X91 — Ring Terminal at Right Door Switch Ground
X92 — 7-Wire Trailer Outlet Connector
X93 — 6-Wire Connector at Instrument Panel
Y1 — Fuel Shut-Off Solenoid
Y2 — A/C Compressor Clutch Coil

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OUO1085,00001B4 –19–26SEP00–4/8

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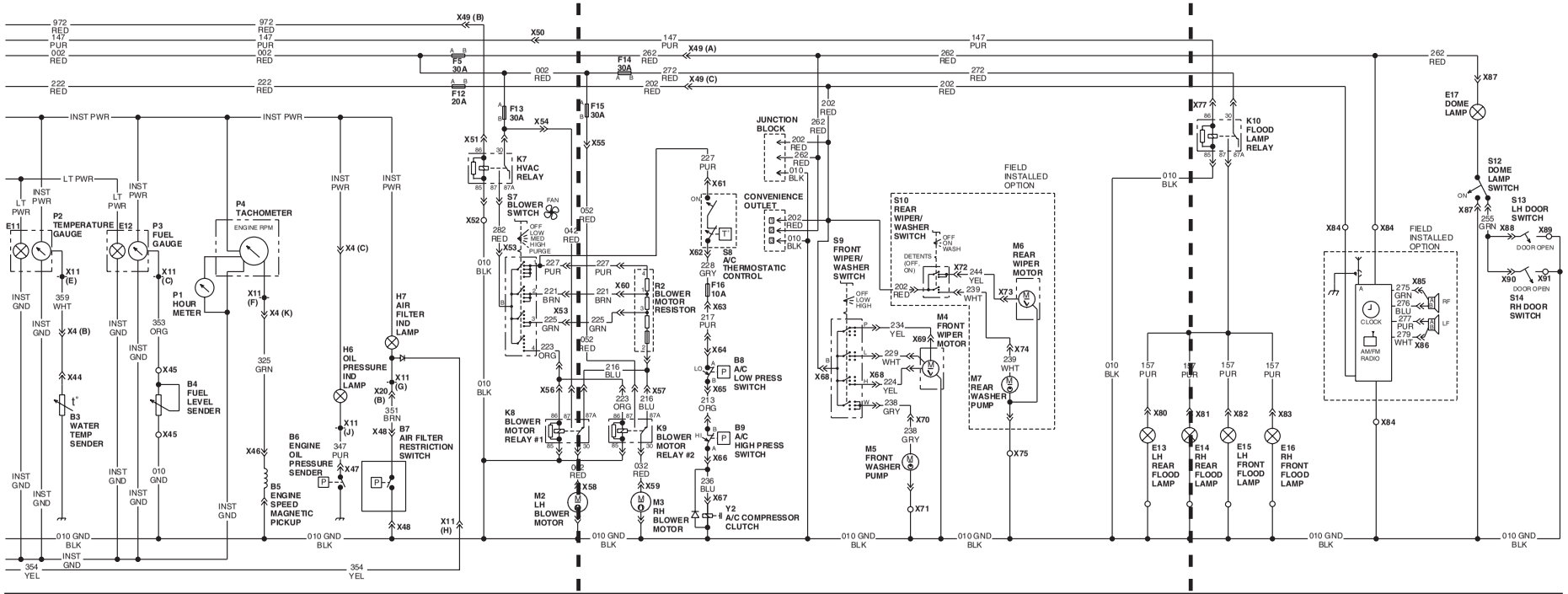

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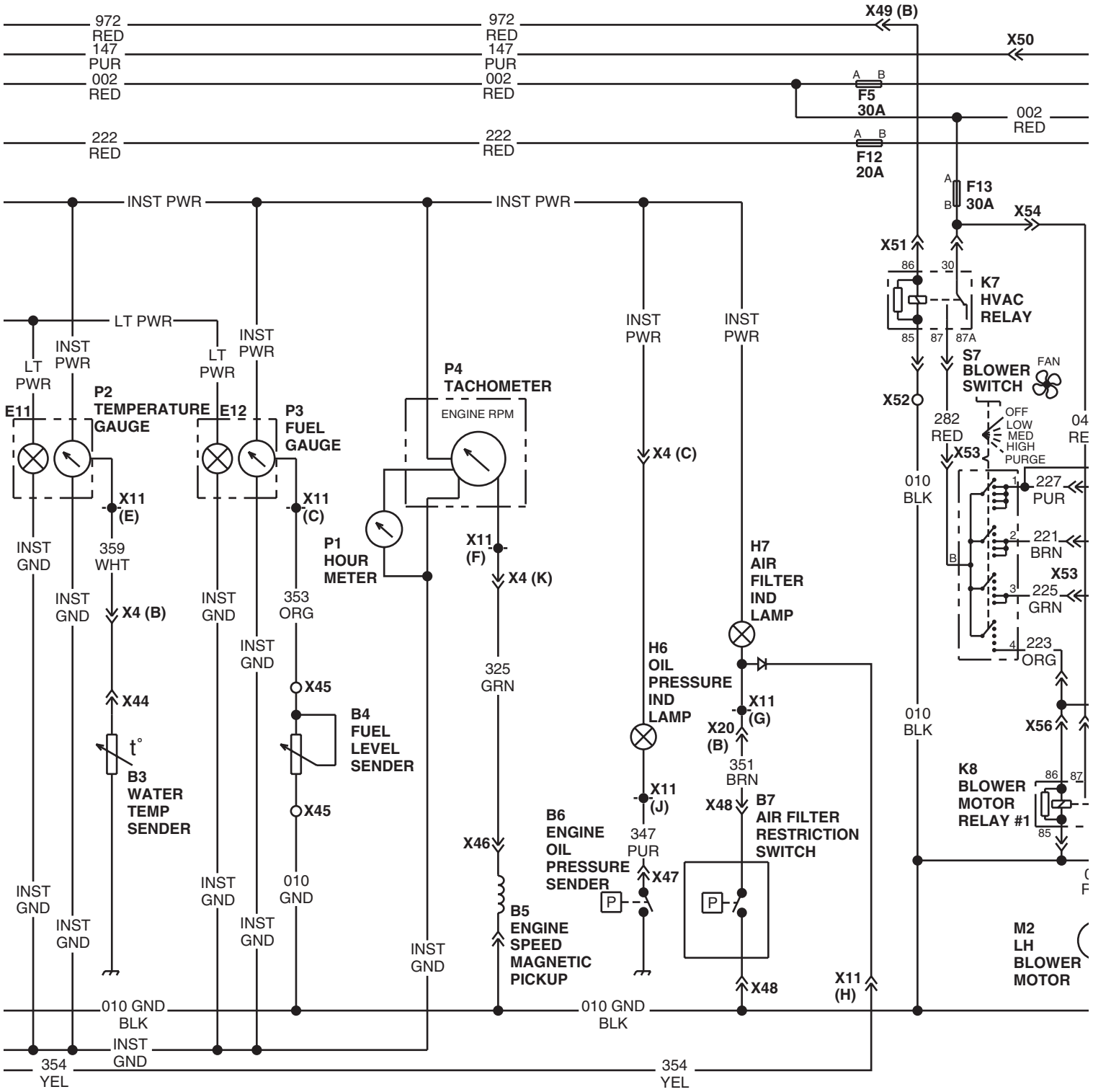
See Page 240-20-10 C



SE3 – INSTRUMENTATION	SE4

LV2223

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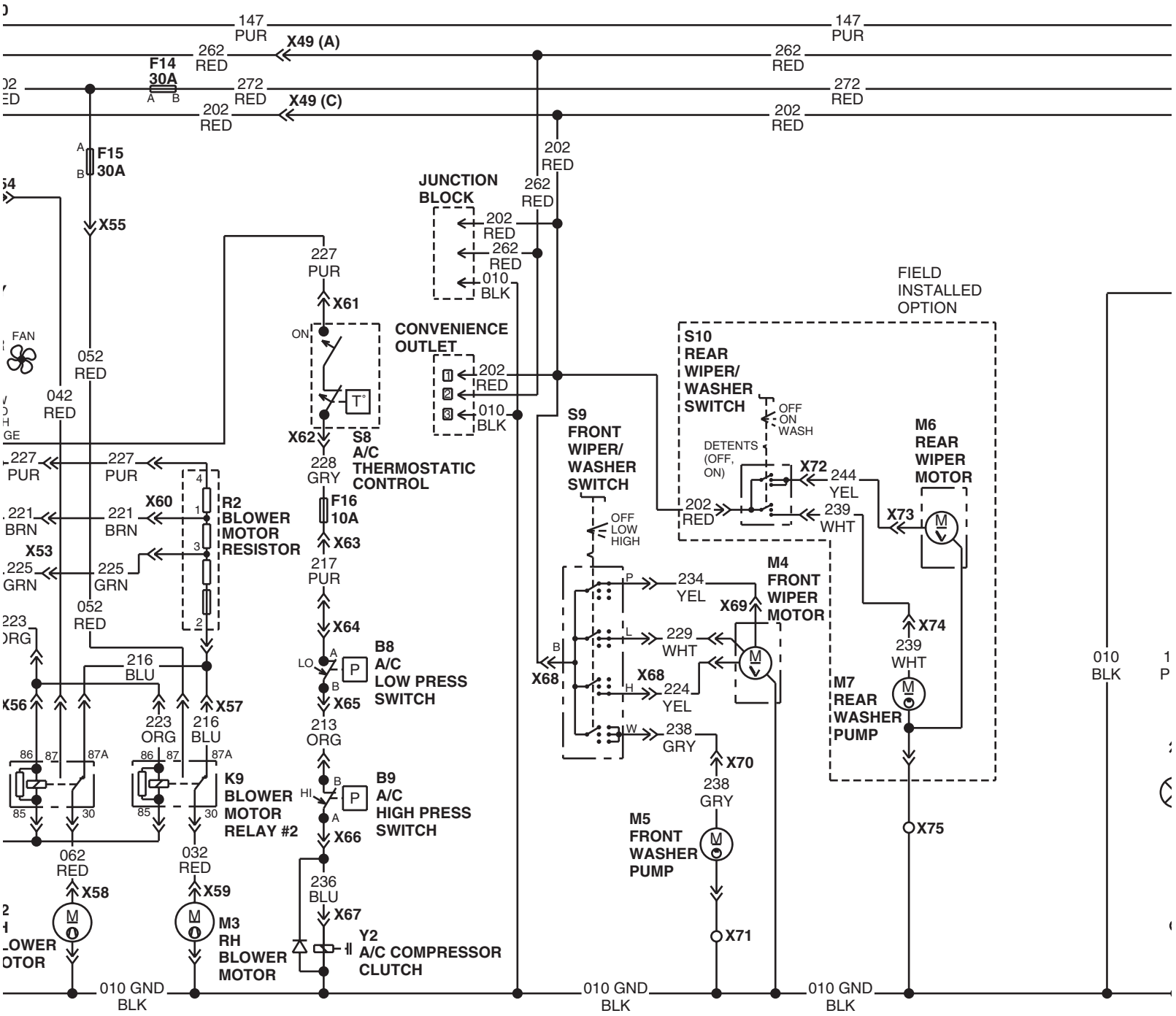

SE4 – CAB HEAT AND A/C

SE5 –

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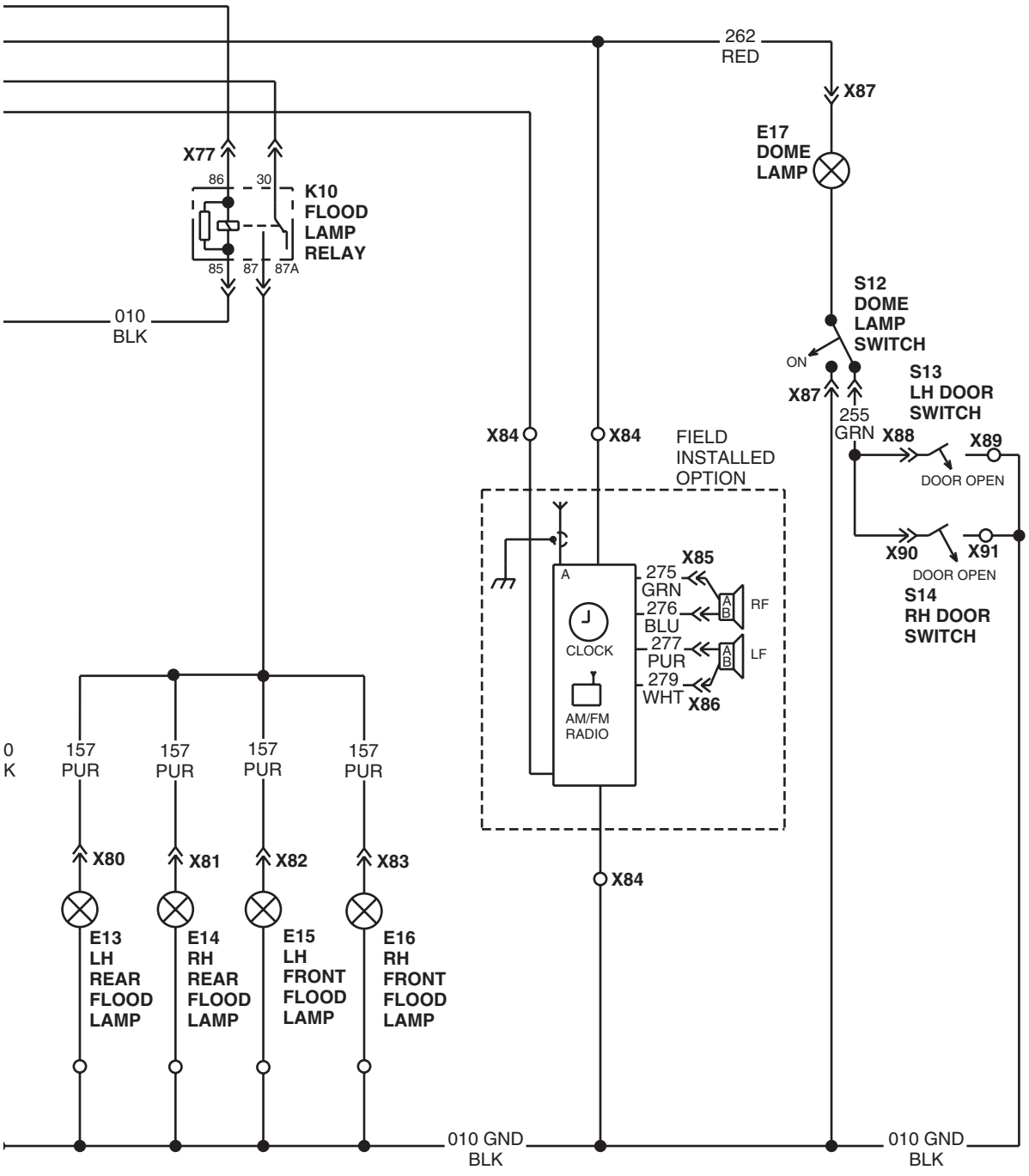

SE5 – CAB ACCESSORIES

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B1 — Horn Timer
B2 — Horn (optional)
B3 — Coolant Temperature Sender
B4 — Fuel Level Sender
B5 — Engine Speed Magnetic Pickup
B6 — Engine Oil Pressure Sender
B7 — Air Filter Restriction Switch
B8 — A/C Low Pressure Switch
B9 — A/C High Pressure Switch
E1 — Left Front Low Beam Light
E2 — Left Front High Beam Light
E3 — Right Front Low Beam Light
E4 — Right Front High Beam Light
E5 — Left Tail Light
E6 — Right Tail Light
E7 — Left Front Warn/Turn Light
E8 — Left Rear Warn/Turn Light
E9 — Right Front Warn/Turn Light
E10 — Right Rear Warn/Turn Light
E11 — Instrument Light
E12 — Instrument Light
E13 — Left Rear Flood Light
E14 — Right Rear Flood Light
E15 — Left Front Flood Light
E16 — Right Front Flood Light
E17 — Dome Light
F1 — 10-Amp Fuse for Instrument Panel
F2 — 20-Amp Fuse for Ignition Circuits
F3 — 20-Amp Fuse for Warn/Turn Lights
F4 — 20-Amp Fuse for Flood Light Relay
F5 — 30-Amp Fuse for Dome Light and Convenience Outlet
F6 — 30-Amp Fuse for Key Switch
F7 — 30-Amp Fuse for Light Switch
F8 — 30-Amp Fuse for Accessories
F9 — 20-Amp Fuse for Tail Lights
F10 — 20-Amp Fuse for High Beam Head Lights
F11 — 20-Amp Fuse for Low Beam Head Lights
F12 — 20-Amp Fuse for Radio and Wipers
F13 — 30-Amp Fuse for Blower Switch and Left Blower Motor
F14 — 30-Amp Fuse for Flood Lights
F15 — 30-Amp Fuse for Right Blower Motor
F16 — 10-Amp Fuse for A/C Compressor Clutch
F17 — Fuse Link
G1 — Battery
G2 — Alternator/Regulator
H1 — PTO Indicator Light
H2 — Charge Indicator Light
H3 — High Beam Indicator
H4 — Left Turn Indicator
H5 — Right Turn Indicator
H6 — Oil Pressure Indicator Light
H7 — Air Filter Restriction Indicator Light
K1 — Manifold Heater Relay
K2 — Fuel Shutoff Relay
K3 — Bypass Start Relay
K4 — Start Relay
K5 — Accessory Relay
K6 — Turn Signal Controller
K7 — HVAC Relay
K8 — Blower Motor Relay #1
K9 — Blower Motor Relay #2
K10 — Flood Light Relay
M1 — Starter Motor
M2 — Left Blower Motor
M3 — Right Blower Motor
M4 — Front Wiper Motor
M5 — Front Washer Pump
M6 — Rear Wiper Motor
M7 — Rear Washer Pump
P1 — Hour Meter
P2 — Temperature Gauge
P3 — Fuel Gauge
P4 — Tachometer
R1 — Manifold Heater
R2 — Blower Motor Resistor
S1 — Key Switch
S2 — Rear PTO Switch
S3 — Seat Switch
S4 — Neutral Start Switch
S5 — Light Switch
S6 — Horn Switch (optional)
S7 — Blower Switch
S8 — A/C Thermostatic Control
S9 — Front Wiper/Washer Switch
S10 — Rear Wiper/Washer Switch
S12 — Dome Light Switch
S13 — Left Door Switch
S14 — Right Door Switch
V1 — Diode Pack
X1 — Ring Terminals at Fuse Link (2 used)

Continued on next page

X2 — 8-Wire Connector at Key Switch
X3 — 1-Wire Connector for Key Switch Ground
X4 — 10-Wire Connector, Rear Harness-to-Front Harness
X5 — Single Wire Connectors at Manifold Heater Relay (2 used)
X6 — Single Wire Connectors at Manifold Heater Relay (2 used)
X7 — Ring Terminal at Manifold Heater
X8 — 6-Wire Connector at Rear PTO Switch
X9 — 3-Wire Connector at Seat Switch
X10 — 2-Wire Connector at Horn Timer
X11 — 10-Wire Connector at Instrument Panel
X12 — 2-Wire Connector at Neutral Start Switch
X13 — Ring Terminal at Start Relay (4 used)
X14 — 5-Wire Connector at Bypass Start Relay #1
X15 — 9-Wire Connector at Diode Pack
X16 — 5-Wire Connector at Bypass Start Relay #2
X17 — Ring Terminal at Fuel Shut-Off Solenoid
X18 — Ring Terminal at Starter Motor (2 used)
X19 — Ring Terminal at Alternator
X20 — 2-Wire Connector, Rear Harness-to-Front Harness
X21 — 2-Wire Connector at Alternator
X22 — 1-Wire Connector at Light Switch (6 used)
X23 — 1-Wire Connector at Horn Switch (2 used)
X24 — 1-Wire Connector at Horn
X25 — 3-Wire Connector at Left Headlight
X26 — 3-Wire Connector at Right Headlight
X27 — 5-Wire Connector at Accessory Relay
X28 — 1-Wire Connector, Rear Harness-to-Tail Light Harness
X29 — 1-Wire Connector at Left Tail Light
X30 — 1-Wire Connector at Right Tail Light (—)
X31 — 1-Wire Connector at Left Tail Light Ground
X32 — 1-Wire Connector at Right Tail Light Ground
X33 — 6-Wire Connector at Turn Signal Controller
X34 — 1-Wire Connector, Rear Harness-to-Cab Harness, Left Cab Post
X35 — 1-Wire Connector, Rear Harness-to-Cab Harness, Right Cab Post
X36 — 2-Wire Connector at Left Front Warn/Turn Light
X37 — Ring Terminal at Left Front Warn/Turn Light Ground
X38 — 2-Wire Connector at Left Rear Warn/Turn Light
X39 — Ring Terminal at Left Rear Warn/Turn Light Ground
X40 — 2-Wire Connector at Right Front Warn/Turn Light
X41 — Ring Terminal at Right Front Warn/Turn Light Ground
X42 — 2-Wire Connector at Right Rear Warn/Turn Light
X43 — Ring Terminal at Right Rear Warn/Turn Light Ground
X44 — 1-Wire Connector at Water Temperature Sender
X45 — Ring Terminals at Fuel Gauge Sender (2 used)
X46 — 2-Wire Connector at Engine Speed Magnetic Pickup
X47 — 1-Wire Connector at Engine Oil Pressure Sender
X48 — 2-Wire Connector at Air Filter Restriction Switch
X49 — 3-Wire Connector, Rear Harness-to-Cab Harness, Right Cab Post
X50 — 1-Wire Connector, Rear Harness-to-Cab Harness, Left Cab Post
X51 — 5-Wire Connector at HVAC Relay
X52 — Ring Terminal at HVAC Relay Ground
X53 — 5-Wire Connector at Blower Switch
X54 — 1-Wire Connector at Left Blower Relay
X55 — 1-Wire Connector at Right Blower Relay
X56 — 5-Wire Connector at Left Blower Relay
X57 — 5-Wire Connector at Right Blower Relay
X58 — 2-Wire Connector at Left Blower Motor
X59 — 2-Wire Connector at Right Blower Motor
X60 — 4-Wire Connector at Blower Motor Resistors
X61 — 1-Wire Connector at A/C Temperature Control
X62 — 1-Wire Connector at A/C Temperature Control
X63 — 1-Wire Connector, Rear Harness-to-Cab Harness, Right Cab Post
X64 — 1-Wire Connector, Rear Harness-to-Front Harness
X65 — 2-Wire Connector at A/C Low Pressure Switch
X66 — 2-Wire Connector at A/C High Pressure Switch
X67 — 1-Wire Connector at A/C Compressor Clutch
X68 — 1-Wire Connector at Front Wiper Switch (5 used)
X69 — 3-Wire Connector at Front Wiper Motor
X70 — 2-Wire Connector at Front Washer Pump

Continued on next page

X71 — Ring Terminal at Front Washer Pump Ground
X72 — 3-Wire Connector at Rear Wiper Switch
X73 — 1-Wire Connector at Rear Wiper Motor
X74 — 2-Wire Connector Rear Washer Pump
X75 — Ring Terminal at Rear Washer Pump Ground
X77 — 5-Wire Connector at Flood Light Relay
X80 — 1-Wire Connector at Left Rear Flood Light
X81 — 1-Wire Connector at Right Rear Flood Light
X82 — 1-Wire Connector at Left Front Flood Light
X83 — 1-Wire Connector at Right Front Flood Light
X84 — Ring Terminal at Radio (3 used)
X85 — 2-Wire Connector at Right Speaker
X86 — 2-Wire Connector at Left Speaker
X87 — 1-Wire Connector at Dome Light
X88 — 1-Wire Connector at Left Door Switch
X89 — Ring Terminal at Left Door Switch Ground
X90 — 1-Wire Connector at Right Door Switch
X91 — Ring Terminal at Right Door Switch Ground
X92 — 7-Wire Trailer Outlet Connector
X93 — 6-Wire Connector at Instrument Panel
Y1 — Fuel Shut-Off Solenoid
Y2 — A/C Compressor Clutch Coil

OUO1085,00001B4 –19–26SEP00–8/8

Section 250
Power Train Operation, Tests, andAdjustments

Contents

Continued on next page

Component Location Information

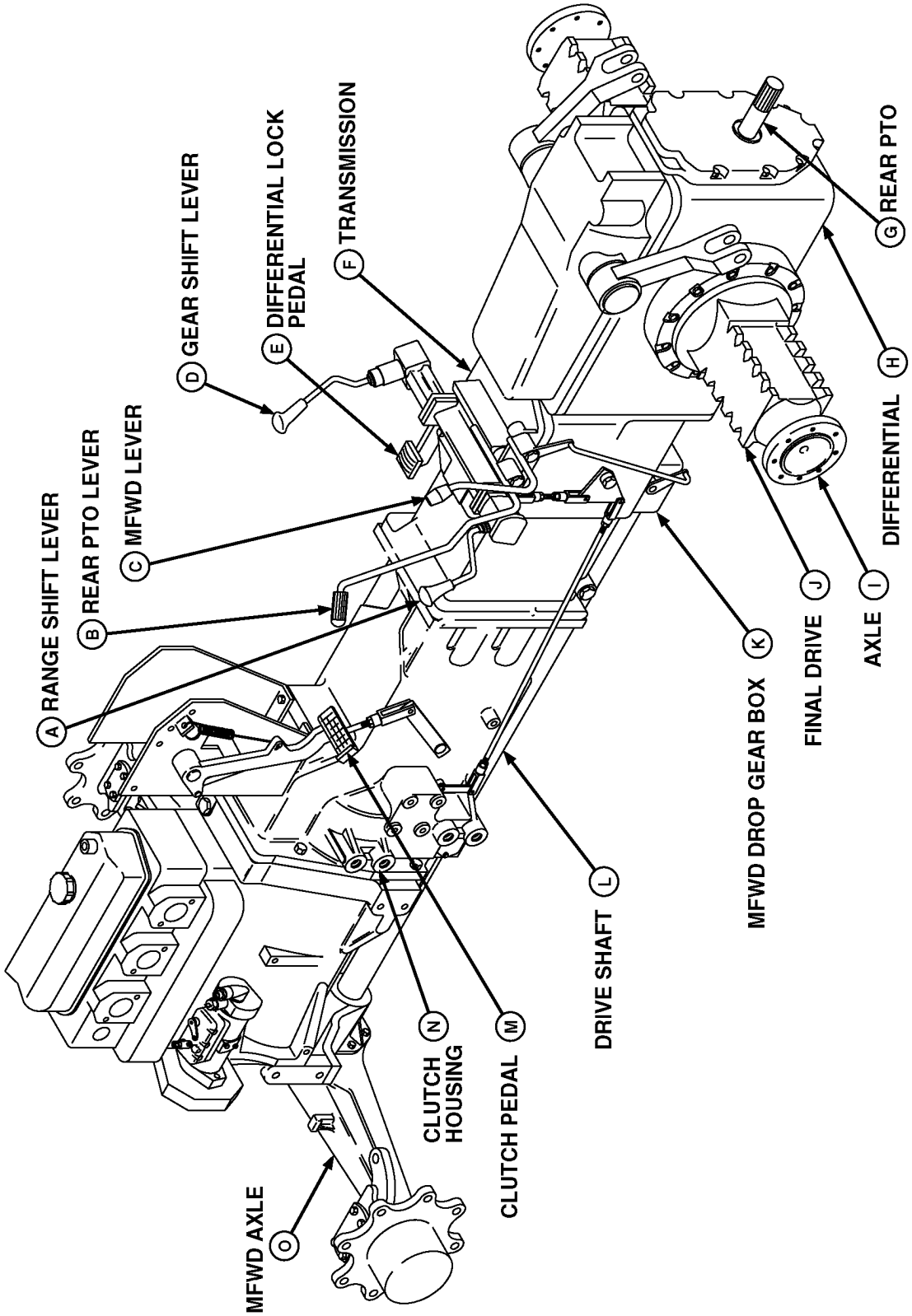
This group contains component location drawings for the following power train components:

- Power Train Components
- Clutch
- Transmission—Collar Shift
- Transmission—SyncShuttle™
- Final Drive
- Rear PTO

Use the drawings when diagnosing a power train problem and to help locate the components to be tested.

OUO1085,00001B5 –19–28SEP00–1/1

Power Train Components



LV123AE –19–17DEC97

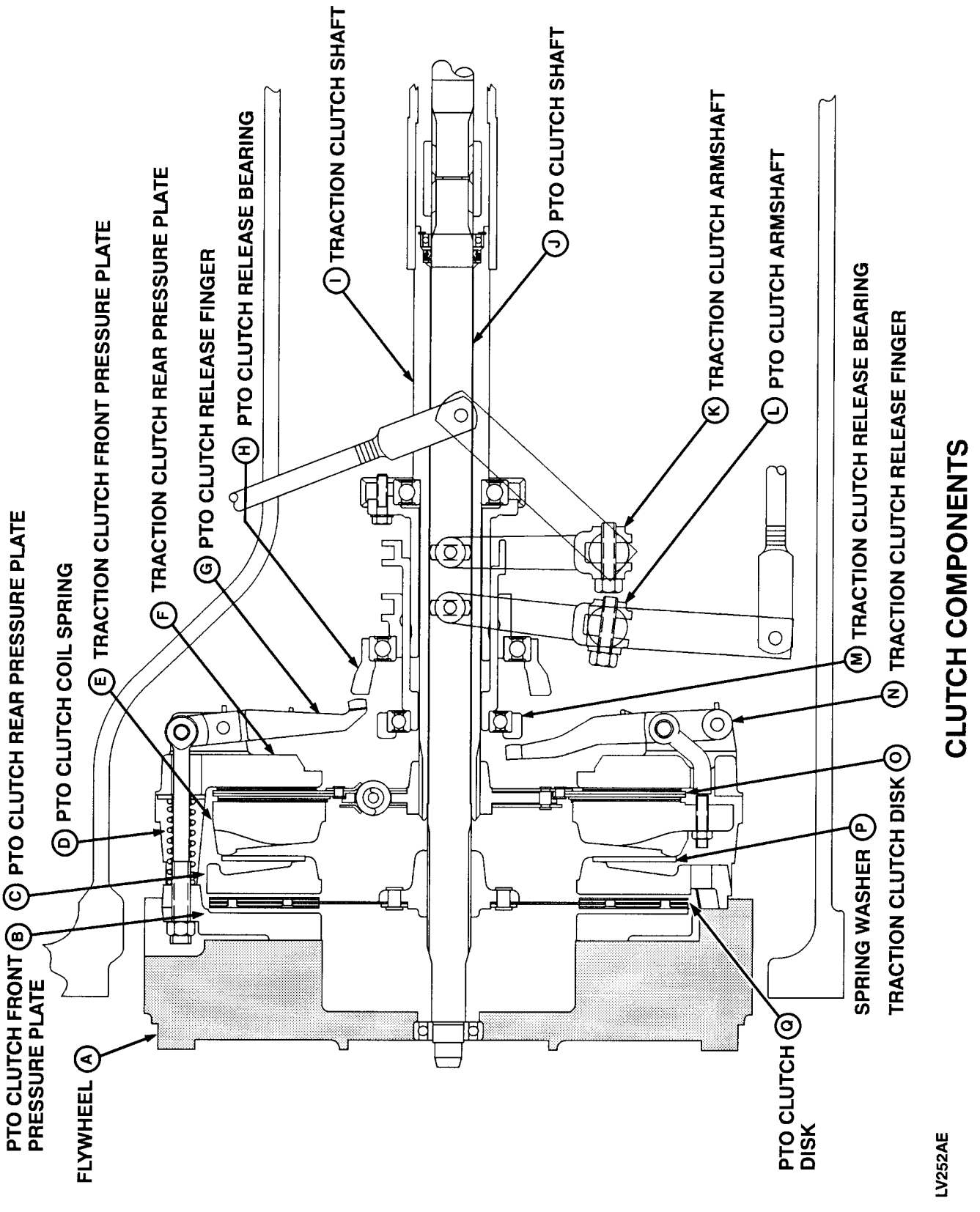
Continued on next page

OUO1085,00001B7 –19–28SEP00–1/2

A—Range Shift Lever
B—Rear PTO Lever
C—MFWD Lever
D—Gear Shift Lever
E—Differential Lock Pedal
F—Transmission
G—Rear PTO
H—Differential
I—Axle
J—Final Drive
K—MFWD Drop Gearbox (Optional)
L—Drive Shaft (Optional)
M—Clutch Pedal
N—Clutch Housing
O—MFWD Axle (Optional)

OUO1085,00001B7 –19–28SEP00–2/2

Clutch Components



LV252AE –19–01JUL02

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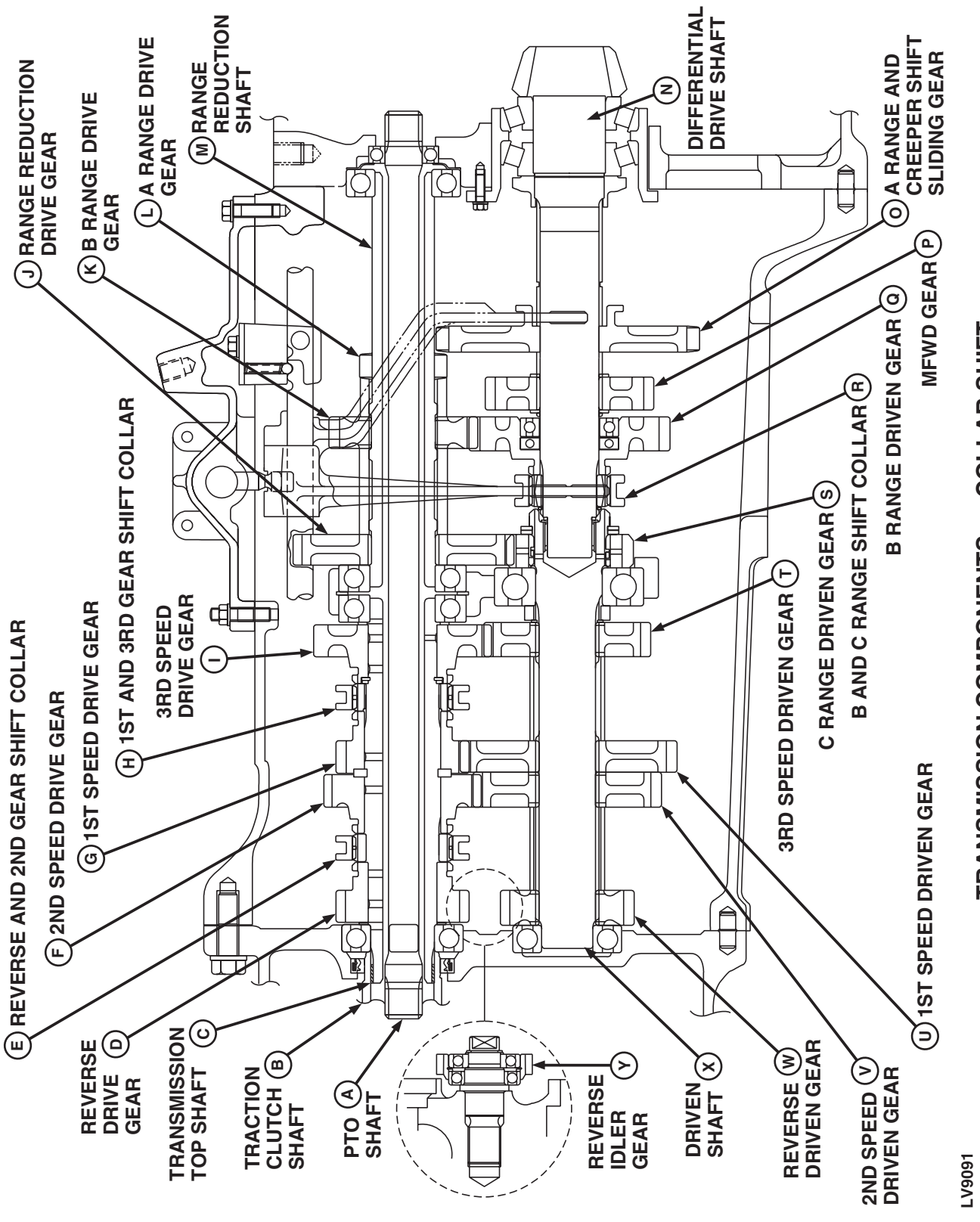
OUO1085,00001B6 –19–28SEP00–1/2

A—Flywheel
B—PTO Clutch Front Pressure Plate
C—PTO Clutch Rear Pressure Plate
D—Traction Clutch Coil Spring
E—Traction Clutch Front Pressure Plate
F—Traction Clutch Rear Pressure Plate
G—PTO Clutch Release Lever
H—PTO Clutch Release Bearing
I—Traction Clutch Shaft
J—PTO Clutch Shaft
K—Traction Clutch Armshaft
L—PTO Clutch Armshaft
M—Traction Clutch Release Bearing
N—Traction Clutch Release Finger
O—Traction Clutch Disk
P—Spring Washer
Q—PTO Clutch Disk

OUO1085,00001B6 –19–28SEP00–2/2

Transmission Components—Collar Shift

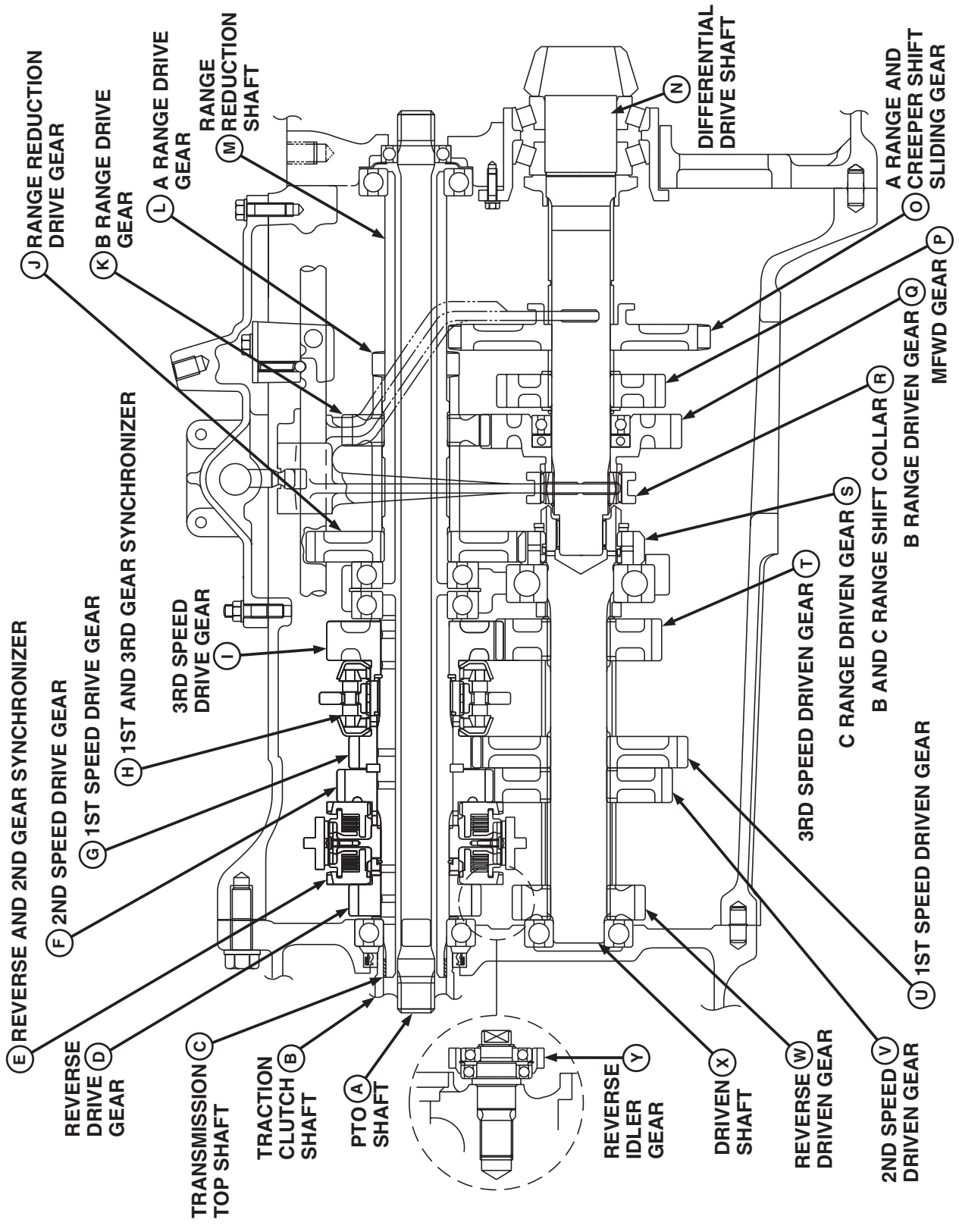


Continued on next page

A—PTO Shaft
B—Traction Clutch Shaft
C—Transmission Top Shaft
D—Reverse Drive Gear
E—Reverse and 2nd Gear Shift Collar
F—2nd Speed Drive Gear
G—1st Speed Drive Gear
H—1st and 3rd Gear Shift Collar
I—3rd Speed Drive Gear
J—Range Reduction Drive Gear
K—B Range Drive Gear
L—A Range Drive Gear
M—Range Reduction Shaft
N—Differential Drive Shaft
O—A Range and Creeper Shift Sliding Gear
P—MFWD Gear
Q—B Range Driven Gear
R—B and C Range Shift Collar
S—C Range Driven Gear
T—3rd Speed Driven Gear
U—1st Speed Driven Gear
V—2nd Speed Driven Gear
W—Reverse Driven Gear
X—Driven Shaft
Y—Reverse Idler Gear

OUO1023,0000017 –19–12APR04–2/2

Transmission Components—SyncShuttle™ (SS)



LV7987 –19–12JUL02

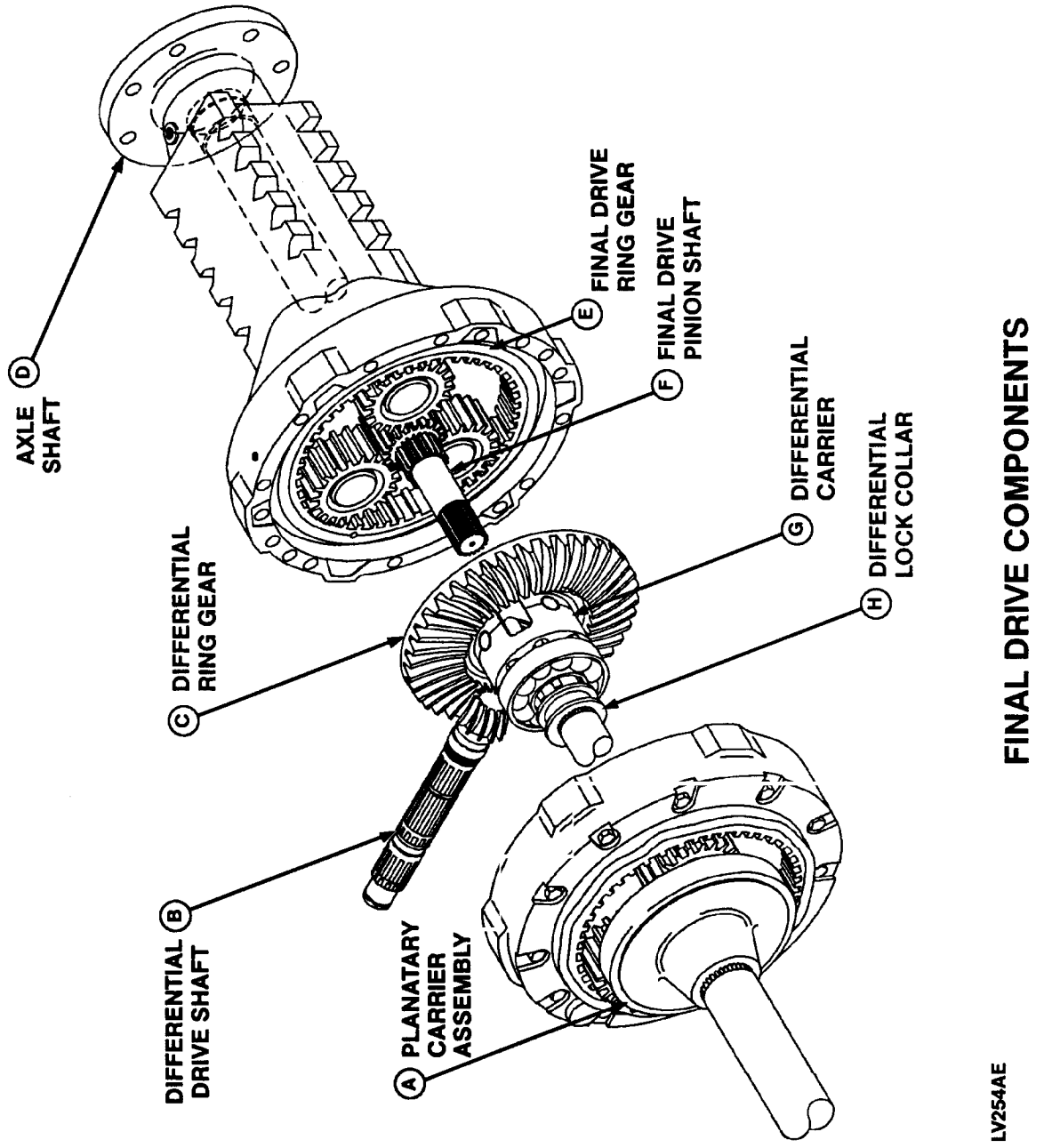
Continued on next page

OUO1085,00001BA –19–28SEP00–1/2

A—PTO Shaft
B—Traction Clutch Shaft
C—Transmission Top Shaft
D—Reverse Drive Gear
E—Reverse and 2nd Gear Synchronizer
F—2nd Speed Drive Gear
G—1st Speed Drive Gear
H—1st and 3rd Gear Synchronizer
I—3rd Speed Drive Gear
J—Range Reduction Drive Gear
K—B Range Drive Gear
L—A Range Drive Gear
M—Range Reduction Shaft
N—Differential Drive Shaft
O—A Range and Creeper Shift Sliding Gear
P—MFWD Gear
Q—B Range Driven Gear
R—B and C Range Shift Collar
S—C Range Driven Gear
T—3rd Speed Driven Gear
U—1st Speed Driven Gear
V—2nd Speed Driven Gear
W—Reverse Driven Gear
X—Driven Shaft
Y—Reverse Idler Gear

OUO1085,00001BA –19–28SEP00–2/2

Final Drive Components



A—Planetary Carrier Assembly **C—Differential Ring Gear** **E—Final Drive Ring Gear** **G—Differential Carrier**
B—Differential Drive Shaft **D—Axle Shaft** **F—Final Drive Pinion Shaft** **H—Differential Lock Collar**

AG,OUO1023,429 –19–28SEP00–1/1

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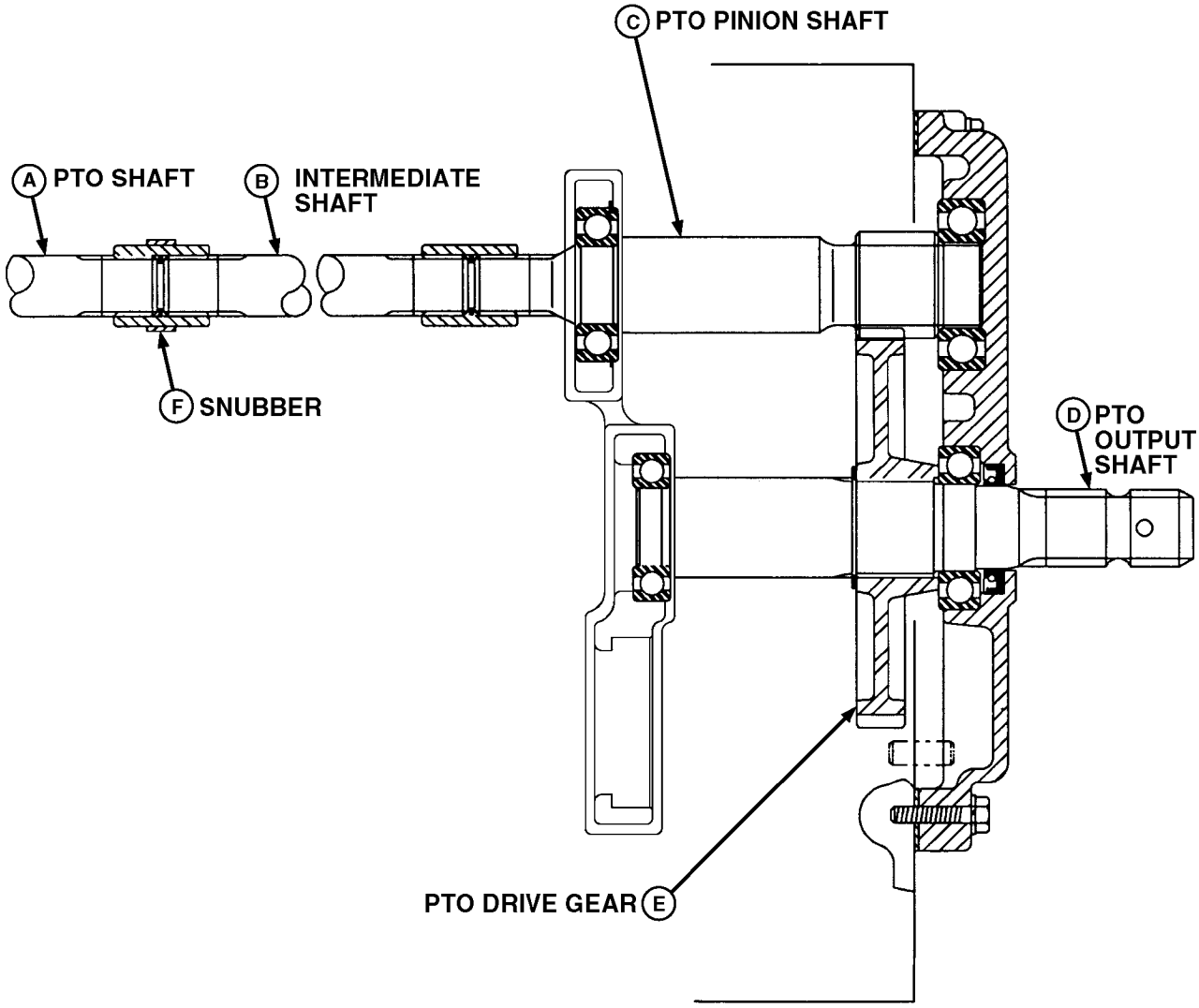
05
10

Rear PTO Components



LV255AE

REAR PTO COMPONENTS

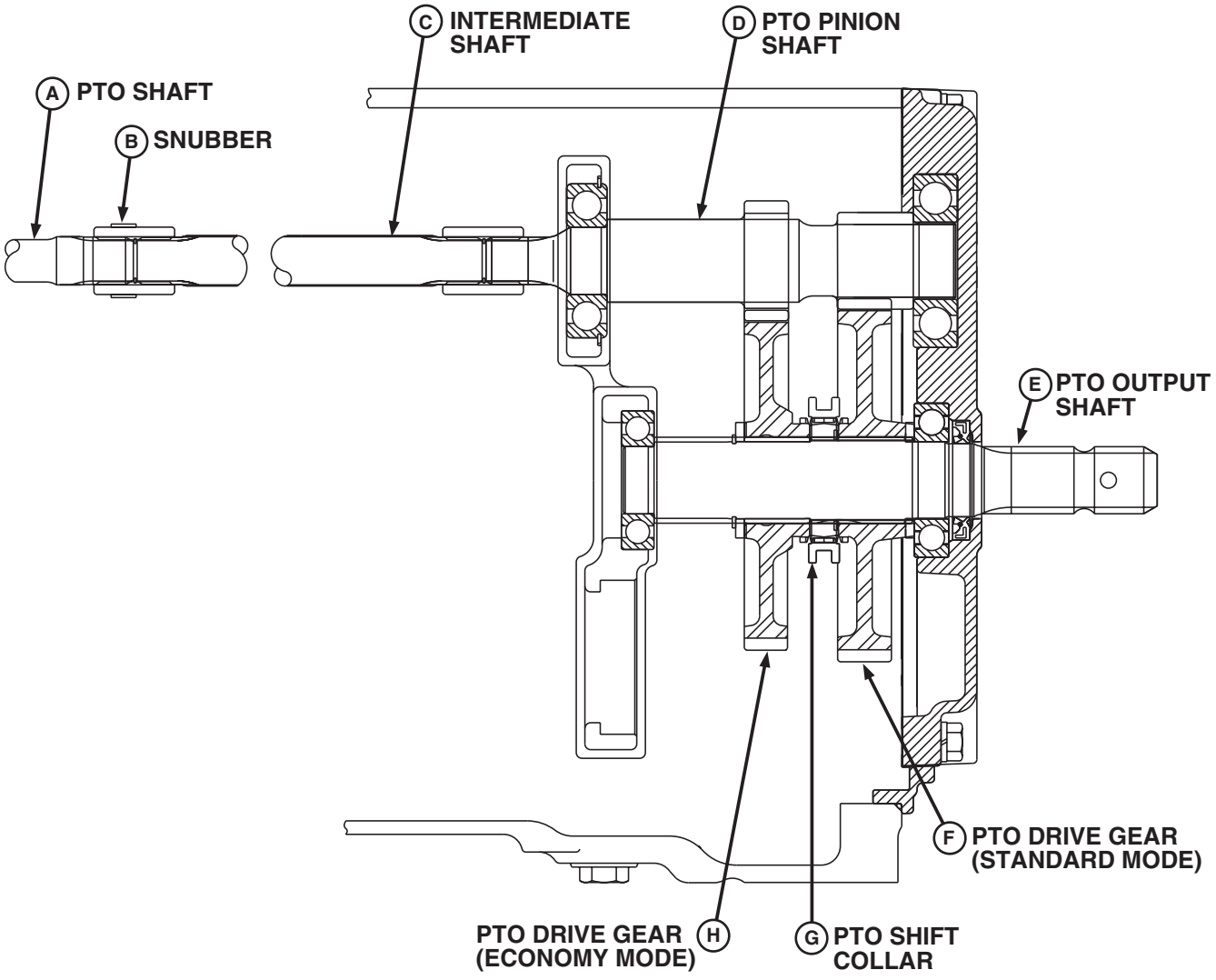
LV255AE –19–02FEB01

A—PTO Shaft
B—Intermediate Shaft
C—PTO Pinion Shaft
D—PTO Output Shaft
E—PTO Drive Gear
F—Snubber

OUO1085,00001BB –19–28SEP00–1/1

250 05 11

Rear 540/540E PTO Components (SyncShuttle™ Transmission Only)



LV1005AE

REAR PTO COMPONENTS

LV1005AE –19–14SEP00

A—PTO Shaft
B—Snubber
C—Intermediate Shaft
D—PTO Pinion Shaft
E—PTO Output Shaft
F—PTO Drive Gear for Standard (540) Mode
G—PTO Shift Collar
H—PTO Drive Gear for Economy (540E) Mode

OUO1085,00001BC –19–28SEP00–1/1

250
05
12

Component Location Information

This group contains component location drawings for the following power train components:

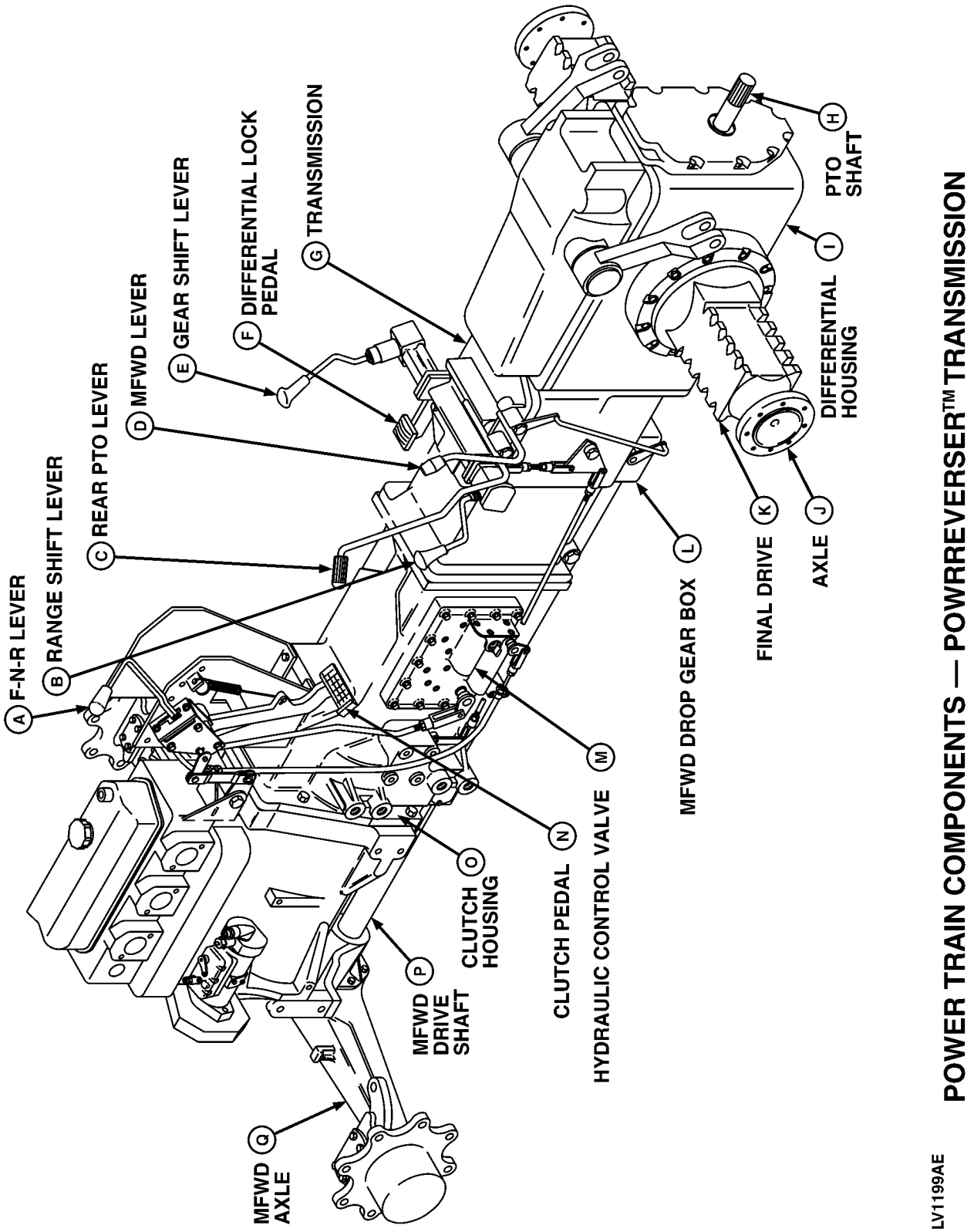
- Power Train Components
- Clutch Components
- PowrReverser™ Components
- Transmission Components

Use the drawings when diagnosing a power train problem and to help locate the components to be tested.

NOTE: Final drive components and rear PTO components are the same as those on units with collar shift or SyncShuttle™ transmissions. See Group 05 for these component location drawings.

OUO1085,00001BE –19–28SEP00–1/1

Power Train Components—PowrReverser™ Transmission

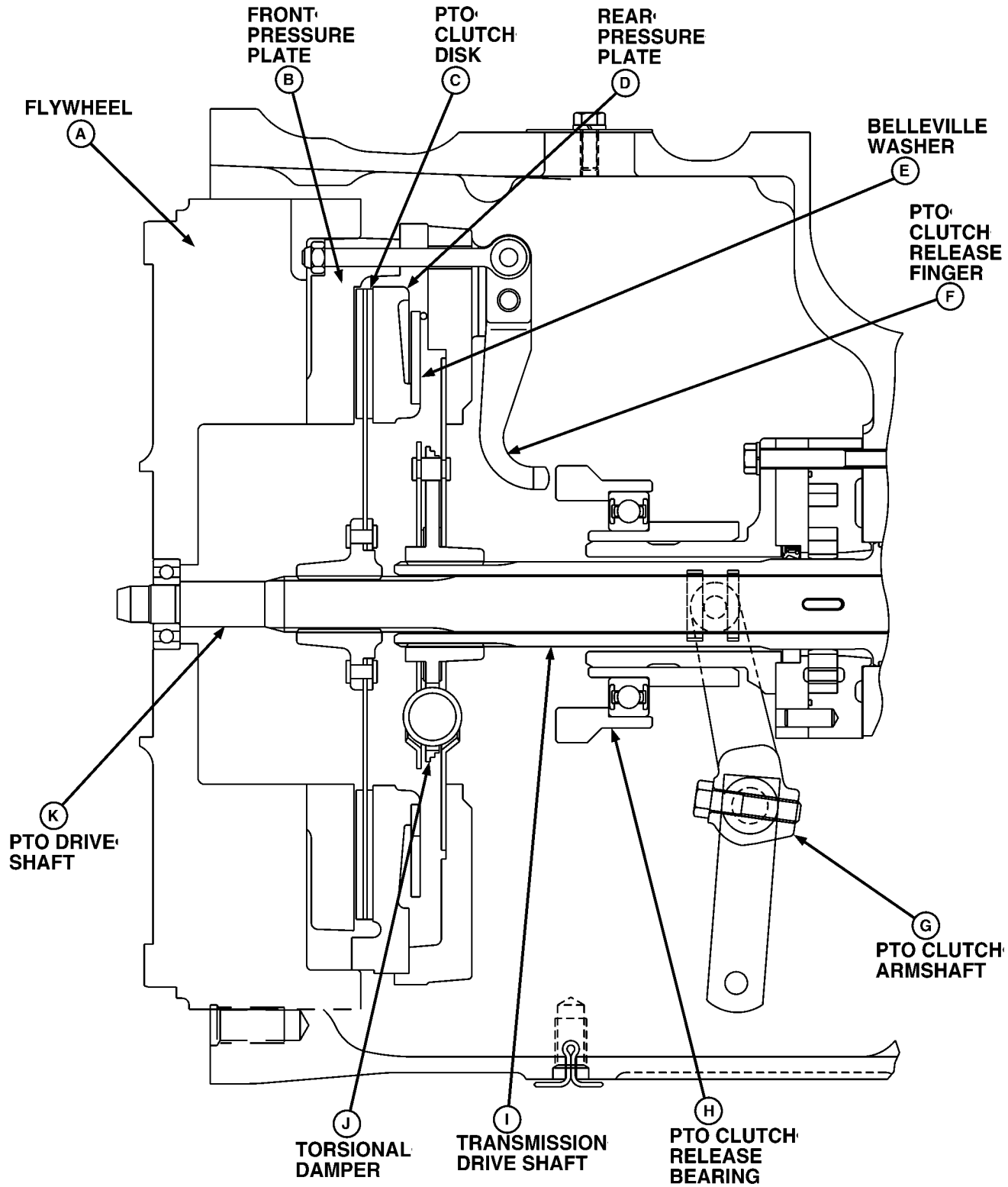


Continued on next page

A—F-N-R Lever
B—Range Shift Lever
C—Rear PTO Lever
D—MFWD Lever
E—Gear Shift Lever
F—Differential Lock Pedal
G—Transmission
H—PTO Shaft
I—Differential Housing
J—Axle
K—Final Drive
L—MFWD Drop Gear Box
M—Hydraulic Control Valve
N—Clutch Pedal
O—Clutch Housing
P—MFWD Drive Shaft
Q—MFWD Axle

OUO1085,00001BF –19–28SEP00–2/2

Clutch Components—PowrReverser™ Transmission



CLUTCH COMPONENTS POWRREVERSER™ TRANSMISSION

LV1200AE

LV1200AE –19–24FEB98

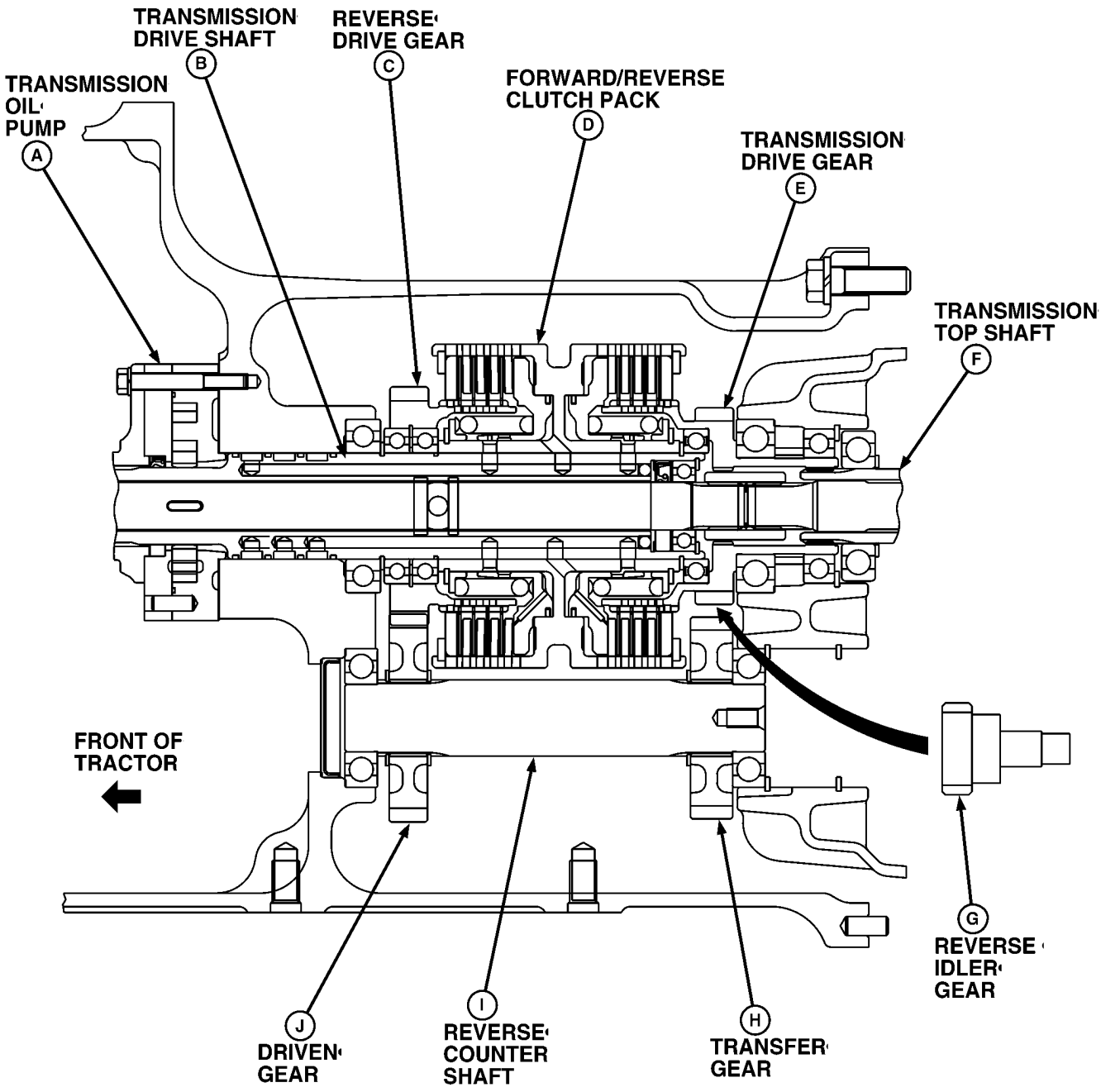
Continued on next page

OUO1085,00001C0 –19–28SEP00–1/2

A—Flywheel
B—Front Pressure Plate
C—PTO Clutch Disk
D—Rear Pressure Plate
E—Belleville Washer
F—PTO Clutch Release Finger
G—PTO Clutch Armshaft
H—PTO Clutch Release Bearing
I—Transmission Drive Shaft
J—Torsional Damper
K—PTO Drive Shaft

OUO1085,00001C0 –19–28SEP00–2/2

PowrReverser™ Components



LV1201AE

POWRREVERSER™ COMPONENTS

LV1201AE –19–24FEB98

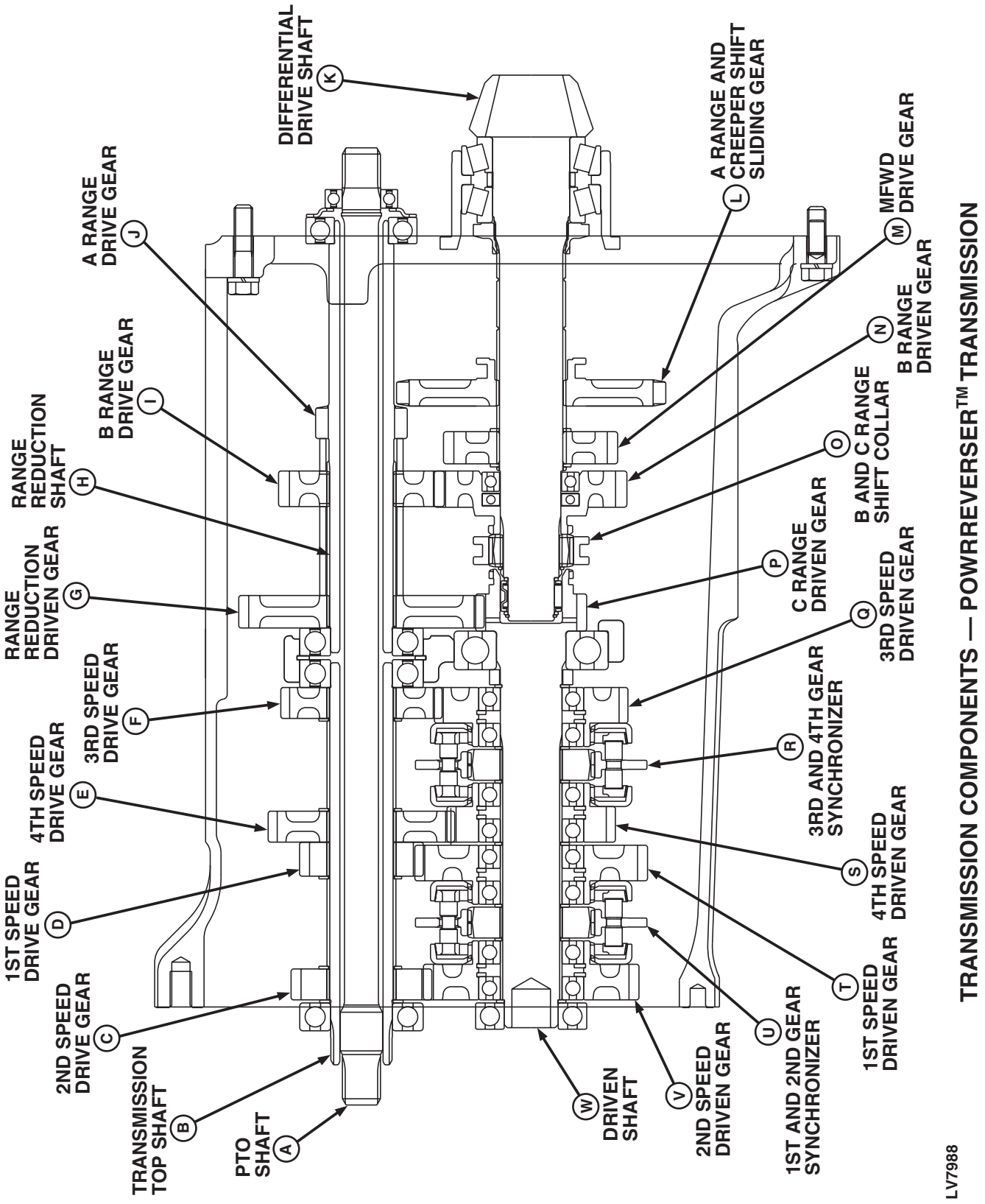
Continued on next page

OUO1085,00001C1 –19–28SEP00–1/2

A—Transmission Oil Pump
B—Traction Drive Shaft
C—Reverse Drive Gear
D—Forward and Reverse Clutch Pack
E—Transmission Drive Gear
F—Transmission Top Shaft
G—Reverse Idler Gear
H—Transfer Gear
I—Reverse Counter Shaft
J—Driven Gear

OUO1085,00001C1 –19–28SEP00–2/2

Transmission Components—PowrReverser™ Transmission



Continued on next page

OUO1085,00001C2 –19–28SEP00–1/2

A—PTO Shaft
B—Transmission Top Shaft
C—2nd Speed Drive Gear
D—1st Speed Drive Gear
E—4th Speed Drive Gear
F—3rd Speed Drive Gear
G—Range Reduction Driven Gear
H—Range Reduction Shaft
I—B Range Drive Gear
J—A Range Drive Gear
K—Differential Drive Shaft
L—A Range and Creeper Shift Sliding Gear
M—MFWD Drive Gear
N—B Range Driven Gear
O—B and C Range Shift Collar
P—C Range Drive Gear
Q—3rd Speed Driven Gear
R—3rd and 4th Gear Synchronizer
S—4th Speed Driven Gear
T—1st Speed Driven Gear
U—1st and 2nd Gear Synchronizer
V—2nd Speed Driven Gear
W—Driven Shaft

OUO1085,00001C2 –19–28SEP00–2/2

Final Drive Components

Final drive components for units with PowrReverser™ transmissions are the same as those on collar shift or SyncShuttle™ transmissions. See information in Group 05.

OUO1085,00001C3 –19–28SEP00–1/1

Rear PTO Components

Rear PTO components for units with PowrReverser™ transmissions are the same as those on collar shift or SyncShuttle™ transmissions. See information in Group 05.

OUO1085,00001C4 –19–28SEP00–1/1

Theory of Operation Information

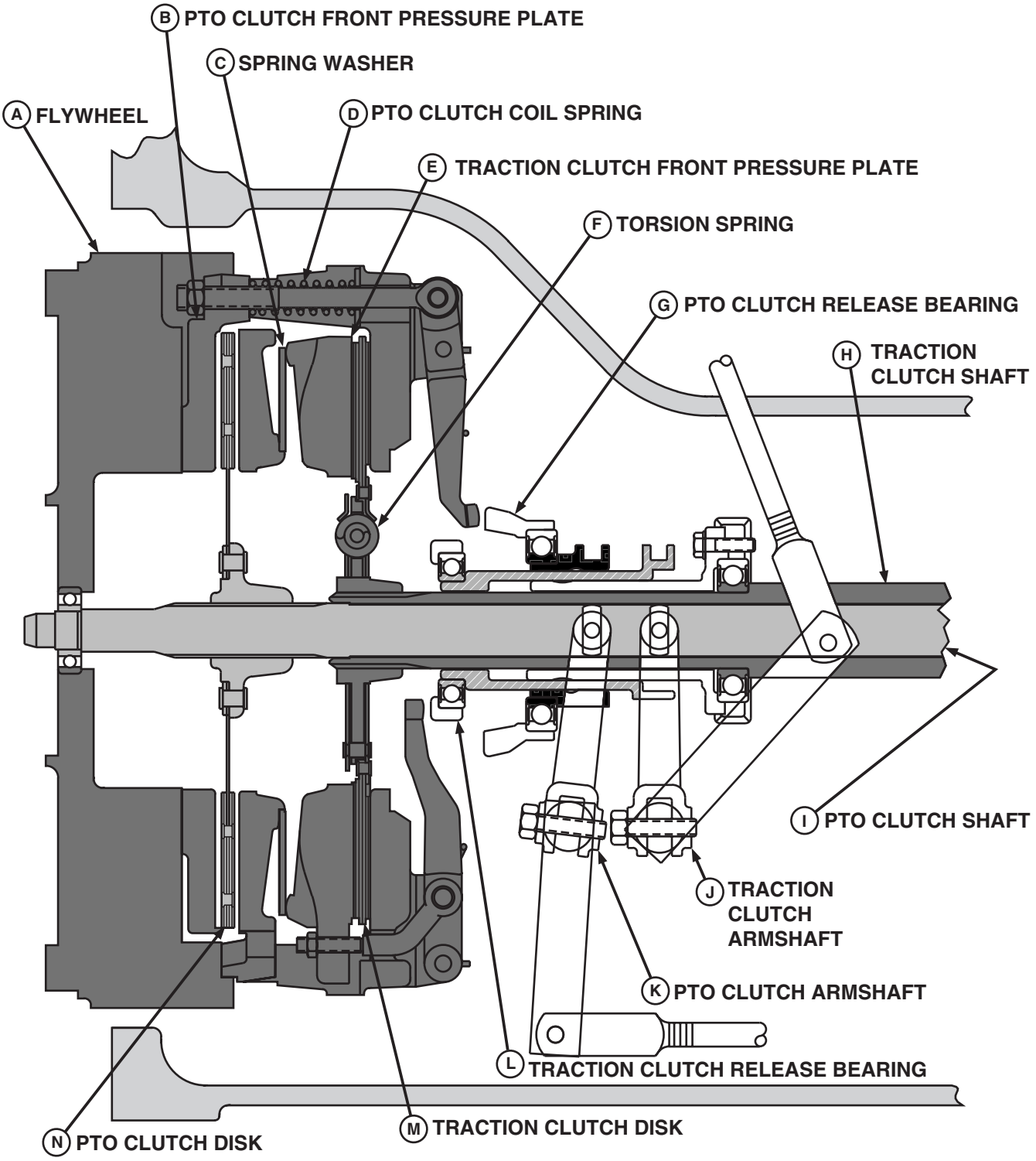
This group divides the power train into individual components or systems by function. The story contains information on function, component, or system identification and theory of operation.

The following systems or components are covered:

- Clutch Operation
  - – Traction Clutch Engaged and PTO Clutch Disengaged
  - – Traction Clutch Engaged and PTO Clutch Engaged
  - – Traction Clutch Disengaged and PTO Clutch Engaged
  - – Traction Clutch Disengaged and PTO Clutch Disengaged
- Transmission
  - – Lubrication System
  - – Gear Shift Power Flow
  - – Range Shift Power Flow
- Differential Power Flow
- Differential Lock Operation
- Final Drive Operation
- Rear PTO Operation
- Mechanical Front Wheel Drive Operation

OUO1085,00001BD –19–28SEP00–1/1

Clutch Operation



LVC6684

CLUTCH OPERATION
TRACTION CLUTCH ENGAGED AND PTO CLUTCH DISENGAGED

LVC6684 –19–15MAY01

Continued on next page

AG,OUO1008,334 –19–13JAN00–1/8

A—Flywheel
B—PTO Clutch Pressure Plate
C—Spring Washer
D—Coil Spring
E—Traction Clutch Pressure Plate
F—Torsion Spring
G—PTO Clutch Release Bearing
H—Traction Clutch Shaft
I—PTO Clutch Shaft
J—Traction Clutch Armshaft
K—PTO Clutch Armshaft
L—Traction Clutch Release Bearing
M—Traction Clutch Disk
N—PTO Clutch Disk

FUNCTION:

Dry disk clutches provide a positive means of mechanically engaging and disengaging power flow between the engine and the transmission and PTO.

MAJOR COMPONENTS:

- Pressure Plates
- Clutch Disks
- Clutch Release Levers
- Clutch Release Bearings
- Armshafts
- Spring Washer
- Traction Clutch Shaft
- PTO Clutch Shaft

THEORY OF OPERATION:

The clutch assembly is attached to the rear of the engine flywheel (A). The traction (L) and the PTO (G) clutch release bearing mechanisms are operated independently of each other by means of armshafts (J and K). Linkage rods connect the armshafts to the traction clutch pedal and the PTO clutch lever.

Traction Clutch Engaged:

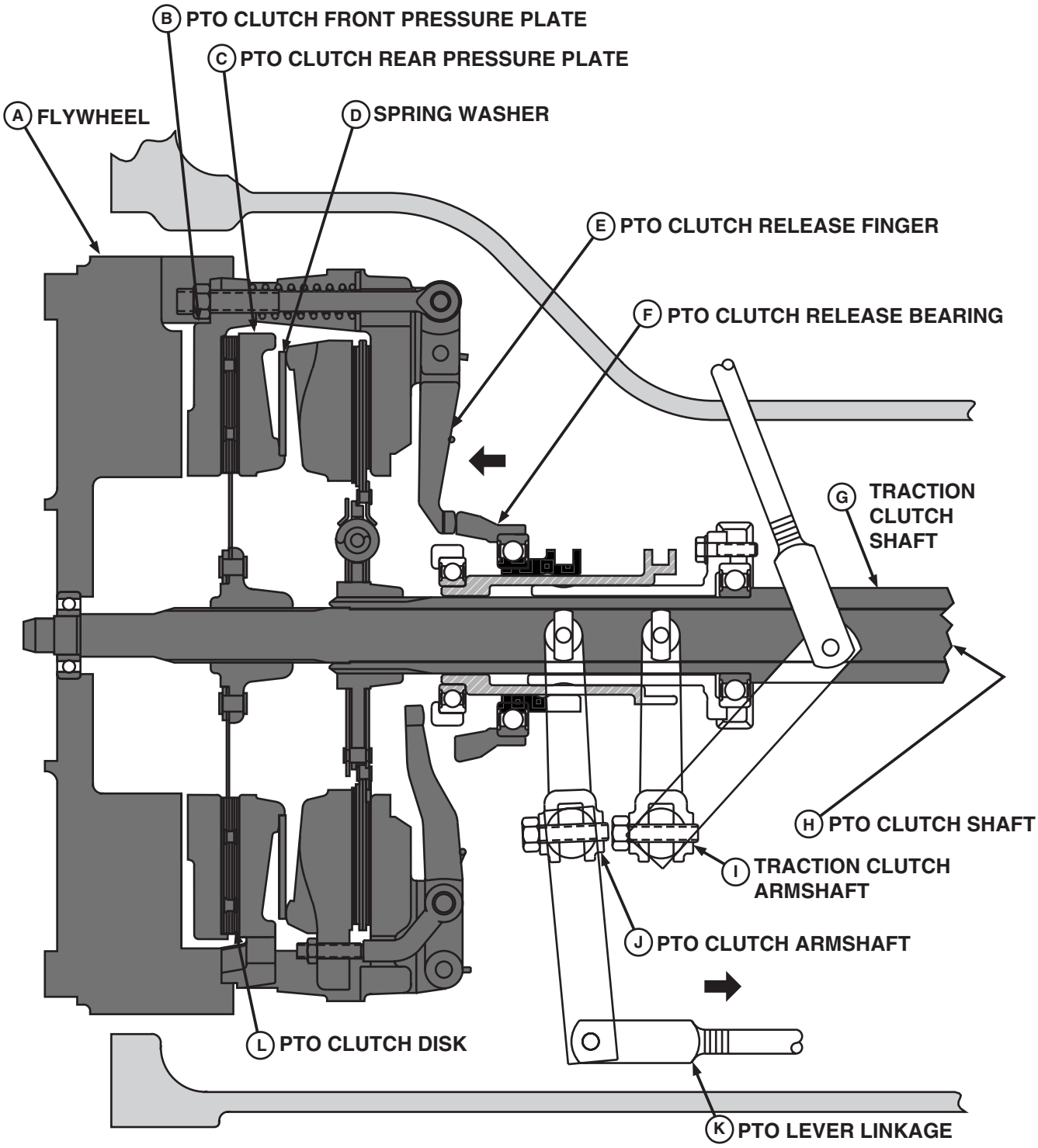
When the traction clutch is engaged (clutch pedal released), spring washer (C) forces pressure plate (E) against traction clutch disk (M), causing the clutch disk to rotate with the flywheel. Because the traction clutch disk is splined to the traction clutch shaft (H), power is transmitted from the traction clutch disk to the traction clutch shaft. Torsion springs (F) dampen shock to the clutch disk facings during clutch engagement.

PTO Clutch Disengaged:

When the PTO clutch is disengaged (PTO lever released), pressure plate (B) is forced forward by coil springs (D), removing contact between the pressure plate and PTO clutch disk (N). In this mode, no power will be transmitted from the flywheel to the PTO clutch shaft (I), because the PTO clutch disk does not rotate with flywheel (A).

Continued on next page

AG,OUO1008,334 –19–13JAN00–2/8



LVC6685

CLUTCH OPERATION
TRACTION CLUTCH ENGAGED AND PTO CLUTCH ENGAGED

LVC6685 –19–07MAY01

Continued on next page

AG,OUO1008,334 –19–13JAN00–3/8

A—Flywheel
B—PTO Clutch Front Pressure Plate
C—PTO Clutch Rear Pressure Plate
D—Spring Washer
E—PTO Clutch Release Finger
F—PTO Clutch Release Bearing
G—Traction Clutch Shaft
H—PTO Clutch Shaft
I—Traction Clutch Armshaft
J—PTO Clutch Armshaft
K—PTO Lever Linkage
L—PTO Clutch Disk

PTO Clutch Engaged:

Pushing the PTO clutch lever forward moves linkage (K) rearward, causing PTO clutch armshaft (J) to rotate and force PTO clutch release bearing (F) against PTO clutch release fingers (E). The clutch release bearing depresses the release fingers, causing PTO clutch pressure plate (B) to move rearward. Pressure plate (B) is forced against PTO clutch disk (L), clamping the PTO clutch disk between pressure plate (B) and rear plate (C).

This causes the PTO clutch disk to rotate with the flywheel. Because the PTO clutch disk is splined to the PTO clutch shaft (H), power is transmitted from the PTO clutch disk to the PTO clutch shaft and on to the rear PTO shaft.

Traction Clutch Engaged:

The traction clutch power transmittal is uninterrupted by the PTO clutch engagement.

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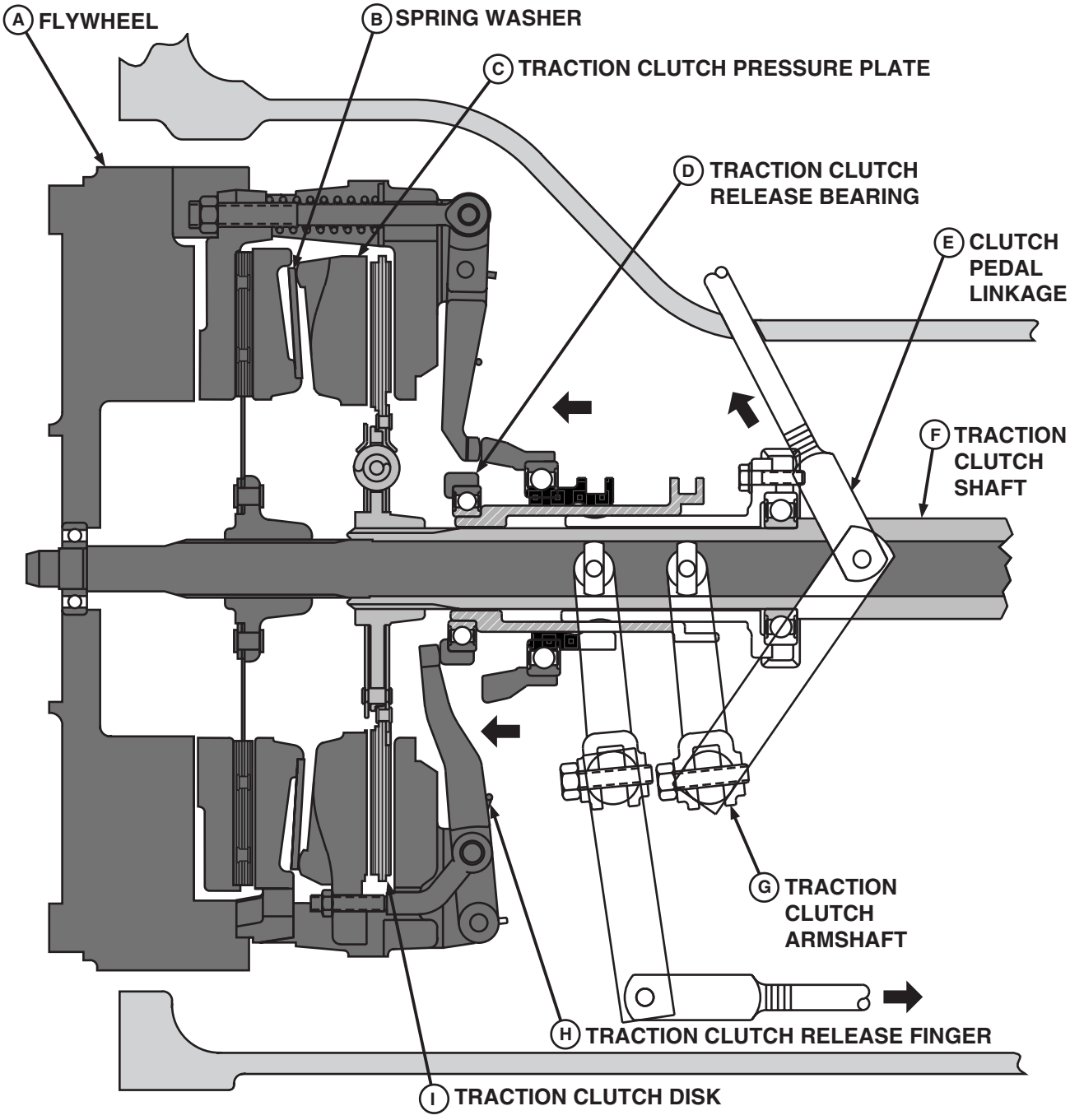

LVC6686

CLUTCH OPERATION
TRACTION CLUTCH DISENGAGED AND PTO CLUTCH ENGAGED

LVC6686 –19–07MAY01

Continued on next page

AG,OUO1008,334 –19–13JAN00–5/8

A—Flywheel
B—Spring Washer
C—Traction Clutch Pressure Plate
D—Traction Clutch Release Bearing
E—Clutch Pedal Linkage
F—Traction Clutch Shaft
G—Traction Clutch Armshaft
H—Traction Clutch Release Finger
I—Traction Clutch Disk

Traction Clutch Disengaged:

Depressing the clutch pedal moves clutch pedal linkage (E) upward, causing the traction clutch armshaft (G) to rotate and force traction clutch release bearing (D) against traction clutch release fingers (H). The clutch release bearing depresses the release fingers, causing traction clutch pressure plate (C) to move rearward against spring washer (B), compressing the spring washer.

Since pressure plate (C) is no longer held against traction clutch disk (I) by the clamping force of spring washer (B), the traction clutch disk is no longer forced to turn with flywheel (A). The traction clutch shaft (F) stops turning.

PTO Clutch Engaged:

The PTO clutch power transmittal is uninterrupted by the traction clutch disengagement.

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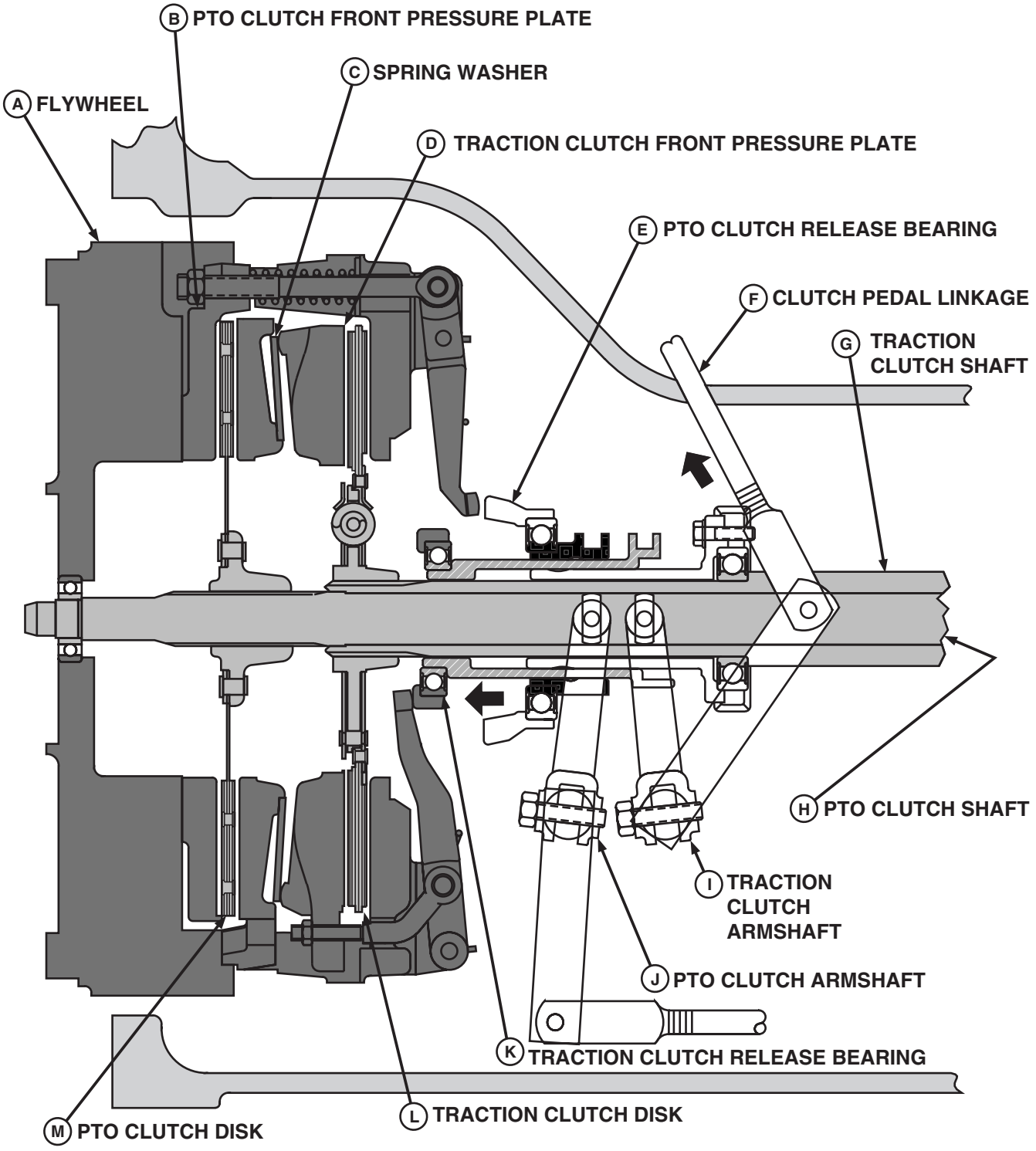


LVC6683

CLUTCH OPERATION
TRACTION CLUTCH DISENGAGED AND PTO CLUTCH DISENGAGED

LVC6683 –19–15MAY01

Continued on next page

AG,OUO1008,334 –19–13JAN00–7/8

A—Flywheel
B—PTO Clutch Front Pressure Plate
C—Spring Washer
D—Traction Clutch Front Pressure Plate
E—PTO Clutch Release Bearing
F—Clutch Pedal Linkage
G—Traction Clutch Shaft
H—PTO Clutch Shaft
I—Traction Clutch Armshaft
J—PTO Clutch Armshaft
K—Traction Clutch Release Bearing
L—Traction Clutch Disk
M—PTO Clutch Disk

Traction Clutch Disengaged and PTO Clutch Disengaged

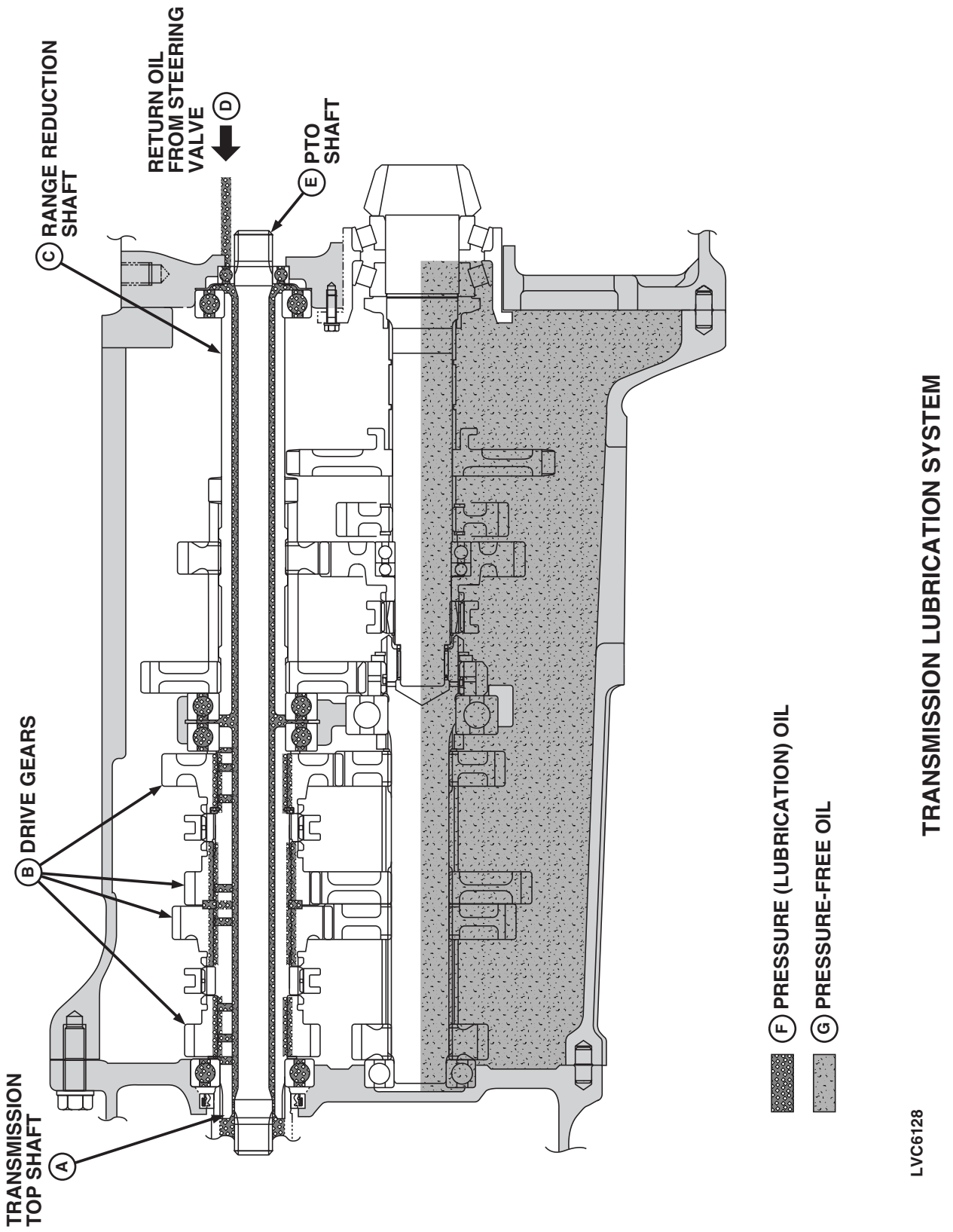
Depressing the clutch pedal moves clutch pedal linkage (F) upward, causing the traction clutch armshaft (I) to rotate and force traction clutch release bearing (K) against traction clutch release fingers. The clutch release bearing depresses the release fingers, causing traction clutch front pressure plate (D) to move forward against spring washer (C), compressing the spring washer.

Since pressure plate (D) is no longer held against traction clutch disk (L) by the clamping force of spring washer (C), the traction clutch disk is no longer forced to turn with flywheel (A). The traction clutch shaft (G) stops turning.

When the PTO clutch is disengaged (PTO lever released), PTO clutch front pressure plate (B) is forced forward by coil springs, removing contact between the pressure plate and PTO clutch disk (M). In this mode, no power will be transmitted from the flywheel to the PTO clutch shaft (H), because the PTO clutch disk does not rotate with flywheel (A).

AG,OUO1008,334 –19–13JAN00–8/8

Transmission Lubrication System



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OUO1085,00001C6 –19–29SEP00–1/2

A—Transmission Top Shaft
B—Drive Gears
C—Range Reduction Shaft
D—Return Oil From Steering Valve
E—PTO Shaft
F—Pressure (Lubrication) Oil
G—Pressure Free Oil

FUNCTION:

The transmission case serves as the main oil reservoir for the hydraulic system, steering system, and brake system. The oil also acts as lubrication oil for transmission and differential components.

MAJOR COMPONENTS:

- Transmission Case
- Power Steering System Return/Transmission Lubrication Line
- Relief Valve
- Range Reduction Shaft
- Transmission Top Shaft

THEORY OF OPERATION:

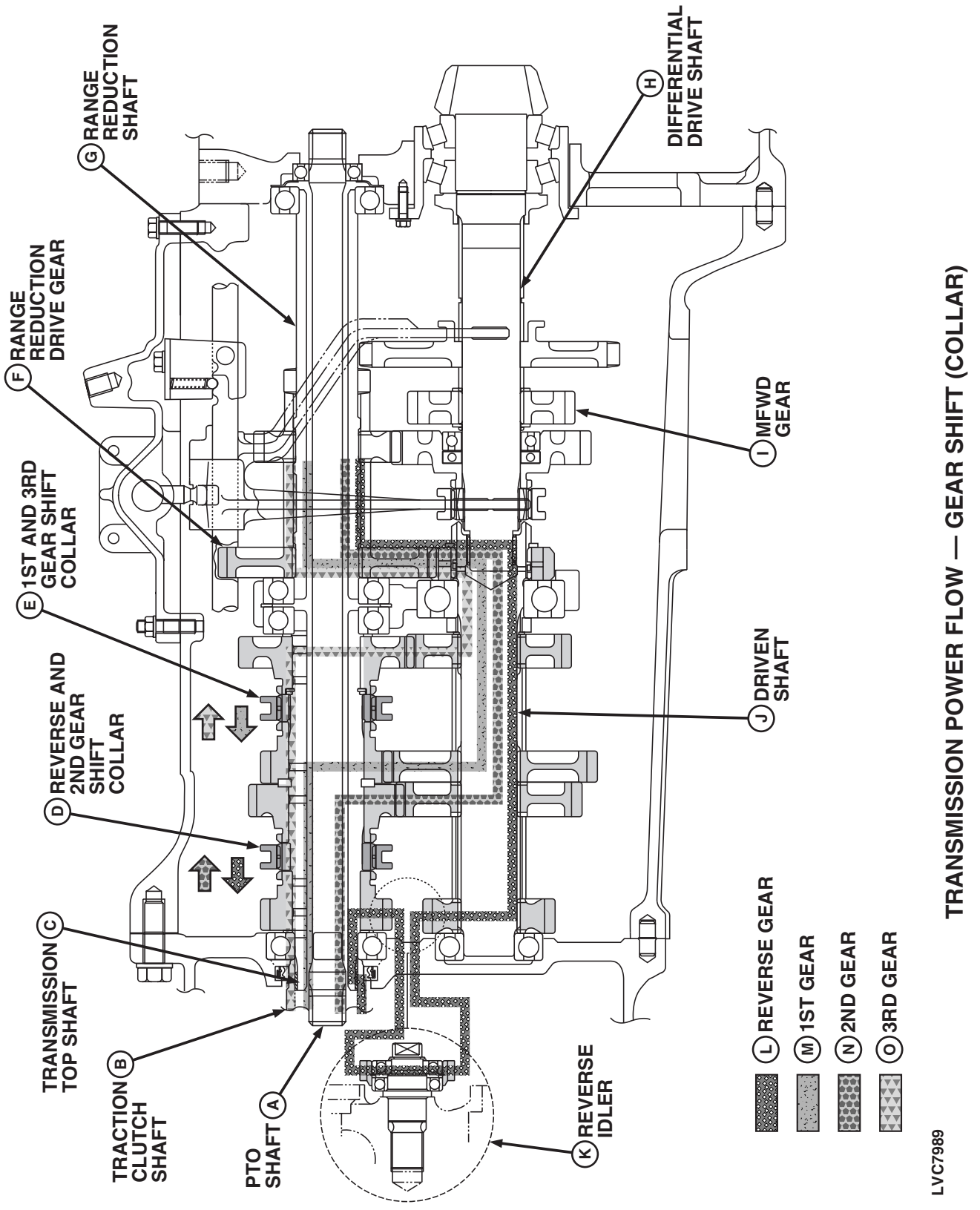
During operation, pressure free oil (G) in the transmission case is thrown up by the turning gears to lubricate the transmission components. Pressurized return oil from the steering valve (D) enters the left side of the differential case via the transmission lubrication line.

A passage in the differential case intersects the bearing bore at the end of range reduction shaft (C). The pressurized lube oil (F) flows around the PTO shaft (E) and through the hollow range reduction shaft (C) and transmission top shaft (A). Passages in the transmission top shaft provide lubrication for the 1st, 2nd, 3rd, and reverse drive gears (B) which rotate independently on the transmission top shaft unless engaged by one of the shift collars. The bearings for the transmission top shaft and range reduction shaft are also lubricated by this pressurized oil.

A transmission lube relief valve is located between return oil inlet and range reduction shaft bearing bore in differential case. An increase in oil pressure causes the relief valve spring to compress, unseating a poppet, allowing return oil to flow directly into the transmission case.

OUO1085,00001C6 –19–29SEP00–2/2

Transmission Power Flow—Gear Shift (Collar)



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OUO1085,00001C5 –19–29SEP00–1/2

A—PTO Shaft
B—Traction Clutch Shaft
C—Transmission Top Shaft
D—Reverse and 2nd Gear Shift Collar
E—1st and 3rd Gear Shift Collar
F—Range Reduction Drive Gear
G—Range Reduction Shaft
H—Differential Drive Shaft
I—MFWD Gear
J—Driven Shaft
K—Reverse Idler
L—Reverse Gear
M—1st Gear
N—2nd Gear
O—3rd Gear

FUNCTION:

Provides three forward gears and reverse gear to the range section of the transmission.

MAJOR COMPONENTS:

- Traction Clutch Shaft
- Transmission Top Shaft
- Drive Gears
- Driven Gears
- Reverse Idler
- Gear Shift Collars
- Driven Shaft
- Range Reduction Drive Gear
- Range Reduction Shaft

THEORY OF OPERATION:

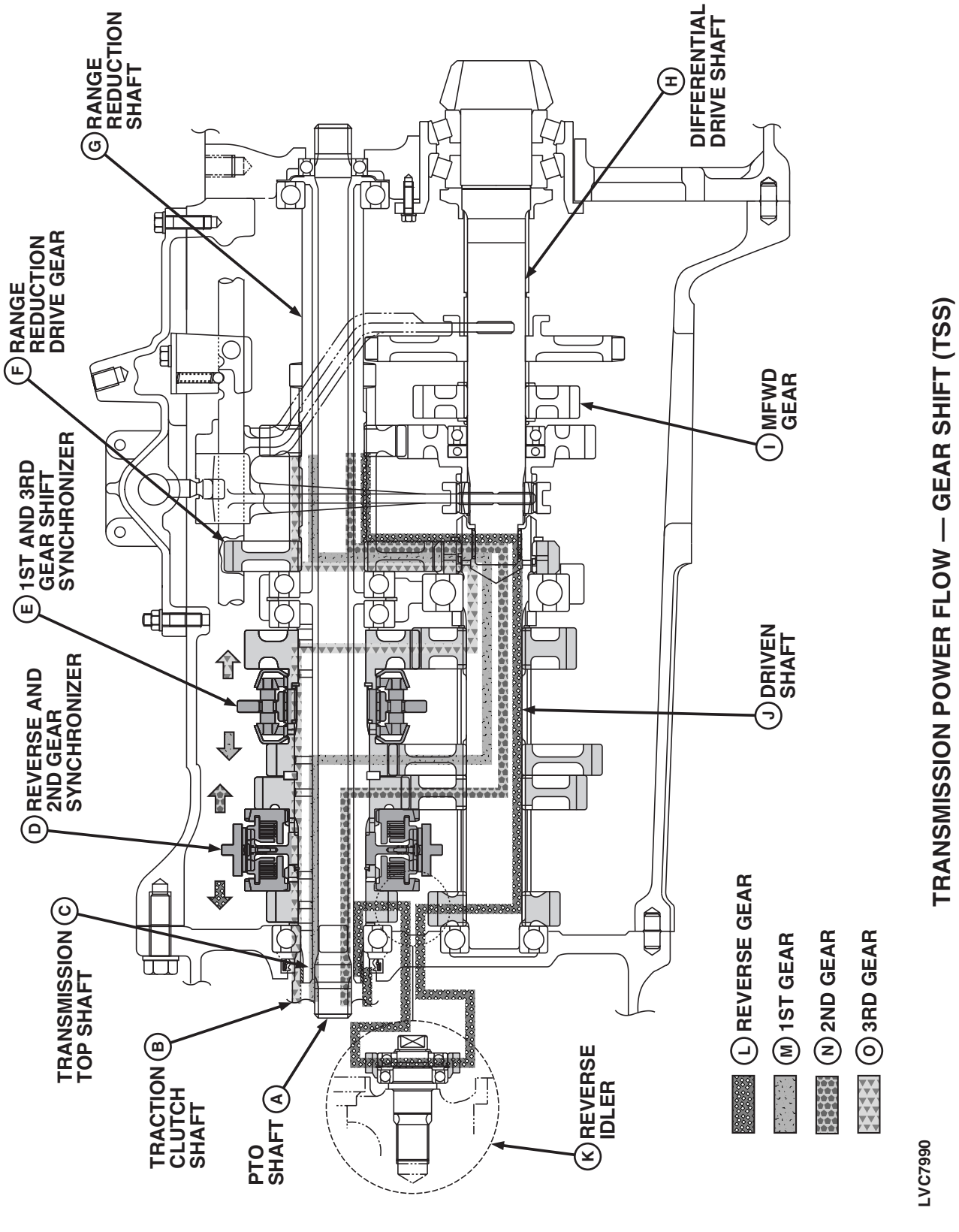
The transmission speed gears are constantly in mesh. The driven gears are splined to the driven shaft (J).

The drive gears rotate independently on the transmission top shaft (C) until a shift collar (D or E) is moved toward it. This engages the gear to the transmission top shaft through the collar.

Power will then flow from the top shaft through the selected gears to the driven shaft, through the range reduction drive gear (F) to the range reduction shaft (G).

When gearshift lever is moved into the park position, a mechanical park pawl assembly within the transmission meshes with mechanical front wheel drive (MFWD) gear (I). With MFWD gear splined to differential drive shaft (H), movement of machine is not possible.

Transmission Power Flow—Gear Shift (SyncShuttle™)



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OUO1085,00001C7 –19–29SEP00–1/2

A—PTO Shaft
B—Traction Clutch Shaft
C—Transmission Top Shaft
D—Reverse and 2nd Gear Synchronizer
E—1st and 3rd Gear Synchronizer
F—Range Reduction Drive Gear
G—Range Reduction Shaft
H—Differential Drive Shaft
I—MFWD Gear
J—Driven Shaft
K—Reverse Idler Gear
L—Reverse Gear
M—1st Gear
N—2nd Gear
O—3rd Gear

FUNCTION:

Provides three forward gears and reverse gear to the range section of the transmission.

MAJOR COMPONENTS:

- Traction Clutch Shaft
- Drive Gears
- Driven Gears
- Reverse Idler
- Reverse and 2nd Gear Synchronizer
- 1st and 3rd Gear Synchronizer
- Driven Shaft
- Range Reduction Drive Gear
- Range Reduction Shaft

THEORY OF OPERATION:

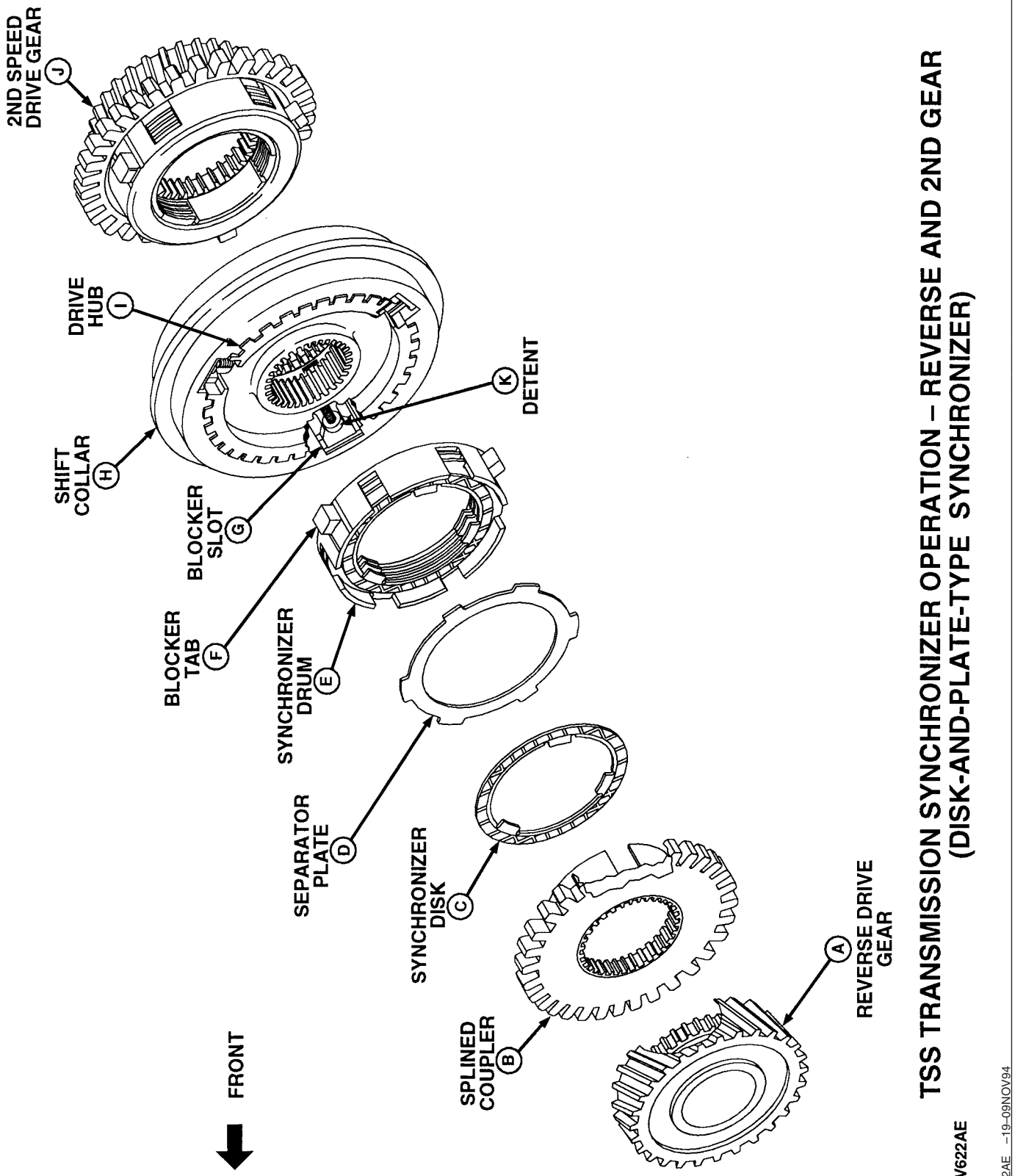
The transmission speed drive gears are constantly in mesh. The driven gears are splined to the driven shaft (J).

The drive gears rotate independently on the transmission top shaft (C) until either synchronizer (D or E) moves toward it. The synchronizer then equalizes the shaft and drive gear speed before engaging the gear to the shaft through the shift collar/actuator hub. (See SyncShuttle™ Transmission Synchronizer Operation—Reverse and 2nd Gear (Disk-and-Plate Type Synchronizer) or SyncShuttle™ Transmission Synchronizer Operation—1st and 3rd Gear (Cone-Type Synchronizer) for further information.)

Power will then flow from the top shaft through the selected gear to the driven shaft, through the range reduction gear (F) to the range reduction shaft (G).

When the gearshift lever is moved into the park position, a mechanical park pawl assembly within the transmission meshes with the mechanical front wheel drive (MFWD) gear (I). With the MFWD splined to the differential drive shaft (H), movement of the machine is not possible.

SyncShuttle™ Transmission Synchronizer Operation—Reverse and 2nd Gear (Disk-and-Plate Type Synchronizer)



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A—Reverse Drive Gear
B—Splined Coupler (2 used)
C—Synchronizer Disk (8 used)
D—Separator Plate (6 used)
E—Synchronizer Drum (2 used)
F—Blocker Tab
G—Blocker Slot
H—Shift Collar
I—Drive Hub
J—2nd Speed Drive Gear
K—Detent (3 used).

FUNCTION:

Synchronizer equalizes speeds of mating gears to allow a clash-free shift while the tractor is in motion.

MAJOR COMPONENTS:

- Reverse Drive Gear
- Splined Coupler
- Synchronizer Disc
- Separator Plates
- Synchronizer Drum
- Blocker Tab
- Blocker Slots
- Shift Collar
- Drive Hub
- Detent
- Transmission Drive Gear

THEORY OF OPERATION:

Drive hub (I) is splined to the traction clutch shaft, and is in motion when the traction clutch is engaged. To obtain a clash-free shift, reverse drive gear (A), splined coupler (B), shift collar (H), and drive hub (I) must be turning at the same rate of speed. When at the same rate of speed, blocker tabs (F) will align with blocker slots (G) to allow a clash-free shift.

Reverse Gear Operation:

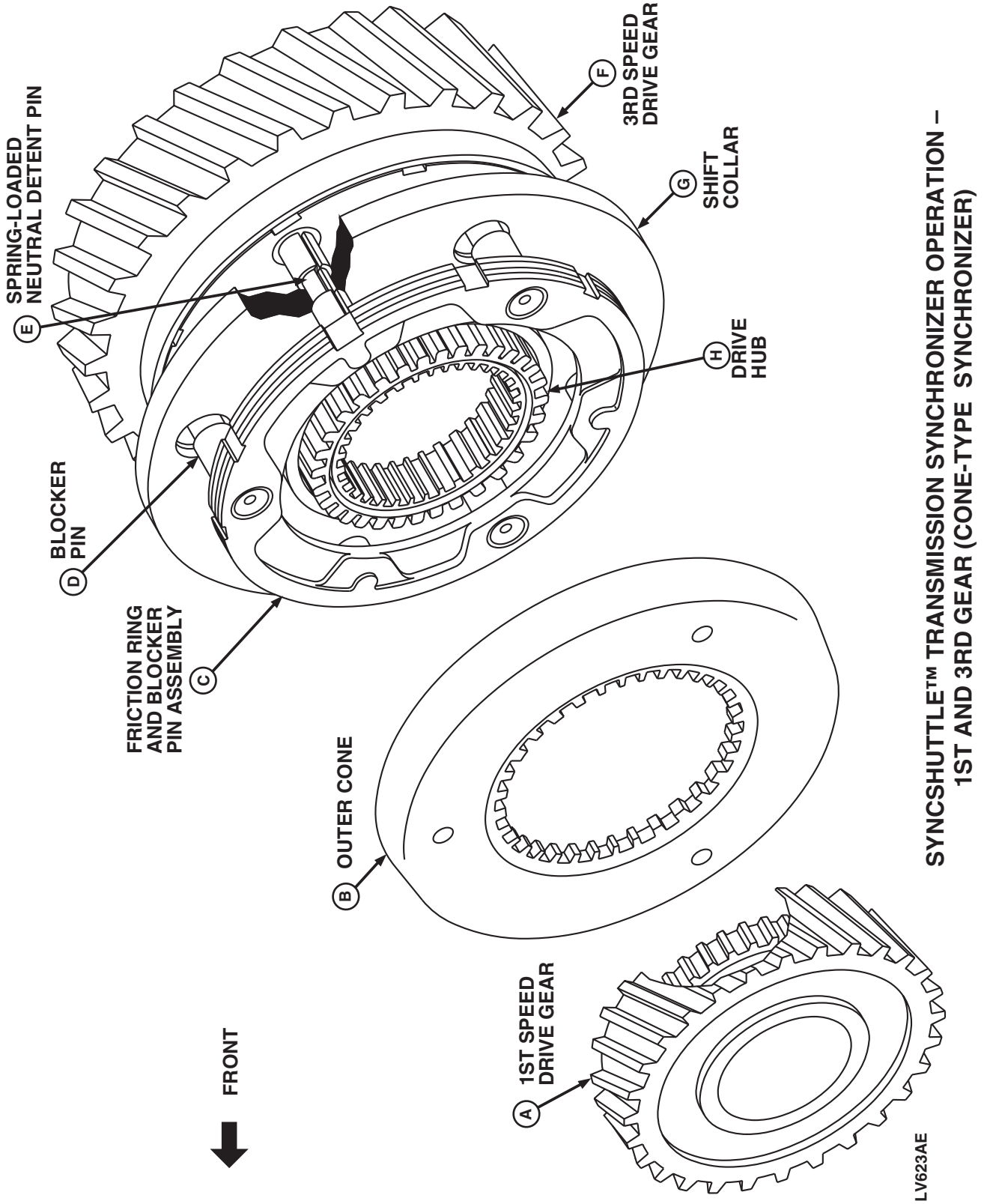
To make a reverse shift, shift collar (H) is moved forward by the shift fork. As the shift collar is moved forward, misalignment of the blocker tabs and blocker slots move synchronizer drum (E) forward. This puts pressure on separator plates (D) and synchronizer discs (C). This pressure brings splined coupler (B) and reverse drive gear (A) to the same speed as drive hub (I). Blocker tabs (F) align with blocker slots (G) and allow the splines on shift collar to engage splines on splined coupler placing transmission in reverse. Power flow for reverse gear selection is described and illustrated in Transmission Power Flow—Gear Shift (SyncShuttle™) in this group.

2nd Gear Operation:

The operation of the synchronizer in 2nd gear is the same as reverse, except the shift collar is moved to the rear. Power flow for 2nd gear selection is described and illustrated in Transmission Power Flow—Gear Shift (SyncShuttle™) in this group.

OUO1085,00001C8 –19–29SEP00–2/2

SyncShuttle™ Transmission Synchronizer Operation—1st and 3rd Gear (Cone-Type Synchronizer)



LV623AE –19–02JUL01

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OUO1085,00001C9 –19–29SEP00–1/2

A—1st Speed Drive Gear
B—Outer Cone (2 used)
C—Friction Ring and Blocker Pin Assembly (2 used)
D—Blocker Pin (3 used)
E—Spring-Loaded Neutral Detent Pin (3 used)
F—3rd Speed Drive Gear
G—Shift Collar
H—Drive Hub

FUNCTION:

Synchronizer equalizes speeds of mating gears to allow a clash-free shift while the tractor is in motion.

MAJOR COMPONENTS:

- 1st Speed Drive Gear
- Outer Cone
- Friction Ring and Blocker Assembly
- Neutral Detent Pins
- Blocker Pins
- Shift Collar
- Drive Hub
- 3rd Speed Drive Gear

THEORY OF OPERATION:

Drive hub (H) is splined to the transmission top shaft, and is in motion when the traction clutch is engaged. To obtain a clash-free shift, 1st speed drive gear (A), outer cone (B), friction ring, and blocker pin assembly (C), shift collar (G), and drive hub (H), must be turning at the same rate of speed. When at the same rate of speed, blocker pins (E) will allow a clash-free shift.

1st Gear Operation:

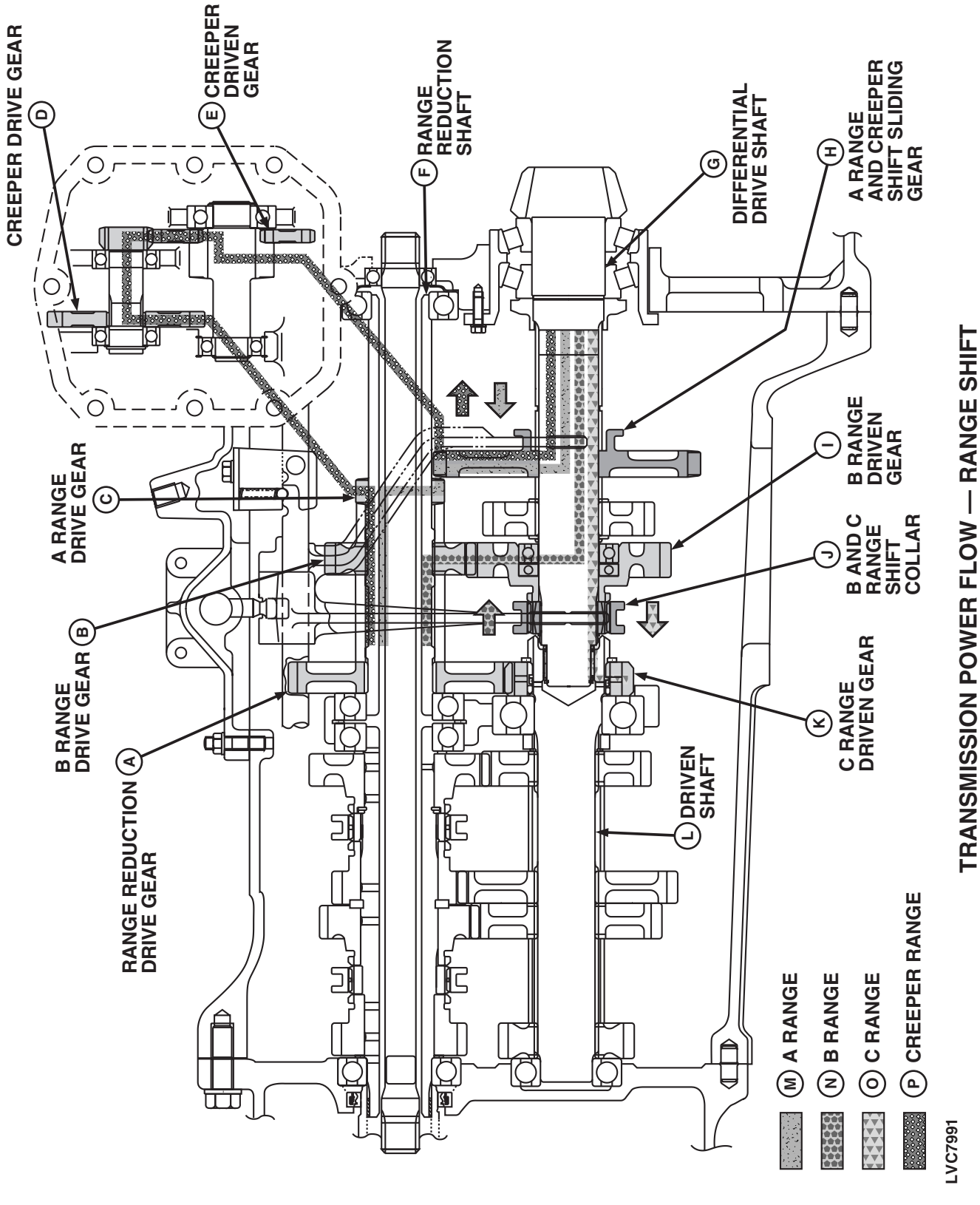
To shift into first gear, shift collar (G) is moved forward by the shift fork. As the shift collar is moved forward forward, misalignment of the blocker pins and shift collar will move the friction ring and blocker pin assembly forward into outer cone (B). The friction between the friction ring assembly and the outer cone will bring 1st speed drive gear (A) to the same rate of speed as drive hub (H). When 1st speed drive gear is turning at the same rate of speed as the drive hub, the blocker pins will allow the shift collar to move forward. As the shift collar moves forward, it engages to the splines on the 1st speed drive gear to place the transmission into 1st gear. Power flow for 1st gear selection is described and illustrated in Transmission Power Flow—Gear Shift (SyncShuttle™) in this group.

3rd Gear operation:

The operation of the synchronizer in 3rd gear is the same as 1st gear, except the actuator hub is moved to the rear. Power flow for 3rd gear selection is described and illustrated in Transmission Power Flow—Gear Shift (SyncShuttle™) in this group.

OUO1085,00001C9 –19–29SEP00–2/2

Transmission Power Flow—Range Shift



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OUO1085,00001CA –19–29SEP00–1/2

A—Range Reduction Drive Gear
B—B Range Drive Gear
C—A Range Drive Gear
D—Creeper Drive Gear
E—Creeper Driven Gear
F—Range Reduction Shaft
G—Differential Drive Shaft
H—A Range and Creeper Shift Sliding Gear
I—B Range Driven Gear
J—B and C Range Shift Collar
K—C Range Driven Gear
L—Driven Shaft
M—A Range
N—B Range
O—C Range
P—Creeper Range

FUNCTION:

Provides three range speeds and an optional creeper speed.

MAJOR COMPONENTS:

- Driven Shaft
- Range Reduction Drive Gear
- Range Reduction Shaft
- Drive Gears
- Driven Gears
- B and C Range Shift Collar
- A Range and Creeper Shift Sliding Gear
- Differential Drive Shaft
- Creeper Assembly (optional)

THEORY OF OPERATION:

Range selection is achieved through a combination of the gears on the range reduction shaft (F) and the gears on the differential drive shaft (G).

The driven shaft (L) transmits power to the range reduction shaft (F) through the C range driven gear (K) and the range reduction drive gear (A) which are constantly in mesh. The C range driven gear is splined to the driven shaft, and the range reduction drive gear is splined to the range reduction shaft (F).

C Range:

The C range driven gear (K) is splined to the end of the driven shaft (L). The B and C range shift collar (J) is splined to the differential drive shaft (G). When the 3rd range is selected, the range shift collar slides and engages the splines on the end of the driven shaft (L) and power is transmitted to the differential drive shaft (G).

B Range:

The B range drive gear (B) is splined to the range reduction shaft (F). The B range drive gear is constantly in mesh with the B range driven gear (I) which floats on the differential drive shaft (G). When the B range is selected, the shift collar (J) engages the B range driven gear and power is transmitted to the differential drive shaft.

A Range:

The A range drive gear (C) is splined to the range reduction shaft (F). When the A range is selected, the 1st range and creeper shift sliding gear (H) slides and engages the A range drive gear (C).

Optional Creeper Range:

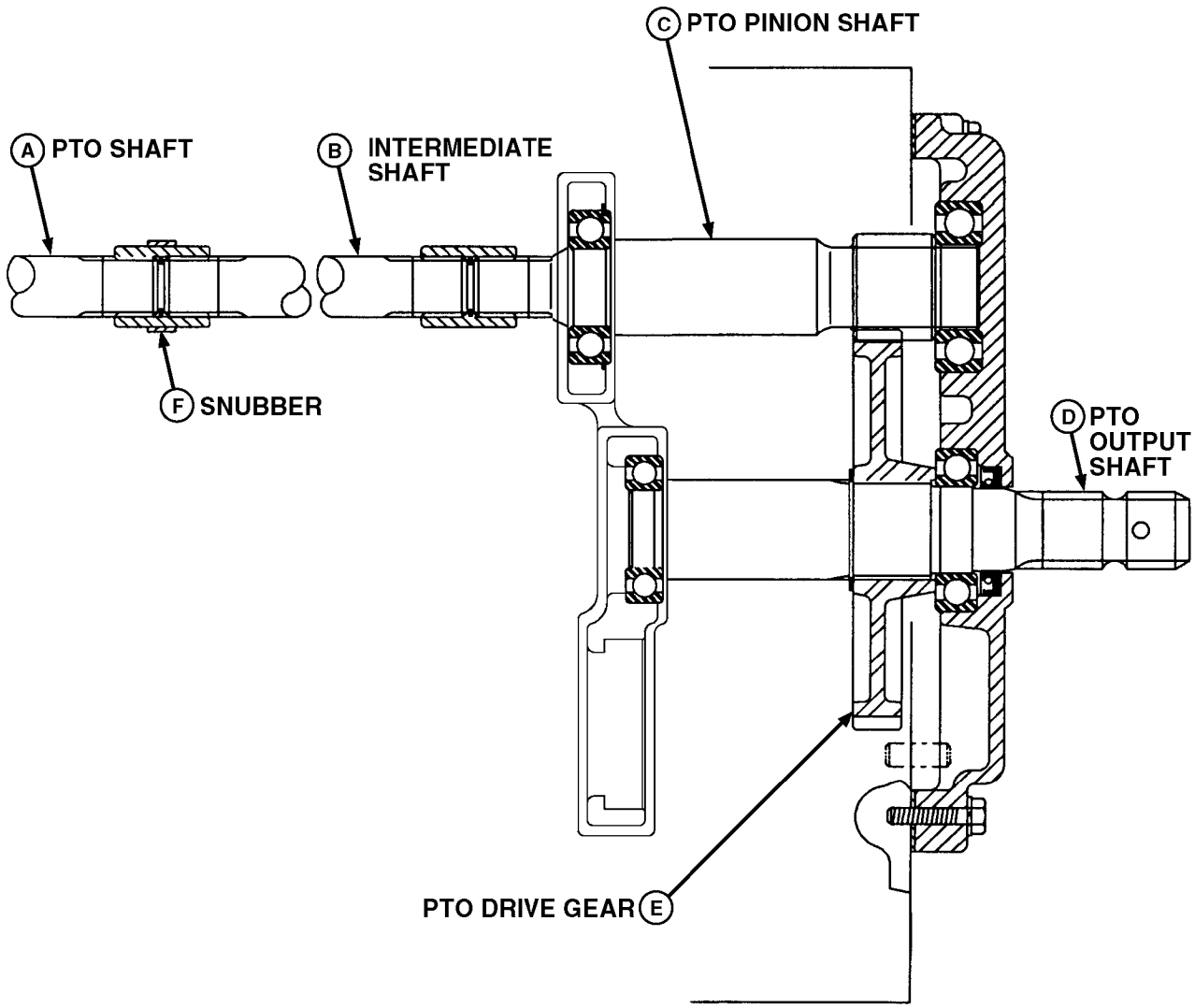
When the optional creeper assembly is installed on the transmission, the A range drive gear (C) on the range reduction shaft (F) is constantly in mesh with the creeper drive gear (D).

When the creeper range is selected, the A range and creeper shift sliding gear (H) slides to engage the creeper driven gear (E).

Power flow is then transmitted from the range reduction shaft through the creeper assembly to the A range and creeper shift sliding gear and to the differential drive shaft (G).

OUO1085,00001CA –19–29SEP00–2/2

Rear PTO Operation



LV268AE

REAR PTO OPERATION

LV268AE –19–02FEB01

A—PTO Shaft
B—Intermediate Shaft
C—PTO Pinion Shaft
D—PTO Output Shaft
E—PTO Drive Gear
F—Snubber

FUNCTION:

Transfers or relays engine power output to drive rear mounted implements or attachments.

MAJOR COMPONENTS:

- PTO Clutch Disk
- PTO Drive Shaft
- PTO Shaft
- Intermediate Shaft
- PTO Pinion Shaft
- PTO Gear

Continued on next page

OUO1085,00001CB –19–29SEP00–1/2

- PTO Output Shaft
- Snubber

THEORY OF OPERATION:

Pushing the PTO lever forward to the engaged position provides PTO clutch engagement. The PTO clutch disk is splined to the PTO drive shaft. When the PTO clutch is engaged, power from the engine is transmitted through PTO shaft (A) and intermediate shaft (B) to the PTO pinion shaft (C).

The PTO pinion shaft turns the PTO drive gear (E) which then turns the PTO output shaft (D).

When the PTO lever is pulled to the disengaged position, the PTO clutch disengages and the PTO shaft stops turning.

Snubber (F) aids in bringing the PTO shaft to a stop when the PTO clutch is disengaged.

A safety switch on the PTO clutch linkage prevents starting the tractor when the PTO is engaged.

OUO1085,00001CB –19–29SEP00–2/2

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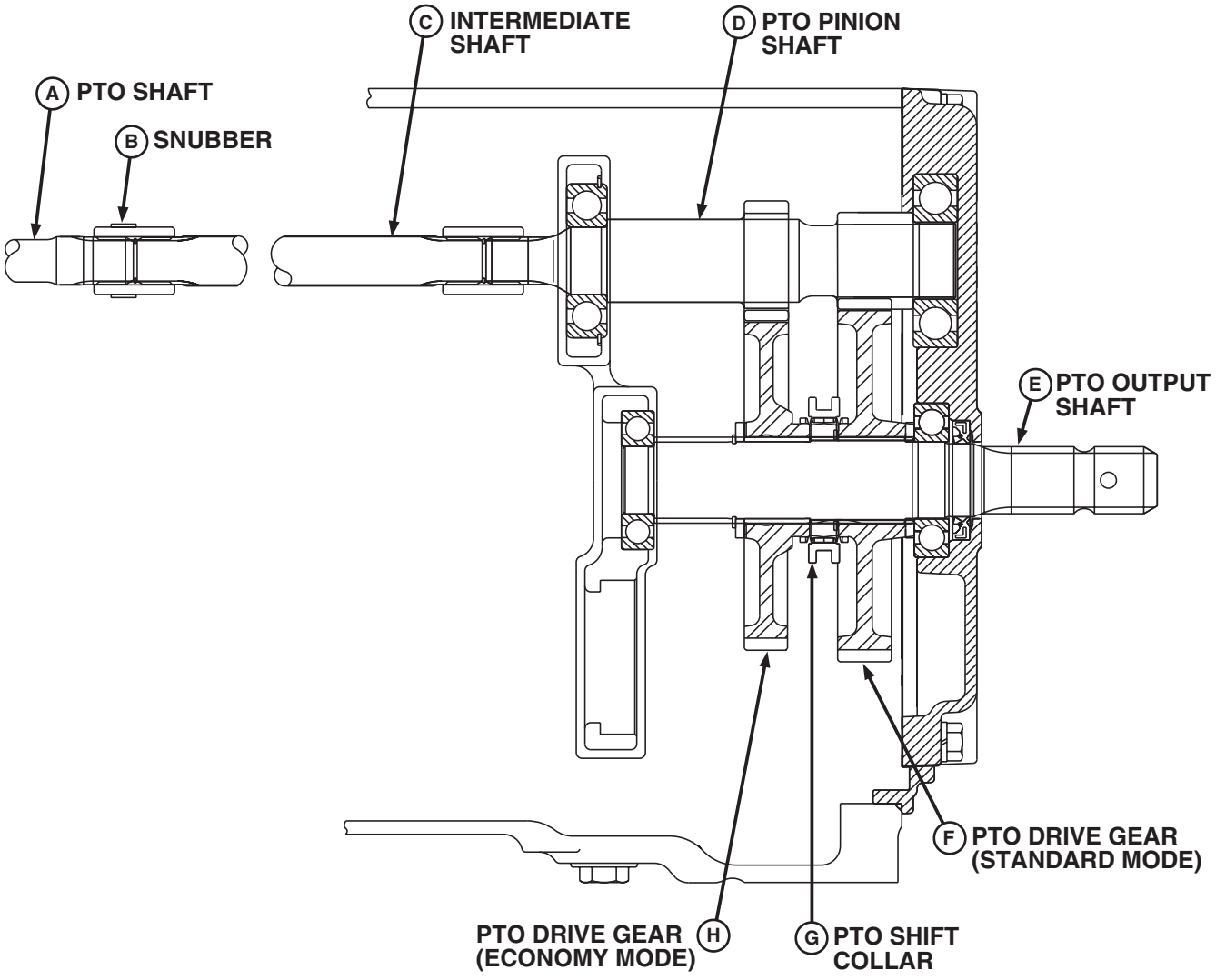
Rear 540/540E PTO Operation (SyncShuttle™ Transmission Only)



LV1005AE

LV1005AE –19–14SEP00

REAR PTO COMPONENTS

A—PTO Shaft
B—Snubber
C—Intermediate Shaft
D—PTO Pinion Shaft
E—PTO Output Shaft
F—PTO Drive Gear for Standard (540) Mode
G—PTO Shift Collar
H—PTO Drive Gear for Economy (540E) Mode

FUNCTION:

Transmits engine power output to drive rear mounted implements or attachments.

MAJOR COMPONENTS:

- PTO Clutch Disk
- PTO Shaft
- Intermediate Shaft
- PTO Pinion Shaft
- PTO Drive Gears

Continued on next page

OUO1085,00001CD –19–29SEP00–1/2

- PTO Output Shaft
- Snubber

THEORY OF OPERATION:

Pushing the PTO lever forward to the engaged position provides PTO clutch engagement. The PTO clutch disk is splined to the PTO drive shaft. When the PTO clutch is engaged, power from the engine is transmitted through PTO shaft (A) and intermediate shaft (C) to the PTO pinion shaft (D).

Tractors equipped with SyncShuttle™ transmission provide for 2 modes of PTO operation:

Standard (540) Mode:

When full engine power is required, standard 540 mode allows engine to run at rated speed of 2400 rpm and delivers output power to the PTO at 540 rpm.

Economy (540E) Mode:

For lighter loads, 540E mode allows engine to run at 1700 rpm to conserve fuel while still turning the PTO output shaft at 540 rpm.

The PTO pinion shaft (D) is in constant mesh with the PTO drive gears (F and H). The drive gears rotate freely on the PTO output shaft until engaged by the shift collar (G), which is splined to the output shaft.

When standard 540 mode is selected, the PTO shift collar slides toward rear of tractor and engages drive gear (F). When 540E mode is selected, the shift collar moves toward front of tractor and engages drive gear (H).

When the PTO lever is pulled to the disengaged position, the PTO clutch disengages and the PTO shaft stops turning.

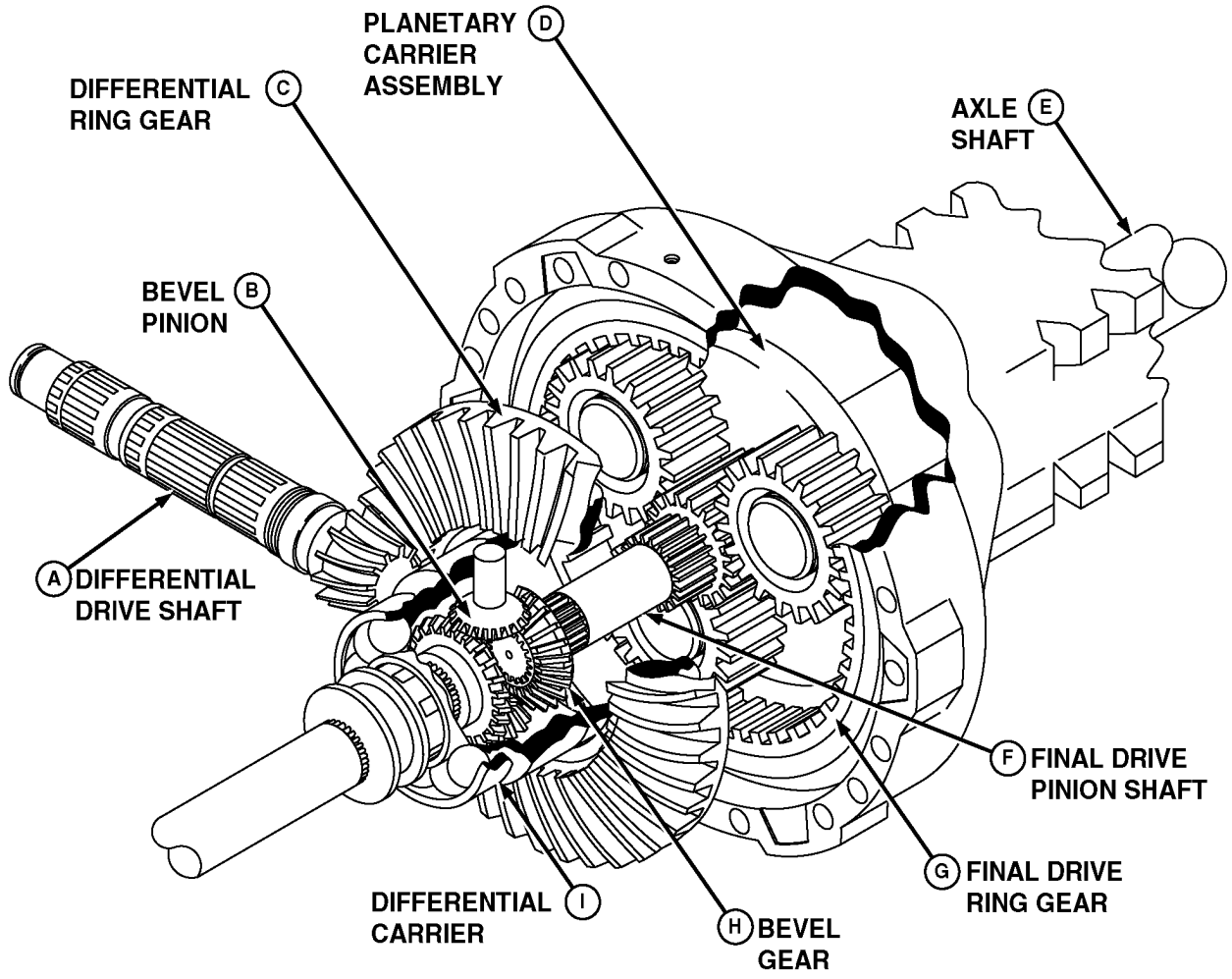
Snubber (B) aids in bringing the PTO shaft to a stop when the PTO clutch is disengaged.

A safety switch on the PTO clutch linkage prevents starting the tractor when the PTO is engaged.

The linkage is also configured to prevent shifting into 540E mode when the throttle setting exceeds 1700 rpm, or raising the throttle above 1700 rpm while in 540E mode.

OUO1085,00001CD –19–29SEP00–2/2

Differential Power Flow



LV269AE

DIFFERENTIAL POWER FLOW

LV269AE –19–27FEB96

A—Differential Drive Shaft
B—Bevel Pinion
C—Differential Ring Gear
D—Planetary Carrier Assembly
E—Axle Shaft
F—Final Drive Pinion Shaft
G—Final Drive Ring Gear
H—Bevel Gear
I—Differential Carrier

FUNCTION:

The differential transmits power from the differential drive shaft to the final drive pinion shafts. It allows each wheel to rotate at varying speeds and still pull its own load.

MAJOR COMPONENTS:

- Differential Drive Shaft
- Differential Ring Gear
- Differential Carrier Assembly
- Final Drive Pinion Shafts

Continued on next page

OUO1085,00001CF –19–02OCT00–1/2

- Final Drive Ring Gear
- Planetary Carrier Assembly
- Axle Shaft

THEORY OF OPERATION:

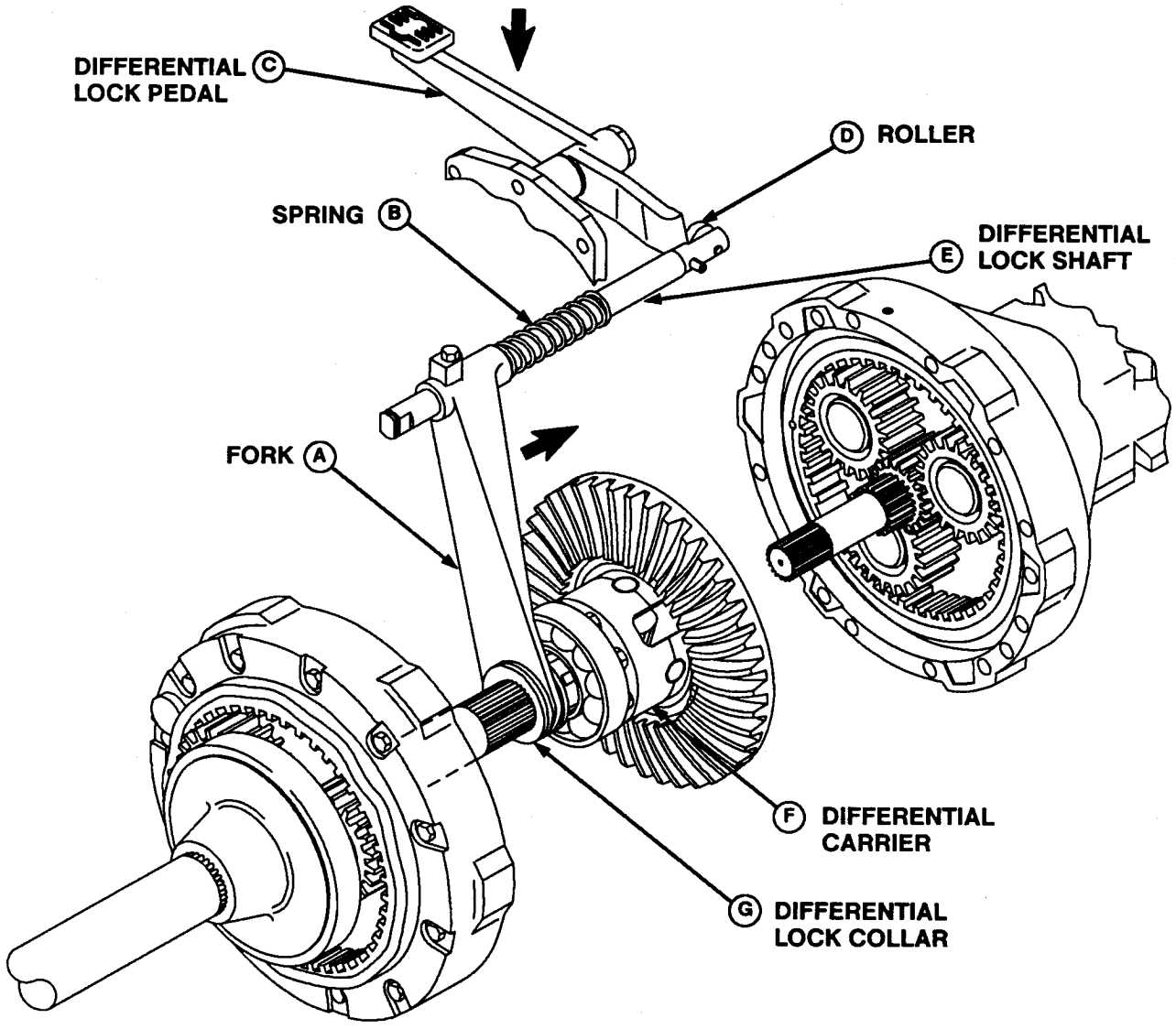
Power from the differential drive shaft (A) is transmitted through the differential assembly to the final drive pinion shaft (F). The final drive pinion shaft is in mesh with the three small gears on the planetary carrier assembly (D). These small gears walk around the inside of final drive ring gear (G). The result is rotation of the axle shaft (E).

The differential assembly is a ring gear (C) bolted to the carrier (I). Inside the carrier are two bevel gears (H) and four bevel pinions (B).

When the tractor turns sharply, one axle is held stationary. The result is that the bevel pinions rotate on their own axis and walk around the stationary bevel gears. The turning ring gear transmits power through the pinion to the opposite bevel gear.

OUO1085,00001CF –19–02OCT00–2/2

Differential Lock Operation



LV270AE

DIFFERENTIAL LOCK OPERATION

LV270AE –19–27JAN92

A—Fork
B—Spring
C—Differential Lock Pedal
D—Roller
E—Differential Lock Shaft
F—Differential Carrier
G—Differential Lock Collar

FUNCTION:

Engaging the differential lock pedal locks the two differential output shafts together. This ensures that an equal amount of power is transmitted to both rear axles (eliminating differential action).

MAJOR COMPONENTS:

- Lock Pedal
- Lock Shaft
- Fork
- Lock Collar

Continued on next page

- Differential Carrier

THEORY OF OPERATION:

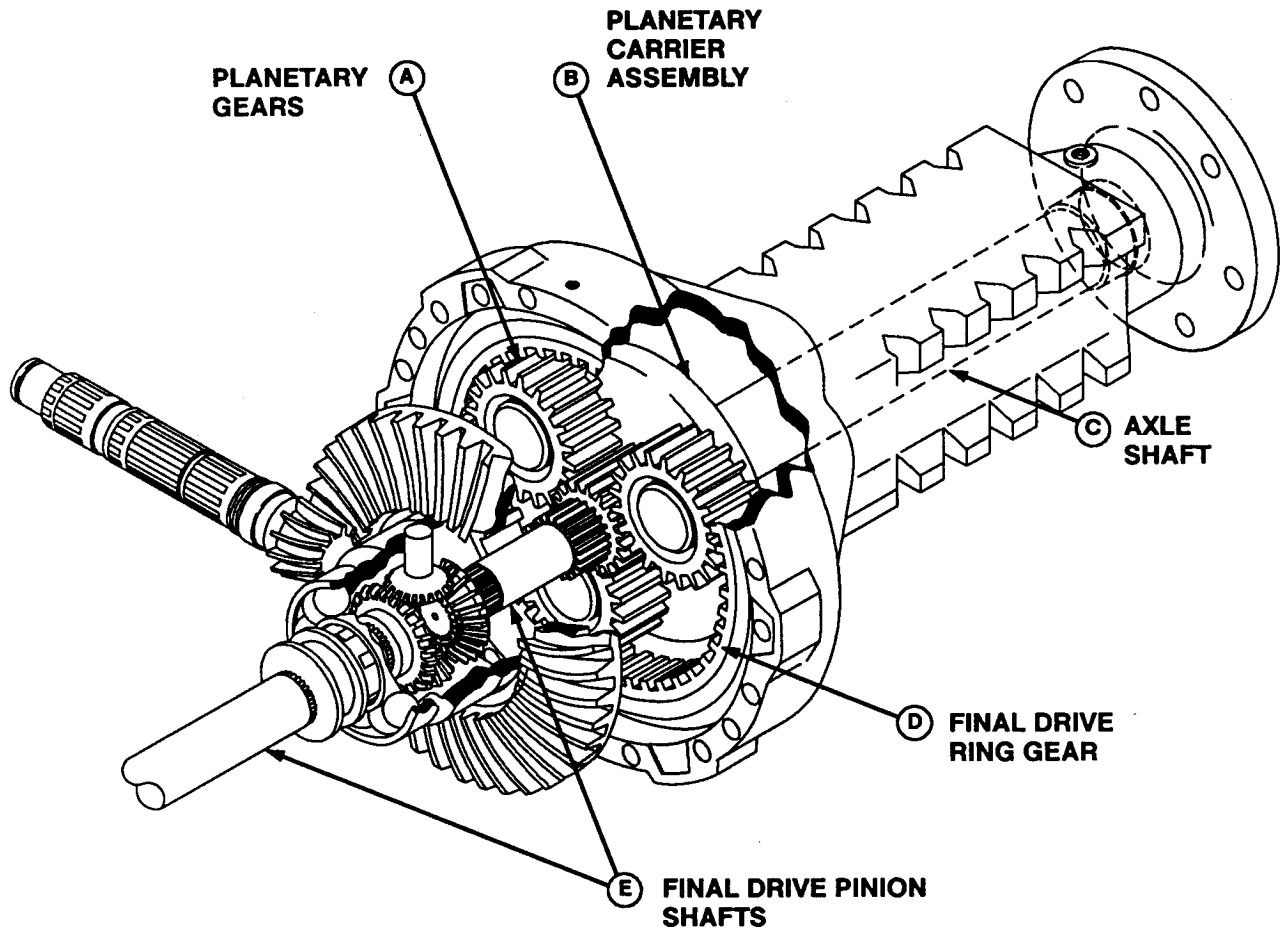
When the differential lock pedal (C) is pressed downward, a ramp on the end of pedal pivots against a roller (D) on the end of the differential lock shaft (E), and the shaft is forced to the right. As the shaft moves, spring (B) is compressed and fork (A) forces the differential lock collar (G) toward the differential carrier (F).

When the pins on the collar align with the slots in the carrier, the pins will slip into the slots. Since the collar is splined to the right differential output shaft, no differential action will take place and both output shafts turn equally.

Unequal traction will keep the lock engaged. When traction equalizes, lock will disengage itself by spring action. If lock does not disengage, depress one brake pedal and then the other.

OUO1085,00001D0 –19–02OCT00–2/2

Final Drive Operation



LV271AE

FINAL DRIVE OPERATION

LV271AE –19–27JAN92

A—Planetary Gears **C—Axle Shaft** **D—Final Drive Ring Gear** **E—Final Drive Pinion Shafts**
B—Planetary Carrier Assembly

FUNCTION:

The final drive planetary gives the drive wheels a final speed reduction and torque increases.

MAJOR COMPONENTS:

- Final Drive Pinion Shafts
- Planetary Carrier Assembly
- Planetary Gears
- Final Drive Ring Gear
- Axle Shaft

Continued on next page

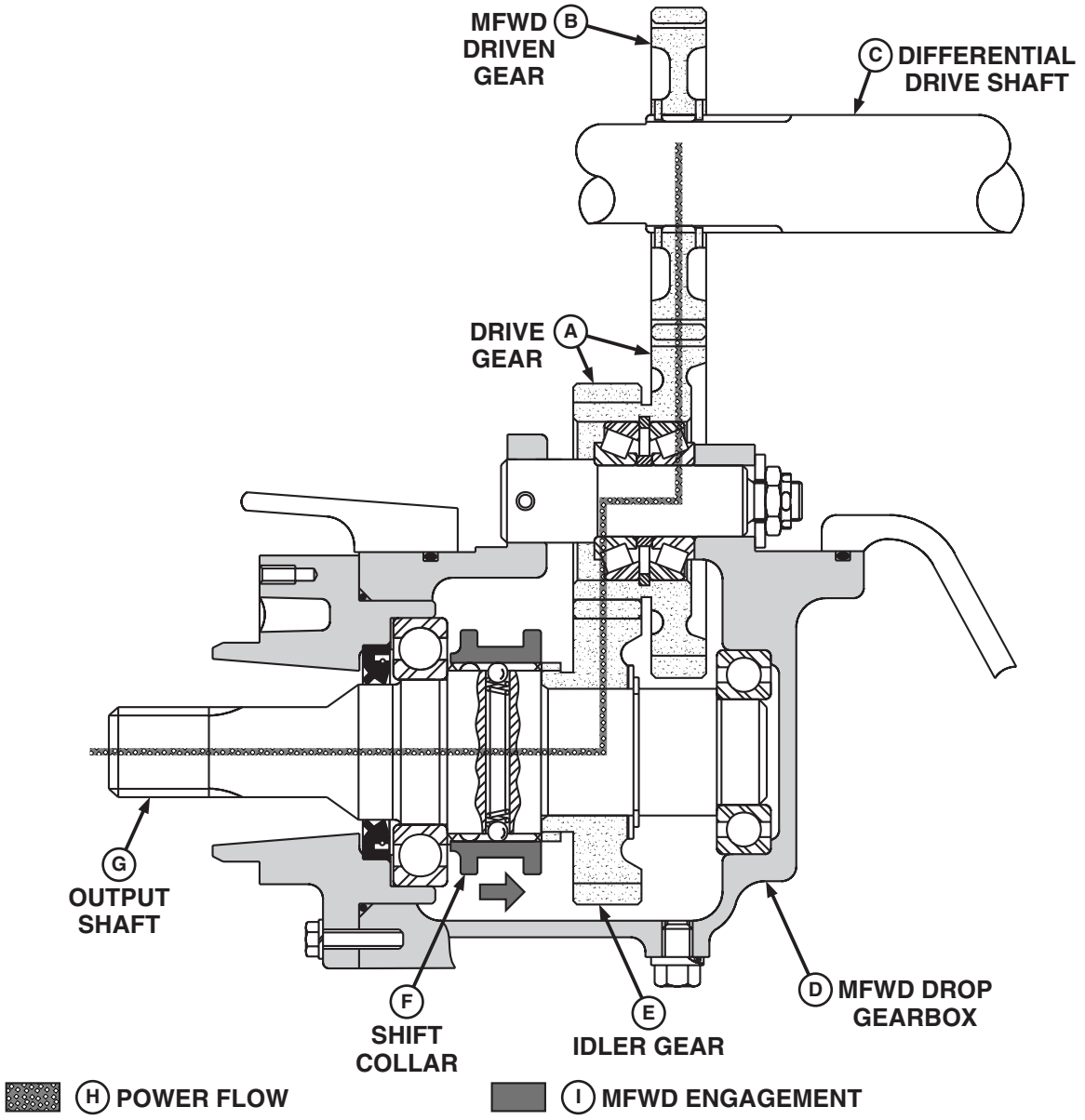
THEORY OF OPERATION:

The final drive is a planetary ring gear type system. The final drive pinion shafts (E) are in mesh with the planetary gears (A) attached to the planetary carrier assembly (B) and ride inside final drive ring gear (D).

The axle shafts (C) are splined to the planetary carrier. Power from the differential output shafts turns the planetary assembly, which rotates the planetary assembly, and, therefore, the axle shafts. This provides the proper gear reduction and high torque load capabilities required.

OUO1085,00001D1 –19–02OCT00–2/2

Mechanical Front Wheel Drive (MFWD) Operation



LVC272

LVC272 –19–02FEB01

MECHANICAL FRONT WHEEL DRIVE (MFWD) DROP GEARBOX OPERATION

A—Driven Gears
B—MFWD Drive Gear
C—Differential Drive Shaft
D—MFWD Drop Gearbox
E—Idler Gear
F—Shift Collar
G—Output Shaft
H—Power Flow
I—MFWD Engagement

FUNCTION:

Provides power to the MFWD housing for extra added traction.

MAJOR COMPONENTS:

- Differential Drive Shaft
- MFWD Gear

Continued on next page

- MFWD Drop Gearbox
- Drive Shaft
- MFWD Axle

THEORY OF OPERATION:

The MFWD drive gear (B) on the differential drive shaft (C) of the transmission is constantly in mesh with driven gears (A) in the drop gearbox (D). These gears transmit power (H) to the idler gear (E), which spins freely on the output shaft (G) until engaged by shift collar (F).

When the MFWD lever is pushed forward, the shift collar slides back and engages the idler gear. Power is then transmitted through the output shaft and drive shaft to the MFWD axle housing.

OUO1085,00001D2 –19–02OCT00–2/2

Theory of Operation Information

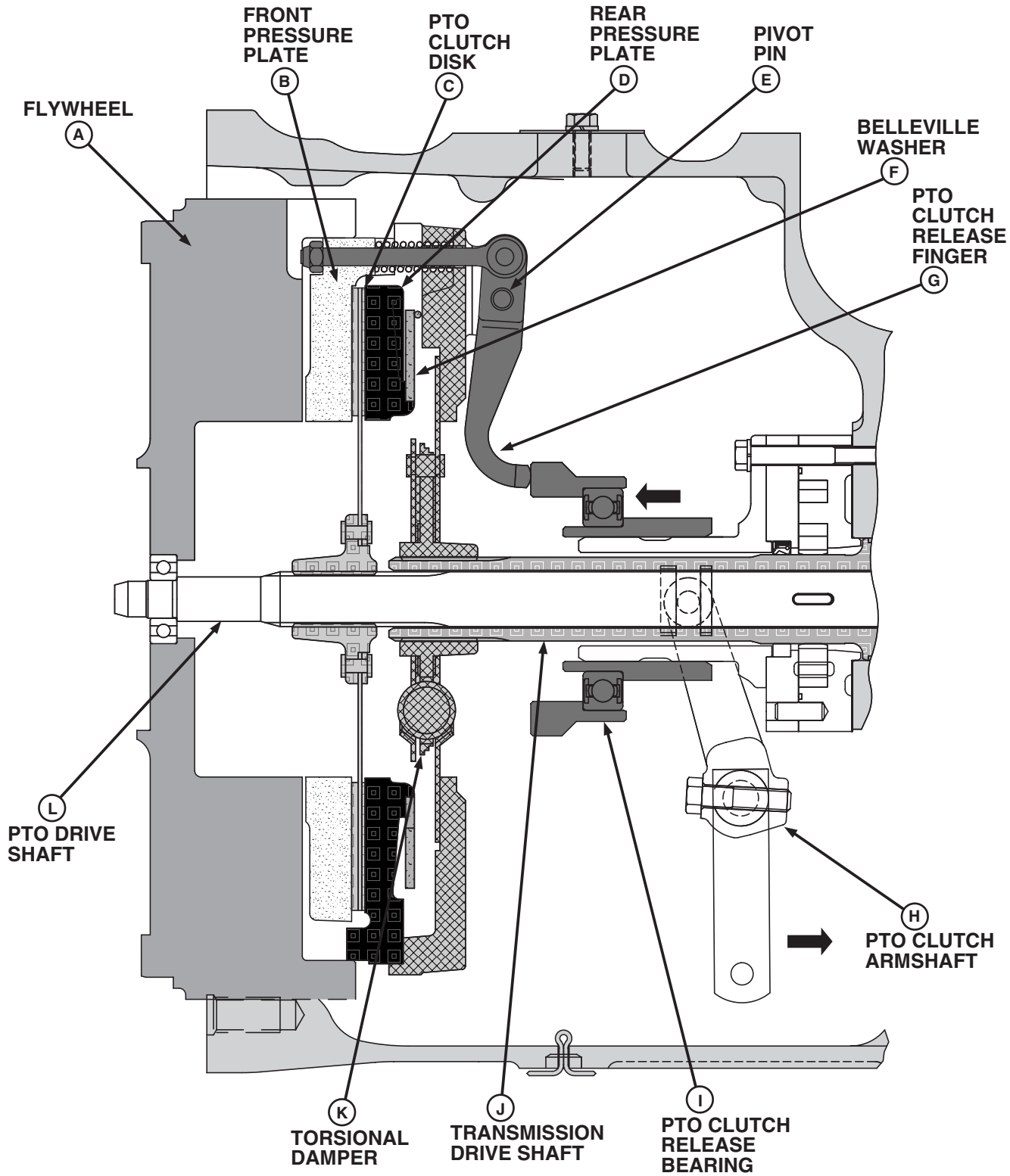
This group divides the power train into individual components or systems by function. The story contains information on function, component, or system identification, and theory of operation.

The following systems or components are covered:

- Clutch Operation
- PowrReverser™
  - – Operation (Forward and Reverse)
  - – Power Flow
- Hydraulic Control Valve Operation
- Transmission
  - – Power Flow—Gear Shift
  - – Power Flow—Range Shift
  - – Gear Shift Synchronizer Operation
  - – Lubrication

OUO1085,00001D3 –19–02OCT00–1/1

Clutch Operation—PTO Clutch Engaged (PowrReverser™ Transmission)



PTO CLUTCH OPERATION — ENGAGED HYDRAULIC REVERSER TRANSMISSION

LVC7935

LVC7935 –19–02JUL02

Continued on next page

OUO1085,00001D5 –19–02OCT00–1/2

A—Flywheel
B—Front Pressure Plate
C—PTO Clutch Disk
D—Rear Pressure Plate
E—Pivot Pin
F—Belleville Washer
G—PTO Clutch Release Finger
H—PTO Clutch Armshaft
I—PTO Clutch Release Bearing
J—Transmission Drive Shaft
K—Torsional Damper
L—PTO Drive Shaft

FUNCTION:

The dry PTO clutch disk provides mechanical engagement and disengagement of the power flow between the engine and rear PTO.

MAJOR COMPONENTS:

- Pressure Plates
- Clutch Disk
- Belleville Washer
- Clutch Release Fingers
- PTO Clutch Linkage
- PTO Drive Shaft
- Torsional Damper
- Traction Drive Shaft

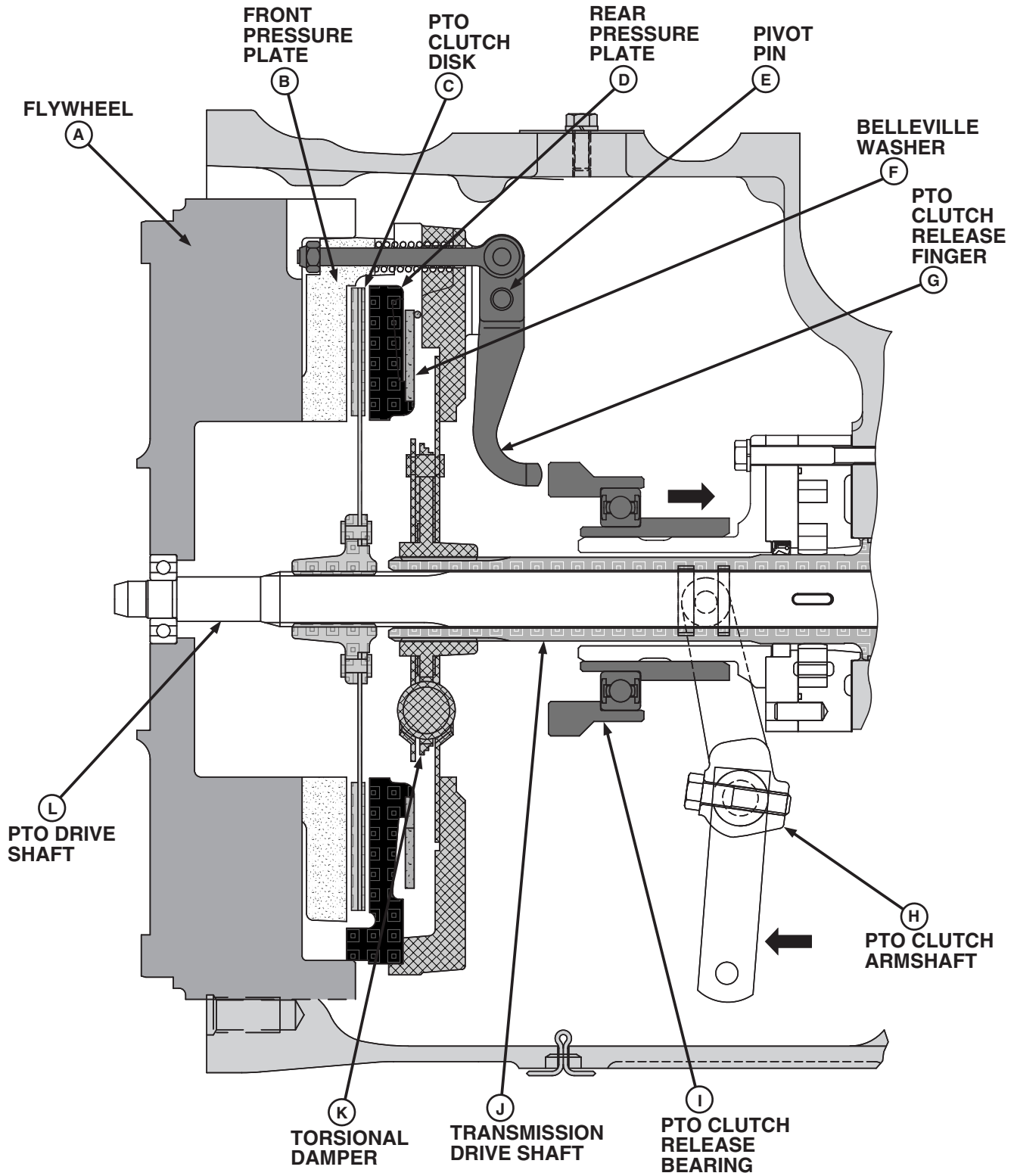
THEORY OF OPERATION:

The clutch assembly is attached to the rear of engine flywheel (A). Clutch disk (C) is splined to PTO drive shaft (L). PTO clutch armshaft (H) is connected by linkage to the PTO clutch lever at the operator's station. When the PTO lever is pushed forward, clutch release bearing (I) pushes clutch release fingers (G) forward and the front and rear pressure plates (B and D) are compressed through the clutch disk to the PTO drive shaft.

Torsional damper (K) is connected directly to the flywheel. The torsional damper is splined to transmission drive shaft (J), thus the traction drive shaft turns whenever the engine is running. Engagement and disengagement of the power flow between the engine and transmission is accomplished by the PowrReverser™. (See PowrReverser™ Operation later in this group.)

OUO1085,00001D5 –19–02OCT00–2/2

Clutch Operation—PTO Clutch Disengaged (PowrReverser™ Transmission)



PTO CLUTCH OPERATION — DISENGAGED HYDRAULIC REVERSER TRANSMISSION

LVC7936

LVC7936 –19–02JUL02

Continued on next page

OUO1043,0000EC1 –19–09JUL02–1/2

A—Flywheel
B—Front Pressure Plate
C—PTO Clutch Disk
D—Rear Pressure Plate
E—Pivot Pin
F—Belleville Washer
G—PTO Clutch Release Finger
H—PTO Clutch Armshaft
I—PTO Clutch Release Bearing
J—Transmission Drive Shaft
K—Torsional Damper
L—PTO Drive Shaft

FUNCTION:

The dry PTO clutch disk provides mechanical engagement and disengagement of the power flow between the engine and rear PTO.

MAJOR COMPONENTS:

- Pressure Plates
- Clutch Disk
- Belleville Washer
- Clutch Release Fingers
- PTO Clutch Linkage
- PTO Drive Shaft
- Torsional Damper
- Traction Drive Shaft

THEORY OF OPERATION:

The clutch assembly is attached to flywheel (A). Pushing the PTO clutch lever rearward, causing PTO clutch armshaft (H) to rotate and pull the PTO clutch release bearing (I) rearward away from the PTO clutch release fingers (G), causing the pressure plate (B) to move forward.

This causes the PTO clutch disk (C) not to rotate with the flywheel. Because the PTO clutch disk is splined to the PTO drive shaft (L), power is no longer transmitted from the PTO clutch disk to the PTO drive shaft and on to the rear PTO shaft. Engagement and disengagement of the power flow between the engine and transmission is accomplished by the PowrReverser™. (See PowrReverser™ Operation later in this group.)

OUO1043,0000EC1 –19–09JUL02–2/2

PowrReverser™ General Information

The PowrReverser™ uses the same oil supply as the steering and hydraulic systems. An external tube between the right-side transmission housing and clutch housing provides oil supply to the PowrReverser™ transmission oil pump. The transmission oil pump is located inside the clutch housing and driven by the transmission drive shaft.

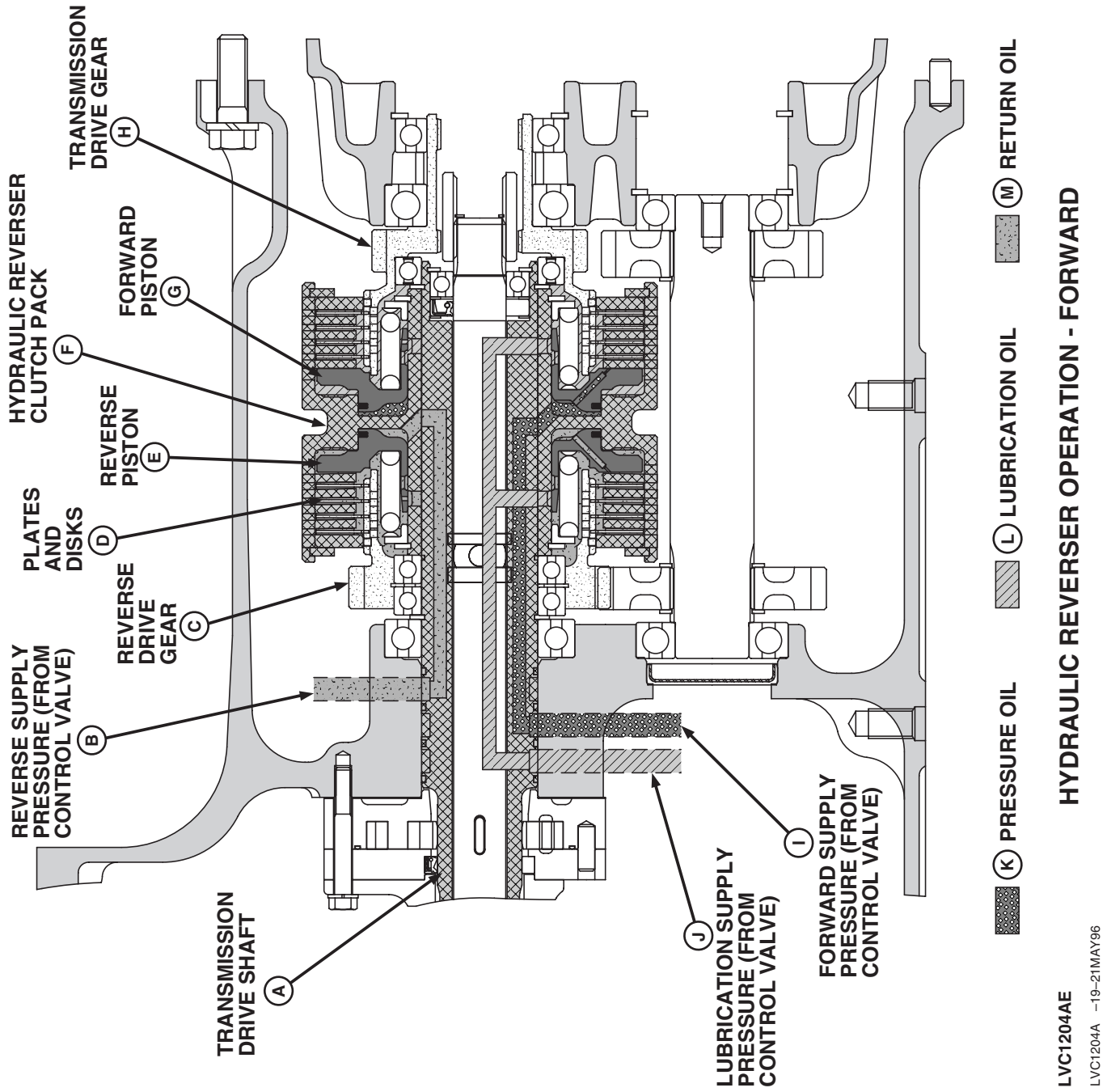
Operation of the PowrReverser™ is regulated by the control valve mounted to the left side of the clutch housing. The clutch pedal and F-N-R lever are connected to spools in the control valve that control the flow of oil to the forward and reverse clutch packs.

Cylinder is keyed to traction drive shaft. Piston, plates, and disks are assembled inside the cylinder and retained by snap ring. Snap ring retains support and spring on shaft. Spring forces piston to bottom of cylinder and keeps plates and disks separated when in neutral.

When forward or reverse is selected, pressurized oil flows through passages in the shaft to the inside of the cylinder, behind the piston. Oil pressure behind the piston overcomes the spring force and compresses the plates and disks together. Power from the engine is transmitted to the drive gear for the direction selected. Power flow through the PowrReverser™ clutch pack is described and illustrated later in this group.

OUO1085,00001D6 –19–02OCT00–1/1

PowrReverser™ Operation in Forward



A—Transmission Drive Shaft
B—Reverse Supply Pressure (From Control Valve)
C—Reverse Drive Gear
D—Plates and Disks
E—Reverse Piston
F—PowrReverser™ Clutch Pack
G—Forward Piston
H—Transmission Drive Gear
I—Forward Supply Pressure (From Control Valve)
J—Lubrication Supply Pressure (From Control Valve)
K—Pressure Oil
L—Lubrication Oil
M—Return Oil

FUNCTION:

Continued on next page

Transmits power from engine to transmission when F-N-R lever is in forward position.

MAJOR COMPONENTS:

- Traction Drive Shaft
- PowrReverser™ Clutch Pack

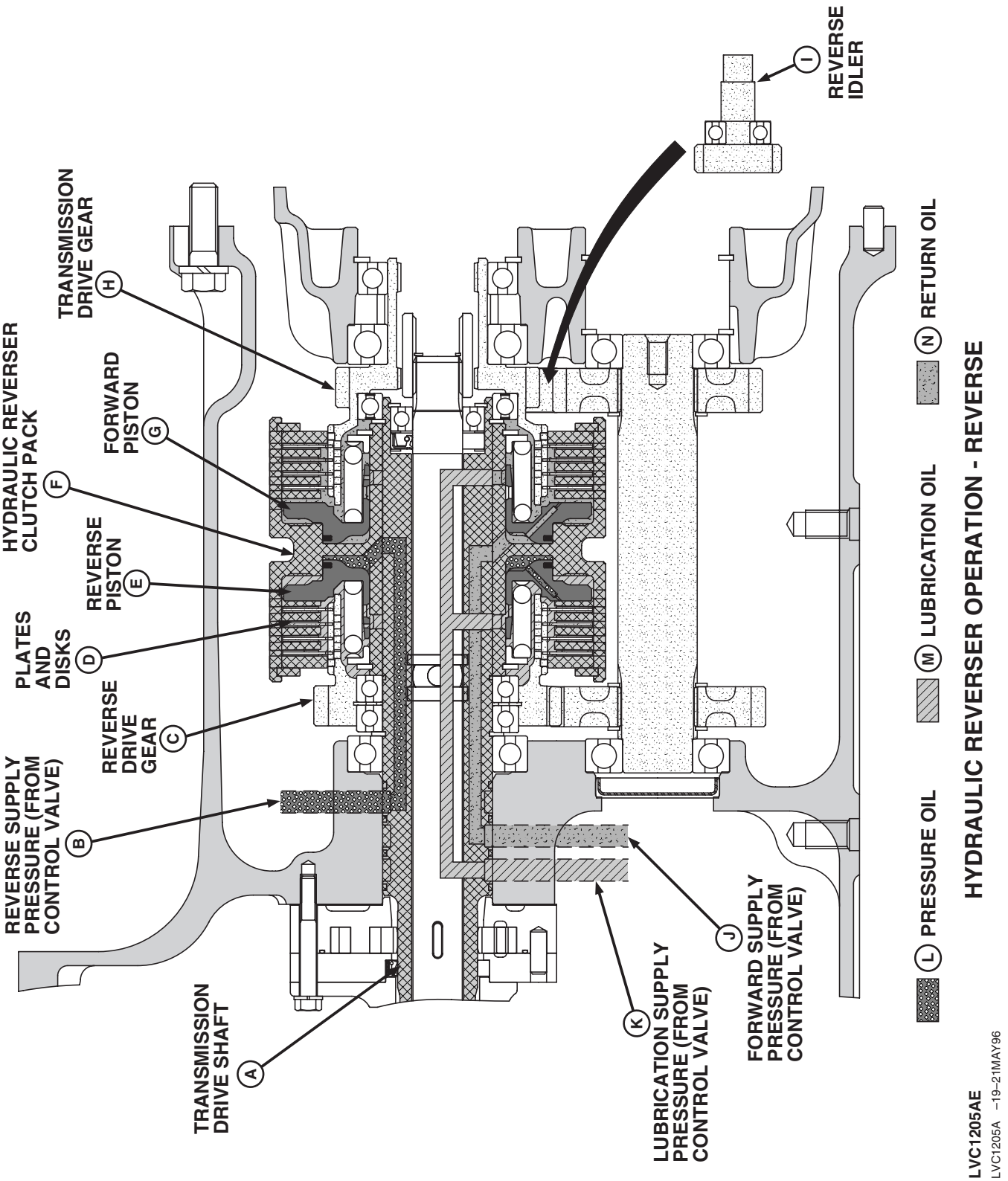
THEORY OF OPERATION:

Pressure oil from the PowrReverser™ control valve is routed through passages in transmission drive shaft (A) to PowrReverser™ clutch pack (F). When forward is selected, pressure oil (I) enters the clutch pack behind forward piston (G) and compresses plates and disks (D) together. Power is transmitted through transmission drive gear (H) to the transmission top shaft.

When the forward piston moves, a passage opens allowing pressurized lubrication oil to enter the clutch pack to lubricate the plates and disks. With reverse piston (E) retracted, lubrication passage to reverse clutch pack is significantly reduced. Oil in reverse side of clutch pack returns to sump.

OUO1085,00001D7 –19–02OCT00–2/2

PowrReverser™ Operation in Reverse



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OUO1085,00001D8 –19–22MAY03–1/2

A—Transmission Drive Shaft
B—Reverse Supply Pressure (From Control Valve)
C—Reverse Drive Gear
D—Plates and Disks
E—Reverse Piston
F—PowrReverser™ Clutch Pack
G—Forward Piston
H—Transmission Drive Gear
I—Reverse Idler
J—Forward Supply Pressure (From Control Valve)
K—Lubrication Supply Pressure (From Control Valve)
L—Pressure Oil
M—Lubrication Oil
N—Return Oil

FUNCTION:

Transmits power from engine to transmission when F-N-R lever is in reverse position.

MAJOR COMPONENTS:

- Traction Drive Shaft
- PowrReverser™ Clutch Pack

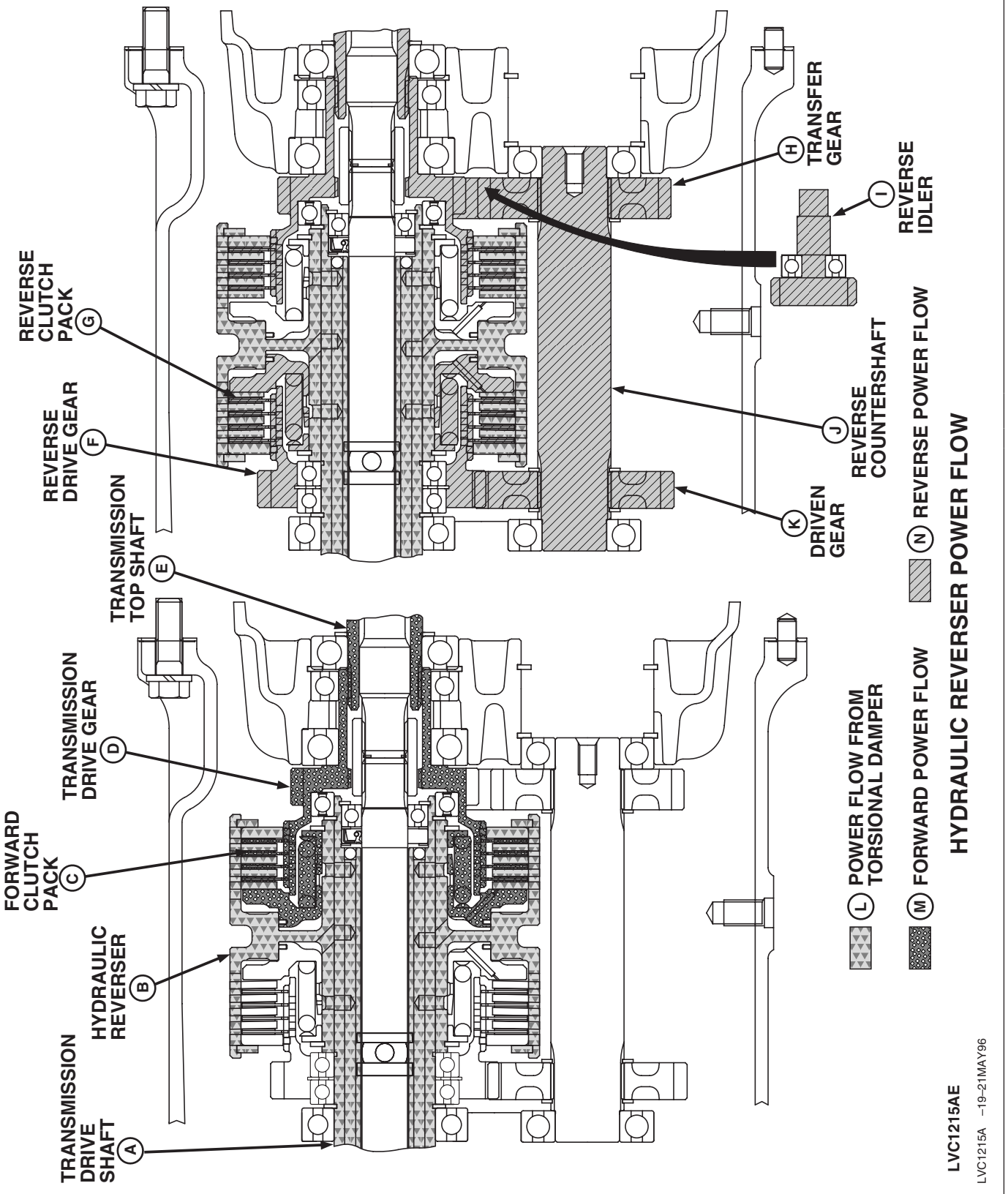
THEORY OF OPERATION:

Pressure oil from the PowrReverser™ control valve is routed through passages in transmission drive shaft (A) to PowrReverser™ clutch pack (F). When reverse is selected, pressure oil (B) enters the clutch pack behind reverse piston (E) and compresses plates and disks (D) together. Power is transmitted to reverse drive gear (C). Power flow through PowrReverser™ is described and illustrated later in this group.

When the reverse piston moves, a passage opens allowing pressurized lubrication oil to enter the clutch pack to lubricate the plates and disks. With forward piston (G) retracted, lubrication passage to forward clutch pack is significantly reduced. Oil in forward side of pack returns to sump.

OUO1085,00001D8 –19–22MAY03–2/2

PowrReverser™ Power Flow



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OUO1085,00001D9 –19–02OCT00–1/2

A—Transmission Drive Shaft
B—PowrReverser™
C—Forward Clutch Pack
D—Transmission Drive Gear
E—Transmission Top Shaft
F—Reverse Drive Gear
G—Reverse Clutch Pack
H—Transfer Gear
I—Reverse Idler
J—Reverse Countershaft
K—Driven Gear

Power is transmitted from the clutch through transmission drive shaft (A) to the PowrReverser™ (B).

When the F-N-R lever is moved from neutral to forward, oil pressure compresses the plates and disks in forward clutch pack (C) and power is transmitted through transmission drive gear (D) to transmission top shaft (E).

When reverse is selected, the reverse clutch pack (G) is actuated and power is transmitted to reverse drive gear (F) which is in mesh with driven gear (K). The driven gear drives reverse countershaft (J) and transfer gear (H). Power is transmitted from the transfer gear, through reverse idler (I), to the transmission drive gear. Transmission top shaft (E) is driven in reverse direction.

OUO1085,00001D9 –19–02OCT00–2/2

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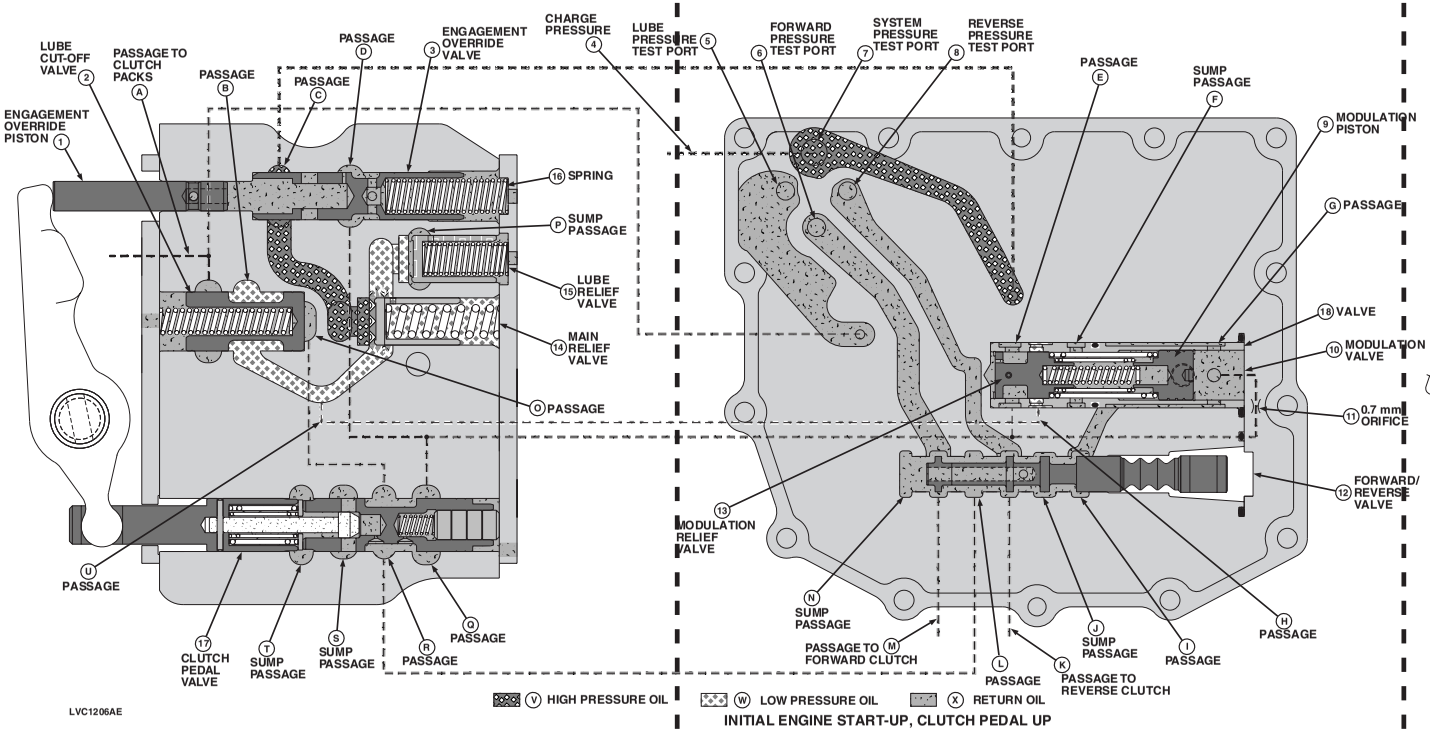
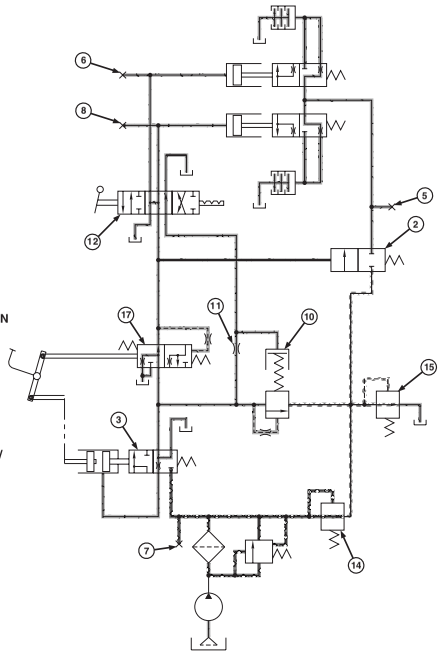
11
13

PowrReverser™ Control Valve Operation—Initial Engine Start-Up, Clutch Pedal Up

LVC1206AE –19–08FEB01



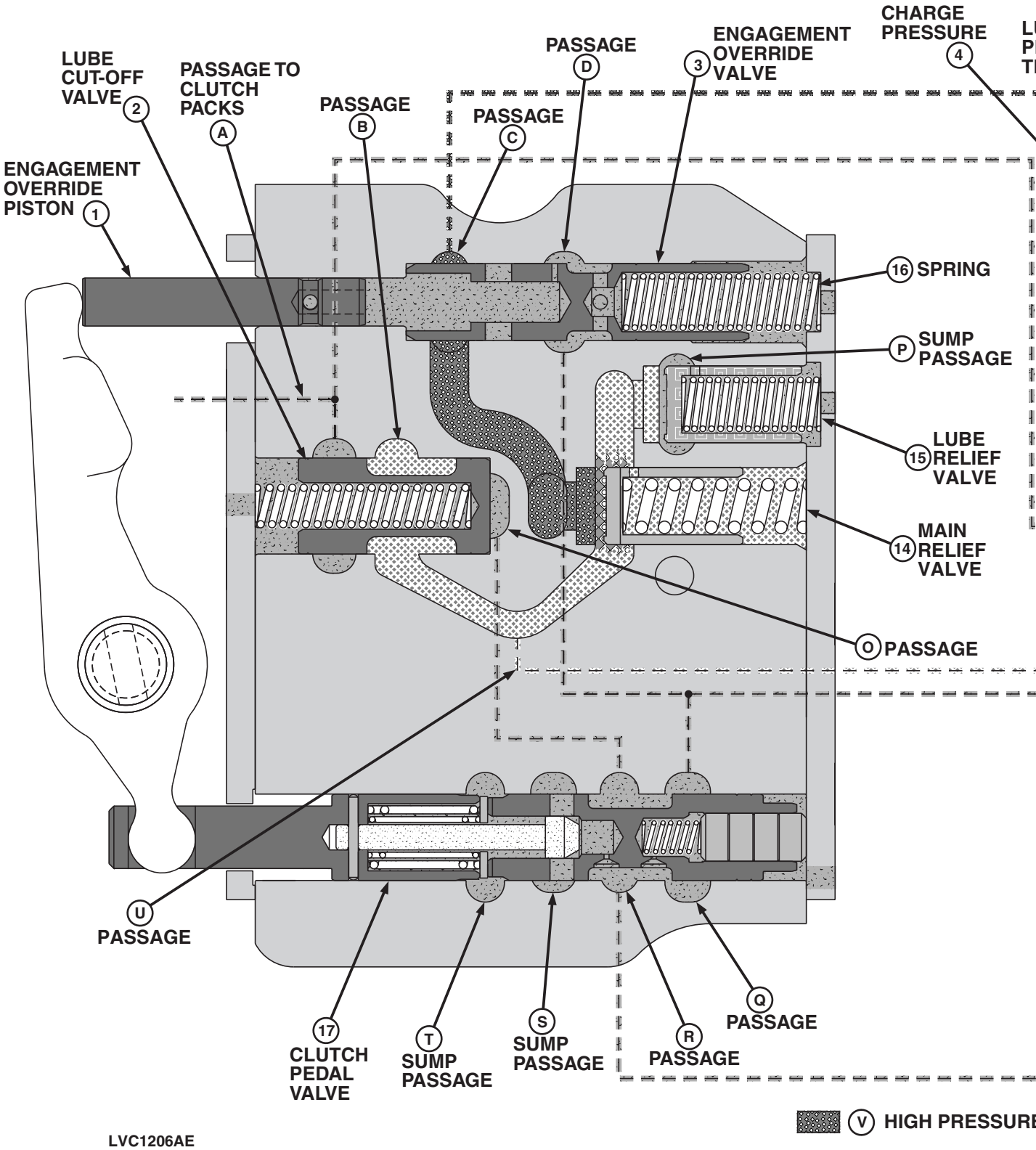
INITIAL ENGINE START-UP, CLUTCH PEDAL UP



See Page 250-11-14 A

See Page 250-11-14 B

See Page 250-11-14 C


LUBE CUT-OFF VALVE 2
PASSAGE TO CLUTCH PACKS A
PASSAGE B
PASSAGE C
PASSAGE D
ENGAGEMENT OVERRIDE VALVE 3
CHARGE PRESSURE 4
ENGAGEMENT OVERRIDE PISTON 1
16 SPRING
P SUMP PASSAGE
15 LUBE RELIEF VALVE
14 MAIN RELIEF VALVE
O PASSAGE
U PASSAGE
17 CLUTCH PEDAL VALVE
T SUMP PASSAGE
S SUMP PASSAGE
R PASSAGE
Q PASSAGE
V HIGH PRESSURE
LVC1206AE

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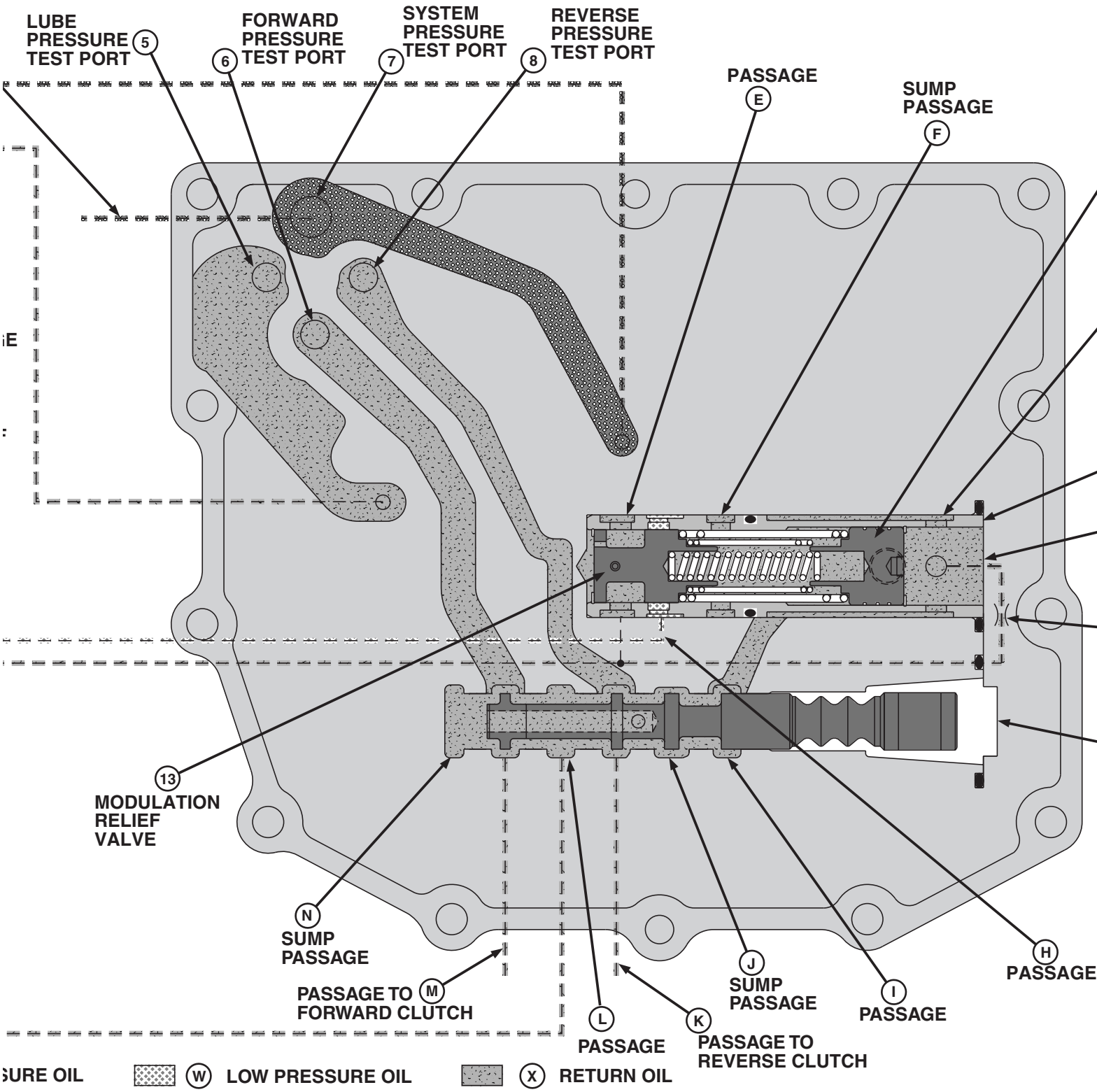

INITIAL ENGINE START-UP, CLUTCH PEDAL UP

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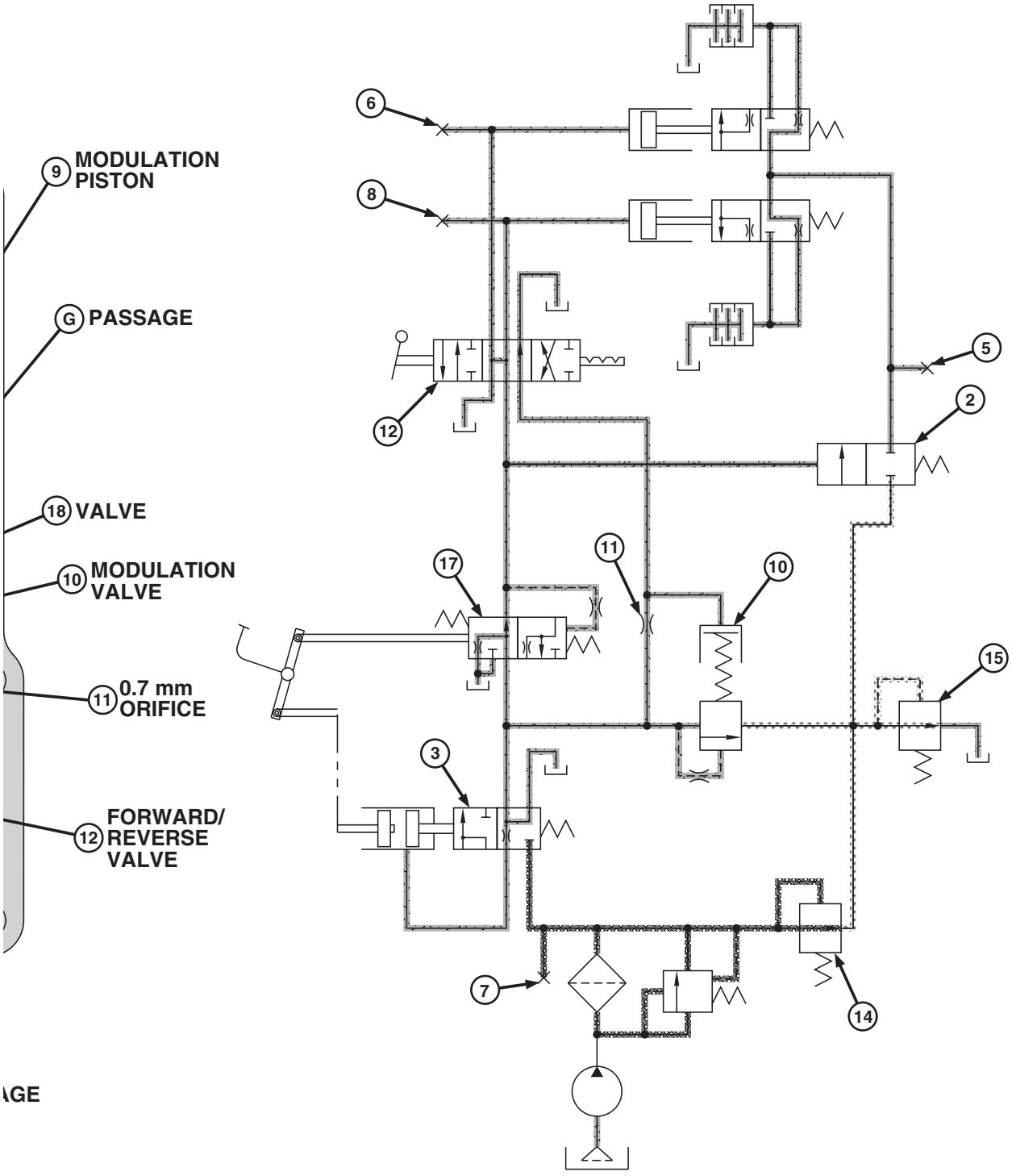
rReverser™ Control Valve Operation—Initial Engine Start-Up, Clutch Pedal Up

AE –19–08FEB01



OUO1085,00001DA –19–02OCT00–1/2

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1—Engagement Override Piston
2—Lube Cut-Off Valve
3—Engagement Override Valve
4—Charge Pressure
5—Lube Pressure Test Port
6—Forward Pressure Test Port
7—System Pressure Test Port
8—Reverse Pressure Test Port
9—Modulation Piston
10—Modulation Valve
11—0.7 mm Orifice
12—Forward/Reverse Valve
13—Modulation Relief Valve
14—Main Relief Valve
15—Lube Relief Valve
16—Spring
17—Clutch Pedal Valve
18—Valve
A—Lube Passage to Clutch Packs
B—Passage
C—Passage
D—Passage
E—Passage
F—Passage
G—Sump Passage
H—Passage
I—Passage
J—Sump Passage
K—Passage to Reverse Clutch
L—Passage
M—Passage to Forward Clutch
N—Sump Passage
O—Passage
P—Sump Passage
Q—Passage
R—Passage
S—Sump Passage
T—Sump Passage
U—Passage
V—High Pressure Oil
W—Medium Pressure Oil
X—Return Oil

FUNCTION:

Controls all functions of the PowrReverser™.

MAJOR COMPONENTS:

- Engagement Override Valve
- Clutch Pedal Valve
- Main Relief Valve
- Lubrication Relief Valve
- Lubrication Cut-Off Valve
- Modulation Valve
- Forward/Reverse Valve

THEORY OF OPERATION:

The engagement override valve (3) prevents tractor movement if the engine is started in gear with the clutch pedal raised. It is primarily a safety device to prevent tractor movement if the vehicle is jump-started with the clutch pedal raised.

When the engine is off, spring (16) forces spool in engagement override valve (3) to close passage (C).

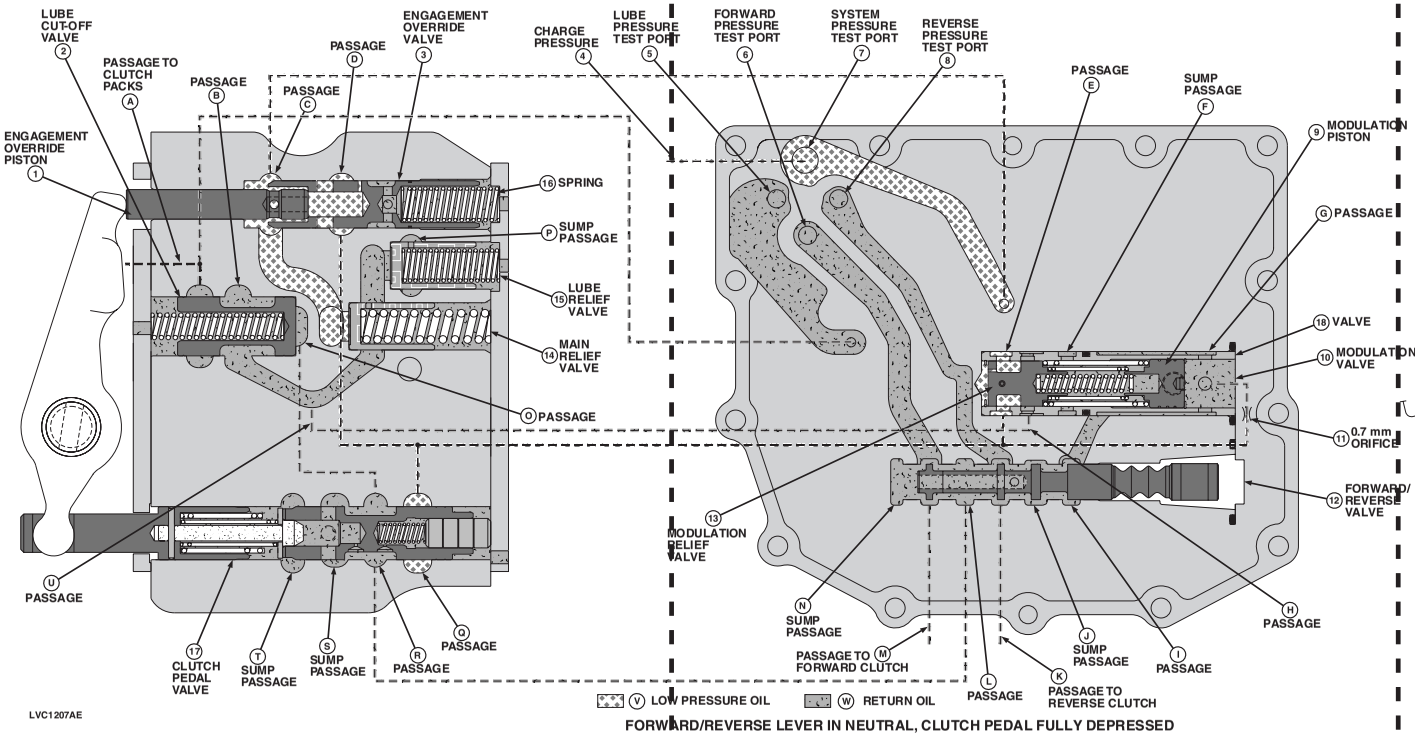
If the engine is started with the clutch pedal up, charge pressure entering passage (C) is blocked by the engagement override spool. System pressure opens main relief valve (14) and lube relief valve (15). All oil flow returns to sump through sump passage (P). The PowrReverser™ remains in neutral and tractor movement is prevented.

The clutch pedal must be fully depressed once after the engine is started to make system pressure available to the remainder of the PowrReverser™ control circuits.

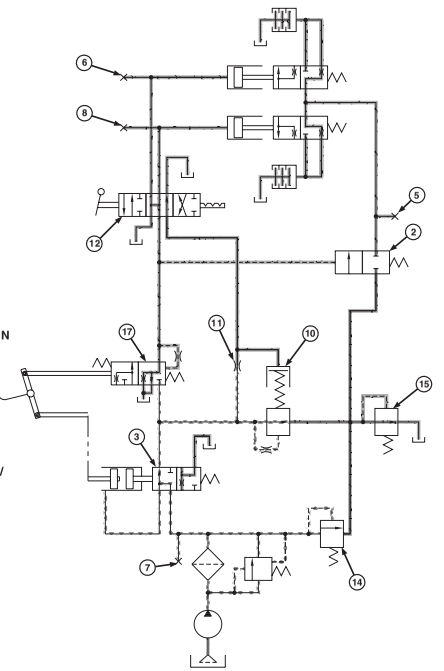
OUO1085,00001DA –19–02OCT00–2/2

PowrReverser™ Control Valve Operation—F-N-R Lever in Neutral, Clutch Pedal Down

LVC1207AE –19–08FEB01



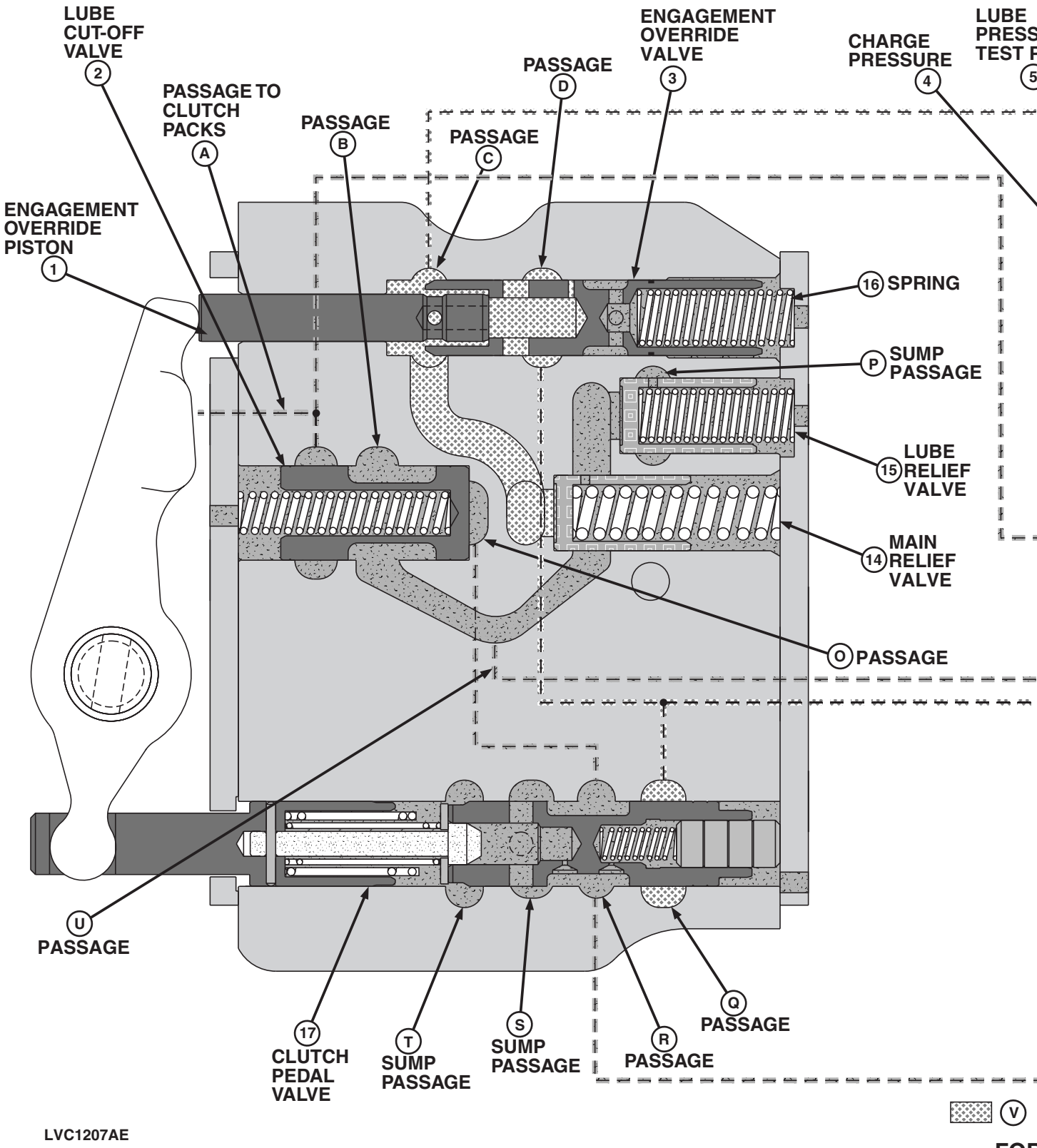
FORWARD/REVERSE LEVER IN NEUTRAL, CLUTCH PEDAL FULLY DEPRESSED



See Page 250-11-16 A

See Page 250-11-16 B

See Page 250-11-16 C


LUBE CUT-OFF VALVE 2
PASSAGE TO CLUTCH PACKS A
PASSAGE B
PASSAGE C
PASSAGE D
ENGAGEMENT OVERRIDE VALVE 3
CHARGE PRESSURE 4
LUBE PRESS TEST P 5
ENGAGEMENT OVERRIDE PISTON 1
16 SPRING
P SUMP PASSAGE
15 LUBE RELIEF VALVE
14 MAIN RELIEF VALVE
O PASSAGE
U PASSAGE
17 CLUTCH PEDAL VALVE
T SUMP PASSAGE
S SUMP PASSAGE
R PASSAGE
Q PASSAGE
V
LVC1207AE
FOR

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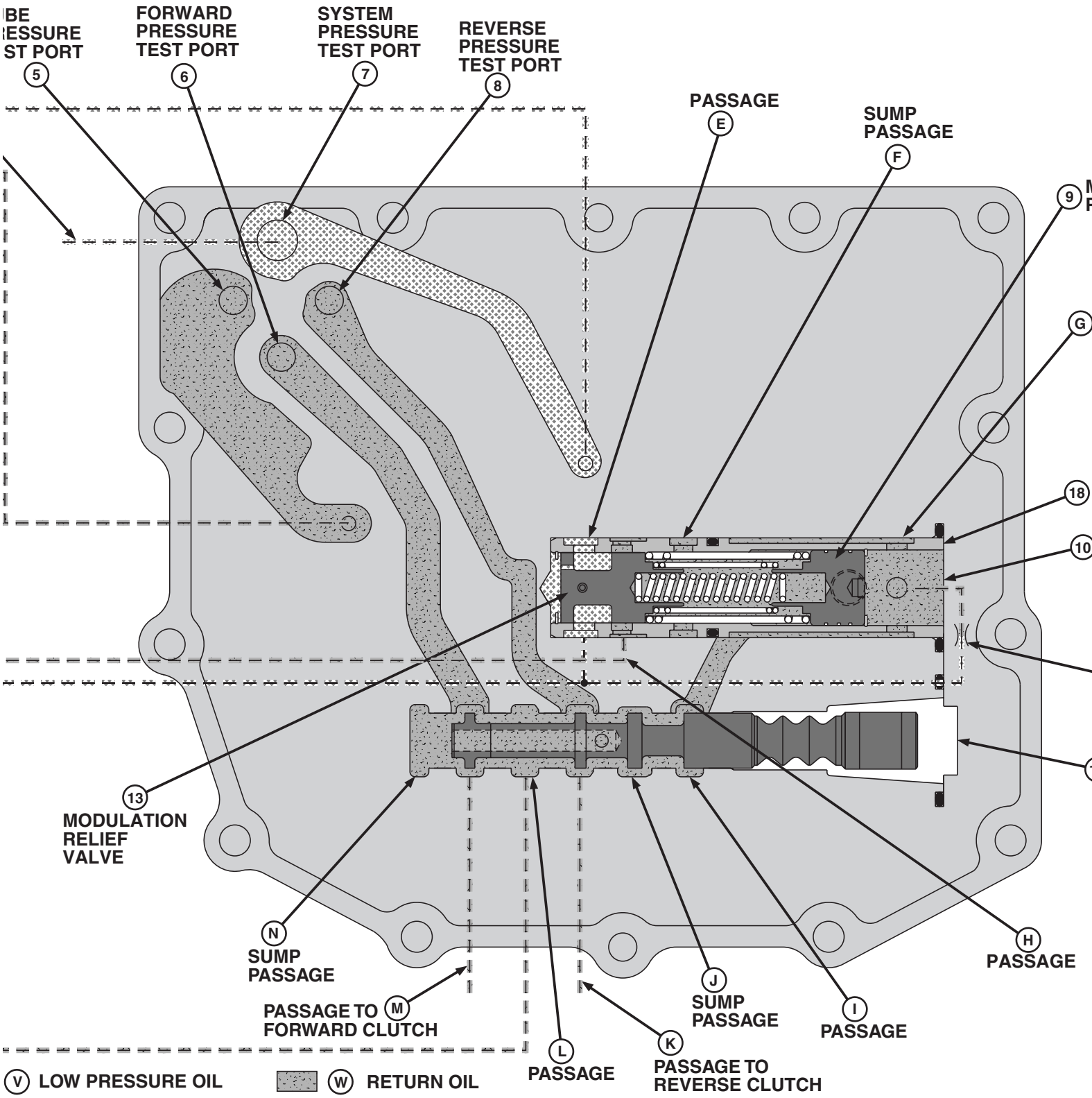

FORWARD/REVERSE LEVER IN NEUTRAL, CLUTCH PEDAL FULLY DEPRESSED

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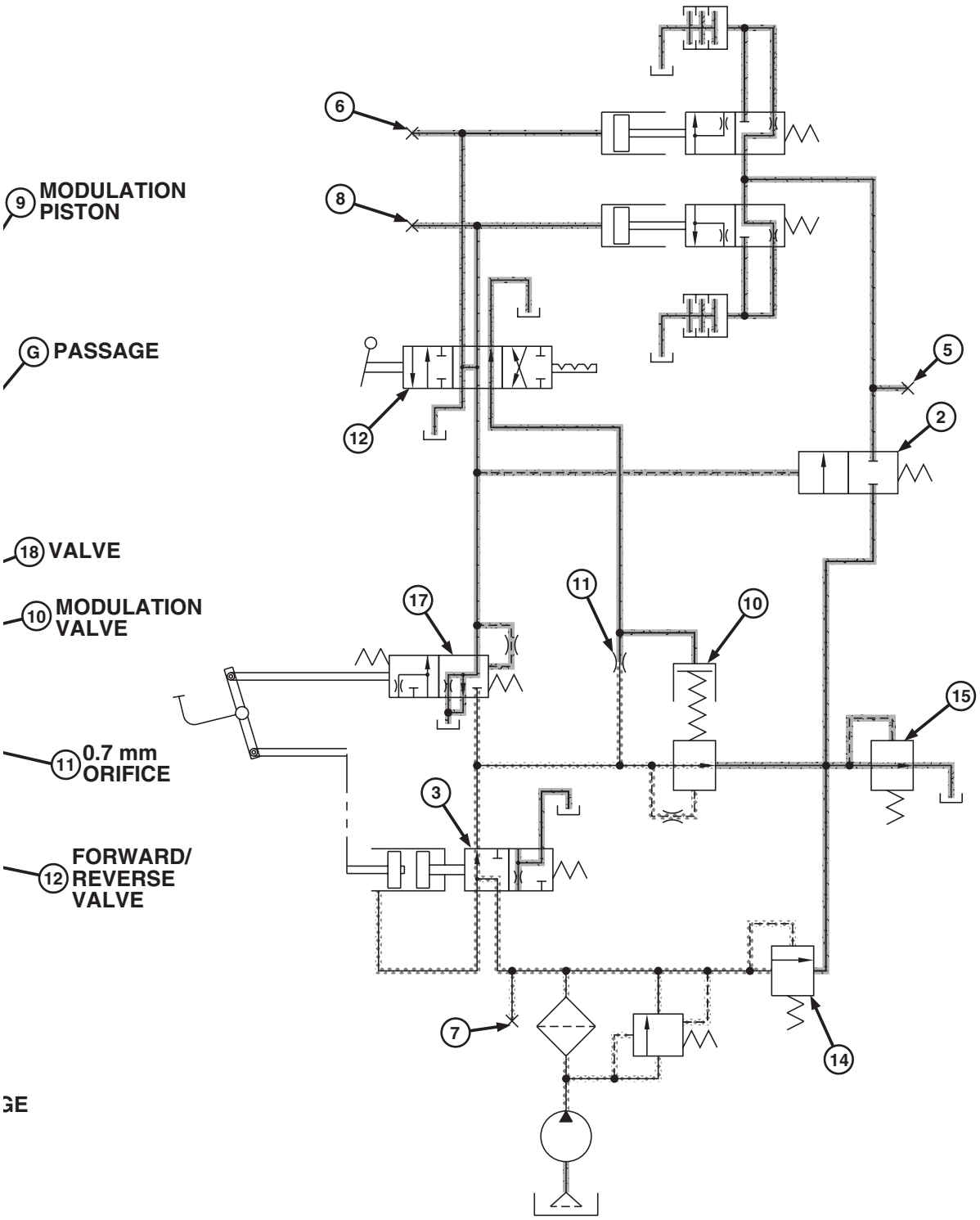
everser™ Control Valve Operation—F-N-R Lever in Neutral, Clutch Pedal Down

–19–08FEB01



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1—Engagement Override Piston
2—Lube Cut-Off Valve
3—Engagement Override Valve
4—Charge Pressure
5—Lube Pressure Test Port
6—Forward Pressure Test Port
7—System Pressure Test Port
8—Reverse Pressure Test Port
9—Modulation Piston
10—Modulation Valve
11—0.7 mm Orifice
12—Forward/Reverse Valve
13—Modulation Relief Valve
14—Main Relief Valve
15—Lube Relief Valve
16—Spring
17—Clutch Pedal Valve
18—Valve
A—Lube Passage to Clutch Packs
B—Passage
C—Passage
D—Passage
E—Passage
F—Passage
G—Sump Passage
H—Passage
I—Passage
J—Sump Passage
K—Passage to Reverse Clutch
L—Passage
M—Passage to Forward Clutch
N—Sump Passage
O—Passage
P—Sump Passage
Q—Passage
R—Passage
S—Sump Passage
T—Sump Passage
U—Passage
V—High Pressure Oil
W—Medium Pressure Oil
X—Return Oil

FUNCTION:

Controls all functions of the PowrReverser™.

MAJOR COMPONENTS:

- Engagement Override Valve
- Clutch Pedal Valve
- Main Relief Valve
- Lubrication Relief Valve
- Lubrication Cut-Off Valve
- Modulation Valve
- Forward/Reverse Valve

THEORY OF OPERATION:

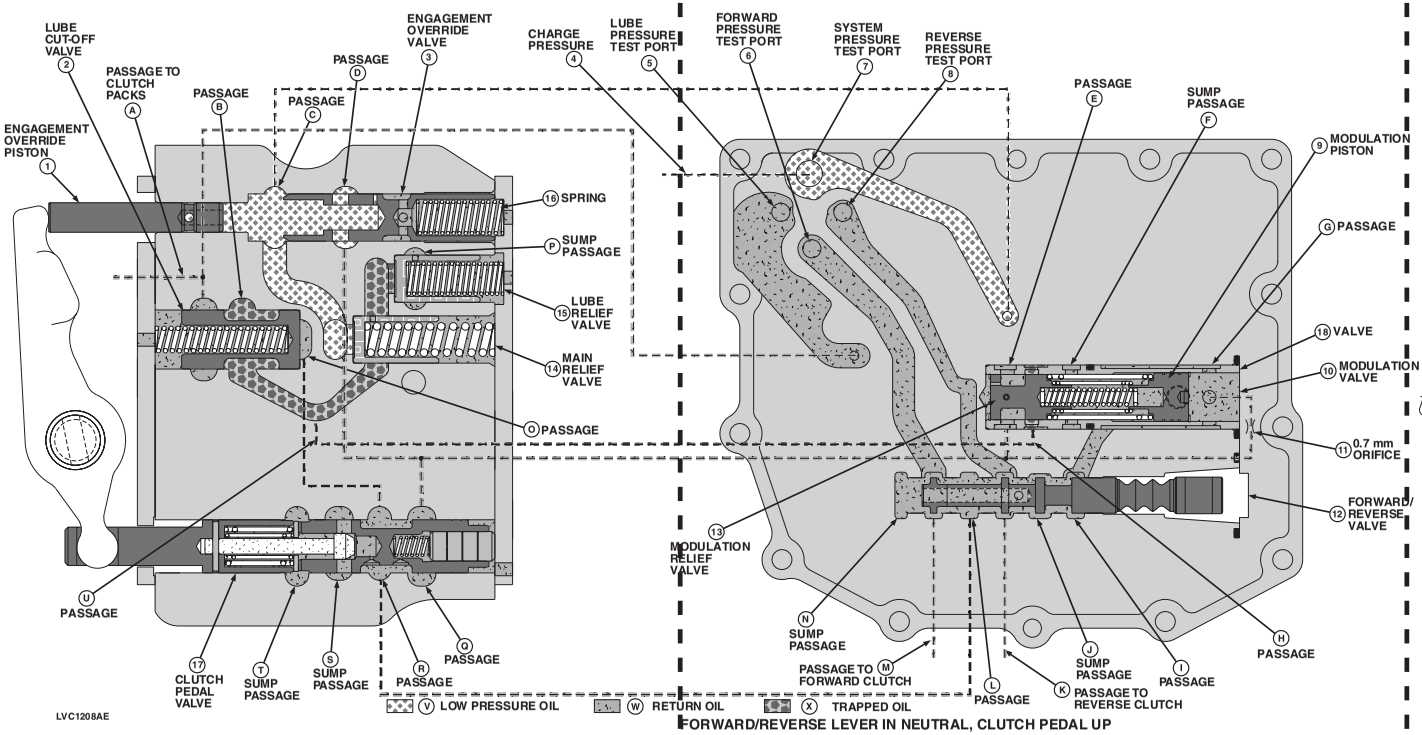
When the engine is running and the clutch pedal is depressed for the first time, engagement override piston (1) pushes the engagement override valve (3) to the end of its chamber which opens passage (C) to charge pump pressure. At the same time, clutch pedal valve (17) shifts and closes passage (Q). System pressure flows through orifice (10) to forward/reverse valve (12). With the forward/reverse valve in neutral, oil pressure returns to sump through sump passages (J and N).

When the clutch pedal is released, system pressure keeps the engagement override spool shifted until the engine is shut off. See PowrReverser™ Control Valve Operation—F-N-R Lever in Neutral, Clutch Pedal Up on the following pages.

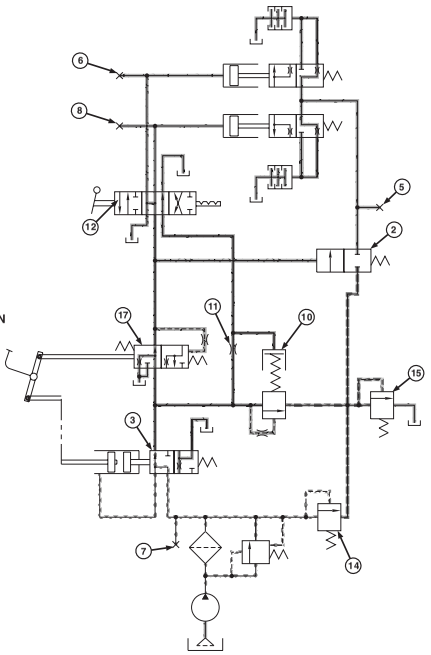
OUO1085,00001DB –19–03OCT00–2/2

PowrReverser™ Control Valve Operation—F-N-R Lever in Neutral, Clutch Pedal Up

LVC1208AE –19–08FEB01



FORWARD/REVERSE LEVER IN NEUTRAL, CLUTCH PEDAL UP



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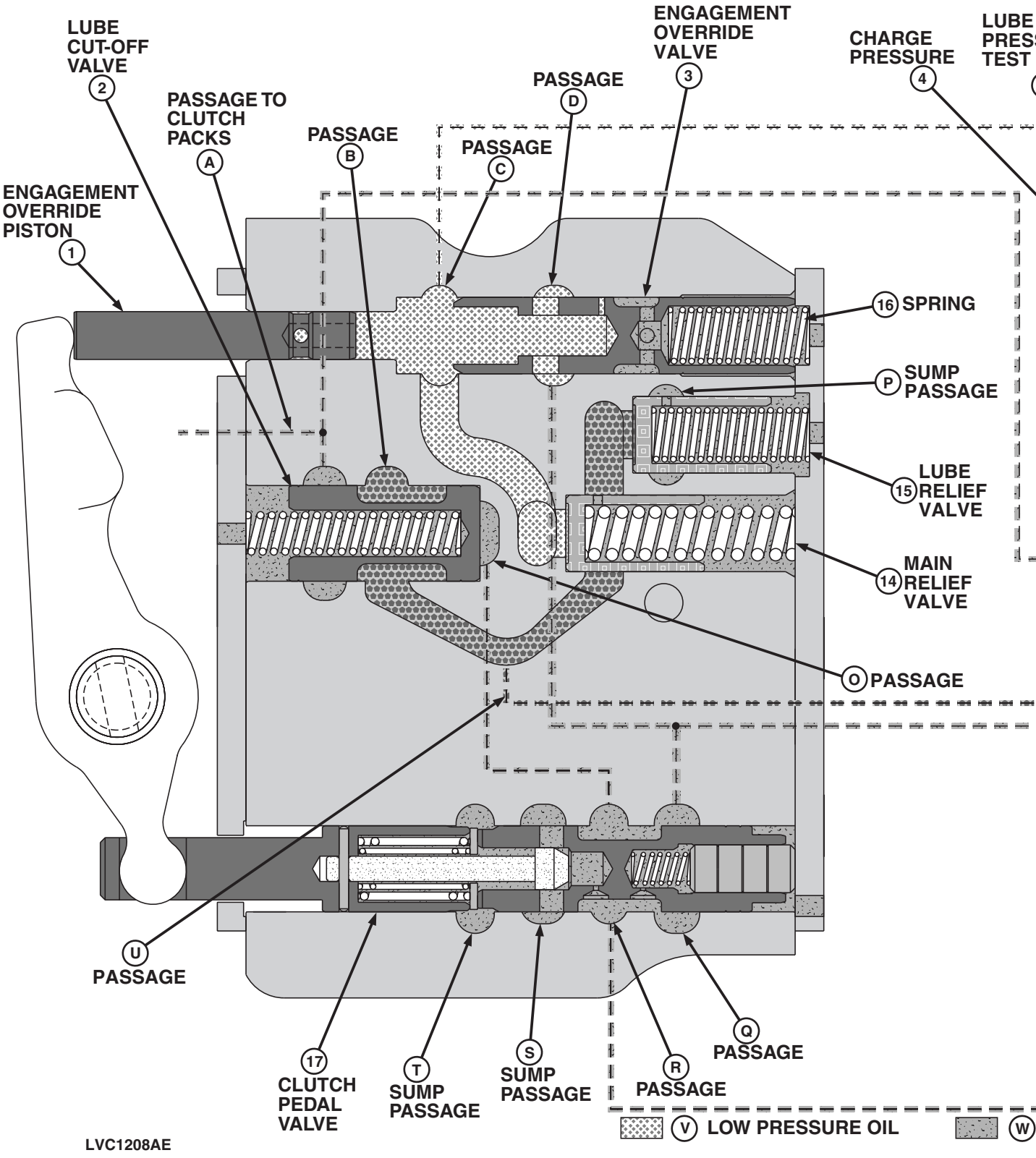
See Page 250-11-18 C


LUBE CUT-OFF VALVE 2
PASSAGE TO CLUTCH PACKS A
PASSAGE B
PASSAGE C
PASSAGE D
ENGAGEMENT OVERRIDE VALVE 3
CHARGE PRESSURE 4
ENGAGEMENT OVERRIDE PISTON 1
16 SPRING
P SUMP PASSAGE
15 LUBE RELIEF VALVE
14 MAIN RELIEF VALVE
O PASSAGE
U PASSAGE
17 CLUTCH PEDAL VALVE
T SUMP PASSAGE
S SUMP PASSAGE
R PASSAGE
Q PASSAGE
V LOW PRESSURE OIL
W
LVC1208AE

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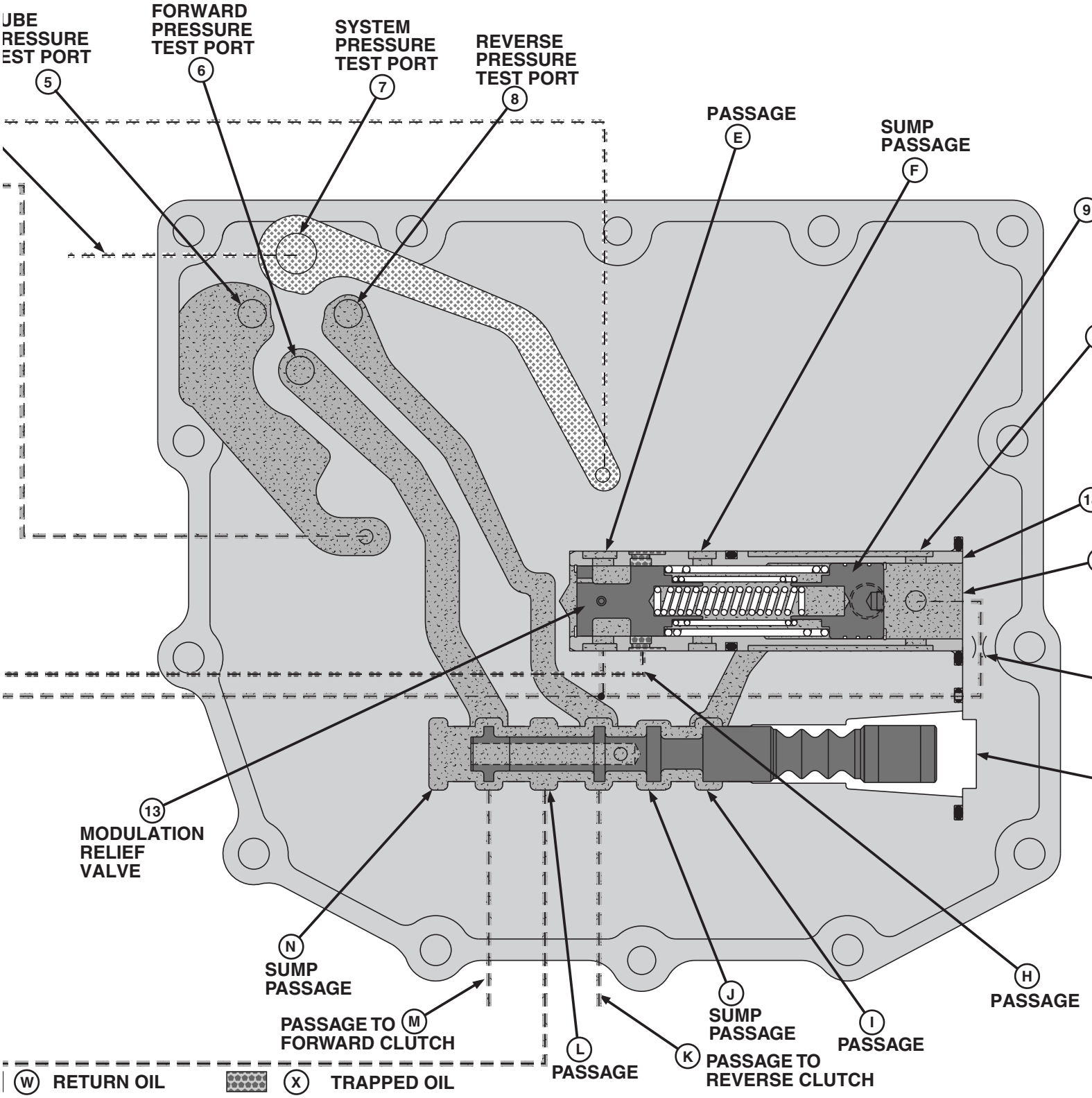

FORWARD/REVERSE LEVER IN NEUTRAL, CLUTCH PEDAL UP

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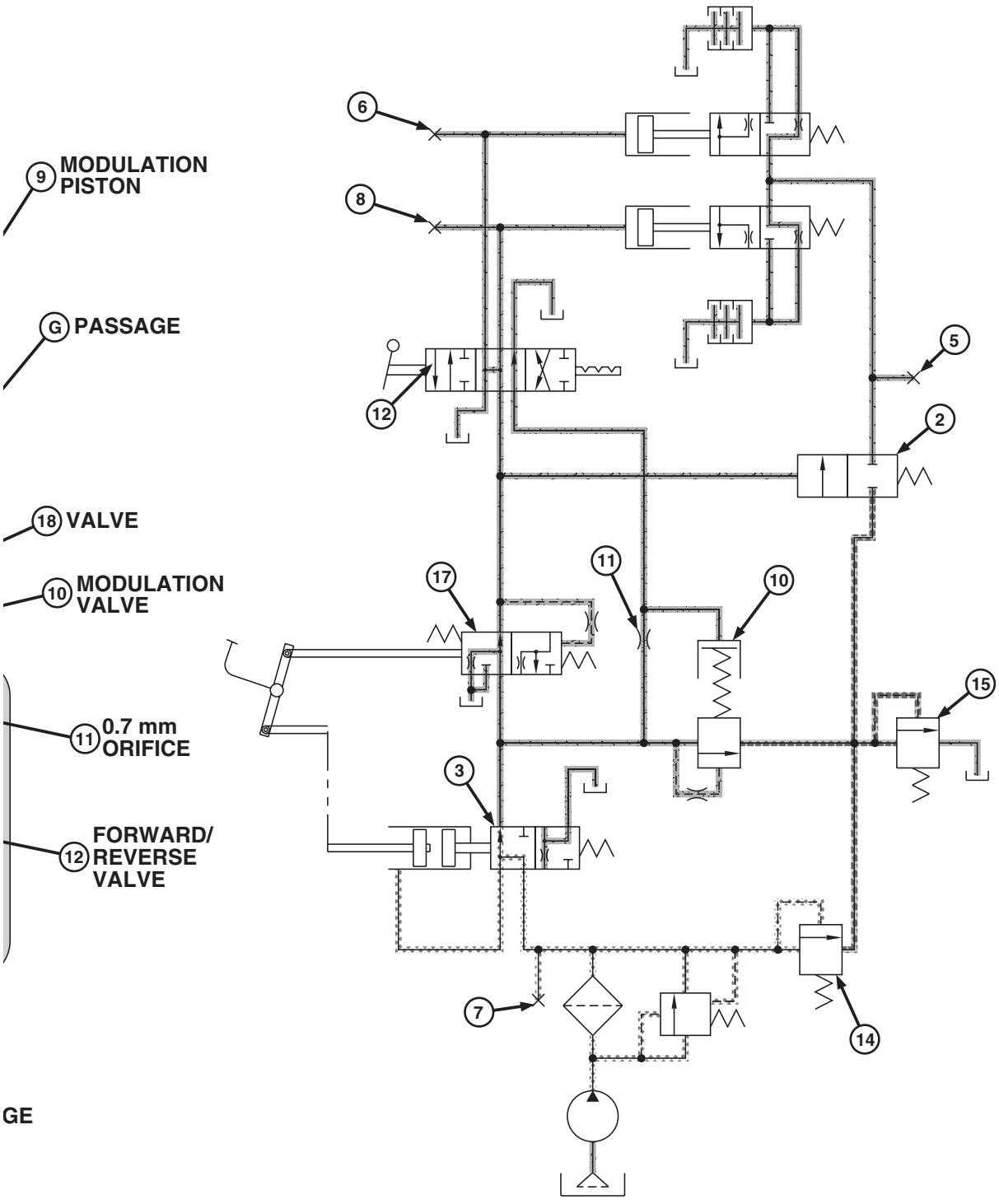
rReverser™ Control Valve Operation—F-N-R Lever in Neutral, Clutch Pedal Up

3AE –19–08FEB01



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1—Engagement Override Piston
2—Lube Cut-Off Valve
3—Engagement Override Valve
4—Charge Pressure
5—Lube Pressure Test Port
6—Forward Pressure Test Port
7—System Pressure Test Port
8—Reverse Pressure Test Port
9—Modulation Piston
10—Modulation Valve
11—0.7 mm Orifice
12—Forward/Reverse Valve
13—Modulation Relief Valve
14—Main Relief Valve
15—Lube Relief Valve
16—Spring
17—Clutch Pedal Valve
18—Valve
A—Lube Passage to Clutch Packs
B—Passage
C—Passage
D—Passage
E—Passage
F—Passage
G—Sump Passage
H—Passage
I—Passage
J—Sump Passage
K—Passage to Reverse Clutch
L—Passage
M—Passage to Forward Clutch
N—Sump Passage
O—Passage
P—Sump Passage
Q—Passage
R—Passage
S—Sump Passage
T—Sump Passage
U—Passage
V—Low Pressure Oil
W—Return Oil
X—Trapped Oil

FUNCTION:

Controls all functions of the PowrReverser™.

MAJOR COMPONENTS:

- Engagement Override Valve
- Clutch Pedal Valve
- Main Relief Valve
- Lubrication Relief Valve
- Lubrication Cut-Off Valve
- Modulation Valve
- Forward/Reverse Valve

THEORY OF OPERATION:

When the clutch pedal is returned to the up position, low pressure oil in engagement override valve (3) keeps the spool shifted.

Oil from passage (D) flows to three places: passage (Q) of clutch pedal valve (17), passage (E) of modulation relief valve (13), and through orifice (11) to modulation valve (10).

Oil entering passage (Q) of clutch pedal valve flows from passage (R) to passage (L) of forward/reverse valve (12). With forward/reverse valve in neutral, oil returns to sump through sump passages (J and N).

Oil entering passage (E) of modulation relief valve is insufficient to overcome spring pressure. Modulation relief valve (13) remains closed.

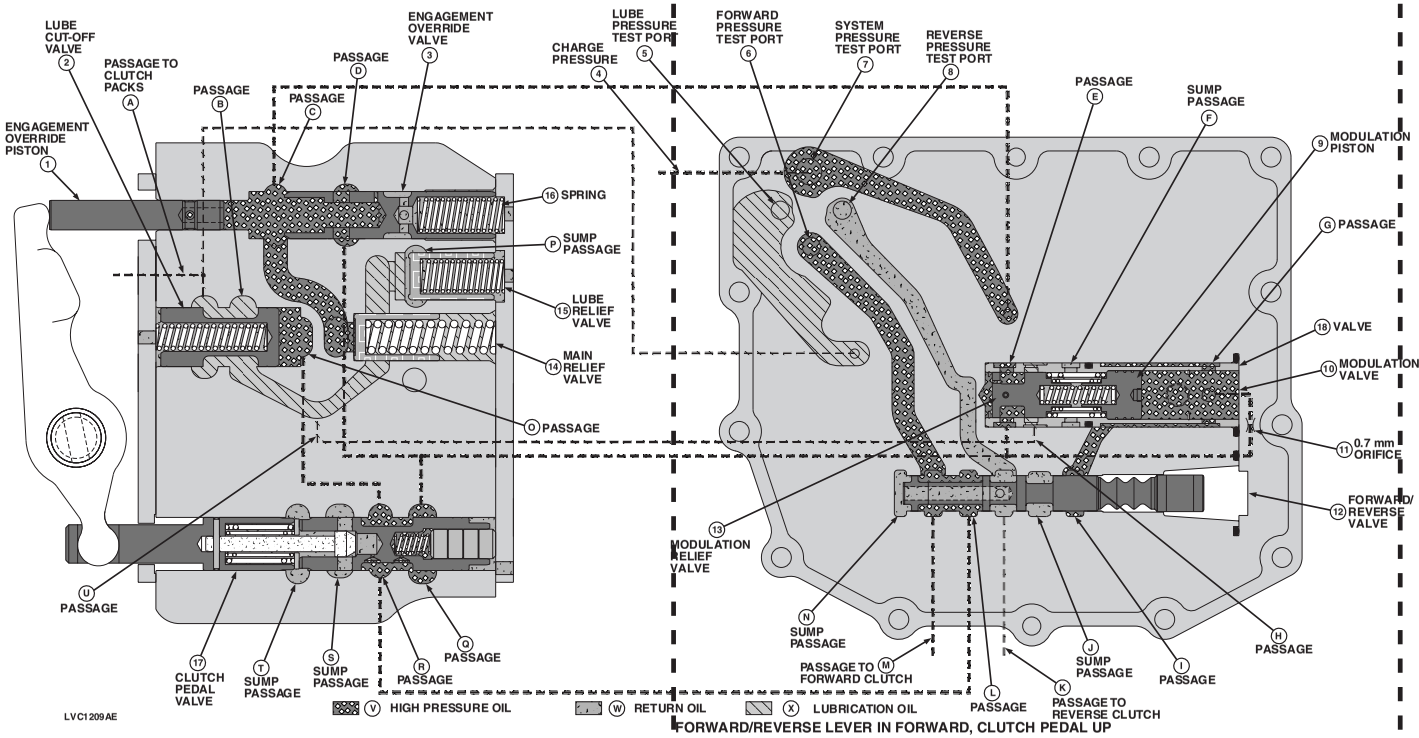
Oil flowing through orifice (11) enters forward/reverse valve at passage (I) and returns to sump through sump passages (J and N).

Low pressure oil at passage (O) is insufficient to overcome spring pressure of lube cut-off valve (2), thus oil is trapped between relief valves and lube cut-off valve. Oil at passage (A) returns to sump through forward/reverse clutch pack.

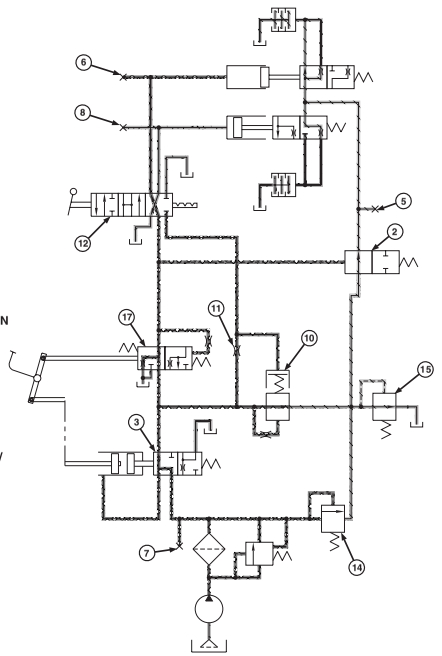
OUO1085,00001DC –19–03OCT00–2/2

PowrReverser™ Control Valve Operation—F-N-R Lever in Forward, Clutch Pedal Up

LVC1209AE –19–02JUL01



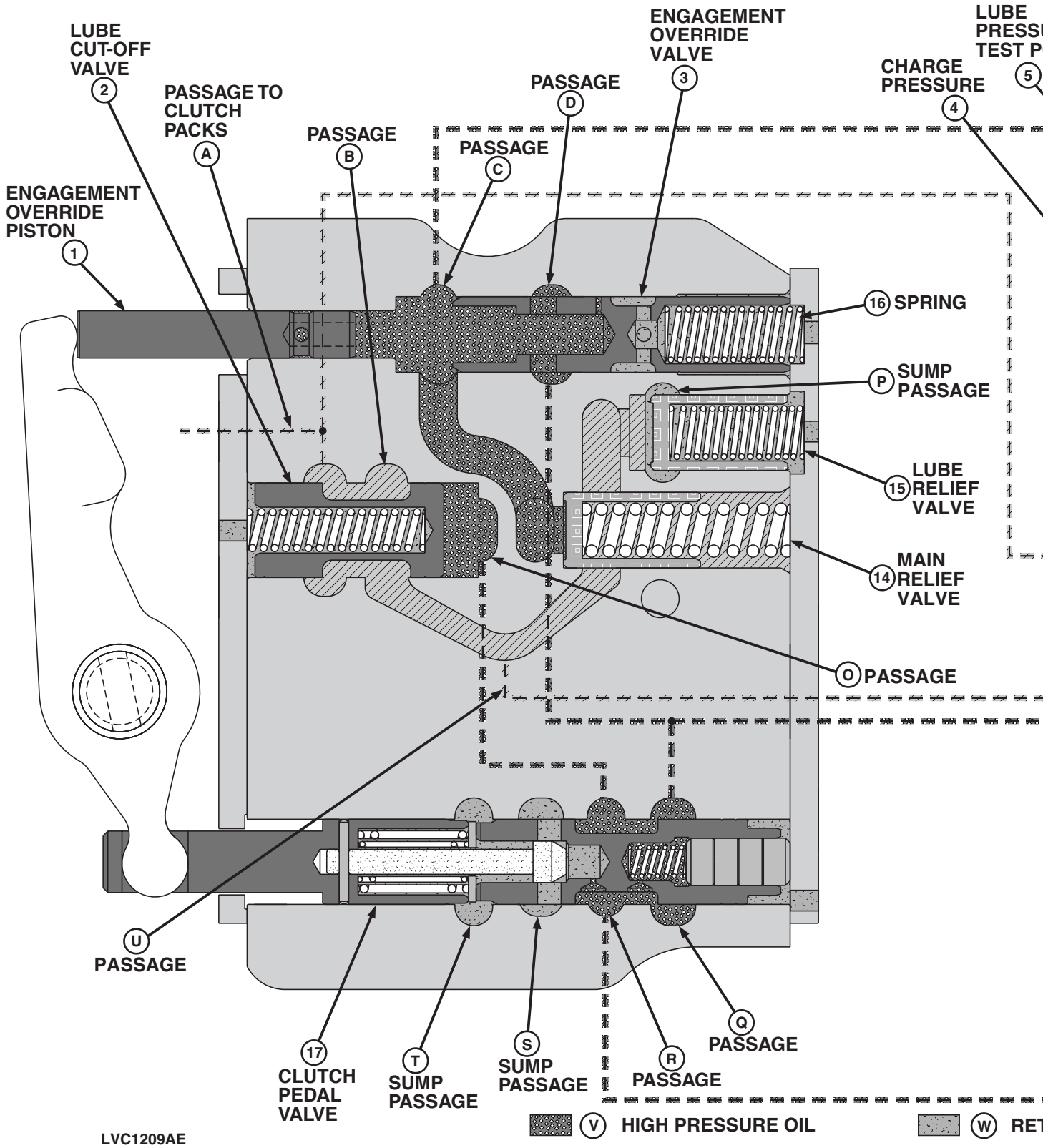
FORWARD/REVERSE LEVER IN FORWARD, CLUTCH PEDAL UP



See Page 250-11-20 A

See Page 250-11-20 B

See Page 250-11-20 C


LUBE CUT-OFF VALVE 2
PASSAGE TO CLUTCH PACKS A
PASSAGE B
PASSAGE C
PASSAGE D
ENGAGEMENT OVERRIDE VALVE 3
CHARGE PRESSURE 4
LUBE PRESSU TEST P 5
ENGAGEMENT OVERRIDE PISTON 1
16 SPRING
P SUMP PASSAGE
15 LUBE RELIEF VALVE
14 MAIN RELIEF VALVE
O PASSAGE
U PASSAGE
17 CLUTCH PEDAL VALVE
T SUMP PASSAGE
S SUMP PASSAGE
R PASSAGE
Q PASSAGE
V HIGH PRESSURE OIL
W RET
LVC1209AE

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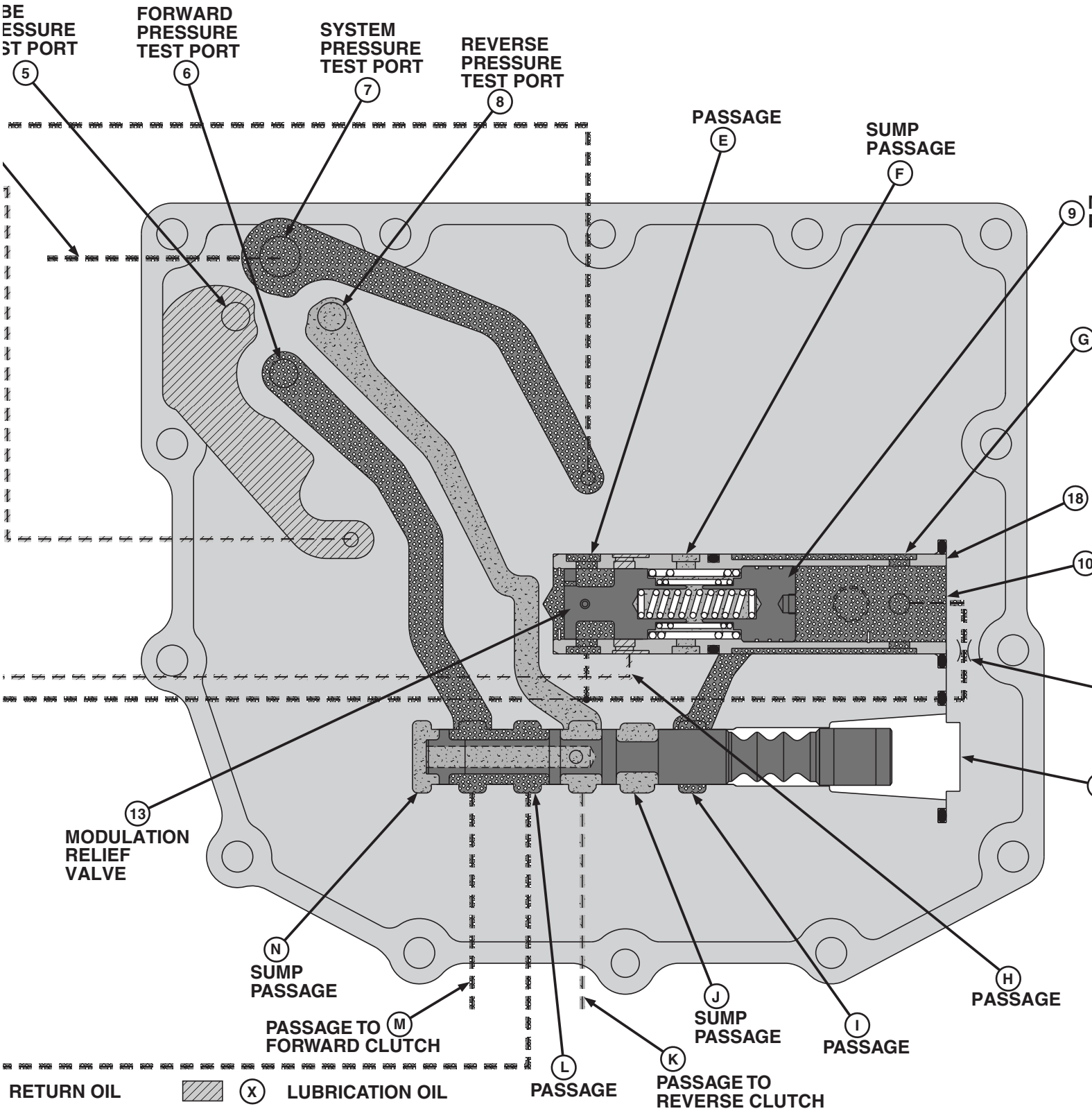

FORWARD/REVERSE LEVER IN FORWARD, CLUTCH PEDAL UP

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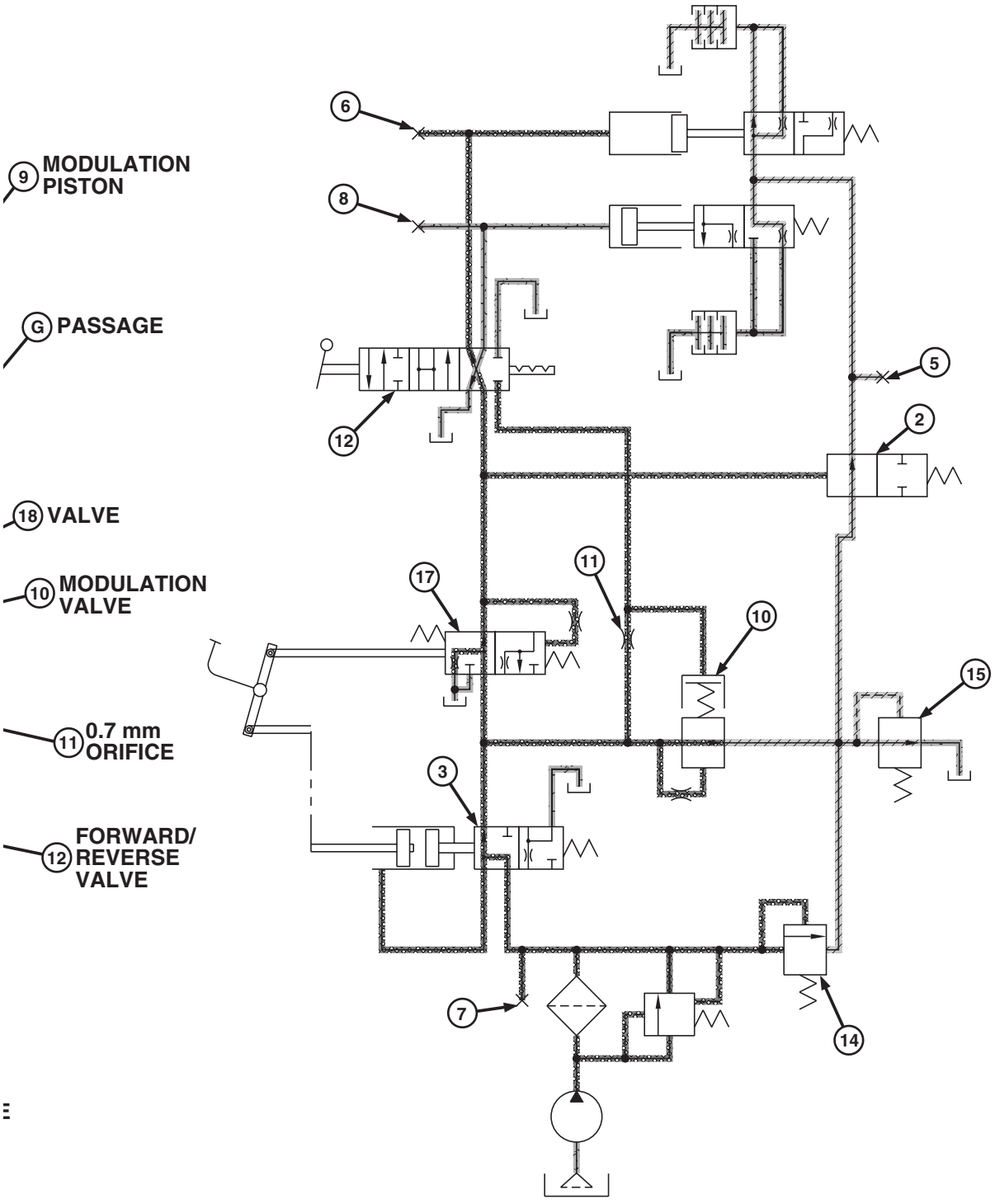
everser™ Control Valve Operation—F-N-R Lever in Forward, Clutch Pedal Up

–19–02JUL01



OUO1085,00001DD –19–03OCT00–1/3

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1—Engagement Override Piston
2—Lube Cut-Off Valve
3—Engagement Override Valve
4—Charge Pressure
5—Lube Pressure Test Port
6—Forward Pressure Test Port
7—System Pressure Test Port
8—Reverse Pressure Test Port
9—Modulation Piston
10—Modulation Valve
11—0.7 mm Orifice
12—Forward/Reverse Valve
13—Modulation Relief Valve
14—Main Relief Valve
15—Lube Relief Valve
16—Spring
17—Clutch Pedal Valve
18—Valve
A—Lube Passage to Clutch Packs
B—Passage
C—Passage
D—Passage
E—Passage
F—Passage
G—Sump Passage
H—Passage
I—Passage
J—Sump Passage
K—Passage to Reverse Clutch
L—Passage
M—Passage to Forward Clutch
N—Sump Passage
O—Passage
P—Sump Passage
Q—Passage
R—Passage
S—Sump Passage
T—Sump Passage
U—Passage
V—High Pressure Oil
W—Return Oil
X—Lubrication Oil

FUNCTION:

Controls all functions of the PowrReverser™.

MAJOR COMPONENTS:

- Engagement Override Valve
- Clutch Pedal Valve
- Main Relief Valve
- Lubrication Relief Valve
- Lubrication Cut-Off Valve
- Modulation Valve
- Forward/Reverse Valve

THEORY OF OPERATION:

Engagement Oil Flow:

When the F-N-R lever is in neutral, all system oil is returned to sump and there is no pressure in the modulation valve.

When the F-N-R lever is moved from neutral to forward, system pressure flows from passage (D) of engagement override valve (3) to three places: passage (Q) of clutch pedal valve (17), passage (E) of modulation relief valve (13), and through orifice (11) to modulation valve (10).

Oil pressure flowing through orifice (11) travels to passage (I) and is blocked by the spool of forward/reverse valve (12), causing pressure to push against piston (9) of modulation valve (10). The piston pushes against three nested springs, which at the same time push the modulation relief valve (13) closed. This spring force increases the pressure at which the relief valve opens, so the pressure flowing through passage (I) to the forward clutch pack increases. The three springs also act as an accumulator, allowing oil pressure to increase at different rates, providing modulated engagement of the clutch pack.

As the pressure modulates, modulation relief valve opens and closes providing lubrication oil for the clutch packs. This oil flows from passage (H) to passage (U) of lube cut-off valve (2).

System pressure also flows from passage (R) of clutch pedal valve to passage (L) of forward/reverse valve (12). With the F-N-R lever in forward, the forward/reverse spool is shifted and oil flows from passage (M) to the PowrReverser™. See POWRREVERSER™ OPERATION and POWRREVERSER™ POWER FLOW earlier in this group.

Lubrication Oil Flow:

When forward or reverse is selected, and system pressure reaches approximately 255 kPa (37 psi), pressure in passage (O) opens lube cut-off valve (2) allowing pressurized oil that has been bypassed by the modulation valve into passage (A) to lubricate the clutch packs. This lubrication of oil flows through the clutch packs and then returns to sump. The lubrication oil pressure is controlled by the lube relief valve set at 196 kPa (28 psi).

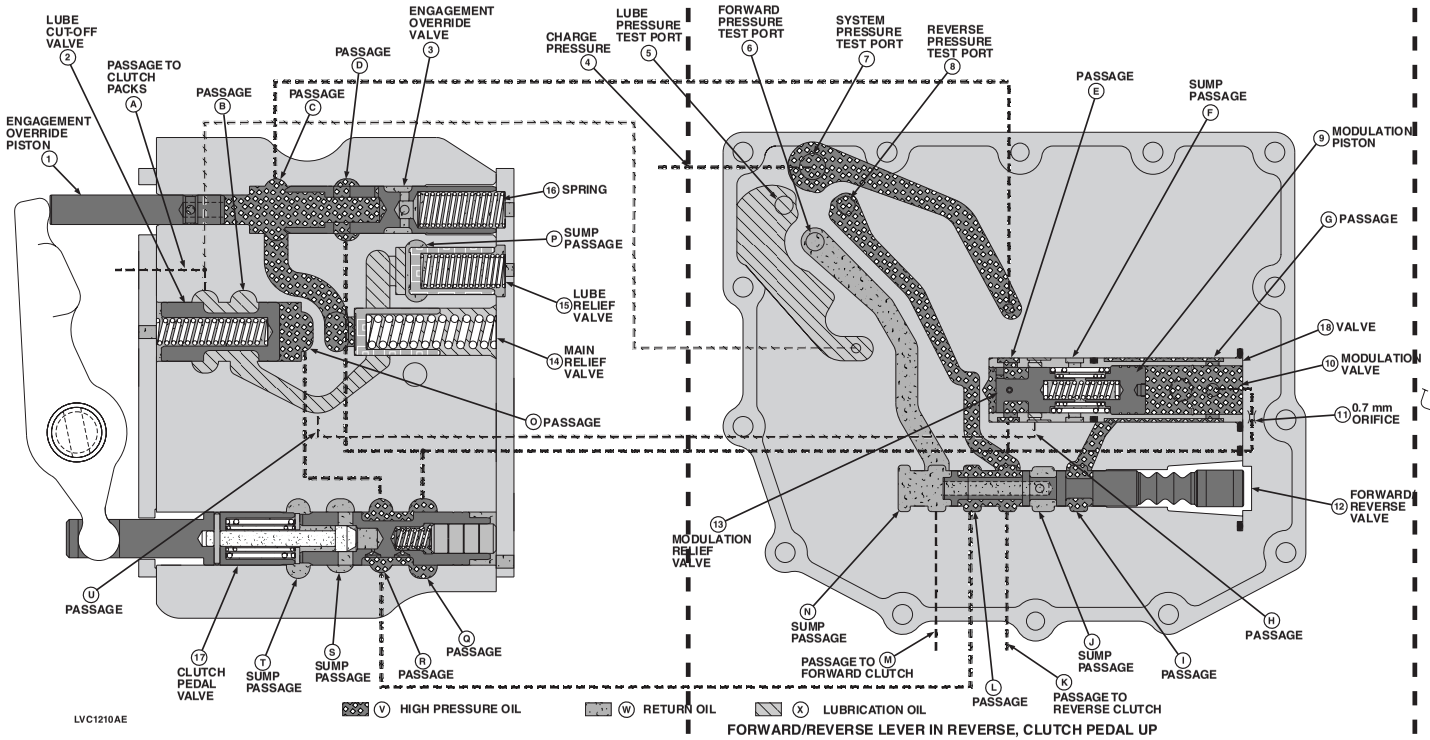
Continued on next page

When a direction change is initiated, the forward/reverse spool passes through its neutral position and system oil returns to sump. System pressure to the clutch pack again accumulates slowly to prevent damage to the components from sudden direction changes. Also, when system pressure returns to sump, lube cut-off valve closes, thus stopping the flow of pressurized lubrication oil to the clutch pack.

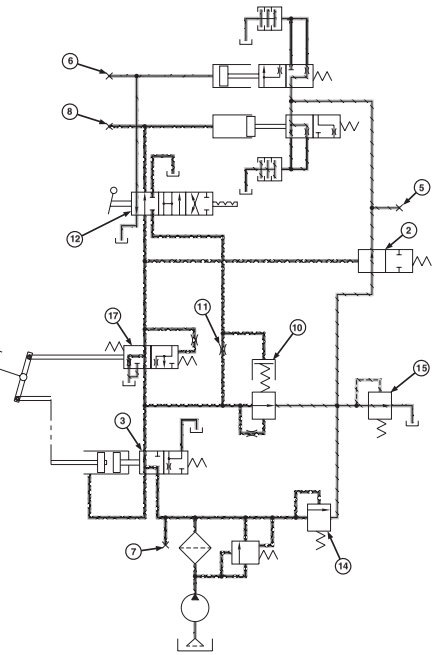
OUO1085,00001DD –19–03OCT00–3/3

PowrReverser™ Control Valve Operation—F-N-R Lever in Reverse, Clutch Pedal Up

LVC1210AE –19–03JUL01



FORWARD/REVERSE LEVER IN REVERSE, CLUTCH PEDAL UP



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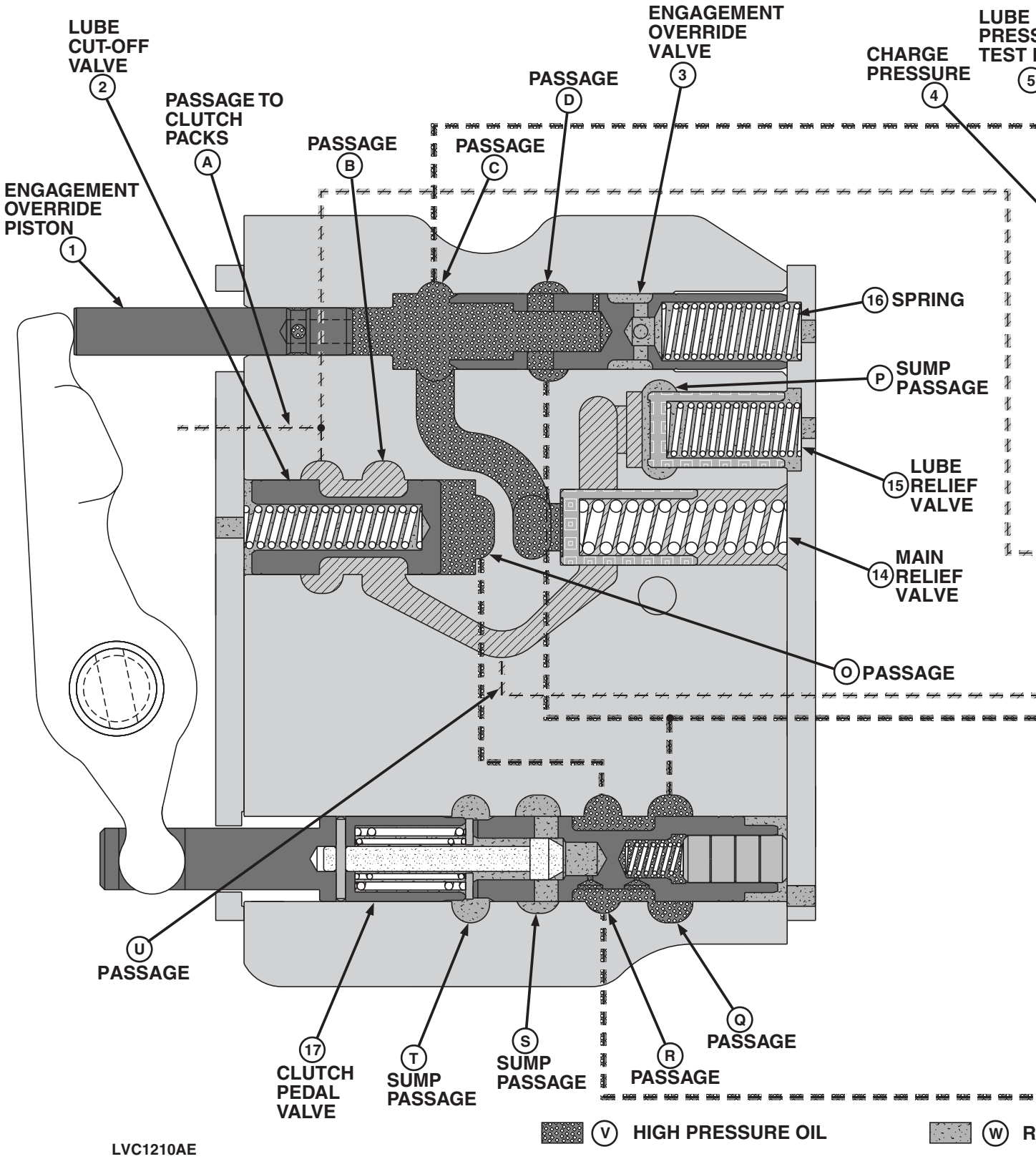
See Page 250-11-24 B

See Page 250-11-24 C


LUBE CUT-OFF VALVE 2
PASSAGE TO CLUTCH PACKS A
PASSAGE B
PASSAGE C
PASSAGE D
ENGAGEMENT OVERRIDE VALVE 3
CHARGE PRESSURE 4
LUBE PRESS TEST 5
ENGAGEMENT OVERRIDE PISTON 1
16 SPRING
P SUMP PASSAGE
15 LUBE RELIEF VALVE
14 MAIN RELIEF VALVE
O PASSAGE
U PASSAGE
17 CLUTCH PEDAL VALVE
T SUMP PASSAGE
S SUMP PASSAGE
R PASSAGE
Q PASSAGE
V HIGH PRESSURE OIL
W R
LVC1210AE

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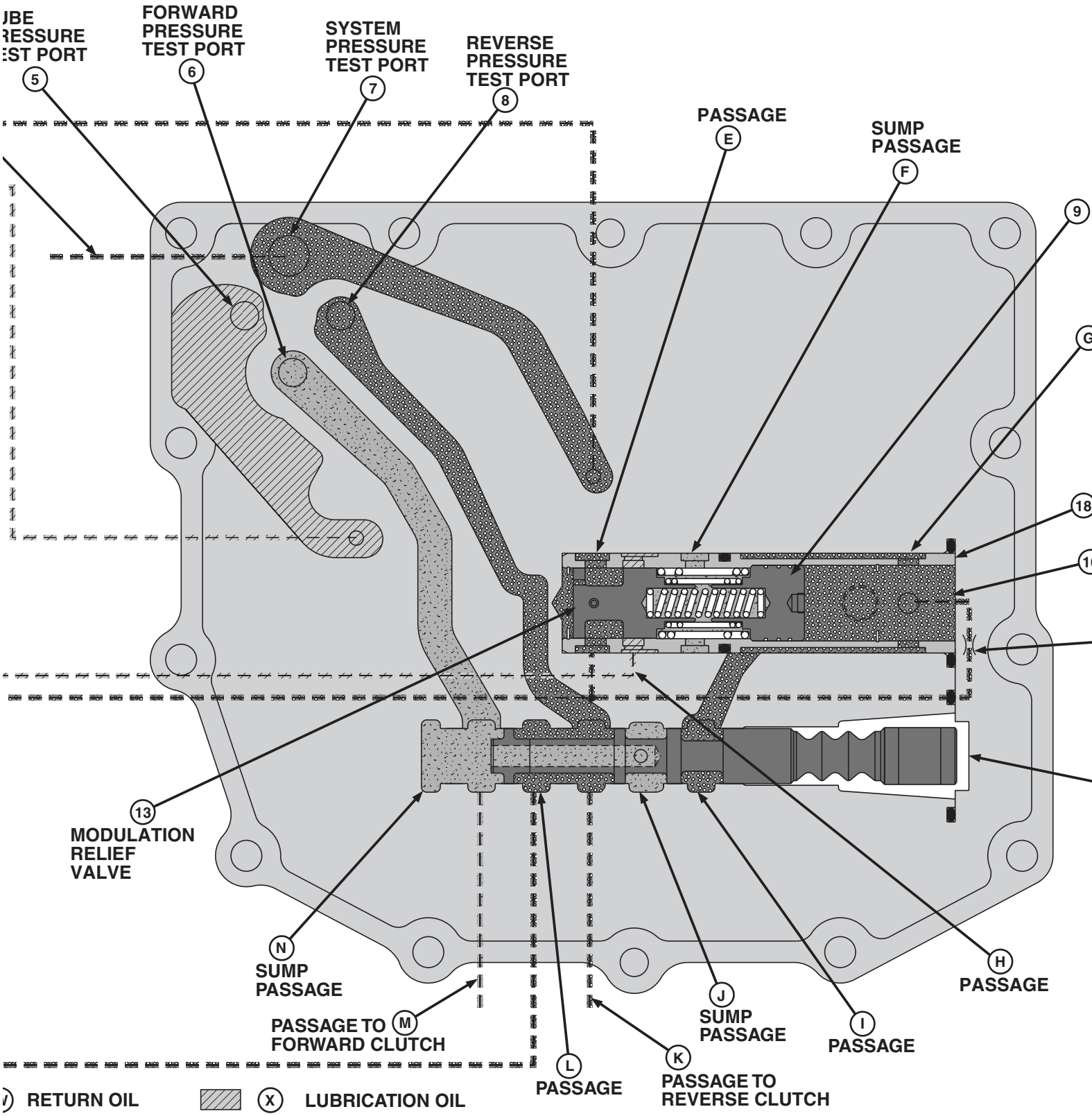

FORWARD/REVERSE LEVER IN REVERSE, CLUTCH PEDAL UP

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rReverser™ Control Valve Operation—F-N-R Lever in Reverse, Clutch Pedal Up

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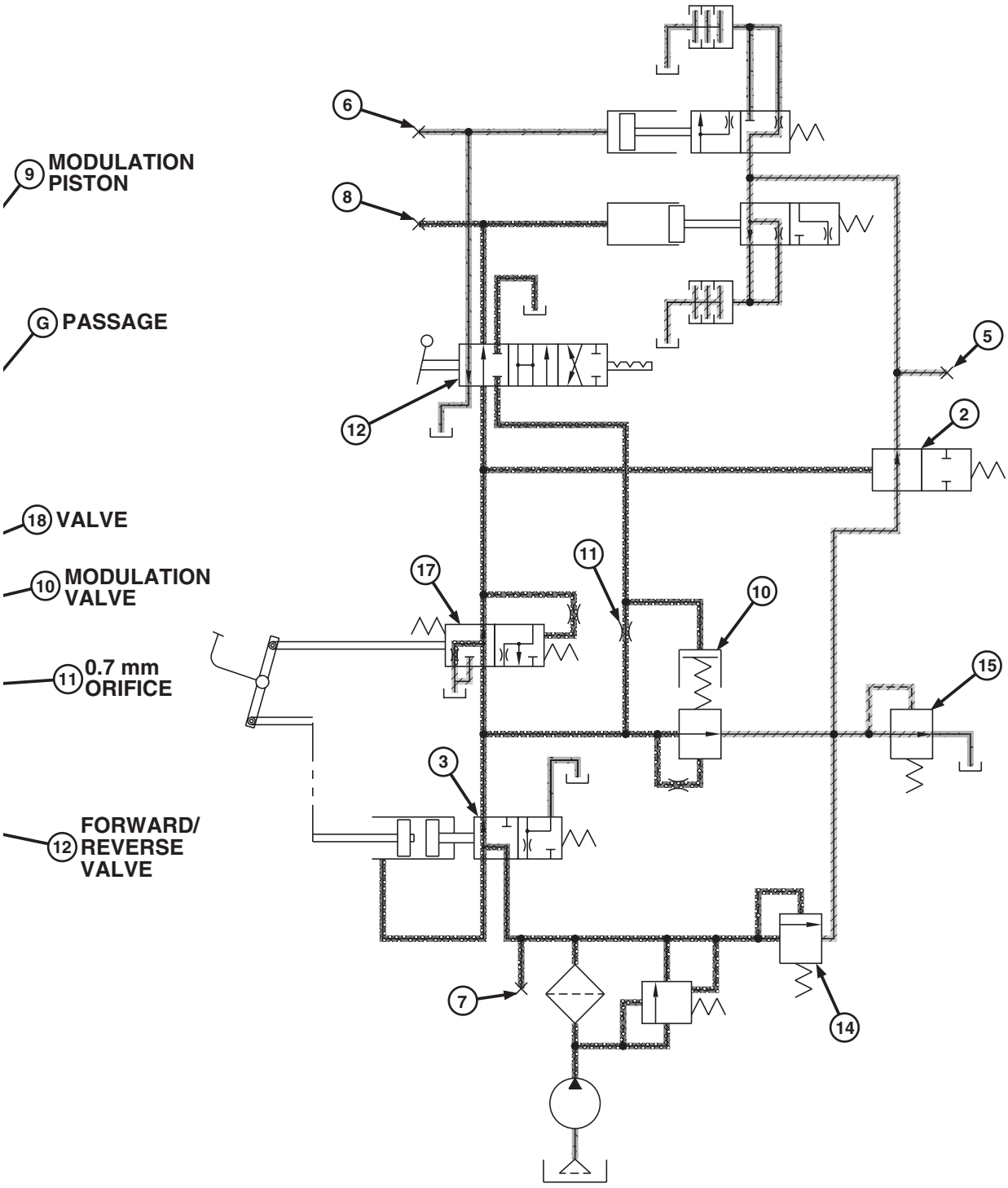

OUO1085,00001DE –19–03OCT00–1/2

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1—Engagement Override Piston
2—Lube Cut-Off Valve
3—Engagement Override Valve
4—Charge Pressure
5—Lube Pressure Test Port
6—Forward Pressure Test Port
7—System Pressure Test Port
8—Reverse Pressure Test Port
9—Modulation Piston
10—Modulation Valve
11—0.7 mm Orifice
12—Forward/Reverse Valve
13—Modulation Relief Valve
14—Main Relief Valve
15—Lube Relief Valve
16—Spring
17—Clutch Pedal Valve
18—Valve
A—Lube Passage to Clutch Packs
B—Passage
C—Passage
D—Passage
E—Passage
F—Passage
G—Sump Passage
H—Passage
I—Passage
J—Sump Passage
K—Passage to Reverse Clutch
L—Passage
M—Passage to Forward Clutch
N—Sump Passage
O—Passage
P—Sump Passage
Q—Passage
R—Passage
S—Sump Passage
T—Sump Passage
U—Passage
V—High Pressure Oil
W—Return Oil
X—Lubrication Oil

FUNCTION:

Controls all functions of the PowrReverser™.

MAJOR COMPONENTS:

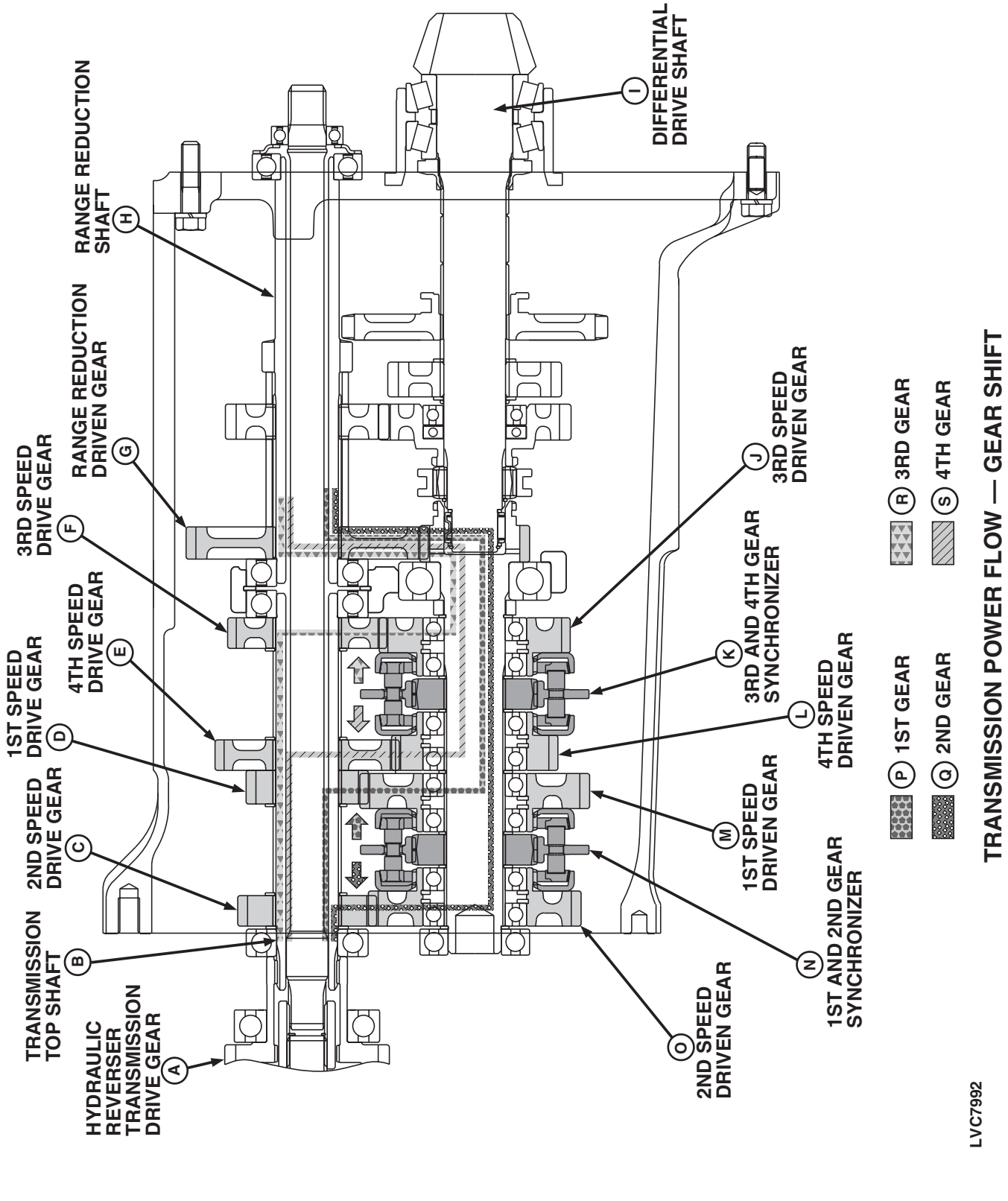
- Engagement Override Valve
- Clutch Pedal Valve
- Main Relief Valve
- Lubrication Relief Valve
- Lubrication Cut-Off Valve
- Modulation Valve
- Forward/Reverse Valve

THEORY OF OPERATION:

Theory of operation for reverse is the same as forward, except that the forward/reverse valve is shifted in the opposite direction and pressure oil flows from passage (K) to the reverse clutch pack.

OUO1085,00001DE –19–03OCT00–2/2

Transmission Power Flow—Gear Shift



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OUO1085,00001DF –19–03OCT00–1/2

A—PowrReverser™ Transmission Drive Gear
B—Transmission Top Shaft
C—2nd Speed Drive Gear
D—1st Speed Drive Gear
E—4th Speed Drive Gear
F—3rd Speed Drive Gear
G—Range Reduction Driven Gear
H—Range Reduction Shaft
I—Differential Drive Shaft
J—3rd Speed Driven Gear
K—3rd and 4th Gear Synchronizer
L—4th Speed Driven Gear
M—1st Speed Driven Gear
N—1st and 2nd Gear Synchronizer
O—2nd Speed Driven Gear
P—1st Gear
Q—2nd Gear
R—3rd Gear
S—4th Gear

FUNCTION:

Gear shift section of transmission provides four speeds (forward or reverse) to the range shift section of the transmission.

THEORY OF OPERATION:

Transmission speed drive gears (C—F) are splined to transmission top shaft (B). The driven gears rotate freely on driven shaft. Synchronizers (K and N) are splined to the driven shaft. When a transmission speed is selected, synchronizer (K or N) engages the appropriate driven gear. Power is then transmitted from the top shaft through the selected drive and driven gears to the driven shaft, and through the range reduction drive gear (G) to the range reduction shaft (H).

Power flow through the range reduction section is explained later in this group.

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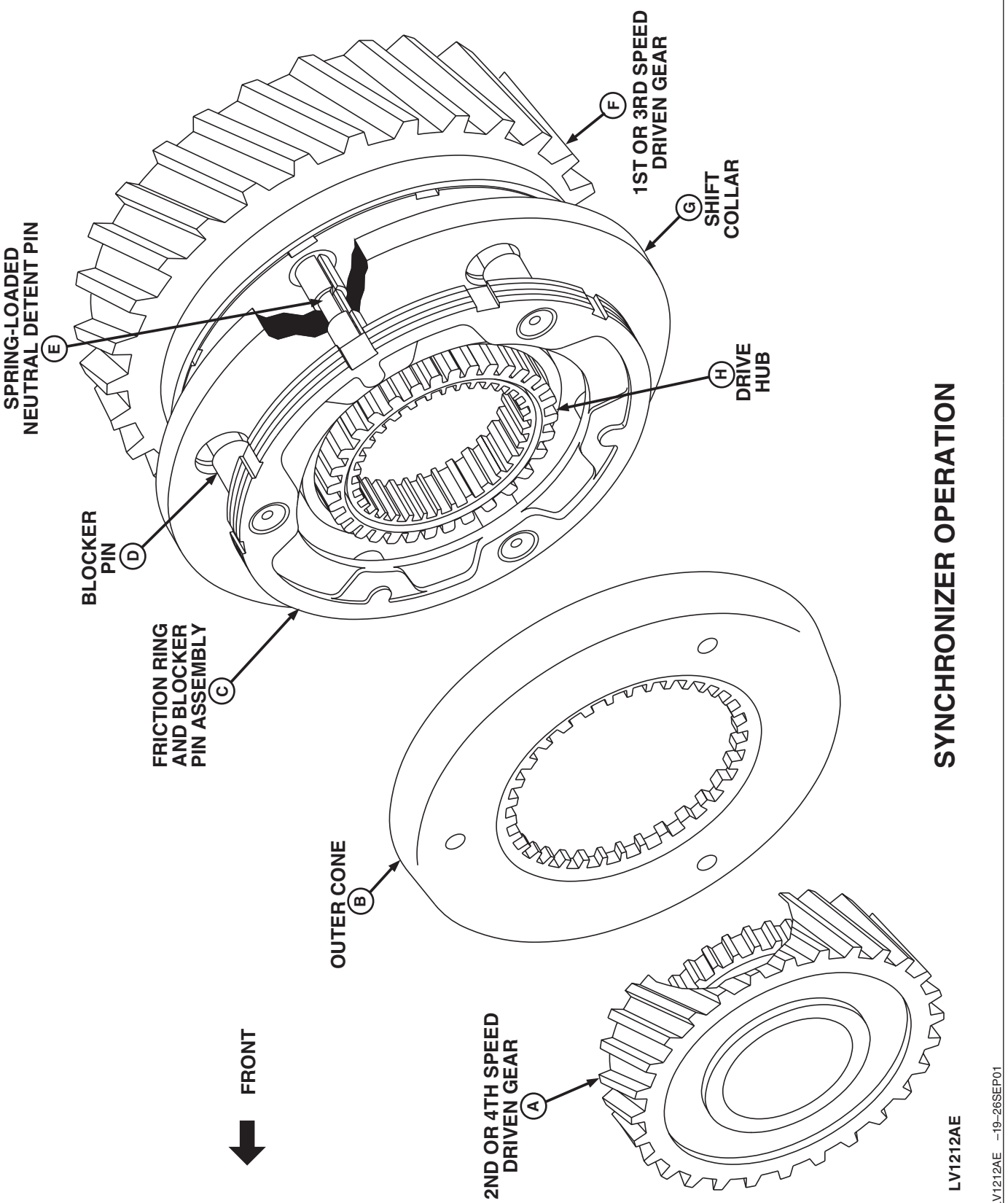
OUO1085,00001DF –19–03OCT00–2/2

Gear Shift Synchronizer Operation



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OUO1085,00001E0 –19–03OCT00–1/2

A—2nd or 4th Speed Driven Gear
B—Outer Cone
C—Friction Ring and Blocker Pin Assembly
D—Blocker Pin
E—Spring-Loaded Neutral Detent Pin
F—1st or 3rd Speed Driven Gear
G—Shift Collar
H—Drive Hub

FUNCTION:

Synchronizer equalizes speeds of mating gears to allow a clash-free shift while the tractor is in motion.

MAJOR COMPONENTS:

- 2nd Speed Drive Gear
- Outer Cone
- Friction Ring and Blocker Pin Assembly
- Blocker Pins
- Neutral Detent Pins
- 1st Speed Driven Gear
- Shift Collar
- Drive Hub

THEORY OF OPERATION:

Drive hub (H) is splined to the transmission bottom shaft, and is in motion when the traction clutch is engaged. To obtain a clash-free shift, 2nd speed driven gear (A), outer cone (B), friction ring and blocker pin assembly (C), shift collar (G), and drive hub (H) must be turning at the same rate of speed. When at the same rate of speed, blocker pins will allow a clash-free shift.

1st Gear Operation:

To shift into 1st gear, shift collar (G) will be moved toward the rear of the transmission by the shift fork.

As the shift collar is moved rearward, misalignment of the blocker pins and shift collar moves the friction ring and blocker pin assembly rearward into the outer cone. The friction between the friction ring assembly and the outer cone will bring 1st speed driven gear (F) to the same rate of speed as drive hub (H). When 1st speed driven gear is turning at the same rate of speed as the drive hub, the blocker pins will allow the shift collar to move rearward. As the shift collar moves rearward, it engages to the splines on the 1st speed driven gear to place the transmission into 1st gear.

2nd Gear Operation:

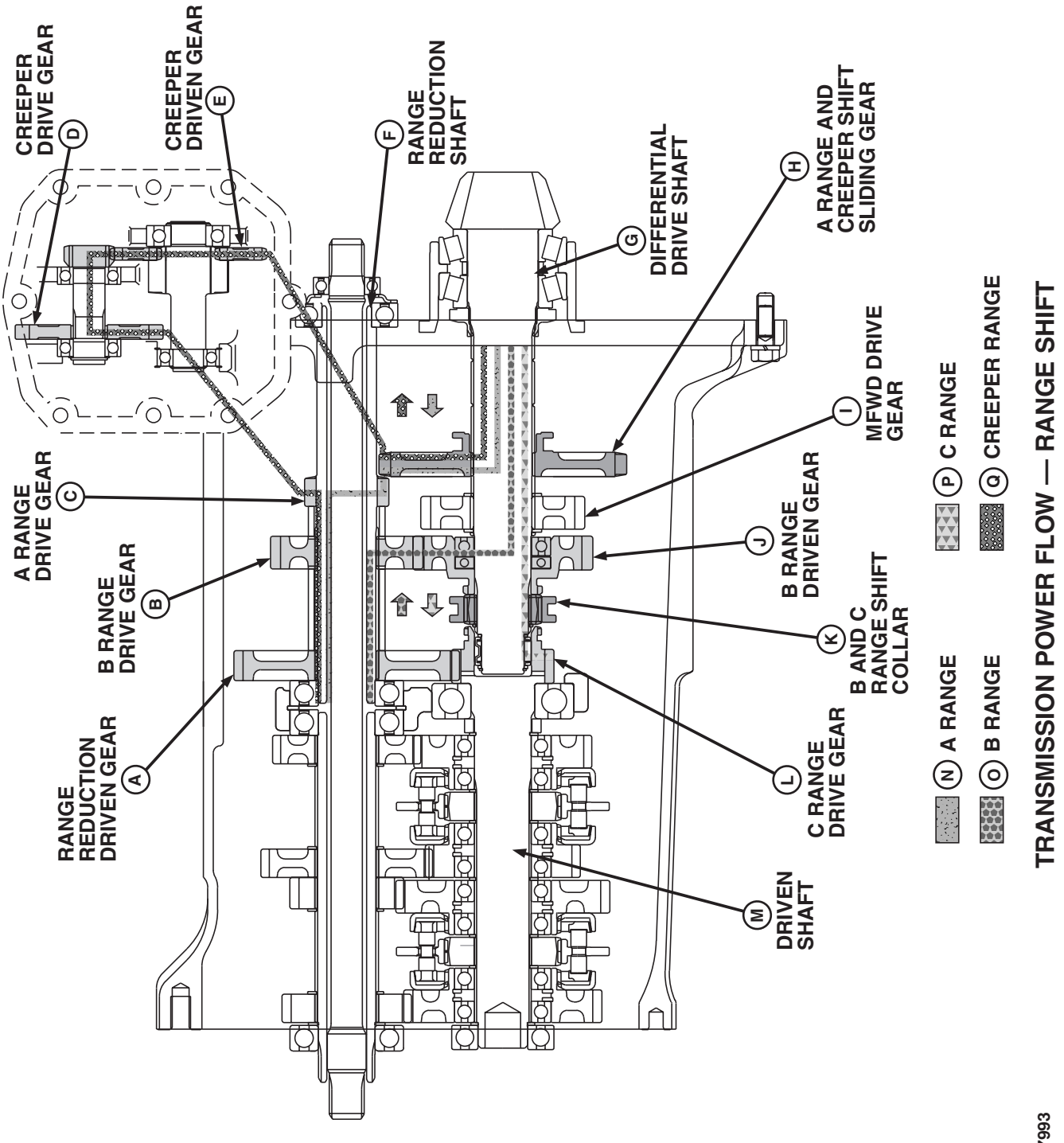
Operation of the synchronizer when 2nd gear is selected is the same as 1st gear, except the shift collar is moved toward the front of the transmission.

3rd and 4th Gear Operation:

Operation of the 3rd and 4th gear synchronizer is the same as described above. The shift collar is moved rearward to engage 3rd gear and forward to engage 4th gear.

OUO1085,00001E0 –19–03OCT00–2/2

Transmission Power Flow—Range Shift



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OUO1085,00001E1 –19–03OCT00–1/2

A—Range Reduction Driven Gear
B—B Range Drive Gear
C—A Range Drive Gear
D—Creeper Drive Gear
E—Creeper Driven Gear
F—Range Reduction Shaft
G—Differential Drive Shaft
H—A Range and Creeper Shift Sliding Gear
I—MFWD Driven Gear
J—B Range Driven Gear
K—B and C Range Shift Collar
L—C Range Drive Gear
M—Driven Shaft
N—A Range
O—B Range
P—C Range
Q—Creeper Range

FUNCTION:

Provides three range speeds and an optional creeper speed.

MAJOR COMPONENTS:

- Range Reduction Drive Gear
- Range Reduction Shaft
- Drive Gears
- Driven Gears
- B and C Range Shift Collar
- A Range and Creeper Shift Sliding Gear
- Driven Shaft
- Differential Drive Shaft

THEORY OF OPERATION:

Range selection is achieved through a combination of the drive gears on the range reduction shaft (F) and the driven gears on the differential drive shaft (G).

Driven shaft (M) transmits power to the range reduction shaft through C range drive gear (L) and range reduction driven gear (A) which are constantly in mesh. The C range drive gear is part of the driven shaft, and the range reduction driven gear (A) is splined to the range reduction shaft.

C Range:

C range drive gear (L) is machined on the end of driven shaft (M). B and C range shift collar (K) is splined to differential drive shaft (G). When the C range is selected, the range shift collar slides and engages the splines on the end of the driven shaft (M) and power is transmitted to the differential drive shaft (G).

B Range:

The B range drive gear (B) is splined to the range reduction shaft (F). The B range drive gear is constantly in mesh with the B range driven gear (J) which floats on the differential drive shaft (G). When the B range is selected, the shift collar (K) engages the B range driven gear and power is transmitted to the differential drive shaft.

A Range:

The A range drive gear (C) is splined to the range reduction shaft (F). When the A range is selected, the A range and creeper shift sliding gear (H) slides and engages the A range drive gear (C).

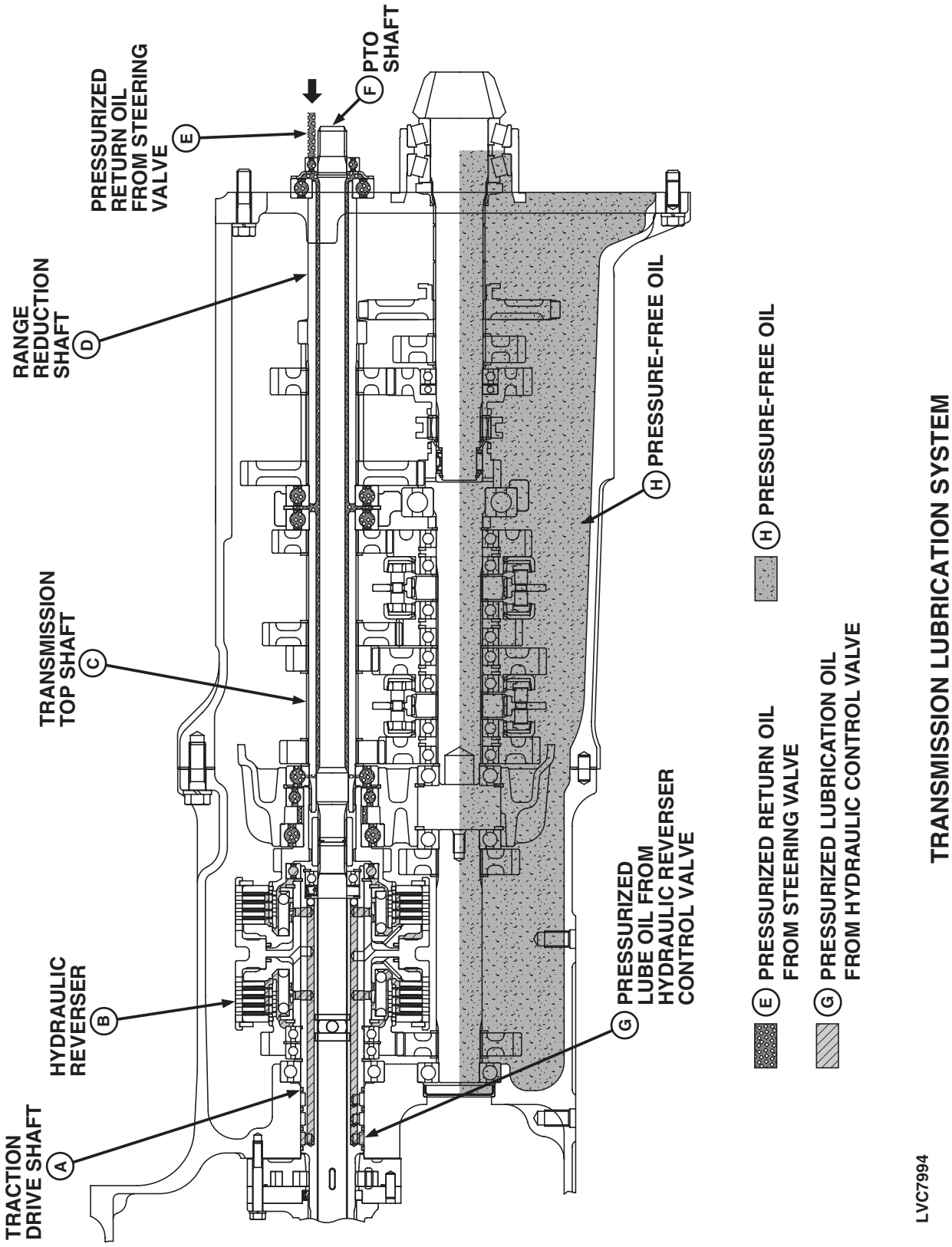
Optional Creeper Range:

When the optional creeper assembly is installed on the transmission, the A range drive gear (C) on the range reduction shaft (F) is constantly in mesh with the creeper drive gear (D).

When the creeper range is selected, the A range and creeper shift sliding gear (H) slides to engage the creeper driven gear (E).

Power flow is then transmitted from the range reduction shaft through the creeper assembly to the A range and creeper shift sliding gear and to the differential drive shaft (G).

PowrReverser™ Transmission Lubrication System



LVC7994 –19–12JUL02

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OUO1085,00001E3 –19–03OCT00–1/2

A—Traction Drive Shaft
B—PowrReverser™
C—Transmission Top Shaft
D—Range Reduction Shaft
E—Pressurized Return Oil From Steering Valve
F—PTO Shaft
G—Pressurized Lube Oil From Hydraulic Reverser Control Valve
H—Pressure-Free Oil

FUNCTION:

The transmission case and clutch housing serve as the main reservoir for the hydraulic system, steering system, and brake system. The oil also acts as lubrication oil for the PowrReverser™, transmission, and differential components.

MAJOR COMPONENTS:

- Clutch Housing
- Transmission Case
- PowrReverser™
- Transmission Top Shaft
- Range Reduction Shaft

THEORY OF OPERATION:

During operation, pressure-free oil (H) in the clutch housing and transmission case is thrown up by the turning gears to lubricate transmission and PowrReverser™ components.

Pressurized return oil (E) from the steering valve enters the left side of the differential case via the transmission lubrication line. A passage in the differential case intersects the bearing bore at the end of the range reduction shaft (D). The pressurized lube oil flows around the PTO shaft (F) and through the hollow range reduction shaft (D) and transmission top shaft (C) to lubricate the bearings for these shafts.

Pressurized lubrication oil (G) is also provided by the PowrReverser™ charge pump via the PowrReverser™ control valve. This oil flows through passages in the traction drive shaft (A) to lubricate the PowrReverser™ clutch packs.

OUO1085,00001E3 –19–03OCT00–2/2

Rear PTO Operation

Rear PTO operation for units with PowrReverser™ transmissions is the same as units with collar shift or SyncShuttle™ transmissions. See Group 10 for information.

OUO1085,00001E4 –19–03OCT00–1/1

Final Drive Operation

Final drive operation for units with PowrReverser™ transmissions is the same as units with collar shift or SyncShuttle™ transmissions. See Group 10 for information.

OUO1085,00001E5 –19–03OCT00–1/1

Differential Operation

Differential operation for units with PowrReverser™ transmissions is the same as units with collar shift or SyncShuttle™ transmissions. See Group 10 for information.

OUO1085,00001E6 –19–03OCT00–1/1

MFWD Operation

MFWD operation for units with PowrReverser™ transmissions is the same as units with collar shift or SyncShuttle™ transmissions. See Group 10 for information.

OUO1085,00001E7 –19–03OCT00–1/1

Diagnostic Information

The diagnostic information in this group is used to test components related to a specific problem or system. Select a symptom or system from the list and follow the test procedures under the heading. The symptom or system headings are:

Isolate the Problem Area

- Clutch
- Transmission
- Rear PTO
- Differential and Final Drive
- Mechanical Front Wheel Drive

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “Normal” column gives the reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the test, check, or adjustment listed in the third “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located at the end of this group.

OUO1085,00001E8 –19–03OCT00–1/1

Isolate the Problem Area

CONDITIONS:

- Before starting, inspect the entire tractor for oil leakage. Locate the source of leakage, determine the cause and make the necessary repairs.
- During the tests you will be listening for abnormal noises. A mechanic's stethoscope may be helpful.
- Begin the test procedure with the gear shift lever and range shift lever in neutral, and the MFWD and rear PTO disengaged.

Test Location	Normal	If Not Normal
1. Check transmission oil.	Level not too low.	Check for leakage and refill.
	Level not too high.	Drain oil to proper level.
	Oil not contaminated with metal fragments or debris.	Drain oil and replace filter. Clean screen and determine cause of contamination.
	Oil not foamy or discolored.	Make sure type of oil is correct. Check for hydraulic cause of overheating.
2. Check all linkage operation and return it to the neutral or disengaged position.	No damage or binding.	Repair linkage.
3. Run engine with transmission clutch pedal disengaged.	No noise or vibration.	Inspect engine.
4. Partially engage clutch pedal and vary engine rpm.	No noise or vibration.	Inspect clutch. Inspect PTO drive shaft and bearings.
5. Fully engage clutch pedal and vary engine rpm.	No noise or vibration.	Inspect clutch. Inspect traction drive shaft.
6. Place gear shift lever in each forward gear and reverse. Leave range shift lever in neutral. Engage traction clutch pedal and vary engine rpm in each gear.	No noise or vibration.	Inspect gear mesh for speed selected when noise or vibration occurred. Inspect driven shaft or range reduction shaft bearing if noise occurred in all speeds. Inspect reverse idle shaft and bearing if problem occurred (only in reverse).
7. Place transmission in neutral, engage rear PTO, and vary engine rpm.	No noise or vibration.	Inspect rear PTO shaft, gears, and bearings.

Continued on next page

NOTE: From this point on you will be driving the tractor. Operate in an open level area and turn sharply from left to right periodically to observe any change in noise as you turn.

Test Location	Normal	If Not Normal
8. Place transmission in 2nd gear. Operate tractor in each range.	Tractor moves smoothly going straight.	Inspect gear mesh in range where problem was evident.
		Inspect differential drive shaft if problem was evident in all ranges.
	No change when making turns.	Inspect differential or final drive and axles.
9. Leave transmission in 2nd gear and low range and engage differential lock while operating at low engine rpm. Turn from left to right.	Tractor resists turning. Differential lock stays engaged. No noise.	Inspect differential lock and linkage.
10. Leave transmission in 2nd gear and low range. Release differential lock. Engage MFWD. Drive straight and turn left and right.	No noise or vibration.	Inspect gears and bearings in MFWD drop gearbox if problem was evident at all times.
		Inspect MFWD axles if problem was evident only when turning.

OUO1085,00001E9 –19–03OCT00–2/2

Traction Clutch Slips

CONDITIONS:

- Adjustments found in this group.
- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Clutch pedal.	Free play at correct specification.	Adjust pedal free play.
2. Traction clutch disk.	No oil or grease on facing.	Clean or replace disk.
	No evidence of wear or glazing on facing. No warpage.	Replace disk.
3. Traction clutch pressure plate.	Does not bind on operating bolts.	Clean or replace operating bolts or pressure plate.
	No evidence of warpage.	Replace pressure plate.
4. Traction clutch coil springs.	All springs same length. No evidence of bent or damaged condition.	Replace springs.
5. Traction clutch release fingers.	No binding or sticking.	Clean or replace fingers.
6. Spring washer under PTO clutch rear pressure plate.	Tractor moves forward and reverse with no clutch slippage.	Replace spring washer.

OUO1085,00001EA –19–03OCT00–1/1

Traction Clutch Dragging

CONDITIONS:

- Adjustments found in this group.
- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Clutch pedal.	Free play at correct specification.	Adjust free play if excessive.
2. Traction clutch release bearing.	Slides freely on shaft.	Clean, lubricate, or replace.
3. Traction clutch disk.	Slides freely on shaft splines.	Clean, lubricate, or replace.
	No warpage or damage.	Replace disk.
4. Traction clutch pressure plate.	No warpage.	Replace pressure plate.

OUO1085,00001EB –19–03OCT00–1/1

Traction Clutch Does Not Engage

CONDITIONS:

- Adjustments and repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Traction clutch release bearing.	Slides freely on shaft.	Clean, lubricate, or replace bearing.
2. Traction clutch release levers.	Adjusting screws adjusted for proper clearance.	Adjust screws.
3. Traction clutch disk.	No evidence of wear, scoring, or burning on disk faces.	Replace disk.
	No evidence of damage to disk hub.	Replace disk.

OUO1085,00001EC –19–03OCT00–1/1

Traction Clutch Grabs

CONDITIONS:

- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Clutch pedal linkage and armshaft.	Operates freely with no binding.	Clean, lubricate, or adjust.
2. Traction clutch disk.	Slides freely on shaft splines.	Clean, lubricate, or replace.
	No oil or grease on disk facing. No evidence of wear or glazing on disk face. No warpage or damage. Rivets at hub are tight.	Clean or replace disk.
3. Traction clutch pressure plate.	No warpage or damage.	Replace pressure plate.

OUO1085,00001ED –19–03OCT00–1/1

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Traction Clutch Squeaks

CONDITIONS:

- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Flywheel pilot bearing.	Lubricated sufficiently.	Lubricate.
2. Traction clutch release bearing.	Lubricated sufficiently.	Lubricate.
	Bearing spins freely. No evidence of wear or damage.	Replace bearing.

OUO1085,00001EE –19–03OCT00–1/1

Traction Clutch Does Not Release

CONDITIONS:

- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Traction clutch disk and pressure plate.	Disk and pressure plate separate freely with no sticking.	Clean or replace disk and/or pressure plate. If storing tractor, block clutch pedal in disengaged position.

OUO1085,00001EF –19–03OCT00–1/1

Traction Clutch Chatters

CONDITIONS:

- Clutch repair in Section 50, Group 10.
- Rear axle repair in Section 50, Group 30.
- Transmission repair in Section 50, Group 15.

Test Location	Normal	If Not Normal
1. Clutch assembly.	Clean and free of rust.	Clean or replace clutch components or assembly.
2. Traction clutch disk.	No oil or grease on facing.	Clean or replace disk.
	No evidence of wear or glazing on facing. No evidence of warpage.	Replace disk.
3. Traction clutch pressure plate.	Not warped. No evidence of cracks or other damage.	Replace pressure plate.
4. Traction clutch operating levers.	Operate freely with no binding or sticking.	Clean, lubricate, or replace operating levers.
5. Traction clutch disk hub and shaft.	Hub slides freely on shaft. No evidence of wear or damage.	Clean, lubricate, or replace disk and/or shaft.
6. Traction clutch coil springs.	All springs are same length. No evidence of bent or damaged condition.	Replace springs.
7. Rear axles.	Rotate smoothly with little or no end play.	Lubricate bearings and/or adjust end play. Replace worn or damaged components.
8. Transmission.	Backlash is adjusted properly.	Adjust or repair transmission.
9. Spring washer under PTO clutch pressure plate.	Tractor moves forward and reverse with no clutch slippage or chatter.	Replace spring washer.

OUO1085,00001F0 –19–03OCT00–1/1

Traction Clutch Rattles

CONDITIONS:

- Repair and adjustment in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Traction clutch release bearing.	Bearing spins freely. No evidence of wear or damage.	Replace bearing.
2. Flywheel pilot bearing.	Bearing spins freely. No evidence of wear or damage.	Replace bearing.
3. Traction clutch release fingers.	Adjusting screws adjusted for proper clearance.	Adjust screws.
4. Clutch shaft.	No evidence of wear, damage, or bent condition.	Replace shaft.
5. Traction clutch disk.	Hub is tight on disk. All rivets are tight.	Replace disk.

OUO1085,00001F1 –19–03OCT00–1/1

Traction Clutch Engagement Is Noisy

CONDITIONS:

- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Clutch shaft.	No evidence of wear, damage, or bent condition.	Replace shaft.
2. Traction clutch disk.	Hub is tight on disk. All rivets are tight.	Replace disk.

OUO1085,00001F2 –19–03OCT00–1/1

Excessive Vibration in Traction Clutch

CONDITIONS:

- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Clutch assembly.	Clean and free of rust.	Clean or replace clutch.
2. Clutch shaft.	No evidence of wear, damage, or bent condition.	Replace shaft.
3. Traction clutch disk.	No evidence of wear or glazing on facing. No warpage.	Replace disk.
4. Traction clutch pressure plate.	No evidence of damage or warpage.	Replace pressure plate.
5. Flywheel pilot bearing.	Bearing spins freely. No evidence of wear or damage.	Replace bearing.

OUO1085,00001F3 –19–04OCT00–1/1

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Clutch Pedal Does Not Return

CONDITIONS:

- Repair in Section 50, Groups 05 and 10.
- Pedal adjustment in this group.

Test Location	Normal	If Not Normal
1. Clutch pedal linkage.	Operates freely and smoothly in both directions. No evidence of wear or damage.	Adjust or replace linkage components.
	Clutch pedal return spring is connected securely and not distorted or broken.	Connect or replace spring.
2. Traction clutch release bearing.	Bearing and sleeve operate smoothly without binding.	Clean, lubricate, or replace sleeve.

OUO1085,00001F4 –19–04OCT00–1/1

Clutch Pedal Loose

CONDITIONS:

- Repair in Section 50, Groups 05 and 10.

Test Location	Normal	If Not Normal
1. Clutch pedal linkage.	Yoke and jam nut are tight on rod.	Tighten or replace yoke, nut, or rod.
	Pedal shaft bushings are not worn or damaged.	Replace bushings or pedal.
2. Traction clutch release linkage.	No evidence of wear or damage to yoke, shoes, armshaft, or bushings.	Replace worn or damaged components.

OUO1085,00001F5 –19–04OCT00–1/1

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10

Clutch Pedal Pulsates

CONDITIONS:

- Clutch repair in Section 50, Groups 05 and 10.
- Flywheel repair in CTM104 or CTM125.

Test Location	Normal	If Not Normal
1. Clutch pedal linkage.	Clutch pedal return spring is connected securely and not distorted or broken.	Connect or replace spring.
2. Clutch shaft.	Shaft is straight.	Replace shaft.
3. Traction clutch release linkage.	No evidence of wear or damage to yoke, shoes, armshaft, or bushings.	Replace worn or damaged components.
4. Flywheel.	Flywheel turns evenly. No evidence of warpage or uneven mounting.	Tighten, reinstall, or replace flywheel.

OUO1085,00001F6 –19–04OCT00–1/1

Jerky or Rough Transmission of Power

CONDITIONS:

- Repair in Section 50, Group 10.

Test Location	Normal	If Not Normal
1. Traction clutch disk and pressure plate.	No evidence of warpage or uneven wear.	Replace disk and/or pressure plate.

OUO1085,00001F7 –19–04OCT00–1/1

Low Transmission Oil Level (Excessive Oil Leakage)

CONDITIONS:

- Repair in Section 50.

Test Location	Normal	If Not Normal
1. Clutch, transmission, and differential housings.	Power train housings are clean and dry, with no evidence of leakage from drain plugs, gaskets, or seals.	Tighten drain plug(s).
	All hardware securing housings and covers is tight.	Tighten all mounting hardware to correct torque. Replace missing hardware. Replace leaking seals or gaskets.
	Transmission oil has proper viscosity and grade.	Drain and refill.

OUO1085,00001F8 –19–04OCT00–1/1

Gears Clash, Shift Hard, or Will Not Engage

CONDITIONS:

- Clutch adjustment in Section 50, Group 10.
- Transmission and lever repair in Section 50, Group 15.

Test Location	Normal	If Not Normal
1. Clutch.	Clutch operates smoothly. All gears engage freely.	Adjust clutch.
2. Speed and range shifter linkage.	Linkage is adjusted properly.	Adjust.
	Linkage shows no evidence of wear or damage.	Replace worn or damaged components.
3. Speed and range shifter assemblies.	All shafts operate smoothly. No evidence of wear or damage to shifters, arms, forks, or detent balls and springs. Shifter forks are not loose on shafts.	Replace worn or damaged components.
4. Transmission.	No evidence of wear or damage to gear teeth or splines. Gears that are splined to shafts are not loose. Gears that float on shafts turn freely. Shift collars and/or synchronizers slide freely between gears with no binding.	Clean and lubricate any binding parts. Replace worn or damaged components.

OUO1085,00001F9 –19–04OCT00–1/1

Two Speeds Engage Together

CONDITIONS:

- Repair in Section 50, Group 15.

Test Location	Normal	If Not Normal
1. Speed and range shifter assemblies.	All shafts operate smoothly. No wear or damage to shaft detents. Detent ball assemblies installed properly and not worn or damaged. Springs not weak or broken.	Replace worn or damaged components.
2. Transmission.	No evidence of wear or damage to gear teeth or splines. Gears that are splined to shafts are not loose. Gears that float on shafts turn freely.	Replace worn or damaged components.
	All transmission components assembled correctly.	Reassemble.

OUO1085,00001FA –19–04OCT00–1/1

Transmission Will Not Stay in Gear

CONDITIONS:

- Repair in Section 50, Group 15.

Test Location	Normal	If Not Normal
1. Speed and range shifter assemblies.	All shafts operate smoothly. No wear or damage to shaft detents. Detent ball assemblies installed properly and not damaged. Springs not weak or broken.	Replace worn or damaged components.
2. Transmission.	No evidence of wear or damage to gear teeth, splines, shift collars, and/or synchronizers or shifter forks.	Replace worn or damaged components.

OUO1085,00001FB –19–04OCT00–1/1

Transmission Noisy

CONDITIONS:

- Repair in Section 50, Group 15.

Test Location	Normal	If Not Normal
1. Transmission shafts.	Shafts and shaft bearings spin freely and without noise. No evidence of wear or damage to shaft splines or bearings.	Replace worn or damaged components.
2. Transmission gears.	Gears that are splined to shafts are not loose. Gears that float on shafts turn freely. Shift collars and/or synchronizers slide freely between gears with no binding. No evidence of wear or damage to gear teeth or splines.	Clean and lubricate any binding parts. Replace worn or damaged components.
3. Speed and range shift forks.	No evidence of wear, damage, or bent condition.	Replace worn or damaged components.
4. Park pawl assembly.	Park pawl retracts fully when disengaged.	Replace worn or damaged linkage or springs.

OUO1085,00001FC –19–04OCT00–1/1

PTO Noisy

CONDITIONS:

- Repair in Section 50, Group 20.

Test Location	Normal	If Not Normal
1. PTO connection.	No noise from PTO, even when implements connected.	Disconnect implement and check for PTO noise.
2. PTO gears.	No evidence of wear or damage to gear teeth or splines.	Replace worn or damaged gears.
3. PTO shafts.	All shafts are straight. No evidence of wear or damage to splines or bearing surfaces.	Replace worn or damaged shafts.
4. PTO bearings.	All bearings spin freely. No wear or damage.	Replace worn or damaged bearings.

OUO1085,00001FD –19–04OCT00–1/1

PTO Hard to Engage

CONDITIONS:

- Adjustments in this group.
- Repair in Section 50, Group 20.

Test Location	Normal	If Not Normal
1. PTO lever linkage.	Operates freely with no binding. Linkage adjusted properly.	Adjust linkage.
2. PTO gears.	No wear or damage to gear teeth or splines.	Replace worn or damaged components.

OUO1085,00001FE –19–04OCT00–1/1

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PTO Will Not Operate

CONDITIONS:

- Repair in Section 50, Group 20.

Test Location	Normal	If Not Normal
1. PTO shafts.	All shafts are straight. No wear or damage to shaft splines or bearing surfaces.	Replace worn or damaged components.
2. PTO assembly.	PTO is assembled correctly.	Reassemble.

OUO1085,00001FF –19–04OCT00–1/1

PTO Will Not Stay Engaged

Test Location	Normal	If Not Normal
1. PTO gears.	No wear or damage to gear teeth or splines.	Replace worn or damaged components.

OUO1085,0000200 –19–04OCT00–1/1

Excessive Differential Noise

CONDITIONS:

- Adjustments and repair in Section 50, Group 25.

Test Location	Normal	If Not Normal
1. Differential lock assembly.	Lock disengages fully when pedal is replaced.	Repair lock assembly.
2. Differential gears.	Cone point adjustment and backlash adjustment are correct.	Adjust.
	No wear or damage to gears or pinion teeth and splines.	Replace worn or damaged components.
3. Differential bearings.	All bearings spin freely. No evidence of wear or damage.	Replace worn or damaged components.

OUO1085,0000201 –19–04OCT00–1/1

Differential Does Not Work

CONDITIONS:

- Repair in Section 50, Group 25.

Test Location	Normal	If Not Normal
1. Differential lock.	Lock disengages when pedal is released.	Repair lock assembly.
2. Pinion shaft.	Shaft is straight. No wear or damage to teeth or splines.	Replace pinion shaft.
3. Bevel pinions and gears.	No wear or damage to teeth or splines.	Replace pinions and/or gears.
4. Thrust washers.	No wear or damage.	Replace thrust washers.
5. Differential housing.	Housing is not damaged or distorted.	Replace housing.

OUO1085,0000204 –19–04OCT00–1/1

No Differential Lock

CONDITIONS:

- Repair in Section 50, Group 25.

Test Location	Normal	If Not Normal
1. Pedal.	Movement of pedal causes shaft to move out of housing. Pedal is not worn, bent, or damaged.	Replace pedal.
2. Lock shaft.	Roller at end of shaft turns freely on bolt. Roller is not worn or damaged.	Replace roller and/or bolt.
	Shaft slides freely and is not worn or damaged.	Replace lock shaft.

OUO1085,0000205 –19–04OCT00–1/1

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Differential Chatters

CONDITIONS:

- Axle repair in Section 50, Group 30.
- Differential repair in Section 50, Group 25.

Test Location	Normal	If Not Normal
1. Axles.	Axles are mounted securely and show no evidence of wear or damage.	Repair axle(s).
2. Differential gears and pinions.	No wear or damage to gear teeth or splines.	Replace gears or pinions.
3. Differential bearings.	Bearings spin freely. No wear or damage.	Replace bearings.

OUO1085,0000206 –19–04OCT00–1/1

Axle Noise

CONDITIONS:

- Repair in Section 50, Group 30.

Test Location	Normal	If Not Normal
1. Final drive pinion shaft.	No wear or damage.	Replace pinion shaft.
2. Planetary pinions.	No wear or damage.	Replace pinions.
3. Ring gear.	Adjusted properly. No wear or damage.	Adjust free play or replace ring gear.
4. Axle bearings.	All bearings spin freely. No wear or damage.	Replace bearings.

OUO1085,0000207 –19–04OCT00–1/1

Axle Shaft Will Not Turn

CONDITIONS:

- Brake repair in Section 60, Group 10.
- Axle repair in Section 50, Group 30.

Test Location	Normal	If Not Normal
1. Brakes.	Brakes disengage fully when pedal is released.	Adjust or repair brakes.
2. Axle shaft.	Axle shaft is not seized or broken.	Repair or replace axle.
3. Planetary unit.	Planetary is not seized or broken.	Repair or replace planetary.

OUO1085,0000208 –19–04OCT00–1/1

MFWD Lever is Hard to Engage

CONDITIONS:

- Repair in Section 50, Group 35.

Test Location	Normal	If Not Normal
1. MFWD shift linkage.	Linkage operates smoothly. No evidence of wear, damage or bent condition.	Repair or replace linkage.
2. Shift fork.	No evidence of wear, damage or bent condition.	Replace shift fork.
3. Shift collar.	Collar slides smoothly. No wear or damage to splines.	Clean and lubricate, or replace collar.
4. MFWD Shaft.	No wear or damage to splines.	Replace shaft.

OUO1085,0000209 –19–04OCT00–1/1

MFWD Lever Will Not Stay in “ON” Position

CONDITIONS:

- Repair in Section 50, Group 35.

Test Location	Normal	If Not Normal
1. MFWD shift linkage.	No evidence of wear, damage, or bent condition.	Repair or replace linkage.
2. Shift fork.	No evidence of wear, damage, or bent condition.	Replace shift fork.

OUO1085,000020A –19–04OCT00–1/1

Noisy Front Wheel Drive Operation

CONDITIONS:

- Repair in Section 50, Group 35.

Test Location	Normal	If Not Normal
1. MFWD shafts and gears.	No wear or damage to teeth or splines.	Replace shafts or gears.
2. Bearings.	All bearings spin freely. No wear or damage.	Replace bearings.

OUO1085,000020B –19–04OCT00–1/1

Clutch Pedal Free Play Adjustment

REASON:

To make sure traction clutch is fully engaged when clutch pedal is released and fully disengaged when pedal is depressed.

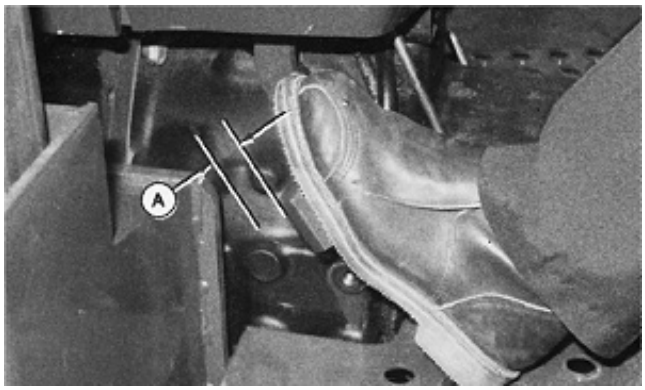
PROCEDURE:

1. Depress clutch pedal to feel how far the pedal travels before resistance is felt. Measure free play distance (A).
2. If not within specifications, loosen lock nut (B), remove clip and pin (C) and rotate turnbuckle as necessary.

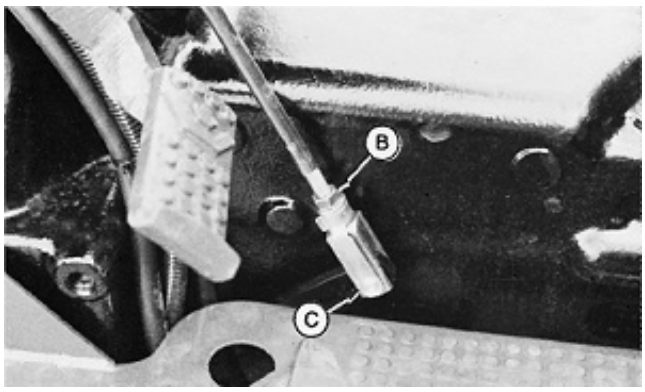
Specification

Pedal—Free Play Distance ..... 13 ± 3 mm (0.512 ± 0.118 in.)

A—Pedal Free Play Distance
B—Lock Nut
C—Pin



LV274 –UN–18FEB92



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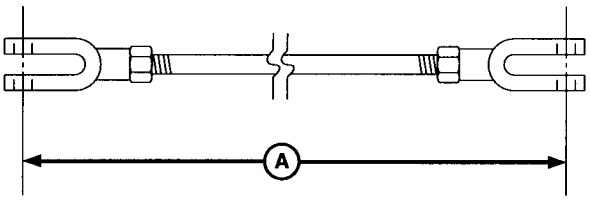
OUO1085,000020C –19–04OCT00–1/1

PTO Clutch Lever Adjustment

REASON:

To make sure PTO clutch is fully engaged when lever is in full forward and fully disengaged when lever is full rearward.



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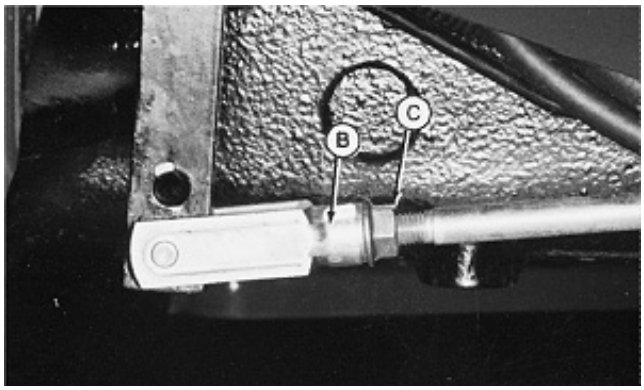
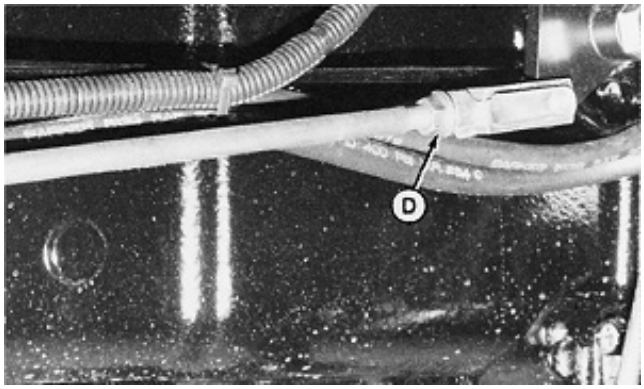
PROCEDURE:

NOTE: PTO lever should be in its rearward (disengaged) position for adjusting PTO clutch linkage.

1. Move PTO lever to rearward (disengaged) position.
2. Remove pin with clip (B) from forward end of PTO clutch rod.
3. Loosen jam nut (C) at front of PTO clutch rod.
4. Adjust initial rod length to 783 mm (30.8 in.) (A).
5. Adjust length of rod to eliminate free play. Lengthen rod by 1/2 turn of the clevis to provide a slight amount of lever free play.
6. Install clip pin (B) in the PTO link.
7. Check for equal thread engagement at each end of the PTO clutch rod. Jam nut (D) at the rear can be loosened and the rod turned to equalize thread engagement (PTO adjustment is not affected).
8. Tighten jam nuts (C and D) at each end of rod.



LV277 –UN–18FEB92



LV278 –UN–18FEB92

A—Initial Rod Length
B—Pin With Clip
C—Jam Nut
D—Jam Nut

OUO1085,000020D –19–04OCT00–1/1

Diagnostic Information

The diagnostic information in this group is used to test components related to a specific problem or system. Select a symptom or system from the list and follow the test procedures under the heading. The symptom or system headings are:

Isolate the Problem Area

- Clutch Pedal
- PowrReverser™
- Transmission

The diagnostic procedure lists:

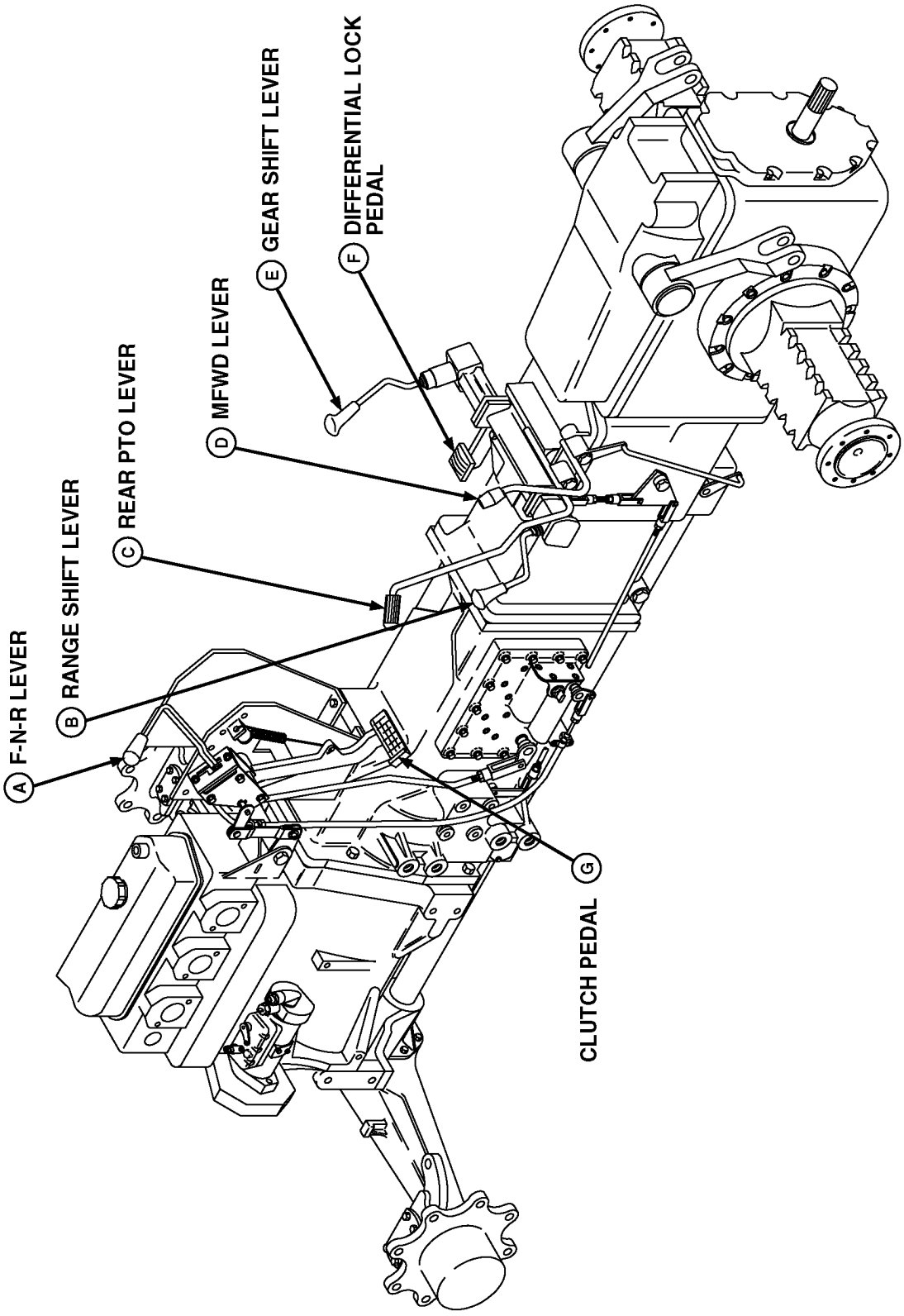
- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “Normal” column gives the reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the test, check, or adjustment listed in the third “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located at the end of this group.

NOTE: Diagnosis, Tests, and Adjustments for Rear PTO, Differential, Final Drive, and Mechanical Front Wheel Drive on units with PowrReverser™ transmissions is the same as on units with collar shift or SyncShuttle™ transmissions. See Group 15 for information.

OUO1085,000020F –19–04OCT00–1/1

Isolate the Problem Area



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OUO1085,0000210 –19–04OCT00–1/3

A—F-N-R Lever
B—Range Shift Lever
C—Rear PTO Lever
D—MFWD Lever
E—Gear Shift Lever
F—Differential Lock Pedal
G—Clutch Pedal

During the tests, you will be using all of your senses to evaluate machine operation. Does something feel different or abnormal? Does something smell different? Observe gauges and indicator lights. Listen for abnormal noises. A mechanic's stethoscope may be helpful.

CONDITIONS:

- Begin test procedures with all levers in neutral, and with MFWD and PTO disengaged.

Test	Normal	If Not Normal
1. Check transmission oil.	Level not too low.	Check for leakage. Repair as necessary. Refill to proper level.
	Level not too high.	Drain oil to proper level.
	Oil not contaminated with metal fragments or debris.	Drain oil and replace filter. Clean screen in differential and filter screen in PowrReverser™ control valve.
	Oil not foamy or discolored.	Be sure oil is correct type and grade. Check for cause of hydraulic overheating.
2. Check all control linkage. Ensure proper adjustment and operation. Return all controls to the neutral or disengaged position.	No damage or binding.	Adjust or repair linkage.
3. Start engine without depressing clutch pedal.	No abnormal noise or vibration. No tractor movement.	Inspect traction drive shaft bearings in clutch housing. Inspect PowrReverser™ clutch packs.
4. Without depressing clutch pedal, place transmission in B-2 and place F-N-R lever in forward. Vary engine speed. Return all levers to neutral position.	No tractor movement.	Perform PowrReverser™ control valve tests.
5. Engage rear PTO and vary engine speed.	No abnormal noise or vibration.	Inspect rear PTO shaft, gears, and bearings (from clutch housing to PTO output shaft).
6. Press clutch pedal down once and release. Place F-N-R lever in forward. Leave range shift lever in neutral. Place gear shift lever in each speed and vary engine speed in each gear.	No abnormal noise or vibration.	Inspect gear mesh for speed selected when noise or vibration occurred. Inspect bearings for transmission top shaft, driven shaft, or range reduction shaft if noise occurs in all speeds.
7. Place transmission in 2nd gear. Leave range shift lever in neutral. Place F-N-R lever in reverse. Vary engine speed.	No abnormal noise or vibration.	Inspect mesh of reverse drive gear with driven gear and mesh of transfer gear, reverse idler, and transmission drive gear. Inspect bearings of driven shaft and reverse idler.

Continued on next page

NOTE: From this point on you will be driving the tractor. Operate in an open level area and turn sharply from left to right periodically to observe any change in noise as you turn.

Test	Normal	If Not Normal
8. Place transmission in 2nd gear and low range. Shift from neutral to forward and reverse at low idle and full speed.	Tractor moves smoothly from stop or changes direction smoothly after 1.5—2.5 second delay.	Perform PowrReverser™ control valve tests.
9. Place transmission in 2nd gear. Operate tractor in each range.	Tractor moves smoothly going straight.	Inspect gear mesh in range where problem was evident. Inspect differential drive shaft if problem is evident in all ranges.
	No abnormal noise or vibration when making turns.	Inspect differential or final drive and axles.
10. Leave transmission in 2nd gear and low range. Engage differential lock while operating at low engine speed. Turn from left to right.	Tractor resists turning. Differential lock stays engaged. No abnormal noise or vibration.	Inspect differential lock and linkage.
11. Leave transmission in 2nd gear and low range. Release differential lock. Engage MFWD. Drive straight and turn left and right.	No abnormal noise or vibration.	Inspect gears and bearings in MFWD drop gearbox if problem is evident at all times.
		Inspect MFWD axles if problem was evident only when turning.

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OUO1085,0000210 –19–04OCT00–3/3

Low Transmission Oil Level (Excessive Oil Leakage)

CONDITIONS:

- Repair in Section 50.

Test Location	Normal	If Not Normal
1. Clutch, transmission, and differential housings.	Power train housings are clean and dry, with no evidence of leakage from drain plugs, gaskets, or seals.	Tighten drain plug(s).
	All hardware securing housings and covers is tight.	Tighten all mounting hardware to correct torque. Replace missing hardware. Replace leaking seals or gaskets.
	Transmission oil has proper viscosity and grade.	Drain and refill.

OUO1085,0000211 –19–04OCT00–1/1

Clutch Pedal Does Not Return

CONDITIONS:

- Repair in Section 50, Group 06.
- Linkage adjustment in this group.

Test	Normal	If Not Normal
1. Clutch pedal linkage.	Operates freely and smoothly in both directions. No evidence of wear or damage.	Adjust or replace linkage components. Inspect clutch pedal valve spool for binding. Repair as necessary.
	Clutch pedal return spring is connected securely and not distorted or broken.	Connect or replace spring.

OUO1085,0000213 –19–04OCT00–1/1

Tractor Does Not Move in Forward or Reverse

CONDITIONS:

- Linkage adjustment and hydraulic tests in this group.
- Linkage and PowrReverser™ repair in Section 50, Group 12.

Test	Normal	If Not Normal
1. F-N-R linkage.	Linkage is adjusted properly and shows no evidence of wear or damage.	Adjust or repair linkage.
2. Hydraulic system.	All pressures within specifications. See PowrReverser™ Control Valve Tests later in this group.	Repair PowrReverser™ control valve.
3. PowrReverser™.	No evidence of wear or damage to PowrReverser™ components. Pistons, plates, and discs slide freely within cylinder.	Repair PowrReverser™.

OUO1085,0000214 –19–04OCT00–1/1

PowrReverser™ Engages Too Quickly or Too Slowly

CONDITIONS:

- Linkage adjustment and hydraulic tests in this group.
- Linkage and PowrReverser™ repair in Section 50, Group 12.

NOTE: Normal engagement of PowrReverser™ occurs within 1.5—2.5 seconds.

Test	Normal	If Not Normal
1. F-N-R linkage.	Linkage is adjusted properly and shows no evidence of wear or damage.	Adjust or repair linkage.
2. Hydraulic system.	All pressures within specifications. See PowrReverser™ Control Valve Tests later in this group.	Repair PowrReverser™ control valve.
3. PowrReverser™.	No evidence of wear or damage to PowrReverser™ components. Pistons, plates, and discs slide freely within cylinder.	Repair PowrReverser™.

OUO1085,0000215 –19–04OCT00–1/1

PowrReverser™ Does Not Disengage

CONDITIONS:

- Linkage adjustment and hydraulic tests in this group.
- Linkage and PowrReverser™ repair in Section 50, Group 12.

Test	Normal	If Not Normal
1. F-N-R linkage.	Linkage is adjusted properly and shows no evidence of wear or damage.	Adjust or repair linkage.
2. Hydraulic system.	All pressures within specifications. See PowrReverser™ Control Valve Tests later in this group.	Repair PowrReverser™ control valve.
3. PowrReverser™.	No evidence of wear or damage to PowrReverser™ components. Pistons, plates, and discs slide freely within cylinder.	Repair PowrReverser™.

OUO1085,0000216 –19–04OCT00–1/1

Gears Clash, Shift Hard, or Will Not Engage

CONDITIONS:

- Transmission and lever repair in Section 50, Group 16.

Test	Normal	If Not Normal
1. Speed and range shifter linkage.	Linkage is adjusted properly.	Adjust.
	Linkage shows no evidence of wear or damage.	Replace worn or damaged components.
2. Speed and range shifter assemblies.	All shafts operate smoothly. No evidence of wear or damage to shifters, arms, forks, or detent balls and springs. Shifter forks are not loose on shafts.	Replace worn or damaged components.
3. Transmission.	No evidence of wear or damage to gear teeth or splines. Gears that are splined to shafts are not loose. Gears that float on shafts turn freely. Shift collars and/or synchronizers slide freely between gears with no binding.	Clean and lubricate any binding parts. Replace worn or damaged components.

OUO1085,0000218 –19–04OCT00–1/1

Two Speeds Engage Together

CONDITIONS:

- Repair in Section 50, Group 16.

Test Location	Normal	If Not Normal
1. Speed and range shifter assemblies.	All shafts operate smoothly. No wear or damage to shaft detents. Detent ball assemblies installed properly and not worn or damaged. Springs not weak or broken.	Replace worn or damaged components.
2. Transmission.	No evidence of wear or damage to gear teeth or splines. Gears that are splined to shafts are not loose. Gears that float on shafts turn freely.	Replace worn or damaged components.
	All transmission components assembled correctly.	Reassemble.

OUO1085,0000219 –19–04OCT00–1/1

Transmission Will Not Stay in Gear

CONDITIONS:

- Repair in Section 50, Group 16.

Test Location	Normal	If Not Normal
1. Speed and range shifter assemblies.	All shafts operate smoothly. No wear or damage to shaft detents. Detent ball assemblies installed properly and not damaged. Springs not weak or broken.	Replace worn or damaged components.
2. Transmission.	No evidence of wear or damage to gear teeth, splines, shift collars, and/or synchronizers or shifter forks.	Replace worn or damaged components.

OUO1085,000021A –19–04OCT00–1/1

Transmission Noisy

CONDITIONS:

- Repair in Section 50, Group 16.

Test Location	Normal	If Not Normal
1. Transmission shafts.	Shafts and shaft bearings spin freely and without noise. No evidence of wear or damage to shaft splines or bearings.	Replace worn or damaged components.
2. Transmission gears.	Gears that are splined to shafts are not loose. Gears that float on shafts turn freely. Shift collars and/or synchronizers slide freely between gears with no binding. No evidence of wear or damage to gear teeth or splines.	Clean and lubricate any binding parts. Replace worn or damaged components.
3. Speed and range shift forks.	No evidence of wear, damage, or bent condition.	Replace worn or damaged components.
4. Park pawl assembly.	Park pawl retracts fully when disengaged.	Replace worn or damaged linkage or springs.

OUO1085,000021B –19–04OCT00–1/1

PTO Troubleshooting

PTO troubleshooting for units with PowrReverser™ transmission is the same as for units with collar shift or SyncShuttle™ transmissions. See Group 15 for information.

OUO1085,000021C –19–04OCT00–1/1

Differential Troubleshooting

Differential troubleshooting for units with PowrReverser™ transmission is the same as for units with collar shift or SyncShuttle™ transmissions. See Group 15 for information.

OUO1085,000021D –19–04OCT00–1/1

Axle Troubleshooting

Axle troubleshooting for units with PowrReverser™ transmission is the same as for units with collar shift or SyncShuttle™ transmissions. See Group 15 for information.

OUO1085,000021E –19–04OCT00–1/1

MFWD Troubleshooting

MFWD troubleshooting for units with PowrReverser™ transmission is the same as for units with collar shift or SyncShuttle™ transmissions. See Group 15 for information.

OUO1085,000021F –19–04OCT00–1/1

PowrReverser™ Control Valve Tests

NOTE: Tractor without cab shown; procedure for cab tractor is similar. Differences for cab tractors are noted below.

REASON:

To determine if PowrReverser™ control valve is functioning properly.

CONDITIONS:

Transmission pump producing correct flow and pressure. See Transmission Pump Flow Test later in this group.

Block front wheels (front and rear). Install suitable jack stands under rear axles to raise rear wheels off of floor.

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If equipped with MFWD, be sure MFWD is disengaged (or support front of tractor on jack stands).

Ensure that F-N-R, gear shift, range shift, PTO, and MFWD levers are in neutral or disengaged positions.

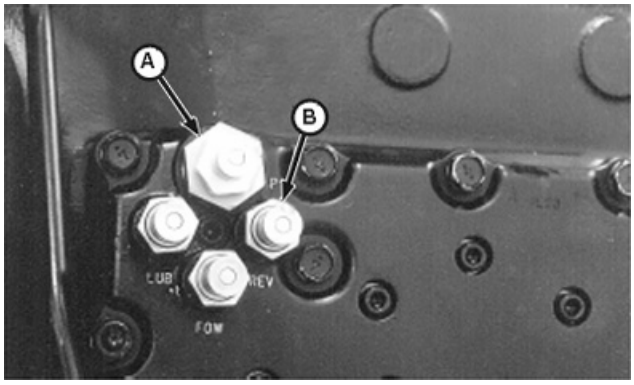
If equipped with cab, remove floor mat, clutch housing floor plate, and battery access plate on cab floor.

EQUIPMENT:

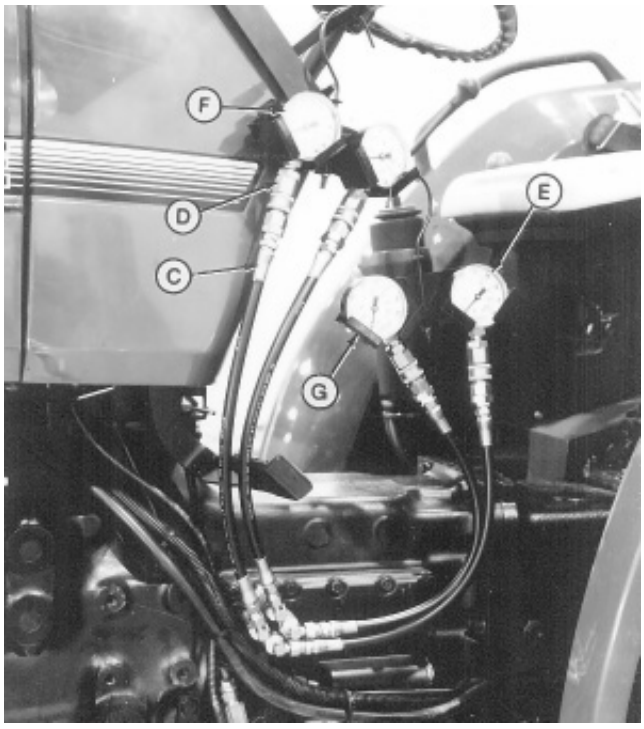
- JT07032 Gauge, 400 kPa (60 psi) (1 used)
- JT07041 Gauge, 2800 kPa (400 psi) (3 used)
- JT05498 Hose, 508 mm (20 in.) (4 used)
- JT03262 Adapter (4 used)
- JT03481 Hydraulic Test Kit, Includes:
  - JT03481-1, Male Quick Coupler (3)
  - JT03481-2, Male Quick Coupler Plug (1)
  - JT03481-3, Straight Fitting (1)
- JT03236 Elbow 45°, 1/8 M NPT, 1/8 F NPT (1 used)

CONNECTIONS:

1. Assemble four hoses (C) with adapters (D) and gauges (E and F).



LV1300A –UN–24APR01



LV1304A –UN–19JAN95

A—Adapter, JT03481-2 M20-1.5 x 1/8 FNPT (1 used)[1]
B—Diagnostic Receptacle, JT03481-1 (4 used)[1]
C—Hose, JT05498 (4 used)
D—Adapter, JT03262 (4 used)
E—Gauge, JT07041 (3 used)
F—Gauge, JT07032 (1 used)
G—Hangar, JDG196 (2 used)
H—Elbow 45°, JT03236 (1 used on Cab Tractors Only) (Elbow Not Shown)

[1]Part of Kit JT03481

Continued on next page

2. Install adapter (A) in top port “P” on PowrReverser™ control valve.

Continued on next page

3. On tractors with cab, install 45° elbow in “FOW” port facing downward.

NOTE: On tractors equipped with cab, route one hose with 2800 kPa (400 psi) gauges to the “FOW” port through the battery access hole on cab floor.

4. Install adapters (B) in “P”, “FOW”, “REV”, and “LUB” ports. Connect hoses with 2800 kPa (400 psi) gauges to “P”, “FOW”, and “REV” ports.

5. Connect hose with 400 kPa (60 psi) gauge to “LUB” port.

PROCEDURES:

This procedure requires checking hydraulic pressures in each of five operating modes. Perform each test at 2400 rpm engine speed. Record pressures for each test, compare with specifications, and then proceed to the next test.

250
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12

Test #1: Initial Start-Up, Clutch Pedal Up

1. Start engine without depressing clutch pedal.

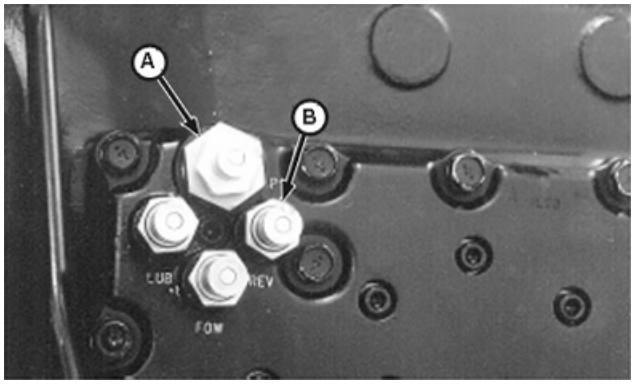
2. Record pressures on all four gauges at 2400 rpm engine speed. Compare readings to specifications.

POWRREVERSER™ CONTROL VALVE TEST SPECIFICATIONS INITIAL START-UP, CLUTCH PEDAL UP					
Engine	**Pressure at test ports:**				
RPM	**P[a]**	**FOW**	**REV**	**LUB**	
2400	2550±296	0	0	0	kPa
	(25.5±3)	0	0	0	(bar)
	(370±30)	0	0	0	(psi)
[a]Note "P" is pump pressure.					

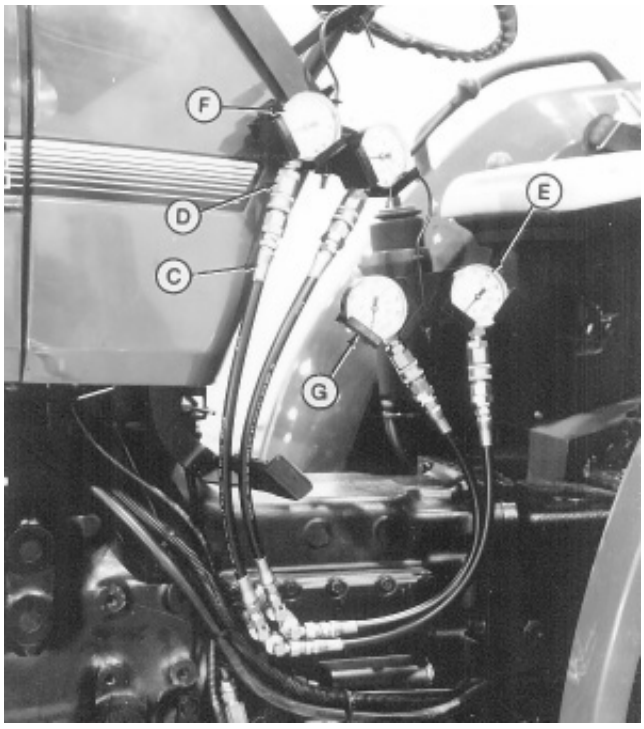
If pressures are within specifications, proceed to Test #2.

If pressures are low, minimum specification 2254 kPa (340 psi):

- Filter in Port P may be restricted.



LV1300A –UN–24APR01



LV1304A –UN–19JAN95

A—Adapter, JT03481-2 M20-1.5 x 1/8 FNPT (1 used)[1]
B—Diagnostic Receptacle, JT03481-1 (4 used)[1]
C—Hose, JT05498 (4 used)
D—Adapter, JT03262 (4 used)
E—Gauge, JT07041 (3 used)
F—Gauge, JT07032 (1 used)
G—Hangar, JDG196 (2 used)
H—Elbow 45°, JT03236 (1 used on Cab Tractors Only) (Elbow Not Shown)

[1]Part of Kit JT03481

Continued on next page

- Main relief valve or engagement override valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.

Test #2: F-N-R Lever in Neutral, Clutch Pedal Down

With F-N-R lever in neutral, hold clutch pedal down. Record pressures on all four gauges at 2400 rpm engine speed. Compare readings to specifications.

POWRREVERSER™ CONTROL VALVE TEST SPECIFICATIONS F-N-R LEVER IN NEUTRAL, CLUTCH PEDAL DOWN @ 140±23°F (60±10°C) OIL TEMPERATURE					
Engine	**Pressure at test ports:**				
RPM	**P[a]**	**FOW**	**REV**	**LUB**	
2400	510±200	0	0	0	kPa
	(5.10±2)	0	0	0	(bar)
	(74±30)	0	0	0	(psi)
[a]Note "P" is pump pressure.					

If pressures are within specifications, proceed to Test #3.

If pressures are low, minimum specification 310 kPa (34 psi):

- Clutch pedal valve or modulation relief valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.

If no pressure is recorded at port P:

- Check clutch pedal adjustment. The clutch pedal adjustment determines the engagement of the (EOV) engagement override valve.

Test #3: F-N-R Lever in Neutral, Clutch Pedal Up

With F-N-R lever in neutral, return clutch pedal to raised position. Record pressures on all four gauges at 2400 rpm engine speed. Compare readings to specifications.

Continued on next page

POWRREVERSER™ CONTROL VALVE TEST SPECIFICATIONS F-N-R LEVER IN NEUTRAL, CLUTCH PEDAL UP					
Engine	**Pressure at test ports:**				
RPM	**P[a]**	**FOW**	**REV**	**LUB**	
2400	310±200	76±50	76±50	0	kPa
	(3.10±1.9)	(0.76±49)	(0.76±49)	0	(bar)
	(45±15)	(11±7)	(11±7)	0	(psi)
[a]Note "P" is pump pressure.					

If pressures are within specifications, proceed to Test #4.

If pressures are low, minimum specification 110 kPa (30 psi):

- Modulation valve or lube cut-off valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.
- Seals on traction drive shaft may be leaking.
- PowrReverser™ piston(s) may be leaking.

If pressure is high in FOW or REV, maximum 126 kPa (18 psi):

- The F-N-R valve may not be in neutral. Inspect or adjust the F-N-R lever linkage.

Test #4: F-N-R Lever in Forward, Clutch Pedal Up

CAUTION: Be sure rear of tractor is supported on jack stands, and that MFWD (if equipped) is disengaged, or raise front wheels off of floor also.

Shift F-N-R lever to forward, and return clutch pedal to raised position. Record pressures on all four gauges at 2400 rpm engine speed. Compare readings to specifications.

Continued on next page

POWRREVERSER™ CONTROL VALVE TEST SPECIFICATIONS F-N-R LEVER IN FORWARD, CLUTCH PEDAL UP					
Engine	**Pressure at test ports:**				
RPM	**P[a]**	**FOW**	**REV**	**LUB**	
2400	1950±150	1813±150	0	145±70	kPa
	(19.50±1.5)	(18.13±1.5)	0	(1.45±7)	(bar)
	(280±22)	(258±28)	0	(21±10)	(psi)
[a]Note "P" is pump pressure.					

If pressures are within specifications, proceed to Test #5.

If pressures are low at test ports P or FOW, minimum 1663 kPa (230 psi):

- Modulation valve or lube cut-off valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.
- Seals on traction drive shaft may be leaking.
- PowrReverser™ piston may be leaking.

If pressures are low at test port LUB, minimum 75 kPa (11 psi):

- Modulation valve, lube relief valve, or lube cut-off valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.
- Seals on traction drive shaft may be leaking.

Test #5: F-N-R Lever in Reverse, Clutch Pedal Up

Shift F-N-R lever to reverse and return clutch pedal to raised position. Record pressures on all four gauges at 2400 rpm engine speed. Compare readings to specifications.

POWRREVERSER™ CONTROL VALVE TEST SPECIFICATIONS F-N-R LEVER IN REVERSE, CLUTCH PEDAL UP					
Engine	**Pressure at test ports:**				
RPM	**P[a]**	**FOW**	**REV**	**LUB**	
2400	1950±150	0	1813±150	145±70	kPa
	(19.50±1.5)	0	(18.13±1.5)	(1.45±7)	(bar)
	(280±22)	0	(258±28)	(21±10)	(psi)
[a]Note "P" is pump pressure.					

Continued on next page

If pressures are low at test ports P or REV, minimum 1663 kPa (230 psi):

- Modulation valve or lube cut-off valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.
- Seals on traction drive shaft may be leaking.
- PowrReverser™ piston may be leaking.

If pressures are low at test port LUB, minimum 75 kPa (11 psi):

- Modulation valve, lube relief valve, or lube cut-off valve may be leaking.
- Gaskets in PowrReverser™ control valve may be leaking.
- Seals on traction drive shaft may be leaking.

OUO1085,0000220 –19–12APR04–7/7

Transmission Pump Flow Test

NOTE: Tractor without cab shown, procedure for cab tractor is similar.

Differences for cab tractors are noted below.

REASON:

To determine if transmission pump can provide adequate flow under pressure.

EQUIPMENT:

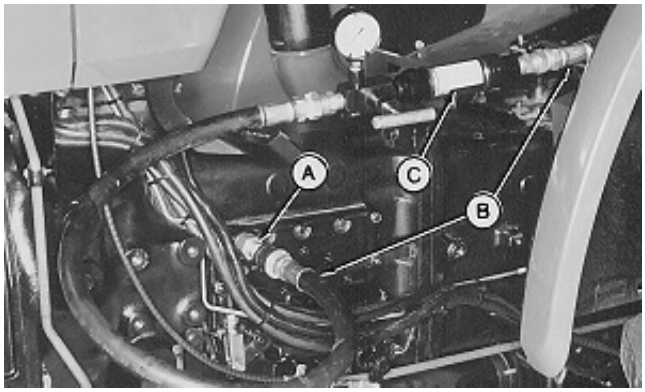
- JT03481 Hydraulic Test Kit, Includes:
  - JT03481-1, Male Quick Coupler (3)
  - JT03481-2, Male Quick Coupler Plug (1)
  - JT03481-3, Straight Fitting (1)
- JT05469 Flowmeter

CONNECTIONS:

1. If equipped with cab, remove floor mat and clutch housing floor plate.
2. Remove plug from port “P” on PowrReverser™ control valve.
3. Connect flowmeter hose to adapter.
4. Install adapter and flowmeter to control valve.
5. Insert flowmeter return hose into hydraulic oil fill at rear of tractor.

PROCEDURE:

1. Fully open flowmeter control valve.
2. Start tractor without depressing clutch pedal and run engine at 2400 rpm.



LV1218A –UN–13MAR95

A—JT03481-3 Adapter, M20-1.5 x 3/4 FNPT[1]
B—JT05531 Hose (2 used)[2]
C—Flowmeter[2]

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[1]Part of JT03481 Hydraulic Test Kit

[2]Part of JT05469 Flowmeter Kit

Continued on next page

3. Adjust flowmeter control valve until 1900 kPa (17 bar) (250 psi) shows on gauge.

4. Record flow, then release pressure.

RESULTS:

If flow is less than minimum 21.0 L/min (5.5 gpm) at 2400 rpm:

- The mesh filter in the differential case may be restricted.
- The transmission pump suction line may be restricted or leaking air.
- The seals in the transmission drive shaft (between the transmission pump and the PowrReverser™ control valve) may be leaking.
- The PowrReverser™ control valve gaskets may be leaking.
- The pump may be worn or damaged, requiring repair or replacement.

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16
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OUO1085,0000221 –19–05OCT00–2/2

Forward-Neutral-Reverse Control Cable Adjustment

IMPORTANT: The following adjustments are critical for the proper operation of this equipment. This adjustment is done to center the forward and reverse free play of the control lever along the forward/reverse slot. Failure to follow the instructions below may result in personal injury and equipment damage.

1. Move the PowrReverser™ control lever (A) into the park slot.

A—PowrReverser™ Control Lever

LV6500 –UN–27AUG02

Continued on next page

OUO1023,0000412 –19–12APR04–1/7

2. Loosen jam nut (A) on forward-neutral-reverse cable yoke.

3. Remove cotter pin (C) and retaining pin (B).

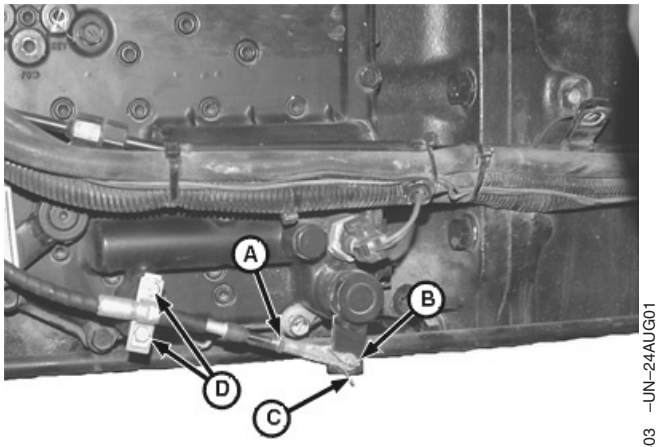
4. Remove cap screws (D) and inspect cable clamp for wear or damage, replace if necessary. Apply medium strength thread lock and sealer to screws (D). Install cable clamp and cap screws (D). Tighten cap screws to specification.

Specification

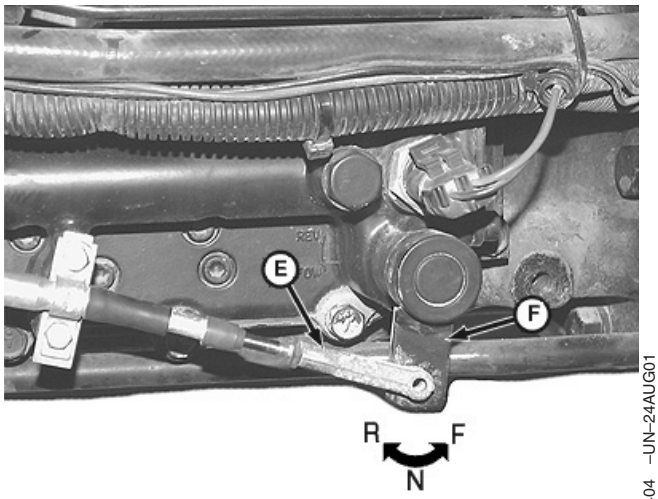
Forward-Neutral-Reverse Cable
Clamp Cap Screws—Torque..... 11 N•m (8.5 lb-ft)

5. The control valve lever (F) must be set and remain in the neutral position for proper adjustment. Move the yoke (E) away from the lever. To ensure the lever is in neutral, move the lever to forward, to reverse, and then to the neutral position.

A—Jam Nut
B—Retaining Pin
C—Cotter Pin
D—Cap Screw (2 used)
E—Yoke
F—Control Valve Lever



LV7403 –UN–24AUG01



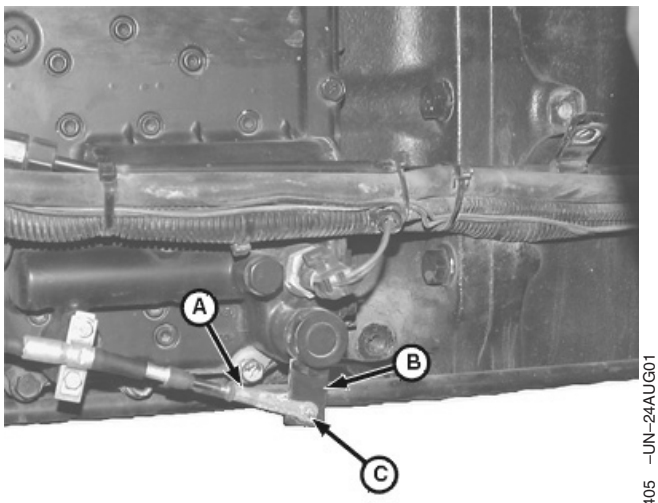
LV7404 –UN–24AUG01

OUO1023,0000412 –19–12APR04–2/7

6. Turn the yoke (A) on the forward-neutral-reverse cable in or out until the holes in the control valve lever (B) and the yoke (A) are aligned and the retaining pin (C) can be installed and slide freely into the holes. Install the retaining pin (C) but do not install cotter pin at this time.

7. Remove the neutral alignment tool from controller.

A—Yoke
B—Control Valve Lever
C—Retaining Pin



LV7405 –UN–24AUG01

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OUO1023,0000412 –19–12APR04–3/7

8. Position PowrReverser™ control lever in to the reverse position.

9. Place a piece of masking tape (B) over the neutral crossover slot. Make sure that the right edge (A) of masking tape (B) only covers one half of the neutral crossover tabs (C) as shown in photo.

10. Move the control lever (D) next to the neutral crossover slot. Slowly move the control lever into the neutral crossover slot just to the right edge (A) of the masking tape (B). Do not disturb the position of the masking tape.

11. Center the control lever (D) between the neutral crossover tabs (C), without touching the tabs.

12. While holding the control lever (D) centered between the neutral crossover tabs (C), place a mark on the masking tape as shown in photo along the top (E) and bottom (F) surfaces of the control lever.

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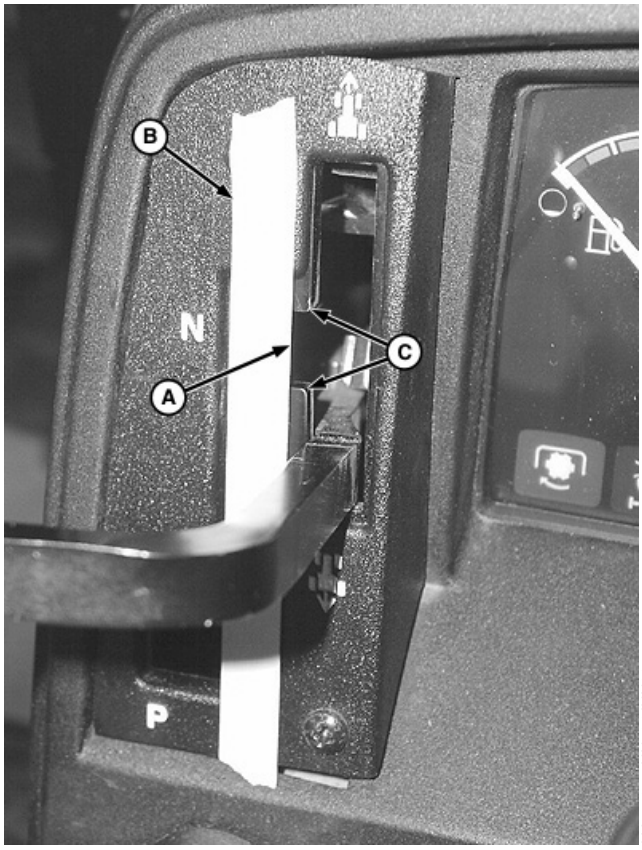
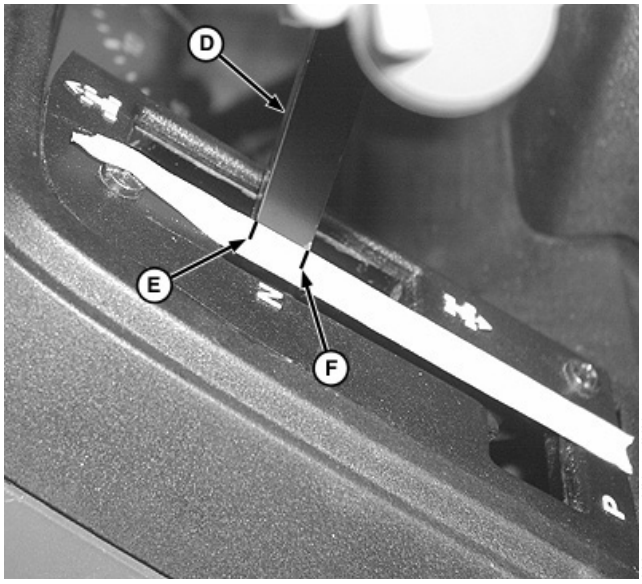
A—Right Edge
B—Masking Tape
C—Neutral Crossover Tabs
D—Control Lever
E—Top Mark
F—Bottom Mark



LV7559 –UN–24JUN03



LV7560 –UN–24JUN03

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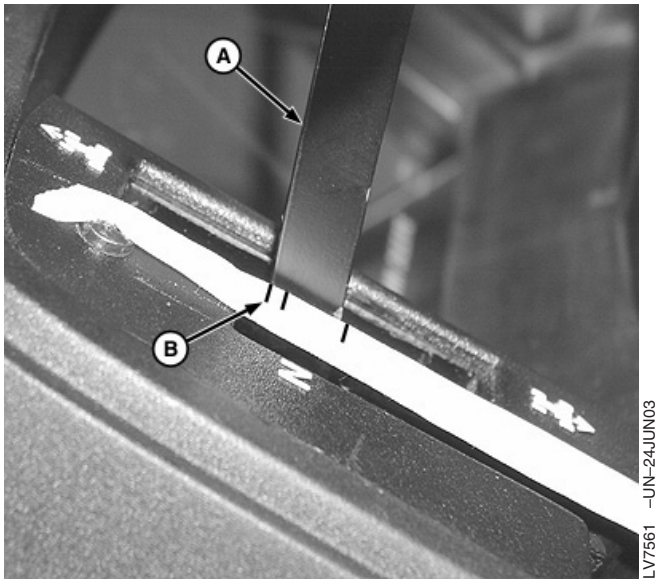
OUO1023,0000412 –19–12APR04–4/7

13. Move the control lever (A) slowly out of the neutral crossover slot and push the control lever forward until resistance is felt, this is the top of the neutral detent. Place a mark (B) on the masking tape along the top surface of the control lever as shown in photo.

14. Slowly pull control lever (A) rearward until resistance is felt, this is the bottom of the neutral detent. Place a mark (C) on the masking tape along the bottom surface of the control lever as shown in photo.

A—Control Lever
B—Forward Tape Mark
C—Rearward Tape Mark



LV7561 –UN–24JUN03

LV7562 –UN–24JUN03

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OUO1023,0000412 –19–12APR04–5/7

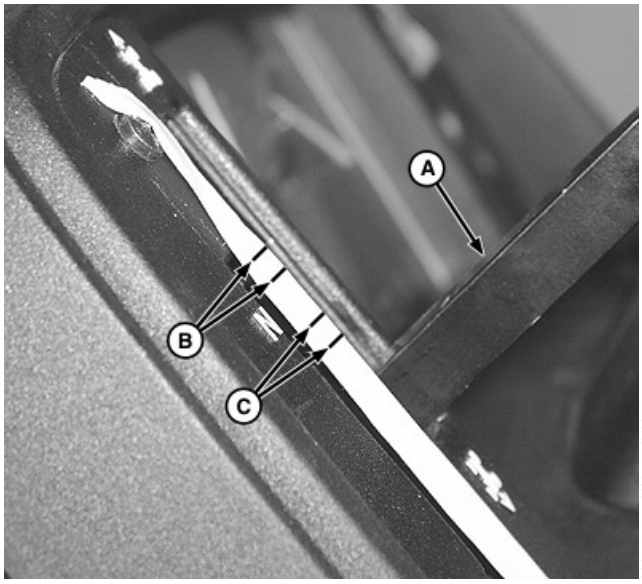
15. Position the control lever (A) in reverse.

16. Measure the distance between the top two marks (B) and the bottom two marks (C) on the masking tape.

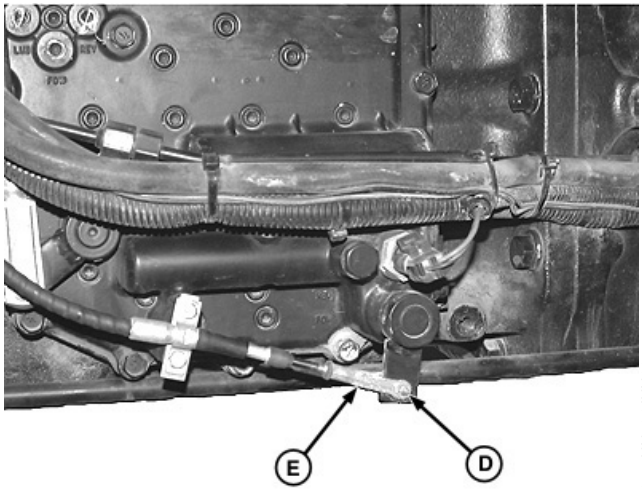
17. Record and compare the two measurements. If measurements are not equal remove the retaining pin (D) and turn yoke (E) in or out until the two measurements (B and C) at control lever are equal.

18. Repeat steps 11 through 20 of Adjust Forward-Neutral-Reverse Cable using a new piece of masking tape if measurements are not equal.

A—Control Lever
B—Top Two Marks
C—Bottom Two Marks
D—Retaining Pin



LV7532 –UN–24JUN03



LV7533 –UN–24JUN03

250
16
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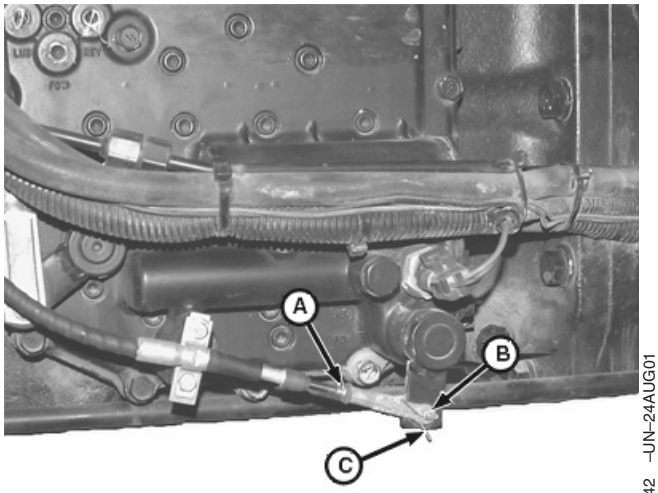
OUO1023,0000412 –19–12APR04–6/7

19. Install retaining pin (B), cotter pin (C) and tighten jam nut (A) securely.

A—Jam Nut
B—Retaining Pin
C—Cotter Pin



LV7542 –UN–24AUG01

OUO1023,0000412 –19–12APR04–7/7

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16
23

Clutch Pedal Linkage Adjustment

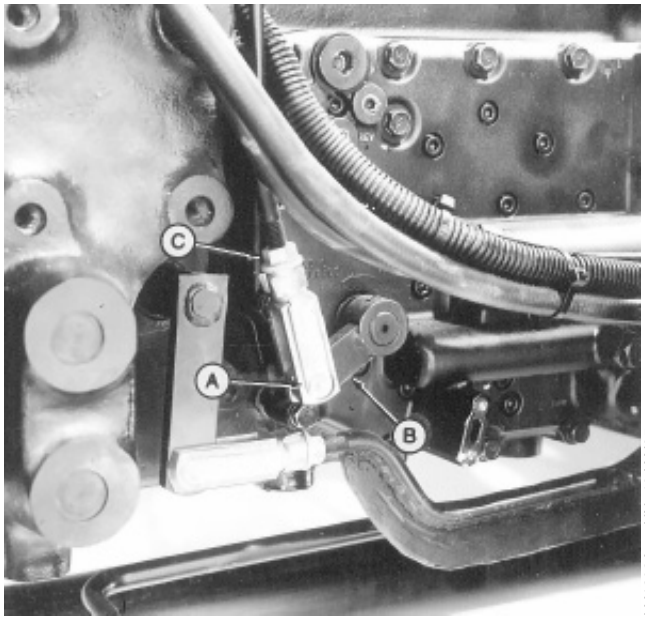
1. Block tires (front and rear).
2. Remove left-hand dash cowl and disconnect clutch pedal return spring.
3. Disconnect long PTO rod assembly at both ends and remove assembly.
4. Remove left-hand step.
5. Remove clevis pin (A) and disconnect clevis from clutch control arm (B).
6. Push clutch pedal down fully and retain in this position.

NOTE: The clutch control arm is spring loaded in both directions from its free position. You must feel the spring in both directions to assure that control arm is in its free position and not stuck in either direction, before linkage can be adjusted.

7. Using a wrench, turn clutch control arm clockwise until it stops.
8. Loosen jam nut (C) on clutch rod and adjust rod length until clevis pin can be inserted through holes in clevis and hole in clutch control arm when clutch is fully depressed and control arm is rotated fully clockwise. Remove clevis pin and rotate clevis 1/2 turn (to lengthen rod) and tighten jam nut.
9. Install clevis pin and locking clip.
10. Install left-hand step and long PTO rod assembly. (See PTO Clutch Lever Adjustment in Group 15 for adjustment procedure.)

NOTE: Whenever a tractor engine is started with PowrReverser™ lever in park or neutral, the tractor is designed not to move unless clutch pedal is fully depressed one time to cycle engagement override valve.

11. Install clutch return spring and dash cowl. Test clutch operation or perform PowrReverser™ control valve tests.



LV1303A –UN–19JAN95

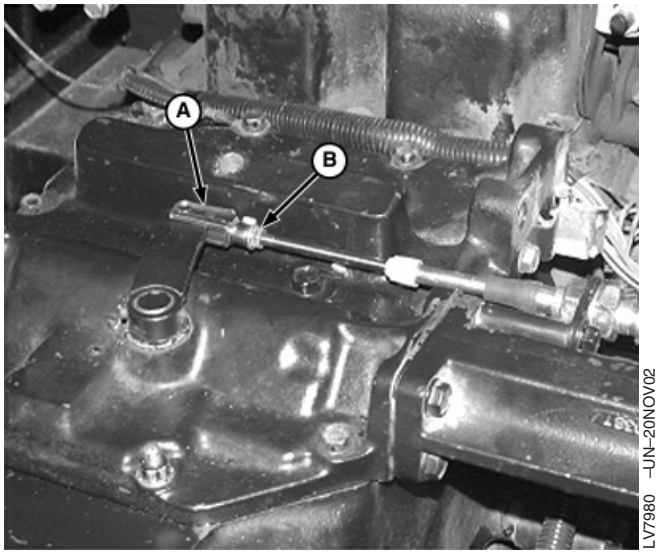
A—Clevis Pin
B—Clutch Control Arm
C—Jam Nut

OUO1085,0000223 –19–05OCT00–1/1

Park Brake Cable Adjustment

IMPORTANT: The following adjustments are critical for the proper operation of this equipment. Failure to follow the instructions below may result in personal injury and equipment damage.

1. Park tractor on flat level surface. Place wheel chuaks in front and behind rear tiers.
2. Remove seat and support (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)
3. Remove spring locking pin (A) and loosen jam nut (B).



LV7980 –UN–20NOV02

A—Spring Locking Pin
B—Jam Nut

250
16
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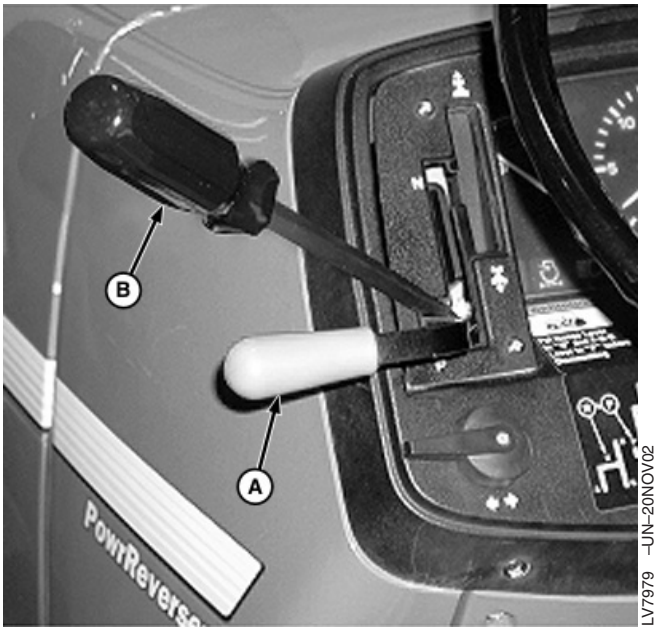
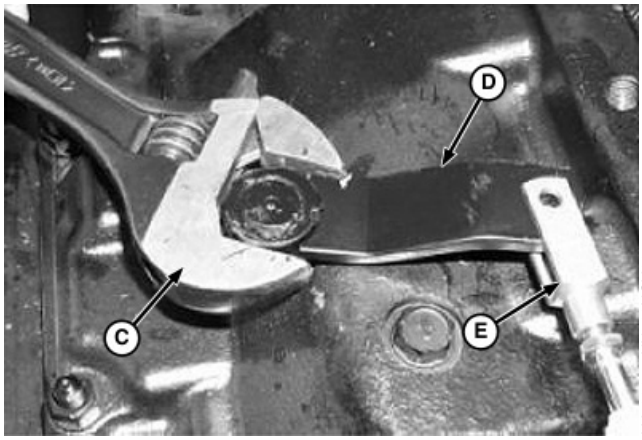
OUO1085,0000224 –19–13NOV02–1/2

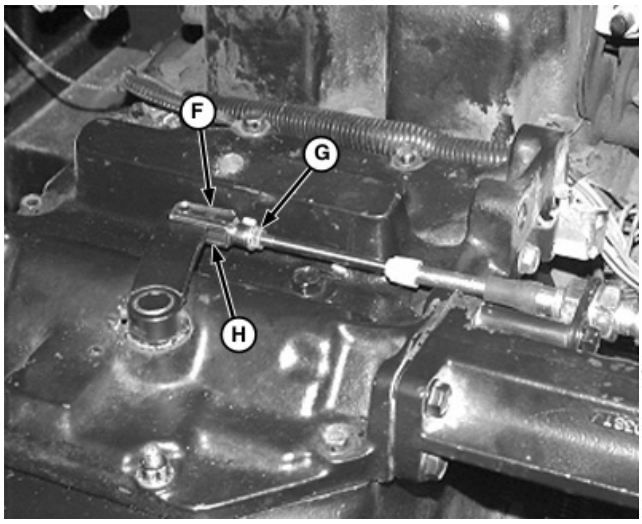


LV7979 –UN–20NOV02

4. Position and hold the shift control lever (A) in the bottom of park slot using a screwdriver (B) as a wedge.
5. Position and hold the park engagement lever (D) fully engaged to the left side of tractor using a wrench (C).
6. Pull cable toward park engagement lever (D) to remove any slack in cable.
7. Using the spring locking pin to check alignment, turn yoke (E) on park brake cable until hole in yoke aligns with hole in park engagement lever (D).
8. Shorten the cable by turning yoke (H) four full turns clockwise.
9. Remove wrench (C) from park engagement lever (D) and screwdriver (B) from shift control lever (A).
10. Move the shift control lever to the neutral position.
11. Install spring locking pin (F) and tighten jam nut (G) against back of yoke (H).
12. Install seat and support. (See Remove and Install Seat and Support—Tractors Without Cab or Remove and Install Seat and Support Plate—Tractors With Cab in Section 90, Group 05.)



LV7981 –UN–20NOV02

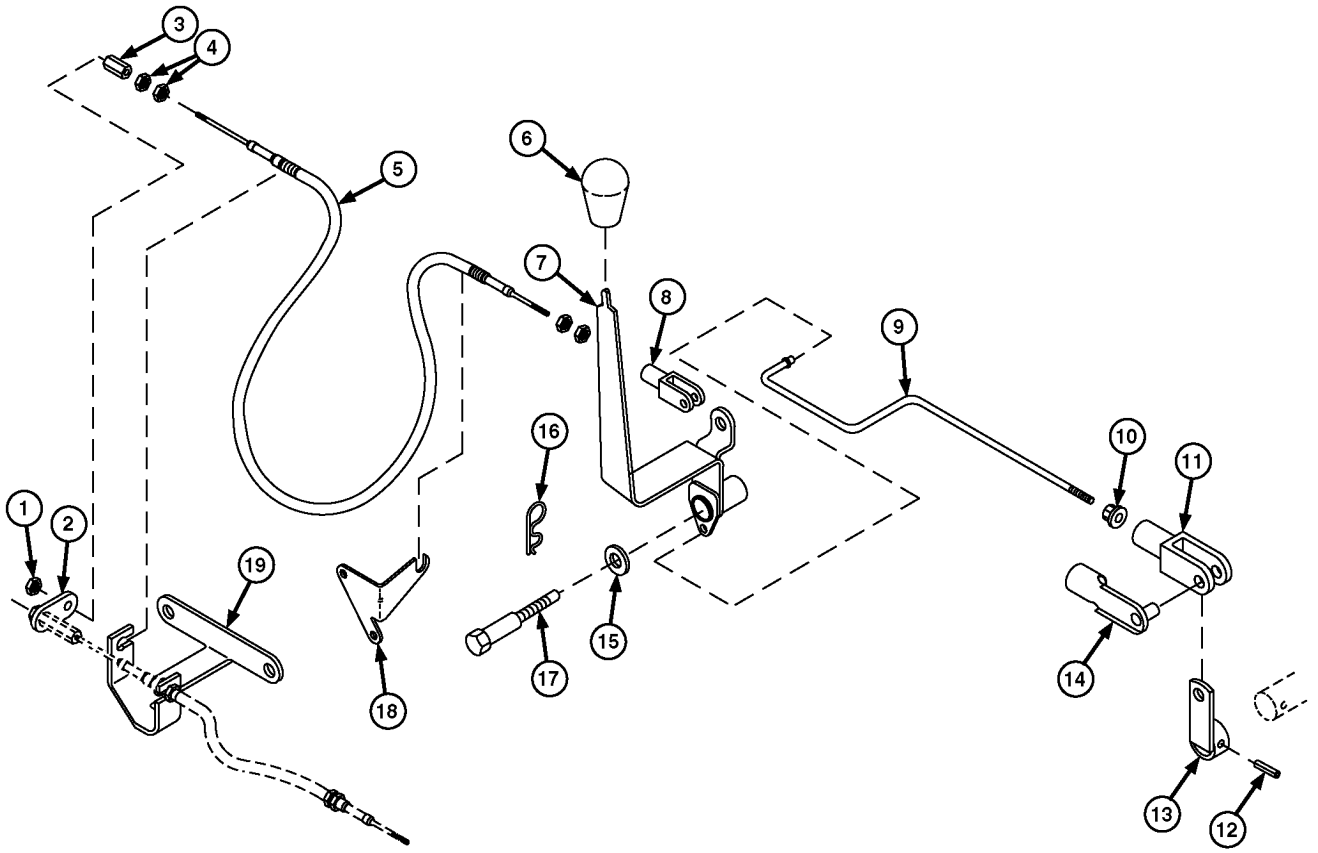


LV7982 –UN–20NOV02

A—Shift Control Lever
B—Screwdriver
C—Wrench
D—Park Engagement Lever
E—Yoke
F—Spring Locking Pin
G—Jam Nut
H—Yoke

OUO1085,0000224 –19–13NOV02–2/2

PTO 540/540E Lever and Linkage Adjustment



LV2463 –UN–05JAN98

1—Nut	6—Knob	11—Yoke	16—Retaining Clip
2—Plate	7—Lever	12—Pin	17—Bolt
3—Adjustment Nut	8—Yoke	13—Arm	18—Bracket
4—Nut (4 used)	9—Rod	14—Spring Locking Pin	19—Control Bracket
5—Control Cable	10—Nut	15—Washer	

1. Remove spring locking pin (14) and disconnect yoke (11) from arm (13).
2. Shift arm (13) to forward position.
3. Position lever (7) approximately 15 degrees forward of vertical.
4. Adjust yoke (11) so spring locking pin (14) aligns with hole in yoke and arm (13). Install spring locking pin and tighten nut (10).

OUO1085,0000225 –19–05OCT00–1/1

Section 260
Steering and Brake Operation, Tests, and Adjustments

Contents

Page

Component Location Information

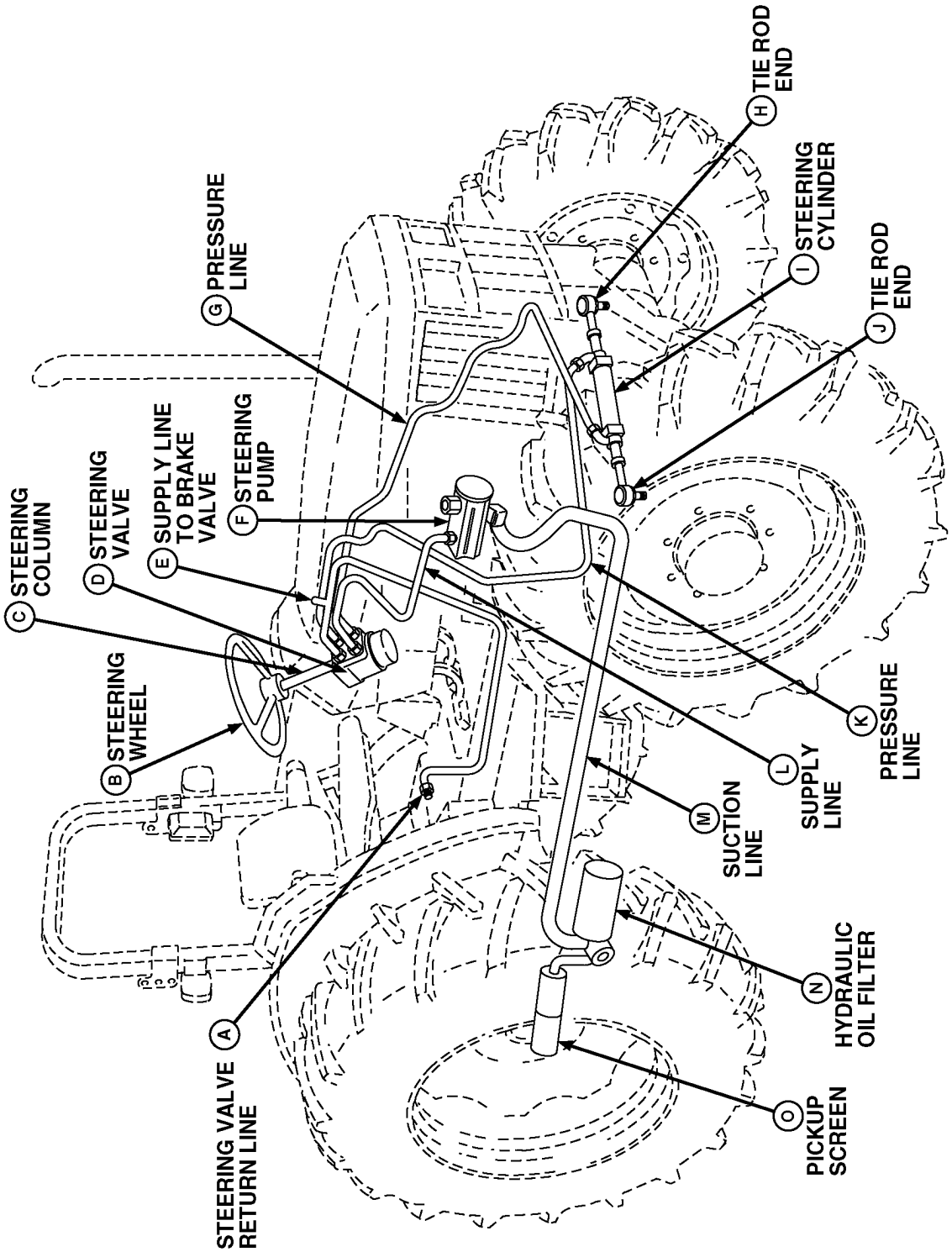
This group contains component location drawings for the following steering and brake system components:

- Steering System—5210, 5310, 5410, and 5510 Tractors, With or Without Cab
- Brake System

Use the drawings when troubleshooting steering and brake problems to help locate the components to be tested.

OUO1085,0000226 –19–05OCT00–1/1

Steering System Components—5210, 5310, and 5410 Without Cab



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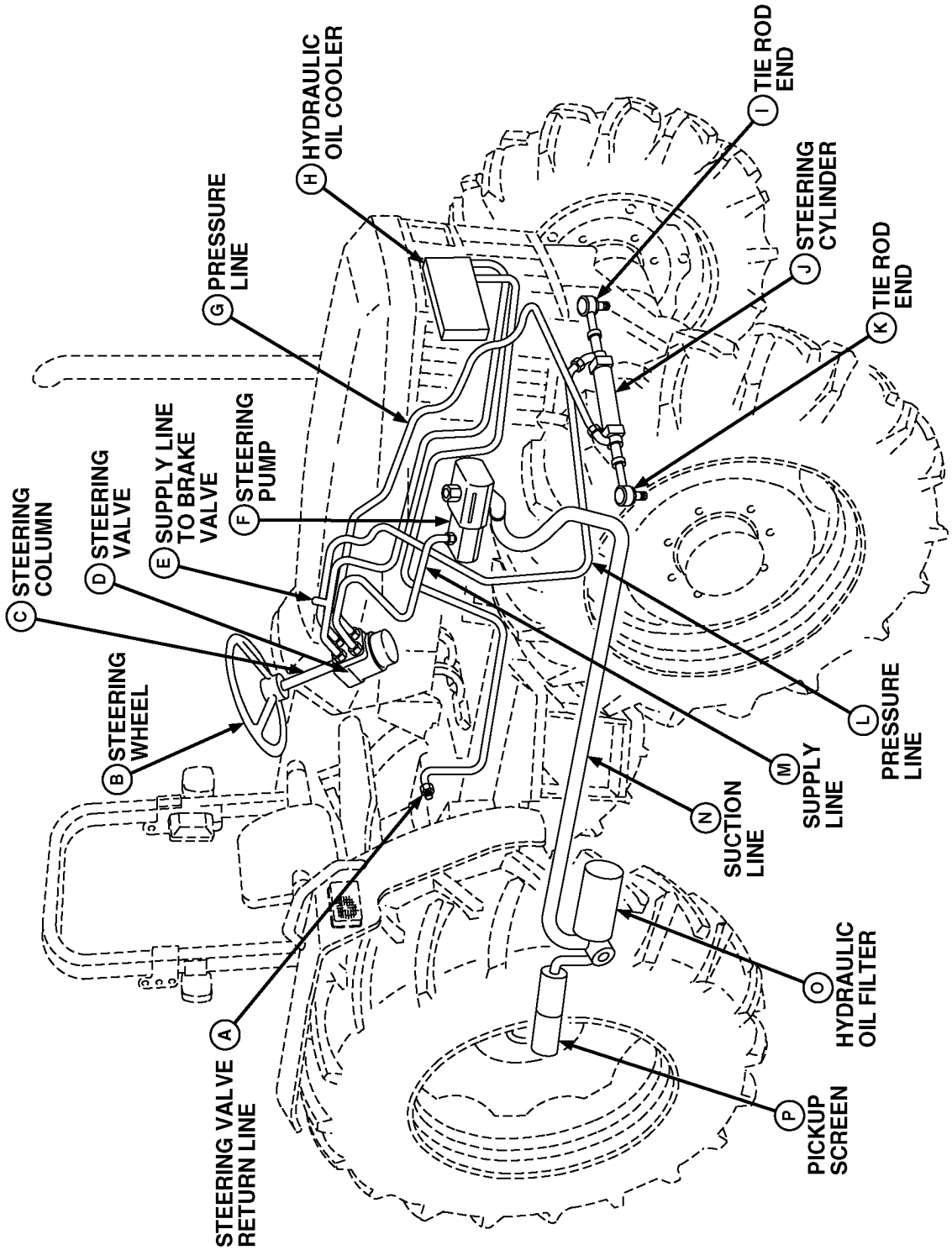
A—Steering Valve Return Line
B—Steering Wheel
C—Steering Column
D—Steering Valve
E—Supply Line to Brake Valve
F—Steering Pump
G—Pressure Line
H—Tie Rod End
I—Steering Cylinder
J—Tie Rod End
K—Pressure Line
L—Supply Line
M—Suction Line
N—Hydraulic Oil Filter
O—Pickup Screen

OUO1085,0000227 –19–25JUL02–2/2

Steering System Components—5510 and All Cab Units



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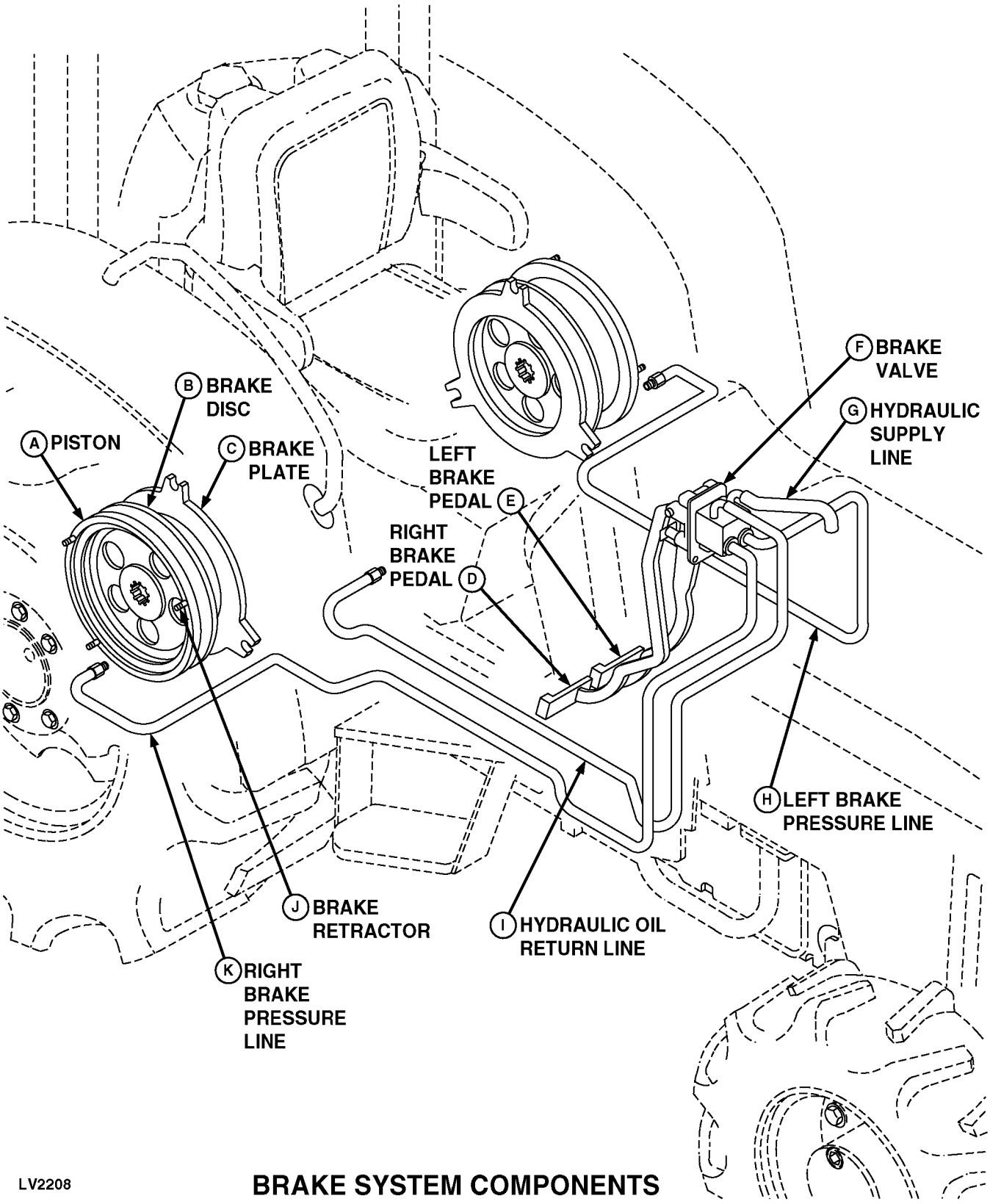
A—Steering Valve Return Line
B—Steering Wheel
C—Steering Column
D—Steering Valve
E—Supply Line to Brake Valve
F—Steering Pump
G—Pressure Line
H—Hydraulic Oil Cooler
I—Tie Rod End
J—Steering Cylinder
K—Tie Rod End
L—Pressure Line
M—Supply Line
N—Suction Line
O—Hydraulic Oil Filter
P—Pickup Screen

NOTE: Model 5510 and all tractors with cab are equipped with hydraulic oil cooler.

OUO1085,0000228 –19–06OCT00–2/2

Brake System Components



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OUO1085,0000229 –19–06OCT00–1/2

A—Piston
B—Brake Disc
C—Brake Plate
D—Right Brake Pedal
E—Left Brake Pedal
F—Brake Valve
G—Hydraulic Oil Supply Line
H—Left Brake Pressure Line
I—Hydraulic Oil Return Line
J—Brake Retractor
K—Right Brake Pressure Line

NOTE: Brake valve supply line (G) is connected to steering valve return line.

The tractor is equipped with a mechanical park brake. The park brake linkage is part of the transmission assembly.

OUO1085,0000229 –19–06OCT00–2/2

Theory of Operation Information

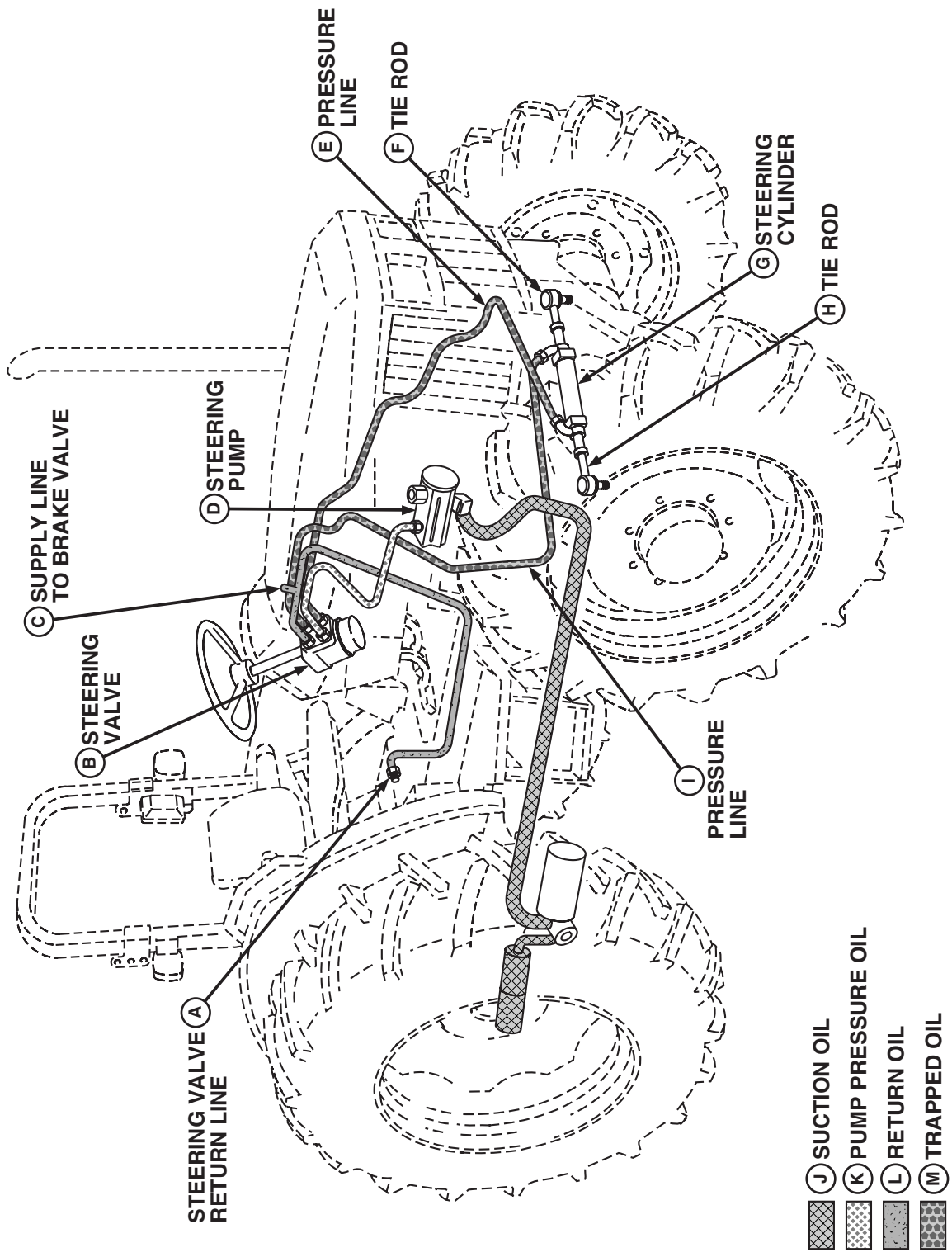
This group divides the steering and brake system into individual components by function. The theory of operation story explains: function of the component, operating conditions, components used, and system operation.

The following systems or components are covered in this group:

- Power Steering System—5210, 5310, and 5410 Tractors Without Cab
- Power Steering System—5510 Tractors and All Units With Cab
- Power Steering Valve
- Brake System
- Brake Valve

OUO1085,000022A –19–25JUL02–1/1

Steering System Operation—5210, 5310, and 5410 Without Cab



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OUO1085,000022B –19–06OCT00–1/2

A—Steering Valve Return Line
B—Steering Valve
C—Supply Line to Brake Valve
D—Steering Pump
E—Pressure Line (Right Turn)
F—Tie Rod
G—Steering Cylinder
H—Tie Rod
I—Pressure Line (Left Turn)
J—Suction Oil
K—Pump Pressure Oil
L—Return Oil
M—Trapped Oil

FUNCTION:

Offer hydraulic power steering for ease of operation.

MAJOR COMPONENTS:

- Steering Valve
- Hydraulic Pump
- Steering Cylinder

THEORY OF OPERATION:

The steering pump (D) takes filtered suction oil (J) from the transmission sump and pressurizes it. Pressure oil (K) is supplied to the steering valve (B). The steering valve distributes oil through pressure lines (E and I) to the steering cylinder (G) as needed.

Under neutral steer conditions (no steering wheel movement), the pressure lines and steering cylinder contain trapped oil (M), which maintains steering direction. Turning the steering wheel to the right, even a slight amount, allows pressure oil to enter line (E), pushing the steering cylinder rod and left tie rod (F) outward (and pulling the right tie rod (H) inward). Under these conditions line (I) allows return oil to flow from the steering cylinder to the steering valve and through steering valve return line (A) to the transmission. This return oil lubricates the transmission top shaft before returning to sump.

When the steering wheel is turned to the left, pressure oil enters line (I) pushing the steering cylinder rod and right tie rod (H) outward (and pulling the left tie rod (F) inward). Return oil can flow through line (E) from the steering cylinder to the steering valve and through steering valve return line to the transmission.

NOTE: The steering valve is designed to allow manual steering if the engine is not running or the hydraulic pump fails.

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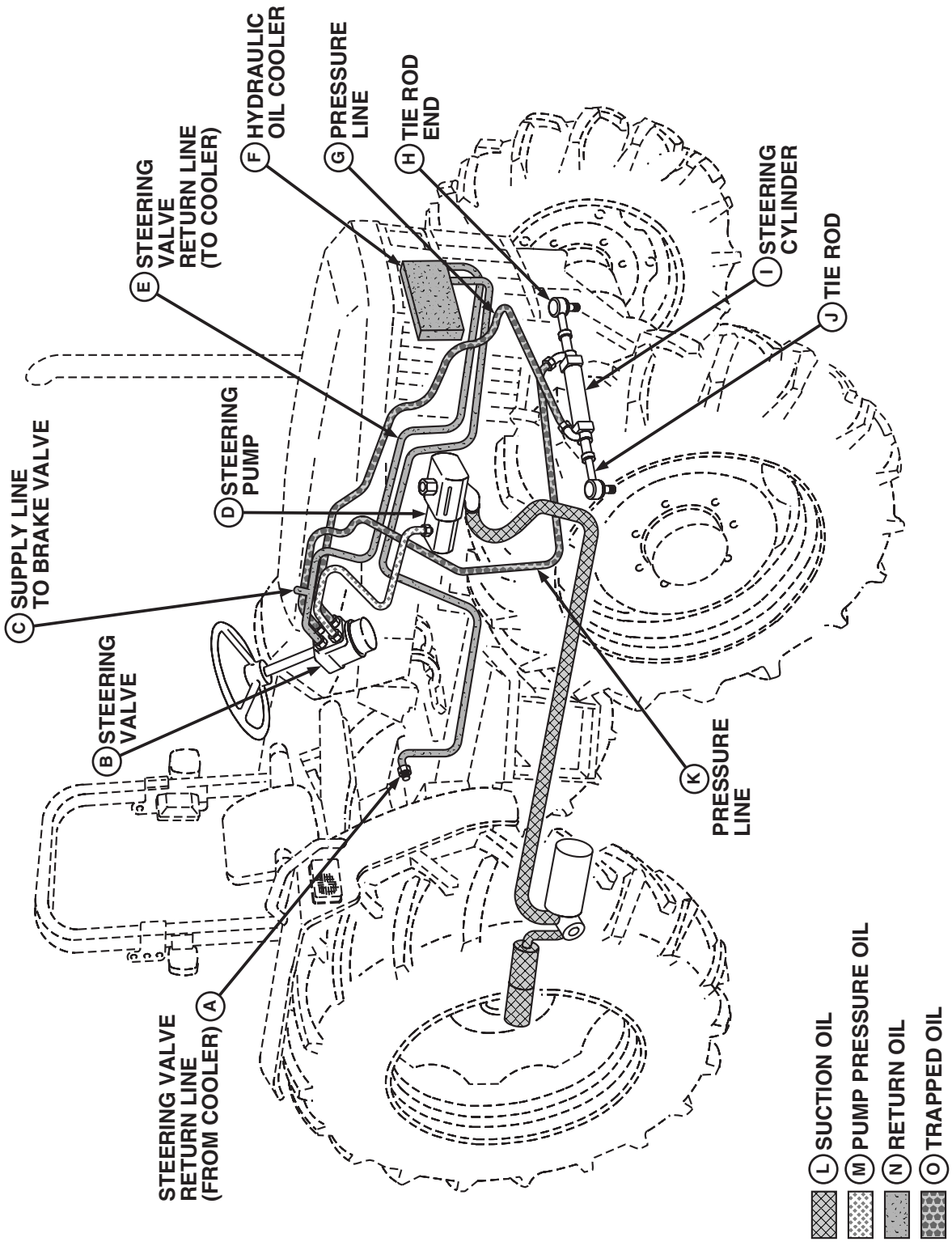
OUO1085,000022B –19–06OCT00–2/2

Steering System Operation—5510 and All Cab Units



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OUO1085,000022C –19–06OCT00–1/2

A—Steering Valve Return Line (From Cooler)
B—Steering Valve
C—Supply Line to Brake Valve
D—Steering Pump
E—Steering Valve Return Line (To Cooler)
F—Hydraulic Oil Cooler
G—Pressure Line (Right Turn)
H—Tie Rod
I—Steering Cylinder
J—Tie Rod
K—Pressure Line (Left Turn)
L—Suction Oil
M—Pump Pressure Oil
N—Return Oil
O—Trapped Oil

NOTE: Model 5510 and all tractors with cab are equipped with hydraulic oil cooler.

FUNCTION:

Offer hydraulic power steering for ease of operation.

MAJOR COMPONENTS:

- Steering Valve
- Steering Pump
- Steering Cylinder
- Hydraulic Oil Cooler

THEORY OF OPERATION:

The steering pump (D) takes filtered suction oil (L) from the transmission sump and pressurizes it. Pressure oil (M) is supplied to the steering valve (B). The steering valve distributes oil through pressure lines (G and K) to the steering cylinder (I) as needed.

Under neutral steer conditions (no steering wheel movement), the pressure lines and steering cylinder contain trapped oil (O), which maintains steering direction. Turning the steering wheel to the right, even a slight amount, allows pressure oil to enter line (G), pushing the steering cylinder rod and left tie rod (H) outward (and pulling the right tie rod (J) inward). Under these conditions line (K) allows return oil to flow from the steering cylinder to the steering valve. From the steering valve, return oil flows through steering valve return line (E), hydraulic oil cooler (F) and steering valve return line (A) to the transmission. This return oil lubricates the transmission top shaft before returning to sump.

When the steering wheel is turned to the left, pressure oil enters line (K) pushing the steering cylinder rod and right tie rod (J) outward (and pulling the left tie rod (H) inward). Return oil can flow through line (G) from the steering cylinder to the steering valve. From the steering valve, return oil flows through steering valve return line (E), hydraulic oil cooler (F), and steering valve return line (A) to the transmission.

NOTE: The steering valve is designed to allow manual steering if the engine is not running or the hydraulic pump fails.

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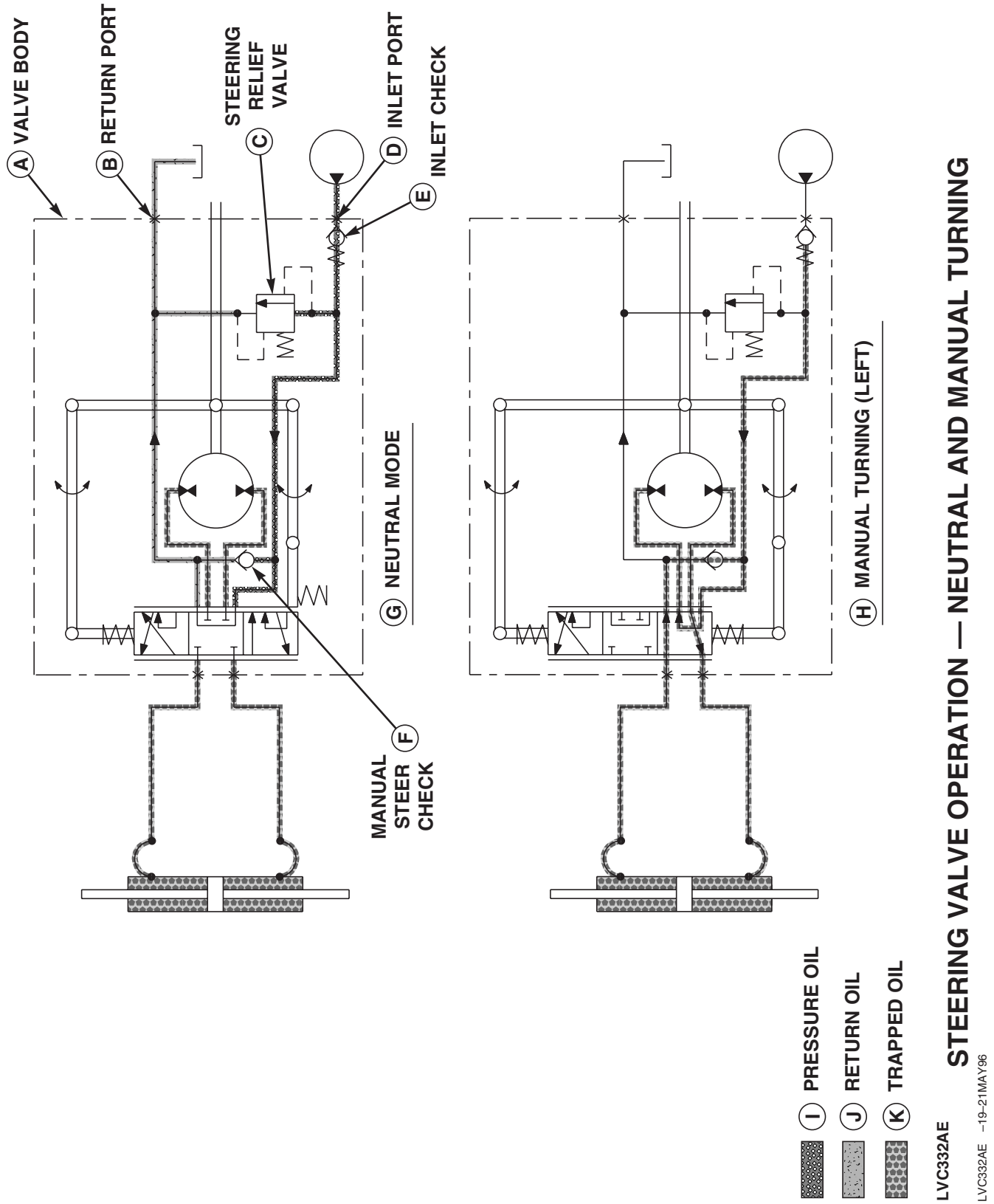
OUO1085,000022C –19–06OCT00–2/2

Steering Valve Operation—Neutral and Manual Turning



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LV,26010HA,A5 –19–06OCT00–1/2

A—Valve Body
B—Return Port
C—Steering Relief Valve
D—Inlet Port
E—Inlet Check
F—Manual Steer Check
G—Neutral Mode
H—Manual Turning (Left)
I—Pressure Oil
J—Return Oil
K—Trapped Oil

FUNCTION:

To block pressurized oil flow to the steering cylinder when no turning action is desired. To allow for manual turning of the machine when no power is available.

MAJOR COMPONENTS:

- Inlet Check
- Valve Body
- Manual Steer Check
- Spool
- Sleeve
- Gerotor
- Relief Valve

THEORY OF OPERATION:

Pressurized oil (I) opens the spring loaded inlet check (E) and flows into the valve body (A) through the inlet port (D). Oil then flows through the inlet passage to close the manual steer check (F) and reach the feed holes. The feed holes direct oil flow through the sleeve inlet groove to the spool inlet.

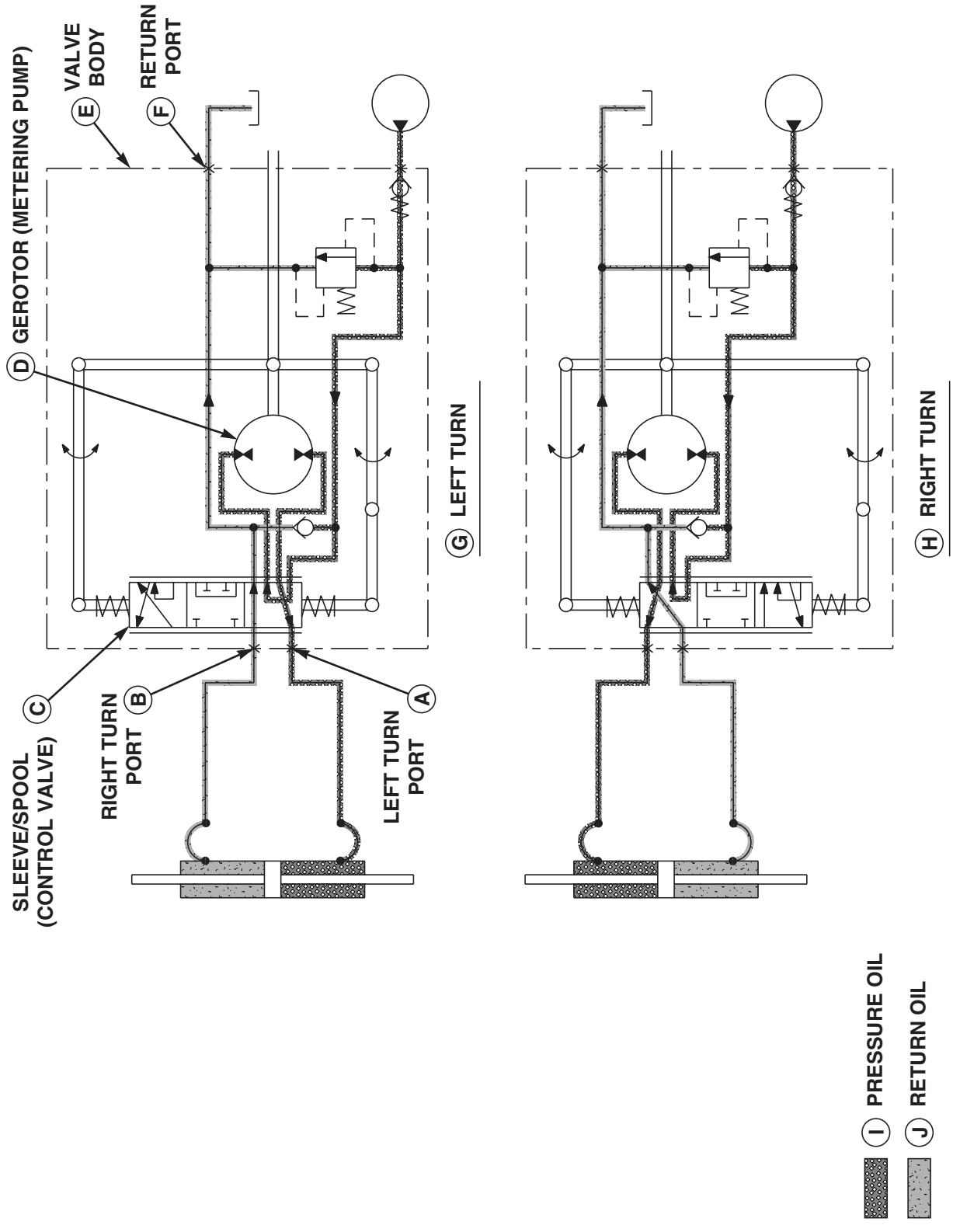
When the valve is in neutral mode (G), the return oil passages of the sleeve and spool are aligned and open, while the right turn and left turn passages are blocked and closed. The open passage allows return oil (J) to travel through the center of the spool and leave the valve through the return port (B). Blocking the turn passages traps oil (K) in the gerotor cavities, hydraulic lines and the steering cylinder.

Should hydraulic pressure be lost (engine off or pump failure), the inlet check closes and manual steer check opens to create a closed-loop steering system. The closed-loop steering system uses trapped oil to allow for manual steering of the machine (no power). As the steering wheel is turned (right or left), trapped oil is forced from the gerotor cavities through the now-aligned turn passages of the sleeve and spool, and out of the valve to the pressure side of the steering cylinder piston, which moves the front wheels. Movement of the piston forces trapped oil from the non-pressure side of the piston to the return passage of the spool and sleeve and then to the gerotor cavities, where it replenishes the system and completes the closed-loop.

To prevent damage to hydraulic system components a relief valve (C) is installed in the valve body. Should the oil flow be blocked and hydraulic pressure rise above relief pressure, the relief valve will open and direct all oil flow to the return port.

LV,26010HA,A5 –19–06OCT00–2/2

Steering Valve Operation—Power Turning



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LV,26010HA,A7 –19–06OCT00–1/2

A—Left Turn Port
B—Right Turn Port
C—Sleeve/Spool (Control Valve)
D—Gerotor (Metering Pump)
E—Valve Body
F—Return Port
G—Left Turn
H—Right Turn
I—Pressure Oil
J—Return Oil

FUNCTION:

Supply hydraulic oil to the proper side of the steering cylinder to turn the wheels when the engine is running.

MAJOR COMPONENTS:

- Valve Body
- Spool Sleeve
- Gerotor

THEORY OF OPERATION:

Pressurized oil (I) is supplied to the sleeve inlet groove and spool inlet following the same path as when the valve is in neutral.

The steering wheel is mechanically connected to the valve spool and gerotor gear by the steering column. Turning the steering wheel (right or left) rotates the valve spool within the sleeve to align pressure and return passages.

Oil flows through the pressure passage to the gerotor where it fills the cavity between the gerotor gear and body.

The rotation of the gerotor gear is offset to the body to enlarge and reduce the size of the cavity as the gear turns. The gerotor gear is timed to the valve body passages so the cavity is filled with oil when it is at its largest and emptied when it is smallest. By enlarging and then reducing the size of the gerotor cavities a greater volume of oil is metered to the steering cylinder, which improves steering efficiency. The gerotor cavities are filled and emptied six times faster when the steering wheel is turned.

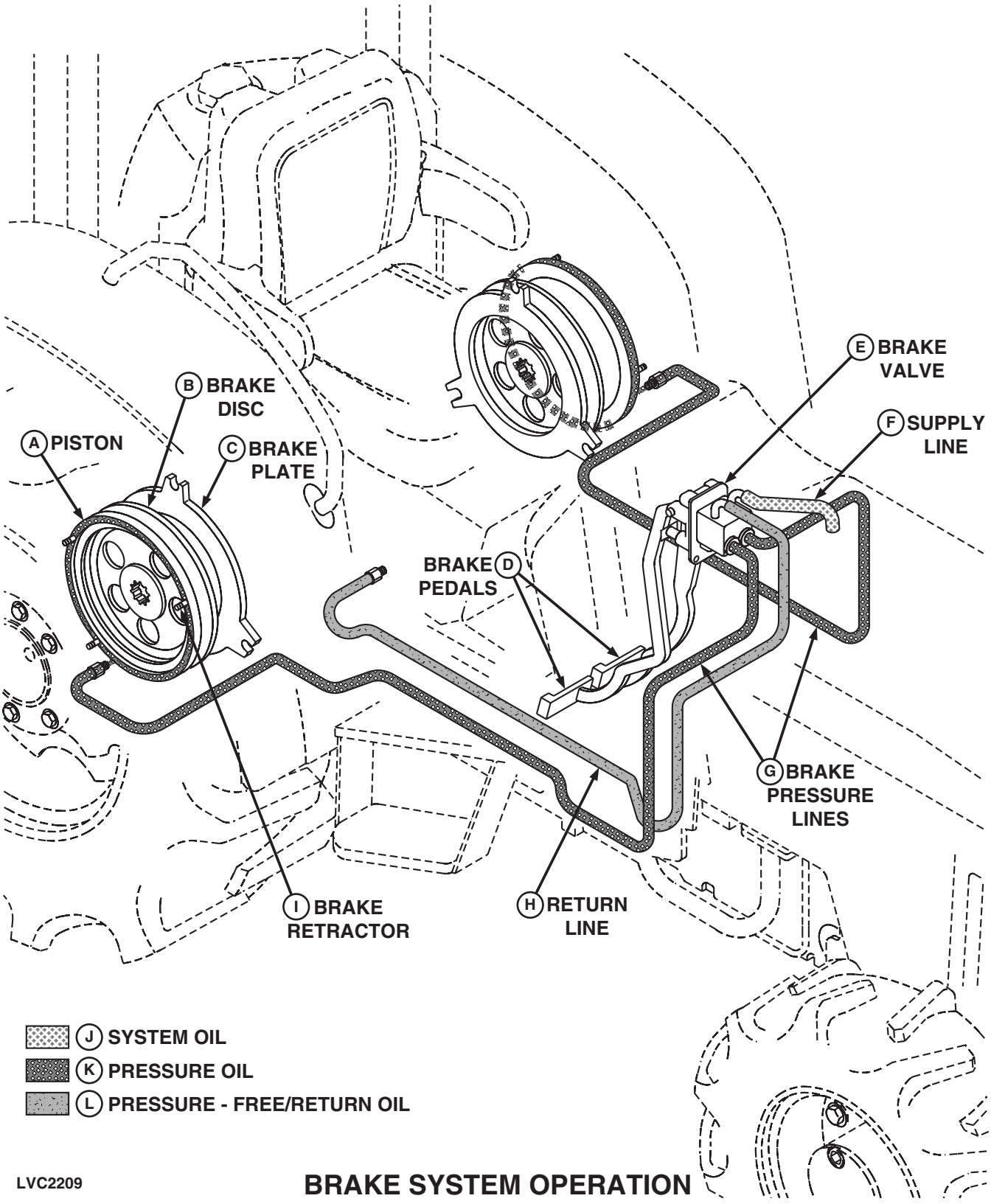
Pressurized oil flows from the gerotor back to the sleeve and spool where it is directed out of the valve through the open turn passage and turn port (A). Oil then flows through a hydraulic line to the steering cylinder where it moves the piston which turns the front wheels.

Oil on the opposite side of the piston is forced from the cylinder and returns to the steering valve through a hydraulic line and the opposite turn port (B).

Return oil (J) flows through a valve passage to the open return passages in the sleeve and spool. Oil then flows to a common return passage located at the center of the spool. Oil leaves the valve by the common return passage and port (F).

LV,26010HA,A7 –19–06OCT00–2/2

Brake System Operation



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OUO1085,000022D –19–06OCT00–1/2

A—Piston
B—Brake Disc
C—Brake Plate
D—Brake Pedals
E—Brake Valve
F—Supply Line
G—Brake Pressure Lines
H—Return Line
I—Brake Retractor
J—System Oil
K—Pressure Oil
L—Pressure-Free/Return Oil

FUNCTION:

To provide a means of stopping the tractor and assist the operator when maneuvering the tractor through tight turns.

MAJOR COMPONENTS:

- Brake Valve
- Piston
- Brake Plate
- Brake Disc
- Pressure Lines

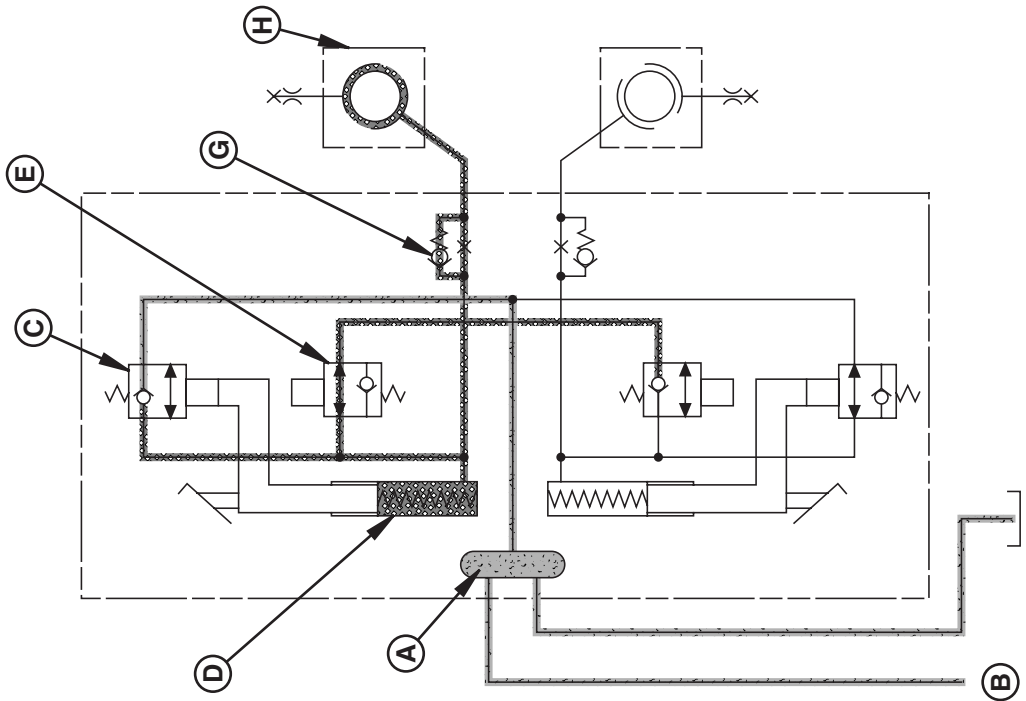
THEORY OF OPERATION:

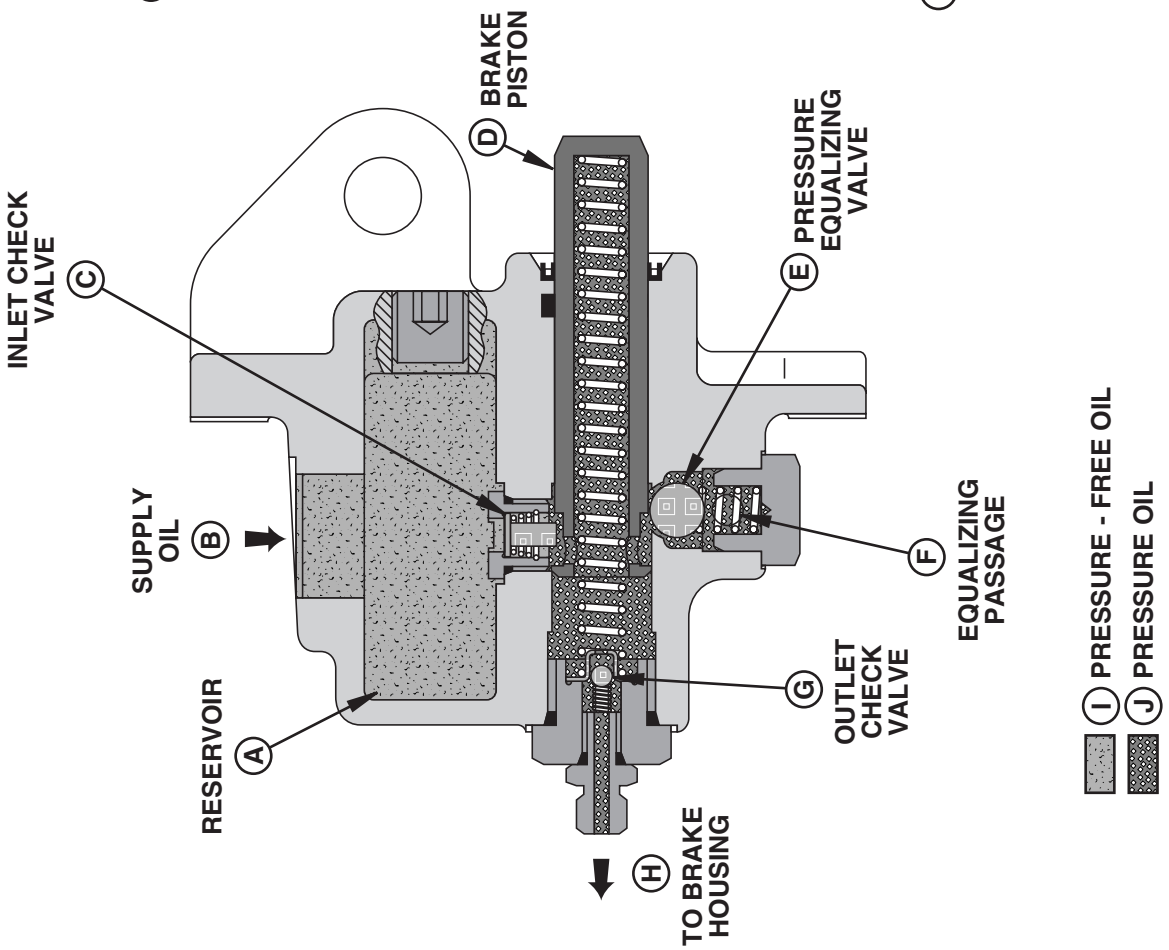
Pressing brake pedals (D) activates brake valve (E) which pressurizes the oil in lines (G). Pressurized oil (K) forces piston (A) against brake disc (B), pressing it against brake plate (C). The brake plate is keyed to the final drive housing and cannot rotate. The brake disc is splined to the axle shaft and rotates with it. When the plate and disc are forced together by the piston, the friction surface of the disc causes it to bind against the plate and therefore stop axle shaft rotation. When pressure on the brake pedal is released, system pressure is released and the disc and axle are free to rotate.

Oil for the brake system is provided via a supply line (F) is branching off the transmission lubrication line at the steering valve. Excess oil (L) is vented to the transmission sump via return line (H).

Brake pedals can be activated individually to assist in turning, or together for equal braking.

Brake Valve Operation





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OUO1085,000022E –19–06OCT00–1/4

A—Reservoir
B—Supply Oil
C—Inlet Check Valve
D—Brake Piston
E—Pressure Equalizing Valve
F—Equalizing Passage
G—Outlet Check Valve
H—To Brake Housing
I—Pressure-Free Oil
J—Pressure Oil

FUNCTION:

To supply hydraulic oil allowing both individual and dual braking.

MAJOR COMPONENTS:

- Pistons
- Reservoir
- Inlet Check Valves
- Outlet Check Valves
- Equalizing Valves

THEORY OF OPERATION:

Supply oil is pressure-free oil in a sense, that it circulates through the brake valve acting as supply keeping the reservoir full.

Brake Pedal Depressed:

When either brake pedal is pressed, piston (D) is moved to the front, thereby closing inlet check valve (C), which immediately closes brake valve reservoir (A). As it travel further, the piston opens pressure equalizing valve (E), trapping the oil in equalizing passage (F). The increase in pressure causes outlet check valve (G) to open and the oil is forced under pressure to either brake housing.

When both brake pedals are pressed, pressure oil flows through both outlet check valves to the brake housings causing the pistons to open both pressure equalizing valves (E), and the pressure in both brake cylinders is equalized.

The outlet check valves (G) ensure a simultaneous braking effect. The pressure equalizing valves and outlet check valves ensure equal braking.

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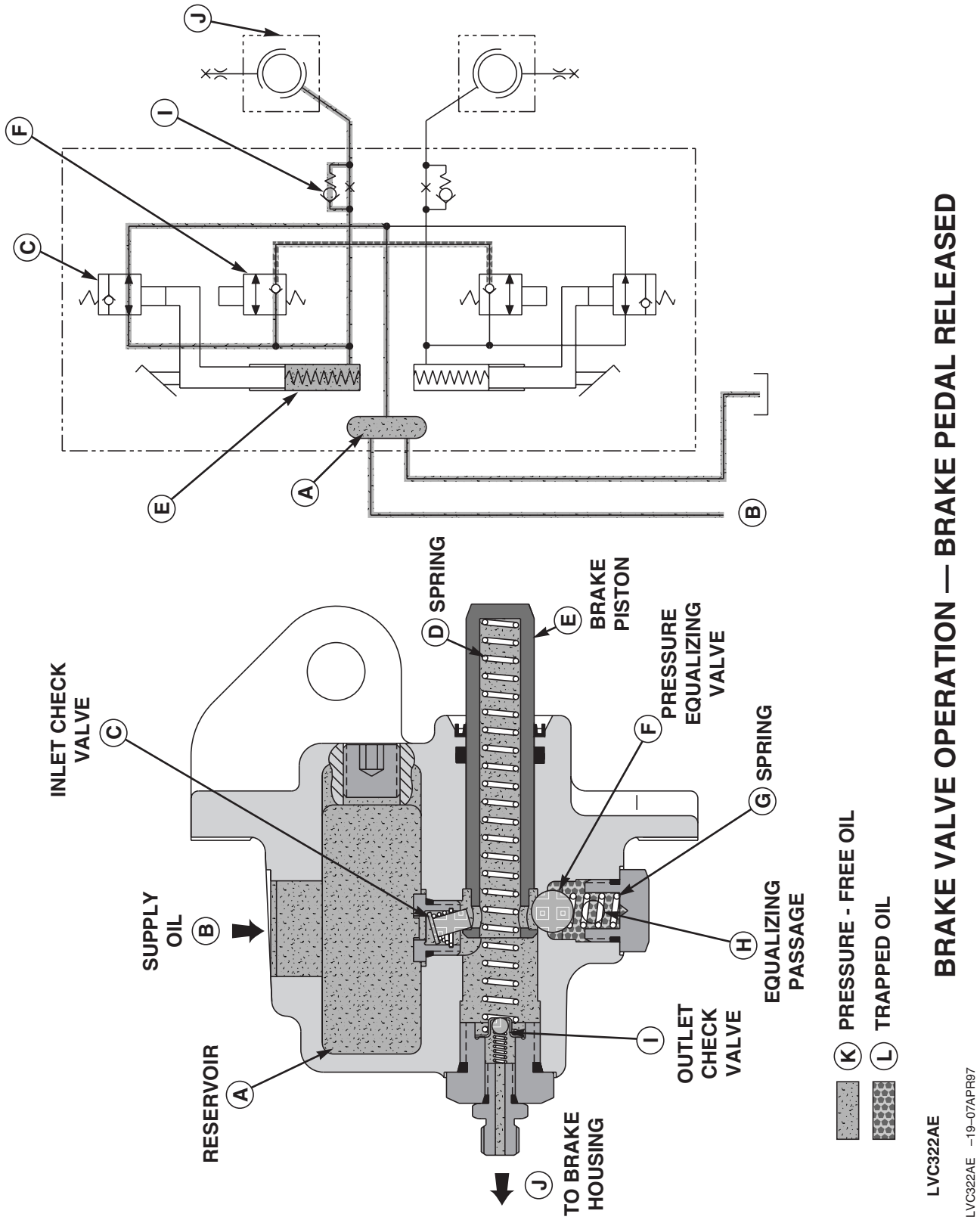

A—Reservoir
B—Supply Oil
C—Inlet Check Valve
D—Spring
E—Brake Piston
F—Pressure Equalizing Valve
G—Spring
H—Equalizing Passage
I—Outlet Check Valve
J—To Brake Housing
K—Pressure-Free Oil
L—Trapped Oil

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OUO1085,000022E –19–06OCT00–3/4

Brake Pedal Released:

When brake pedals are released, oil in brake housing is pressure-free and flows back to main brake valve. At the same time brake piston (E) is forced back by spring (D). Just before the pistons reach their final position, inlet check valves (C) open and oil can flow back into the brake valve reservoir (A). The orifice in outlet check valves (I) prevents the oil from returning to the brake valve reservoir too quickly and thus making an interruption in the oil flow.

As piston reaches its final position, spring (G) forces equalizing valve (F) closed, trapping oil in equalizing passage (H).

OUO1085,000022E –19–06OCT00–4/4

Diagnostic Information

The diagnostic information in this group is used to test components related to a specific problem. Select the appropriate symptom from the list that best matches your problem and follow the test procedures under that heading.

The symptom headings are:

- Steering System
- Brake System

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to follow the test conditions and sequence carefully. The middle, “Normal” column gives the normal reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the operation listed in the third, “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located at the end of this group.

LV,26015HA,A1 –19–25JUL02–1/1

Isolate the Problem—Steering System

CONDITIONS:

- Make sure tire inflation is correct, front ballasting is not excessive and implements are properly fitted and adjusted.
- Inspect complete system for leakage. Locate the source of leakage and make any necessary repairs.
- On tractors with MFWD operate the tractor with MFWD engaged and disengaged. If a difference in steering is noticed, with the MFWD engaged, inspect the front axle.
- Make sure hydraulic oil level is correct.

NOTE: Perform tests 1 and 2 with front end blocked up.

Test Location	Normal	If Not Normal
1. Rotate front wheels.	Wheels rotate freely. (no rough areas)	Inspect front wheel bearings.
2. Disconnect steering cylinder and turn axle by hand.	Axle turns easily by hand.	Inspect spindle bearings.

NOTE: Lower front of tractor to ground. Warm up hydraulic oil to 43°C (110°F).

Test Location	Normal	If Not Normal
3. Check steering cylinder for leakage.	No leakage.	Replace cylinder.
4. Check steering relief valve pressure.	Relief pressure within specification.	Replace relief valve.
5. Check steering valve for leakage.	No external/internal leakage	Check valve for leakage (See Steering Valve Leakage Test in this group.)
6. Check steering pump flow.	5210 and 5310 model tractors 25.7 Lpm @ 2000 rpm (6.8 gpm @ 2000 rpm).	Clean mesh filter. Inspect suction line. Replace filter canister. Repair pump.
	5410 and 5510 model tractors 24.9 Lpm @ 2000 rpm (6.6 gpm @ 2000 rpm)	

AG,OUO1008,341 –19–17JUL02–1/1

Steering Sluggish or Loss of Steering

CONDITIONS:

- Key switch off (test 1—4).
- Engine running (test 5—7).

Test Location	Normal	If Not Normal
1. Transmission filter canister.	Filter passes oil freely.	Replace filter canister.
2. Dipstick.	Oil level full.	Add oil to full mark.
3. Transmission sump.	Oil of correct viscosity.	Replace with correct oil.
4. Mesh filter and pickup tube.	Filter clean of debris. Tube clear.	Clean or replace.
5. Hydraulic pump.	Pump pressure and flow within specifications.	Repair pump.
6. Steering valve.	No excessive internal or external leakage. Valve leakage test within specifications.	Repair steering valve.
7. Steering cylinder.	No excessive internal or external leaks. Cylinder leakage test within specifications.	Repair steering cylinder.
8. Hydraulic lines.	No leaks or kinks in lines.	Replace lines.
9. Transmission oil cooler. (Model 5510 and all tractors equipped with cab.)	No excessive build-up of debris in cooler fins.	Clean cooler fins.
	No leakage.	Repair or replace cooler.

OUO1085,0000230 –19–17JUL02–1/1

Isolate the Problem—Brakes

Test Location	Normal	If Not Normal
1. Apply and release each brake individually to check pedal return.	Both pedals return smoothly.	Inspect pedal pivot for damage or binding. Inspect internal brake components.
2. Operate tractor on flat surface. Allow it to roll with clutch depressed.	Tractor does not pull to one side.	Inspect internal brake components on side tractor pulls toward.
3. Operate tractor on flat surface. Allow it to roll with clutch depressed and apply both brakes evenly.	Tractor stops without pulling to one side.	Inspect internal brake components on side opposite the direction the tractor pulled to.
4. Operate tractor on flat surface. Allow it to roll with clutch depressed and apply each brake separately.	Tractor slows and pulls slightly to one side without noise or vibration.	Inspect internal components on side indicating noise or vibration.

OUO1085,000022F –19–17JUL02–1/1

Excessive Brake Pedal Leak-Down

CONDITIONS:

- Operator on seat.
- Problem isolated to either brake valve or brake components.
- Brake repair in Section 60.

Test Location	Normal	If Not Normal
1. Brake valve.	No pedal leak-down when pedals are applied individually or simultaneously.	Pedal leak-down occurs both when pedals applied individually and simultaneously: repair reservoir check valves.
		Pedal leak-down occurs when pedals applied individually: repair equalizing check valve.
		Replace brake piston cylinder O-rings.
2. Pressure ring.	No pedal leak-down when pedal is applied.	Replace pressure ring O-rings.

OUO1085,0000231 –19–17JUL02–1/1

Excessive Brake Chatter

CONDITIONS:

- Key switch off.
- Bleed brake system found in this group.
- Brake repair in Section 60.

Test Location	Normal	If Not Normal
1. Transmission sump.	Clean oil of proper viscosity.	Replace with proper oil.
2. Bleed valves. (Located on top of final drive housing.)	No air in system.	Bleed brake system. Repair brakes.

OUO1085,0000232 –19–26JUL02–1/1

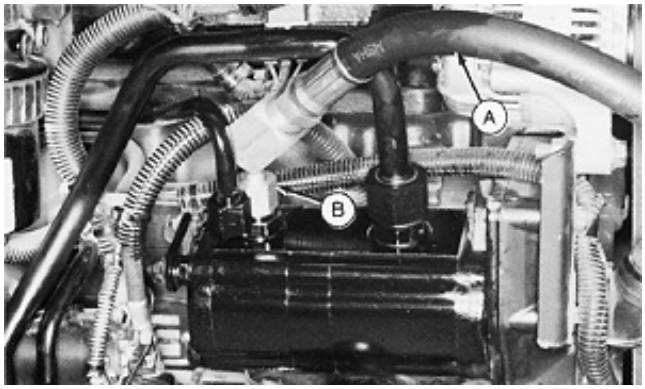
Steering Pump Flow Test

REASON:

To determine if steering pump can provide adequate flow under pressure.

EQUIPMENT:

- JT05469 Flowmeter
- JT03368 Pump Adapter 3/4 FNPT x 13/16-16 FORFS 45° elbow (B)
- (Flowmeter with 37° flare hose) JT03336 Adapter 3/4 MNPT x 3/4-16 M 37° flare
- (Flowmeter with 3/4-16 M ORB hose) JT03123 Adapter 3/4 MNPT x 1/2 FNPT and JT03041 1/2 MNPT x 3/4-16 FORB



LV331 –UN–18FEB92

A—JT05469 Flowmeter
B—JT03368 Pump Adapter

CONNECTIONS:

1. Remove steering pump outlet line.
2. Connect flowmeter inlet hose (A) to adapter.
3. Install adapter (B) and flowmeter assembly.
4. Insert flowmeter return hose into hydraulic oil fill hole.

PROCEDURE:

1. Fully open flowmeter control valve.
2. Start tractor and run at 2000 rpm.
3. Slowly close flowmeter control valve until 10345 kPa (103.5 bar) (1500 psi) shows on gauge.
4. Compare flow to specifications then release pressure.

Specification	
Flowmeter Control Valve—Flow Rate (5210 and 5310 tractors)	25.7 Lpm (6.8 gpm)
Flow Rate (5410 and 5510 tractors)	24.9 Lpm (6.6 gpm)

RESULTS:

If flow is less than minimum:

Continued on next page

- The mesh filter may be restricted.
- The suction line may be restricted or leaking air.
- The pump may be worn or damaged, requiring repair or replacement.

OUO1085,0000233 –19–25JUL02–2/2

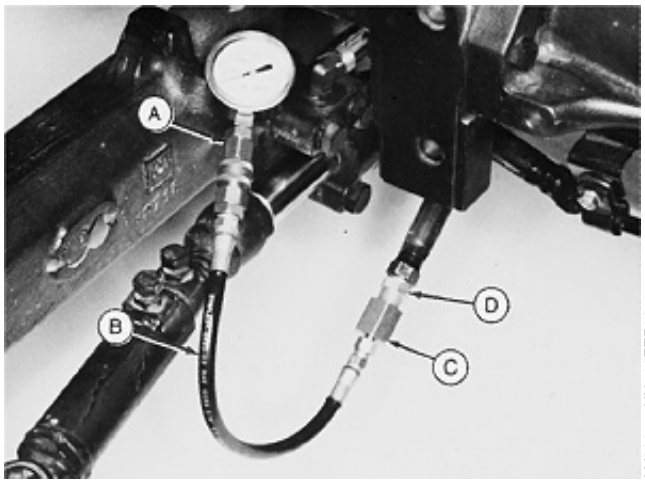
Steering Valve Relief Test

REASON:

To determine if manufacturer setting of relief valve maintains correct pressure or is leaking.

EQUIPMENT:

- JT03345 Gauge with coupler 3000 psi (A)
- JT03364 Hose with coupler (B)
- JT03110 Adapter 7/16-20 m 37° Flare x 1/2 KNPT (C)
- JT03367 Connector 13/16-16 MORFS x 1/2 MNPT (D)



LV328 –UN–18FEB92

A—JT03345 Gauge
B—JT03364 Hose
C—JT03110 Adapter
D—JT03367 Connector

CONNECTIONS:

1. Assemble gauge, hose, and adapter.
2. Disconnect hydraulic hose from left-hand side of steering cylinder.
3. Connect test equipment to hydraulic hose.

PROCEDURE:

1. Run engine at fast idle
2. Turn steering wheel full left and continue turning while comparing gauge to specification.

	Specification
Hydraulic Steering Hose—Pressure	12990—13493 kPa (130—135 bar) (1884—1957 psi)

RESULTS:

- If pressure reading is not within specifications, replace relief valve assembly.

OUO1085,0000234 –19–26JUL02–1/1

Steering Cylinder Leakage Test

REASON:

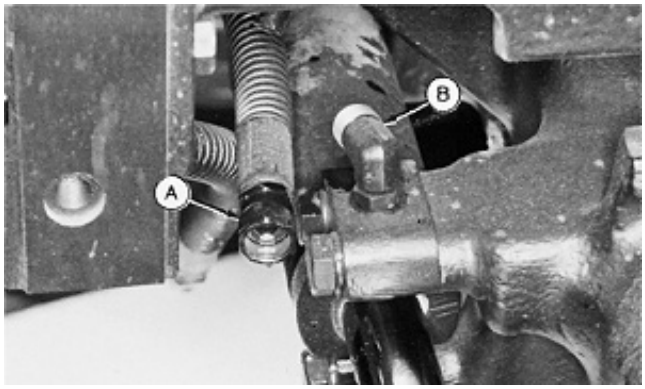
To determine if leakage exists in steering cylinder.

PROCEDURE:

1. Turn steering wheel to a full left to fully extend cylinder end.
2. Shut off engine.
3. Disconnect hydraulic hose (A) from right-hand side of steering cylinder (extended end).
4. Start engine and run at high idle.
5. Continue to turn steering wheel to the left.
6. Watch for any flow of oil out of cylinder at fitting (B).
7. Repeat steps 1—6 for right turn and left-hand side of cylinder.

RESULTS:

- If any flow of oil out of cylinder occurred, there is internal leakage in the cylinder. Repair or replace cylinder.

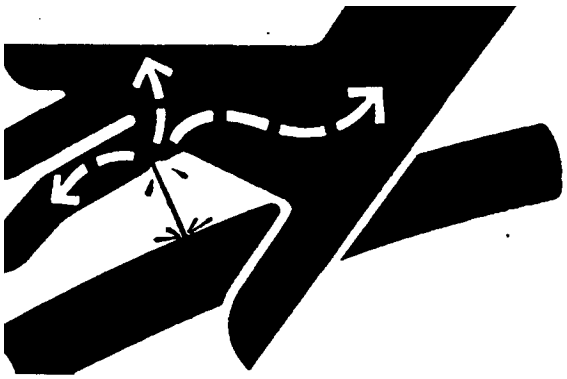


LV329 –UN–18FEB92

A—Hydraulic Hose
B—Cylinder Fitting

OUO1085,0000235 –19–26JUL02–1/1

Steering Valve Leakage Test



X9811 –UN–23AUG88

REASON:

To check the steering valve for internal leakage.

EQUIPMENT:

- Torque wrench
- (2) 13/16-16 MORFS Plugs

IMPORTANT: O-ring seal (ORS) plugs must be used to plug pressurized hydraulic hoses.

PROCEDURE:

1. Stop the engine.

CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

2. Disconnect hoses from steering cylinder. Close all openings using caps and two 13/16-16 MORFS plugs.

3. Start engine and run at slow idle (800 rpm).

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15
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Continued on next page

OUO1085,0000236 –19–26JUL02–1/2

4. Turn steering wheel to the right, with a constant torque of 7 N•m (60 lb-in.).

5. Compare the number of rotations of the steering wheel that occur in one minute to specification.

Specification

Steering—Maximum Right Turn ..... 5 rpm

6. Turn steering wheel to the left, with a constant torque of 7 N•m (60 lb-in.)

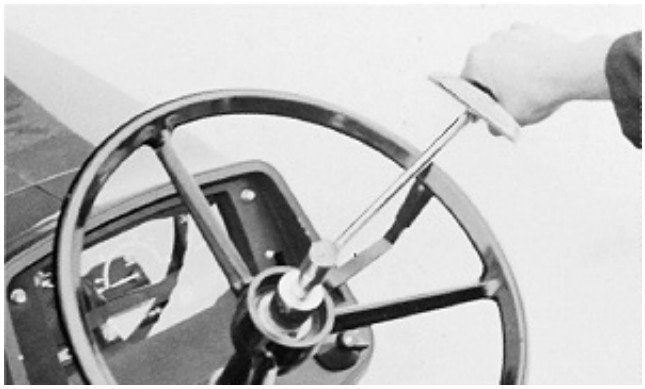
7. Compare the number of rotations of the steering wheel that occur in one minute to specification.

Specification

Steering—Maximum Left Turn ..... 5 rpm

RESULTS:

- If rpm is more than specifications, repair steering valve. Go to Section 60 and service as needed.



LV330 –UN–18FEB92

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15
9

OUO1085,0000236 –19–26JUL02–2/2

Toe-In Check and Adjustment—Standard Axle

REASON:

To reduce tire wear.

PROCEDURE:

1. Park machine on level surface.
2. Turn steering wheel so front wheels are in the straight-ahead position. Stop engine.
3. Measure distance (A) between tires at hub level in front of axle. Record measurement and mark the tires.
4. Move tractor back about 1 m (3 ft), so mark is at hub level behind the axle. Again measure distance between tires at same point on tire. Record measurement.

NOTE: When the front measurement is smaller than the rear measurement, this is called "toe-in."

5. Determine the difference between front and rear measurements. The toe-in difference should be between specifications.

Specification

Toe-In—Standard Axle—Distance ..... 3—6 mm (1/8—1/4 in.)

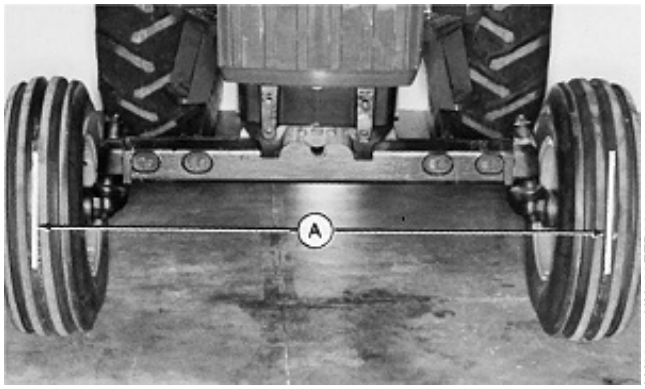
RESULTS:

- If not according to specifications, loosen lock nuts (C) and back out cap screws (B). Adjust tie rods on both sides of tractor equally by turning the inner tube (D) to lengthen or shorten tie rod until toe-in is correct to specifications. Tighten cap screws to specifications.

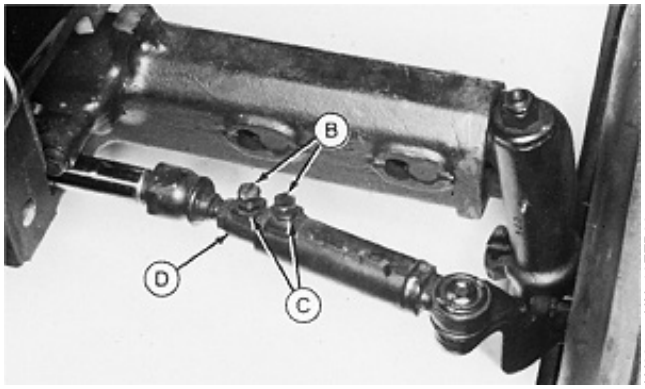
Specification

Tie Rod-to-Inner Sleeve Cap Screws—Torque ..... 90 N•m (66 lb-ft)

- Tighten lock nuts (C) securely.



LV334 –UN–18FEB92



LV335 –UN–18FEB92

A—Distance
B—Cap Screws
C—Lock Nuts
D—Tie Rod Inner Tube

Continued on next page

NOTE: One half turn of tie rod inner tube (D) equals 8 mm (5/16 in.) change of toe-in.

One turn of tie rod inner tube (D) equals 16 mm (5/8 in.) change of toe-in.

OUO1085,0000237 –19–26JUL02–2/2

Toe-In Check and Adjustment—MFWD

REASON:

To reduce tire wear.

PROCEDURE:

1. Disengage MFWD and park tractor on smooth, level surface. Steer front wheels straight ahead. Stop engine.
2. Measure distance (A) between centerline of tires at hub level in front of axle, using an outside bar of each tire or an inside bar of each tire. Record measurement.
3. Repeat step 2 at rear of axle.

NOTE: When the front measurement is smaller than the rear measurement, this is called "toe-in." If the front measurement is larger than the rear measurement, this is called "toe-out."

4. Determine the difference between front and rear measurements. The difference may be in either direction (toe-in or toe-out), but should be less than specification.

Specification

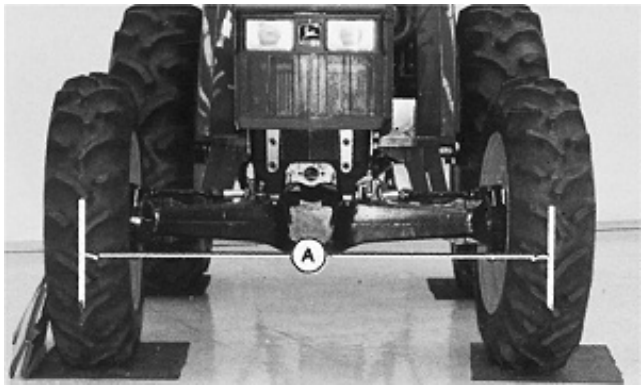
Toe-In—MFWD Axle—Distance ..... 3 mm (1/8 in.)

RESULTS:

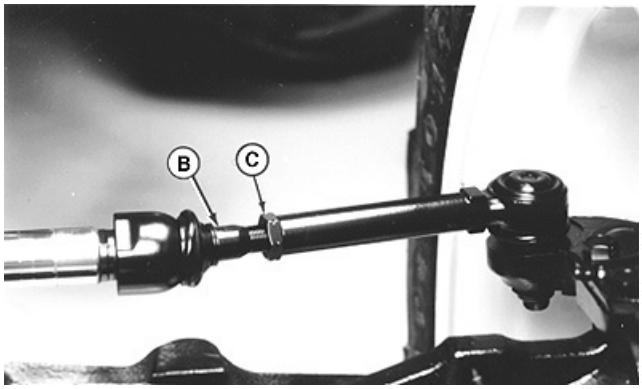
- If toe-in not to specifications:
  - Loosen jam nuts (C).
  - Turn ball joint stud (B) equally on both sides of tractor to lengthen or shorten tie rods.
  - Adjust tie rods until toe-in is to specification.
  - Tighten jam nuts to specification.

Specification

Tie Rod Jam Nut—Torque ..... 120 N•m (88 lb-ft)



LV336 –UN–18FEB92



LV2210 –UN–01JUL97

A—Distance
B—Ball Joint Stud
C—Jam Nut

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NOTE: One eighth turn of ball joint stud (B) equals 4 mm (3/16 in.) change of toe-in or toe-out.

One quarter turn of inner rod equals 8 mm (3/8 in.) change of toe-in or toe-out.

One half turn of inner rod equals 16 mm (5/8 in.) change of toe-in or toe-out.

OUO1085,0000238 –19–26JUL02–2/2

MFWD Steering Stop Adjustment

REASON:

To prevent interference between tire and tractor.

PROCEDURE:

1. Raise and support the front of the tractor so the axle can be oscillated to its stops.

2. Slowly turn the steering wheel to the left until the steering cylinder travel has reached its limit, the steering stops, or the tires are within specification of the grille screen or the side panels.

Specification

Tire to Tractor Component—
MFWD Axle—Clearance ..... 25 mm (1 in.)

3. Raise the left side of the axle against its axle pivot stop and measure the clearance between the tire and the nearest tractor component. The distance should not be less than specifications, as indicated above.

4. Repeat steps 2 and 3 for the right side.

RESULTS:

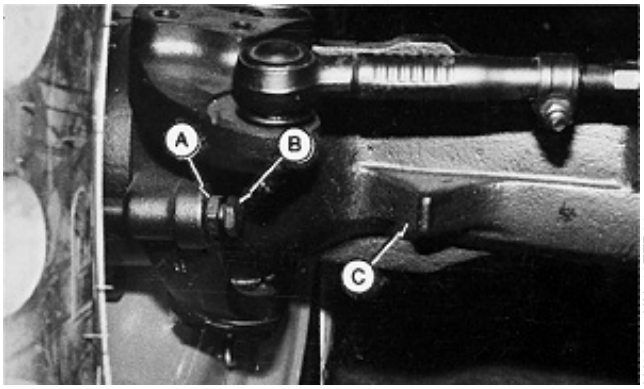
- If not according to specifications, loosen lock nut (A) and adjust stop bolt (B) so it touches stop (C). Tighten lock nut to specifications.

Specification

Steering Stop Lock Nut—MFWD
Axle—Torque..... 125 N•m (92 lb-ft)

NOTE: It may be necessary to shorten stop bolt (B) in order to obtain the maximum turning angle.

Wide tread settings and large tire sizes will increase turn radius slightly.



LV338 –UN–18FEB92

A—Lock Nut
B—Stop Bolt
C—Stop

OUO1085,0000239 –19–26JUL02–1/1

Brake Pedal Adjustment

REASON:

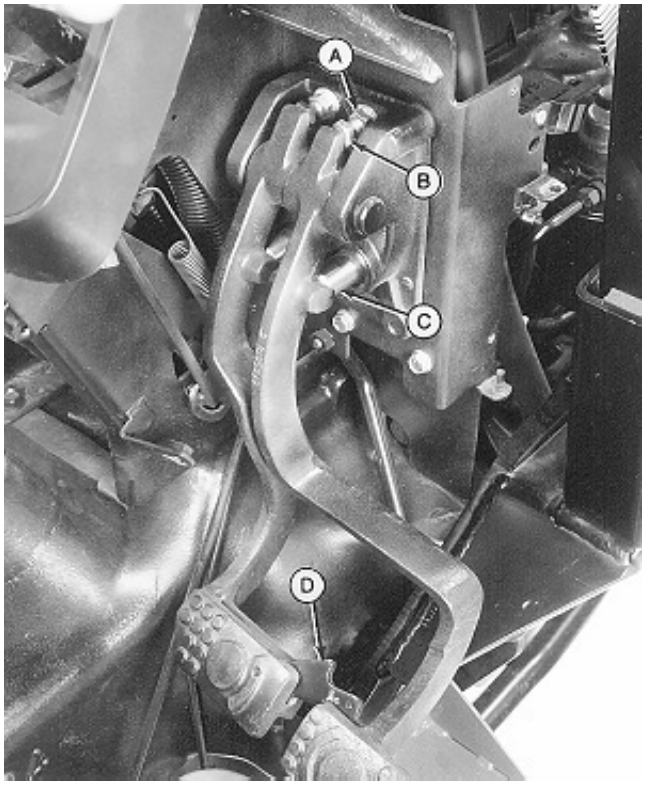
To make sure brakes are fully engaged when brake pedals are depressed and fully disengaged when pedals are released.

To align slots in pedals for locking lever.

PROCEDURE:

NOTE: This procedure can be done with brake valve assembly out of machine or in machine. Procedure is for brake valve assembly mounted in machine.

1. Remove right-hand dash cover.
2. Remove locking lever (D) from slot.
3. Loosen jam nut (A).
4. Turn screw (B) clockwise until pedal rests freely on valve piston (C).
5. Turn screw counterclockwise until it contacts brake pedal. Turn screw three additional flats or 1/2 turn counterclockwise and tighten jam nut.
6. Repeat procedure for other pedal.
7. Install right-hand dash cover.



LV638 –UN–02AUG94

A—Jam Nut
B—Adjusting Screw
C—Valve Piston
D—Pedal Locking Lever

OUO1085,000023A –19–09OCT00–1/1

Adjust Brake Drag

NOTE: Left rear tire shown removed for clarity of photo.

REASON:

After reassembling brake components in axle, brake drag must be adjusted by pressurizing brake system and pressing brake retractors into rear axle housing.

EQUIPMENT:

- JT03520 Special Adapter
- JT05634 Pressure Gauge 14 000 kPa (140 bar) (2000 psi)

PROCEDURE:

1. Assemble special adapter (A) and pressure gauge (B).

NOTE: Two service technicians are needed to adjust brake drag: one to operate the brake pedals and the other to read pressure on gauge.

2. Remove socket head screw from left rear axle.

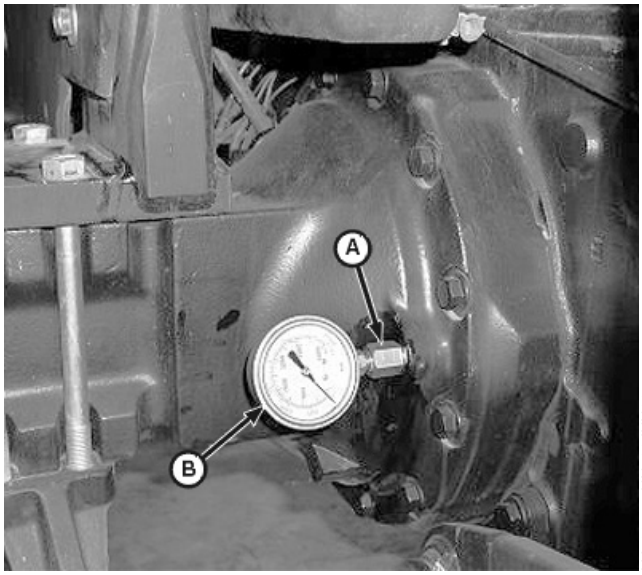
3. Install assembled special adapter and pressure gauge.

4. Bleed brakes. See Bleed Brake System in this group.

NOTE: If brake pedal goes to stop when depressed, let tractor sit overnight and bleed brakes again. Repeat brake drag adjustment procedure.

5. Start engine. With brake pedals unlocked, depress left brake pedal until pressure gauge reads 10 000 kPa (100 bar) (1450 psi). The applied pressure deflects the components to obtain proper working clearance.

6. Repeat brake drag adjustment for the other brake.



A—JT03520 Special Adapter
B—JT05634 Pressure Gauge

OUO1023,00003E2 –19–27JUN02–1/1

Bleed Brake System

REASON:

Any time the brake system has been opened up for service (lines disconnected), it will be necessary to bleed air from the system.

CONNECTIONS:

1. Connect a clear plastic tube to the left brake bleed screw (A). Put the other end of tube into a bucket.

PROCEDURE:

NOTE: Two service technicians are needed to bleed the brake system: one to operate the brake pedals and the other to open and close bleed screws.

1. Start the engine and run at slow idle to keep brake valve reservoir full of oil.

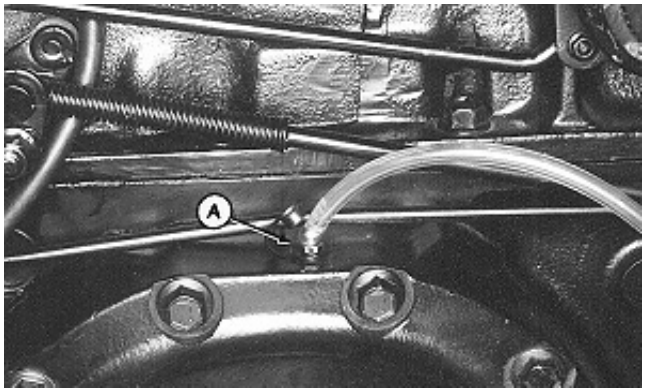
2. Pump brake pedal to obtain highest pedal position and hold. Loosen bleed screw 3/4 turn and slowly push on brake pedal. Before brake pedal completes full pedal travel, tighten bleed screw.

3. Let pedal return slowly to the top of its stroke. Continue this operation until the flow of oil in plastic tube is free of air bubbles.

4. When flow of oil is free of air bubbles hold the pedal down and tighten bleed screw.

5. Remove the plastic tube.

6. Repeat brake bleed procedure for the other brake.



A—Brake Bleed Screw

OUO1085,000023B –19–26JUL02–1/1

Section 270
Hydraulic System Operation,Tests, and Adjustments

Contents

Continued on next page

Page

Component Location Information

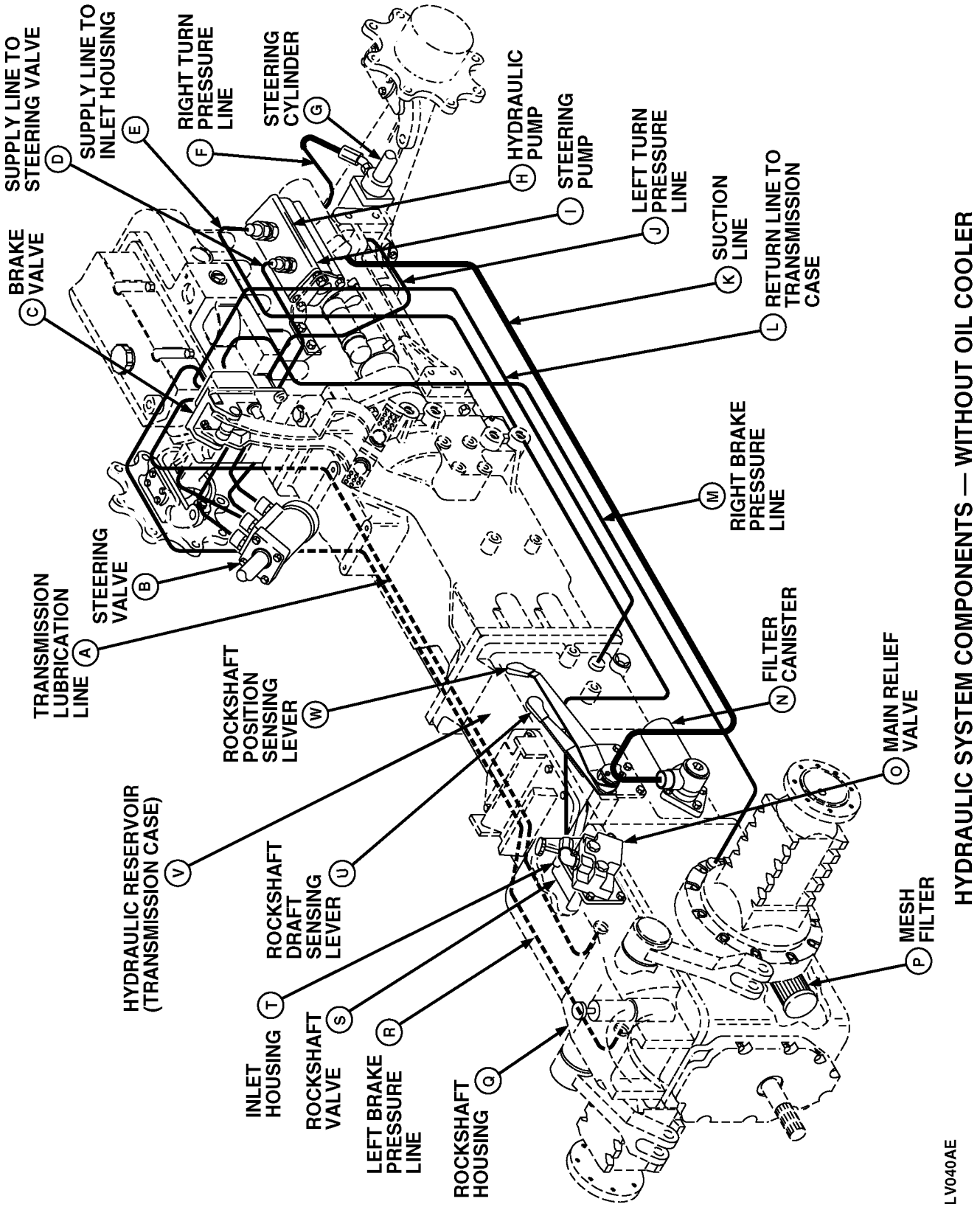
This group contains component location drawings for the following hydraulic components:

- Hydraulic System
- Selective Control Valve Components

Use the drawings when diagnosing a hydraulic problem and to help locate the components to be tested.

OUO1085,000023C –19–09OCT00–1/1

Hydraulic System Components—Without Oil Cooler



LV040AE –19–16DEC97

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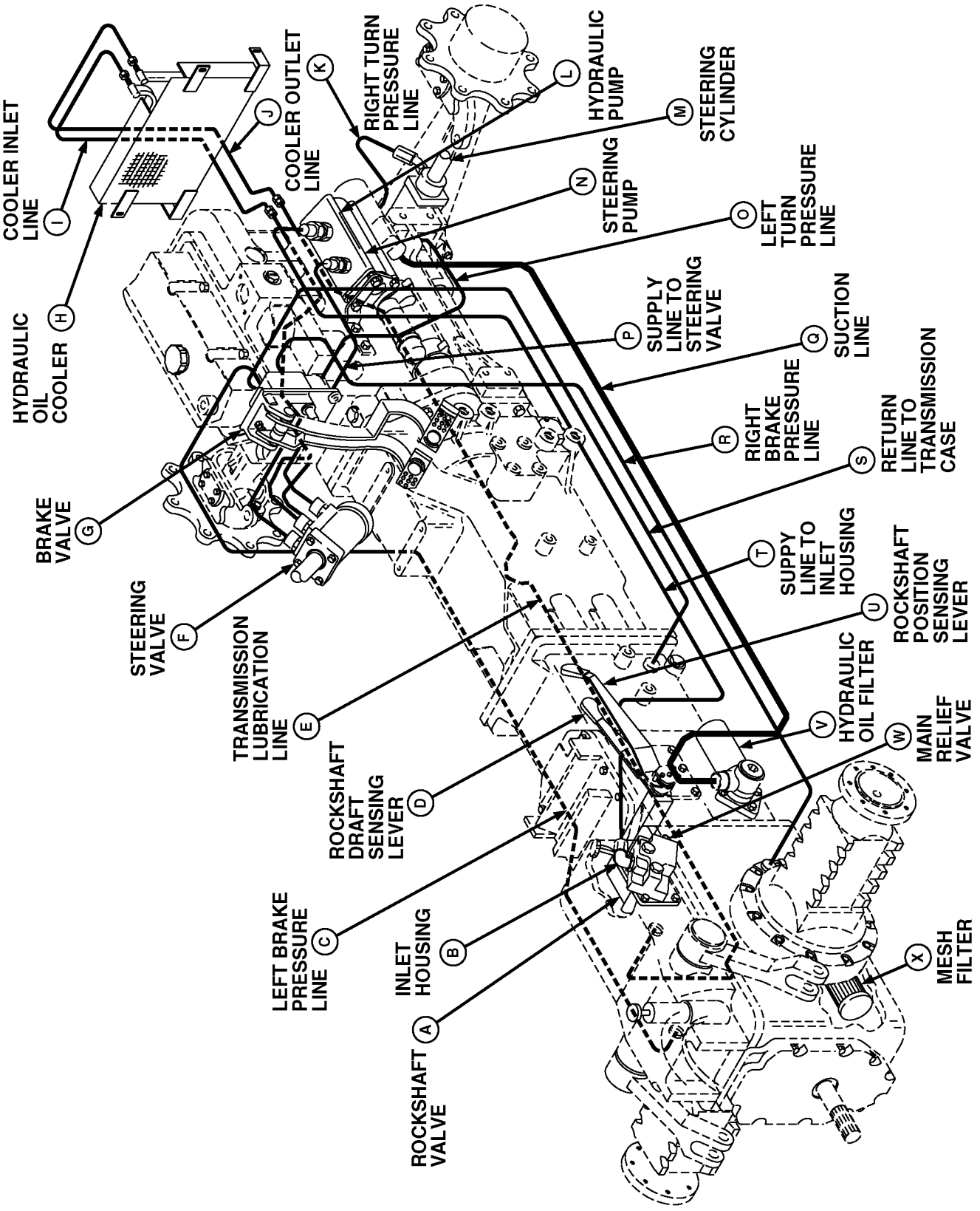
OUO1085,000023D –19–09OCT00–1/2

A—Transmission Lubrication Line
B—Steering Valve
C—Brake Valve
D—Supply Line to Steering Valve
E—Supply Line to Inlet Housing
F—Right Turn Pressure Line
G—Steering Cylinder
H—Hydraulic Pump
I—Steering Pump
J—Left Turn Pressure Line
K—Suction Line
L—Return Line to Transmission Case
M—Right Brake Pressure Line
N—Filter Canister
O—Main Relief Valve
P—Mesh Filter
Q—Rockshaft Housing
R—Left Brake Pressure Line
S—Rockshaft Valve
T—Inlet Housing
U—Rockshaft Draft-Sensing Lever
V—Hydraulic Reservoir (Transmission Case)
W—Rockshaft Position-Sensing Lever

OUO1085,000023D –19–09OCT00–2/2

Hydraulic System Components—With Oil Cooler



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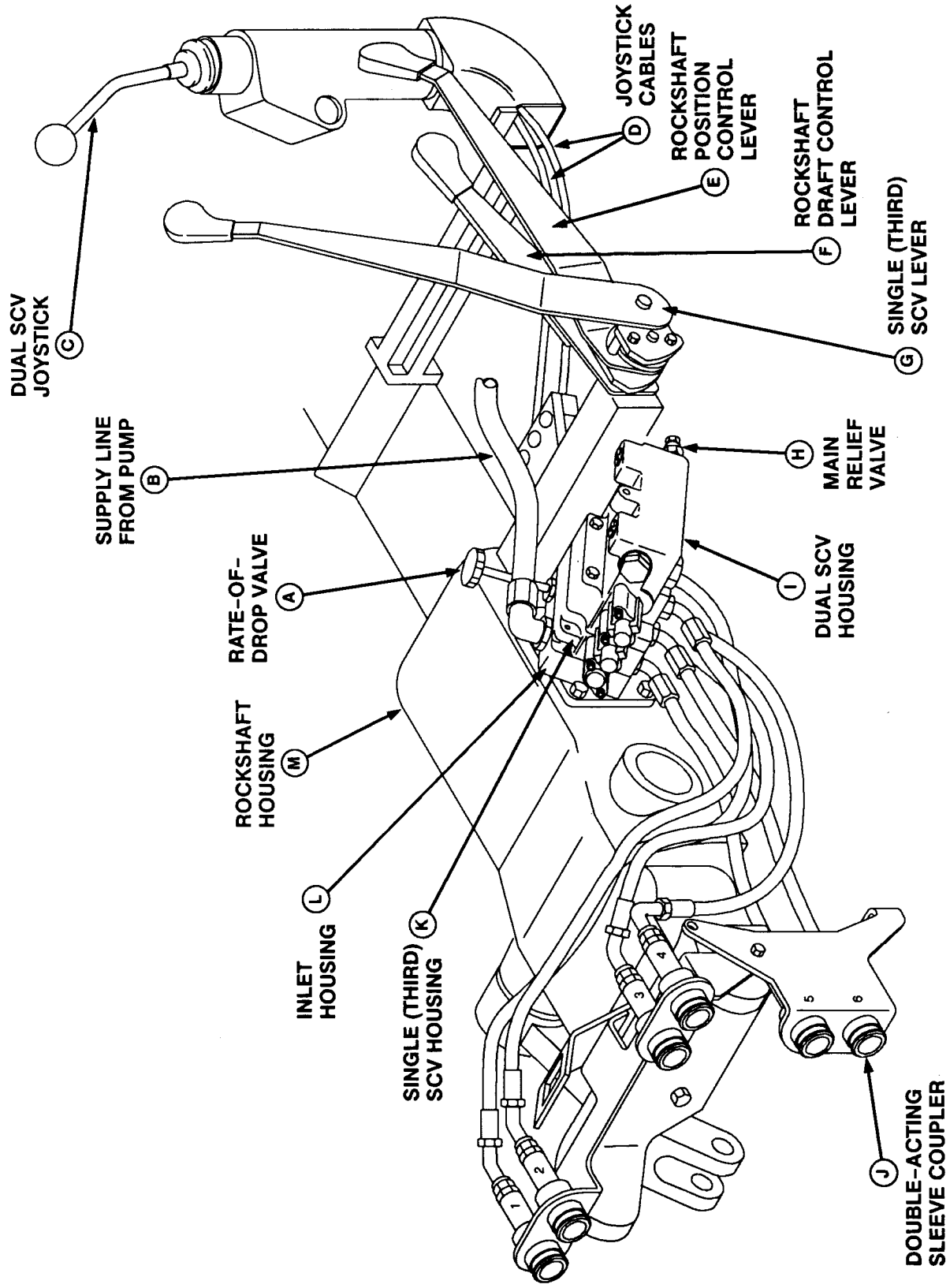
OUO1085,000023E –19–09OCT00–1/2

A—Rockshaft Valve
B—Inlet Housing
C—Left Brake Pressure Line
D—Rockshaft Draft-Sensing Lever
E—Transmission Lubrication Line
F—Steering Valve
G—Brake Valve
H—Hydraulic Oil Cooler
I—Cooler Inlet Line
J—Cooler Outlet Line
K—Right Turn Pressure Line
L—Hydraulic Pump
M—Steering Cylinder
N—Steering Pump
O—Left Turn Pressure Line
P—Supply Line to Steering Valve
Q—Suction Line
R—Right Brake Pressure Line
S—Return Line to Transmission Case
T—Supply Line to Inlet Housing
U—Rockshaft Position-Sensing Lever
V—Hydraulic Oil Filter
W—Main Relief Valve
X—Mesh Filter

OUO1085,000023E –19–09OCT00–2/2

Selective Control Valve Components



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A—Rate-of-Drop Valve
B—Supply Line From Pump
C—Dual SCV Joystick
D—Joystick Cables
E—Rockshaft Position Control Lever
F—Rockshaft Draft Control Lever
G—Single (Third) SCV Lever
H—Main Relief Valve
I—Dual SCV Housing
J—Double-Acting Sleeve Coupler
K—Single (Third) SCV Housing
L—Inlet Housing
M—Rockshaft Housing

NOTE: Dual SCV and single (third) SCV valve components are offered as optional field installed kits.

OUO1085,000023F –19–09OCT00–2/2

Theory of Operation Information

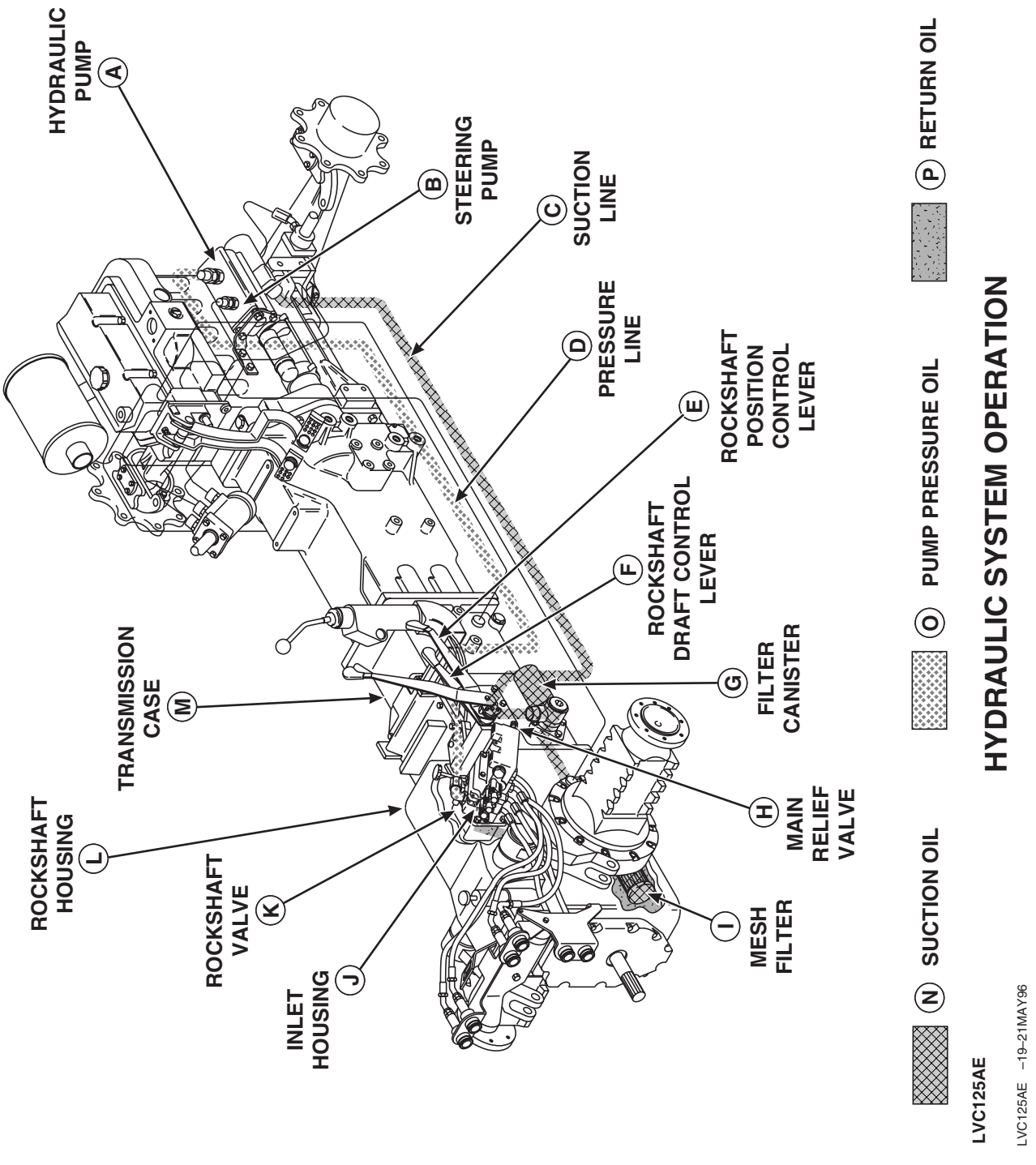
This group divides the hydraulic system into individual components by function. The story contains information on function, component or system identification and theory of operation.

The following systems or components are covered in this group:

- Hydraulic System
- Hydraulic Filters
- Hydraulic Pump
- Rockshaft Control Valve
- Surge Relief Valve
- Main Relief Valve
- Rate-of-Drop Valve
- Rockshaft Draft-Sensing
- Selective Control Valves
- Double-Acting Sleeve Coupler

OUO1085,0000240 –19–10OCT00–1/1

Hydraulic System Operation



A—Hydraulic Pump
B—Steering Pump
C—Suction Line
D—Pressure Line
E—Rockshaft Position Control Lever
F—Rockshaft Draft Control Lever
G—Filter Canister
H—Main Relief Valve
I—Mesh Filter
J—Inlet Housing
K—Rockshaft Valve
L—Rockshaft Housing
M—Transmission Case
N—Suction Oil
O—Pump Pressure Oil
P—Return Oil

Continued on next page

OUO1085,0000241 –19–10OCT00–1/2

FUNCTION:

The hydraulic system provides:

- Filtered oil to the power steering system.
- Lubrication oil to the transmission.
- Hydraulic power to the rockshaft for hitch operation.
- Hydraulic power to the optional selective control valves.

MAJOR COMPONENTS:

- Hydraulic Pump
- Filter Canister
- Mesh Filter
- Reservoir (Transmission Case)
- Rockshaft
- Rockshaft Valve
- Pressure Lines
- Suction Line
- Rate-of-Drop Valve
- Rockshaft Control Levers

THEORY OF OPERATION:

The hydraulic system of 5210, 5310, 5410, and 5510 tractors is equipped with 12-cc and 20-cc or 12-cc and 29-cc external-gear, constant-displacement pumps. The 12-cc pump (B) provides fluid power to the power steering system and to lubricate the transmission.

The 20-cc or 29-cc hydraulic pump (A) provides hydraulic power to the rockshaft (L) for hitch operation and to optional selective control valves, if equipped. The hitch is category 2/1 with draft sensing through the center link.

The hydraulic system uses an open-center design. This means that low pressure oil flows continuously through the valves and lines as long as the valves are in a neutral position. Because of this flow of oil there always must be a way for the oil to return to the reservoir.

The transmission case (M) of the tractor serves as a reservoir for the hydraulic oil. Proper level must be maintained for adequate transmission lubrication and oil supply to the hydraulic pumps (A and B).

The engine drives the hydraulic pump from the camshaft drive gear. As the hydraulic pump turns, a low-pressure area develops in the suction line (C). Oil then moves from the transmission case through mesh filter (I) and 25-micron filter canister (G), then on through suction line (C) to the inlet side of the hydraulic pumps.

Oil flows from the outlet side of the hydraulic pump, through pressure line (D) to inlet housing (J). A relief valve (H) limits hydraulic system pressure to a range of 18995—19685 kPa (190.1—196.9 bar) (2755—2855 psi). If the system encounters sufficient resistance to oil flow due to a heavy load or restriction, the relief valve opens, allowing oil to return to the reservoir.

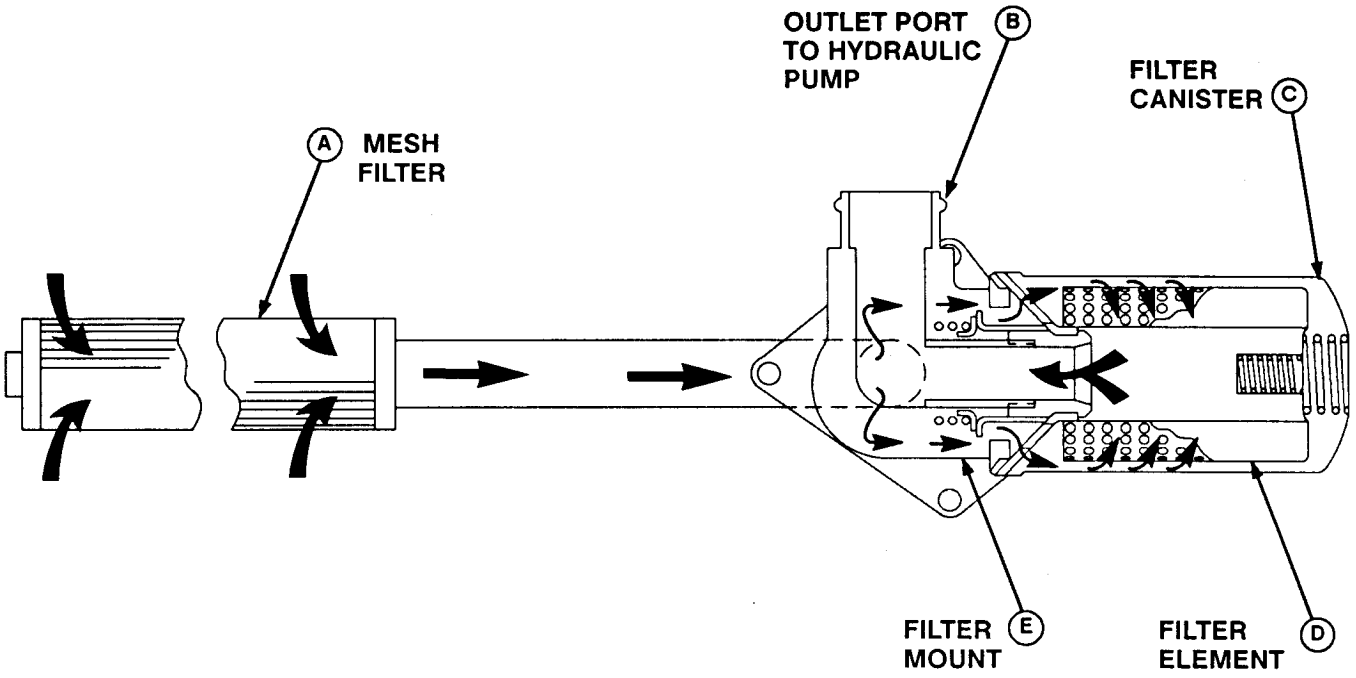
The inlet housing (J) also provides a mounting location for up to three optional selective control valves. (See this group for selective control valve oil flow.)

Oil flows from the inlet housing to the rockshaft valve (K). A flow regulating valve controls the amount of oil flow to the rockshaft (L) so it will rise at a constant rate regardless of engine speed.

When in neutral, the rockshaft control valve passes oil to the sump. When the control valve is actuated by movement of control lever (E) or by the draft sensing linkage, oil passes to or from the rockshaft cylinder, raising or lowering the 3-point hitch.

NOTE: See Section 260, Group 10 for steering and brake operation. See this group for hydraulic pump and rockshaft operation.

Hydraulic Filter Operation—Early Model



LV126AE

HYDRAULIC FILTER OPERATION

A—Mesh Filter
B—Outlet Port to Hydraulic Pump
C—Filter Canister
D—Filter Element
E—Filter Mount

FUNCTION:

Strains particles or contaminants from the oil.

MAJOR COMPONENTS:

- Filter Screen
- Filter Housing
- Filter Canister

THEORY OF OPERATION:

Continued on next page

LV126AE –19–27JAN92

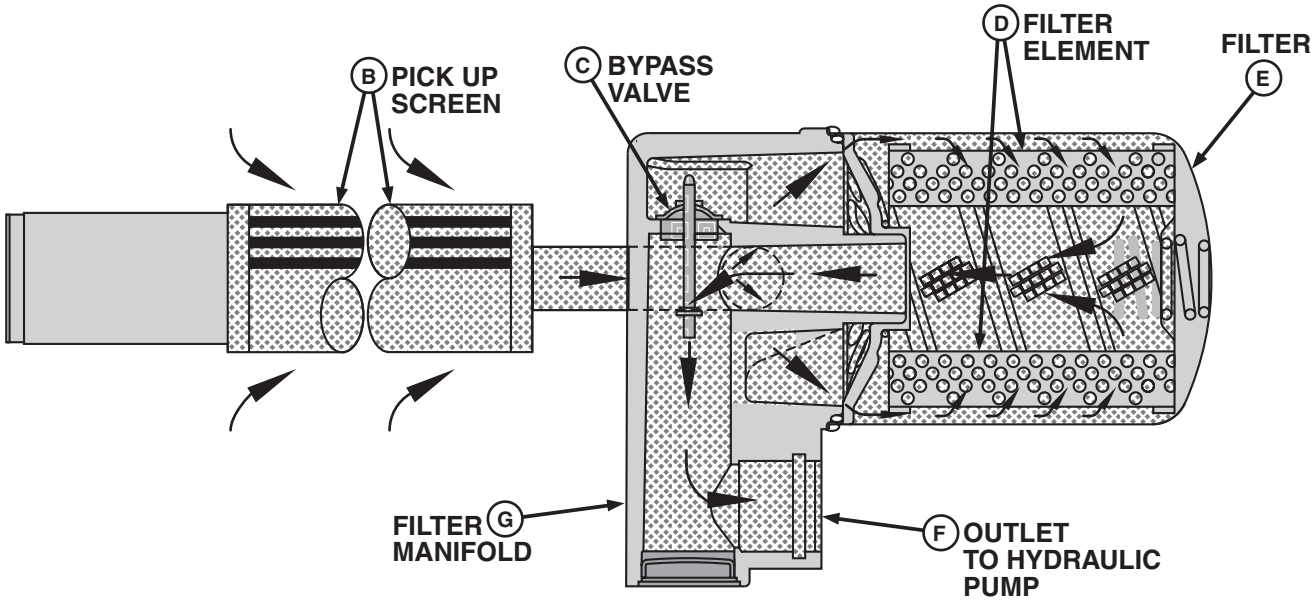
The filter system consists of a 150-mesh filter (A) and a filter canister (C). Hydraulic oil first moves through mesh filter (A) to strain large particles of debris before the oil leaves the transmission case. Oil then enters filter mount (E) and travels to the outside of filter element (D). The oil then passes through the element and out port (B) to the hydraulic pumps.

If the filter canister should plug and there is more than 55 kPa (0.5 bar) (8 psi) pressure differential, a relief valve opens, allowing unfiltered oil to enter the hydraulic pumps.

IMPORTANT: Hydraulic filters should be changed according to the maintenance schedule to prevent damage to the hydraulic system.

OUO1085,0000242 –19–10OCT00–2/2

Hydraulic Filter Operation—Later Model



LVC7362

HYDRAULIC FILTER OPERATION

LVC7362 –19–24SEP01

A—Suction Oil
B—Pick-Up Screen
C—Bypass Valve
D—Filter Element
E—Filter
F—Outlet to Hydraulic Pump
G—Filter Manifold

FUNCTION:

Strains particles or contaminants from the oil.

MAJOR COMPONENTS:

- Pickup Screen
- Filter Manifold
- Filter
- Bypass Valve

THEORY OF OPERATION:

Continued on next page

OUO1082,0000113 –19–08JUL02–1/2

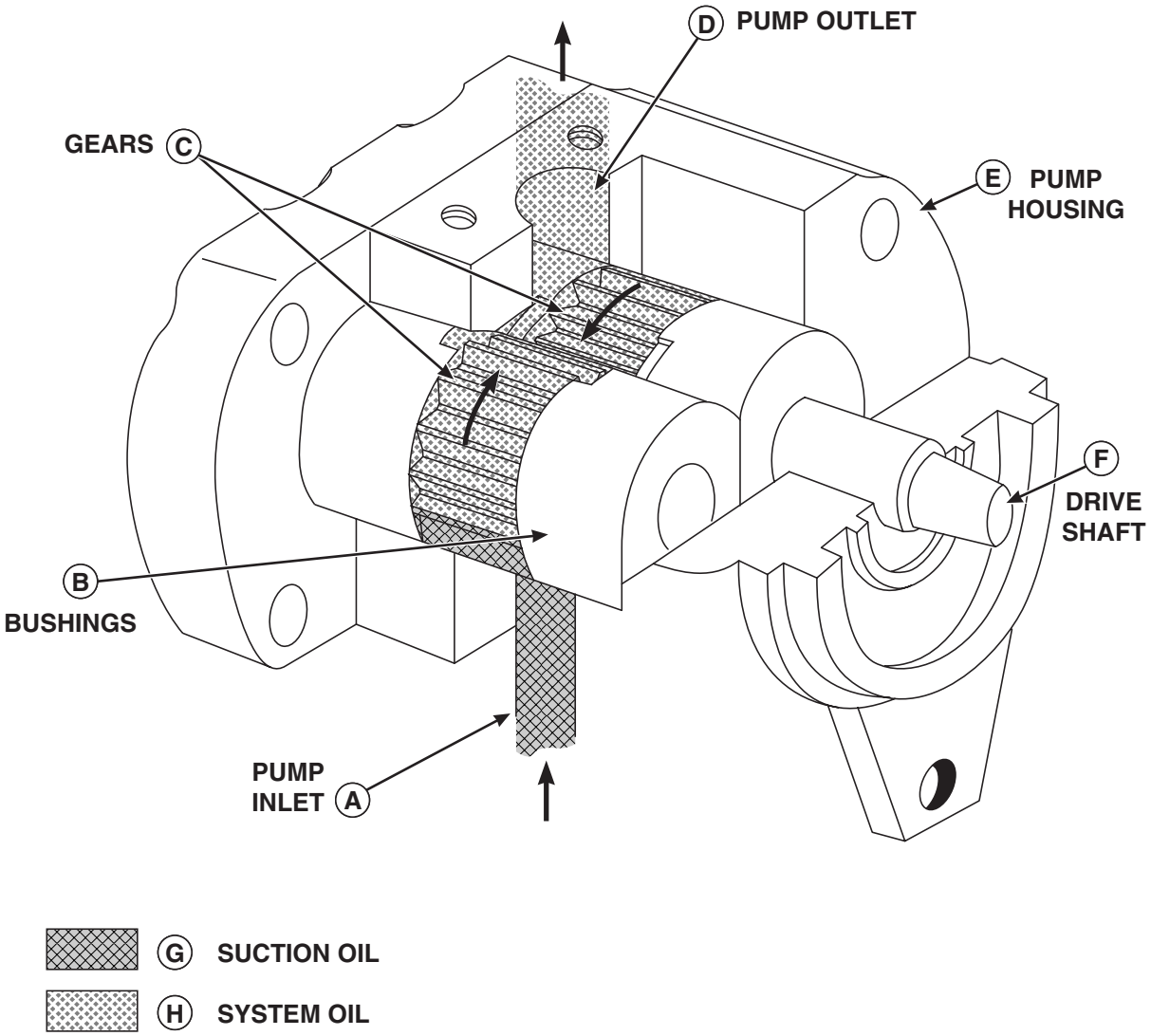
The filter system consists of a 125 mesh pick-up screen (B), a 25-micron filter (E) and bypass valve (C). Hydraulic oil first moves through pickup screen (B) to strain large particles of debris before the oil leaves the transmission case. Oil then enters filter manifold (G) and travels to the outside of filter element (D). The oil then passes through the element and out port (F) to the hydraulic pumps.

If the filter should plug and there is more than 50 kPa (0.5 bar) (7 psi) pressure differential, bypass valve (C) opens allowing unfiltered oil to the hydraulic pumps.

IMPORTANT: Hydraulic filters should be changed according to the maintenance schedule to prevent damage to the hydraulic system.

OUO1082,0000113 –19–08JUL02–2/2

Hydraulic Pump Operation



LVC127AE

LVC127AE –19–07APR97

HYDRAULIC PUMP OPERATION

A—Pump Inlet **C—Gears** **E—Pump Housing** **G—Suction Oil**
B—Bushings **D—Pump Outlet** **F—Drive Shaft** **H—System Oil**

FUNCTION:

Supplies a continuous flow of oil to operate the rockshaft and implements connected to optional selective control valves. Also supplies oil for transmission lubrication and power steering.

MAJOR COMPONENTS:

Continued on next page

- Hydraulic Pump

THEORY OF OPERATION:

The hydraulic pump assembly contains two pumps, each of different displacements. The 20-cc or 29-cc hydraulic pump supplies oil for the rockshaft and other tractor hydraulics. The 12-cc pump supplies oil for the steering system and transmission lubrication.

Both pumps operate identically and use a positive-displacement, external-gear design that moves a set volume of fluid with each revolution. Output volume changes only when the speed of the pump changes.

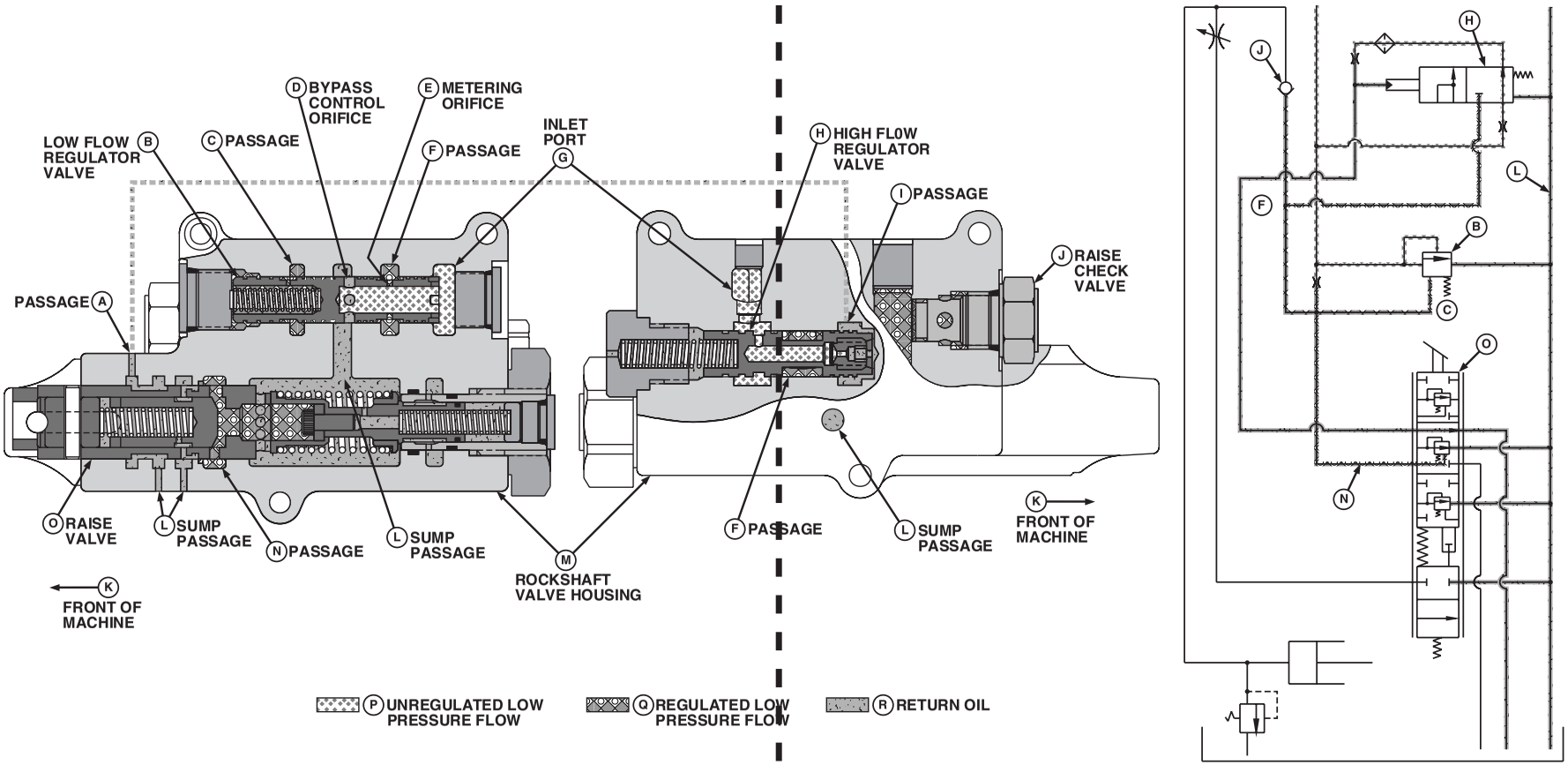
The engine drives the hydraulic pumps from the camshaft drive gear. As the pump gears (C) rotate, they continuously move in and out of mesh with each other. When the gears separate, a vacuum develops which draws oil into the pump inlet (A). The oil continues to move with the gears as they turn.

As the gears come back into mesh, they form a seal which prevents oil from returning to the pump inlet. Further meshing forces oil out the pump outlet (D) and into the hydraulic system. This cycle repeats continuously as long as the pump turns.

OUO1085,0000243 –19–10OCT00–2/2

Rockshaft Control Valve Operation—Two Flow Regulator Valves

LVC2211 –UN–21JUN97

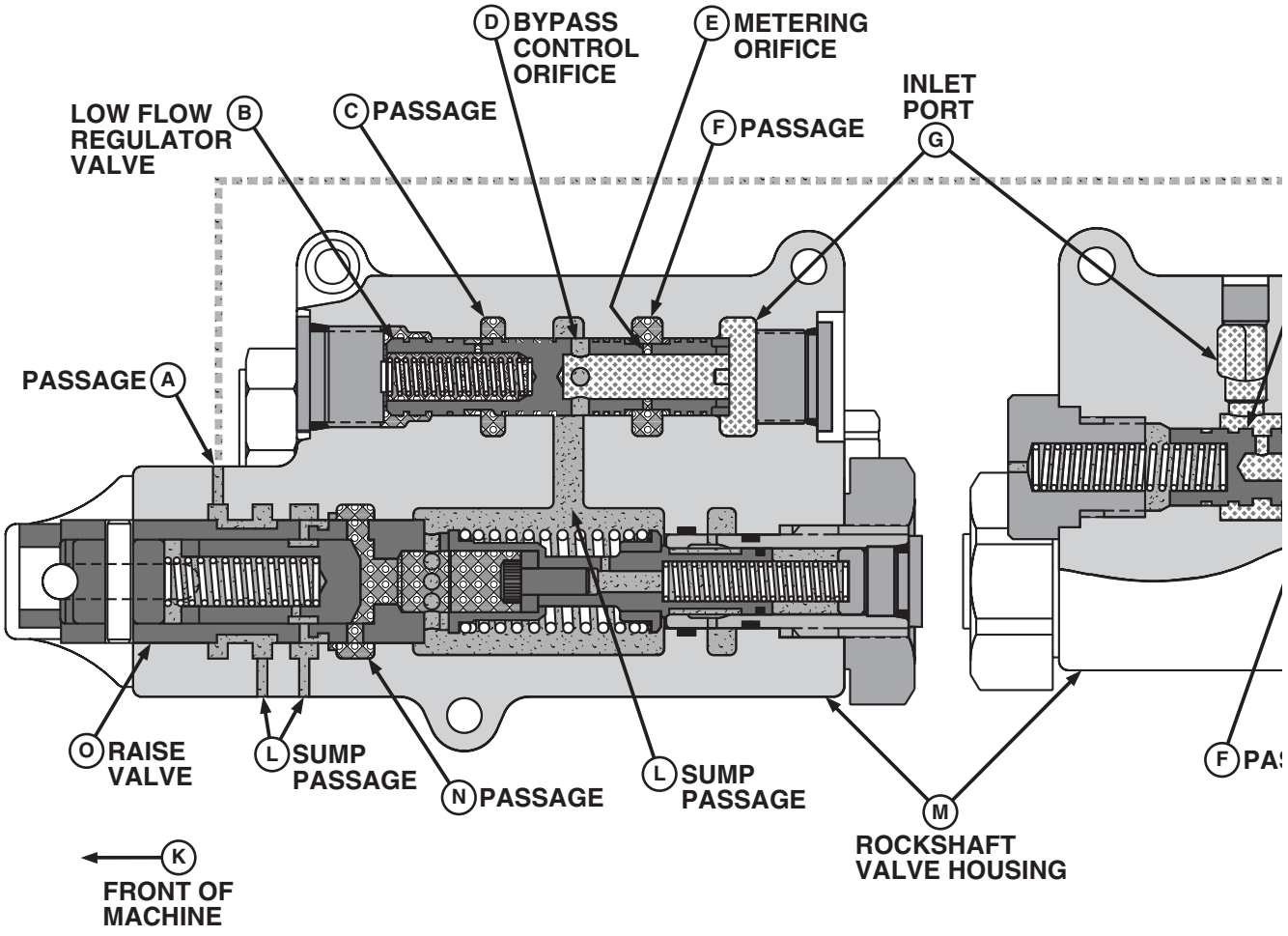


LVC2211

ROCKSHAFT CONTROL VALVE OPERATION TWO FLOW REGULATOR VALVES

See Page 270-10-10 A

See Page 270-10-10 B



ROCKSHAFT CONTR
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LVC2211

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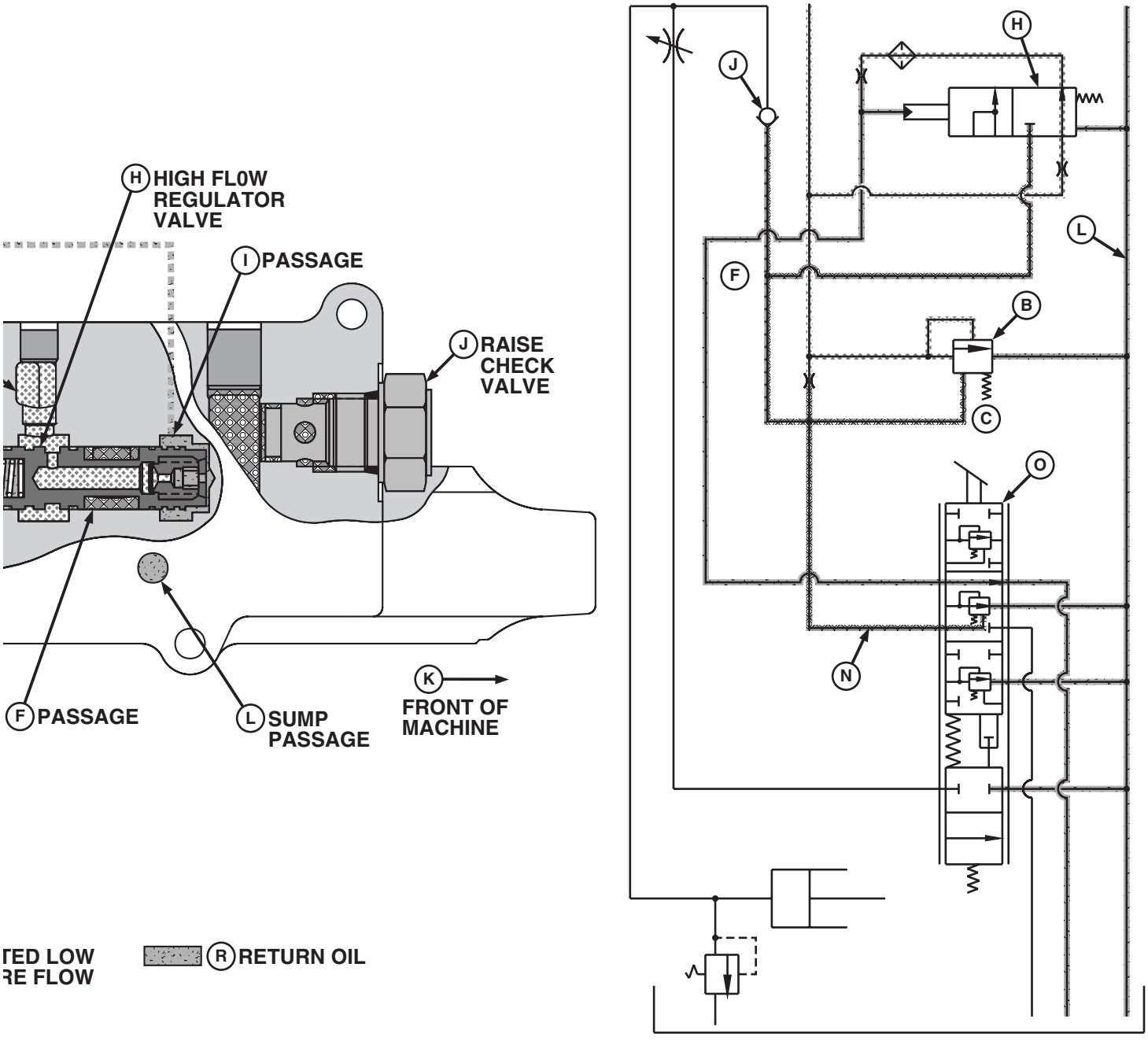
Rockshaft Control Valve Operation—Two Flow Regulator Valves

LVC2211 –UN–21JUN97



ONTROL VALVE OPERATION
' REGULATOR VALVES

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A—Passage
B—Low Flow Regulator Valve
C—Passage
D—Bypass Control Orifice
E—Metering Orifice
F—Passage
G—Inlet Port
H—High Flow Regulator Valve
I—Passage
J—Raise Check Valve
K—Front of Machine
L—Sump Passage
M—Rockshaft Valve Housing
N—Passage
O—Raise Valve
P—Unregulated Low Pressure Flow
Q—Regulated Low Pressure Flow
R—Return Oil

FUNCTION:

The two flow regulator valves meter two separate oil supplies to the rockshaft control valve. This system compensates for variations in hitch load and pump output, to maintain a constant lift rate at the rockshaft cylinder. The rockshaft cylinder rises at one of two steady speeds regardless of engine speed and/or hitch load. The low flow regulator valve (B) meters oil for small hitch movements. The high flow regulator valve (H) meters oil flow for large hitch movements.

MAJOR COMPONENTS:

- Rockshaft Valve Housing
- Rockshaft Low Flow Regulator Valve
- Rockshaft High Flow Regulator Valve

THEORY OF OPERATION:

Low Flow Regulator Valve:

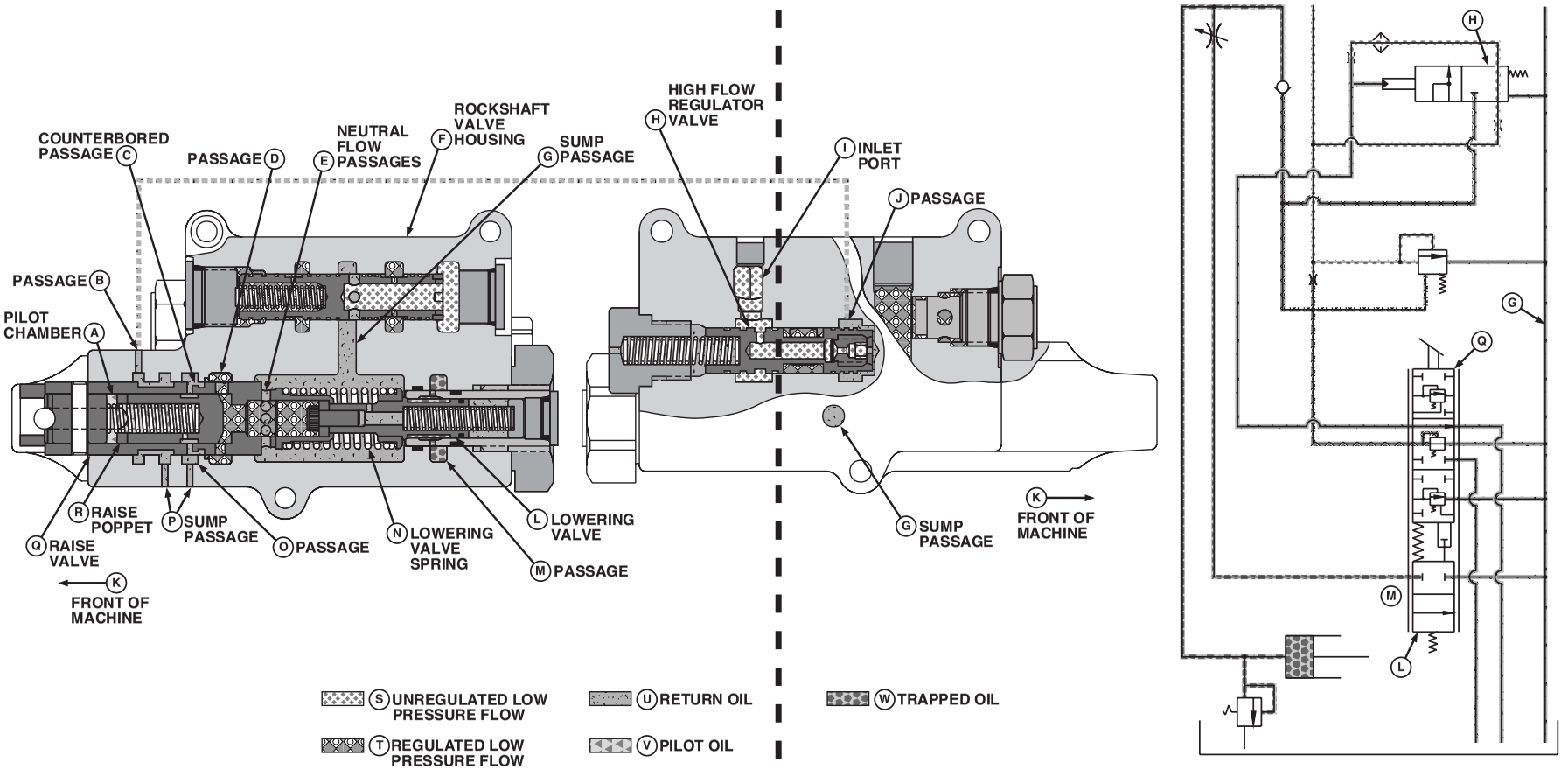
Oil from the hydraulic pump enters inlet port (G) near rear of low flow regulator valve (B). Oil continues through center of valve, exiting through metering orifice (E) to passage (F). Hydraulic pump flow is reduced from a maximum of 47 L/m (12 gpm) to 4 L/m (1 gpm). This oil is supplied to raise valve (O) regardless of hitch or raise valve position. Remaining oil flows through the bypass control orifices (D) and back to sump through passage (L).

High Flow Regulator Valve:

Oil from the hydraulic pump enters inlet port (G) of high flow regulator valve (H). When the raise valve is moved more than 0.8 mm (0.030 in.), oil flow from sump passage (A) to sump passage (L) is blocked. Control oil in front of the high flow regulator valve shifts the spool and meters an additional 11 L/m (3 gpm) from inlet port (G) to passage (F). This oil combines with flow from low flow regulating valve (B) for a total flow of 14 L/m (4 gpm) to raise valve (O). Passages (C), (F), and (N) connect, providing a combined regulated supply of oil to raise valve (O).

Rockshaft Control Valve Operation—Neutral Position

LVC2212 –UN–21JUN97

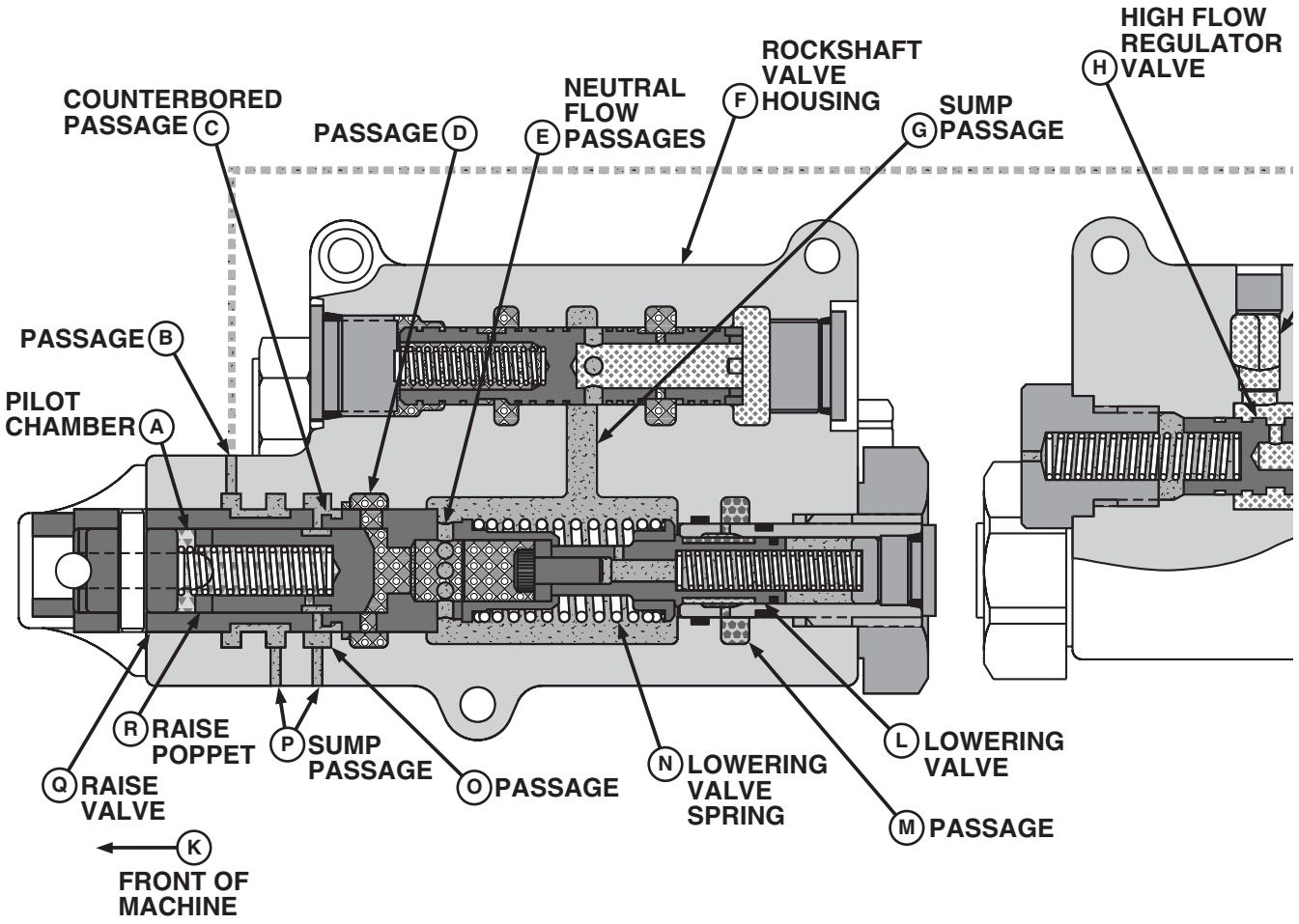


LVC2212

ROCKSHAFT CONTROL VALVE OPERATION NEUTRAL POSITION

See Page 270-10-12 A

See Page 270-10-12 B



ROCKSHAFT CONTR
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LVC2212

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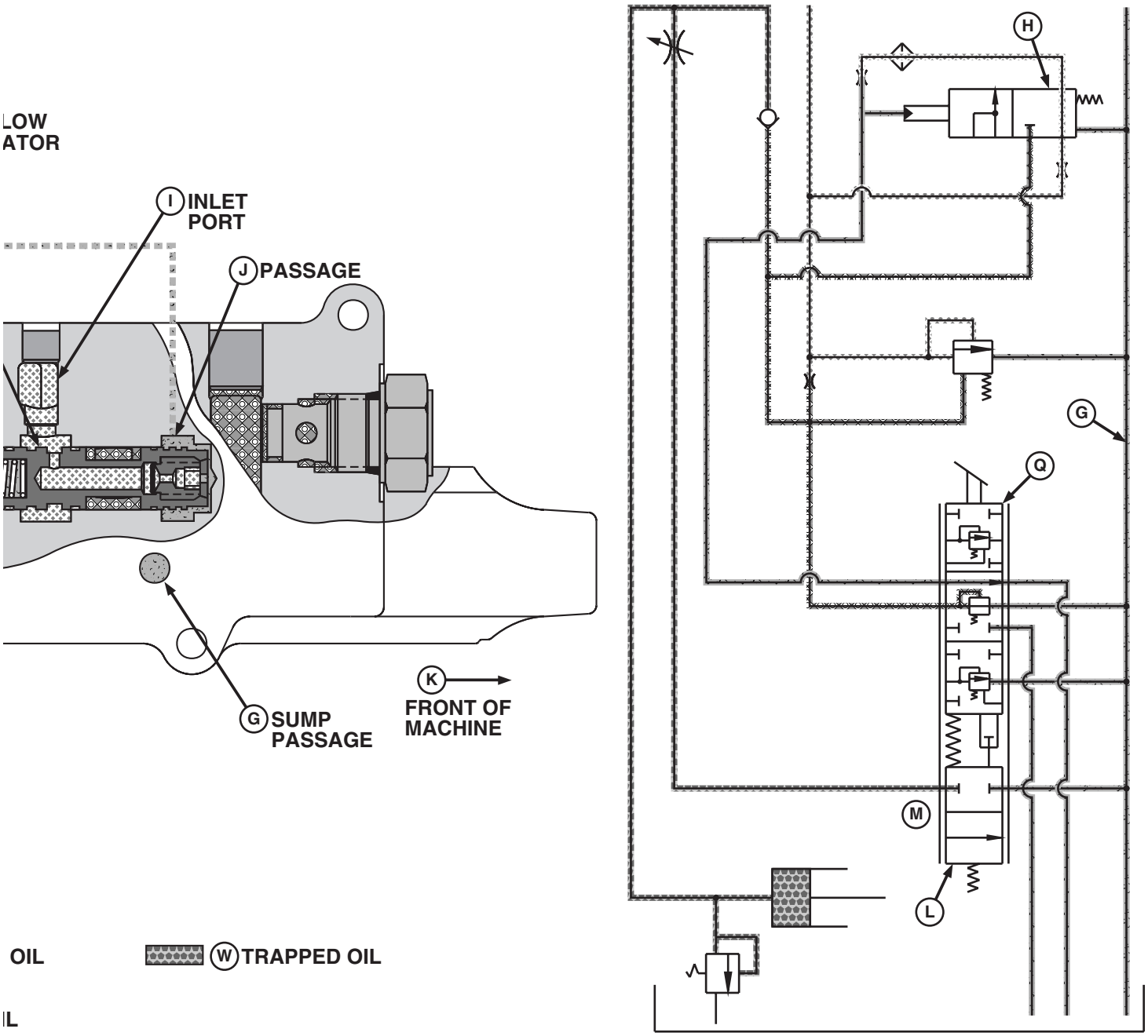
Rockshaft Control Valve Operation—Neutral Position

LVC2212 –UN–21JUN97



ONTROL VALVE OPERATION
TRAL POSITION

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A—Pilot Chamber
B—Passage
C—Counterbored Passage
D—Passage
E—Neutral Flow Passages
F—Rockshaft Valve Housing
G—Sump Passage
H—High Flow Regulator Valve
I—Inlet Port
J—Passage
K—Front of Machine
L—Lowering Valve
M—Passage
N—Lowering Valve Spring
O—Passage
P—Sump Passage
Q—Raise Valve
R—Raise Poppet
S—Unregulated Low Pressure Flow
T—Regulated Low Pressure Flow
U—Return Oil
V—Pilot Oil
W—Trapped Oil

FUNCTION:

Controls oil flow to the rockshaft cylinder.

MAJOR COMPONENTS:

- Rockshaft Valve Housing
- Rockshaft Valve

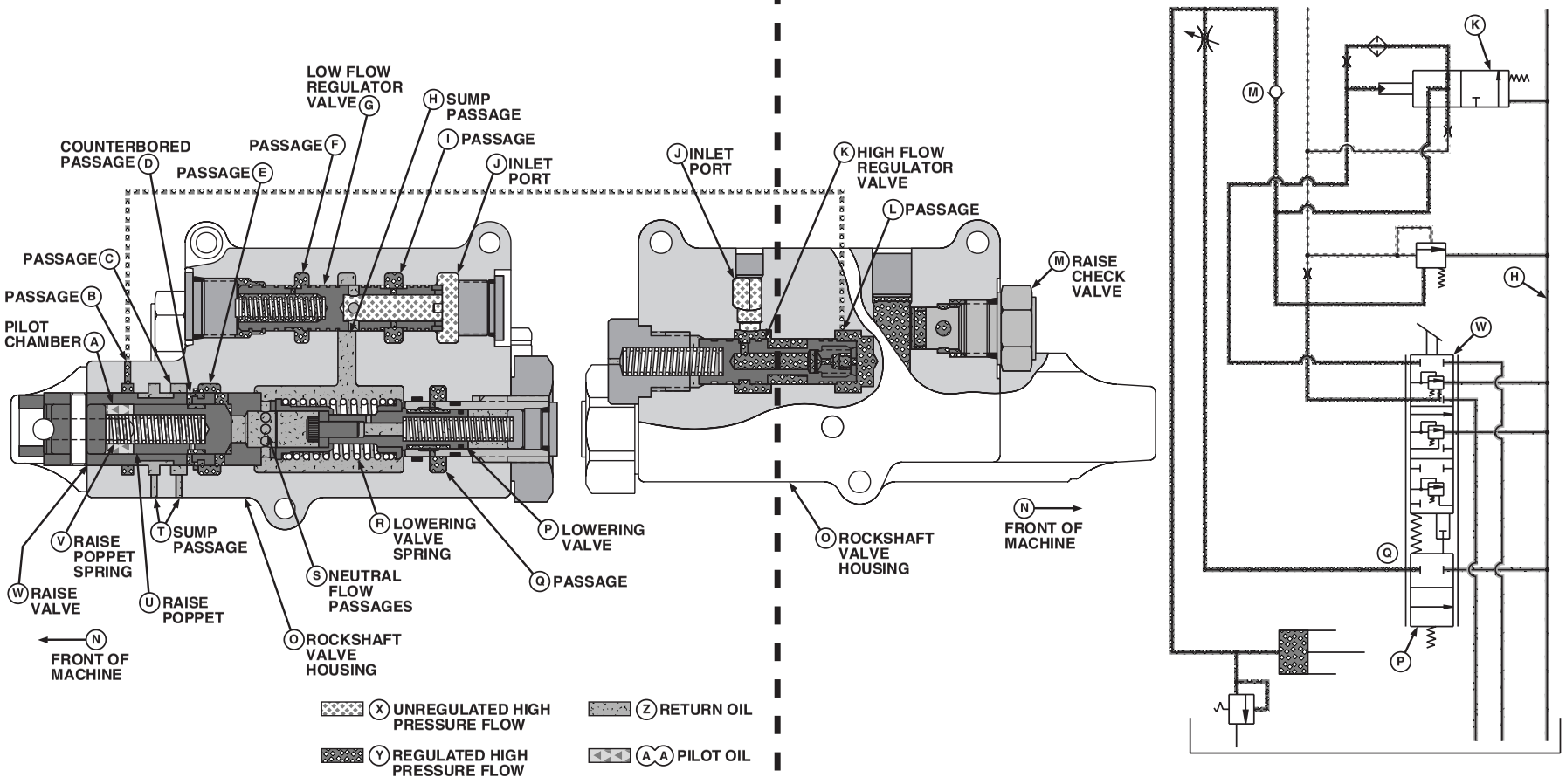
THEORY OF OPERATION:

With the rockshaft control valve in the neutral position, pressure from the lowering spring (N) keeps the lowering valve (L) closed while applying light pressure to the raise valve (Q). Raise valve position allows the counterbored passage (C) to align with passage (O). Pilot pressure in the pilot chamber (A) vents to the sump, causing raise poppet (R) to open and route pump flow from passage (D) to sump through he neutral flow passages (E). Passage (M) connects to the cylinder side of the raise check valve and is blocked by the lowering valve (L) to maintain cylinder position.

OUO1085,0000245 –19–10OCT00–2/2

Rockshaft Control Valve Operation—Raise Position

LVC2213 –UN–21JUN97

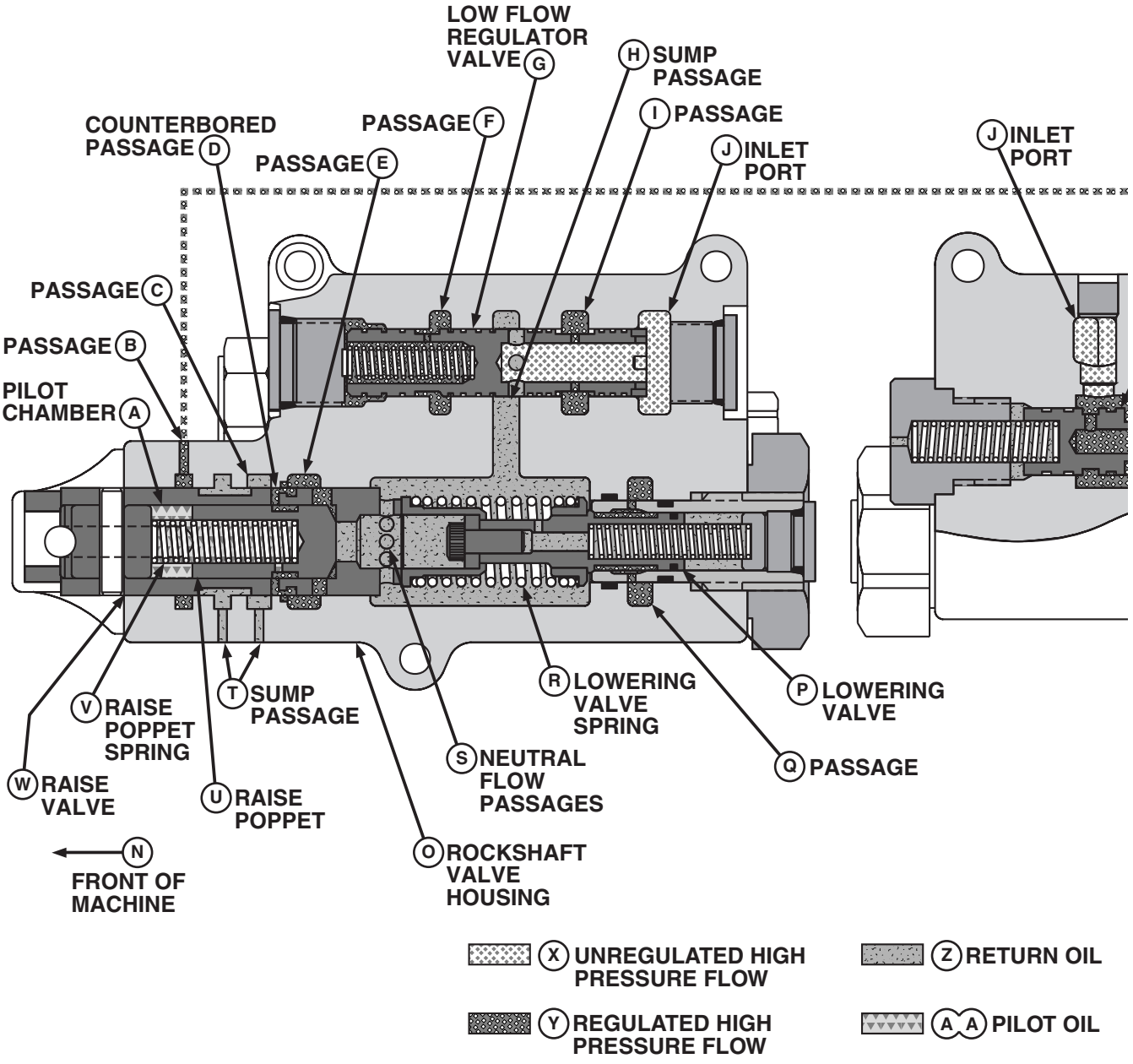


LVC2213

ROCKSHAFT CONTROL VALVE OPERATION RAISE POSITION

See Page 270-10-14 A

See Page 270-10-14 B



ROCKSHAFT CONTR
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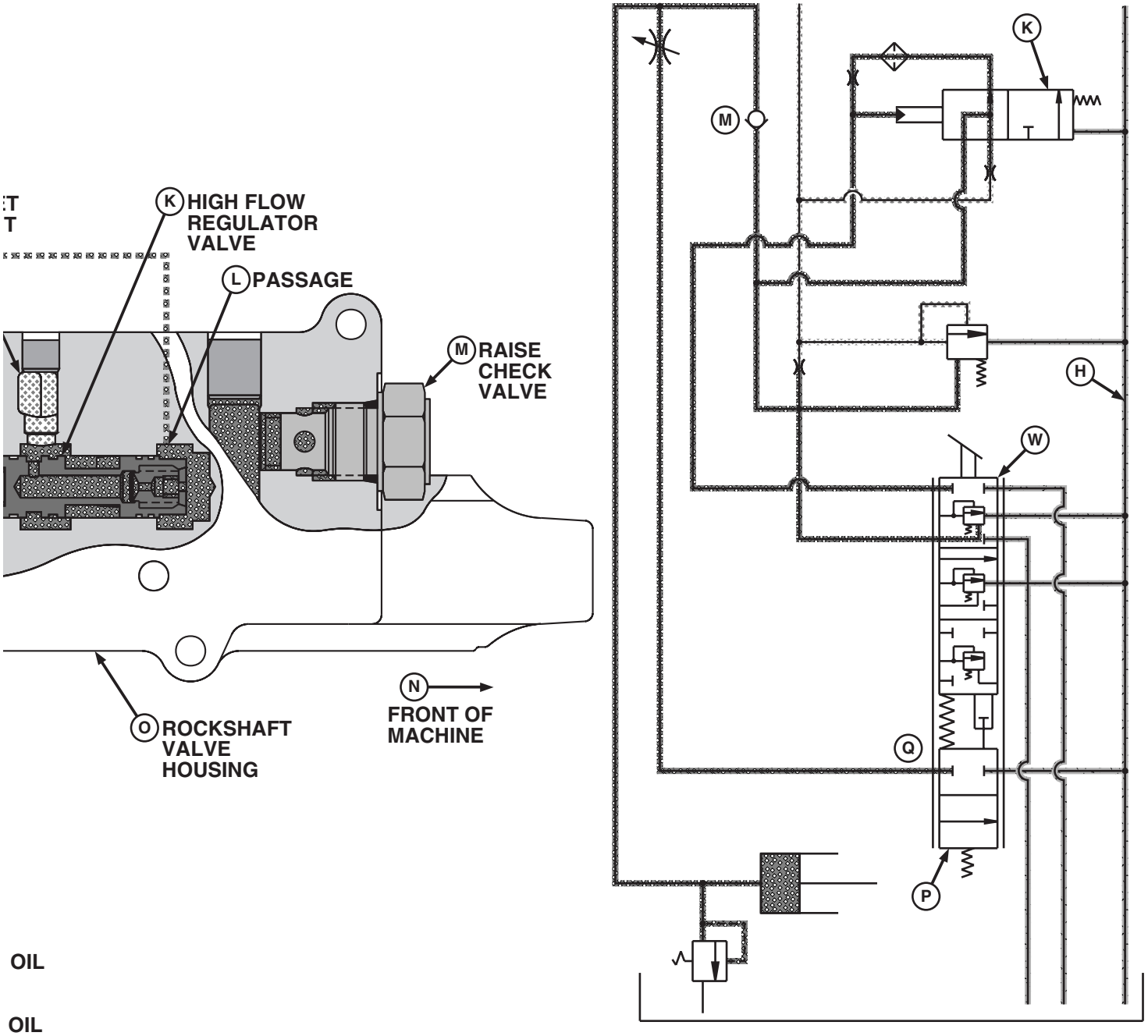
Rockshaft Control Valve Operation—Raise Position

LVC2213 –UN–21JUN97



ONTROL VALVE OPERATION AISE POSITION

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A—Pilot Chamber
B—Passage
C—Passage
D—Counterbored Passage
E—Passage
F—Passage
G—Low Flow Regulator Valve
H—Sump Passage
I—Passage
J—Inlet Port
K—High Flow Regulator Valve
L—Passage
M—Raise Check Valve
N—Front of Machine
O—Rockshaft Valve Housing
P—Lowering Valve
Q—Passage
R—Lowering Valve Spring
S—Neutral Flow Passage
T—Sump Passage
U—Raise Poppet
V—Raise Poppet Spring
W—Raise Valve
X—Unregulated High Pressure Flow
Y—Regulated High Pressure Flow
Z—Return Oil
AA—Pilot Oil

FUNCTION:

Controls oil flow to the rockshaft cylinder with control lever in the raised position.

MAJOR COMPONENTS:

- Rockshaft Valve Housing
- Rockshaft Valve

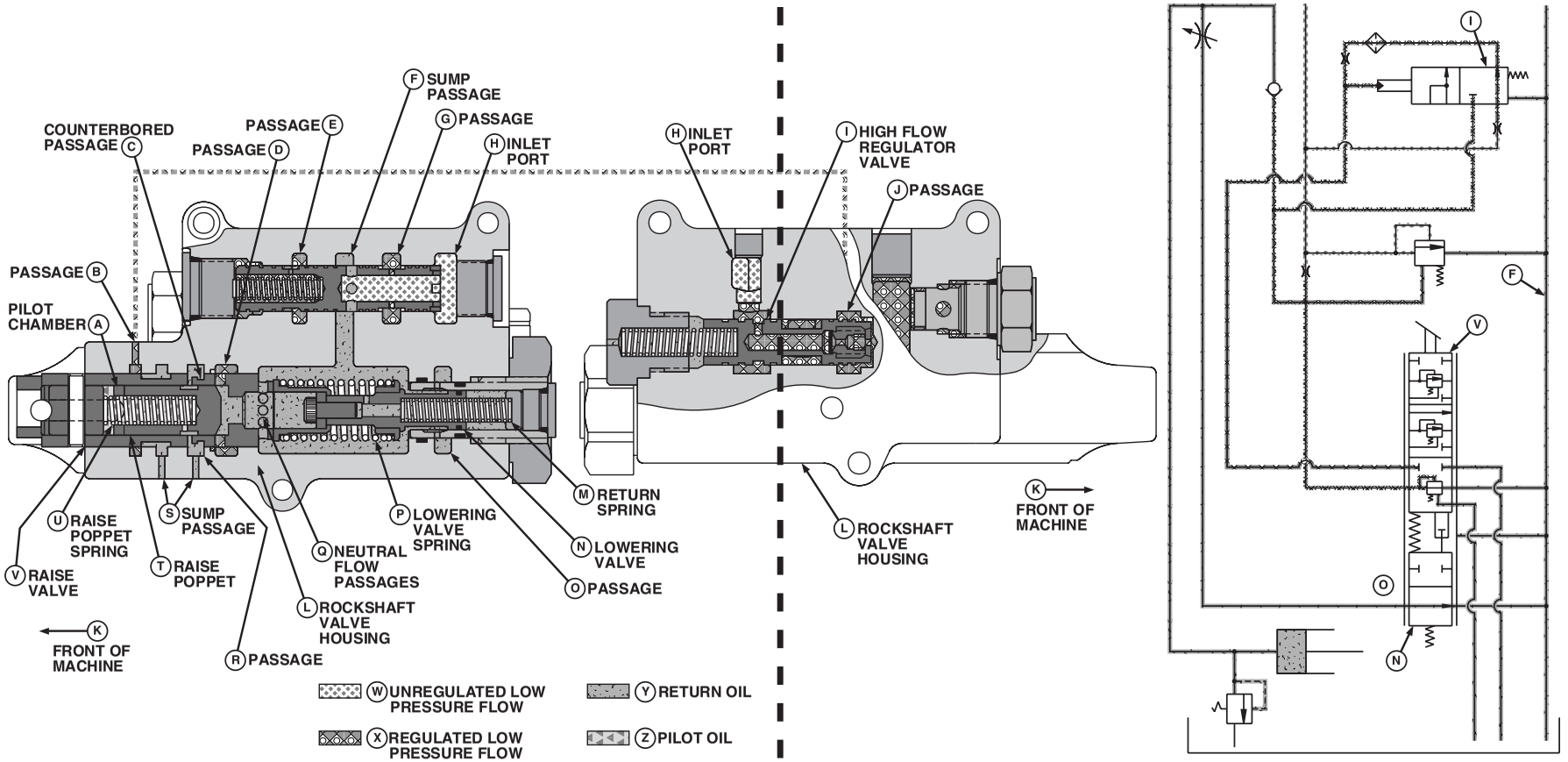
THEORY OF OPERATION:

When the rockshaft control valve is placed in the raise position, raise valve (W) moves rearward, putting added pressure on lowering valve spring (R). Lowering valve (P) remains closed. As the raise valve moves, counterbored passages (D) align with passage (E) instead of passage (C). This fills pilot chamber (A) with pressurized oil. Raise poppet (U) closes due to pressure in the pilot chamber, and force of raise poppet spring (V), which then blocks oil flow to neutral flow passage (S). Pressure increases at passages (E, F, I, and Q), opening raise check valve (M) and thereby supplying oil flow of 11 L/m (3 gpm) to the rockshaft cylinder.

When the raise valve is moved more than 0.8 mm (0.030 in.), oil flow from high flow regulator valve (K) to sump is blocked at sump passage (T). This causes pressure to build, moving the high flow regulator valve and diverting additional oil from inlet port (J) to passage (E). This oil combines with oil from low flow regulator valve (G) to increase total oil flow to the rockshaft cylinder to 14 L/m (4 gpm).

Rockshaft Control Valve Operation—Lower Position

LVC2214 –UN–21JUN97



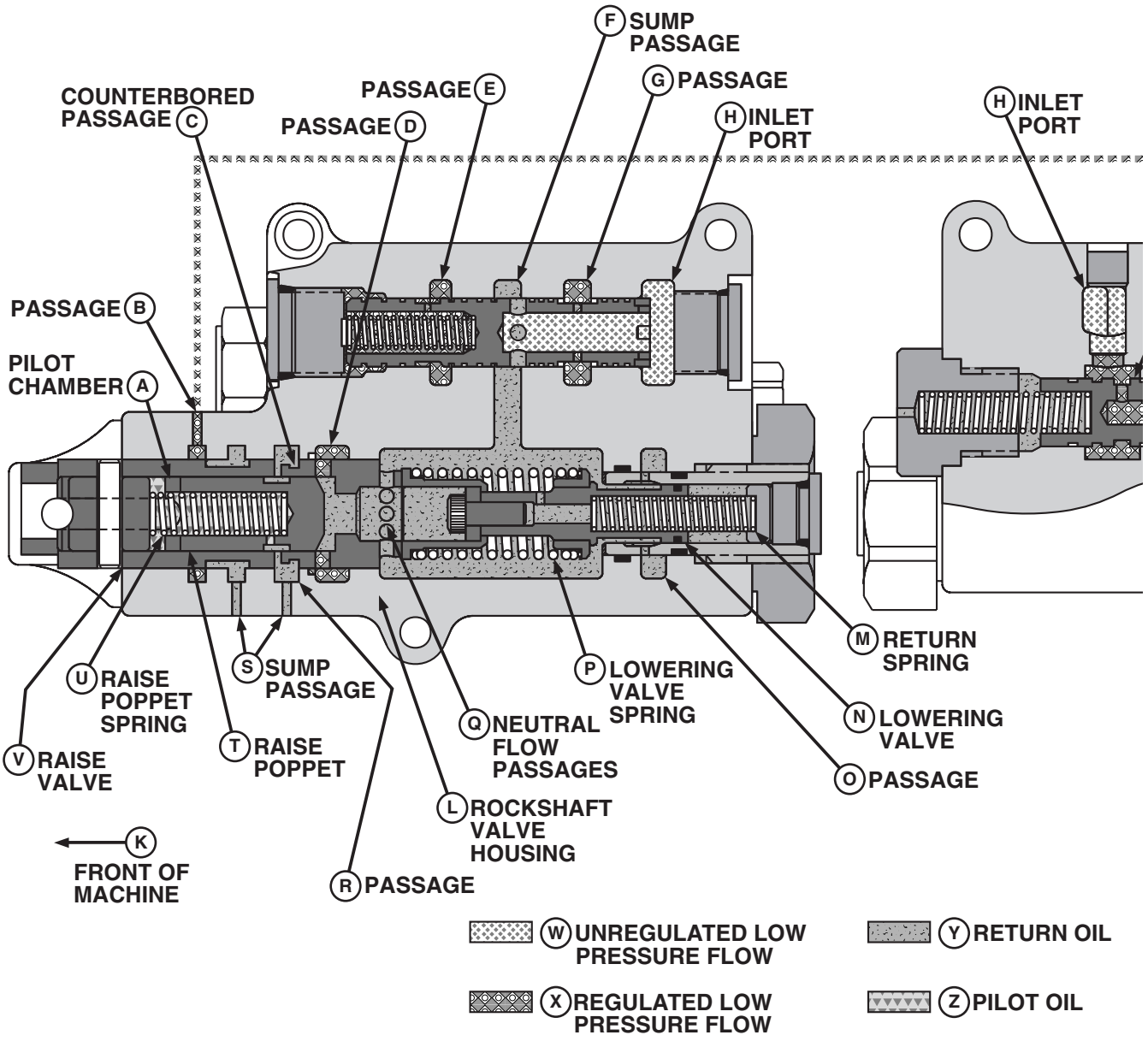
ROCKSHAFT CONTROL VALVE OPERATION LOWER POSITION

LVC2214

OUO1085,0000247 –19–10OCT00–1/2

See Page 270-10-16 A

See Page 270-10-16 B



ROCKSHAFT CONTR
LOWER

LVC2214

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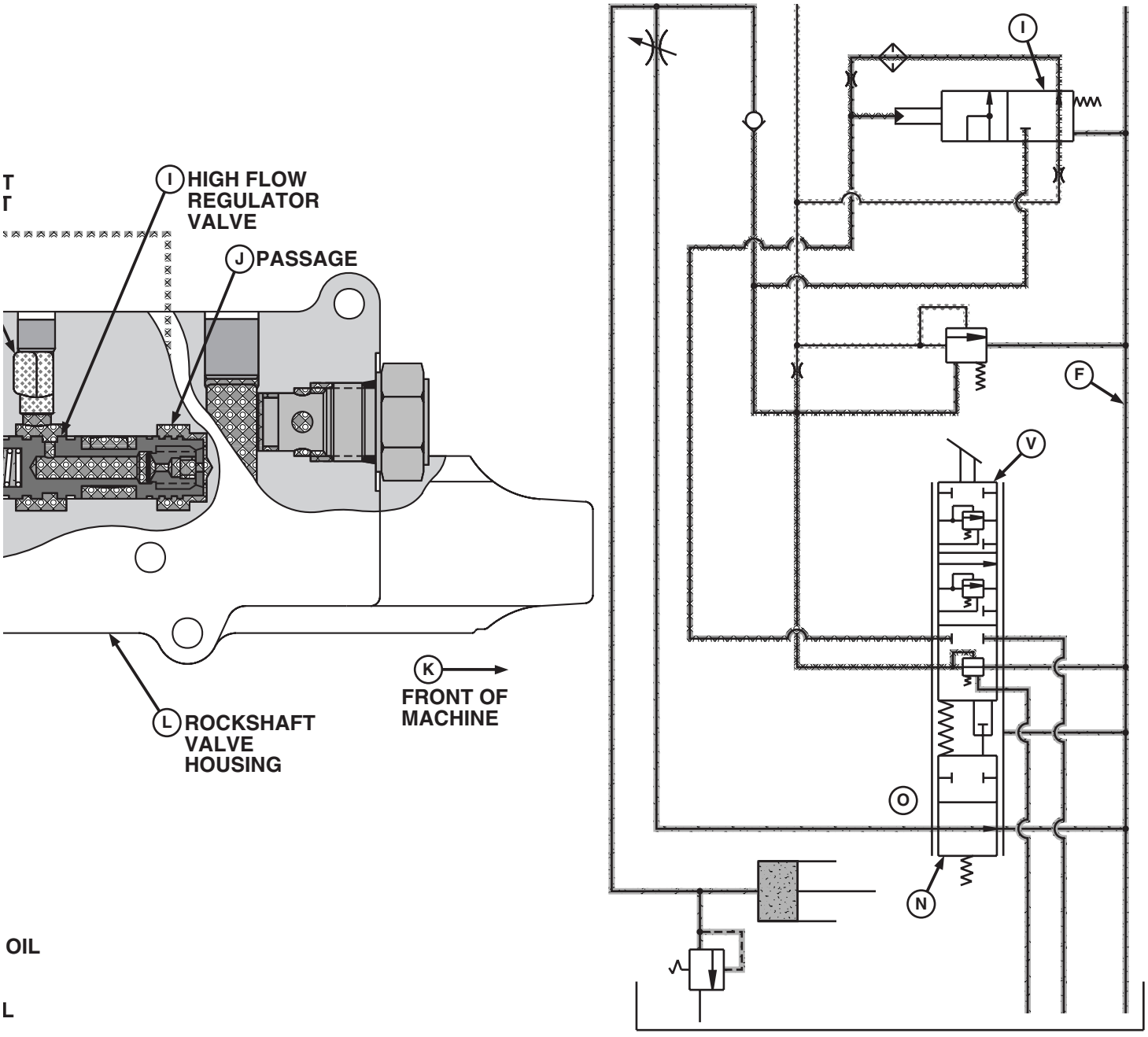
Rockshaft Control Valve Operation—Lower Position

LVC2214 –UN–21JUN97



OIL

L

ONTROL VALVE OPERATION
WER POSITION

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A—Pilot Chamber
B—Passage
C—Counterbored Passage
D—Passage
E—Passage
F—Sump Passage
G—Passage
H—Inlet Port
I—High Flow Regulator Valve
J—Passage
K—Front of Machine
L—Rockshaft Valve Housing
M—Return Spring
N—Lowering Valve
O—Passage
P—Lowering Valve Spring
Q—Neutral Flow Passage
R—Passage
S—Sump Passages
T—Raise Poppet
U—Raise Poppet Spring
V—Raise Valve
W—Unregulated Low Pressure Flow
X—Regulated Low Pressure Flow
Y—Return Oil
Z—Pilot Oil

FUNCTION:

Controls oil flow from the rockshaft cylinder.

MAJOR COMPONENTS:

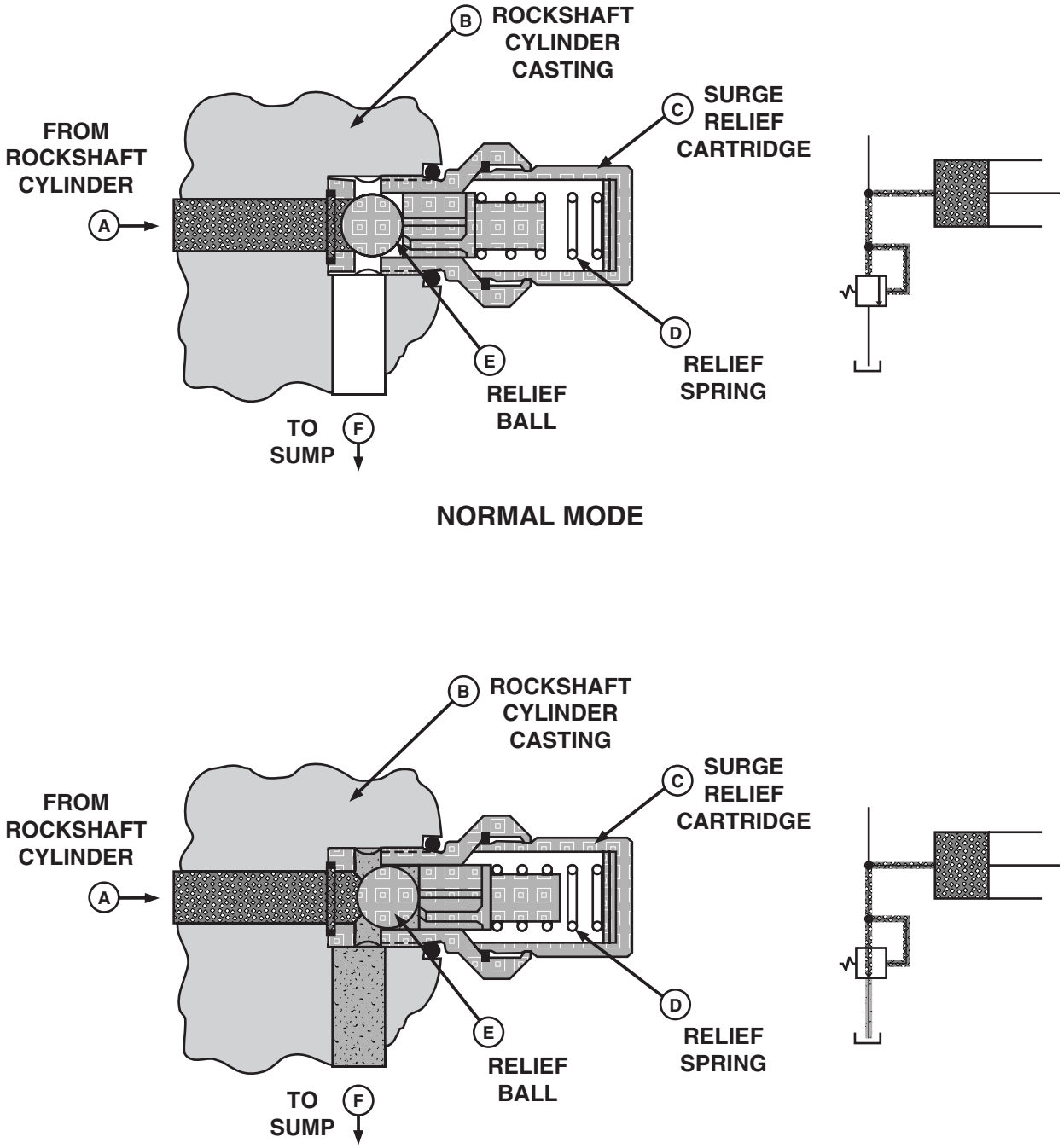
- Rockshaft Valve Housing
- Rockshaft Valve

THEORY OF OPERATION:

When the rockshaft control valve is moved forward to the lowering position, force from return spring (M) pushes lowering valve (N) open. Counterbored passages (C) in the raise valve align with passage (R) allowing pilot pressure to return to sump. Pressure at passage (D) opens raise poppet (T), venting pressurized oil through raised valve, out neutral flow passages (Q) to sump. Oil in rockshaft cylinder flows through passage (O) in lowering valve and returns to sump.

OUO1085,0000247 –19–10OCT00–2/2

Surge Relief Valve Operation



SURGE RELIEF VALVE OPERATION

LVC128AE –19–18MAY01

Continued on next page

A—From Rockshaft Cylinder
B—Rockshaft Cylinder Casting
C—Surge Relief Valve Cartridge
D—Relief Spring
E—Relief Ball
F—To Sump
G—Pressure Oil
H—Return Oil

FUNCTION:

The surge relief valve threads into a passage at the end of the rockshaft cylinder. The valve protects the cylinder and its related parts from damage due to excessive pressure.

MAJOR COMPONENTS:

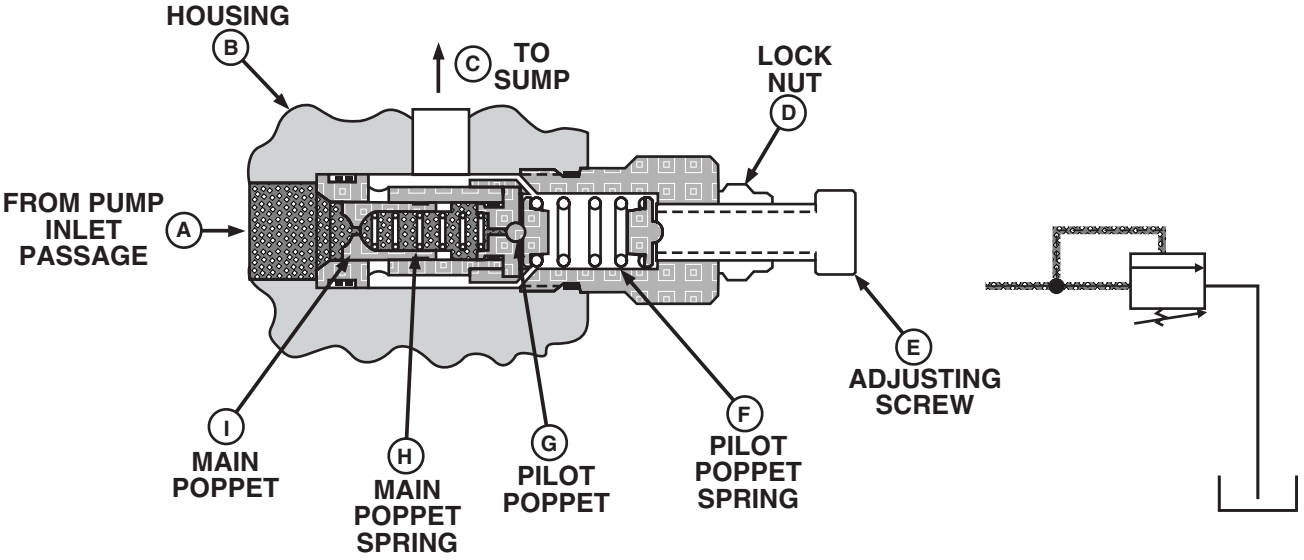
- Surge Relief Valve
- Rockshaft Cylinder
- Rockshaft Piston

THEORY OF OPERATION:

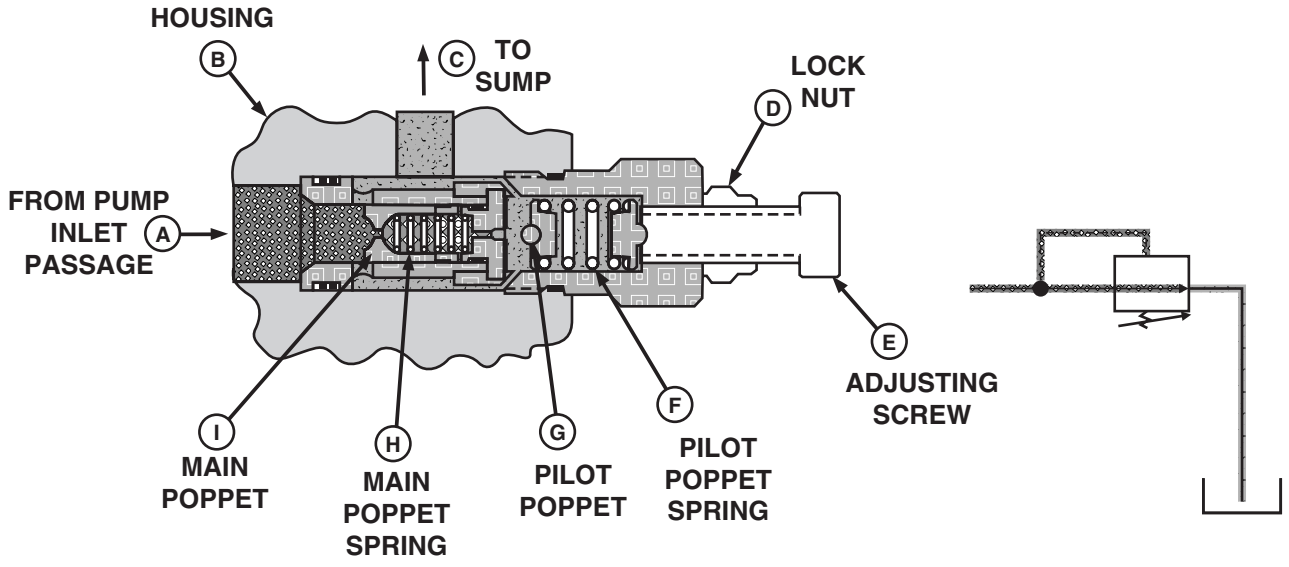
As long as pressure inside the rockshaft cylinder is less than 22994 to 22934 kPa (230 to 240 bar) (3335 to 3480 psi), tension from relief spring (D) holds relief ball (E) closed. If pressure increases suddenly and exceeds spring pressure, relief ball unseats, allowing oil back to sump. This condition can occur when the rockshaft encounters a sudden increase in implement load.

OUO1085,0000248 –19–10OCT00–2/2

Main Relief Valve Operation



NORMAL OPERATING MODE



RELIEF MODE

J PRESSURE OIL K REDUCED PRESSURE OIL L RETURN OIL

LVC129AE

RELIEF VALVE OPERATION

LVC129AE –19–18MAY01

Continued on next page

A—From Pump Inlet Passage
B—Housing
C—To Sump
D—Lock Nut
E—Adjusting Screw
F—Pilot Poppet Spring
G—Pilot Poppet
H—Main Poppet Spring
I—Main Poppet
J—Pressure Oil
K—Reduced Pressure Oil
L—Return Oil

FUNCTION:

The main relief valve serves two purposes:

- Protects the components of the hydraulic system from excessive pressure.
- Prevents overloading of the hydraulic system and tractor.

MAJOR COMPONENTS:

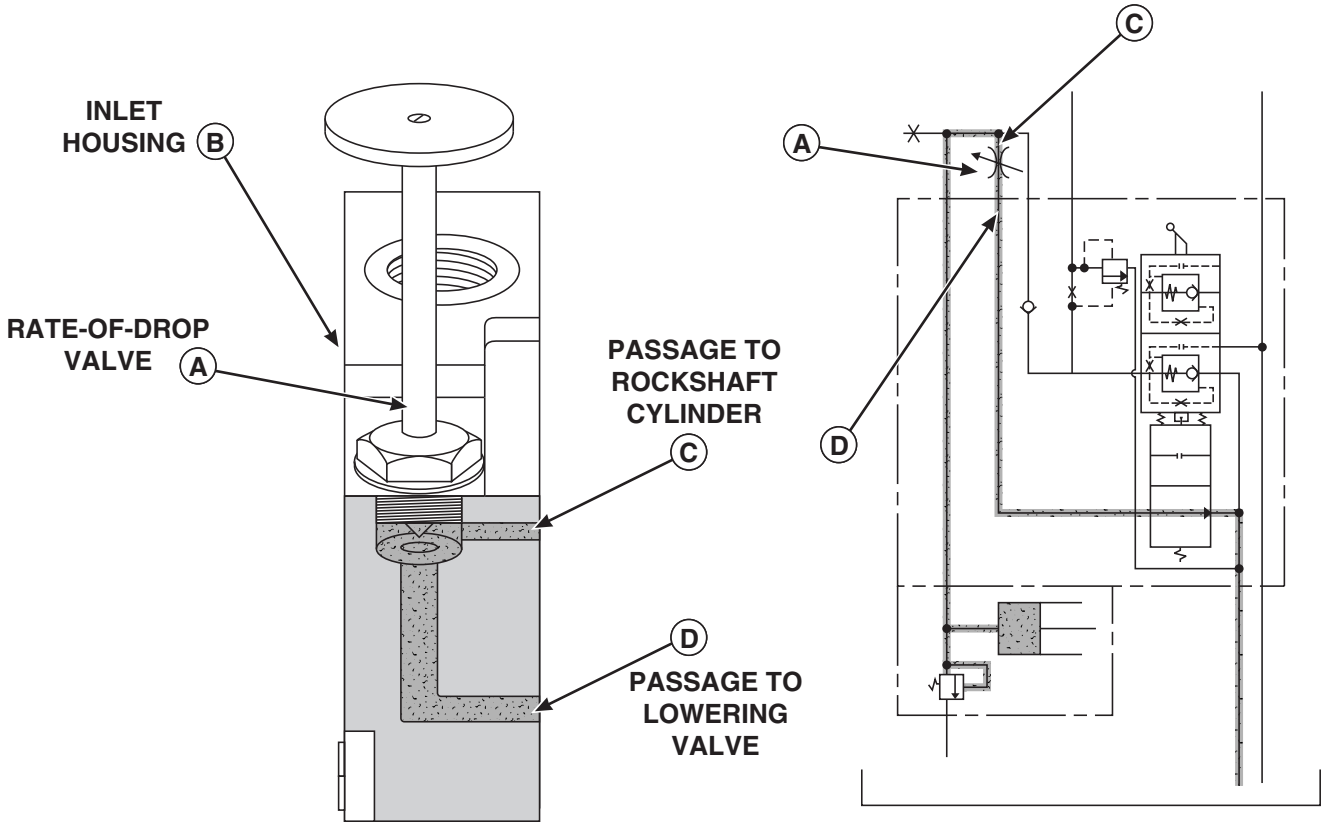
- Main Relief Valve
- Valve End Plate or SCV Assembly

THEORY OF OPERATION:

The system pressure reaches relief setting of 18995—19685 kPa(190—197 bar) (2755—2855 psi), pilot poppet (G) unseats. This drains pilot flow that has been allowed to pass to center of main poppet (I) causing pressure to drop at its back side. System pressure forces main poppet to move, opening passages back to sump.

OUO1040,0000AF8 –19–24APR01–2/2

Rate-of-Drop Valve Operation—Full Open



LVC166AE

RATE-OF-DROP VALVE OPERATION — FULL OPEN

A—Rate-of-Drop Valve
B—Inlet Housing
C—Passage to Rockshaft Cylinder
D—Passage to Lowering Valve
E—Return Oil

FUNCTION:

Controls the lowering rate of implement attached to rockshaft.

MAJOR COMPONENTS:

- Inlet Housing
- Rate-of-Drop Valve
- Lowering Valve

THEORY OF OPERATION:

LVC166AE –19–11SEP00

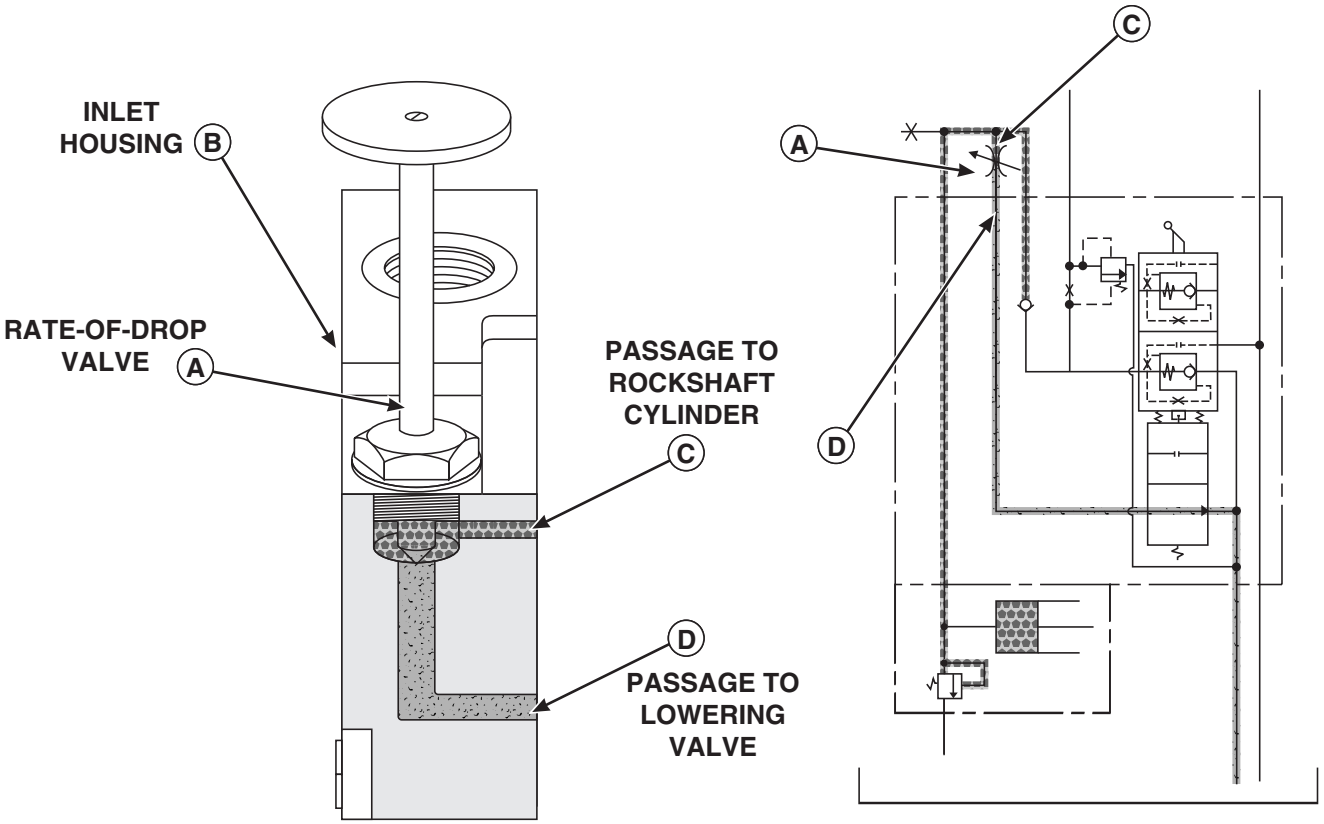
270
10
22

Continued on next page

Rate-of-drop valve (A) acts as a variable orifice for oil flow through the lowering valve. With valve in the fully open position, oil travels through valve opening from passage to rockshaft cylinder (C) to passage to lowering valve (D) oil continues to flow back to sump through lowering valve. Rockshaft drops quickly due to large volume of oil returning to sump.

OUO1085,0000249 –19–10OCT00–2/2

Rate-of-Drop Valve Operation—Full Closed



LVC168AE

RATE-OF-DROP VALVE OPERATION — FULL CLOSED

A—Rate-of-Drop Valve
B—Inlet Housing
C—Passage to Rockshaft Cylinder
D—Passage to Lowering Valve
E—Trapped Oil
F—Return Oil

FUNCTION:

Controls the lowering rate of implement attached to rockshaft.

MAJOR COMPONENTS:

- Inlet Housing
- Rate-of-Drop Valve
- Lowering Valve

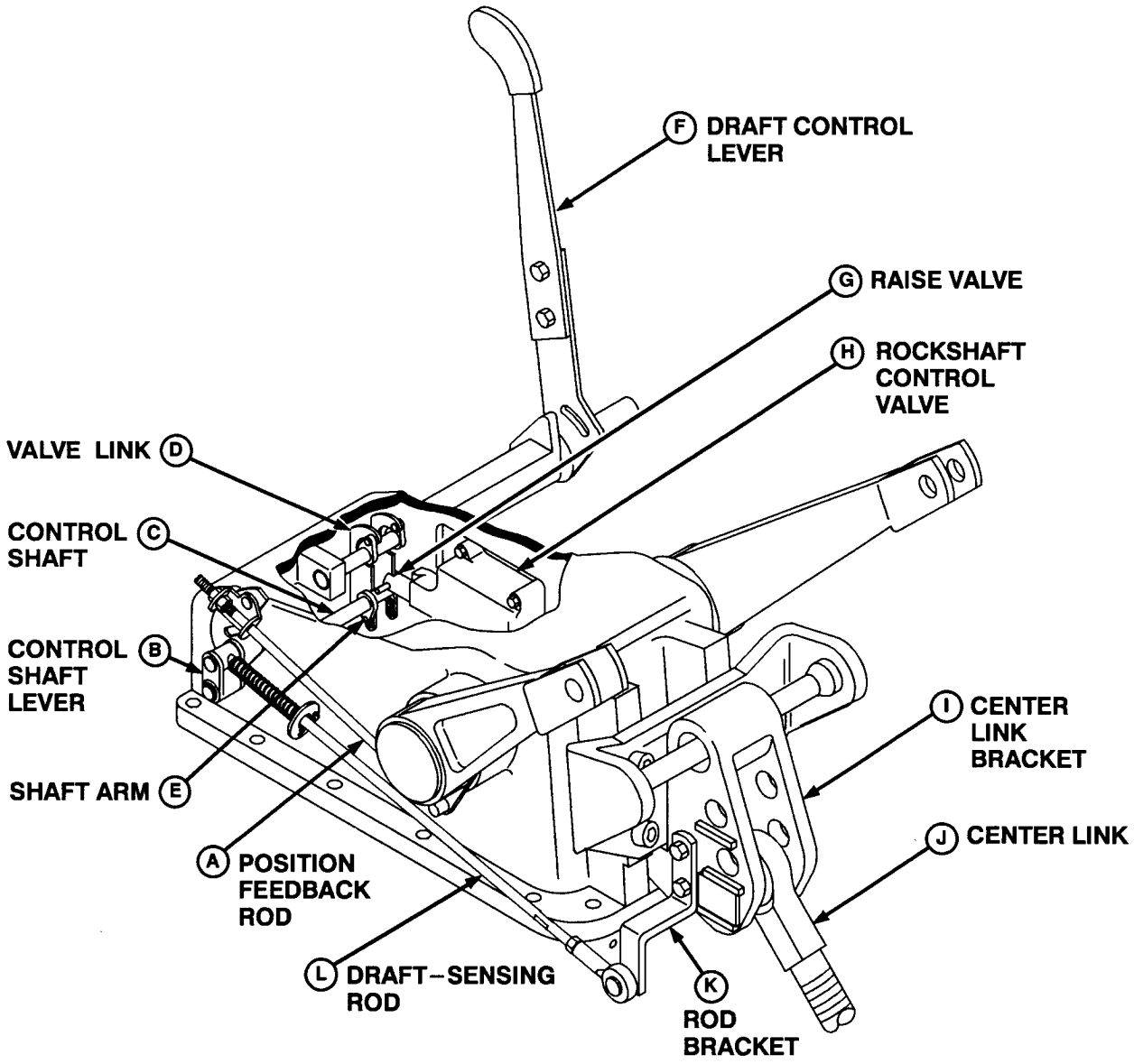
THEORY OF OPERATION:

Rate-of-drop valve (A) acts as a variable orifice for oil flow through the lowering valve. With valve in the closed position, oil is trapped between the rockshaft cylinder, raise check valve, and rate-of-drop valve. Rockshaft maintains its current position.

LVC168AE –19–11SEP00

OUO1085,000024A –19–10OCT00–1/1

Rockshaft Draft-Sensing Operation



LV169AE

ROCKSHAFT DRAFT–SENSING OPERATION

LV169AE –19–10DEC94

A—Position Feedback Rod	D—Valve Link	G—Raise Valve	J—Center Link
B—Control Shaft Lever	E—Shaft Arm	H—Rockshaft Control Valve	K—Rod Bracket
C—Control Shaft	F—Draft Control Lever	I—Center Link Bracket	L—Draft-Sensing Rod

FUNCTION:

Senses implement load and triggers rockshaft to rise if draft load is excessive.

MAJOR COMPONENTS:

- Draft-Sensing Linkage
- Rockshaft Valve
- Rockshaft Cylinder

THEORY OF OPERATION:

Continued on next page

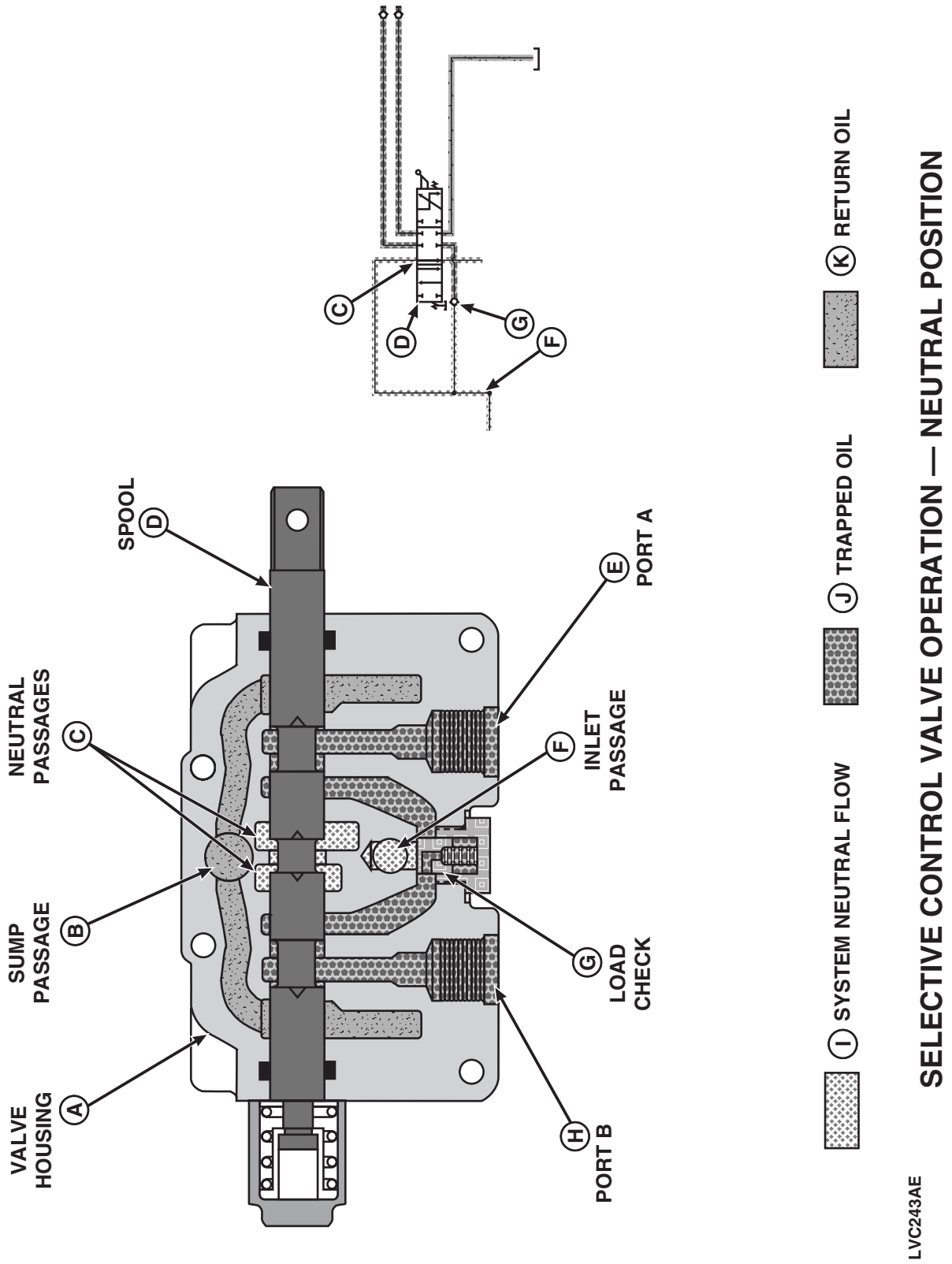
System senses draft load through a linkage arrangement. As implement load increases, inward pressure on center link (J) pushes on center link bracket (I). In turn, rod bracket (K) moves draft-sensing rod (L) forward and pushes control shaft lever (B). Lever turns control shaft (C) and shaft arm (E), which moves valve link (D). Link moves raise valve (G) according to amount of draft load and lever position.

When draft control lever (F) is positioned completely forward, system does not respond to draft sensing. Large amount of clearance between valve link and raise valve prevents valve link from contacting raise valve.

As draft control lever is pulled back, clearance between valve link and raise valve decreases. Movement of the draft-sensing linkage now moves raise valve, which directs oil to rockshaft cylinder and lifts the 3-point hitch. Continued lever movement causes further reduction in clearance between valve link and raise valve, increasing system sensitivity to draft load. The center link can be attached in three different positions. Changing positions affects the draft sensing sensitivity.

OUO1085,000024B –19–10OCT00–2/2

Selective Control Valve Operation—Neutral Position



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OUO1085,000024C –19–10OCT00–1/2

A—Valve Housing
B—Sump Passage
C—Neutral Passages
D—Spool
E—Retract Port
F—Inlet Passages
G—Load Check
H—Extend Port
I—System Neutral Flow
J—Trapped Oil
K—Return Oil

FUNCTION:

Control oil supply to cylinders of attached implements.

MAJOR COMPONENTS:

- Selective Control Valves
- Joystick or Lever
- Control Cables

THEORY OF OPERATION:

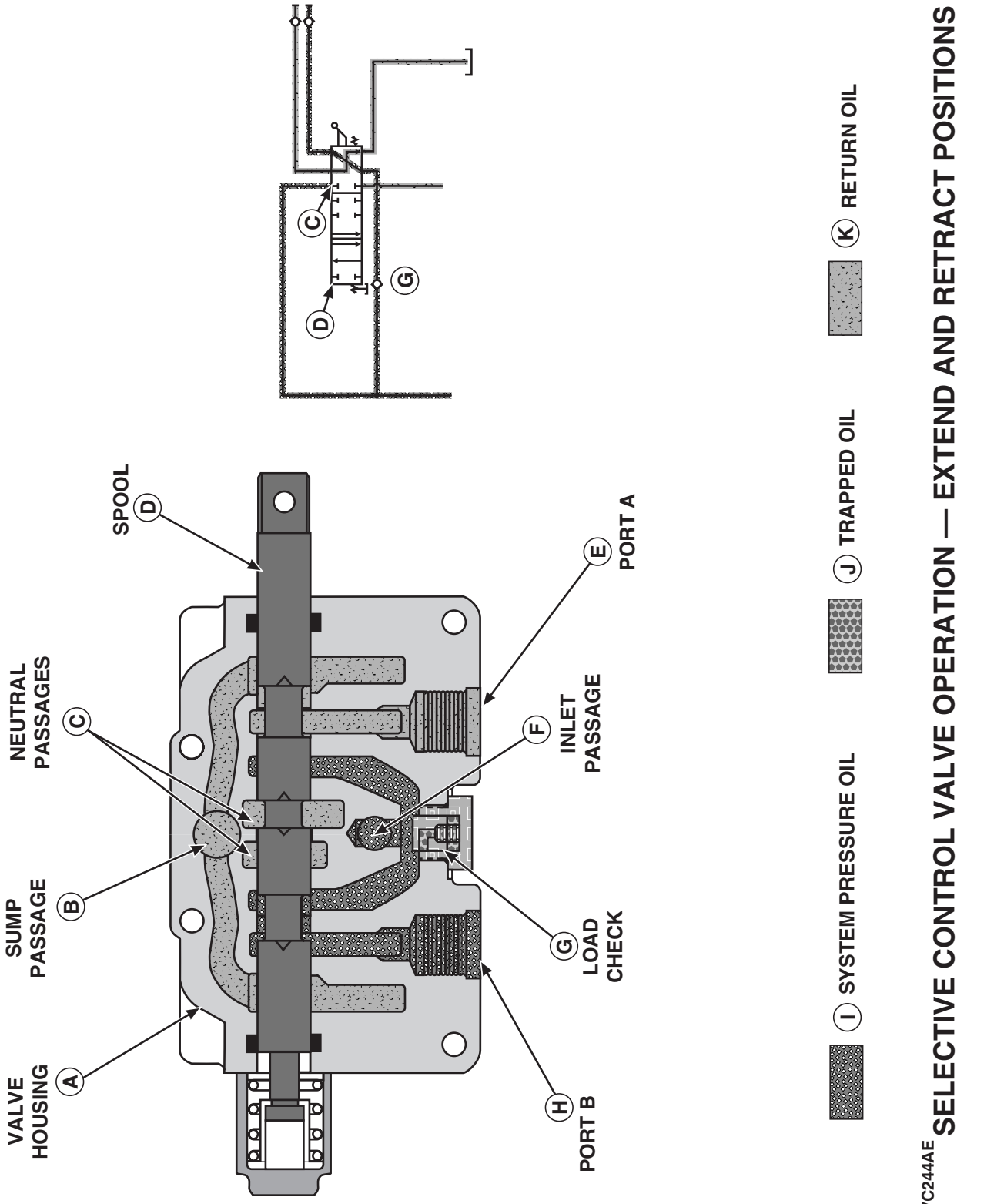
Tractor may be equipped with up to five optional selective control valves. Operation in neutral position is identical for all valves.

Oil from hydraulic pump enters valve at inlet passage (F). Oil continues to flow out of passage to other valves (if equipped) and to valve end plate or valve end housing, depending on number of valves used. After being redirected, oil moves back into neutral passages (C) of valve. Oil flow through neutral passages feeds rockshaft valve.

As long as spool (D) remains in neutral position, oil is trapped in extend port (H) and retract port (E), and load check is inactive.

OUO1085,000024C –19–10OCT00–2/2

Selective Control Valve Operation—Extend and Retract Positions



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A—Valve Housing
B—Sump Passage
C—Neutral Passages
D—Spool
E—Retract Port
F—Inlet Passage
G—Load Check
H—Extend Port
I—System Pressure Oil
J—Trapped Oil
K—Return Oil

FUNCTION:

Control oil supply to cylinders of attached implements.

MAJOR COMPONENTS:

- Selective Control Valves
- Joystick or Lever
- Control Cable

THEORY OF OPERATION:

When the spool moves out, the neutral passages (C) are blocked, causing pressure to rise at the inlet passage (F). Inlet passage is simultaneously connected to extend port (H), allowing inlet to open load check (G) and allow oil flow to extend port (H). With the spool in this position, the sump passage (B) is connected with retract port (E) allowing oil to return to sump.

When spool is moved past neutral, ports reverse flow and connected cylinder moves in the opposite direction.

NOTE: Single (third) selective control valve is shown. Extend and retract positions for other valves are identical.

OUO1085,000024D –19–10OCT00–2/2

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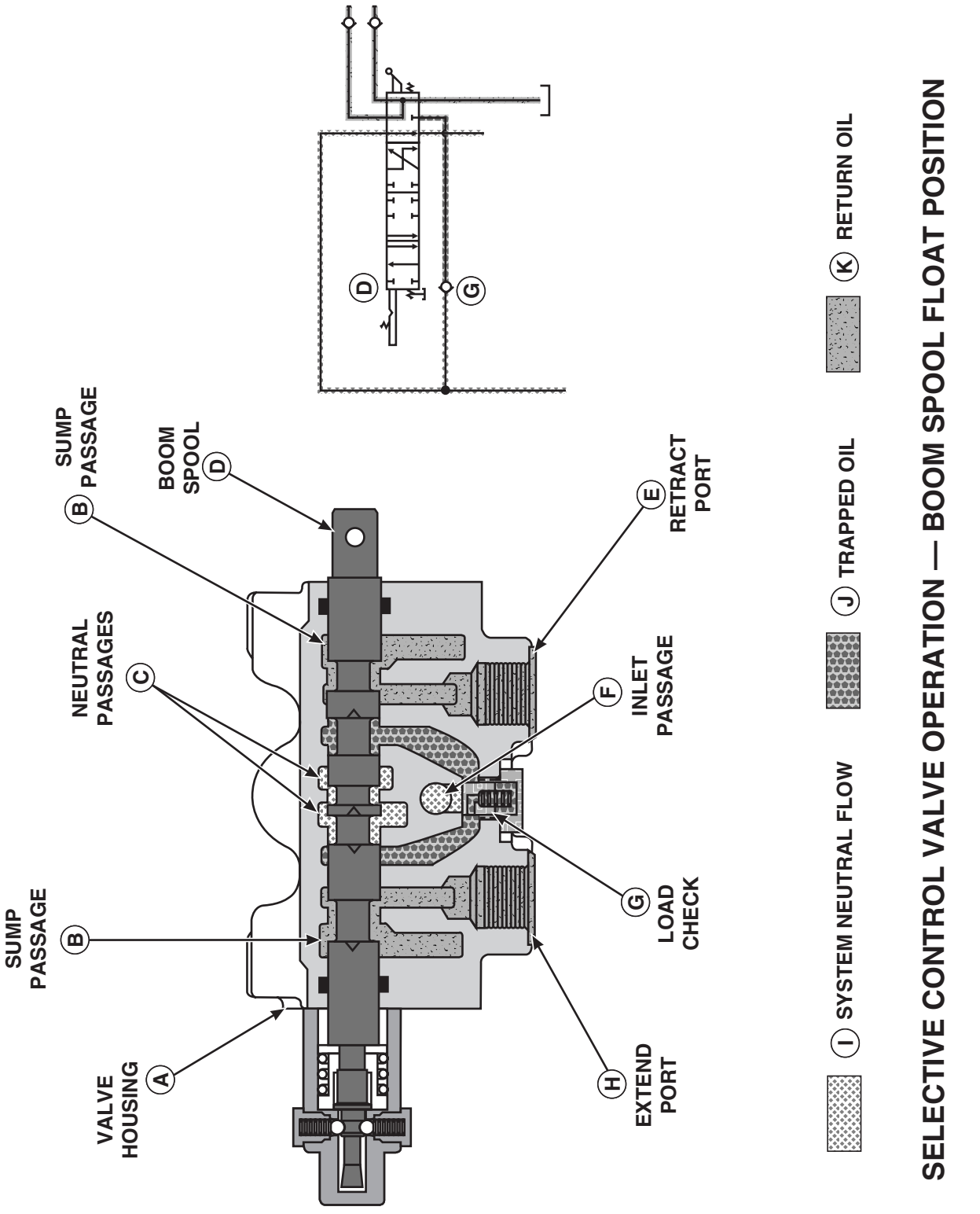
Selective Control Valve Operation—Boom Spool Float Position



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OUO1085,000024E –19–10OCT00–1/2

A—Valve Housing
B—Sump Passages
C—Neutral Passages
D—Boom Spool
E—Retract Port
F—Inlet Passage
G—Load Check
H—Extend Port
I—System Pressure Oil
J—Trapped Oil
K—Return Oil

FUNCTION:

Allows boom to follow ground contour.

MAJOR COMPONENTS:

- Boom Spool
- Joystick
- Control Cable

THEORY OF OPERATION:

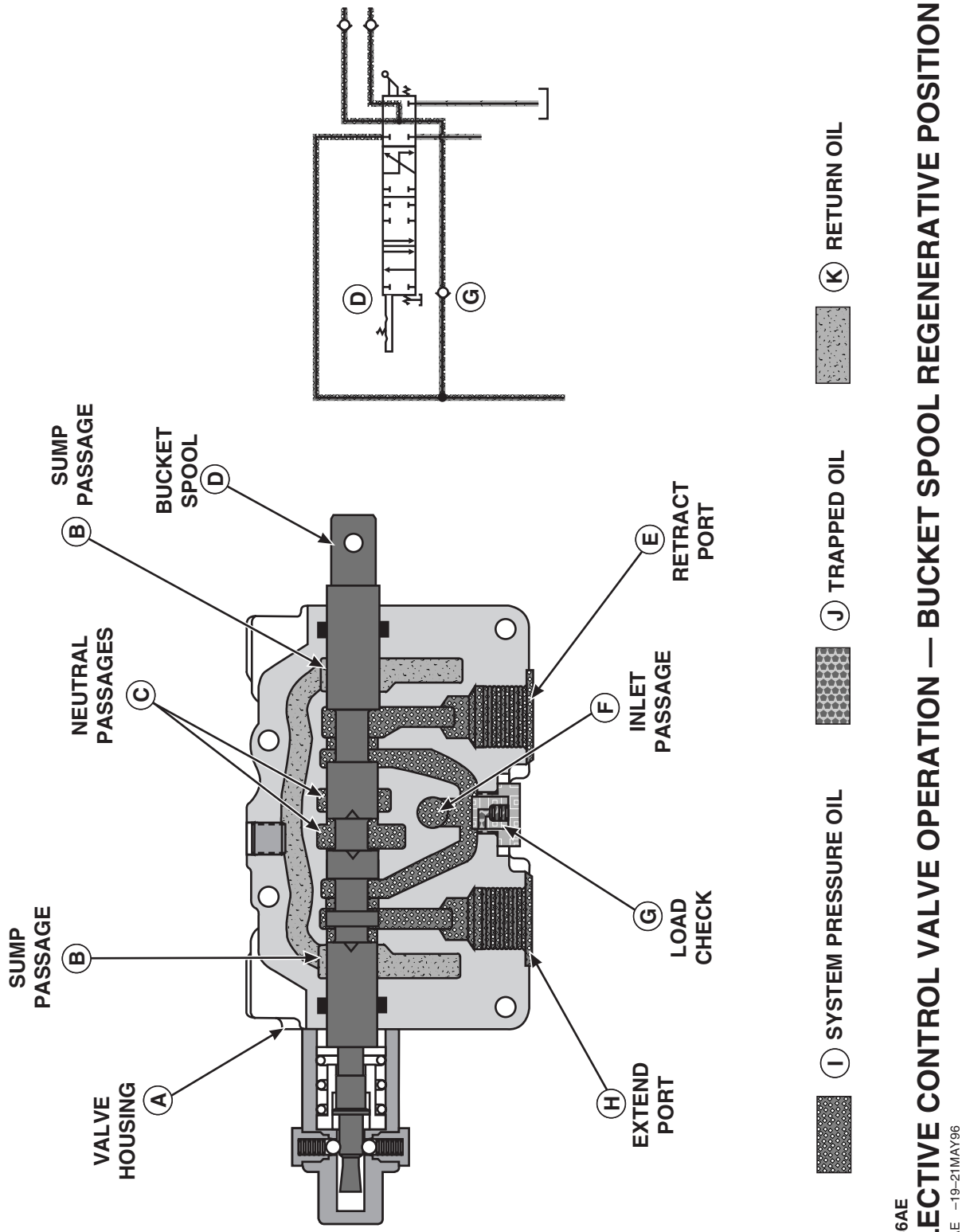
The boom spool is the outer spool valve of the dual selective control valve assembly. Besides the positions of neutral, extend, and retract, the boom spool also has a float position.

When the boom spool (D) is moved fully inward, a detent engages the spool in the float position. This isolates the system pressure oil from retract port (E) and extend port (H) and connects both ports to their respective sump passages (B). With both ends of the boom cylinder connected to sump, oil can pass to sump freely allowing boom to follow the ground contour.

NOTE: Detent locks boom spool in float position and must be released by operator.

OUO1085,000024E –19–10OCT00–2/2

Selective Control Valve Operation—Bucket Spool Regenerative Position



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A—Valve Housing
B—Sump Passage
C—Neutral Passages
D—Bucket Spool
E—Retract Port
F—Inlet Passage
G—Load Check
H—Extend Port
I—System Pressure Oil
J—Trapped Oil
K—Return Oil

FUNCTION:

Increases bucket dumping speed.

MAJOR COMPONENTS:

- Bucket Spool
- Joystick
- Control Cable

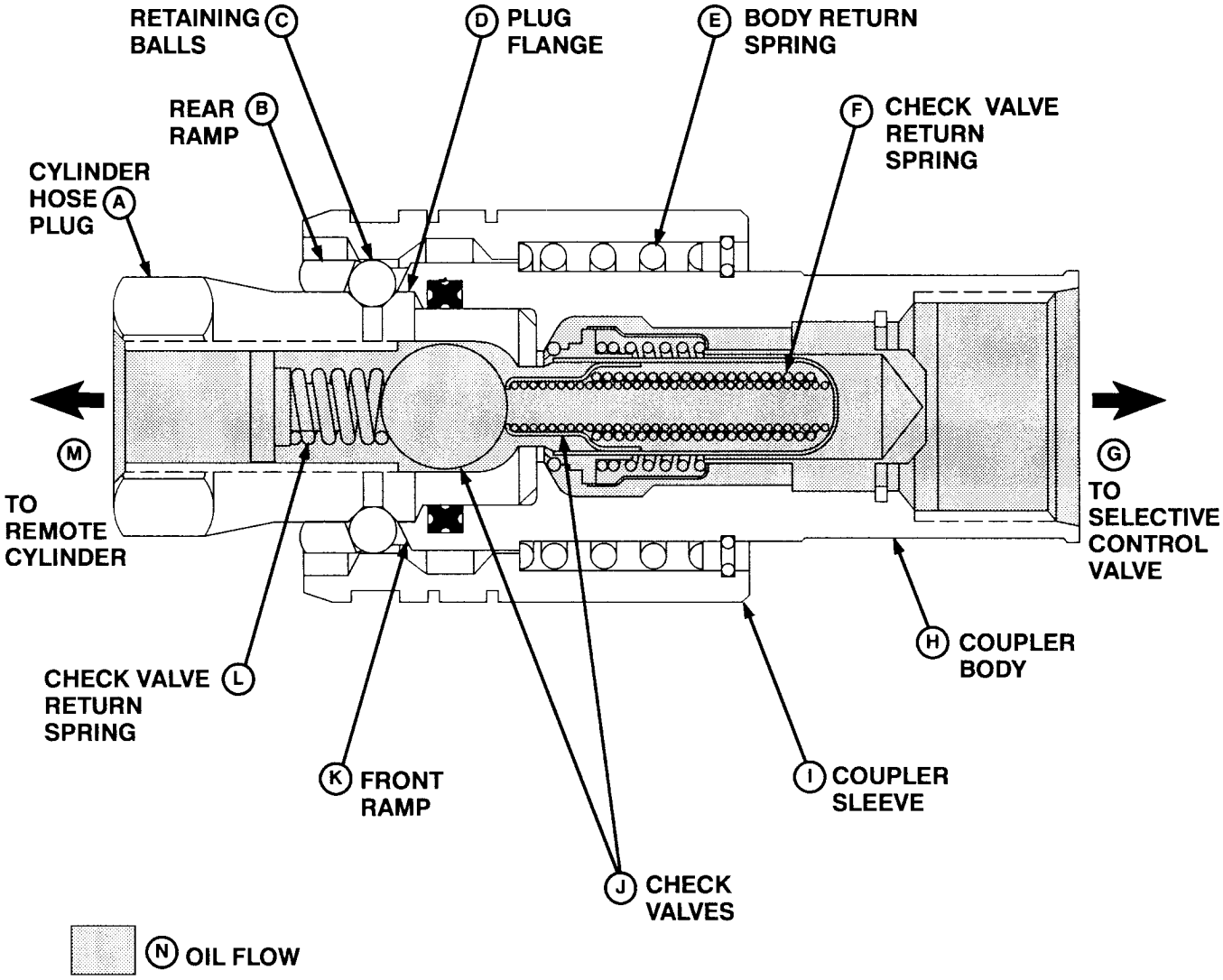
THEORY OF OPERATION:

The bucket spool is the inner spool valve of the dual selective control valve assembly. Besides the positions of neutral, extend, and retract, the bucket spool also has a regenerative position.

When the bucket spool (D) moves inward to the regenerative position, neutral passages (C) are blocked, causing a pressure rise at inlet passage (F). Oil flowing into inlet passage opens load check (G) which allows oil flow to spool. Oil flows out extend port (H) to head end of bucket cylinder. Oil returning through retract port (E) from rod end of cylinder enters extend port (H) and supplements flow passing to piston end of cylinder, causing bucket to dump faster.

OUO1085,000024F –19–10OCT00–2/2

Quick Disconnect Coupler Operation



LV131AE

LV131AE –19–09JAN95

DOUBLE–ACTING SLEEVE COUPLER OPERATION

A—Cylinder Hose Plug
B—Rear Ramp
C—Retaining Balls
D—Plug Flange
E—Body Return Spring
F—Check Valve Return Spring
G—To Selective Control Valve
H—Coupler Body
I—Coupler Sleeve
J—Check Valves
K—Front Ramp
L—Check Valve Return Spring
M—To Remote Cylinder
N—Oil Flow

FUNCTION:

Tractors with SCV option use double-acting sleeve couplers to connect remote cylinder hoses. These couplers provide both a convenient method of connecting hoses and a breakaway feature that releases the hoses when under excessive tension.

MAJOR COMPONENTS:

Continued on next page

OUO1085,0000250 –19–10OCT00–1/2

- Coupler Sleeve
- Retaining Balls
- Check Valves
- Coupler Body
- Body Return Spring
- Check Valve Return Spring

THEORY OF OPERATION:

To connect remote cylinder hoses, push the cylinder hose plug (A) into coupler. This can be done with or without system pressurized.

As coupler body (H) moves toward front of tractor, retaining balls (C) roll down front ramp (K), allowing flange (D) of plug to move past retaining balls. Upon releasing the cylinder hose plug, body return spring (E) moves coupler rearward, locking retaining balls in plug groove.

Once the mating halves of coupler are connected, both check valves (J) open, allowing oil to and from the remote cylinder (M).

Remote cylinder hose plug (A) releases automatically when pulled rearward with sufficient tension. Coupler body (H) moves rearward against spring until retaining balls (C) move into ramp area (B). Retaining balls move outward by releasing plug. Check valves (J) then seat under pressure from springs (F and L), shutting off oil flow.

OUO1085,0000250 –19–10OCT00–2/2

Diagnostic Information

The diagnostic information in this group is used to test components related to a specific problem or symptom. Select a symptom from the list and follow the test procedures under the heading.

The symptom headings are:

- Entire Hydraulic System Fails to Function/No Hydraulic Pump Output
- Insufficient Pump Delivery
- Hydraulic Functions Too Slow
- Excessive Pump Pressure
- Slow Hydraulic Pump Response
- Excessive Pump Noise During Operation
- Rockshaft Does Not Lift or Lifts Slowly
- Rockshaft Does Not Lower or Lowers Slowly
- Neutral Position Unstable, Rockshaft Drops after Engine Shut Down
- SCV Joystick Does Not Return to Neutral Position
- SCV Joystick Does Not Remain in Detent Position
- Remote Cylinder Does Not Extend or Retract
- Remote Cylinder Settles Under Load
- Remote Cylinder Operates Too Fast or Too Slow

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading
- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the test conditions listed and follow the sequence carefully. The middle “Normal” column gives the reading or condition that should be obtained when performing the test or check. If the results of the test or check are not normal, perform the test, check, or adjustment listed in the third “If Not Normal” column to repair the malfunction. The detailed tests or adjustments referred to in the “If Not Normal” column are located in groups 16, 17, 18, and 19.

OUO1085,0000251 –19–10OCT00–1/1

Preliminary Hydraulic System Inspection

CONDITIONS:

- Operate the tractor and make checks with the hydraulic oil warm.

Test Location	Normal	If Not Normal
1. Check entire machine for hydraulic oil leakage.	No leaks.	Repair cause of leakage.
2. Check oil level.	Level between marks on site gauge	Add oil if low.
3. Check oil condition.	Clear.	Milky—check for water in oil.
	Clean.	Dirty—change oil and filter.
	No metal particles.	Change oil, filter and check for mechanical failure.
	Not discolored.	Check for causes of oil overheating.
4. Operate all hydraulic functions.	All functions operate equally smooth and quick.	Change filter canister.
		Check mesh filter.
		Make sure oil is correct type.

NOTE: If the tractor is equipped with SCV, operate each valve to determine if the problem affects complete system or only one valve.

AG,OUO1023,537 –19–28FEB00–1/1

Hydraulic Oil Warm-Up Procedure

REASON:

When making hydraulic tests the oil must be heated to approximately 43°C (110°F) for accurate test results.

EQUIPMENT:

- JDG282 Temperature Gauge

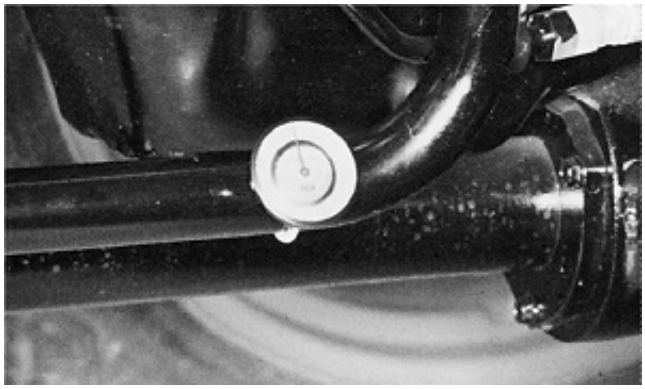
CONNECTIONS:

Install JDG282 Temperature Gauge on suction line.

PROCEDURE:

1. Lower the rockshaft.
2. Run engine at slow idle.
3. Pull SCV lever back to put system into relief.
4. Hold lever back until the suction line is too warm to hold.

At this point the oil temperature should be approximately 38—43°C (100—110°F).



LV132 –UN–18FEB92

Temperature Gauge

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OUO1085,0000255 –19–05JUL02–1/1

Entire Hydraulic System Fails to Function/No Hydraulic Pump Output

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Hydraulic dipstick.	Oil clean and up to proper level.	Add or change oil.
2. Filter canister.	Free of restrictions.	Replace filter.
3. Mesh filter.	Free of debris.	Clean filter.

CONDITIONS:

- Engine idling.

Test Location	Normal	If Not Normal
4. Pump drive.	Drive gear and shaft in good condition.	Repair or replace pump.
5. Hydraulic diverter plug port.	No optional hydraulic equipment installed.	Remove diverter plug in end plate.

OUO1085,0000256 –19–11OCT00–1/1

Insufficient Pump Delivery

CONDITIONS:

- Machine parked on level surface.
- Engine at 2000 rpm.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Filter canister.	Free of restrictions.	Replace filter.
2. Mesh filter.	Free of debris.	Clean filter.
3. Main relief valve.	System pressure within specifications. Relief valve not leaking.	Adjust relief valve. Repair or replace as needed.
4. Hydraulic pump.	Flow output within specifications. Good condition with minimal wear.	Perform Pump Flow Test. Repair or replace as needed.
5. Suction line.	No air leaks.	Repair or replace.

OUO1085,0000257 –19–11OCT00–1/1

Hydraulic Functions Too Slow

CONDITIONS:

- Machine parked on level surface.
- Hydraulic tests and adjustments in this section.
- Engine adjustments in Section 220, Group 15.

Test Location	Normal	If Not Normal
1. Mesh filter.	Free of debris.	Clean filter.
2. Filter canister.	Free of restrictions.	Replace filter.
3. Tachometer.	Reads 2000 rpm with full load.	Check and adjust fast idle.
4. Relief valve.	System pressure within specifications.	Adjust relief valve.
5. Hydraulic pump.	Flow output within specifications	Perform Pump Flow Test.
6. SCV, if equipped.	In neutral position.	Move control lever into neutral position. Inspect linkage. Repair or replace parts as necessary.

OUO1085,0000258 –19–25JUL02–1/1

Excessive Pump Pressure

CONDITIONS:

- Machine parked on level surface.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Relief valve.	Pressure within specifications.	Adjust relief valve.
2. Outlet line.	Free of kinks and restrictions.	Replace line.
3. Rockshaft feedback linkage.	Proper hitch free-play.	Adjust linkage.
4. SCV, if equipped.	Free to return to neutral position.	Operate SCV levers. Check for pressure change. Repair or replace SCV valve.
5. Hydraulic diverter plug port.	No plug installed. No optional equipment installed or used.	Remove diverter plug in end plate. Remove any auxiliary hydraulic equipment.

OUO1085,0000259 –19–11OCT00–1/1

Slow Hydraulic Pump Response

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Filter canister.	Free of restrictions.	Replace filter.
2. Mesh filter.	Free of debris.	Clean filter.
3. Hydraulic dipstick.	Oil of the proper type and viscosity.	Drain and refill with correct oil.
4. Pump suction line.	Oil at approximately 43°C (110°F).	Heat hydraulic oil per recommended procedure.
	Free of kinks and restrictions.	Repair or replace line.
5. SCV, if equipped.	Free to return to neutral position. Not leaking internally.	Operate SCV levers. Check for pressure change. Repair or replace SCV valve.
6. Main relief valve.	Pressure within specifications. Not leaking.	Test relief valve.
7. Hydraulic pump.	Flow output within specifications.	Perform Pump Flow Test.
8. Surge relief valve.	Not leaking.	Perform Rockshaft Leakage Test. Replace valve.

OUO1085,000025A –19–11OCT00–1/1

Excessive Pump Noise During Operation

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Hydraulic dipstick.	Oil level up to marks.	Add oil as needed.
	Oil of the proper type.	Drain and refill with correct oil.
2. Pump suction line.	Secure and free of air leaks.	Tighten suction line clamps. Repair or replace line as needed.
3. Main relief valve.	Pressure within specifications.	Adjust. Replace if necessary.
4. SCV, if equipped.	Free to return to neutral position.	Operate SCV levers. Repair or replace valve.
5. Rockshaft valve.	Neutralizing.	Perform rockshaft leak test.
6. Hydraulic diverter plug port.	No plug installed.	Remove diverter plug in end plate.

OUO1085,000025B –19–11OCT00–1/1

Rockshaft Does Not Lift or Lifts Slowly

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CONDITIONS:

- Machine parked on level surface.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Rockshaft lift arms.	Rockshaft lift cycle within specifications.	Perform rockshaft lift cycle test. (See Rockshaft Lift Cycle Test in Group 18.)
2. Hydraulic dipstick.	Oil of proper type and viscosity.	Drain and refill hydraulic system.
3. Filter canister.	Free of restrictions.	Replace filter.
4. Mesh filter.	Free of debris.	Clean filter.
5. Hydraulic pump.	Flow within specifications.	Perform Pump Flow Test.
6. Relief valve.	System pressure within specifications.	Adjust relief valve.
7. Rockshaft.	Leakage within specifications.	Perform rockshaft leak test.
8. SCV, if equipped.	Free to return to neutral position.	Operate SCV levers. Repair or replace valve.

OUO1085,000025C –19–11OCT00–1/1

Rockshaft Does Not Lower or Lowers Slowly

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Rate-of-drop valve.	Backed-out (open).	Open valve.
	Valve and passages clean.	Clean, repair, or replace valve as needed.
2. Rockshaft linkage.	Linkage connected and not binding, bent, or worn.	Repair or replace as needed.
3. Draft control linkage.	Linkage connected and not binding, bent, or worn.	Repair, replace, or adjust as needed.

OUO1085,000025D –19–11OCT00–1/1

Neutral Position Unstable, Rockshaft Drops after Engine Shut Down

CONDITIONS:

- Machine parked on level surface.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Rockshaft.	Leakage within specifications.	Replace rockshaft piston O-ring. Check cylinder for scoring and other damage, replace if necessary.
	Attachment installed correctly.	Install as instructed by Operator's Manual or Installation Instruction.
2. Rate-of-drop valve.	Closes completely without leaks.	Repair or replace valve as needed.
3. Surge relief valve.	Not leaking.	Perform Rockshaft Leakage Test. Replace valve.

OUO1085,000025E –19–11OCT00–1/1

SCV Joystick Does Not Return to Neutral Position—Single (Third) SCV

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. SCV joystick.	Joystick not binding, bent, or worn.	Repair or replace as needed.
2. SCV.	Spool encounters spring resistance whether pushed or pulled.	Replace valve assembly.
	Spool slides back and forth through housing without binding.	Replace valve assembly.

OUO1085,000025F –19–11OCT00–1/1

SCV Joystick Does Not Return to Neutral Position—Dual SCV

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Joystick.	Free from binding.	Repair or replace as needed.
2. Cables.	Free and properly lubricated.	Lubricate or replace cables as needed.
3. Dual SCV.	Spool releases when moved opposite of detent.	Replace SCV assembly.

NOTE: The dual SCVs employ a detent that engages when the joystick nears the end of its travel in two directions. This is normal. The above diagnostic routines apply when the joystick binds in the non-detent position.

OUO1085,0000260 –19–11OCT00–1/1

SCV Joystick Does Not Remain in Detent Position—Dual SCV

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Joystick.	Full range of travel without binding.	Repair or replace as needed.
2. Cables.	Properly connected and free from binding.	Repair or replace as needed.
Dual SCVs.	Detent locks in when valve nears end of travel in forward direction.	Replace SCV assembly.

OUO1085,0000261 –19–11OCT00–1/1

Remote Cylinder Does Not Extend or Retract

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Remote cylinder.	Cylinder piston O-ring in good condition and stop valve free.	Won't extend. Replace piston O-ring.
2. Double-acting sleeve couplers.	Cylinder hose ends fully seated in couplers.	Seat hose ends in couplers.
	Coupler tips not damaged or worn.	Replace couplers.

OUO1085,0000262 –19–11OCT00–1/1

Remote Cylinder Settles Under Load

CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Remote cylinder.	Cylinder piston O-ring in good condition.	Replace O-ring or cylinder if scored.
2. Double-acting sleeve couplers.	Couplers free from leakage.	Repair or replace coupler. If equipped with dual SCV, connect to additional couplers.
	SCV not leaking.	Excessive leakage at SCV. Perform Hydraulic System Tests—With SCV.

OUO1085,0000263 –19–11OCT00–1/1

Remote Cylinder Operates Too Fast or Too Slow

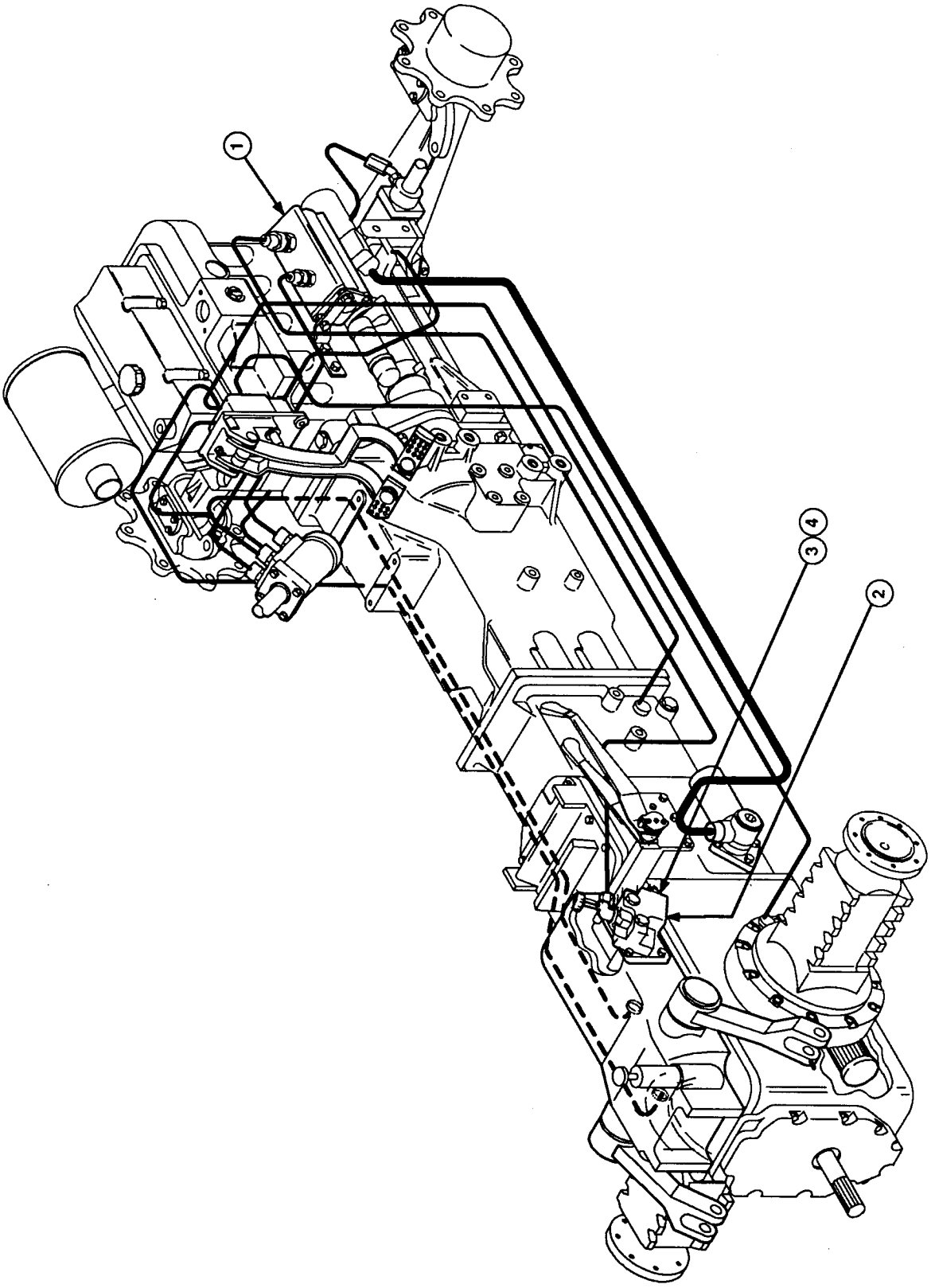
CONDITIONS:

- Machine parked on level surface.
- Key switch in OFF position.
- Hydraulic tests and adjustments in this section.

Test Location	Normal	If Not Normal
1. Remote cylinder.	Stop valve free.	Repair or replace stop valve.
2. SCV joystick cables.	Free and movable throughout range of travel.	Repair, replace, or lubricate cables and linkage.

OUO1085,0000264 –19–11OCT00–1/1

Hydraulic System Tests—Without SCV



HYDRAULIC SYSTEM TESTS—WITHOUT SCV

LV149AE –19–10FEB92

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OUO1085,0000265 –19–25JUL02–1/2

NOTE: For hydraulic system tests on tractors with SCV, see Group 17.

CONDITIONS:

- Hydraulic oil is correct type, clean and at proper level.
- No external hydraulic oil leaks.
- If oil filter was not replaced as part of preliminary inspection, replace it to ensure proper function.
- Rockshaft feedback linkage is properly adjusted.
- Hydraulic oil at approximately 43°C (110°F).

Test Location	Normal	If Not Normal
1. Check pump flow (at pump). Run engine at 2400 rpm and turn flowmeter restriction to 10345 kPa (1500 psi) (103 bar).	5210 and 5310 series tractors: 42 L/min (11 gpm) minimum.	Inspect mesh filter suction line pump.
	5410 and 5510 series tractors: 60 L/min (16 gpm) minimum.	
2. Install pipe plug below power beyond port and check main relief pressure at valve end plate with engine at slow idle.	18995—19685 kPa (190—197 bar) (2755—2855 psi)	High or low reading: adjust valve.
3. Leak test rockshaft with pipe plug installed in rockshaft passage.	Rockshaft holds steady under implement load.	Inspect rockshaft cylinder, seals, and piston, and surge relief valve.
4. Leak test rockshaft without pipe plug installed in rockshaft passage.	Rockshaft holds steady under implement load.	Replace rockshaft valve or seals.

OUO1085,0000265 –19–25JUL02–2/2

270
16
2

Pump Flow Test—Without SCV

REASON:

To determine if hydraulic pump can provide adequate flow under pressure.

EQUIPMENT:

- JT05469 Flowmeter
- JT03468 Pump Adapter 3/4 F NPT Sw x M27 x 2.0 MORB 45° elbow (B)
- (Flowmeter with 37° flare hose) JT03336 Adapter 3/4 M NPT x 3/4 M 37° flare (A).
- (Flowmeter with 3/4-16 M ORB hose) JT03123 Adapter 3/4 M NPT x 1/2 F NPT and JT03041 1/2 M NPT x 3/4-16 F ORB

CONNECTIONS:

1. Remove pump outlet line.
2. Remove pump outlet fitting and install adapter elbow (B).
3. Connect flowmeter inlet hose adapter (A) to adapter elbow (B).
4. Insert flowmeter return hose into hydraulic oil fill hole.

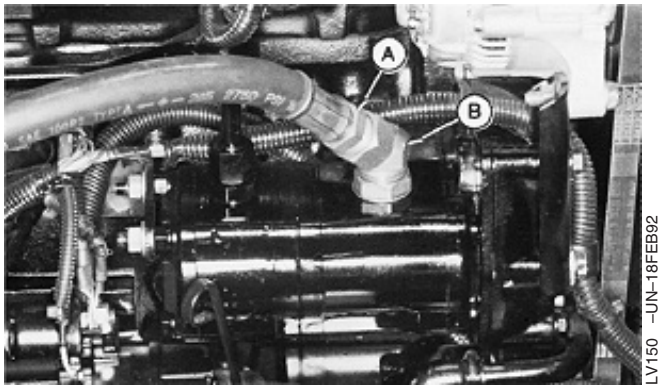
PROCEDURE:

1. Fully open flowmeter control valve.
2. Start tractor and run at 2000 rpm.
3. Slowly close flowmeter control valve until 10345 kPa (103.5 bar) (1500 psi) shows on gauge.
4. Observe flow, then release pressure.

Specification

Pump Flow Test, Without SCV—	
Flow Rate	33—42 Lpm (8.8—11 gpm) 5210 and 5310 series tractors 47.6—60 Lpm (12.6—16 gpm) 5410 and 5510 series tractors

RESULTS: If flow is less than minimum



Flowmeter Connection

A—JT03336 Adapter
B—JT03468 Adapter Elbow

270
16
3

Continued on next page

- The mesh filter may be restricted.
- The suction line may be restricted.
- The suction line may be leaking air. Tighten clamps on both ends of suction line.
- The pump may be worn or damaged, requiring repair or replacement.

OUO1085,0000266 –19–11OCT00–2/2

Main Relief Valve Test—Without SCV

REASON:

To determine if setting of relief valve maintains correct pressure.

EQUIPMENT:

- JT05473 Gauge 35000 kPa (5000 psi) (350 bar) (D).
- JT03364 Hose with coupler (G).
- JT03469A Adapter M22 M ORB x 7/16-20 M 37° Flare (E).
- JT05483 90° Elbow Adapter 7/16-20 M 37° Flare x 7/16-20 F 37° Flare Sw (F).
- 3/8 in. Pipe Plug.

CONNECTIONS:

1. Remove power-beyond plug (B) from end plate (A) and install 3/8 in. pipe plug in threads (C) located in passage.

2. Install adapter (E) into end plate.

3. Assemble gauge (D), hose (G), and adapter (F).

4. Connect test equipment to adapter (E).

PROCEDURE:

1. Start engine and let it idle.

2. Read pressure on gauge.

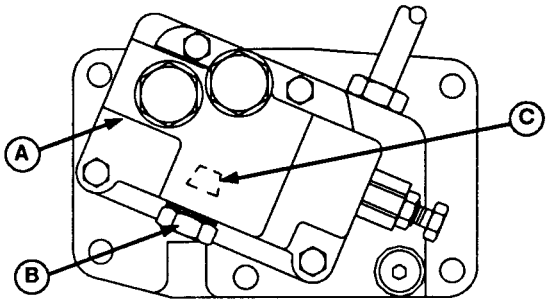
3. Shut engine off immediately after reading pressure.

Specification	
Main Relief Valve—Pressure	18995—19685 kPa (190—197 bar) (2755—2855 psi)

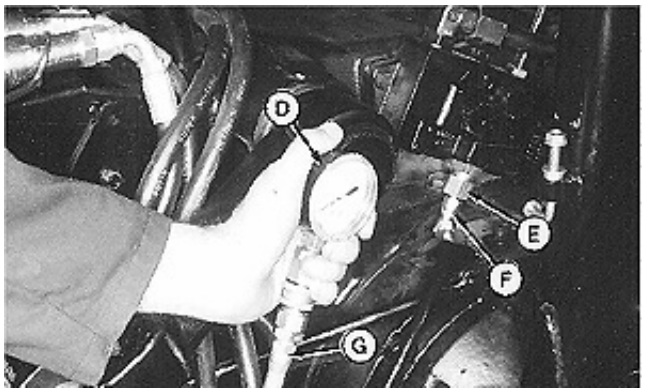
RESULTS:

- Pressure high or low—adjust relief valve. (See Main Relief Valve Adjustment in Group 19.)

IMPORTANT: Remove pipe plug after test is completed.



LV260AE –UN–18FEB92



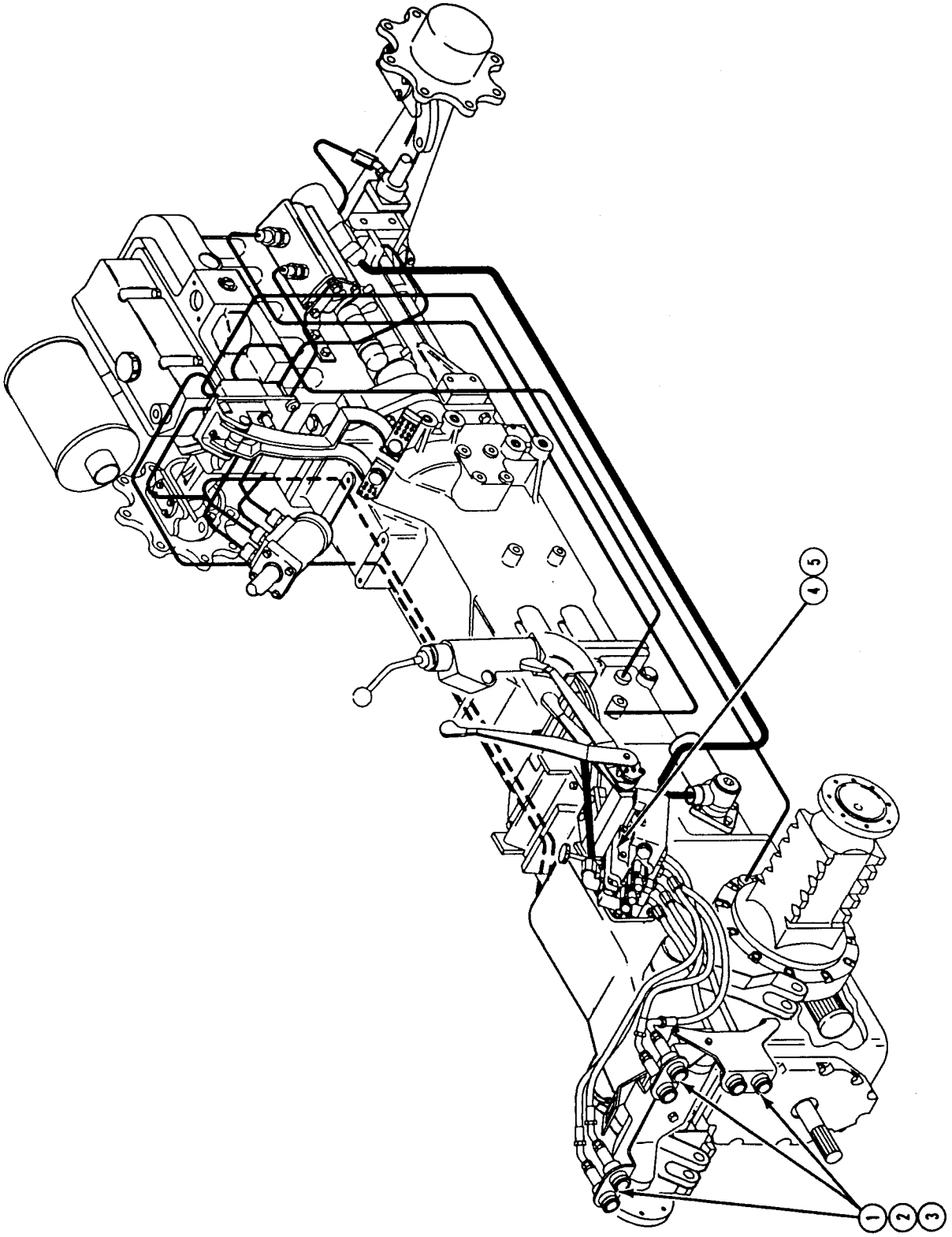
LV151 –UN–02AUG94

A—End Plate
B—Power-Beyond Plug
C—Pipe Threads
D—JT05473 Gauge
E—JT03469A Adapter
F—JT05483 Adapter
G—JT03364 Hose with Coupler

270
16
5

OUO1085,0000267 –19–11OCT00–1/1

Hydraulic System Tests—With SCV



HYDRAULIC SYSTEM TESTS—WITH SCV

LV152AE –19–10FEB92

Continued on next page

OUO1085,0000268 –19–25JUL02–1/2

NOTE: For hydraulic system tests on tractors without SCV, see Group 16.

CONDITIONS:

- Hydraulic oil is correct type, clean and at the proper level.
- No external hydraulic oil leaks.
- If oil filter wasn't replaced during preliminary inspection, replace it to ensure proper function.
- Rockshaft feedback linkage is properly adjusted. Refer to Group 19 for procedure.
- Hydraulic oil at approximately 43°C (110°F).

Test Location	Normal	If Not Normal
1. Check pump flow (at rear couplers). Run engine at 2400 rpm and turn flowmeter restriction to 10345 kPa (103.5 bar) (1500 psi).	5210 and 5310 series tractors: 38 L/min (10 gpm) minimum.	Perform test 2.
	5410 and 5510 series tractors: 55 L/min (14 gpm) minimum.	
2. Check main relief pressure (at rear outlets) with engine at slow idle.	18995—19685 kPa (190—197 bar) (2755—2855 psi).	Reading low (test 1 and 2). Check main relief for leakage.
		Reading low (test 1 only). Inspect mesh filter. Inspect suction line. Inspect pump.
3. Test SCV leakage (at each rear outlet).	Pressure stays above 3448 kPa (34.5 bar) (500 psi) for at least 5 seconds.	Excessive drop at outlet 1 or 2: Repair boom spool.
		Excessive drop at outlet 3 or 4: Repair bucket spool.
	Excessive drop at outlet 5 or 6: Repair #3 SCV spool.	
4. Leak test rockshaft with pipe plug installed in rockshaft passage.	Rockshaft holds steady under implement load.	Inspect rockshaft in cylinder, seals, piston, or surge relief valve.
5. Leak test rockshaft without pipe plug installed in rockshaft passage.	Rockshaft holds steady under implement load.	Replace rockshaft valve or O-ring seals.

OUO1085,0000268 –19–25JUL02–2/2

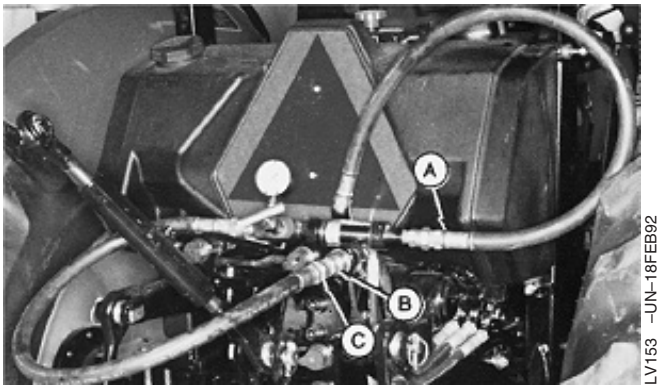
Pump Flow Test—With SCV

REASON:

To determine if hydraulic pump can provide adequate flow under pressure.

EQUIPMENT:

- JT05469 Flowmeter (A).
- AR94522 Coupler (internal half) (B).
- JT03082 Adapter 3/4-16 M ORB x 3/4 F NPT Sw (flowmeter that uses 37° flare hose also requires JT03049 Adapter 3/4-16 M ORB x 3/4-16 M 37°) (C).



LV153 –UN–18FEB92

A—JT05469 Flowmeter
B—AR94522 Coupler
C—JT03082 Adapter 3/4-16 M ORB x 3/4 NPT Sw

CONNECTIONS:

1. Assemble test equipment.
2. Connect flowmeter inlet hose to one of rear couplers.
3. Insert flowmeter return hose into transmission/hydraulic dipstick fill hole.

PROCEDURE:

1. Fully open flowmeter control valve.
2. Start tractor and run at 2000 rpm.
3. Move joystick or single (third) SCV lever as necessary to pressurize test outlet. Slowly close flowmeter control valve until 10345 kPa (103.5 bar) (1500 psi) shows on gauge.
4. Observe flow, then release pressure.

5210 and 5310 Series Tractors:—Specification

Control Valve—Maximum Flow Rate	42 L/min (11 gpm)
Control Valve—Minimum Flow Rate	40.0 L/min (8.8 gpm)

5410 and 5510 Series Tractors:—Specification

Control Valve—Maximum Flow Rate	60 L/min (16 gpm)
Control Valve—Minimum Flow Rate	47.6 L/min (12.6 gpm)

RESULTS:

Continued on next page

If flow is below minimum:

- Mesh filter may be restricted.
- Filter canister may be restricted.
- Suction line may be restricted.
- Suction line may be leaking air.
  Tighten clamps on both ends of suction line.
- Relief valve may be leaking.
- Control lever and cables not allowing full open valve.
- Coupler damaged. Try other outlets.
- SCV valve spool scored or leaking.
- Pump may be worn or damaged, requiring repair or replacement.

OUO1085,0000269 –19–11OCT00–2/2

Main Relief Valve Test—With SCV

REASON:

To determine if factory setting of relief valve maintains correct pressure.

EQUIPMENT:

- JT05473 Gauge 35000 kPa (5000 psi) (350 bar) (A).
- JT03364 Hose with Coupler (B).
- AR94522 Coupler (internal half) (C).
- JT05494 Adapter 3/4-16 M ORB x 7/16-20 M 37° (D).

CONNECTIONS:

1. Assemble gauge, hose and adapter.

2. Connect test equipment into any rear outlet.

PROCEDURE:

1. Run engine at slow idle.

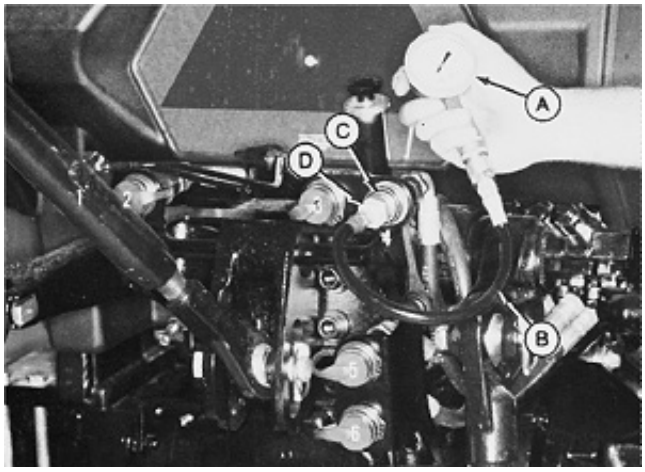
2. Move SCV joystick or lever to pressurize test outlet. Hold until you hear system go into relief.

3. Check pressure reading on gauge.

Specification	
Main Relief Valve Test Outlet—Pressure	18995—19685 kPa (190—197 bar) (2755—2855 psi)

RESULTS:

Pressure high or low—adjust relief valve. (See Main Relief Valve Adjustment in Group 19.)



A—JT05473 Gauge
B—JT03364 Hose with Coupler
C—AR94522 Coupler
D—JT05494 Adapter

270
17
5

OUO1085,000026A –19–11OCT00–1/1

SCV Leakage Test

REASON:

To determine if excessive leakage exists past spool valves.

EQUIPMENT:

- JT05473 Gauge 35000 kPa (5000 psi) (350 bar) (A).
- JT03364 Hose with Coupler (B).
- AR94522 Coupler (internal half) (C).
- JT05494 Adapter 3/4-16 M ORB x 7/16-20 M 37° (D).

CONNECTIONS:

1. Assemble gauge, hose, and adapter.

2. Connect test equipment into any rear outlet.

PROCEDURE:

1. Run engine at fast idle.

2. Move SCV joystick or lever to pressurize test outlet. Hold until system goes into relief.

3. Release joystick or lever and note the time it takes for pressure to drop below 3450 kPa (34.5 bar) (500 psi).

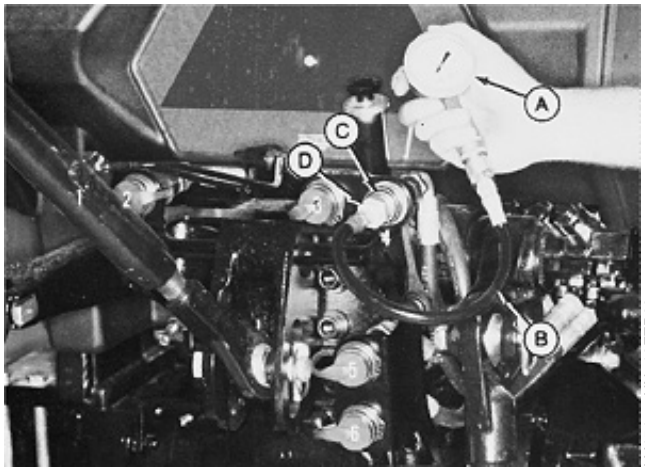
4. Repeat for remaining valves and outlets.

SPECIFICATIONS:

Pressure should stay above 3450 kPa (34.5 bar) (500 psi) for at least 5 seconds.

RESULTS:

- Excessive drop at outlet 1 or 2: Service boom spool.
- Excessive drop at outlet 3 or 4: Service bucket spool.
- Excessive drop at outlet 5 or 6: Service single (third) SCV spool.

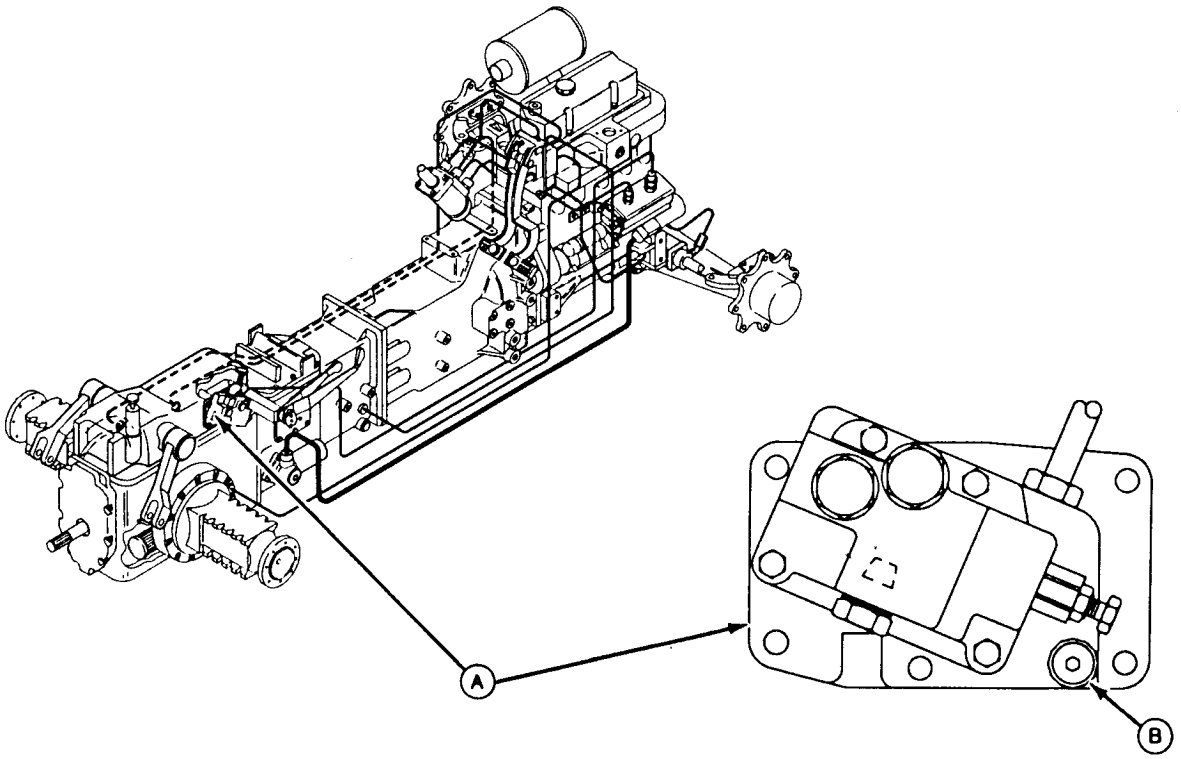


LV154 –UN–18FEB92

A—JT05473 Gauge
B—JT03364 Hose with Coupler
C—AR94522 Coupler
D—JT05494 Adapter

OUO1085,000026B –19–11OCT00–1/1

Rockshaft Leakage Test



LV161AE –UN–18FEB92

A—Rate-of-Drop Valve

B—9/16-18 M ORB Access Plug

REASON:

To determine if leakage exists in rockshaft cylinder, housing, or valve.

EQUIPMENT:

- 1/8 in. M NPT Plug

PROCEDURE:

1. With implement connected to rockshaft, raise to top of its travel.
2. Place blocks under implement to keep it raised.
3. Lower rockshaft so implement weight settles fully on blocks or stands.
4. Move rockshaft position lever all the way forward. Open rate-of-drop valve (A).
5. Remove right rear wheel, if necessary.
6. Remove 9/16-18 M ORB access plug (B).
7. Install 1/8 in. M NPT plug in passage behind plug (B) removed previously. Reinstall access plug.
8. Using jack or other lifting device, lift implement weight off blocks and allow implement to lower.
9. Rockshaft should drop slightly, then hold.

Continued on next page

IMPORTANT: Jack up and support implement before removing plugs.

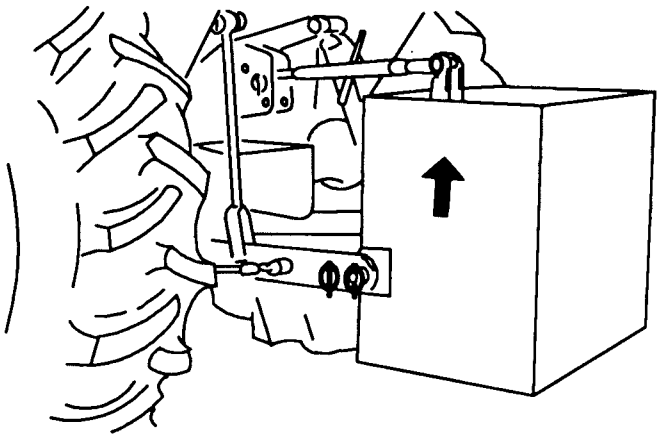
10. Remove access and pipe plugs, then reinstall access plug.
11. Install wheel.
12. Repeat steps (1—4) and (8—9).

RESULTS:

- If rockshaft drops with plug in passage, there is leakage past rockshaft piston, seals, or surge relief valve. Remove rockshaft housing and inspect. Replace parts as necessary.
- If rockshaft drops without plug installed in passage, replace rockshaft valve and seals.

OUO1085,000026C –19–11OCT00–2/2

Rockshaft Lift Cycle Test



M48462 –UN–12FEB90

REASON:

To determine if hydraulic flow can provide enough force to lift the 3-point hitch arms as designed.

PROCEDURE:

NOTE: If equipped with SCVs, make sure all SCV spool valves are neutralized.

1. Attach approximately 227 kg (500 lb) rear weight or implement.

NOTE: BW13568 Ballast Box could be used.

2. Open rate-of-drop valve completely.
3. Lower 3-point hitch completely.
4. Run engine at fast idle.
5. Observe the time it takes to completely raise the 3-point hitch arms after you pull the position lever all the way back.

SPECIFICATIONS:

Item	Measurement	Specification
Full Lower to Full Raise	Time	2.5 to 3 seconds

Continued on next page

NOTE: The speed at which the hitch arms rise during the last few inches of travel at the highest position is slower than the rate of movement from the bottom. The difference in raise rates is normal due to the action of the two flow regulator valves within the rockshaft control valve.

RESULTS:

If the raise time is excessive, leakage exists.

Perform the rockshaft leakage test, pump flow test, and main relief valve test. If tractor passes these tests, the problem is the rockshaft valve, or a leaking seal or O-ring.

OUO1085,000026D –19–11OCT00–2/2

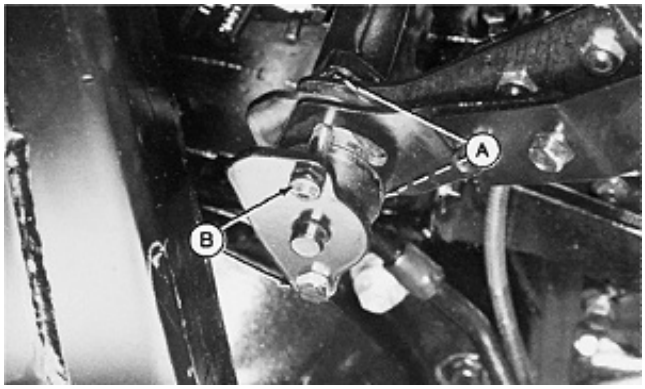
Rockshaft Control Lever Friction Adjustment

REASON:

To keep the rockshaft position and draft-sensing levers in their set positions.

PROCEDURE:

1. Loosen jam nuts (A).
2. Turn adjusting cap screws (B) clockwise to increase friction, counterclockwise to decrease friction. Turn cap screws equal number of times.
3. Retighten jam nuts (A) when adjustment is complete.

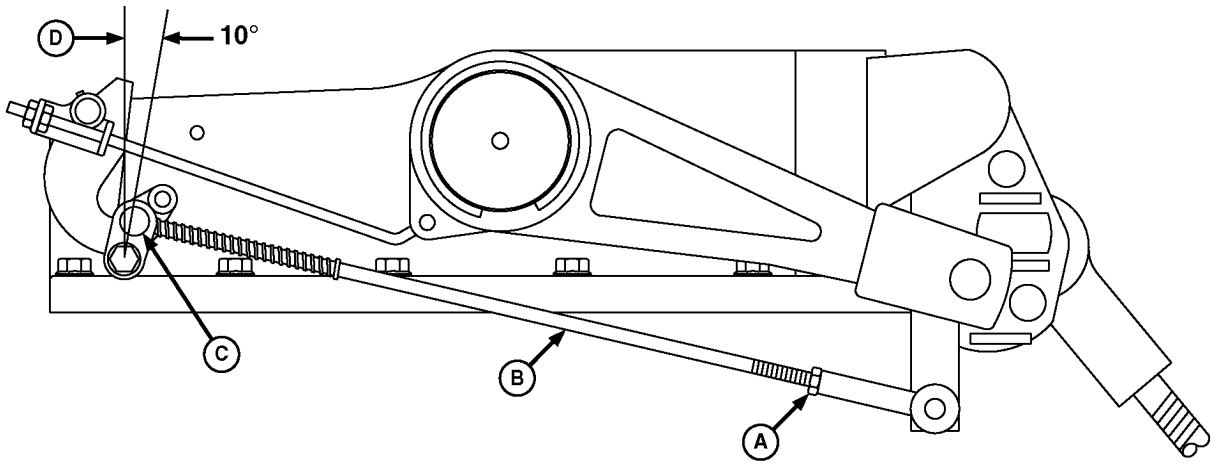


LV156 –UN–18FEB92

A—Jam Nut
B—Cap Screw

OUO1085,000026E –19–11OCT00–1/1

Rockshaft Position-Sensing Feedback Linkage Adjustment



LV1882

LV1882 –UN–18NOV96

A—Jam Nut **B—Draft-Sensing Rod** **C—Pin** **D—Vertical Line**

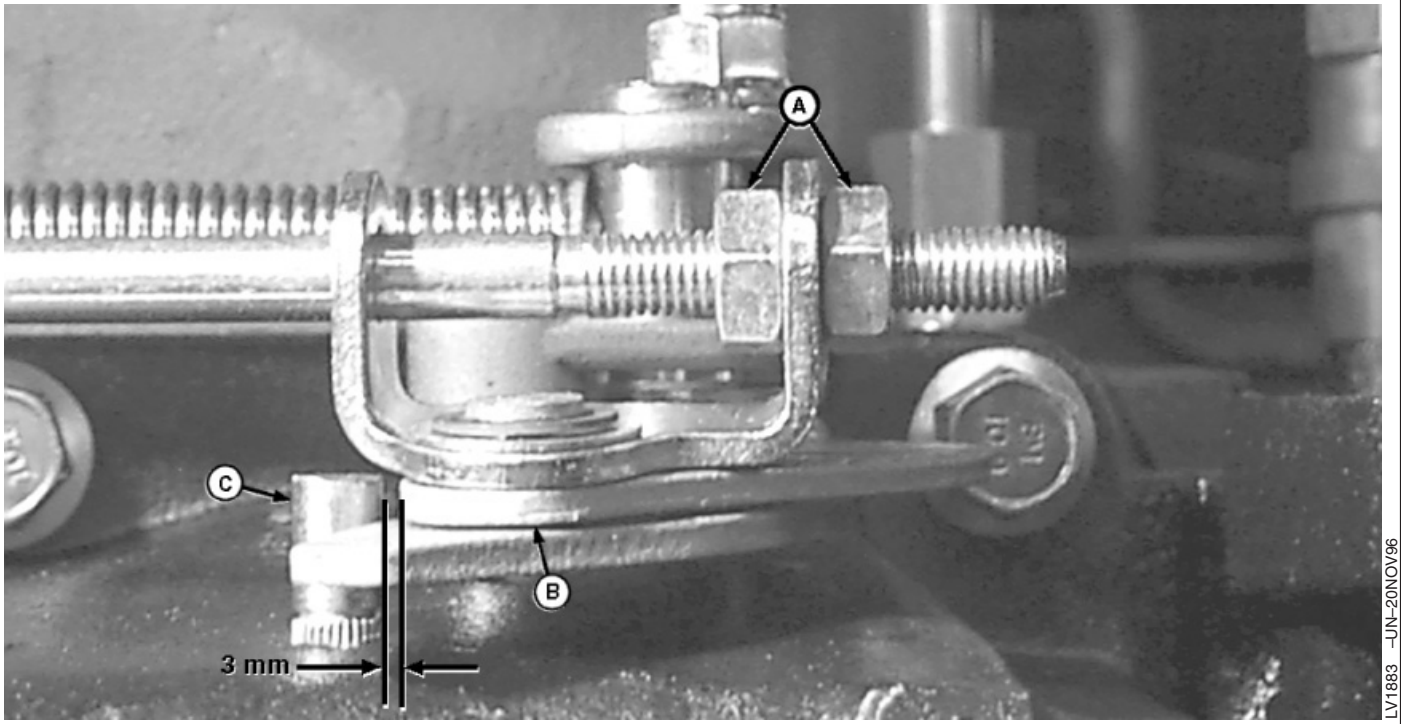
REASON:

To ensure that the lift arms have the proper range of motion.

PROCEDURE:

1. Tractors without cab, remove left-side fender.
2. Tractors with cab, remove fuel tank. (See Remove, Inspect and Install Fuel Tank—With Cab in Section 30, Group 05.)
3. Remove all weight from center link.
4. Loosen jam nut (A).
5. Turn draft-sensing rod (B) so that pin (C) is approximately 10° clockwise from vertical line (D).
6. Tighten jam nut (A).

Continued on next page



A—Nut **B—Arm** **C—Pin**

IMPORTANT: Loosen both nuts (A) to end of thread travel on rod to prevent damage to linkage.

7. Loosen both nuts (A) to end of thread travel on rod.

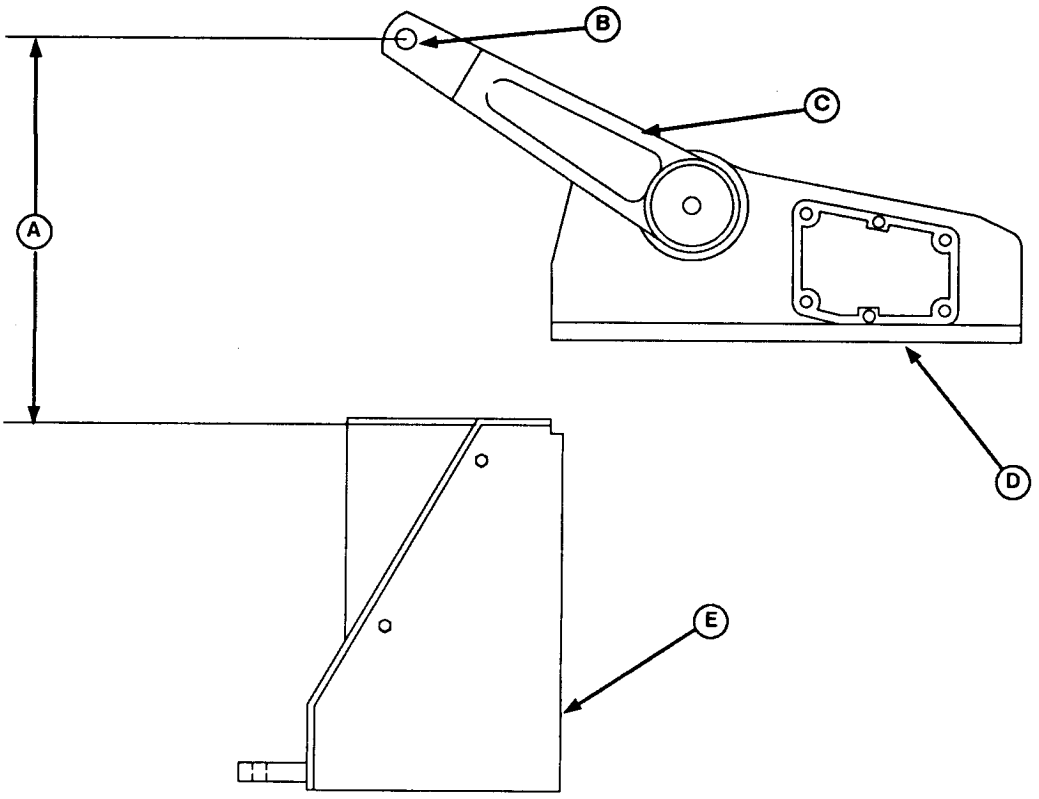
8. Manually raise rockshaft arms up until the upper limit is reached.

NOTE: After clearance specification of 3 mm has been made, this adjustment will not be done again.

9. Turn adjustment nuts (A) so there is 3 mm clearance between arm (B) and pin (C). Lengthen or shorten rod to specification as shown in photo.

270
19
3

Continued on next page OUO1085,000026F –19–11OCT00–2/4



LV170AE –UN–18FEB92

A—Vertical Distance
B—Lift Arm Pin
C—Lift Arm
D—Rockshaft Housing
E—Drawbar Support Side Plate

270
19
4

10. Open rate-of-drop valve by turning knob fully counterclockwise.
11. Attach minimum weight of 20 to 35 kg (44 to 65 lb) to each draft link.
12. Push the position control lever and draft control levers fully forward.
13. Start and run engine at 1500 rpm.
14. Move the outer lever (position control lever) fully rearward and then fully forward five times to purge air from the rockshaft piston and oil lines.
15. Move position control lever fully rearward and allow lift arms (C) to rise to top. Shut off engine.
16. Measure vertical distance (A) from bottom side of the upper flange of drawbar support side plate (E) to center of lift arm pin (B). If measurement is within specifications, no adjustment is necessary. If distance is more or less than specification, continue with procedure on next page.
17. Tractors without cab, install left-side fender.

Specification

Vertical (A)—Distance ..... 416 ± 4 mm (16.400 ± 0.157 in.)

Continued on next page

OUO1085,000026F –19–11OCT00–3/4

18. Tractors without cab, remove right-side fender.

19. Tractors with cab, remove right-side control console and panel. (See Remove and Install Right-Side Control Console and Panel—Tractors With Cab in Section 90, Group 15.)

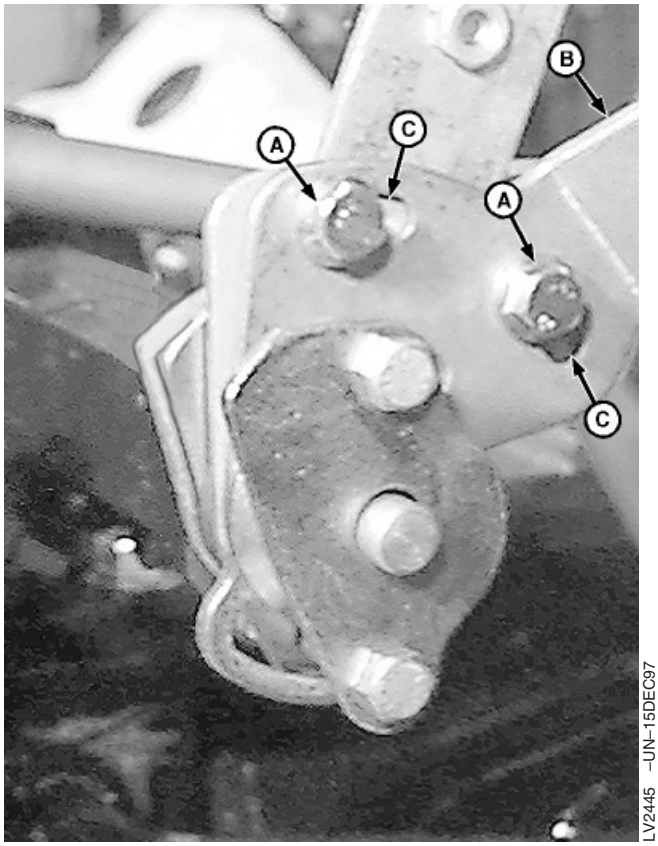
20. If distance measured earlier is greater than the specification 420 mm (16.535 in.), loosen two screws (A) and move outer lever (B) (position-sensing lever) rearward. This will move screws (A) clockwise in the adjustment slots (C).

21. If distance measured earlier is less than the specification 412 mm (16.220 in.), loosen two screws (A) and move outer lever (B) (position-sensing lever) forward. This will move screws (A) counterclockwise in the adjustment slots (C).

22. Tighten screws (A) and repeat step 15. Readjust if necessary.

23. Tractors without cab, install right-side fender.

24. Tractors with cab, install fuel tank and right-side control console.



A—Screw (2 used)
B—Outer Lever
C—Adjustment Slot

OUO1085,000026F –19–11OCT00–4/4

Rockshaft Draft-Sensing Feedback Linkage Adjustment

REASON:

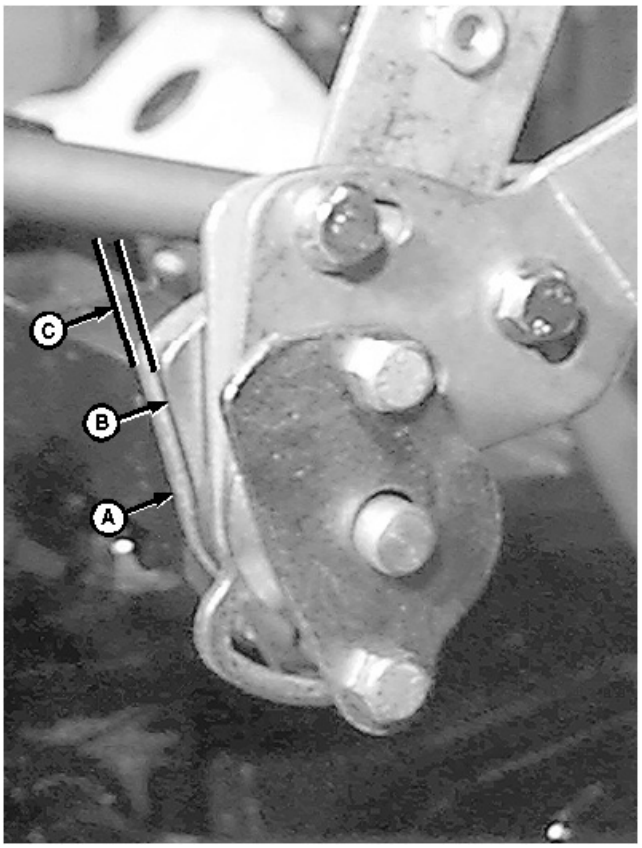
To ensure rockshaft draft system allows proper amount of implement control.

PROCEDURE:

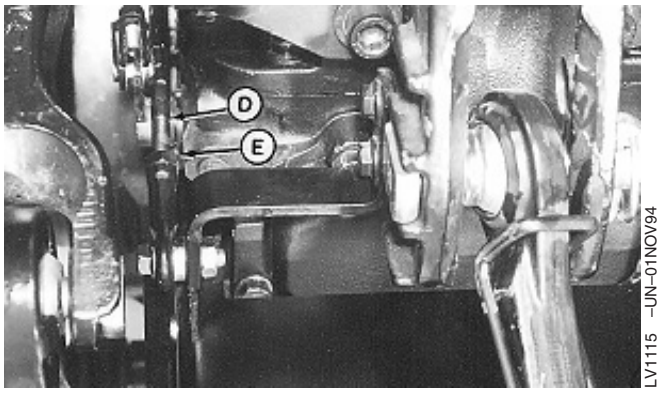
1. Remove right-side fender.
2. Move outer control lever fully forward. Make sure there is no load on the rockshaft centerlink. Slowly move the inner lever rearward until the rockshaft arms begin to rise. At this point, check the position of the rear edge of the inner pivot plate (A). It should align parallel (C) with flat surface on rear of friction plate (B). If surfaces of lever and plate align as shown, no adjustment is necessary. If adjustment is necessary, continue with procedure.
3. Loosen rod end lock nut (E) on the draft-sensing rod (D). If lift arms move before plates align, shorten rod using wrenching flats on rod (D). If lift arms move after plates align, lengthen rod.
4. Repeat procedure until adjustment is correct. Make sure lock nut (E) is tightened securely.

NOTE: With rockshaft completely raised and draft control lever fully rearward, system should not go into relief.

5. Install right-side fender.



LV1885 –UN–18NOV96



LV1115 –UN–01NOV94

A—Inner Level Pivot Plate
B—Friction Plate
C—Parallel Alignment
D—Draft-Sensing Rod
E—Lock Nut

OUO1085,0000270 –19–11OCT00–1/1

Main Relief Valve Adjustment

REASON:

Relief pressure high or low.

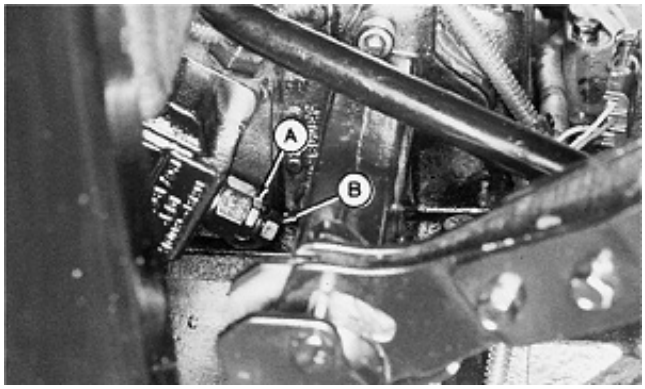
PROCEDURE:

1. Loosen lock nut (A) and turn adjustment screw (B) clockwise to increase pressure, counterclockwise to decrease pressure.

2. Tighten lock nut.

RESULTS:

- Main relief pressure should change. If not, inspect the valve for a damaged spring or leakage past the valve seal.



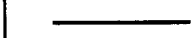
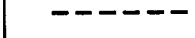
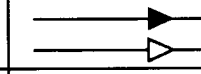
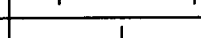
LV159 –UN–18FEB92

A—Lock Nut
B—Adjustment Screw

OUO1085,0000271 –19–11OCT00–1/1

Hydraulic Circuit Symbols

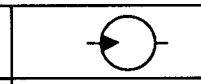
LINES

1		WORKING (MAIN) LINES
2		PILOT CONTROL LINES
3		DRAIN LINE
4		HYDRAULIC / PNEUMATIC } FLOW DIRECTION
5		CROSSING LINES
6		JOINING LINES
7		FLEXIBLE LINE

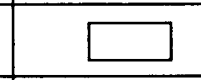
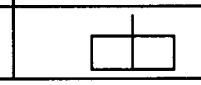
PUMPS

8		FIXED DISPLACEMENT
9		VARIABLE DISPLACEMENT

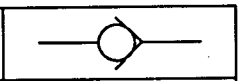
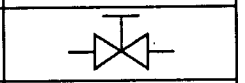
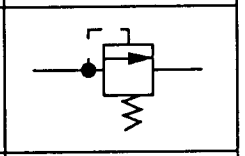
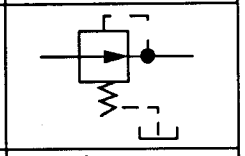
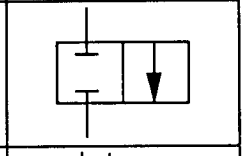
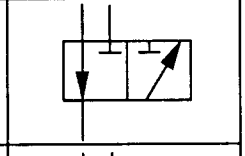
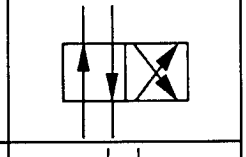
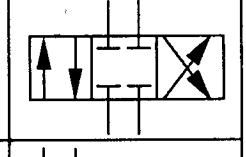
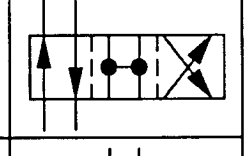
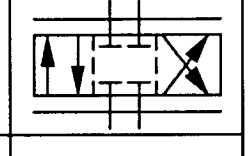
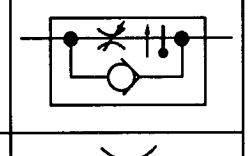
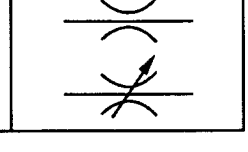
MOTORS

10		FIXED DISPLACEMENT
11		VARIABLE DISPLACEMENT

RESERVOIR

12		VENTED RESERVOIR
13		PRESSURIZED RESERVOIR
14		RESERVOIR RETURN - ABOVE FLUID LEVEL
15		RESERVOIR RETURN - BELOW FLUID LEVEL

VALVES

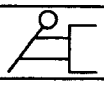
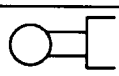
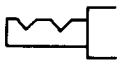
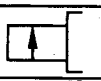
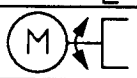
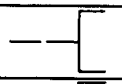
16		CHECK VALVE
17		MANUAL ON/OFF VALVE
19		PRESSURE RELIEF VALVE
20		PRESSURE REDUCTION VALVE
21		TWO POSITION, TWO CONNECTION VALVE
22		TWO POSITION, THREE CONNECTION VALVE
23		TWO POSITION, FOUR CONNECTION VALVE
24		THREE POSITION, FOUR CONNECTION VALVE
25		TWO POSITION, FOUR CONNECTION VALVE WITH TRANSMISSION
26		THREE POSITION, FOUR CONNECTION VALVE WITH INFINITE POSITIONING
27		ADJUSTABLE FLOW CONTROL VALVE (TEMPERATURE AND PRESSURE COMPENSATED)
18		FIXED / VARIABLE } ORIFICE

M81419AE –19–19NOV92

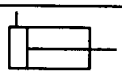
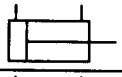
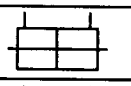
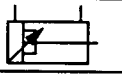
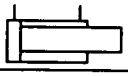
Continued on next page

LV,27020HA,A1A –19–03AUG94–1/2

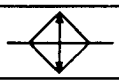
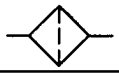
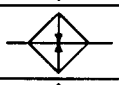
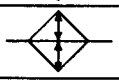
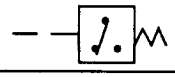
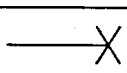
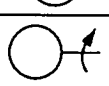
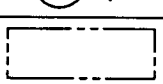
VALVE OPERATORS

28		SPRING
29		MANUAL
30		PUSH BUTTON
31		PUSH/PULL LEVER
32		PEDAL OR TREADLE
33		MECHANICAL
34		DETENTS
35		PRESSURE COMPENSATED
36		SOLENOID-SINGLE WINDING
37		REVERSING MOTOR
38		PILOT PRESSURE -REMOTE SUPPLY
39		PILOT PRESSURE -INTERNAL SUPPLY

CYLINDERS

40		SINGLE ACTING
41		DOUBLE ACTING, SINGLE ROD
42		DOUBLE ACTING, DOUBLE ROD
43		DOUBLE ACTING, ADJ. CUSHION, EXTEND ONLY
44		DOUBLE ACTING, DIFFERENTIAL PISTON

MISCELLANEOUS

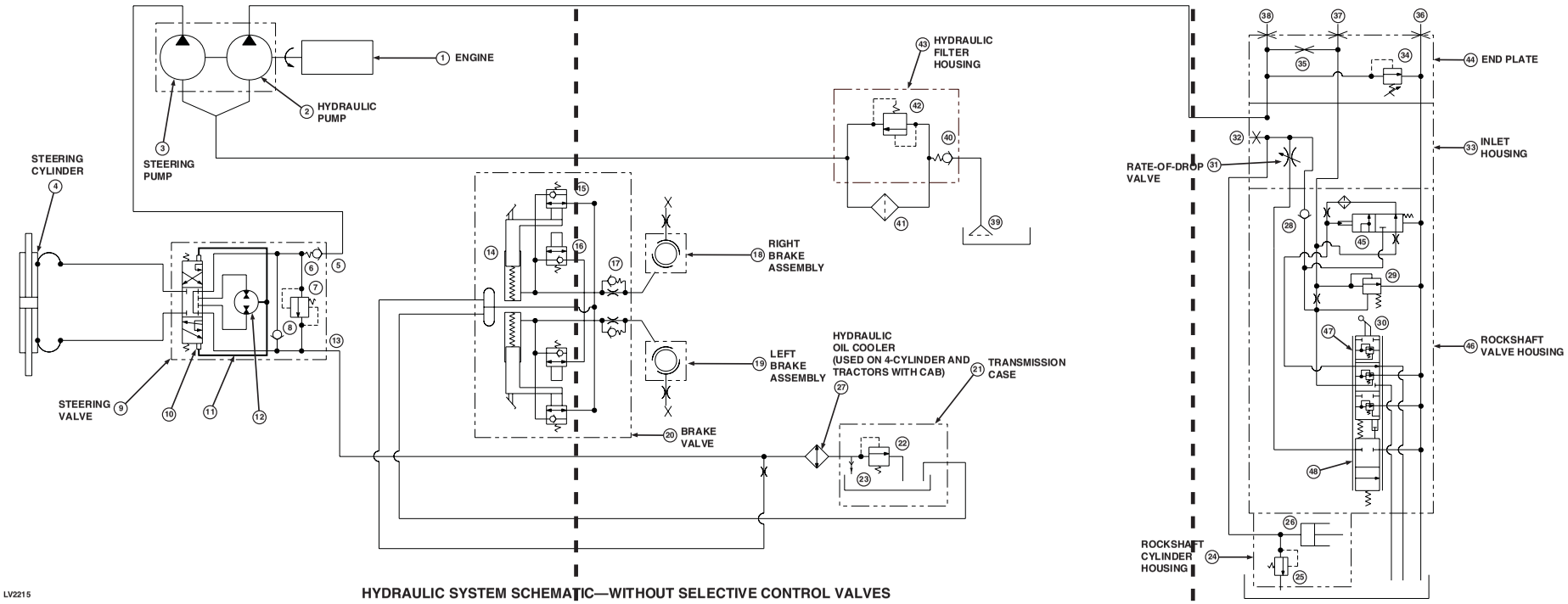
45		COOLER
46		FILTER, STRAINER
47		HEATER
48		TEMPERATURE CONTROLLER
49		PRESSURE SWITCH
50		PRESSURE INDICATOR
51		TEMPERATURE INDICATOR
52		PRESSURE COMPENSATED
53		VARIABLE COMPONENT (SYMBOL THRU COMPONENT)
54		PLUG, TEST PORT, PRESSURE SUPPLY TEST
55		GAS CHARGED ACCUMULATOR
56		SPRING LOADED ACCUMULATOR
57		ELECTRIC MOTOR
58		SHAFT ROTATION (ARROW ON NEAR SIDE OF SHAFT)
59		COMPONENT OUTLINE

M81440AE –19–19NOV92

LV,27020HA,A1A –19–03AUG94–2/2

Hydraulic Schematic—Without Selective Control Valves

LV2215 –UN–24FEB98



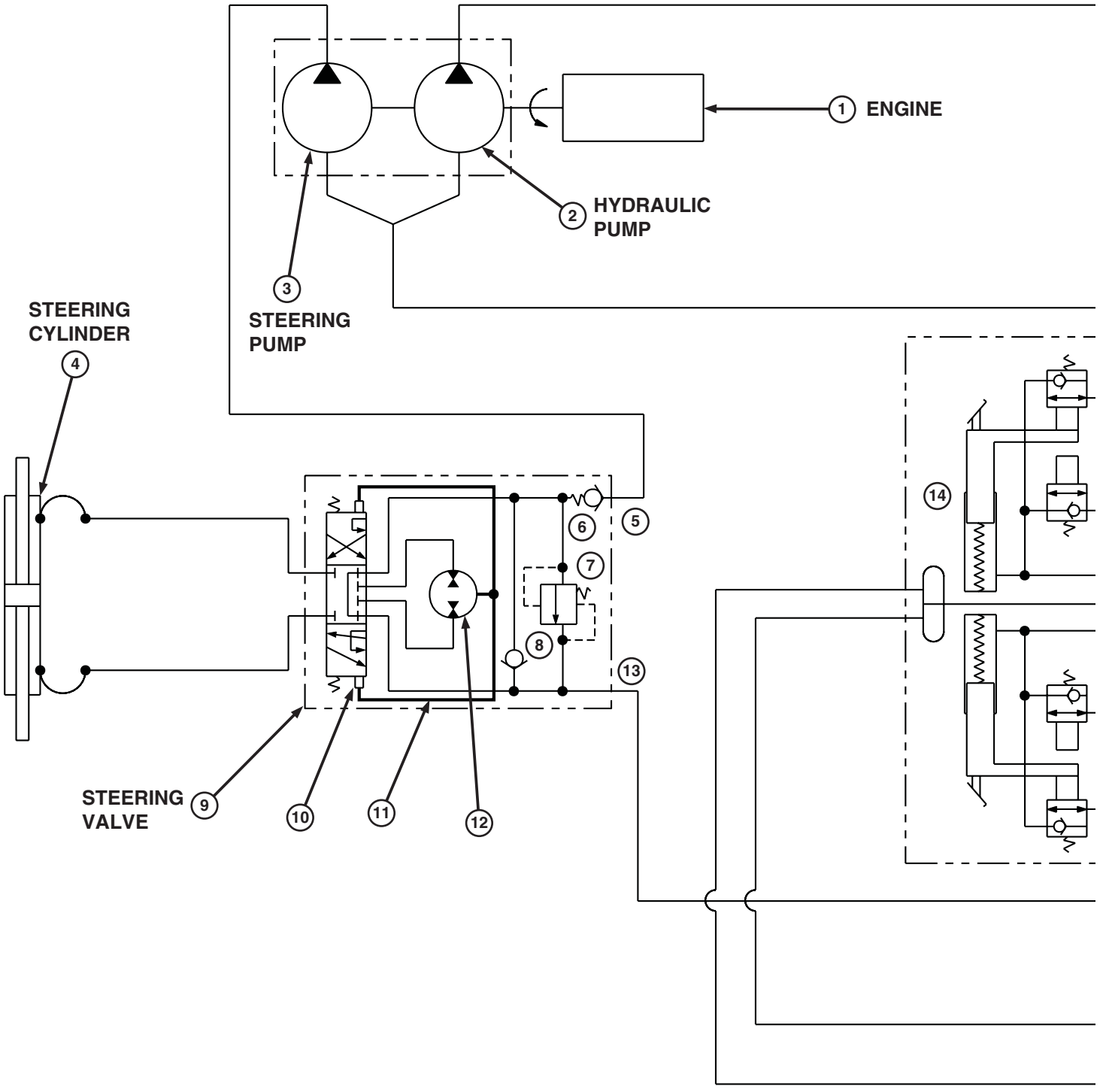
LV2215

HYDRAULIC SYSTEM SCHEMATIC—WITHOUT SELECTIVE CONTROL VALVES

See Page 270-20-4 A

See Page 270-20-4 B

See Page 270-20-4 C



LV2215

HYDRAULIC SYSTEM SCHEMA

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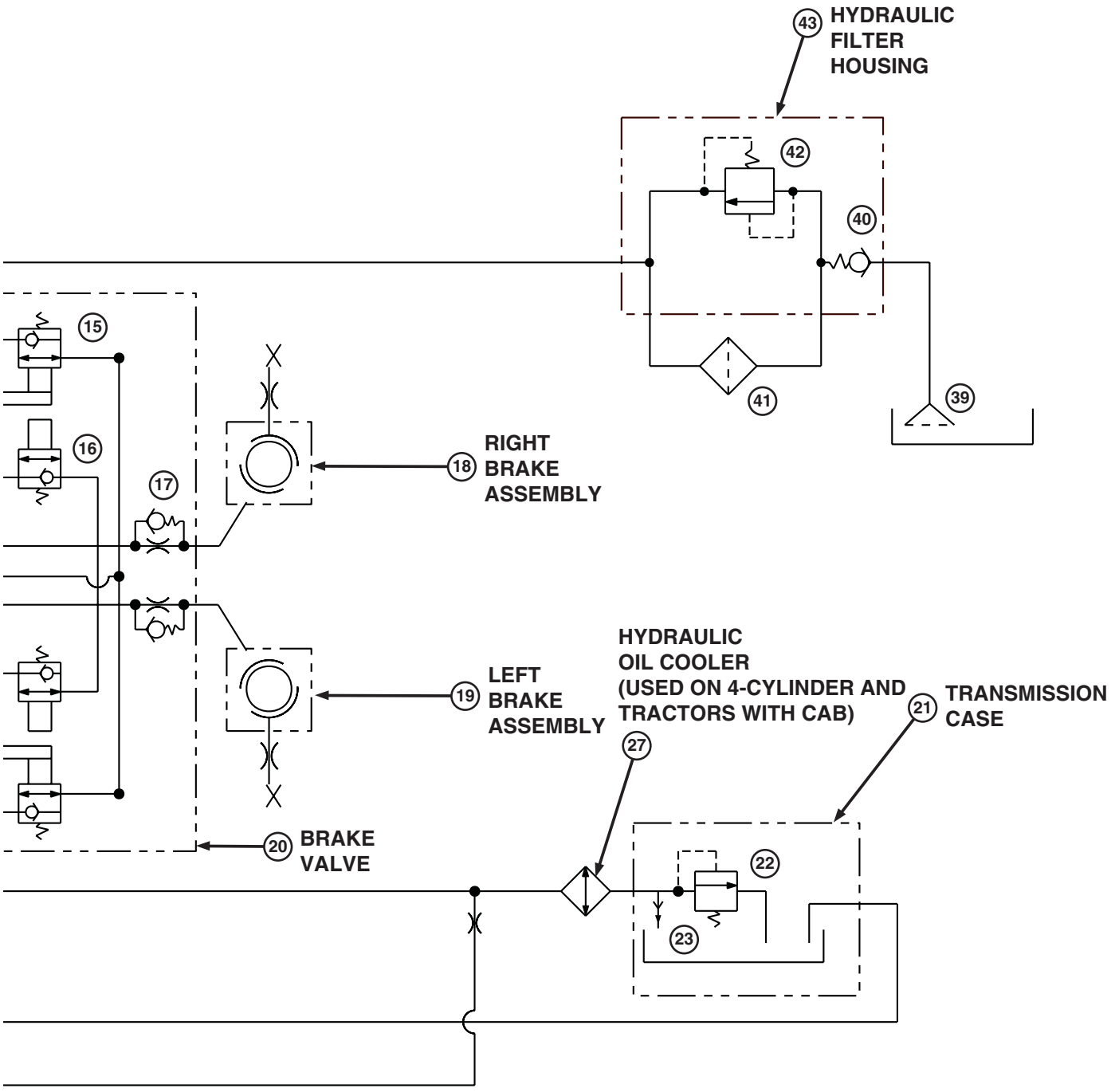

RAT
VAL

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EMATIC—WITHOUT SELECTIVE CONTROL VALVES

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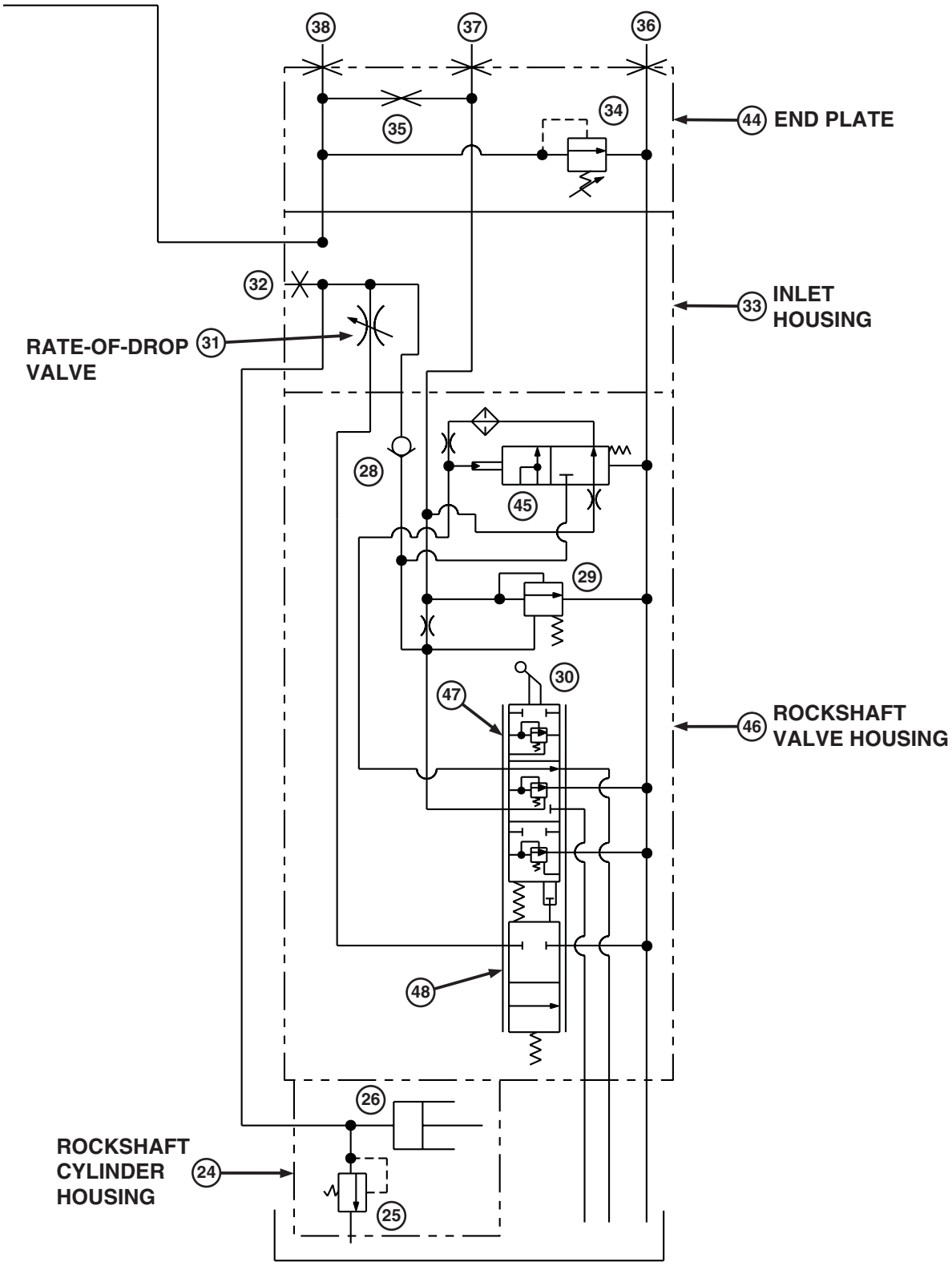
ılic Schematic—Without Selective Control Valves

I–24FEB98



OUO1085,0000272 –19–05JUL02–1/2

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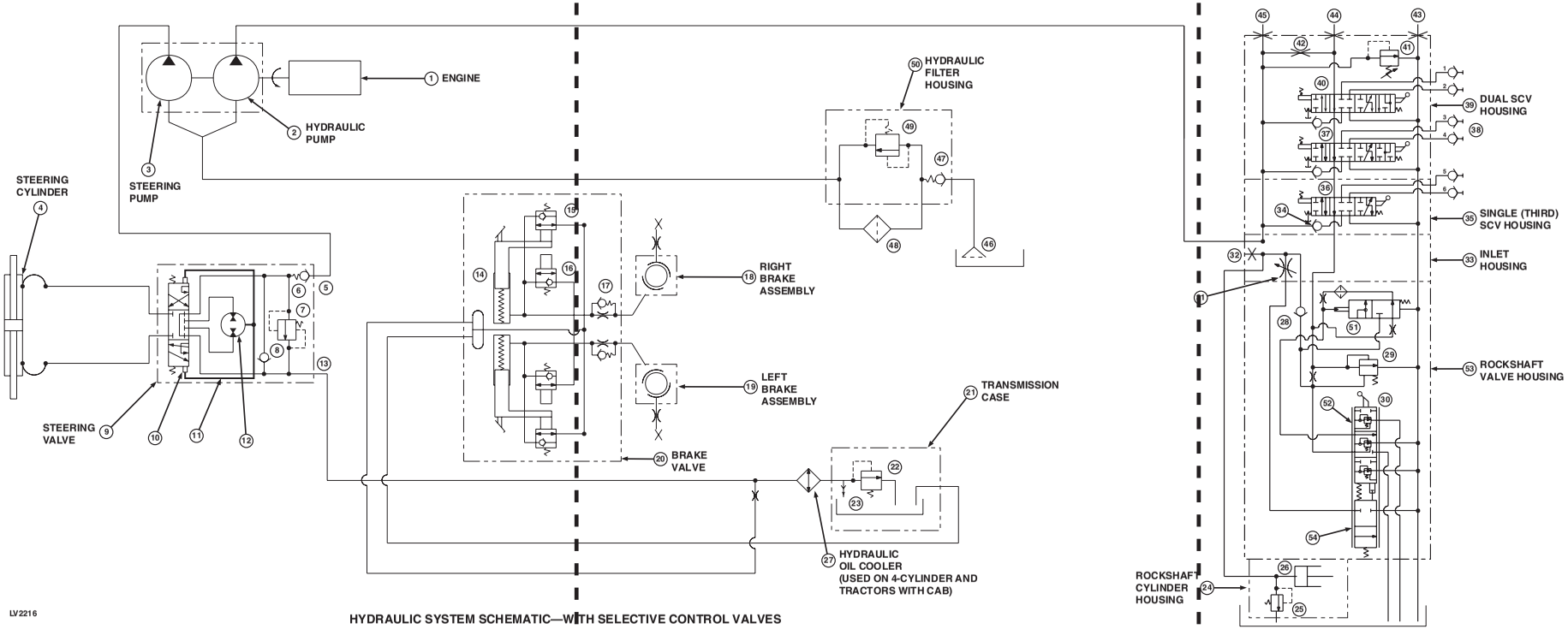
1—Engine
2—Hydraulic Pump
3—Steering Pump
4—Steering Cylinder
5—Inlet Port
6—Inlet Check Valve
7—Steering System Relief Valve
8—Manual Steer Check Valve
9—Steering Valve
10—Control Valve
11—Mechanical Link
12—Metering Pump
13—Return Port
14—Brake Piston
15—Inlet Check Valve
16—Equalizing Valve
17—Outlet Check Valve
18—Right Brake Assembly
19—Left Brake Assembly
20—Brake Valve
21—Transmission Case
22—Lube Relief Valve
23—Transmission Lube Feed
24—Rockshaft Cylinder Housing
25—Surge Relief Valve
26—Rockshaft Cylinder
27—Hydraulic Oil Cooler (Used on 4-Cylinder and Tractors with Cab)
28—Load Check Valve
29—Low Flow Regulator Valve
30—Rockshaft Spool Valve
31—Rate-of-Drop Valve
32—Pressure Test Port
33—Inlet Housing
34—Main Relief Valve
35—Diverter Plug Port
36—Power Beyond Tank Port
37—Power Beyond Return Port
38—Power Beyond Pressure Port
39—Mesh Filter
40—Drainback Check Valve
41—Hydraulic Filter Canister
42—Filter Relief Valve
43—Hydraulic Filter Housing
44—End Plate
45—High Flow Regulator Plate
46—Rockshaft Valve Housing
47—Raise Valve
48—Lower Valve

OUO1085,0000272 –19–05JUL02–2/2

Hydraulic Schematic—With Selective Control Valves

LV2216 –UN–15JUL02



LV2216

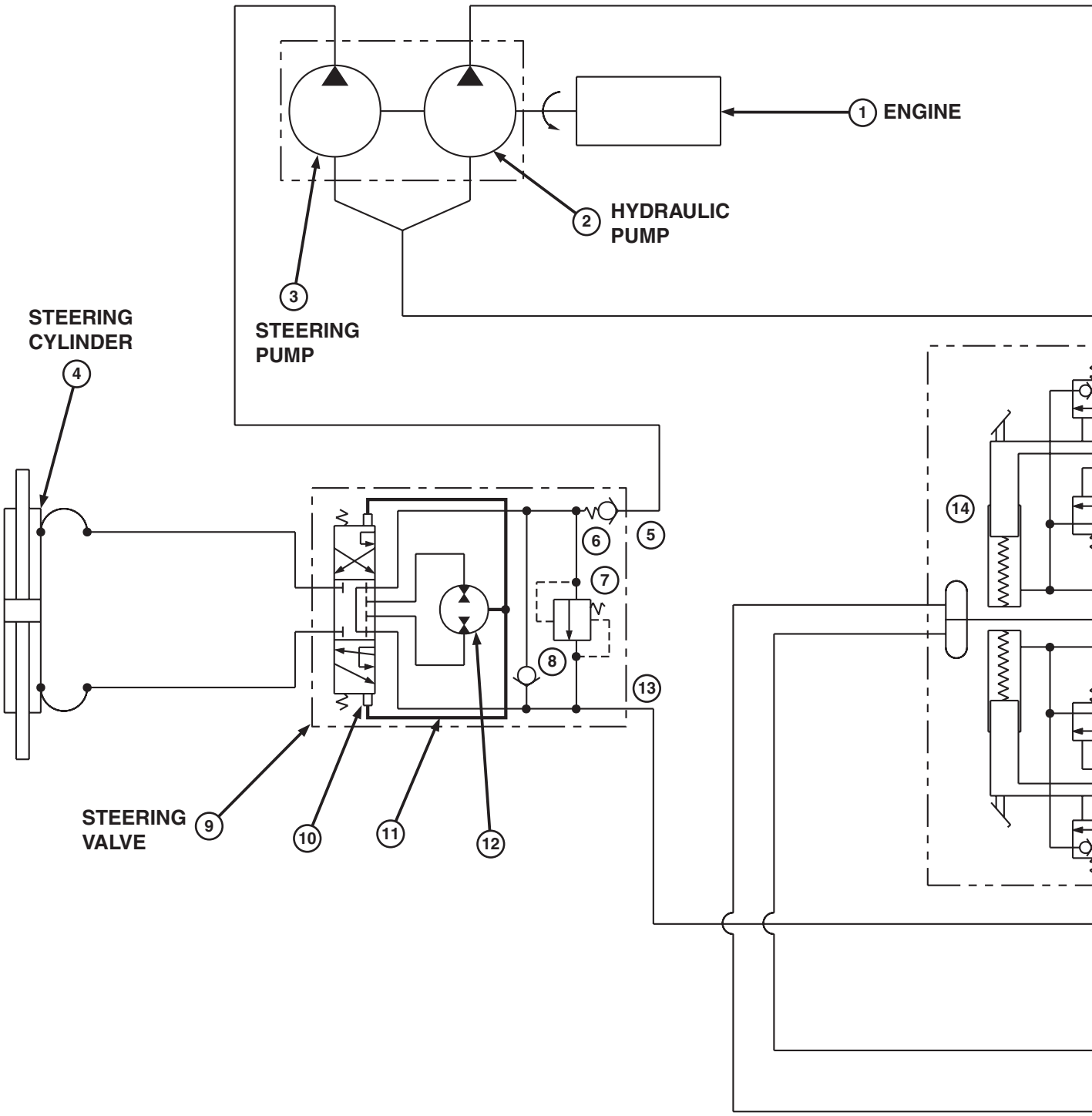
HYDRAULIC SYSTEM SCHEMATIC—WITH SELECTIVE CONTROL VALVES

OUO1085,0000273 –19–05JUL02–1/2

See Page 270-20-6 A

See Page 270-20-6 B

See Page 270-20-6 C



LV2216

HYDRAULIC SYSTEM SCHEMATIC

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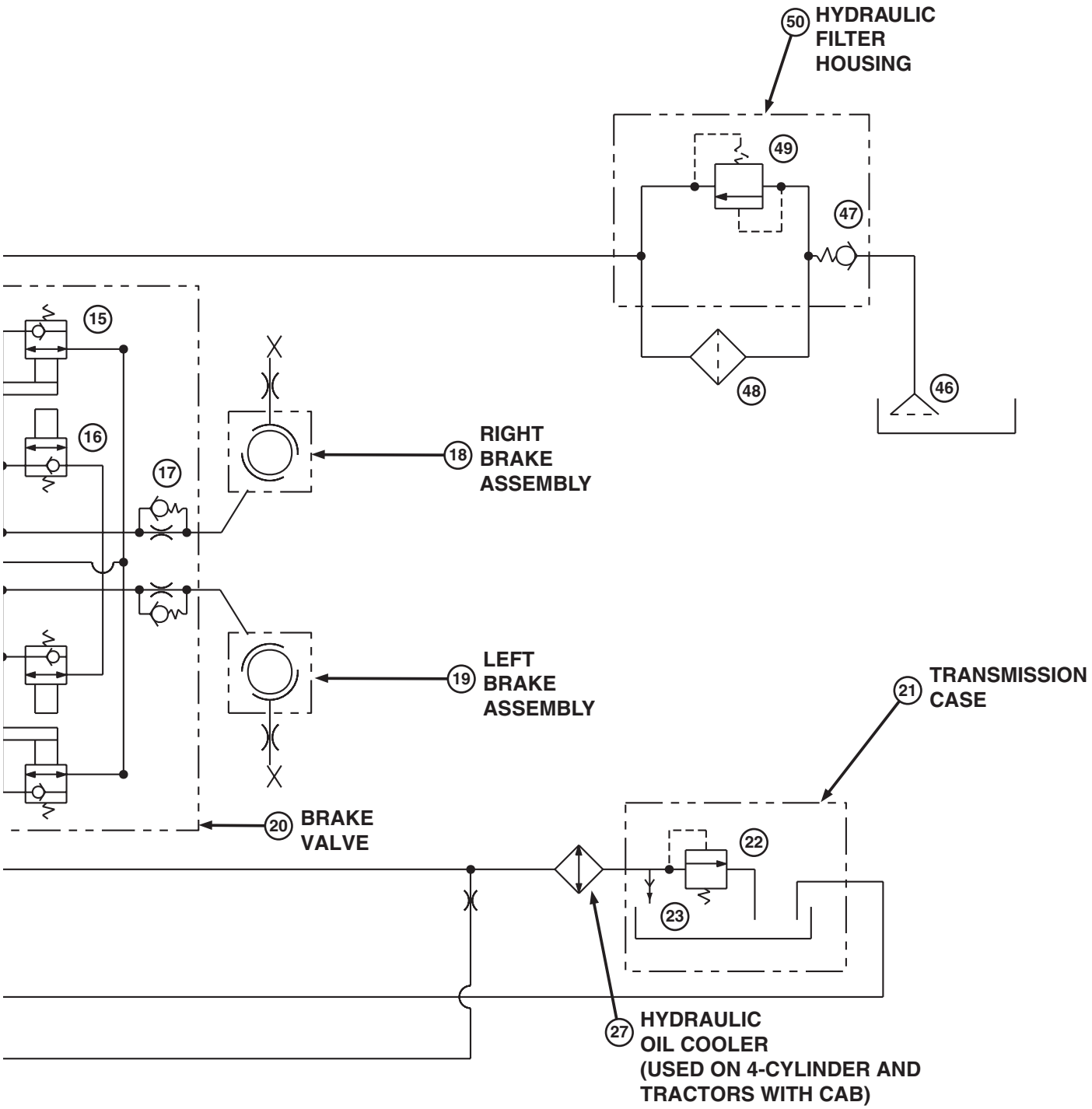

ATIC—WITH SELECTIVE CONTROL VALVES

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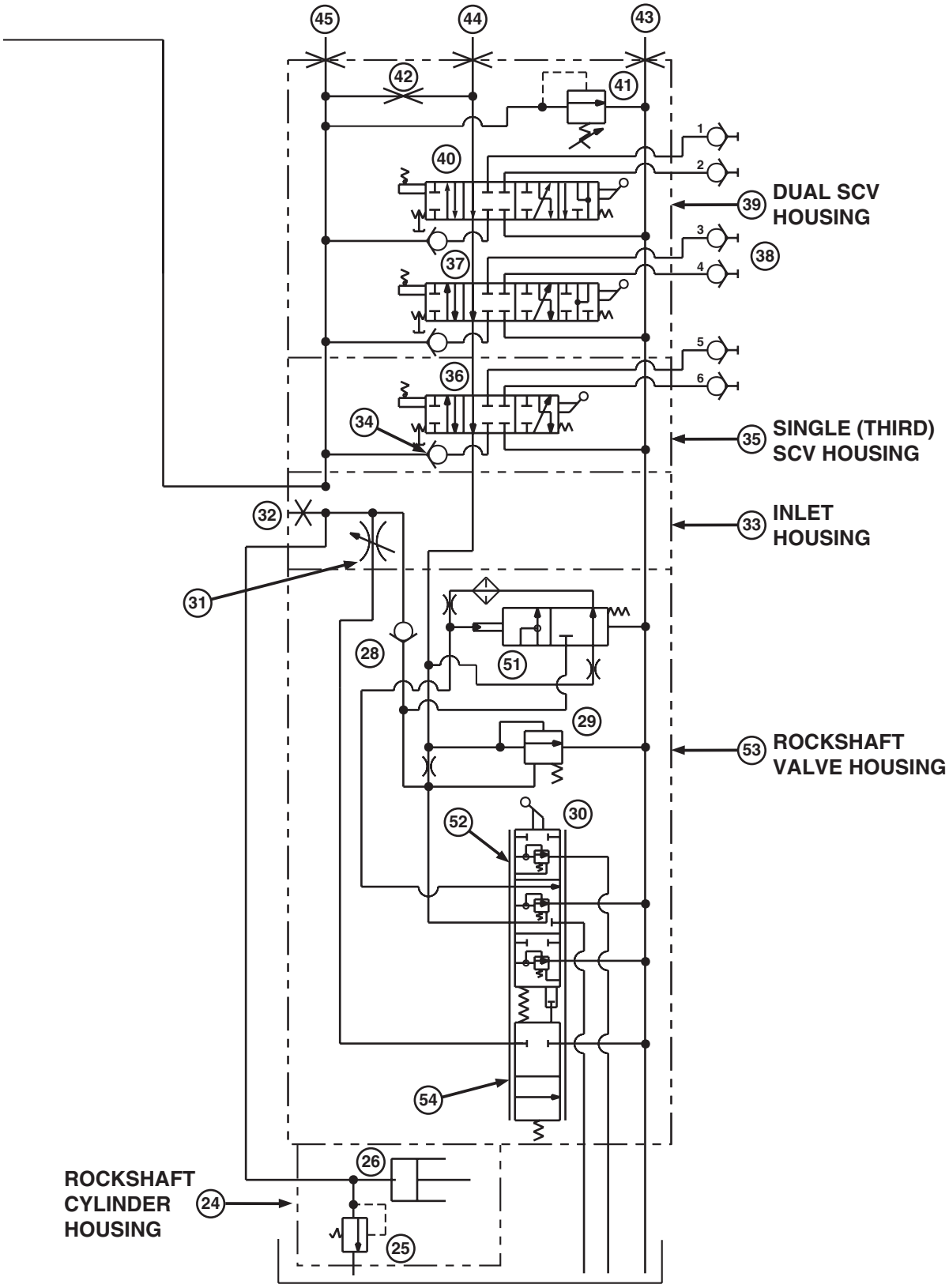
raulic Schematic—With Selective Control Valves

–UN–15JUL02



OUO1085,0000273 –19–05JUL02–1/2

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1—Engine
2—Hydraulic Pump
3—Steering Pump
4—Steering Cylinder
5—Inlet Port
6—Inlet Check Valve
7—Steering System Relief Valve
8—Manual Steer Check Valve
9—Steering Valve
10—Control Valve
11—Mechanical Link
12—Metering Pump
13—Return Port
14—Brake Piston
15—Inlet Check Valve
16—Equalizing Valve
17—Outlet Check Valve
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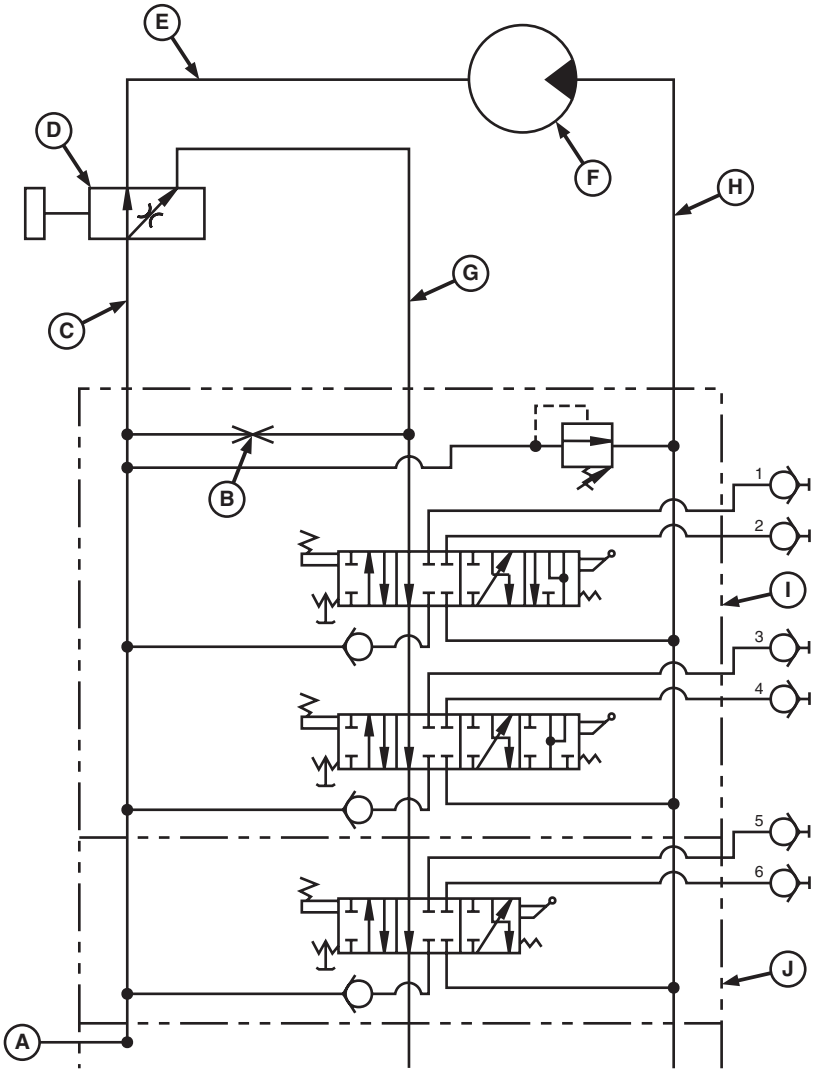
21—Transmission Case
22—Lube Relief Valve
23—Transmission Lube Feed
24—Rockshaft Cylinder Housing
25—Surge Relief Valve
26—Rockshaft Cylinder
27—Hydraulic Oil Cooler (Used on 4-Cylinder and Tractors with Cab)
28—Load Check Valve
29—Low Flow Regulator Valve
30—Rockshaft Spool Valve
31—Rate-of-Drop Valve
32—Pressure Test Port
33—Inlet Housing
34—Load Check Valve
35—Single (Third) SCV Housing
36—Single (Third) SCV Spool
37—Bucket Spool
38—Rear Outlet Couplers
39—Dual SCV Housing
40—Boom Spool
41—Main Relief Valve
42—Diverter Plug Port
43—Power Beyond Tank Port
44—Power Beyond Return Port
45—Power Beyond Pressure Port
46—Mesh Filter
47—Drainback Check Valve
48—Hydraulic Filter Canister
49—Filter Relief Valve
50—Hydraulic Filter Housing
51—High Flow Regulator Valve
52—Raise Valve
53—Rockshaft Valve Housing
54—Lower Valve

OUO1085,0000273 –19–05JUL02–2/2

Power Beyond Hydraulic Schematic



LV2379

LV2379 –UN–15JUL02

POWER BEYOND HYDRAULIC SCHEMATIC

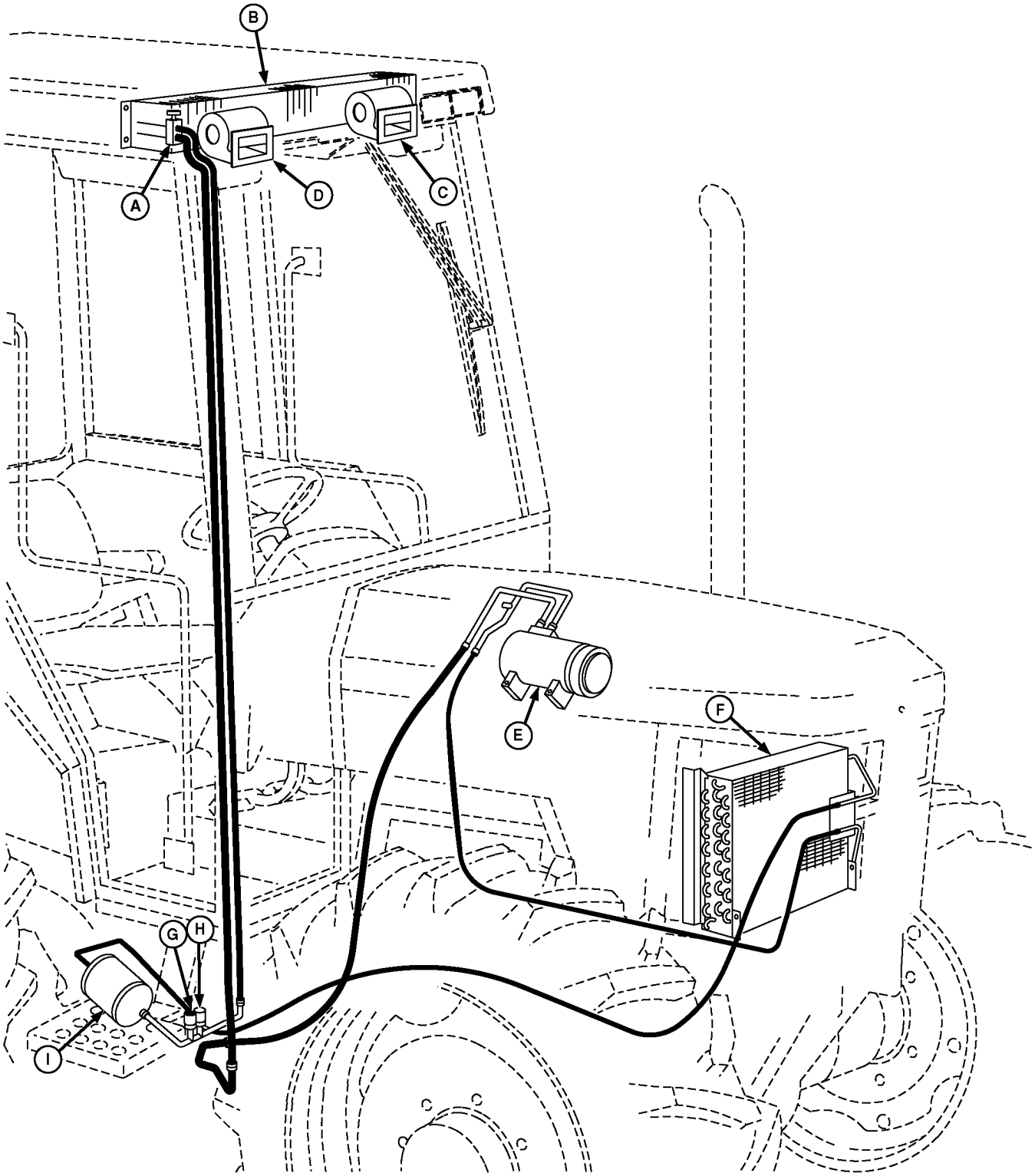
A—From Hydraulic Pump
B—Pipe Plug (3/8 x 18)
C—Hydraulic Supply Line
D—Flow Control Valve
E—Hydraulic Pressure Valve
F—Hydraulic Motor
G—Excess Flow Hydraulic Oil Return Line
H—Hydraulic Oil Return-to-Tractor
I—Dual SCV Housing
J—Single (Third) SCV Housing

OUO1085,0000274 –19–12OCT00–1/1

Section 290
Operator Station

Contents

Air Conditioning System Components



AIR CONDITIONING SYSTEM COMPONENTS

LV1450 –19–15DEC97

Slide LV1450

Continued on next page

OUO1085,0000276 –19–12OCT00–1/2

A—Expansion Valve
B—Evaporator/Heater Core
C—Left Side Blower Motor
D—Right Side Blower Motor
E—Compressor
F—Condenser
G—High Pressure Switch
H—Low Pressure Switch
I—Receiver-Dryer

OUO1085,0000276 –19–12OCT00–2/2

Refrigerant R134a

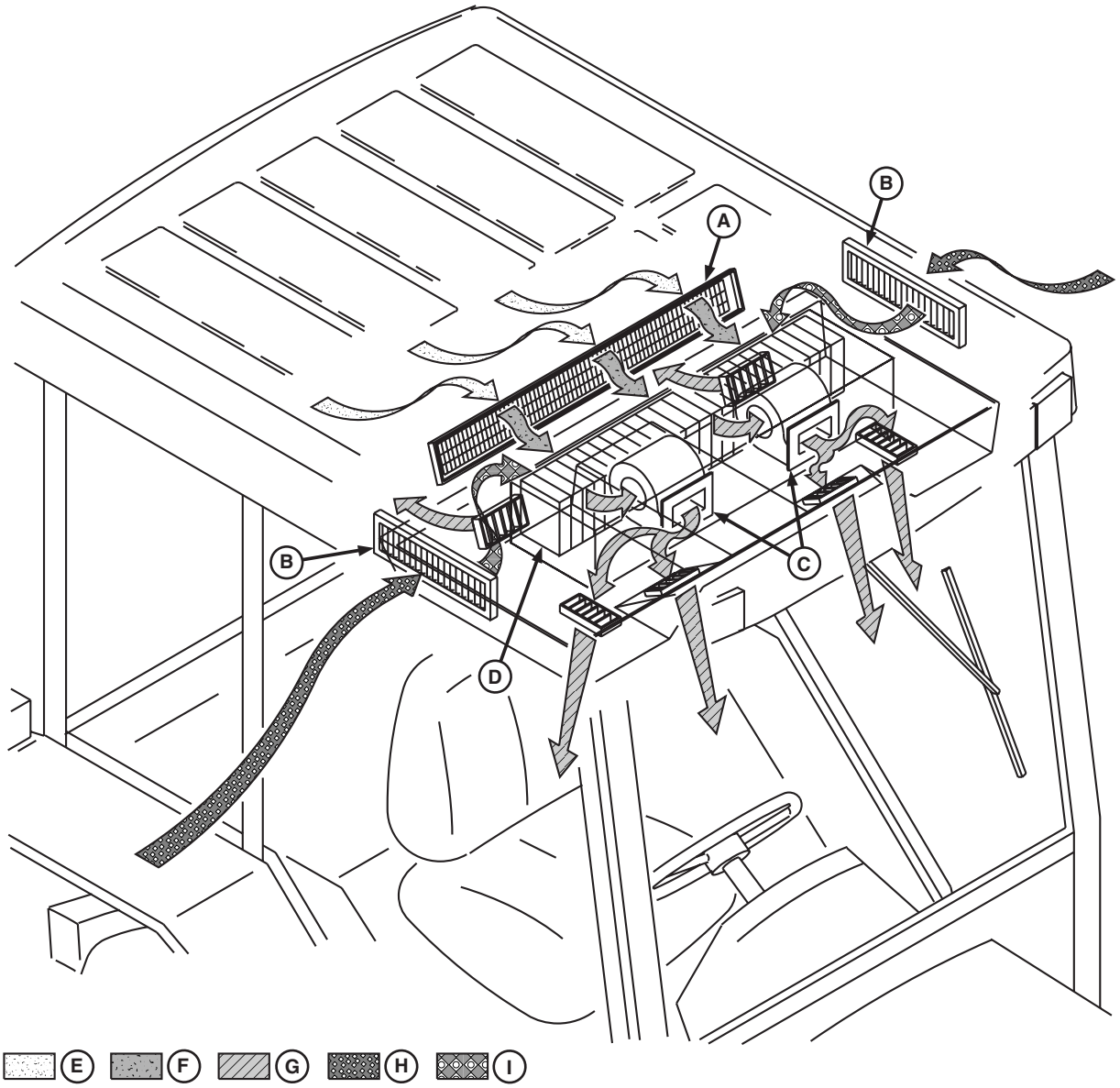
IMPORTANT: To meet forthcoming Government standards relating to the use of refrigerants, the 5210, 5310, 5410, and 5510 tractors (with cab) use refrigerant R134a in their air conditioning system. Because it does not contain chlorine, R134a is not detrimental to the ozone in the atmosphere. However, it is illegal to discharge any refrigerant into the atmosphere. It must be recovered using the appropriate recovery stations.

The recovery, recycle, and charging stations for refrigerants R12 and R134a must NOT be interchanged. Refrigerant R134a is corrosive to copper as well as components used in R12 systems. Certain seals also are not compatible with refrigerant oil used in R134a systems. Therefore, NEVER use R134a in a system which previously contained R12.

Using the correct refrigerant oil is also important. R12 systems use a mineral oil and R134a systems require a polyalkleneglycol (PAG) oil (a synthetic oil). The two oils are not compatible and must NOT be interchanged.

OUO1085,0000277 –19–12OCT00–1/1

Air Conditioning System Air Flow



LVC1451 –19–21MAY96

AIR CONDITIONING SYSTEM AIR FLOW

LVC1451

Slide LVC1451

A—Recirculating Air Intake Filter
B—Outside Intake Air Filter
C—Circulator Blower Motor
D—Evaporator Core
E—Unfiltered Recirculated Air
F—Filtered Recirculated Air
G—Conditioned Air
H—Unfiltered Outside Air
I—Filtered Outside Air

OUO1085,0000278 –19–12OCT00–1/1

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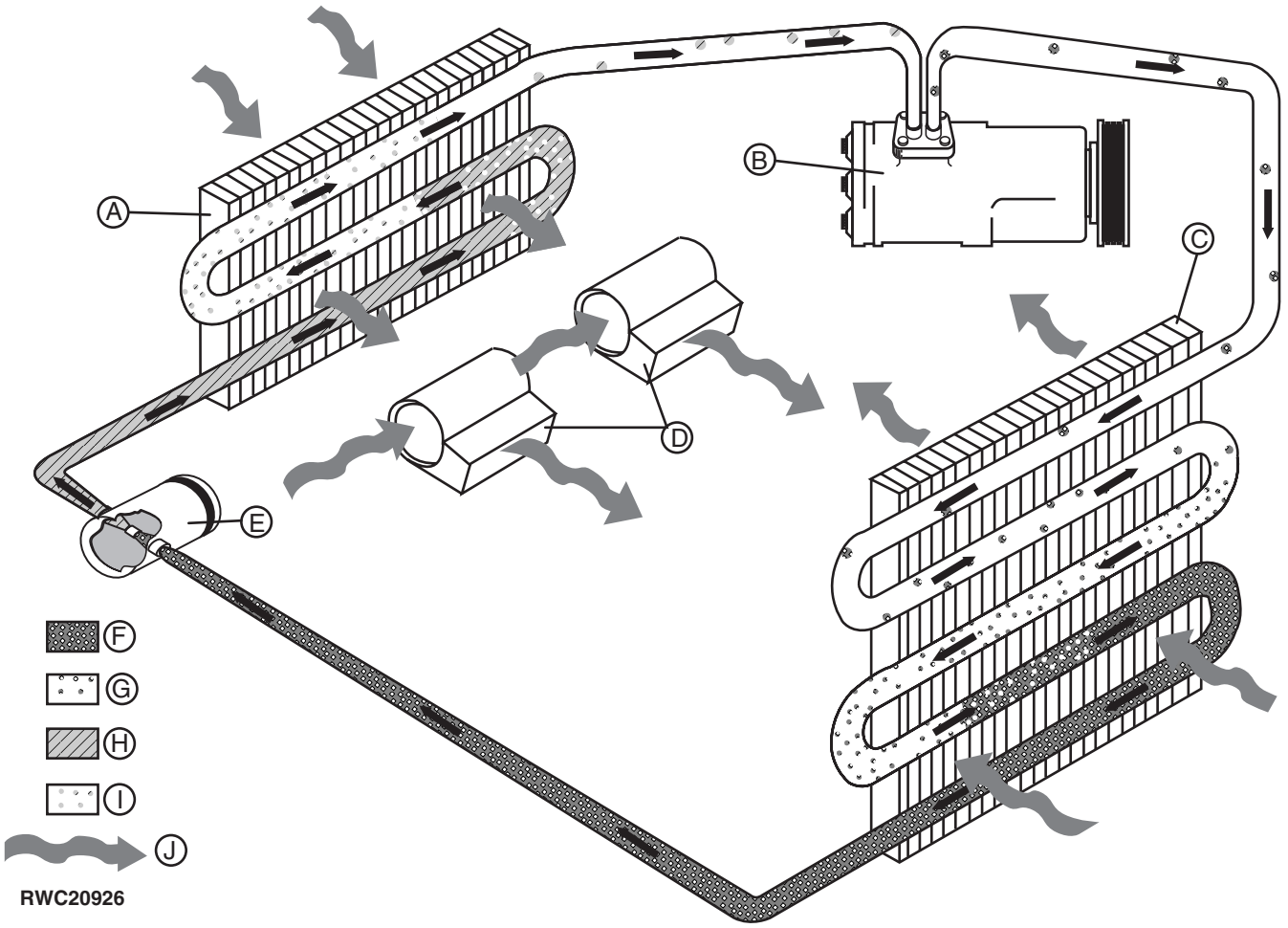
2

Air Conditioning System Cycle



Slide RWC20926

A—Evaporator Core
B—Compressor
C—Condenser
D—Circulation Blower Motors
E—Expansion Valve
F—High Pressure Liquid
G—High Pressure Gas
H—Low Pressure Liquid
I—Low Pressure Gas
J—Air Flow

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3

The compressor (B) draws low pressure refrigerant gas (I) from the evaporator (A) and compresses it to a high pressure gas (G). This causes the temperature of the refrigerant to rise higher than that of the outside air. It goes to the condenser (C) as a high pressure gas.

As the high pressure gas passes through the condenser, heat is removed and transferred to the outside air being drawn through the condenser core by the engine fan. This cools the gas and condenses it into a liquid, still under high pressure. It goes to the receiver-dryer as a high-pressure liquid (F).

The high pressure liquid then passes through the receiver-dryer where a special filter removes contaminants (moisture, acids, solids, etc.). The receiver-dryer also acts as a reservoir for refrigerant.

Continued on next page

The actual cooling and drying of cab air takes place at the evaporator (A). Flow of the high pressure liquid refrigerant through the evaporator is controlled by the expansion valve (E). The expansion valve causes the temperature and pressure of the refrigerant flowing into the evaporator to drop. The expansion valve is a diaphragm-type valve that uses a variable orifice to control the flow of low pressure liquid refrigerant (H) into the evaporator to maintain a constant pressure and temperature.

The circulation blower motors (D) pull a mixture of warm cab and outside air through the evaporator where it is cooled by the refrigerant. The heat absorbed by the evaporator causes the refrigerant to boil and vaporize.

Moisture, from the warm air, is condensed as it contacts the cool evaporator core during the cooling process and is drained away through tubes connected to a drip pan under the evaporator. With the cab air cooled and dehumidified the air conditioning cycle is complete.

OUO1085,000027A –19–12OCT00–2/2

Compressor

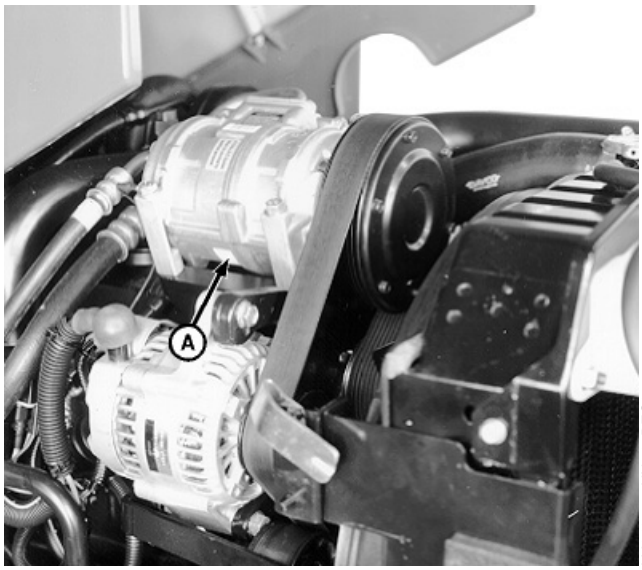
The compressor (A) is located at the front of the engine above the valve cover.

The compressor takes low pressure gas from the outlet of the evaporator and compresses it into a high pressure gas which is sent to the condenser. The temperature of the gas is increased during the compression phase.

It has a multiple groove pulley which is driven by a multiple groove drive belt. The pulley is attached to one side of an electromagnetic clutch. The compressor has five axial pistons that are driven by a swashplate, which is attached to the other side of the electromagnetic clutch. Applying battery voltage to the electromagnetic clutch engages the compressor and removing battery voltage disengages it. The air conditioning circuit automatically controls the compressor engagement/disengagement when the air conditioning system is in operation.

When the key switch is ON and the blower motor switch is in any ON position, the compressor may be operated manually also by using the A/C temperature control switch located on the overhead control panel.

The compressor housing also serves as a reservoir for refrigerant oil.



A—Compressor

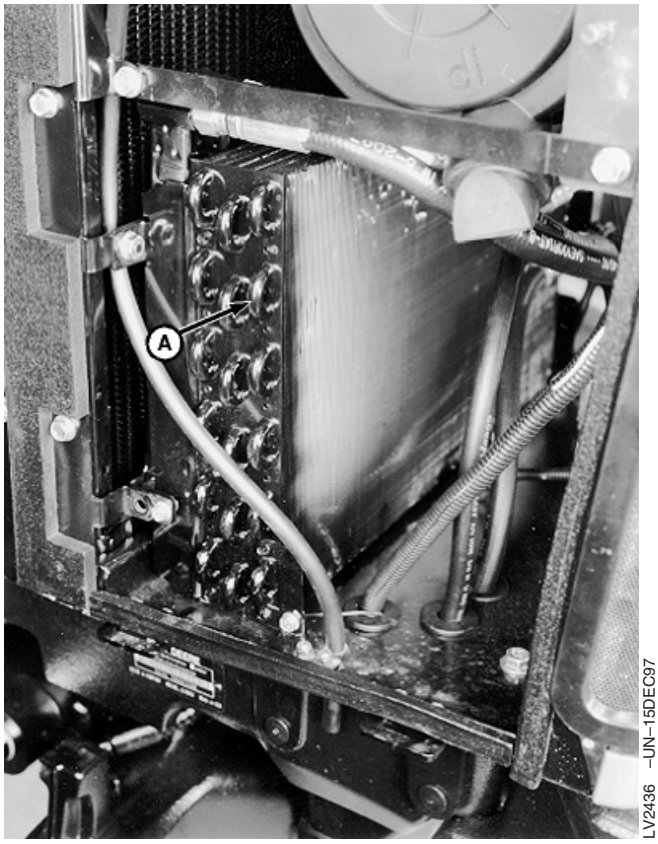
OUO1085,000027B –19–17JUL02–1/1

Condenser

The condenser (A) is located in front of the tractor radiator. It is a heat exchanging unit that receives high pressure and high temperature gas from the compressor and removes heat and condenses it to a high pressure liquid by the time it leaves the condenser. The condenser and transmission oil cooler are a single component and must be replaced as an assembly.

The heat is removed from the high pressure gas by the air drawn through the condenser by the engine fan. The condenser inlet is connected to the compressor outlet and its outlet is connected to the receiver-dryer inlet.

A—Condenser



LV2436 –UN–15DEC97

OUO1085,000027C –19–17JUL02–1/1

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Receiver-Dryer

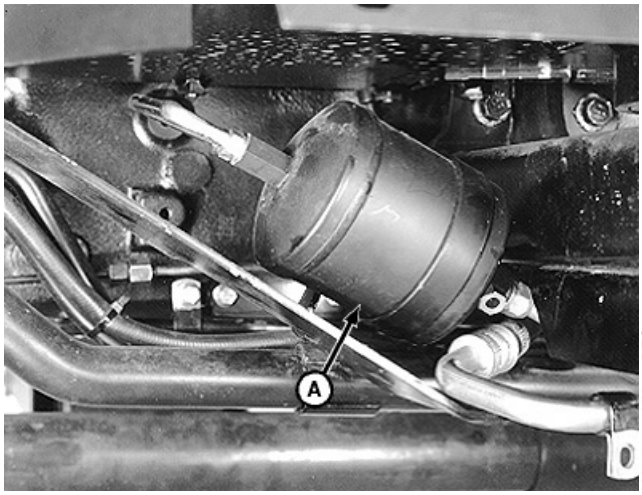
IMPORTANT: Receiver-dryers are NOT interchangeable between R12 and R134a refrigerant systems. The desiccant in each is different (SH5 for R12 and SH7 for R134a) and they are not compatible. When SH5 comes in contact with R134a, it breaks down into a powder that causes excessive wear in the compressor.

NOTE: The receiver-dryer is not repairable. If a malfunction is suspected, install a new receiver-dryer.

If the air conditioning system is discharged for servicing and the receiver-dryer is two years old or older, it should be replaced. If it is less than two years old it should only be replaced if the system is contaminated.

The receiver-dryer (A) is located under the right-side cab floor. Its inlet is connected to the condenser and its outlet is connected to the expansion valve. It performs two functions. One is to store high pressure liquid it receives from the condenser until the evaporator needs it. It also absorbs moisture and acid that would have a detrimental effect on the system's operation for a long period of time.

A sight glass in the line near the inlet to the receiver-dryer allows the operator or technician to observe the level of charge in the system, during normal operation or during test and service work.



A—Receiver-Dryer

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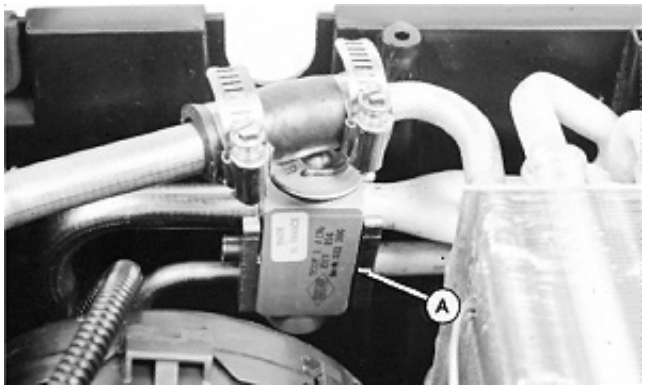
OUO1085,000027D –19–17JUL02–1/1

Expansion Valve

The expansion valve (A) is located in the evaporator/heater core housing in the cab roof. Its inlet is connected to the receiver-dryer and its outlet is connected to the evaporator. It has two additional connections, one from the evaporator outlet and another to the compressor. This circuit is used to sense the outlet temperature and pressure of the evaporator to help modulate the opening of the expansion valve.

The expansion valve is a diaphragm valve with a stainless steel thermal head. The thermal head is filled with gas which expands and contracts as the temperature of the HVAC compartment rises and falls. The expansion valve uses a variable orifice to control the flow of refrigerant through the evaporator to maintain a constant, comfortable temperature in the cab. If the expansion valve is open too far, liquid can reach, and possibly damage, the compressor. If the valve is not open far enough, lack of cooling will be the result.

A ball and seat combination provides the variable orifice to control the flow of refrigerant into the evaporator. The position of the ball relative to its seat, determines the amount of refrigerant that flows into the evaporator. The position of the ball is controlled by an actuating pin. The movement of the actuating pin is controlled by the diaphragm. Gas in the thermal head and the temperature and pressure at the outlet of the evaporator act on the diaphragm to move the actuating pin.



A—Expansion Valve

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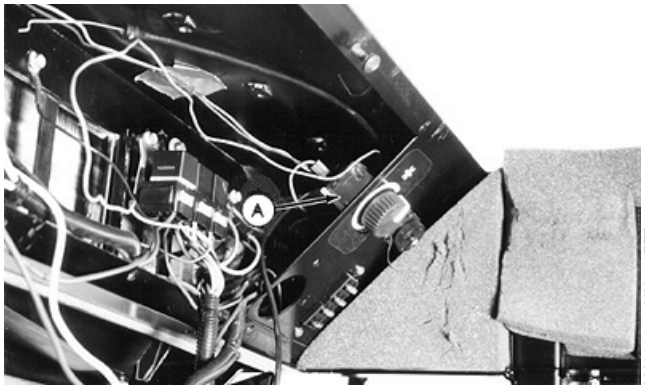
OUO1085,000027E –19–17JUL02–1/1

A/C Temperature Control Switch

The thermostatic temperature control switch (A) is a rotary-type switch with a gas-filled temperature sensing tube inserted into the evaporator core. The switch end of the sensing tube uses a diaphragm to control two external contacts wired to the compressor clutch. When the cab air needs to be cooled (to a preselected temperature setting inside the cab), the gas in the sensing tube expands the diaphragm, completing the circuit in the switch and engaging the compressor clutch. The compressor continues to operate until the preselected cab temperature is reached.



A—Thermostatic Temperature Control Switch

OUO1085,000027F –19–17JUL02–1/1

Evaporator

The evaporator (A) is located in the evaporator/heater core housing, in the cab roof. This is where the heat transfer, from cab air to the refrigerant, takes place.

The refrigerant is still a liquid (under low pressure) as it leaves the expansion valve. As it expands and becomes a gas in the evaporator, its temperature is reduced. This low temperature is transferred to the cooling fins. The air passing through the evaporator transfers its heat to the fins.

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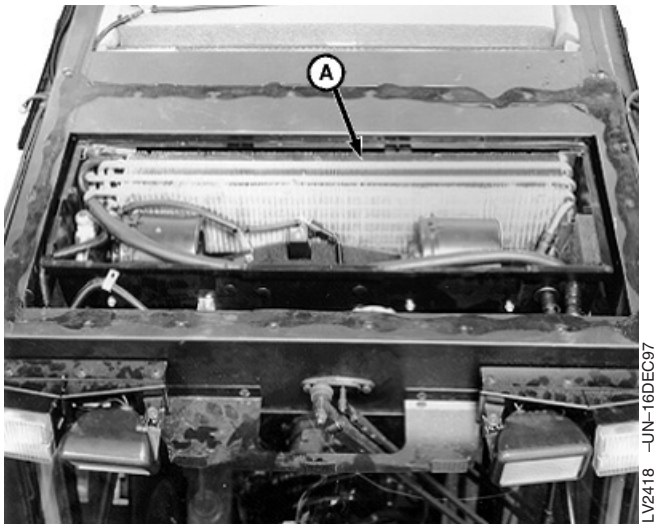
Also, because cool air can hold less moisture than warm air, moisture in the ambient air condenses when it comes into contact with the cold evaporator fins. The condensation is drained away by a drain hose.

The refrigerant flows from the evaporator outlet, through the expansion valve, and back to the compressor inlet.

The heater core is also part of the evaporator heat exchanger. The heater core uses engine coolant to heat the cab air as required. Coolant flow is regulated by the heater valve which is controlled by the operator control knob.



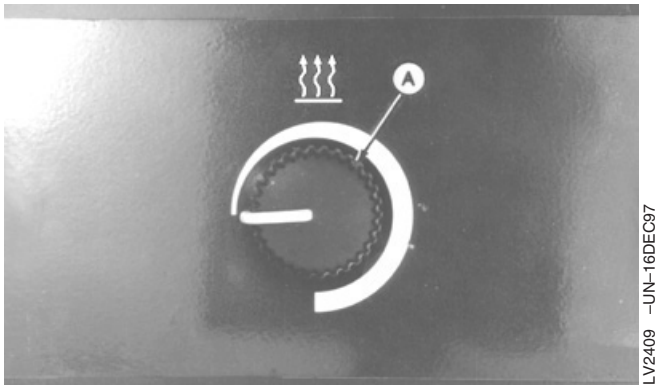
A—Evaporator

OUO1085,0000280 –19–17JUL02–1/1

Heater Temperature Control Knob

The temperature control knob (A) is located on the overhead control panel. Its function is to turn the heater control valve on or off as necessary. It has a single cable that goes to the heater valve which is in the evaporator/heater core housing.

When the knob is fully counterclockwise, the heater valve is OFF. When it is fully clockwise, the heater valve is ON, or fully open. The control can be positioned anywhere within its range of travel to partially open the heater valve for blending heat with cold conditioned air from the evaporator to obtain a comfortable cab temperature.



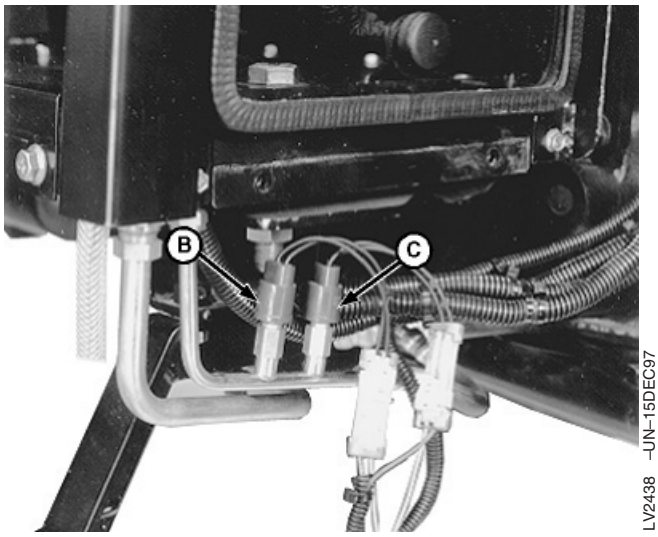
A—Temperature Control Knob

OUO1085,0000281 –19–17JUL02–1/1

High and Low Pressure Switches

The high and low pressure switches (B and C) are located behind the right-side crop guard on the line between the condenser and the receiver-dryer. The function of each is to protect the compressor by shutting it off if system pressure becomes too high or too low. If pressure exceeds 2480—2760 kPa (24.8—27.6 bar) (370—415 psi), or drops below 300—400 kPa (3—4 bar) (45—60 psi), the appropriate switch opens and shuts the compressor off.

NOTE: The high pressure switch (B) is toward the outside of the tractor, and the low pressure switch (C) is toward the inside.



B—High Pressure Switch
C—Low Pressure Switch

OUO1085,0000282 –19–17JUL02–1/1

Essential Tools

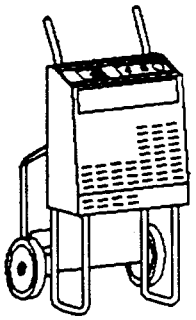
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC).

SERVICEGARD is a trademark of Deere & Company

OUO1080,0000282 –19–11JUL02–1/3

Recovery and Recycling Station . . . . . JT02050[1]

Servicing air conditioning system using R134a refrigerant.



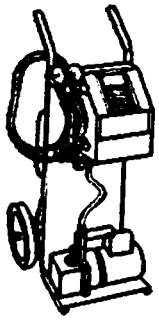
RW21613 –UN–17AUG92

[1]Used with JT02046 Charging Station, JT02047 Recovery, Recycling, and Charging Station can be substituted for JT02046 and JT02050.

OUO1080,0000282 –19–11JUL02–2/3

Charging Station . . . . . JT02046[1]

Servicing air conditioning system using R134a refrigerant.



RW21595 –UN–17AUG92

[1]Used with JT02050 Recovery and Recycling Station, JT02047 Recovery, Recycling, and Recharging Station can be substituted for JT02046 and JT02050.

OUO1080,0000282 –19–11JUL02–3/3

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Service Equipment and Tools

NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

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Continued on next page

OUO1080,0000283 –19–11JUL02–1/8

Manifold Pressure Gauge Assembly JT02051

Service air conditioning system (AQS).

OUO1080,0000283 –19–11JUL02–2/8

Electronic Leak Detector. JT02081

Detect refrigerant leaks.

OUO1080,0000283 –19–11JUL02–3/8

R12/R134a Master Fitting Kit[1] JT02098

Flush and purge air conditioning system. Also check leak components.

[1]Use JT05419 and JT02138 together separately or JT02098 separately.

OUO1080,0000283 –19–11JUL02–4/8

Air Conditioning Service Fitting Kit (R12)[1]. JT05419

Connect flushing and purging test equipment. Use with JT02138 R134A Update Fitting Kit.

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[1]Use JT05419 and JT02138 together separately or JT02098 separately.

OUO1080,0000283 –19–11JUL02–5/8

R134a Update Fitting Kit[1] JT02138

Flush A/C system. Use with JT02078 A/C System Flushing Attachment Kit.

[1]Use JT05419 and JT02138 together separately or JT02098 separately.

Continued on next page

OUO1080,0000283 –19–11JUL02–6/8

A/C System Flushing Kit JT02075

Flush air conditioning system. Use with JT02078 A/C System Flushing Attachment Kit.

OUO1080,0000283 –19–11JUL02–7/8

A/C System Flushing Attachment Kit JT02078

Use with JT02075 to flush air conditioning system.

OUO1080,0000283 –19–11JUL02–8/8

Other Material

Number	Name	Use
TY22025 (8.5 oz) (U.S.)	R134a Compressor Oil	Lubricate air conditioning system components.
TY15949 (12 oz) (U.S.) TY15950 (15 lb) (U.S.) TY15951 (30 lb) (U.S.)	Refrigerant R134a	Charge the air conditioning system.
N/A (U.S.)	GENESOLV 2004®	Flush air conditioning system.

GENESOLV 2004 is a trademark of Micro Care Corp.

OUO1080,0000284 –19–11JUL02–1/1

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Specifications

Item	Measurement	Specification
Compressor Clutch Coil	Resistance	3.5—4.0 Ohms
A/C Low Pressure Switch	Closing Pressure	300—400 kPa (3—4 bar) (45—60 psi)
A/C High Pressure Switch	Opening Pressure	2480—2760 kPa (24.8—27.6 bar) (370—415 psi)
Thermostatic Temperature Control Switch	Closing Temperature	Above 3°C (37°F)
Thermostatic Temperature Control Switch	Opening Temperature	At —1°C (30°F)
R134a	Refrigerant Charge	1.6—1.7 kg (3.5—3.75 lbs.)

OUO1080,0000286 –19–11JUL02–1/1

Diagnosis, Tests, and Adjustments

OUO1085,0000283 –19–17JUL02–1/1

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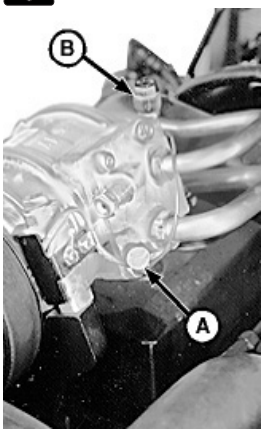
4

Operator Station

– – –1/1

❶ **Compressor Clutch Engagement Check**	Open cab door. Turn key switch on but do NOT start engine. Turn A/C switch ON. Turn blower motor switch from OFF to LOW several times. Listen for click of compressor clutch as the switch is turned on. *NOTE: The evaporator temperature must be above 3°C (37°F) so contacts of temperature control switch will be closed.* *System must also be charged with 300—400 kPa (3—4 bar) (45—60 psi) so the A/C low pressure switch will be closed.*	**OK:** GO TO 9. **NOT OK:** GO TO 2.

– – –1/1

❷ Static Pressure Check	**CAUTION: Engine must be OFF.**  LV2439 –UN–15DEC97 **A—Compressor Fitting** **B—Condenser Fitting** Install JT02051 Manifold Gauge Set. • Connect suction side at compressor fitting (A). • Connect high pressure side at condenser fitting (B). Close center hose on gauge set. Open high and low side valves. *NOTE: A/C system must have at least 300—400 kPa (3—4 bar) (45—60 psi) pressure to close the A/C low pressure switch.* Open high and low side gauge set valves. Close both valves after static pressure check.	**OK:** Pressure is good. GO TO 3. **NOT OK:** Pressure is low. Do 13 and 15 and then repeat 1. – – –1/1
❸ Isolate Malfunction	*NOTE: Refer to Section 240—Electrical System Operation, Tests, and Adjustments.* The following conditions must exist for the compressor clutch to operate: • Key switch must be ON. • Terminal “1” of blower motor switch must supply battery voltage across fuse F16 in all switch positions except OFF.	**NOT OK:** Fuse is failed. (Circuit overloaded after fuse.) GO TO 4. **NOT OK:** Fuse is good but no voltage at fuse. (Loss of power before fuse.) GO TO 5. **NOT OK:** Fuse is good and voltage good at fuse. (Loss of power after fuse.) GO TO 4. – – –1/1

❹ **Check Voltage and Continuity**	Check for battery voltage at compressor clutch coil. Resistance of compressor clutch coil is to specification. **Specification** Compressor Clutch Coil—Resistance ..... 3.5—4.0 Ohms A/C temperature control switch should be open when the switch is OFF and have less than 0.5 ohms resistance when it is ON. A/C low pressure switch should have less than 0.5 ohms resistance when system pressure is at or above specification. The switch should be open when system pressure is below specification. **Specification** A/C Low Pressure Switch—Closing Pressure ..... 300—400 kPa (3—4 bar) (45—60 psi) *NOTE: See 37 to check switch.* A/C high pressure switch should have less than 0.5 ohms resistance when system pressure is below specification. The switch should be open when system pressure is above specification. **Specification** A/C High Pressure Switch—Opening Pressure ..... 2480—2760 kPa (24.8—27.6 bar) (370—415 psi) *NOTE: See 38 to check switch.* The temperature control switch should have less than 0.5 ohms resistance when temperature surrounding the capillary tube is above specification. Switch should be open when temperature is below specification. **Specification** Thermostatic Temperature Control Switch—Closing Temperature ..... Above 3°C (37°F) Thermostatic Temperature Control Switch—Opening Temperature ..... At —1°C (30°F) *NOTE: See 39 to check switch.*	**NOT OK:** Repair the system and then GO TO 1. – – –1/1
❺ **Check Fuse F13**	*NOTE: Key switch and blower motor switch must be ON.* Fuse F13 failed/not failed?	**NOT OK:** Fuse failed. (Circuit overloaded after fuse.) GO TO 6. **NOT OK:** Fuse is good but no voltage before fuse. (Loss of power before fuse.) GO TO 7. **NOT OK:** Fuse is good and voltage is good. (Loss of power after fuse.) GO TO 8. – – –1/1

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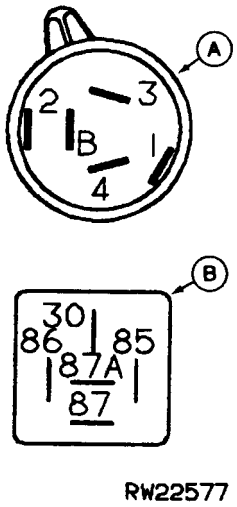
6 Reason for Failed Fuse	Circuit is grounded, shorted, or overloaded after the fuse. Check voltage and continuity of components and wire harnesses as necessary.	**NOT OK:** GO TO 1 after the system has been repaired. – – –1/1

7 Loss of Battery Power Before Fuse	Check voltage and continuity of components and wire harnesses as necessary.	**NOT OK:** GO TO 1 after the system has been repaired. – – –1/1

8 Loss of Battery Power After Fuse



RW22577 –UN–24SEP93

A—Blower Motor Switch
B—Relay K7

Check voltage or continuity of components and wire harnesses as necessary.

There should be less than 0.5 ohms resistance (X) between "B" and "1", "2", "3", and "4" for the blower motor switch (A) positions shown in the following chart. All other combinations should be open. (See "A" in following art.)

Switch Position	Terminal and Wire Color			
	1 (Bl)	2 (Br)	3 (Pu)	4 (Or)
OFF	0V	0V	0V	0V
LOW	12V (X)	8V	6V	0V
MEDIUM	12V (X)	12V (X)	8V	0V
HIGH	12V (X)	12V (X)	12V (X)	0V
PURGE	12V (X)	12V (X)	12V (X)	12V (X)

Check continuity of relay K7 (B) per the following chart.

Terminals	Resistance (In ohms)
85—86	68—78
30—87	Open (0.2[a])
30—87A	0.2 (Open[a])
87—87A	Open (Open[a])

[a]With battery voltage across terminals 85 and 86.

IF OK: GO TO 1 after the system has been repaired.

– – –1/1

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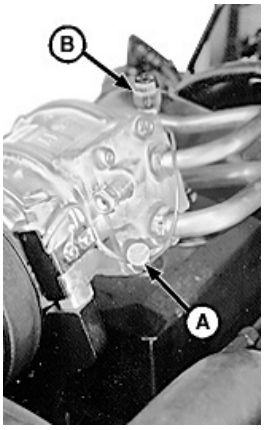
9 System Cooling Check	Set tractor up as follows: • Start engine and run at 2000 rpm. • Temperature control knob must be CCW. • Blower switch must be at PURGE. • A/C compressor switch ON. • Door and windows closed. Sight glass must be clear (no bubbles). Compressor suction line should be cool or cold. Air from air ducts should be cold after about six minutes of operation.	**OK:** GO TO 10. **NOT OK:** GO TO 12. –––1/1

10 Temperature Drop Check	Compare difference of temperature of ambient outside air (in shade), and conditioned air at vent, after 15—20 minutes of continuous operation. Refer to following chart for minimum temperature difference for measured ambient temperature. **Ambient Temperature** / **Minimum Temperature Difference** Below 24°C (75°F) / 12°C (20°F) Between 24—32°C (75—90°F) / 14°C (25°F) Above 32°C (90°F) / 16°C (30°F)	**OK:** GO TO 11. **NOT OK:** GO TO 12. –––1/1

11 Check Heater Valve Operation	Turn heater control CW approximately half way. Air from air ducts should begin to warm up within two minutes. Turn heater control fully CCW. Air from air ducts should become cool within a few minutes.	**OK:** System is normal. Tractor may be released. OPTIONAL: Go to 12 to perform the A/C gas system diagnosis. **NOT OK:** GO TO 12. –––1/1

⓬ Install Test Equipment



LV2439 –UN–15DEC97

A—Compressor Fitting
B—Condenser Fitting

Install JT02051 Manifold Gauge Set.

Connect low pressure hose to suction test coupler on compressor fitting (A).

Remove cap from discharge test coupler at fitting (B) and connect gauge manifold high pressure hose.

NOTE: Purge air from hoses.

Put a thermometer in the shade.

NOTE: Reinstall caps at condenser and compressor after removal of test equipment.

OK: GO TO 13.

–––1/1

⓭ System Static Pressure Check

Engine and compressor OFF.

Plug center hose with fitting or refrigerant container.

Open both high and low valves to stabilize pressure on both sides.

CAUTION: Close both high and low side valves on gauge set after pressures stabilize.

Compare gauge readings to following table.

Temperature		Minimum Pressure		
Degree C	Degree F	kPa	Bar	PSI
15	60	390	3.7	57
18	65	430	4.3	63
21	70	490	4.9	71
24	75	540	5.4	78
27	80	590	5.9	86
29	85	655	6.5	95
32	90	715	7.1	104
35	95	785	7.8	114
38	100	855	8.5	124
41	105	930	9.3	135
43	110	1010	10.1	147
46	115	1095	10.9	159
49	120	1185	11.8	172

NOTE: A static pressure reading 20—30% greater than values listed in the chart is an indication that the system was charged with a mix of nitrogen or another refrigerant. Recover, evacuate, and recharge the system.

OK: Pressure is good. GO TO 16.

NOT OK: Pressure is low. GO TO 15.

NOT OK: No pressure. GO TO 14.

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⓮ No Gauge Pressure	Check test hose coupler for missing or damaged valve depressor. Repair or replace as necessary and reconnect hose. Check depth of valve stem to outer end of test coupler (on tractor) with valve properly positioned in bore. Depth should be 7—8 mm (0.275—0.300 in). Check for restricted gauge orifices. Check gauges for pressure.	**OK:** Pressure restricted on gauges. GO TO 13. **NOT OK:** No pressure. GO TO 15. – – –1/1

⓯ Low Pressure	*NOTE: Make sure the problem is not an improperly connected coupler. See 14.* Engine and compressor must be OFF. Connect refrigerant supply. Purge air from charging hose. Open low and high side gauge set valves. Open refrigerant container valve and add refrigerant until pressure stabilizes. **CAUTION: Close gauge set low and high side valves before operating the compressor.** Use an electronic leak detector, or a 50-50 mix of soap and water, to check all components, fittings, and connections for leaks. *NOTE: Discharging, evacuating, and charging may be required. If necessary, see Section 90.*	**OK:** No leaks. GO TO 16. **NOT OK:** Repair leaks, the GO TO 16. – – –1/1

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⓰ Clutch Cycle Check	Close cab doors and window. A/C temperature control switch at ON position. Operate engine at 2000 rpm. Put blower motor switch at PURGE and temperature control at maximum cooling (CCW). Operate system for 10 minutes. *NOTE: If discharge pressure is 2500—2800 kPa 25—28 bar) (370—415 psi) and the compressor stops operating, go to 21.* Note the length of time the compressor is ON. It should be on a minimum of 25 seconds at 21—27°C (70—80°F). *NOTE: The clutch may stay ON continuously when the temperature is above 27°C (80°F). It also may cycle more frequently at cooler temperatures.*	**OK:** GO TO 18. **NOT OK:** GO TO 17. – – –1/1

17 Causes of Frequent Clutch Cycling	A. Blower motor(s) inoperative. B. Fresh air and recirculating filters dirty. C. Refrigerant charge is low. Do steps 18, 19, and 20 and then repeat step 16. D. Temperature control switch temperature range is set too cold. Temporarily wire compressor clutch coil to starter solenoid. Continue to step 18. *NOTE: See 39 to check switch.* E. Evaporator is dirty.	**NOT OK:** Repair as required and then GO TO 18. – – –1/1

18 Sight Glass Check	*NOTE: Compressor may have to be temporarily wired directly to battery source for this system check. If necessary, disconnect the clutch coil lead at the compressor and connect a jumper wire from the clutch coil to the starter solenoid terminal.* Run engine at 2000 rpm, with compressor operating. **CAUTION: If discharge pressure is high and there are bubbles in sight glass, or there is a vacuum and very slow bubbles, GO TO 21.** Observe gauge pressures. Check sight glass for bubbles.	**OK:** No bubbles. GO TO 21. **NOT OK:** Bubbles in sight glass. GO TO 19. – – –1/1

19 Leak System Check	Use JT02081 Leak Detector to check all components, fittings, and connections for leaks. *NOTE: Use a 50—50 mixture of liquid soap and water if leaks are difficult to find.* Check low and high sides with engine OFF. Repeat check on high side with engine running and compressor operating. *NOTE: Any spot on connections, hoses, or components that is damp with oil and is collecting dust is an indication of refrigerant leakage.* If leakage exceeds 0.5 kg (1 lb) of refrigerant per year and no other leak is found, replace the compressor shaft seal. *NOTE: Discharging, evacuating, and charging may be required. If necessary, see Section 90.*	**OK:** No leaks found. GO TO 20. **NOT OK:** Repair leaks and then GO TO 21. – – –1/1

⑳ **Add Refrigerant**	*NOTE: Bubbles may appear in sight glass, of a fully charged system, when operating below 18°C (65°F) ambient. Bubbles will disappear at higher ambient temperatures.* Close both valves on gauge set and connect refrigerant container to center hose. Open container valve and purge air from center (charging) hose. *NOTE: Container must be upright when adding refrigerant.* With engine at 2000 rpm and compressor operating, open low side valve. Add refrigerant until bubbles disappear from the sight glass, then add 475 ml (1 lb) more. **IMPORTANT: Do not exceed 300 kPa (3 bar) (45 psi) while charging the system.** **Specification** R134a—Refrigerant Charge..... 1.6—1.7 kg (3.5—3.75 lbs.)	**OK:** Repeat Step 18, then GO TO 21. – – –1/1

21 System Pressure Check

Doors and windows must be closed.

With engine at 2000 rpm and compressor operating, put blower motor switch at PURGE position.

NOTE: At cool temperatures, compressor may have to be temporarily wired directly to battery source for this system check. If necessary, disconnect the clutch coil lead at the compressor and connect a jumper wire from the clutch coil to the starter solenoid terminal.

NOTE: Bubbles may appear in sight glass when operating below 18°C (65°F) ambient temperature. Bubbles will disappear with higher ambient temperatures.

Check ambient temperature and gauge pressures. Compare temperature and pressure readings to following specification chart.

NOTE: Lower figures in following table correspond to approximately 10% humidity. Higher figures correspond to approximately 90% humidity.

System Pressure Table

Temperature		Suction Pressure			Discharge Pressure		
°C	°F	kPa	Bar	PSI	kPa	Bar	PSI
11—16	51—60	7—40	0.07—0.4	1—6	760—1100	7.5—11.0	110—160
16—21	61—70	20—70	0.2—0.7	3—10	900—1280	9.0—12.8	130—185
22—27	71—80	40—100	0.4—1.0	6—14	1070—1480	10.7—14.8	155—215
27—32	81—90	60—120	0.6—1.2	9—18	1240—1720	12.4—17.2	180—250
33—38	91—100	80—150	0.8—1.5	12—22	1450—2000	14.5—20.0	210—290
39—43	101—110	100—180	1.0—1.8	15—26	1660—2280	16.6—22.8	240—330
44—49	111—120	120—200	1.2—2.0	18—30	1900—2590	19.0—25.9	275—375

Temperature and Pressure Application Chart

Suction Pressure	Discharge Pressure	GO TO
NORMAL	NORMAL	30
Low, Normal, or High	High w/Bubbles	22
High	Low	23
Normal or High	High w/o Bubbles	24
Low or Vacuum	Normal or Low	28

NOTE: Bubbles may appear in sight glass, of a fully charged system, when operating below 18°C (65°F) ambient. Bubbles will disappear at higher ambient temperatures.

OK: Reconnect the compressor when testing and/or repair is completed.

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22 Possible Causes for Condition of "Suction Pressure Low, Normal, or High and Discharge Pressure High with Bubbles" Are:	Restrictions in the system at or between the following locations: *NOTE: Feeling lines and condenser for temperature changes may or may not locate point of restriction.* **CAUTION: These lines are normally hot.** 1. Refrigerant line between compressor and condenser. 2. Condenser. *NOTE: When feeling tube bends across top of condenser there should be a temperature drop after the fourth bend.* 3. Refrigerant line between condenser and sight glass. 4. Inlet of receiver/dryer. *NOTE: Discharging, flushing, evacuating, and charging may be required. If necessary, see Section 90.*	**NOT OK:** Inspect and repair as necessary. Then GO TO 21. – – –1/1
23 Possible Causes for Conditions of "Suction Pressure High, Discharge Pressure Low" Are:	1. Compressor clutch not engaged. Remove clutch cover to observe clutch operation. 2. Compressor drive belt slipping. Check auto tensioning device for binding. 3. Clutch slipping. Temporarily cover condenser to obtain higher compressor operating pressure to check for slippage. *NOTE: If shaft seal leakage is cause of clutch slippage, discharge, repair, evacuate, and recharge system.* 4. Compressor has an internal failure. *NOTE: Repair requires discharging, replacing receiver-dryer, flushing, purging, and charging system. Perform compressor volumetric efficiency test after removal and before installation. Refer to Section 90.*	**NOT OK:** Repair. Then GO TO 21. – – –1/1

㉔ Possible Causes for Conditions of "Suction Pressure Normal or High and Discharge Pressure High Without Bubbles" Are:	1. Restricted air flow through the condenser, hydraulic oil cooler, or radiator. 2. Leakage through the coolant shutoff valve. If both heater hoses, at right side of engine, are hot, check the shutoff valve at step 31. 3. Restriction at inlet of receiver-dryer. Check for temperature drop from inlet to outlet of receiver-dryer. 4. Expansion valve is stuck open. Check expansion valve operation at step 26. *NOTE: If any of the conditions exist, as specified in steps "1" through "4" above, repair the problem and then GO TO 21. If all components/conditions are normal, continue at step "5" below.* 5. System is charged with a mixture of two refrigerants, or contaminated with nitrogen or air. Checking system static pressure (step 13) can help determine if system is contaminated. However, if system operation was originally normal and nothing has been added to the system, contamination is not the problem. 6. System is overcharged with refrigerant. Remove refrigerant from system until bubbles appear in the sight glass. Check system pressures as recommended in step 21 and compare to the chart.	**OK:** If all components/conditions are normal (1 through 6 above), GO TO step 25. **NOT OK:** If pressures are not OK at 5 or 6 above, GO TO step 13. – – –1/1

㉕ Recharge System	With engine at 2000 rpm and compressor operating, open low side valve but do NOT exceed 400 kPa (4.0 bar) (60 psi). Add refrigerant until bubbles disappear in sight glass and then add 475 ml (16 oz) more. Recheck system pressures and compare readings to chart at step 21.	**OK:** Pressure readings normal. GO TO 30. **NOT OK:** Pressure readings high. GO TO 13. – – –1/1

26 Check Expansion Valve Operation	Put gauge set close to cab for easy viewing from inside the cab. *NOTE: Two people are required for this test if the gauge set cannot be placed close to the cab for clear viewing.* With engine at 2000 rpm and compressor operating, put temperature control at the fully CW (heat) position to heat up the evaporator. Remove plug (above expansion valve) from top of evaporator/heater core housing cover, at right side of housing. *NOTE: Cab roof must be removed to access top of evaporator/heater core housing.* *Reinstall plug after test or repair.* Spray head of expansion valve with refrigerant R134a, using DFRW83 Nozzle Assembly, to close expansion valve. See Section 299 for fabrication of nozzle assembly. The recovery, recycle, and charging stations for refrigerants R12 and R134a must NOT be interchanged. Refrigerant R134a is corrosive to copper as well as components used in R12 systems. Certain seals also are not compatible with refrigerant oil used in R134a systems. Therefore, NEVER use R134a in a system which previously contained R12. *NOTE: Any solution that does not contribute to deterioration of the ozone layer and can produce sub-zero cooling is acceptable for this test.* Quickly check the suction pressure gauge for a decrease in pressure. Pressure should decrease when expansion valve head is cold and increase when the head warms up. *NOTE: At 24°C (75°F), the suction side normally goes to 10—15 in Hg vacuum.* Repeat check two or three times to determine pattern of expansion valve operation. IF the valve changes pressure very slowly, replace the valve. *NOTE: To limit the amount of antifreeze entering the evaporator housing, see Section 90 for removal of the heater valve, expansion valve, and evaporator/heater core.* Install T66355 plastic plug in hole after testing or repair.	**OK:** GO TO previous step (26 or 28). **NOT OK:** GO TO 27. – – –1/1

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27 Pressure Does Not Change	Causes are: • Restriction in receiver-dryer-to-expansion valve line. • Restriction at inlet of expansion valve. • If suction pressure is low, expansion valve is stuck closed or has lost its gas charge. • If suction pressure is high, expansion valve is stuck open. Inspect system for restriction and bench test expansion valve using JT02098 fitting kit. *NOTE: Discharging, flushing, purging, evacuating, and charging may be required. If necessary, see Section 90.*	**NOT OK:** Repair as necessary and then GO TO 21. – – –1/1

28 Possible Causes for Conditions OF "Suction Low or Vacuum and Discharge Normal or Low" Are:	1. Blower motor inoperative. Check electrical circuits. 2. Dirty recirculating or fresh air filters. Clear filter. 3. Expansion valve stuck closed or gas in thermal head. See step 26 to check expansion valve. 4. Restriction in system. Check along refrigerant lines for point where frost accumulates or feel for a temperature change to locate a restriction. • Between condenser and receiver-dryer • At receiver-dryer • Between receiver-dryer and expansion valve • At inlet of expansion valve • Between evaporator and suction side of compressor *NOTE: A very slight temperature change usually indicates a restriction.*	**OK:** Conditions/components are OK. GO TO 29. **NOT OK:** Conditions/components NOT OK. Repair and then GO TO 21. – – –1/1
29 Defrost Evaporator	Turn A/C temperature control switch to OFF to stop the compressor. With engine running and the cab doors open, turn temperature control to maximum HEAT (CCW), for three minutes, to defrost the evaporator. With the engine at 2000 rpm, cab doors closed, and compressor operating, turn temperature control to maximum COOLING (CW). Read high and low pressure gauges after six minutes of operation and compare to chart in step 21.	**OK:** Pressure readings normal. GO TO 30. **NOT OK:** Pressure readings low. GO TO 35. – – –1/1
30 Temperature Drop Check	Record ambient outside temperature in the shade. Cab doors and windows must be closed. With engine at 2000 rpm and compressor operating, put blower motor switch at PURGE position. Put thermometer in left air duct and operate system continuously for 20 minutes. Record air duct temperature and compare it to the following table. **Ambient Temperature** / **Temperature Difference (Minimum)** Below 24°C (75°F) / 12°C (20°F) 24—32°C (75—90°F) / 14°C (25°F) Above 32°C (90°F) / 16°C (30°F)	**OK:** Temperature difference within specification. GO TO 40. **NOT OK:** Temperature difference not within specification. GO TO 31. – – –1/1

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31 Engine Coolant Leak Check	With the engine at 2000 rpm and the compressor operating: Crimp heater hose (at right side of engine) using two flat washers and locking pliers. *NOTE: Hose at rear of block is heater core inlet and hose at top front of engine to water pump is heater core outlet.* Repeat Temperature Drop Check at 30.	**OK:** Temperature difference within specification. GO TO 32. **NOT OK:** Temperature difference not within specification. GO TO 33. – – –1/1
32 Engine Coolant Not Shut Off	Engine coolant is circulating for the following reason(s): • Heater valve control cable is out of adjustment and does not shut off valve. • Heater valve is leaking internally in the OFF position. *NOTE: To avoid spilling antifreeze into the evaporator housing, see Section 90 for removal of heater valve, expansion valve and heater/evaporator core.*	**NOT OK:** Repair and then GO TO 30. – – –1/1
33 Excessive Air Leakage From the Cab	Check for excessive air leakage inside the cab at the following locations: • Cab door and window seals • Possible missing screws at blower motor flange inside evaporator housing • Possible missing grommets around hoses to and from expansion valve at right front of evaporator/heater core housing.	**OK:** No leaks. GO TO 34. **NOT OK:** Repair leaks and then GO TO 30. – – –1/1
34 Possible Causes for Lack of Cooling Are:	Lack of cooling can be caused by the following components if they are dirty or damaged. • Condenser, oil cooler, and radiator • Recirculating filter • Blower air duct and fan cages • Evaporator/heater core *NOTE: Check condenser, radiator, and evaporator for damaged cooling fins.*	**OK:** Components not dirty. GO TO 35. **NOT OK:** Clean appropriate components and then GO TO 30. – – –1/1

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35 Internal Line Restriction Check	**CAUTION: High pressure side lines are normally HOT.** With engine at 2000 rpm and the compressor operating, feel along the entire length of the high pressure side hose, from the compressor to the condensor and the expansion valve for a temperature change (point of restriction). *NOTE: Dented or kinked tubing/hose may restrict flow of refrigerant.*	**OK:** No temperature change, no restriction. GO TO 36. **NOT OK:** Temperature change. Repair restriction and then GO TO 21. –––1/1

36 Possible Causes for Poor Cooling Are:	1. Evaporator freeze up. • Temperature control does not blend heat. Check temperature control cable and coolant shut-off valve for operation and proper adjustment. • Temperature control switch stuck closed. Check switch opening limits as described in step 39. 2. System is contaminated with a mixture of nitrogen, air, two different refrigerants, or moisture in the system. Do number “3” of this step. Recover refrigerant, flush system, replace receiver-dryer, purge system with dry nitrogen, evacuate, and recharge the system. 3. Compressor efficiency is low. Perform volumetric efficiency test as described in Section 90. • If compressor efficiency is normal, poor cooling is a result of conditions in number 2 above. • If compressor efficiency is not normal, replace the compressor.	**OK:** After system/component is repaired, GO TO 21. –––1/1

37 Refrigerant Loss Switch (Low Pressure) Check	*NOTE: System pressure must be at least 300—400 kPa (3—4 bar) (45—60 psi) to keep switch contacts closed for normal operation.* Remove refrigerant loss switch from tube at inlet to receiver-dryer. Install a jumper wire across connector to keep compressor clutch engaged. Connect the refrigerant loss switch to the union connector JT02113 fitting. Connect low side gauge hose to compressor suction quick coupler. Remove hose from high side and close both valves of gauge set. Install WEATHER PACK™ test leads on switch terminals and use an ohmmeter to check (at switch connector) the switch opening and closing action. With engine OFF, slowly open low side valve and observe meter to note when switch contacts close. *NOTE: If higher pressure is required to close the switch, connect to the compressor high side and start the engine.* Disconnect quick coupler from pressure source and slowly open high side valve of gauge set to bleed pressure from switch.	**OK:** Switch operates within specification. Check connections, reinstall switch and then GO TO 1. **NOT OK:** Switch does not operate within specification. Replace switch and then GO TO 1.

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38 High Pressure Switch Check	*NOTE: When system pressure is above 2480—2760 kPa (24.8—27.6 bar) (370—415 psi) the high pressure switch opens to stop compressor operation.* Remove high pressure switch from port at inlet of receiver-dryer and install a jumper wire in its place. Connect the high pressure switch to the center connector of gauge set hose using JT02113 fitting. Install WEATHER PACK™ test leads on switch terminals and use an ohmmeter to check (at switch connector) the switch opening and closing action. Connect high side hose of gauge set to condensor inlet quick coupler. Open high side valve and close low side valve. Completely cover front of condenser with cardboard. **IMPORTANT: Do not let pressure exceed 2900 kPa (29 bar) (435 psi).** With engine at 2000 rpm and compressor operating, turn heater control CW to maximum heat to decrease running time. Observe high pressure gauge for point at which switch contacts open. After switch opens, stop engine and note pressure at which switch contacts close. Remove cardboard from condenser.	**OK:** Switch operates within specification. Check connections and reinstall switch and then GO TO 1. **NOT OK:** Switch does not operate within specification. Replace switch and then GO TO 1.

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39 Temperature Control Switch Check	Start engine and run at 2000 rpm. Doors and window closed. 1. Turn blower motor switch to PURGE (fully clockwise) and set temperature control switch for maximum cooling (fully clockwise). 2. Operate system for 10 minutes. Observe time compressor clutch is ON. When ambient outside air temperature (in shade) is below 29°C (85°F), minimum compressor clutch cycle time should be 30 seconds. *NOTE: The clutch may stay ON when ambient air outside temperature (in shade) is above 29°C (85°F).*	**NOT OK:** Clutch ON more than 30 seconds, GO TO 18. **NOT OK:** Clutch ON less than 30 seconds, GO TO 17. **NOT OK:** Discharge pressure 2500—2800 kPa (25—28 bar) (370—415 psi) and stops operating, GO TO 21. – – –1/1
40 System Testing Summary	1. If compressor clutch was hot wired earlier (to battery voltage source to keep compressor operating), check necessary switches at steps 37, 38, and 39. 2. If the system checks out as NORMAL at this step and any problem (including cleaning filters) has been corrected, the system is NORMAL. 3. If the system checks out to be NORMAL at this step and no problem has been corrected, there is the possibility of moisture in the system. *NOTE: If the temperature control and low pressure switched are not functioning within their specified ranges, the conclusion of moisture in the system would be incorrect.*	**NOT OK:** If customer complaint is "System does not cool properly above approximately 27°C (80°F) ambient temperature," the problem is NOT moisture in the system. GO TO 9 to repeat diagnosis. **NOT OK:** If the customer complaint is "System cools satisfactorily above approximately 27°C (80°F)," there IS moisture in the system. GO TO 41. – – –1/1
41 Remove Moisture from System	• Recover refrigerant from system. • Purge system with dry nitrogen while changing receiver-dryer. • Evacuate system. • Charge system with fresh refrigerant. • Repeat test sequence. *NOTE: Refer to Section 90 for above procedures.*	**OK:** After charging GO TO 9. – – –1/1

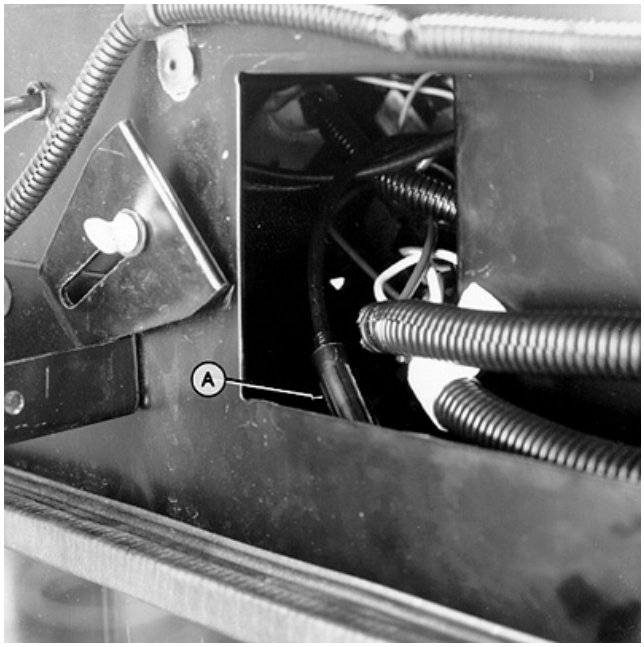
Adjust Heater Temperature Control Cable

NOTE: Heater cable adjustment (A) is located behind right side cab intake filter.

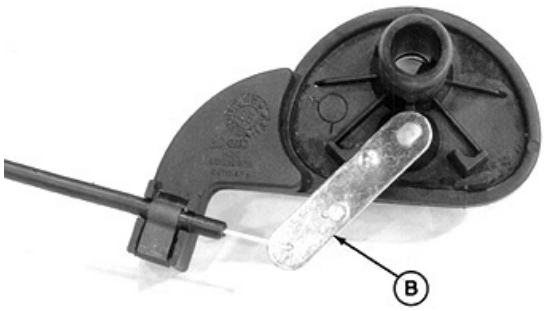
1. Turn the heater temperature control knob (clockwise) to full heat and adjust cable (A) until the heater valve arm (B) is in the full open position.

2. Turn the heater temperature control knob (counterclockwise) until closed. Heater valve arm (C) should be in the full closed position. Adjust cable (A) as required.

A—Heater Cable
B—Heater Valve Arm—Full Open Position
C—Heater Valve Arm—Full Closed Position

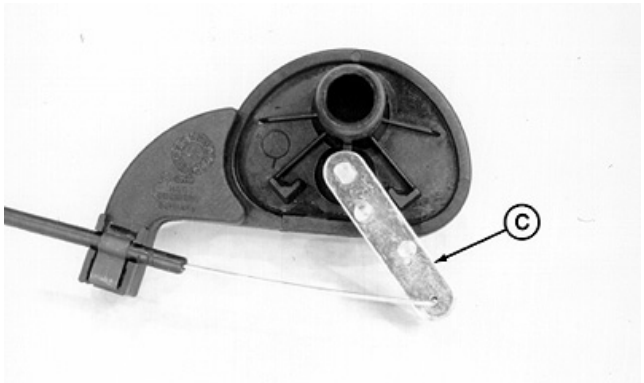


LV1409 –UN–10NOV95



LV1408 –UN–10NOV95

Full Open Position



LV1410 –UN–10NOV95

Full Closed Position

OUO1085,0000284 –19–17JUL02–1/1

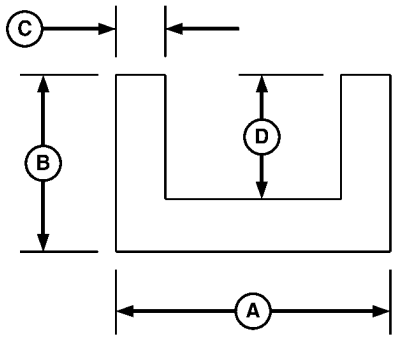
Section 299
Dealer Fabricated Tools

Contents

JDG826—PTO Clutch Finger Height Gauge

PTO Clutch Finger Height Gauge JDG826

Measures PTO clutch finger height.



JDG826 –UN–01JUL97

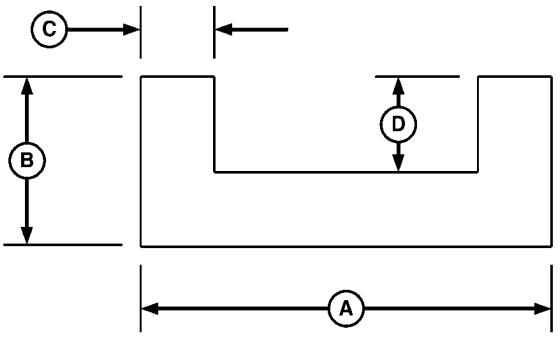
Item	Measurement	Specification
Plate Minimum	Thickness	1.587 mm (0.0625 in.)
Dimension (A)	Thickness	124.617 mm (4.906 in.)
Dimension (B)	Thickness	65.087 mm (2.562 in.)
Dimension (C)	Thickness	19.842 mm (0.781 in.)
Dimension (D)	Thickness	41.275 mm (1.625 in.)

OUO1040,0000B04 –19–02MAY01–1/1

JDG827—Traction Clutch Finger Height Gauge

JDG827—Traction Clutch Finger Height Gauge

Measures traction clutch finger height.



JDG827 –UN–01JUL97

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Item	Measurement	Specification
Plate Minimum	Thickness	1.587 mm (0.0625 in.)
Dimension (A)	Thickness	157.162 mm (6.187 in.)
Dimension (B)	Thickness	34.925 mm (1.375 in.)
Dimension (C)	Thickness	19.842 mm (0.781 in.)
Dimension (D)	Thickness	15.875 mm (0.625 in.)

OUO1040,0000B05 –19–02MAY01–1/1

JDG828 –UN–24FEB98

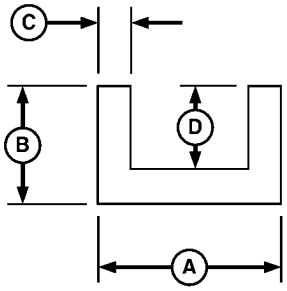
JDG828—Traction Clutch Finger Height Adjustment Tool

JDG828 Traction Clutch Finger Height Adjustment Tool

Item	Measurement	Specification
Long Arm Metric Hex Key	Size	5 mm
Dimension (A)	Height	10 mm (0.393 in.)

OUO1040,0000B06 –19–02MAY01–1/1

JDG919—Clutch Finger Height Gauge



LV2127 –UN–01JUL97

Item	Measurement	Specification
Dimension (A)	Length	149.047 mm (5.858 in.)
Dimension (B)	Length	33.909 mm (1.335 in.)
Dimension (C)	Length	19.431 mm (0.765 in.)
Dimension (D)	Length	32.689 mm (1.27 in.)

OUO1040,0000B02 –19–22JUL02–1/1

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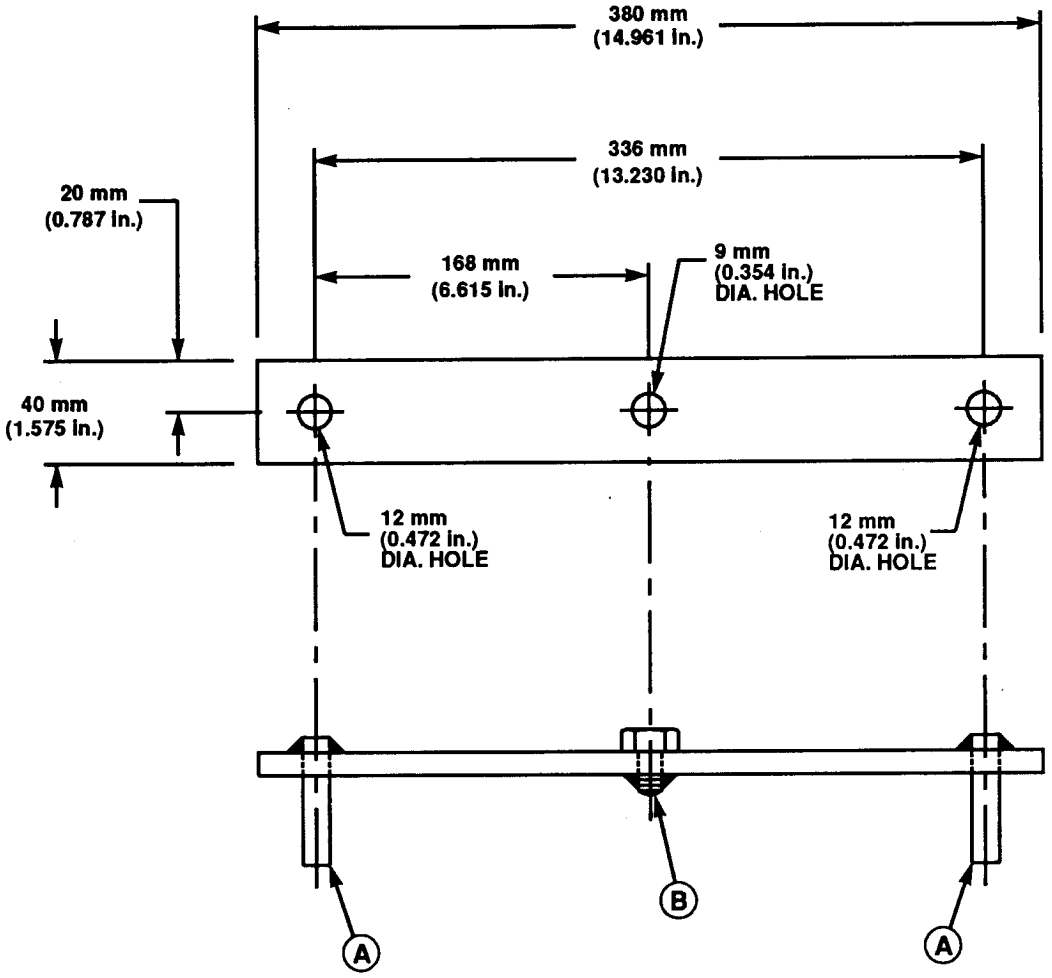
DFLV1A—Final Drive Turning Tool



LV490AE –19–27FEB92

Final Drive Turning Tool is used to rotate final drive housing to determine rolling drag torque.

Material required:

40 x 10 x 380 mm (1.575 x 0.394 x 14.961 in.) Flat Steel Stock.

12 x 50 mm long (0.472 x 1.969 in. long) Round Steel Stock (2 used).

M8 x 15 mm Cap Screw.

Weld rods (A) and cap screw (B) to flat steel stock as shown.

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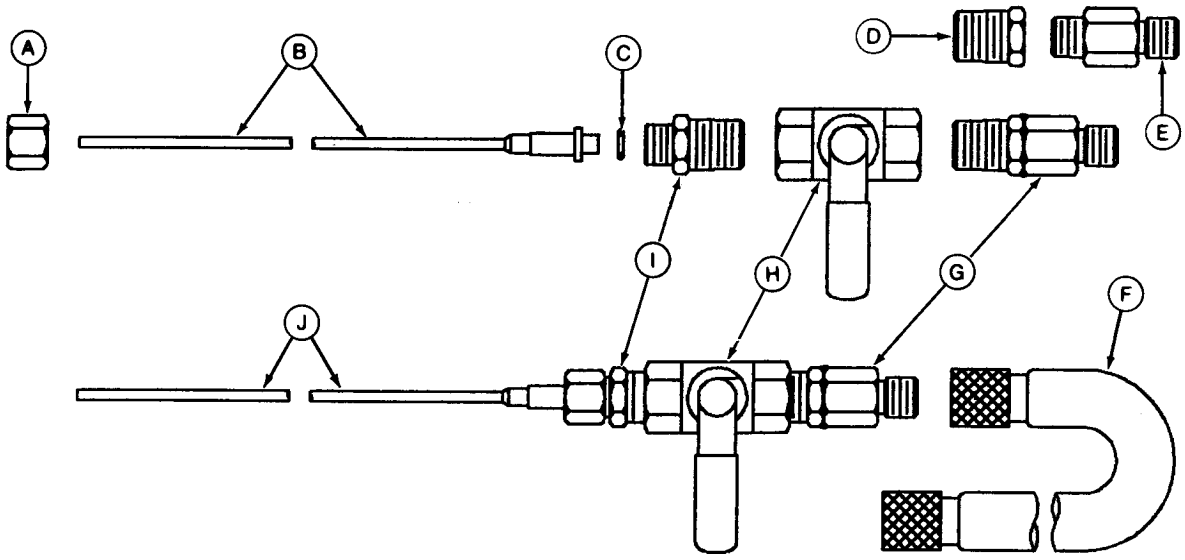
LV,29900HA,A4 –19–03AUG94–1/1

DFRW83—Nozzle Assembly



RW22576 –UN–24SEP93

A—Fitting
B—Pressure Sensing Tube
C—O-Ring
D—JT03232 Adapter
E—JT02219 Fitting
F—R134a Refrigerant Hose
G—R134a Refrigerant Hose Adapter
H—Gas Shut-Off Valve
I—Compression Adapter (W/O Sleeve)
J—Nozzle

Use: To apply refrigerant 134a while testing expansion valve operation on tractors with refrigerant 134a.

NOTE: Do NOT use a shop air blow gun because the stem is not sealed. Refrigerant will leak out around the stem when the valve is opened.

Refer to the following for materials required to fabricate the nozzle assembly.

Use a pressure sensing tube (B) with an O-ring (C) and fitting (A) from a non-functional R12 thermal expansion valve to make nozzle (J).

299 00 4

Brass compression adapter (I) is a 1/4 (male) NPT by 1/4 tube adapter available a local hardware stores. The sleeve from the adapter is not required.

Gas shut-off valve (H) is 1/4 (female) NPT at both ends, available at local hardware stores.

R134a refrigerant hose adapter (G) is cut off from an empty R134a tank and is brazed to a 1/8 in. (female) NPT by 1/4 in. (male) NPT adapter (D).

NOTE: JT03232 1/8 in. (female) NPT by 1/4 in. (male) NPT Adapter (D) and JT02219 1/8 in. (male) NPT by 1/2-16 Acme fitting (E) may be used to make hose adapter (G).

R134a refrigerant hose (F) can be purchased from SERVICEGARD™ or local supplier and should be 61—91 cm (24—36 in.) long.

Use by connecting the DFRW83 Nozzle Assembly to a refrigerant R134a source using hose (F), to apply refrigerant to expansion valve. Control flow of refrigerant using both valve on refrigerant source and shutoff valve (H).

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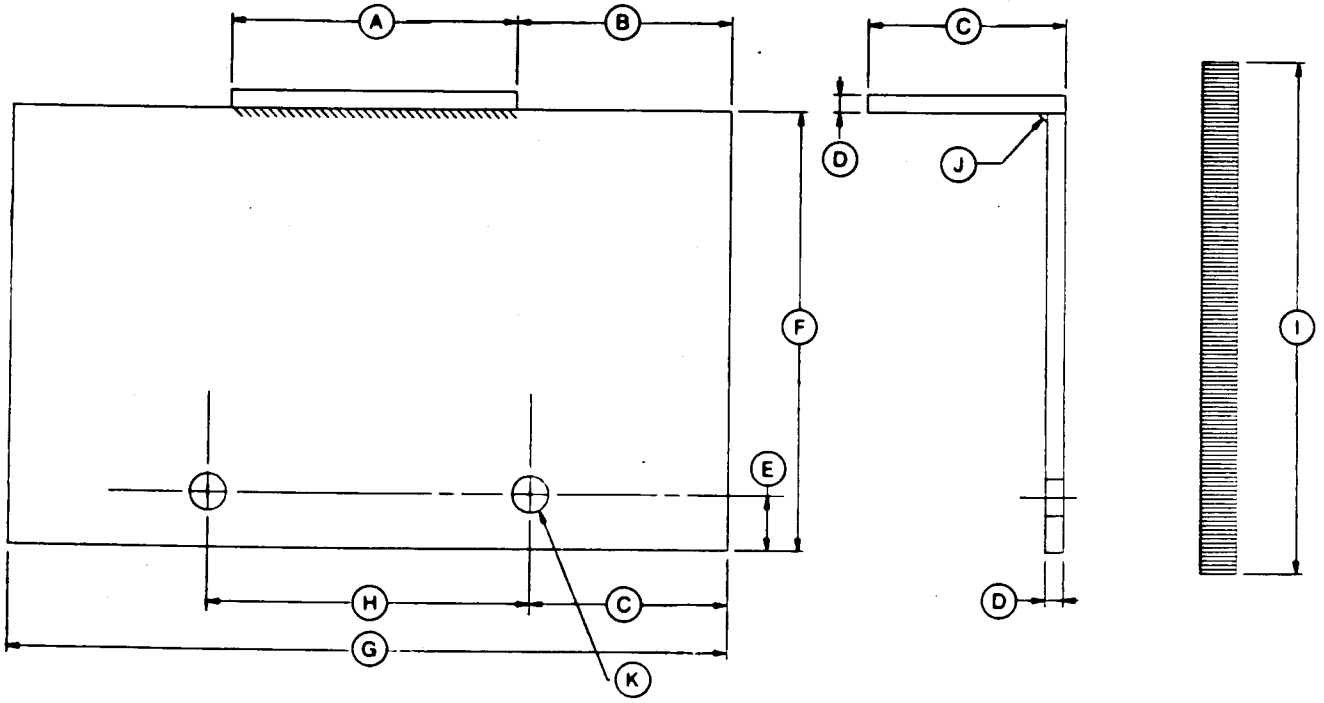
RX,DFRW83 –19–17JAN95–1/1

DFRW20—Compressor Holding Fixture



RW13619 –UN–20SEP89

A—102 mm (4 in.)
B—76 mm (3 in.)
C—70 mm (2.75 in.)
D—6.4 mm (0.25 in.)
E—19 mm (0.75 in.)
F—152 mm (6 in.)
G—254 mm (10 in.)
H—114 mm (4.5 in.)
I—178 mm (7 in.)
J—Weld
K—Two Holes

Meterial Required: tool is used to hold air conditioner compressor during disassembly and assembly.

- 2—Steel Plates (4 x 2.27 in.) and (10 x 6 in.)
- 2—Threaded Steel Rods (0.5 x 7 in.)
- 4—Matching Lock Washers and Nuts
- 2—Eye Bolts (6 x 1/4 in.)
- 2—Matching Washers and Nuts

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