1200 Bunker and Field Rake

For complete service information also see:

John Deere K Series Air Cooled Engines CTM5

John Deere Horicon Works
TM1525 (27SEP91)

LITHO IN U.S.A.
ENGLISH

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.

N 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 diagnostics. Repair sections tell how to repair the components. Diagnostic 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, other materials needed to do the job and service parts kits.

Section 10, Group 15—Repair Specifications, consist of all applicable specifications, near tolerances and specific torque values for various components on each individual machine.

Binders, binder labels, and tab sets can be ordered by John Deere dealers direct from the John Deere Distribution Service Center.

This manual is part of a total product support program.

FOS MANUALS—REFERENCE

TECHNICAL MANUALS—MACHINE SERVICE

COMPONENT MANUALS—COMPONENT SERVICE

Fundamentals of Service (FOS) Manuals cover basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes. FOS Manuals are for training new personnel and for reference by experienced technicians.

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

Component Technical Manuals are concise service guides for specific components. Component technical manuals are written as stand-alone manuals covering multiple machine applications.

MX,TMIFC,A -19-25MAR91

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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.

TM1525-19-27SEP91

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Moline, Illinois
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A John Deere ILLUSTRUCTION® Manual

Section 10
GENERAL INFORMATION

Contents

RECOGNIZE SAFETY INFORMATION

This is the 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 -19-04JUN90

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 -19-04JUN90

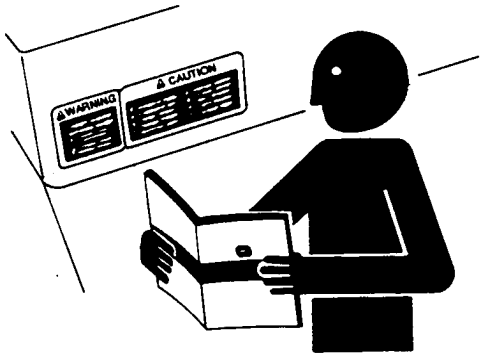
FOLLOW SAFETY INSTRUCTIONS

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 -19-04JUN90

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 -19-04JUN90

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

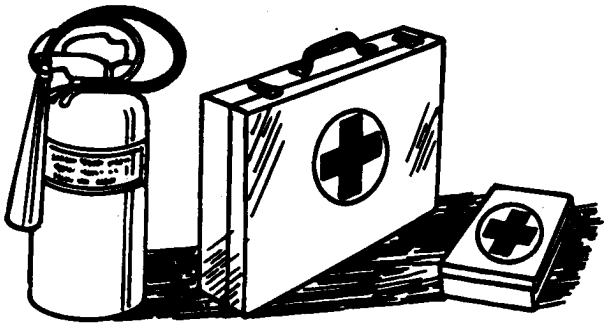
DX,SPARKS -19-04JUN90

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 -19-04JUN90

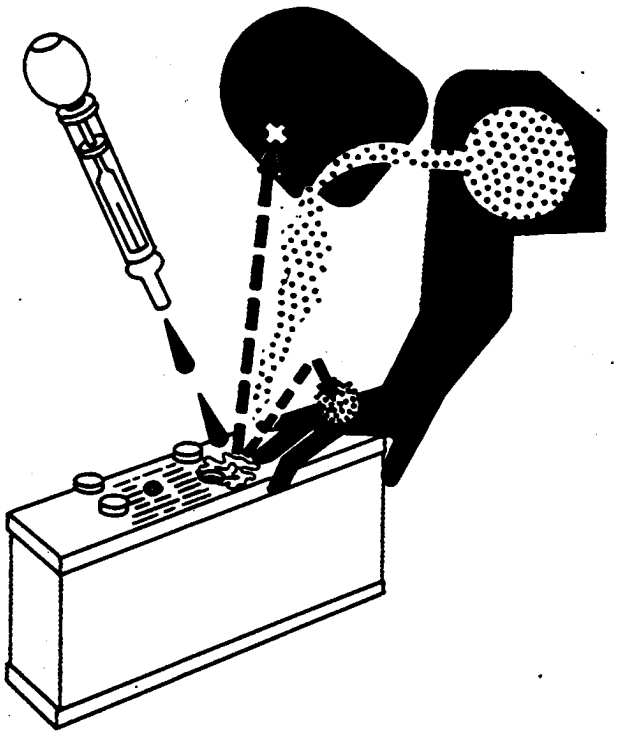
PREVENT ACID BURNS

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 10—15 minutes. Get medical attention immediately.

If acid is swallowed:
1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.



TS203 -UN-23AUG88

DX,POISON -19-04JUN90

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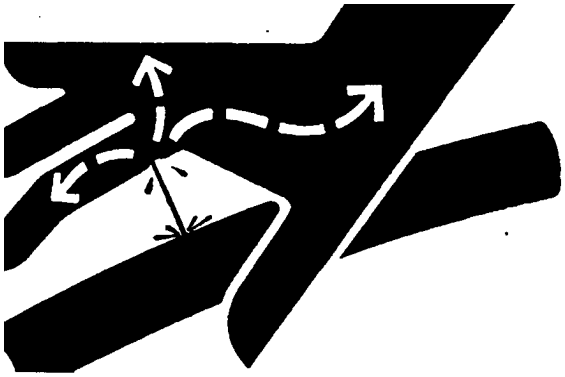
AVOID HIGH-PRESSURE FLUIDS

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.

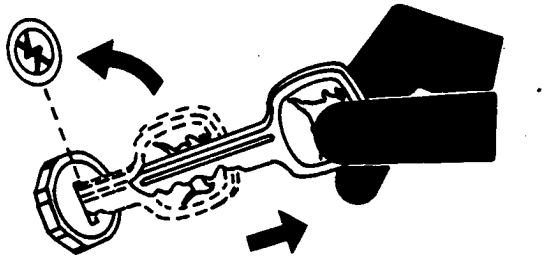


X9811 -UN-23AUG88

DX,FLUID -19-09AUG91

PARK MACHINE SAFELY

Before working on the machine:
- Lower all equipment to the ground.
- Stop the engine and remove the key.
- Disconnect the battery ground strap.
- Hang a “DO NOT OPERATE” tag in operator station.



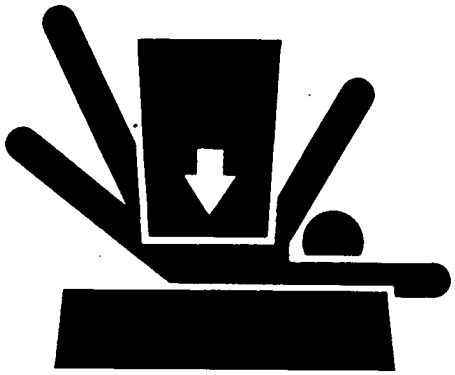
TS230 -UN-24MAY89

DX,PARK -19-04JUN90

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

DX,LOWER -19-04JUN90

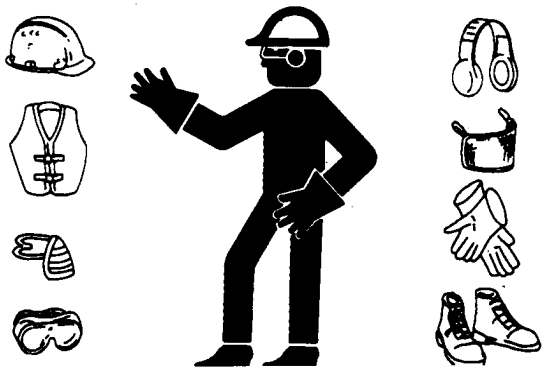
WEAR PROTECTIVE CLOTHING

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.



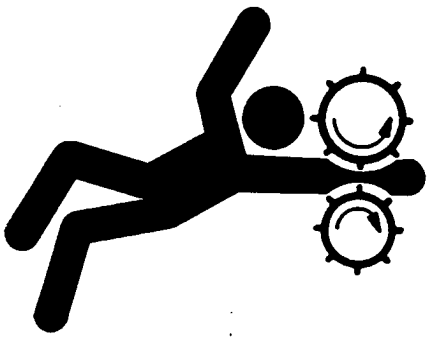
TS206 -UN-23AUG88

DX,WEAR -19-10SEP90

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

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.

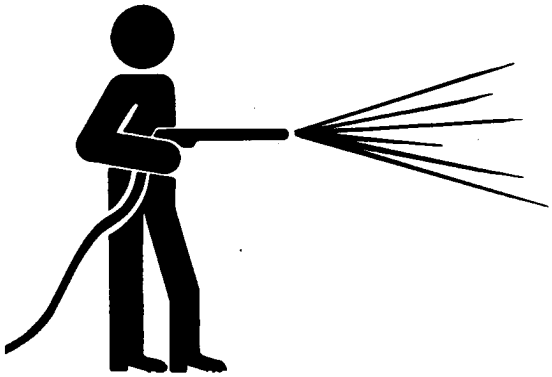
If you do not have an exhaust pipe extension, open the doors and get outside air into the area.

TS220 -UN-23AUG88

DX,AIR -19-04JUN90

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.

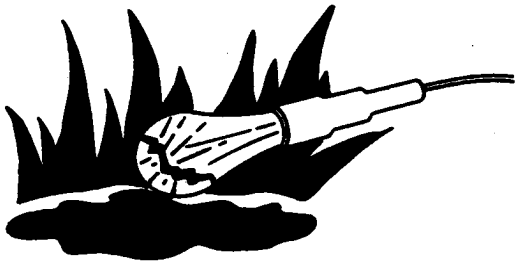


T6642EJ -UN-18OCT88

DX,CLEAN -19-04JUN90

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

REMOVE PAINT BEFORE WELDING OR HEATING

TS220 -UN-23AUG88

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.

DX,PAINT -19-04JUN90

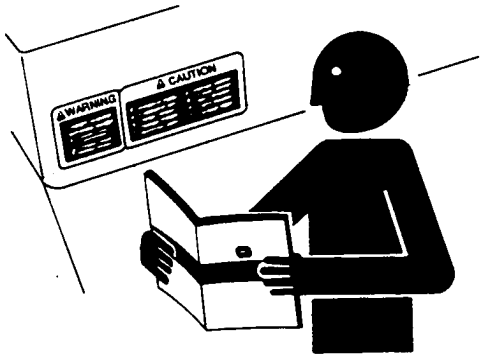
AVOID HEATING NEAR PRESSURIZED FLUID LINES

TS953 -UN-15MAY90

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.

DX,TORCH -19-05OCT90

REPLACE SAFETY SIGNS



TS201 -UN-23AUG88

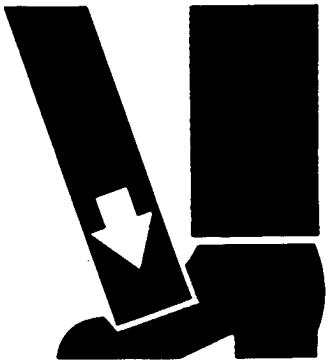
Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

DX,SIGNS1 -19-04JUN90

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

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.

TS952 -UN-12APR90

DX,TIRECP -19-24AUG90

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

PRACTICE SAFE MAINTENANCE

Understand service procedure before doing work. Keep area clean and dry.

Never lubricate or service machine while it is moving. Keep hands, feet, and clothing from power-driven parts. Disengage all power and operate controls to relieve pressure. Lower equipment to the ground. Stop the engine. Remove the key. Allow machine to cool.

Securely support any machine elements that must be raised for service work.

Keep all parts in good condition and properly installed. Fix damage immediately. Replace worn or broken parts. Remove any buildup of grease, oil, or debris.

Disconnect battery ground cable (-) before making adjustments on electrical systems or welding on machine.

TS218 -UN-23AUG88

DX,SERV -19-04JUN90

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.

TS779 -UN-08NOV89

DX,REPAIR -19-04JUN90

DISPOSE OF WASTE PROPERLY

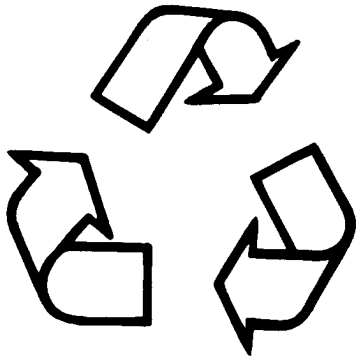
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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.



TS1133 -UN-26NOV90

DX,DRAIN -19-09AUG91

LIVE WITH SAFETY

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

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TS231 -19-07OCT88

DX,LIVE -19-04JUN90

MACHINE SPECIFICATIONS

ENGINE	
Make	John Deere “K” Series
Type	OHV
Model	FE290R
Horsepower	7.5 kW (10 hp)
Number of Cylinders	1
Displacement	286 cm^3 (17.5 cu. in.)
Bore and Stroke	78 x 60 mm (3.07 x 2.36 in.)
Fast Idle	3800 rpm
Slow Idle	1300—1550 rpm
Starting System	Electric
Lubrication	Pressurized
Cooling System	Forced Air
Air Cleaner	Dry Replaceable
Engine Shutoff	Key Switch
FUEL SYSTEM	
Type	Carburetor
Fuel Delivery	Fuel Pump
ELECTRICAL SYSTEM	
Type	12 Volt
Battery Size	255 Cold Cranking Amps at -18˚C (0˚F)
Alternator	13 Amp
POWER TRAIN	
Type	Belt-Driven Torque Converter with Gear-Driven Transaxle
Number of Speeds	Forward-Neutral-Reverse
Clutch	
Type	Kawasaki, Wet 2.1 Reduction (Variable)
Engagement Speed	1600—1800 rpm
Travel Speeds	
Forward/Reverse	Variable, 0—18 km/h (0—11 mph)
STEERING/BRAKES	
Steering	Mechanical, Roller-Chain and Sprocket 6:1 Reduction Ratio
Brakes	Mechanically Operated Disc with Park Brake

MX,1010HE,A1 -19-27SEP91

HYDRAULIC SYSTEM
Lift Pump (optional) . . . . . Oildyne Electro-Hydraulic Lift

CAPACITIES
Fuel Tank . . . . . 9.5 L (2.5 U.S. gal)
Engine Crankcase . . . . . 1.4 L (3.0 U.S. pt)
Wet Reduction Clutch Gearbox . . . . . 0.6 L (1.3 U.S. pt)
Transaxle . . . . . 2.3 L (2.5 qt)

TIRES
Standard Equipment
Front . . . . . One 22.5 x 10.00—8 2 PR High Floatation
Rear . . . . . Two 25 x 12.00—9 2 PR High Floatation

OVERALL DIMENSIONS:
Wheelbase . . . . . 1054 mm (41.5 in.)
Length . . . . . 1676 mm (66 in.)
Width . . . . . 1473 mm (58 in.)
Height . . . . . 1041 mm (41 in.)
Ground Clearance at
Rake Attachment . . . . . 241 mm (9.5 in.)
Turning Radius . . . . . 305 mm (12 in.)
Approximate Shipping
Weight . . . . . 238 kg (525 lb)

(Specifications and design subject to change without notice.)

MX,1010HE,A2 -19-27SEP91

ATTACHMENT SPECIFICATIONS

RAKE (Standard)
Type . . . . . Rear Mount, Hand Lift Control (Hydraulic Lift—Optional)
Width . . . . . 1981 mm (78 in.)
Weight . . . . . 20 kg (44 lb)
Blades . . . . . Five Section, Bunker or Field
Prong Rake . . . . . Three Section, 24 Prongs 25—76 mm (1—3 in.) Adjustment

CULTIVATOR (Optional)
Type . . . . . Mid-Mount, 10 Blades, Hand Control with 5-Position Depth Adjustment
Width . . . . . 1626 mm (64 in.)
Weight . . . . . 20 kg (44 lb)

FRONT BLADE (Optional)
Type . . . . . Front-Mount, Hand Control with Up-Lock Position
Width . . . . . 1016 mm (40 in.)
Height . . . . . 152 mm (6 in.)
Weight . . . . . 25 kg (56 lb)

(Specifications and design subject to change without notice.)

MX,1010HE,A3 -19-27SEP91

REPAIR SPECIFICATIONS

Item	Measurement	Specification
SECTION 20—ENGINE REPAIR		
For all repair specifications—Use CTM5		
Engine-to-Frame Cap Screw	Torque	23 N·m (204 lb-in.)
Muffler-to-Engine Nut	Torque	14 N·m (124 lb-in.)
SECTION 30—FUEL AND AIR REPAIR		
For all carburetor repair specifications—Use CTM5		
SECTION 40—ELECTRICAL SYSTEM		
For all starter and engine ignition and charging system repair—Use CTM5		
Steering Wheel Nut-to-Shaft	Torque	197 N·m (145 lb-ft)
Neutral Start Switch-to-Transaxle	Torque	39 N·m (28 lb-ft)
SECTION 50—POWER TRAIN REPAIR		
Wet Reduction Clutch		
Output Shaft/Gear Gear Side Journal	OD (MIN)	0.25 mm (0.982 in.)
Output Shaft/Gear Shaft Side Journal	OD (MIN)	31.94 mm (1.257 in.)
Drive Hub Journal	OD (MIN)	36.92 mm (1.453 in.)
Clutch Drum Bushing	ID (MAX)	37.08 mm (1.460 in.)
	Installation Depth	1.50 mm (0.060 in.)
	Finished ID	37.00—37.03 mm (1.457—1.458 in.)
Clutch Springs	Free Length (MIN)	22.70 mm (0.890 in.)
Case Half-to-Engine Cap Screw	Torque	28 N·m (20 lb-ft)
Clutch Drum Assembly-to-Engine Crankshaft Cap Screw	Torque	55 N·m (40 lb-ft)
Case Cover-to-Case Half Cap Screw	Torque	28 N·m (20 lb-ft)

MX,1015HE,A1 -19-27SEP91

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Item	Measurement	Specification
SECTION 50—POWER TRAIN REPAIR—CONTINUED		
Drive Clutch		
Drive Clutch-to-Output Shaft Cap Screw	Torque	50 N·m (37 lb-ft)
Roller Arm-to-Moveable Sheave Half Cap Screw	Torque	8 N·m (71 lb-in.)
Ramp Plate-to-Spider Cap Screw	Torque	12 N·m (107 lb-in.)
Driven Clutch Collar-to-Transaxle Input Shaft Set Screw	Torque	8 N·m (71 lb-in.)
Transaxle		
Input Shaft		
Washer	Thickness	1.55—1.65 mm (0.061—0.064 in.)
Washer	Thickness	1.45—1.55 mm (0.057—0.061 in.)
Reverse Drive Sprocket	ID	24.01—24.03 mm (0.945—0.946 in.)
Forward Drive Gear	ID	24.01—24.03 mm (0.945—0.946 in.)
Input Shaft	OD	19.99—20.01 mm (0.787—0.788 in.)
Shift Collar	Groove Width	14.10—14.30 mm (0.550—0.560 in.)
Shift Collar-to-Lock Fork Finger	Clearance (MAX)	2 mm (0.080 in.)
Shift Collar Spring	Free Length	24.20 mm (0.950 in.)
	Free Length (MIN)	20 mm (0.790 in.)
	Working Load	15.80 mm at 53N (0.620 in. at 12 lbs)

MX,1015HE,A2 -19-27SEP91

Item	Measurement	Specification
SECTION 50—POWER TRAIN REPAIR—CONTINUED		
Transaxle—continued		
Differential		
Differential Lock Collar	Groove Width	7.10—7.30 mm (0.280—0.290 in.)
Bevel Gear Washer	Thickness	0.74—0.86 mm (0.029—0.033 in.)
Pinion Gear Washer	Thickness	0.96—1.04 mm (0.038—0.041 in.)
Pinion Gear	ID	16.03—16.05 mm (0.631—0.632 in.)
Bevel Pinion Shaft	OD	15.95—15.97 mm (0.628—0.629 in.)
Shift-to-Pinion Gar	Clearance (MAX)	0.20 mm (0.010 in.)
Differential Half Nut	Torque	25 N·m (221 lb-in.)
Differential Lock Shaft		
Differential Lock Fork Finger	Thickness	6.70—6.90 mm (0.260—0.270 in.)
Differential Lock Fork	ID	20.05—20.10 mm (0.789—0.791 in.)
Finger-to-Collar Groove	Clearance (MAX)	2 mm (0.080 in.)
Differential Lock Shaft	OD	19.95—20.00 mm (0.785—0.787 in.)
Differential Lock Shaft-to-Fork	Clearance (MAX)	0.50 mm (0.020 in.)
Spring	Free Length	77.60 mm (3.060 in.)
	Working Load	52 mm at 511N (2.070 in. at 115 lbs)

MX,1015HE,A2A -19-27SEP91

Item	Measurement	Specification
SECTION 50—POWER TRAIN REPAIR—CONTINUED		
Transaxle—continued		
Shifter Arm		
Shifter Block	Width	13.70—13.90 mm (0.540—0.550 in.)
Block-to-Shift Collar Groove	Clearance (MAX)	2 mm (0.080 in.)
Shifter Arm Shaft	OD	16.96—17.00 mm (0.668—0.669 in.)
Transaxle Case Bore	ID	17.02—17.04 mm (0.670—0.671 in.)
Shaft-to-Case Bore	Clearance (MAX)	0.20 mm (0.010 in.)
Retaining Plate-to-Case Cap Screw	Torque	25 N·m (221 lb-in.)
Transaxle Case-Half Cap Screw	Torque (Same Case) (New Case)	 25 N·m (221 lb-in.) 29 N·m (257 lb-in.)
Vent Tube-to-Transaxle	Torque	10 N·m (88 lb-in.)
Neutral Start Switch-to-Transaxle	Torque	39 N·m (28 lb-ft)
Flangette-to-Frame Nut	Torque	25 N·m (216 lb-in.)
Drive Axles		
Drive Axle-to-Frame	Distance	30.15 mm (1.187 in.)
Flangette-to-Frame Nut	Torque	25 N·m (216 lb-in.)
Locking Collar-to-Axle Shaft Set Screw	Torque	8 N·m (64 lb-in.)
SECTION 60—STEERING AND BRAKE REPAIR		
Locking Collar-to-Steering Shaft Set Screw	Torque	8 N·m (64 lb-in.)
Brake Housing Half Cap Screw	Torque	33 N·m (24 lb-ft)
Axle Bearing Flangette-to-Frame Nut	Torque	25 N·m (216 lb-in.)

MX,1015HE,A2B -19-27SEP91

Item	Measurement	Specification
SECTION 70—HYDRAULIC REPAIR		
Reservoir-to-Gear Pump Screw	Torque	5 N·m (45 lb-in.)
Gear Pump-to-Adapter Screw	Torque	8 N·m (70 lb-in.)
Hex Plug-to-Adapter	Torque	59 N·m (44 lb-ft)
Lower and Raise Relief Valve-to-Adapter Nut	Torque	2 N·m (20 lb-in.)
Thermal Relief Valve	Torque	7 N·m (60 lb-in.)
SECTION 80—MISCELLANEOUS REPAIR		
Steering Wheel Nut	Torque	197 N·m (145 lb-ft)
Rear Wheel Cap Screw	Torque	100 N·m (75 lb-ft)

MX,1015HE,A2C -19-27SEP91

TUNE-UP SPECIFICATIONS

Spark plug gap . . . . . 0.64 mm (0.025 in.)
Spark plug torque . . . . . 20 N·m (177 lb-in.)
Slow idle
  Stop screw setting . . . . . 1300 rpm
  Limiter screw setting . . . . . 1300—1500 rpm
Fast idle limiter screw setting . . . . . 3800 rpm

MX,1015HE,A3 -19-27SEP91

TUNE-UP ADJUSTMENTS

10
15
6

Perform tune-up adjustments in the following order to improve the efficiency and operation of the machine.

Tune-up Adjustment	Section	Group
1. Clean engine cooling fins.	See CTM5	
2. Clean or replace air cleaner element.	30	10
3. Check or replace fuel filter.	30	05
4. Check battery electrolyte level.	See Operators Manual	
5. Clean, regap or replace spark plug.	240	15
6. Check engine compression.	220	15
7. Adjust throttle cable.	230	15
8. Check and adjust choke.	230	15
9. Adjust governor.	230	15
10. Adjust slow idle stop and idle mixture screw.	230	15
11. Adjust slow idle limiter screw.	230	15
12. Adjust fast idle limiter screw.	230	15
13. Check and adjust brakes.	260	15
14. Check charging system output.	240	15
15. Check tire pressure.	See Operators Manual	

MX,1015HE,A4 -19-27SEP91

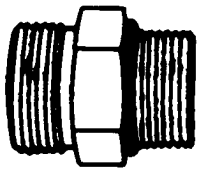
SERVICE RECOMMENDATIONS FOR O-RING BOSS FITTINGS

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

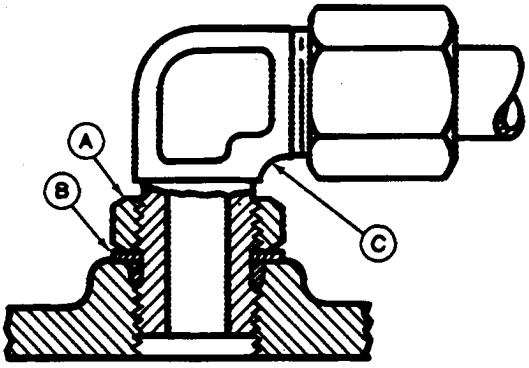
ANGLE FITTING

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).

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



T6520AB -UN-18OCT88

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

TORQUE VALUE

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%.

04T,90,K66 -19-13AUG91

METRIC BOLT AND CAP SCREW TORQUE VALUES

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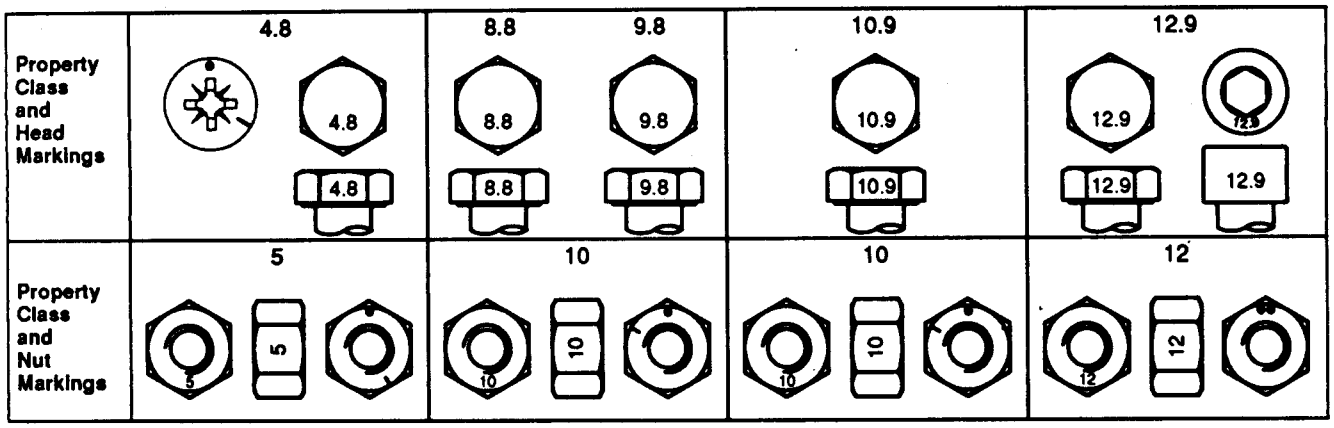
15
8



TS1163 -19-04MAR91

Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
M6	4.8	3.5	6	4.5	9	6.5	11	8.5	13	9.5	17	12	15	11.5	19	14.5
M8	12	8.5	15	11	22	16	28	20	32	24	40	30	37	28	47	35
M10	23	17	29	21	43	32	55	40	63	47	80	60	75	55	95	70
M12	40	29	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	47	80	60	120	88	150	110	175	130	225	165	205	150	260	190
M16	100	73	125	92	190	140	240	175	275	200	350	225	320	240	400	300
M18	135	100	175	125	260	195	330	250	375	275	475	350	440	325	560	410
M20	190	140	240	180	375	275	475	350	530	400	675	500	625	460	800	580
M22	260	190	330	250	510	375	650	475	725	540	925	675	850	625	1075	800
M24	330	250	425	310	650	475	825	600	925	675	1150	850	1075	800	1350	1000
M27	490	360	625	450	950	700	1200	875	1350	1000	1700	1250	1600	1150	2000	1500
M30	675	490	850	625	1300	950	1650	1200	1850	1350	2300	1700	2150	1600	2700	2000
M33	900	675	1150	850	1750	1300	220	1650	2500	1850	3150	2350	2900	2150	3700	2750
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2750	4750	3500

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.

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

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.

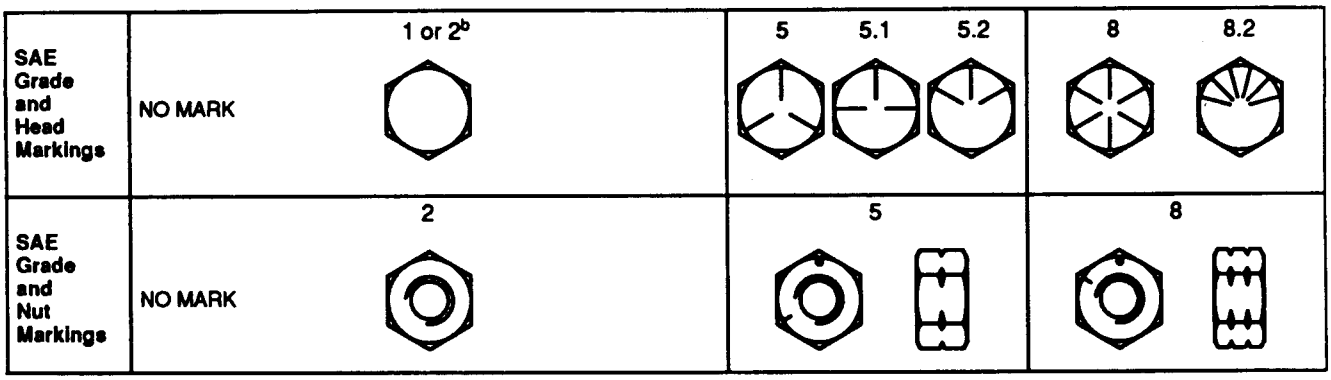
Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

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.

[a] "Lubricated means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry means plain or zinc plated without any lubrication.

DX,TORQ2 -19-05JUN91

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES



TS1162 -19-04MAR91

Size	Grade 1				Grade 2[b]				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	215	160	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	470	300	510	375	470	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

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.

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

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.

Make sure fasteners 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.

[a] "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

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

DX,TORQ1 -19-15MAR91

FUEL

CAUTION: Handle fuel carefully. If engine is hot or running, do not fill the tank. Stop engine and allow to cool several minutes before filling fuel tank. Do not smoke while filling the fuel tank or servicing the fuel system. Fill fuel tank only to bottom of filler neck.

TS185 -UN-23AUG88

IMPORTANT: To avoid engine damage, DO NOT mix oil with gasoline.

Unleaded fuel is recommended because it burns cleaner and leaves less unburned deposits in engine combustion chamber. Regular leaded gasoline with an anti-knock index of 87 or higher may be used.

Use of gasohol is acceptable as long as the ethyl alcohol blend does not exceed 10 percent. Unleaded gasohol is preferred over leaded gasohol. Do not use methanol blended fuels.

Fuel Tank Capacity . . . . . 2.5 gal (9.5 L)

E33529 -UN-12SEP89

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

MX,1020HE,A1 -19-27SEP91

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 -19-04JUN90

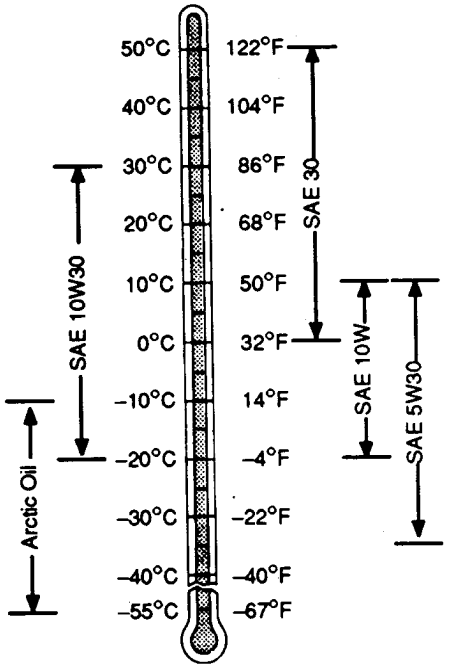
GASOLINE ENGINE/WET CLUTCH OIL

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

John Deere PLUS-4® engine oil is recommended.

Other oils may be used if they meet API Service Classification SF or SE.

Oils meeting Military Specification MIL-L-46167A may be used as arctic oils.



TS239 -19-28NOV90

EX,1200RM,CA -19-27SEP91

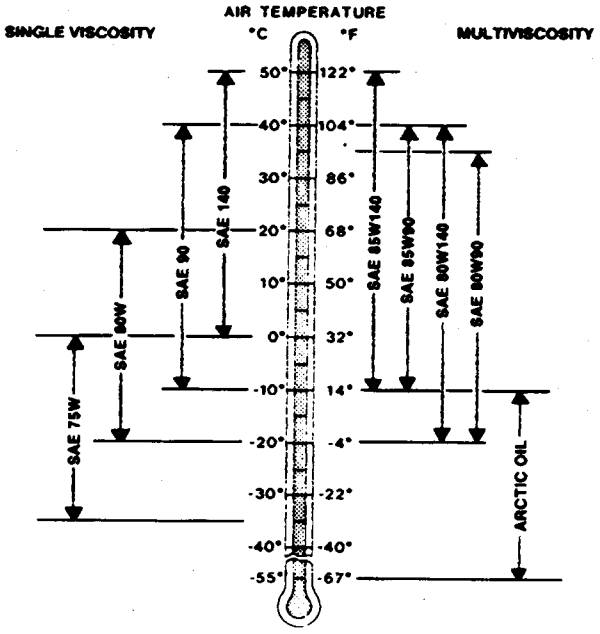
TRANSAXLE OIL

Depending upon the expected air temperature range during the drain interval, use oil viscosity shown on the adjoining temperature chart.

John Deere 85W140 API GL-5 gear oil is recommended. If other oils are used, they must be oils meeting the following requirements:

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

At temperatures below 35˚C (31˚F), use arctic oils such as those meeting Military Specifications MIL-G-10324A.



X9322 -19-30SEP88

MX,1020HE,A2 -19-27SEP91

EXTREME PRESSURE OR MULTIPURPOSE GREASE

Use grease based on the expected air temperature range during the service interval.

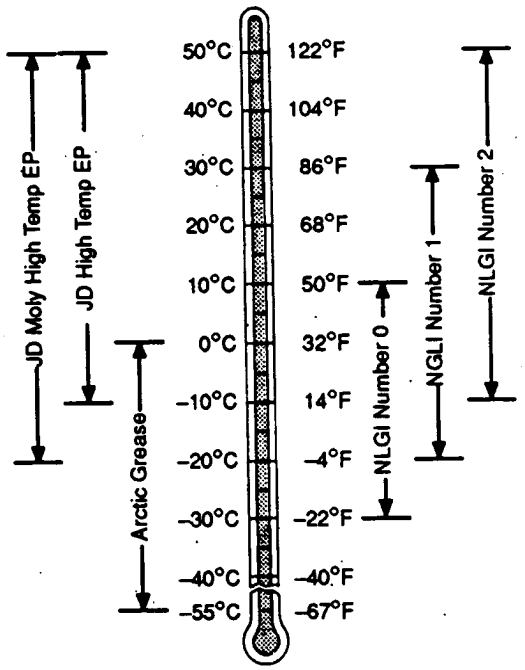
John Deere Moly High Temperature EP Grease and John Deere High Temperature EP Grease are recommended.

Other greases that may be used are:

• SAE Multipurpose EP Grease with 3 to 5 percent molybdenum disulfide.

• SAE Multipurpose EP Grease.

• Greases meeting Military Specification MIL-G-10924C may be used as arctic grease.



DX,GREA1 -19-15MAR91

LUBRICANT STORAGE

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

Use clean containers to handle all lubricants.

Store lubricants and containers in an area protected from dust, moisture, and other contamination.

DX,LUBST -19-15MAR91

ALTERNATIVE LUBRICANTS

Additional information on cold weather operation is available from your John Deere dealer.

Conditions in certain geographical areas may require special lubricants and lubrication practices which do not appear in the operator's manual. If you have any questions, consult your John Deere dealer to obtain the latest information and recommendations.

MX,ALTER,A -19-05FEB91

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.

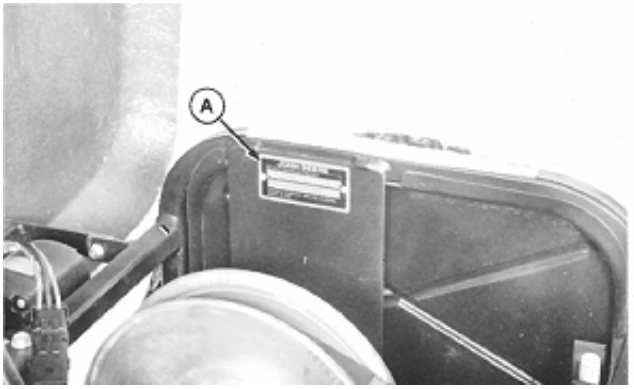
The location of component serial number plates are shown below.

MX,1025FT,A4 -19-15JAN91

PRODUCT IDENTIFICATION NUMBER LOCATION

NOTE: Raise rear body cowling to see product identification number plate.

The machine's 13 digit product identification number (A) is located at the rear, left-hand side of the machine, on the inside of the frame.

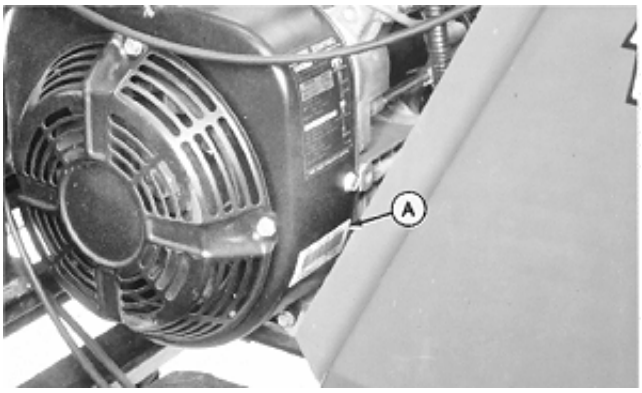


-UN-07AUG91
M80640

MX,1025HE,A1 -19-27SEP91

ENGINE SERIAL NUMBER LOCATION

Engine serial number (A) is located on the front of the engine blower housing.



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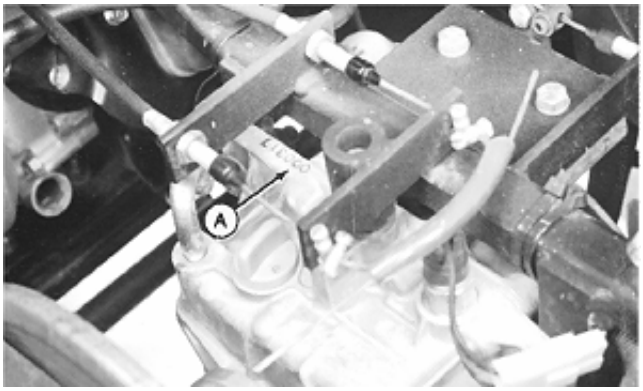
MX,1025HE,A2 -19-27SEP91

TRANSAXLE SERIAL NUMBER LOCATION

Transaxle serial number (A) is stamped into the top flange of the transaxle.



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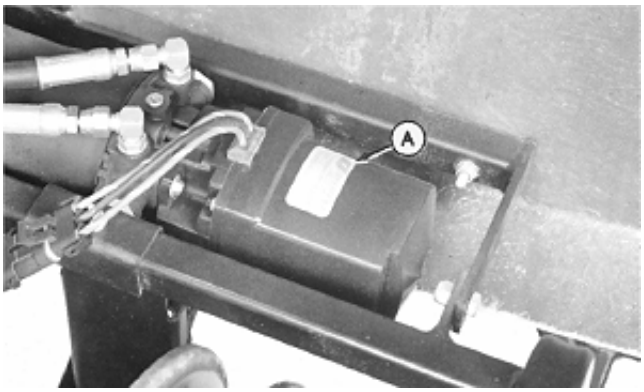
MX,1025HE,A3 -19-27SEP91

HYDRAULIC PUMP SERIAL NUMBER LOCATION (OPTIONAL)

Hydraulic pump serial number (A) is located on top of the electric motor.



MX,1025HE,A4 -19-27SEP91

FEATURES & ATTACHMENTS

The information covered in this group pertains to the features of the machine 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 attachments and kits is also included.

MX,1030HE,A1 -19-27SEP91

MACHINE FEATURES

The 1200 Bunker and Field Rake has the following features:

- •John Deere “K” Series FE290R single cylinder, air cooled engine, with 7.5 kW (10 hp).
- •Drive system consisting of a wet clutch/reduction gearbox, a drive clutch, a driven clutch, a drive belt and a transaxle.
- •Wet clutch for smoother power transmission to the torque converter.
- •Kanzaki transaxle with differential lock.
- •Gear shift pedals, forward and reverse in a single range, variable speed drive system.
- •Utility rack for carrying a variety of hand held equipment.
- •Hinged rear body cowling for ease of serviceability.
- •Pedal operated disc brake.
- •Accelerator pedal.
- •Manual steering, roller chain and sprocket with 6:1 reduction ratio.
- •Bunker/Field Rake

M80644 -UN-07AUG91

Slide M80644

M80645 -UN-07AUG91

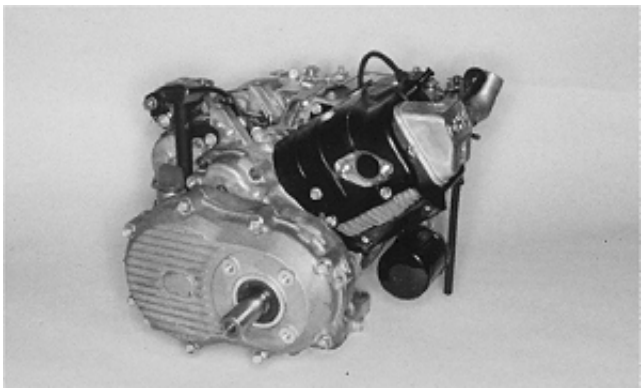
Slide M80645

MX,1030HE,A2 -19-27SEP91

“K” SERIES FE290R ENGINE FEATURES

The John Deere “K” Series FE290R engine used in the 1200 Bunker and Field Rake has the following specifications and features:

- 7.5 kW (10 hp)
- Bore and stroke of 78 x 60 mm (3.07 x 2.36 in.)
- Displacement of 286 cm^3 (17.5 cu. in.)
- Overhead valve, 4-stroke cycle design.
- Solid state, transistorized, battery ignition system.
- Die-cast aluminum block, head, and crankcase with fins for cooling.
- Cast iron cylinder liner.
- Full pressure lubrication system with replaceable oil filter.
- Crankcase oil capacity of 1.4L (3.0 U.S. pt).
- Automatic compression release.
- Electric start.
- Spark arresting muffler.
- Single-stage air filter with paper dry type element. (A dual-stage heavy duty air cleaner is available.)
- Kawasaki, wet clutch 2.1 reduction (variable) gearbox.



M80646 -UN-28AUG91

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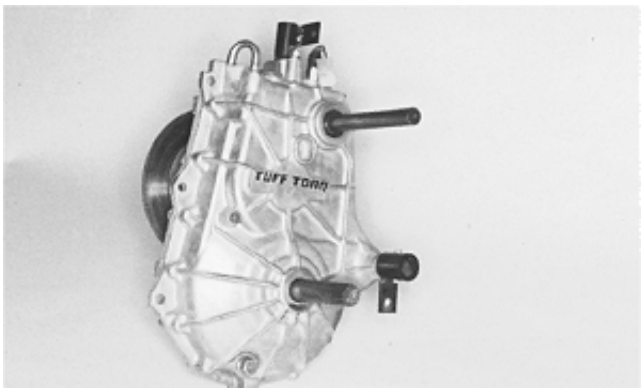
MX,1030HE,A3 -19-27SEP91

POWER TRAIN FEATURES

The power train of the 1200 Bunker and Field Rake has the following specifications and features:

- •Drive clutch, drive belt and driven clutch.
- •Kanzaki gear driven transaxle with foot pedal operated differential lock.
- •No shifting is required to increase speed, and infinite speeds up to 18 km/h (11 mph) are the result.
- •The drive system automatically downshifts (changes gear ratios) under load while maintaining engine rpm.
- •Separate forward and reverse gear shift pedals in a single range, variable speed drive system.
- •Right foot operated brake system with a disc brake mounted to the transaxle intermediate shaft.



M80647 -UN-28AUG91

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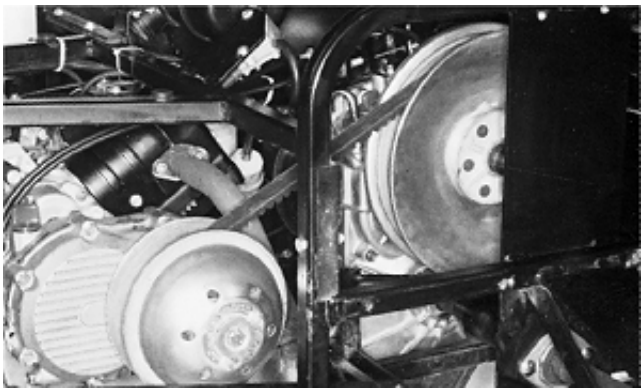

M80659 -UN-10SEP91

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MX,1030HE,A4 -19-27SEP91

ELECTRICAL SYSTEM FEATURES

The electrical system of the 1200 Bunker and Field Rake has the following specifications and features:

- •12 volt battery with 255 cold cranking amps at -18˚C (0˚F).
- •13 Amp stator/alternator.
- •12 Volt regulator/rectifier.
- •Electronic ignition.
- •Voltmeter.
- •Hourmeter.
- •Front light and switch (optional).
- •Toggle switch for an electro-hydraulic lift pump (optional).

-UN-10SEP91
M80648

Slide M80648

-UN-10SEP91
M80649

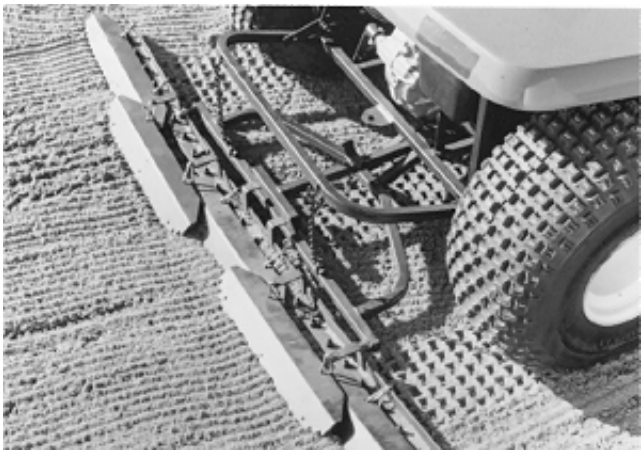
Slide M80649

MX,1030HE,A5 -19-27SEP91

RAKE FEATURES

The rear mounted rake offers the following specifications and features:

- •Hand lift control.
- •Articulating three-piece design.
- •Five section, bunker or field blades.
- •Blades are available with either a serrated or straight edge.
- •Three section, 24 prongs, Prong Rake with 25—76 mm (1—3 in.) adjustment.
- •1981 mm (78 in.) overall width.
- •20 kg (44 lb) overall weight.



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M80650

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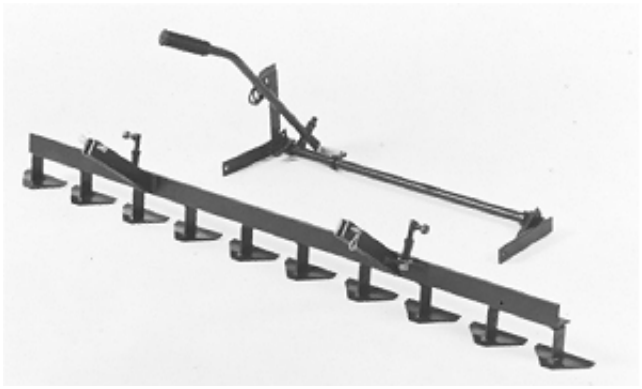
MX,1030HE,A6 -19-27SEP91

OPTIONAL ATTACHMENTS AND KITS

The following Attachments and Kits are available for the 1200 Bunker and Field Rake:

- •Cultivator
- •40-Inch Front Blade
- •60-Inch Front Aluminum Blade



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M80651

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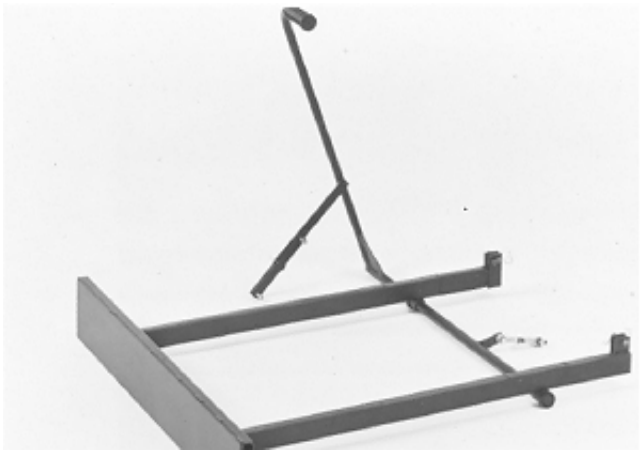

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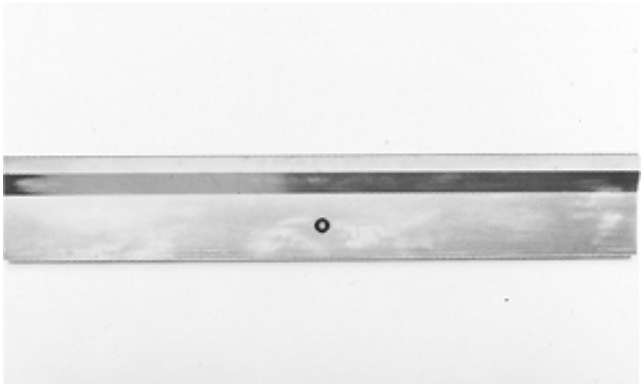

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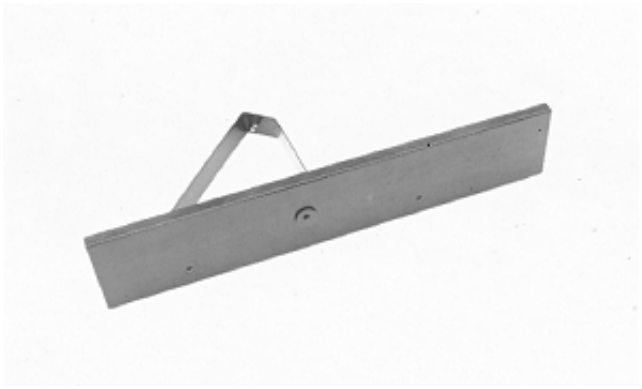
MX,1030HE,A7 -19-27SEP91

- Articulating Front Mount Core Removal Blade
- Mid-Mount 64.5-Inch Scraper Blade
- Rear-Mount 60-Inch Field Finisher
- Wide and Narrow Interval Scarifier Tines
- Lawn Spreaders
- Lawn Rollers
- Sweep Master



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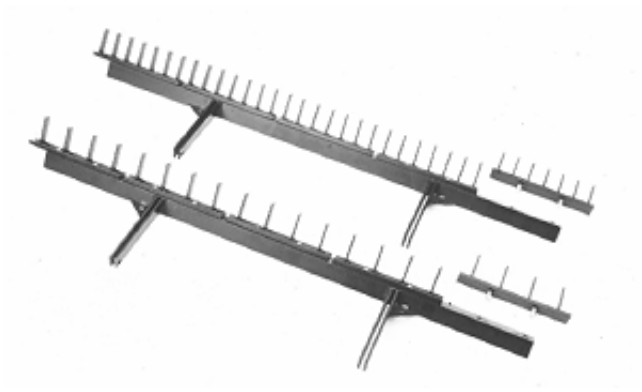

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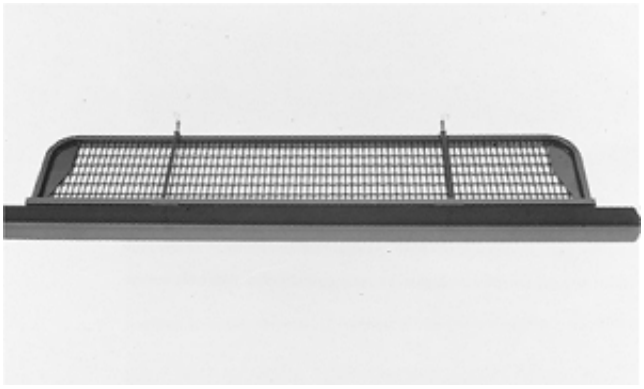

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M80656

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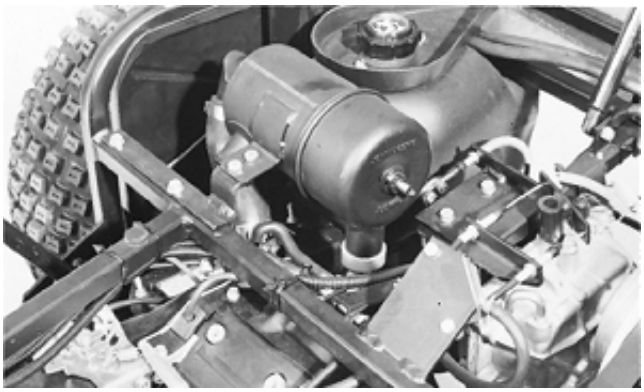
MX,1030HE,A8 -19-27SEP91

- Heavy-Duty Air Filter
- Hydraulic Lift Pump Kit with Quick-Coupler Outlets
- Front Light Kit



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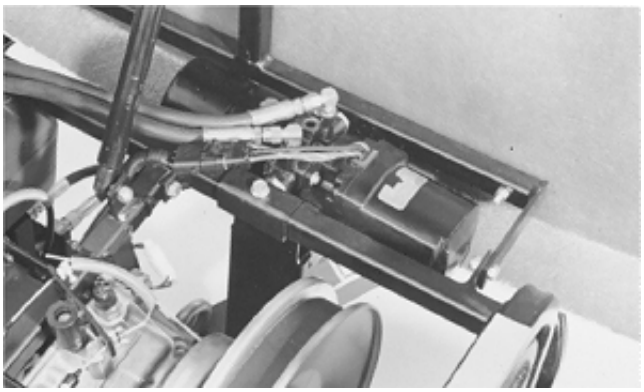

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M80658

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MX,1030HE,A9 -19-27SEP91

Section 20
ENGINE REPAIR

Contents

JOHN DEERE ENGINE REPAIR—USE CTM5

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

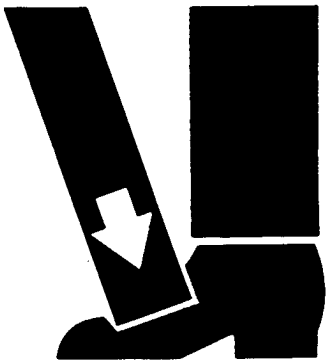
TS225 -UN-17JAN89

20
05
1

MX,2005HE,A1 -19-27SEP91

LOWER ALL ATTACHMENTS

N **CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.**



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE ENGINE

1. Remove battery cover and disconnect battery negative (—) cable.

2. Remove air cleaner. (See Section 30, Group 10.)

3. Remove drive clutch. (See Section 50, Group 10.)

4. Remove muffler. (See Group 10.)

5. Remove differential lock pedal. (See Section 50, Group 15.)

6. Remove rake lift lever, if equipped. (See Section 80, Group 15.)

NOTE: Engine oil capacity is 1.4 L (3.0 U.S. pt).

7. Drain engine oil.

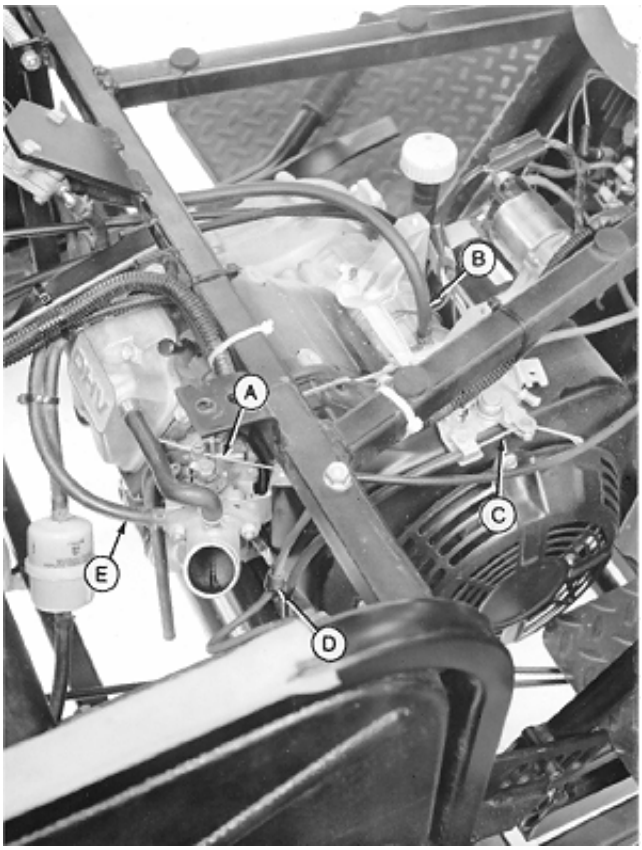
8. Remove battery positive (+) cable from clamp (D).

9. Disconnect cables (A and C).

CAUTION: Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.

10. Disconnect hoses (B and E). Close all openings using caps and plugs.

11. Disconnect spark plug wiring lead.



M80662 -UN-07AUG91

Right Side Shown

A—Choke Control Cable
B—Fuel Pump Vacuum Hose
C—Accelerator Cable
D—Clamp
E—Fuel Supply Hose

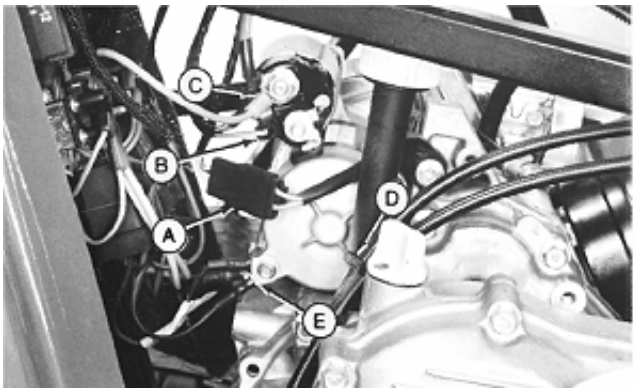
MX,2005HE,A2 -19-27SEP91

12. Disconnect wiring connectors (A and B).

13. Disconnect wiring leads (C and E).

14. Cut tie strap (D).

A—Engine Wiring Harness Connector
B—Starter Solenoid Wiring Connector
C—Battery Positive Cable and Wiring Leads
D—Tie Strap
E—Ground Wiring Leads



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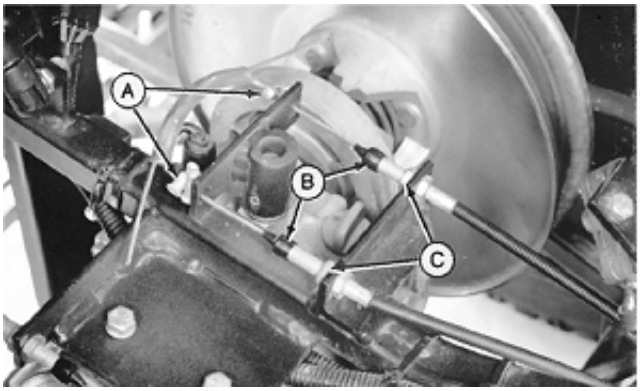
M80663

Left Side Shown

MX,2005HE,A3 -19-27SEP91

15. Remove screws (A), caps (B) and nuts (C).

16. Remove shift cables from bracket.



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M80664

MX,2005HE,A4 -19-27SEP91

17. Remove cultivator blade assembly, if equipped.

NOTE: Remove engine from left-hand side of machine.

18. Remove four cap screws, washers and lock nuts.

19. Remove engine.

NOTE: Removal of wet reduction clutch is only necessary, if engine repair is needed.

20. Remove wet reduction clutch. (See Section 50, Group 05.)

21. Make repairs as necessary. (See CTM5.)

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M80665

MX,2005HE,A5 -19-27SEP91

INSTALL ENGINE

1. Install wet reduction clutch, if removed. (See Section 50, Group 05.)

2. Install engine.

3. Install cap screws, washers and lock nuts. Tighten cap screws to 23 N·m (204 lb-in.).

4. Install cultivator blade assembly, if equipped.

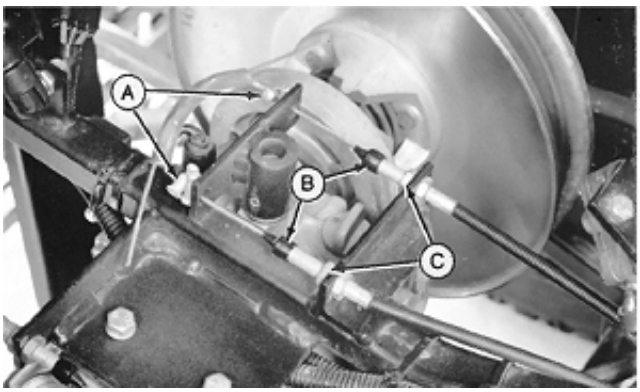
M80665 -UN-07AUG91

MX,2005HE,A6 -19-27SEP91

5. Install shift cables through bracket.

6. Install nuts (C), caps (B) and screws (A).

7. Adjust transaxle shift linkage. (See Section 250, Group 15.)



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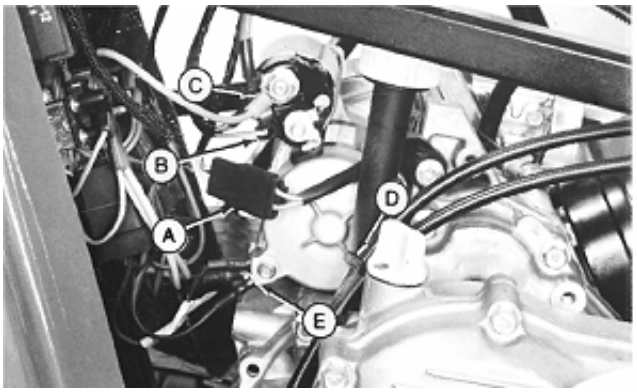
MX,2005HE,A7 -19-27SEP91

8. Install new tie strap (D).

9. Connect wiring leads (E and C).

10. Connect wiring connectors (A and B).

A—Engine Wiring Harness Connector
B—Starter Solenoid Wiring Connector
C—Battery Positive Cable and Wiring Leads
D—Tie Strap
E—Ground Wiring Leads



M80663 -UN-07AUG91

Left Side Shown

MX,2005HE,A8 -19-27SEP91

11. Connect spark plug wiring lead.

12. Connect hoses (B and E).

13. Connect cables (A and C).

14. Install battery positive (+) cable to clamp (D).

15. Install rake lift lever, if equipped. (See Section 80, Group 15.)

16. Install differential lock pedal. (See Section 50, Group 15.)

17. Install muffler. (See Group 10.)

18. Install drive clutch. (See Section 50, Group 10.)

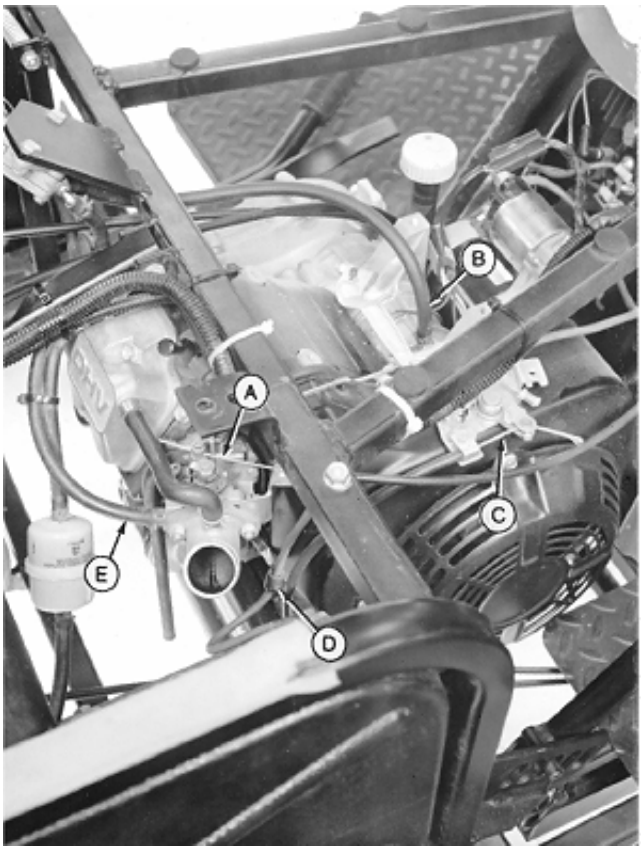
19. Install air cleaner. (See Section 30, Group 10.)

20. Connect battery negative (—) cable and install battery cover.

21. Fill engine with proper oil. (See Section 10, Group 20.)

22. Adjust choke. (See Section 220, Group 15.)

23. Adjust accelerator cable. (See Section 220, Group 15.)



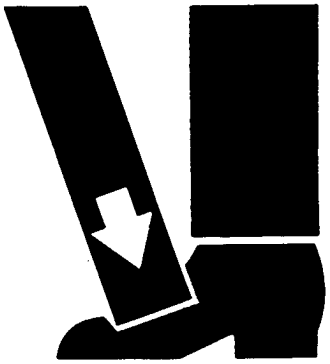
Right Side Shown

A—Choke Control Cable
B—Fuel Pump Vacuum Hose
C—Accelerator Cable
D—Clamp
E—Fuel Supply Hose

MX,2005HE,A9 -19-27SEP91

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



-UN-23AUG88
TS226

MX,LOW,AT -19-27SEP91

REMOVE AND INSTALL MUFFLER

CAUTION: Muffler may be hot. Allow muffler to cool before removing.

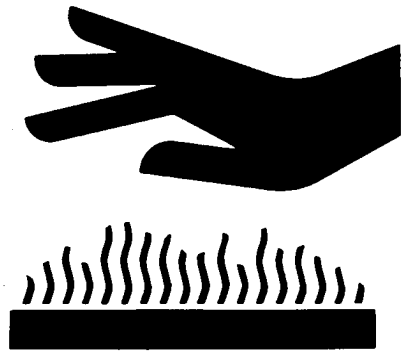
1. Remove nuts and lock washers (A).

2. Remove muffler and gasket.

3. Inspect muffler for wear or damage. Replace if necessary.

4. Install new gasket and muffler.

5. Install lock washers and nuts. Tighten nuts to 14 N·m (124 lb-in.).



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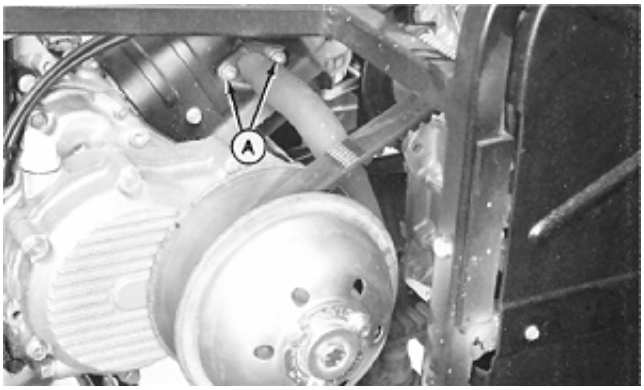

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M80661

MX,2010HE,A1 -19-27SEP91

Section 30
FUEL AND AIR REPAIR

Contents

CARBURETOR REPAIR—USE CTM5

For complete repair information the component technical manual (CTM) is also required.

Use the component manual in conjunction with this machine manual.

TS225 -UN-17JAN89

MX,3005HE,A1 -19-27SEP91

SERVICE PARTS KITS

The following kits are available through your parts catalog:

Carburetor Gasket Kit

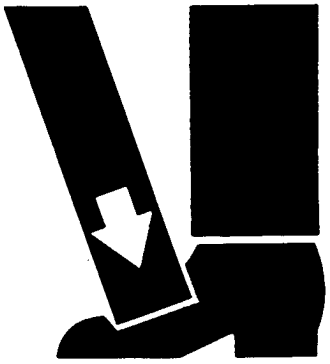
Main Jet High Altitude Kit

Complete Carburetor

MX,3005HE,A2 -19-27SEP91

LOWER ALL ATTACHMENTS

N **CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.**



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE AND INSTALL CARBURETOR

1. Remove air cleaner. (See Group 10.)

CAUTION: Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.

2. Drain fuel from carburetor.

3. Disconnect hoses (C and D). Close all openings using caps and plugs.

4. Disconnect cable (L).

5. Remove hose from clamp (B).

6. Remove duct (A), bracket (E) and gaskets (F).

7. Separate carburetor from heat shield (H). Remove carburetor.

8. Disconnect linkage (K).

9. Remove heat shield (H) and gasket (I and G).

10. Make repairs as necessary. (See CTM5.)

NOTE: Install gasket (I) with tab pointing up on fuel inlet side of carburetor.

11. Install gaskets and heat shield.

12. Connect throttle control linkage and install carburetor.

NOTE: Install gaskets (F) with hole (J) pointing away from fuel inlet side of carburetor.

13. Install gaskets, bracket and duct.

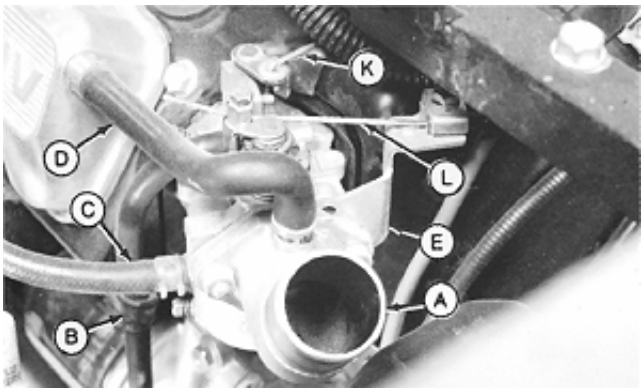
14. Install clamp (B) on hose.

15. Connect choke cable.

16. Connect hoses.

17. Install air cleaner.

18. Adjust choke. (See Section 220, Group 15.)



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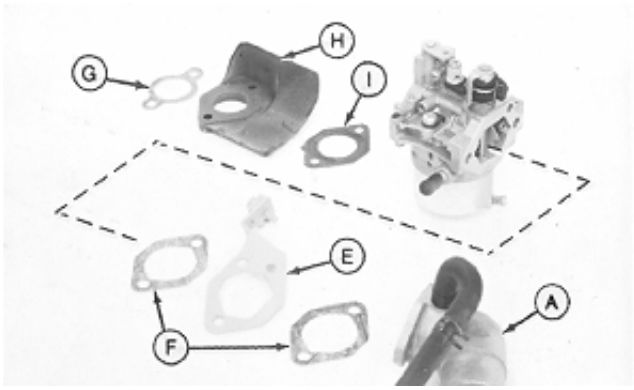

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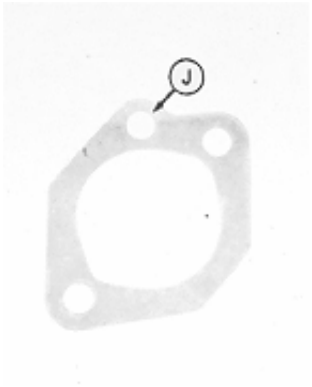


-UN-25APR91
M80401

A—Air Intake Duct
B—Clamp
C—Fuel Supply Hose
D—Breather Hose
E—Bracket
F—Gaskets
G—Gasket
H—Heat Shield
I—Gasket
J—Hole
K—Throttle Control Linkage
L—Choke Cable

MX,3005HE,A3 -19-27SEP91

REMOVE, INSPECT AND INSTALL FUEL PUMP

CAUTION: Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.

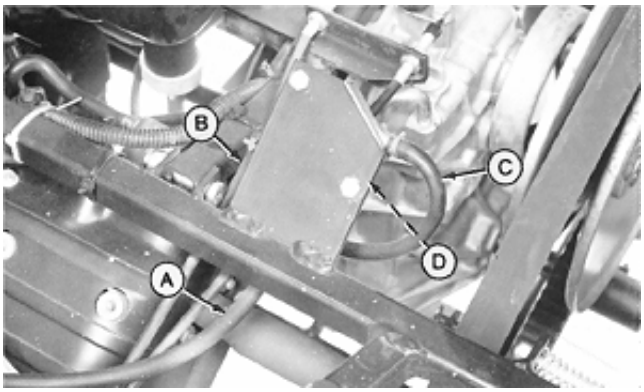
1. Disconnect hoses (A, B and C). Close all openings using caps and plugs.

2. Remove fuel pump (D).

3. Inspect pump for wear or damage. Replace as necessary.

4. Install fuel pump.

5. Connect hoses.



M80667 -UN-07AUG91

A—Vacuum Hose
B—Fuel Filter-to-Fuel Pump Hose
C—Fuel Pump-to-Carburetor Hose
D—Fuel Pump

MX,3005HE,A4 -19-27SEP91

REPLACE FUEL FILTER

CAUTION: Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.

1. Disconnect fuel hoses (A and C). Close all openings using caps and plugs.

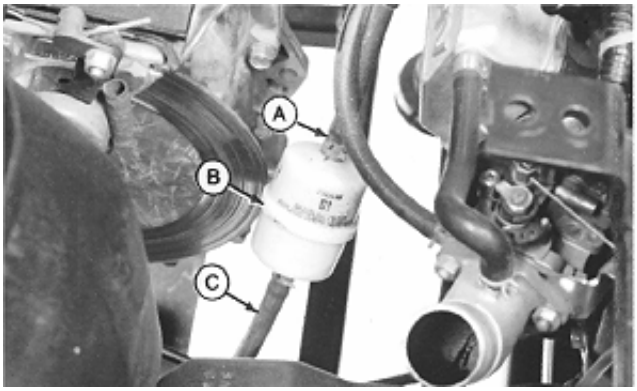
2. Remove filter (B).

NOTE: Arrow on filter housing must point in direction of fuel flow.

3. Install filter with arrow pointing in direction of fuel pump.

4. Connect fuel hoses.

5. Run engine and check for leaks.



M80668 -UN-07AUG91

MX,3005HE,A5 -19-27SEP91

REMOVE, INSPECT AND INSTALL FUEL TANK

1. Remove air cleaner. (See Group 10.)

2. Remove battery. (See Section 40, Group 05.)

N **CAUTION: Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.**

3. Disconnect hose (F). Close all openings using caps and plugs.

4. Remove cap screws (B) and washers.

5. Remove support bracket (C).

6. Remove fuel tank (A).

7. Inspect tank for damage. Replace if necessary.

8. Install fuel tank.

NOTE: Make sure battery negative cable (D) is installed between cap screw (E) and support bracket.

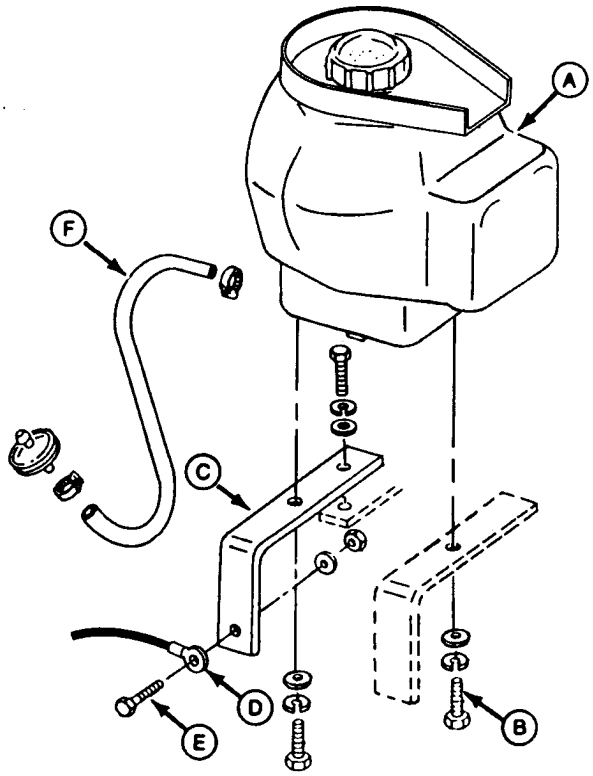
9. Install support bracket.

10. Install cap screws and washers.

11. Connect fuel supply hose.

12. Install battery.

13. Install air cleaner.

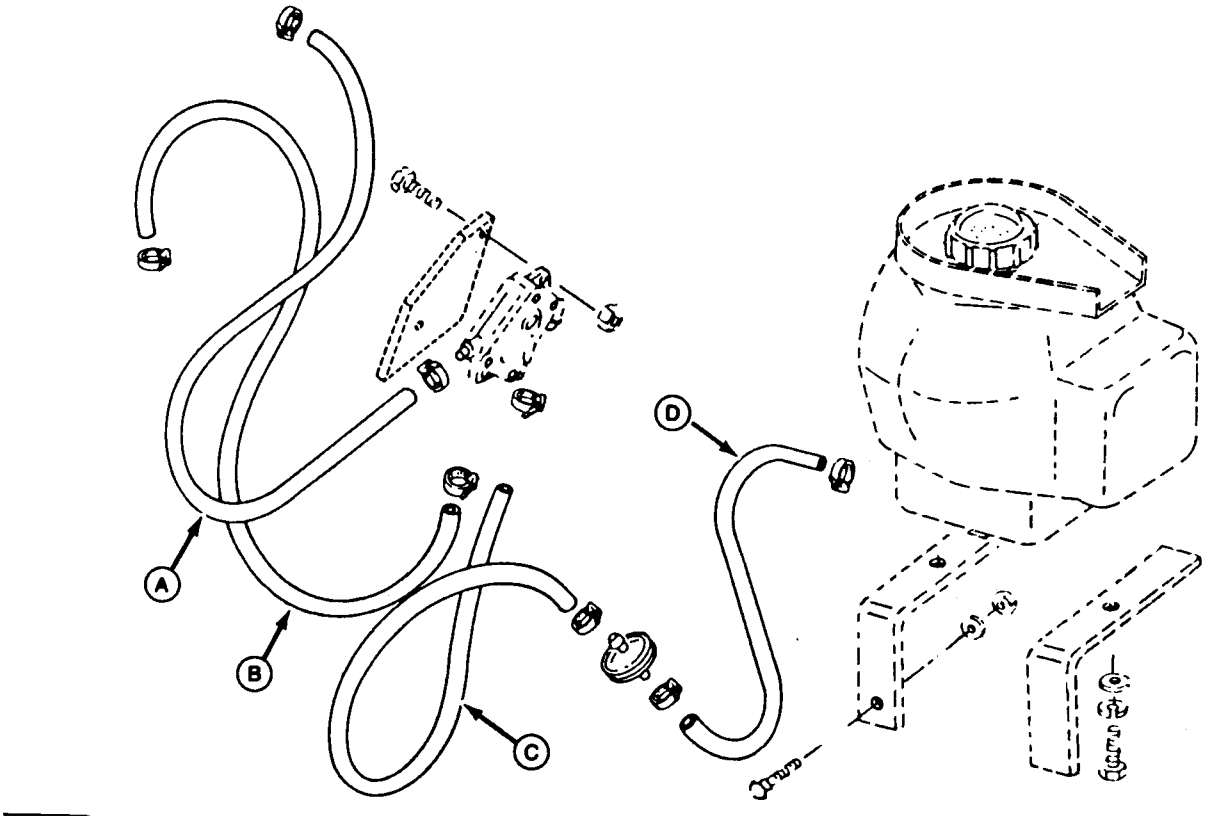


M80669 -UN-07AUG91

A—Fuel Tank
B—Cap Screw (2 used)
C—Support Bracket
D—Battery Negative (-) Cable
E—Cap Screw
F—Fuel Supply Hose

MX,3005HE,A6 -19-27SEP91

REPLACE FUEL HOSES



M80670 -UN-07AUG91

A—Fuel Pump-to-Carburetor Hose

B—Fuel Pump-to-Crankcase Vacuum Hose

C—Fuel Filter-to-Fuel Pump Hose

D—Fuel Tank-to-Fuel Filter Hose

1. Remove air cleaner. (See Group 10.)

CAUTION: Gasoline vapor is explosive. Do not expose to spark or flame. Serious personal injury can result.

2. Inspect and replace fuel hoses (A—D) as necessary.

3. Install air cleaner.

MX,3005HE,A7 -19-27SEP91

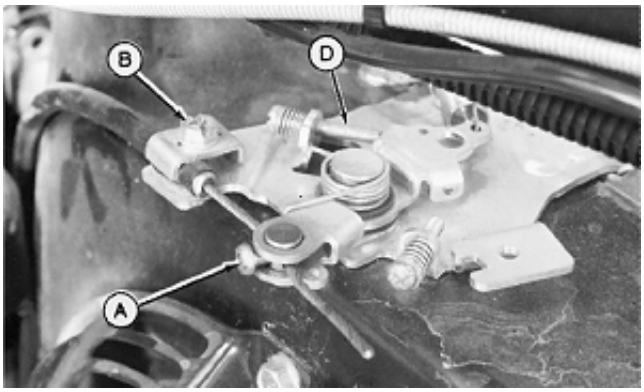
REPLACE ACCELERATOR CABLE AND HOUSING

NOTE: Accelerator cable can be replaced separately.

1. Loosen screw (A).
2. Pull cable through housing and pedal.
3. Loosen screw (B).
4. Remove nut (C).
5. Cut all tie straps.
6. Remove cable housing.
7. Pull new cable out of new housing.

NOTE: Route new housing through loop under platform.

8. Install new cable housing.
9. Install nut and tighten screw.
10. Pull new cable through pedal, housing and lever.
11. Install tie straps as necessary.
12. Adjust accelerator cable. (See Section 220, Group 15.)



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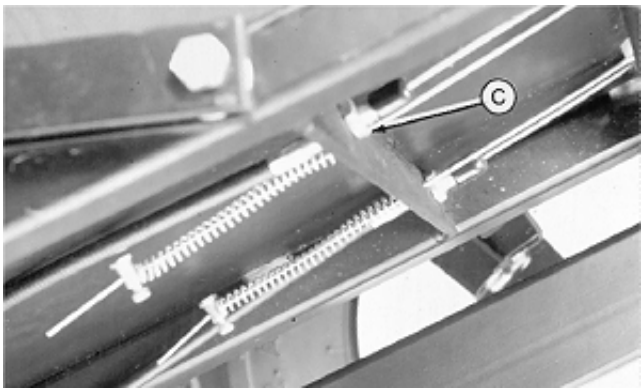
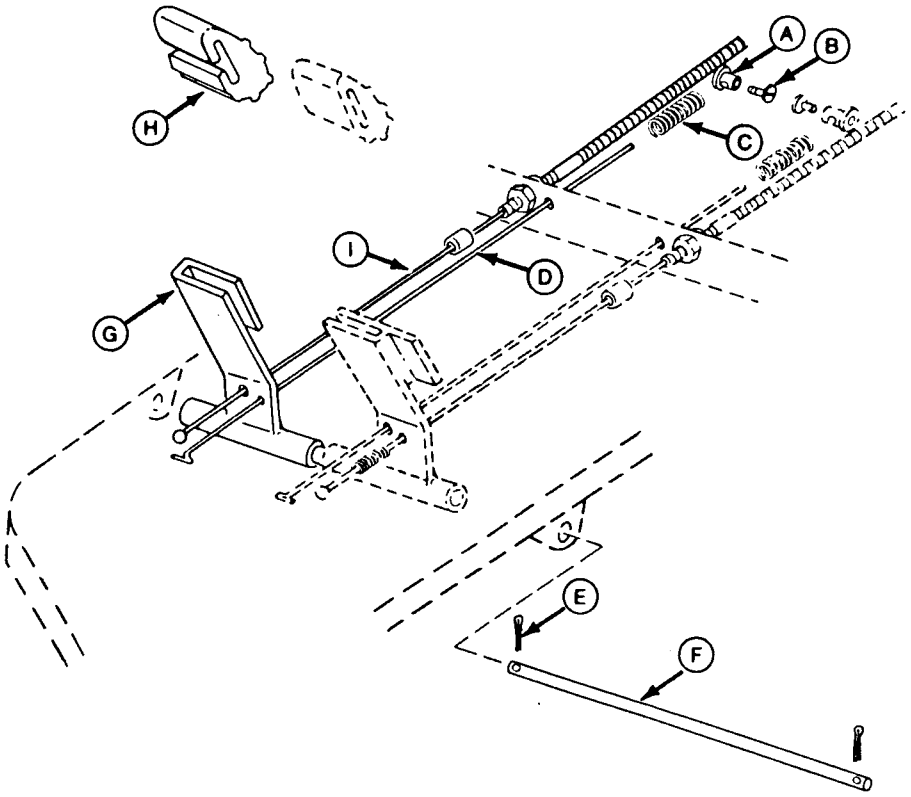


E33629 -UN-18SEP89

A—Screw
B—Clamp Screw
C—Nut
D—Screw

MX,3005HE,A8 -19-27SEP91

INSPECT AND REPAIR ACCELERATOR PEDAL ASSEMBLY



M80671 -UN-07AUG91

A—Clamp
B—Screw
C—Extension Spring
D—Cable
E—Cotter Pin (2 used)
F—Rod
G—Accelerator Pedal
H—Pedal Pad
I—Accelerator Cable

1. Remove accelerator cable (I). (See Replace Accelerator Cable and Housing in this group.)

2. Remove parts (A—H).

3. Inspect parts for wear or damage. Replace as necessary.

4. Install all parts.

5. Install accelerator cable.

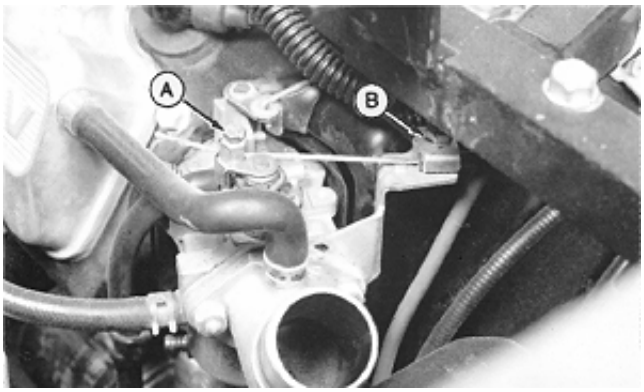
MX,3005HE,A9 -19-27SEP91

REMOVE AND INSTALL CHOKE KNOB AND CABLE

1. Loosen screws (A and B).
2. Remove nut and lock washer (C).
3. Cut tie straps as necessary.
4. Remove choke knob and cable.

NOTE: When installing choke knob and cable, route cable along right-hand side of machine.

5. Install choke knob and cable.
6. Install lock washer and nut.
7. Tighten screw (B).
8. Install tie straps as needed.
9. Adjust choke. (See Section 220, Group 15.)



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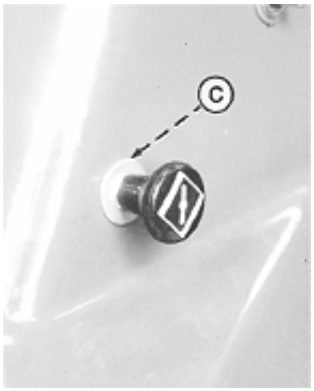

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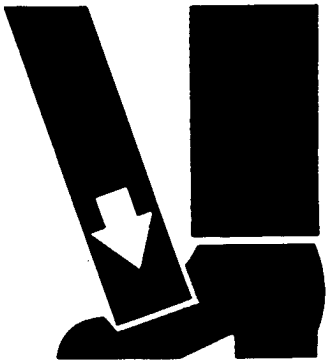
M80673

MX,3005HE,A10 -19-27SEP91

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.

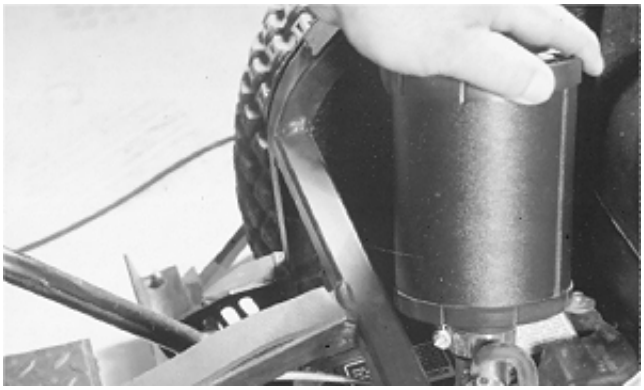


TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

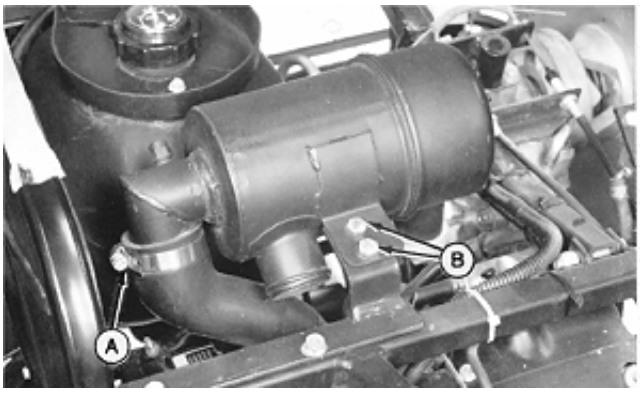
REMOVE AND INSTALL AIR CLEANER

1. Loosen hose clamp (A).
2. Heavy duty air cleaner: Remove cap screws and nuts (B).
3. Remove air cleaner.
4. Inspect all parts for damage. Replace if necessary.
5. Install air cleaner.
6. Heavy duty air cleaner: Install cap screws and nuts.
7. Tighten hose clamp.



E32461 -UN-12OCT88

Standard Air Cleaner



M80674 -UN-07AUG91

Heavy Duty Air Cleaner

MX,3010HE,A1 -19-27SEP91

REMOVE, INSPECT AND INSTALL AIR CLEANER ELEMENT—STANDARD AIR CLEANER


M34527 -UN-07SEP88

1. Remove air cleaner. (See this group.)

2. Remove dust from air cleaner by tapping the element with the palm of your hand, NOT ON A HARD SURFACE.

3. If this does not remove dust, use compressed air under 210 kPa (30 psi). Be careful not to damage the air cleaner.

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2

IMPORTANT: Do not wash air cleaner in fuel oil, gasoline, or solvent. If you do, the air cleaner must be replaced. Wash air cleaner no more than 2 times as directed below.

4. If necessary, wash air cleaner in warm water and R36757 John Deere Filter Element Cleaner or an equivalent non-sudsing detergent for approximately 15 minutes.

5. Rinse air cleaner with clean water using a maximum water pressure of 280 kPa (40 psi).

6. Allow air cleaner to dry completely before using. Do not oven dry or use compressed air.

7. Inspect air cleaner for damage; replace as necessary.

8. Install air cleaner.

MX,3010HE,A2 -19-27SEP91

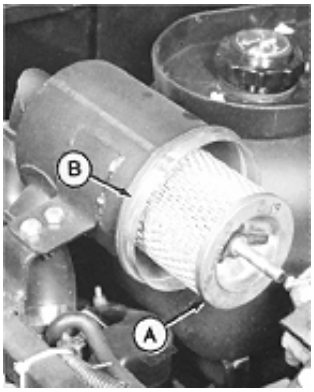
REMOVE, INSPECT AND INSTALL AIR CLEANER ELEMENTS—HEAVY DUTY AIR CLEANER

1. Remove air cleaner cover.

2. Remove wing nut, washer and primary element (A).

3. Inspect gasket (B) for wear or damage. Replace if necessary.

4. Remove wing nut washer and secondary element (C).



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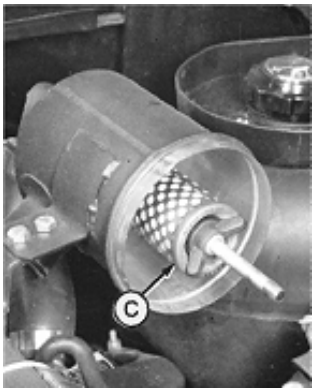
M80675



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M80676

MX,3010HE,A3 -19-27SEP91

5. Pat each element with the palm of your hand, NOT ON HARD SURFACE.

6. If this does not remove dust, use compressed air under 30 psi (210 kPa).

7. Direct air up and down the pleats, blowing from inside to outside. Be careful not to make a break in the elements.

8. After you clean the main element, put a lighted bulb inside it. Inspect the element and gasket for damage. Throw away an element that has the smallest break. If the gasket is broken or missing, install a new element.

9. Be sure rubber gasket on end of elements are in good condition. If gasket is damaged or missing, replace element.

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

10. 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.

11. Flush with clean water. Use water pressure under 280 kPa (40 psi).

IMPORTANT: Air dry element for 24 hours before installing.

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

13. Before you install elements, clean the inside of cleaner housing with a damp cloth.

14. Install elements.

15. Install cover.

M80677 -UN-07AUG91

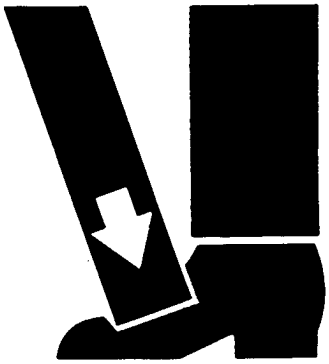
MX,3010HE,A4 -19-27SEP91

Section 40
ELECTRICAL REPAIR

Contents

LOWER ALL ATTACHMENTS

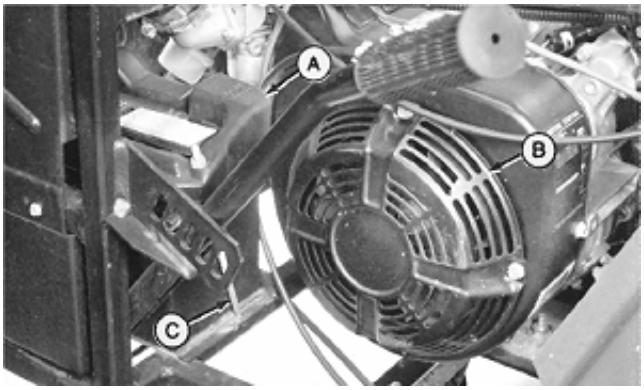
CAUTION: Always lower all attachments or implements to the ground before you work on the machine. If you must work on a lifted machine or attachment, securely support the machine or attachment. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE AND INSTALL BATTERY



M80678 -UN-07AUG91

1. Remove nuts, washers and cover (A).
2. Disconnect battery negative (—) cable.
3. Disconnect battery positive (+) cable.
4. Remove hold-down rods (C).
5. If equipped with cultivator, remove blower screen (B).
6. Remove battery.
7. Service or replace battery as necessary.
8. Install battery.
9. Install blower screen, if removed.
10. Install hold-down rods.
11. Clean battery posts and cable connections. Connect battery positive (+) cable then negative (—) cable.
12. Apply petroleum jelly on battery terminals.
13. Install battery cover, nuts and washers.

MX,4005HE,A1 -19-27SEP91

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REPLACE BATTERY CABLES

1. Remove nuts, washers and cover (A).

2. Disconnect battery negative (—) cable (B) from battery.

3. Disconnect battery positive (+) cable (D) from battery.

4. Remove nut and cap screw (C). Replace battery negative cable if necessary.

5. Remove tie straps from battery positive cable.

6. Remove nut (E). Replace battery positive cable if necessary.

7. Install positive (+) cable and nut on starter terminal.

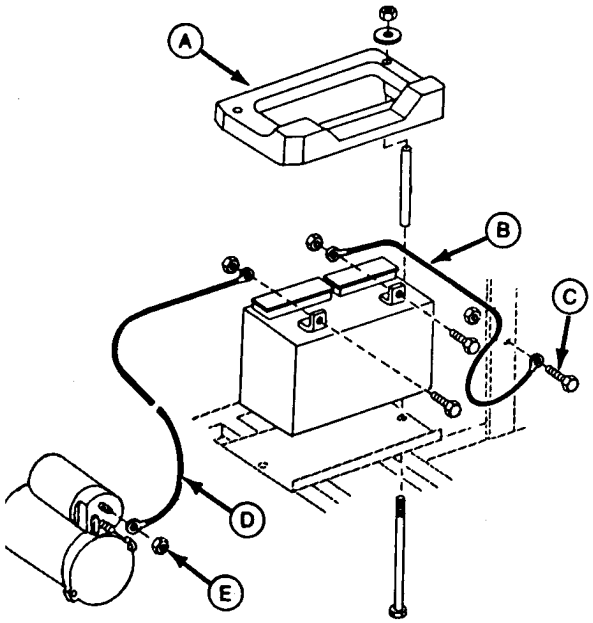
8. Install negative (—) cable, nut and cap screw.

9. Install tie straps as necessary.

10. Clean battery posts and cable connections. Connect positive (+) cable then negative (—) cable.

11. Apply petroleum jelly on battery terminals.

12. Install battery cover, washers and nuts.



M80679 -UN-07AUG91

A—Battery Cover
B—Battery Negative (—) Cable
C—Cap Screw
D—Battery Positive (+) Cable
E—Starter Terminal Nut

MX,4005HE,A2 -19-27SEP91

STARTER AND ENGINE IGNITION/CHARGING SYSTEM REPAIR—USE CTM5

For complete repair information the component technical manula (CTM) is also required.

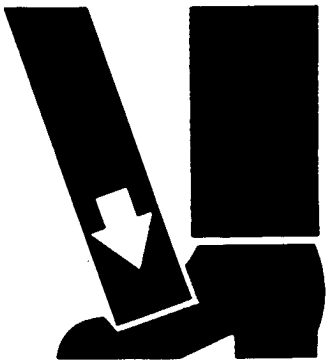
Use the component manual in conjunction with this machine manual.

TS225 -UN-17JAN89

MX,4005FT,A1A -19-27SEP91

LOWER ALL ATTACHMENTS

N **CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.**



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

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1

REMOVE AND INSTALL STARTER

1. Remove battery cover and disconnect battery negative (—) cable.

2. Remove tie strap (E).

3. Remove cap screw and washer (D) and oil fill tube.

4. Disconnect wiring connector (B), positive cable and wiring leads (C).

5. Disconnect wiring leads (A).

6. Remove starter (F).

7. Make repairs as necessary. (See CTM5.)

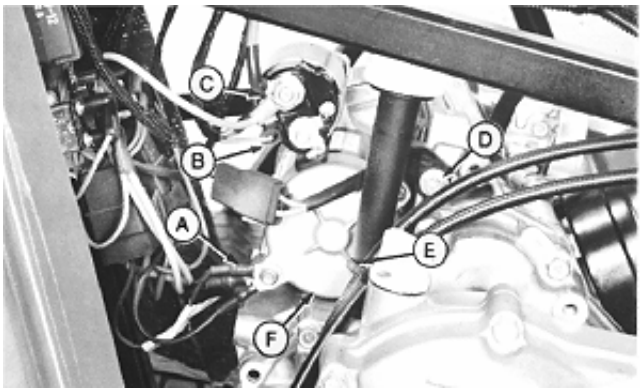
8. Install starter.

9. Connect wiring leads, starter cable and wiring connector.

10. Install oil fill tube, washer and cap screw.

11. Install tie strap.

12. Connect battery negative (—) cable and install cover.

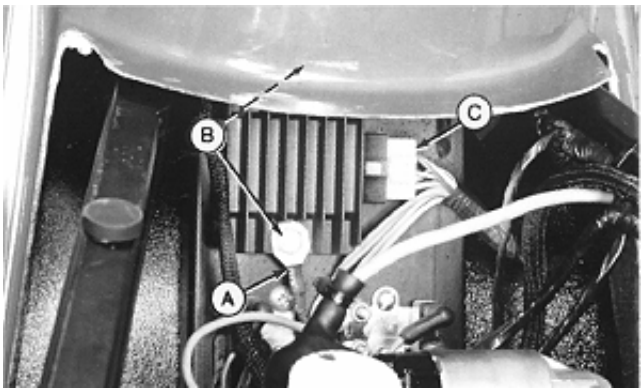


M80680 -UN-07AUG91

A—Ground Wiring Leads
B—Starter Solenoid Wiring Connector
C—Battery Positive Cable and Wiring Leads
D—Cap Screw and Washer
E—Tie Strap
F—Starter

MX,4010HE,A1 -19-27SEP91

REPLACE VOLTAGE REGULATOR



1. Remove battery cover and disconnect battery negative (—) cable.

2. Remove front wheel mud flap, if equipped.

3. Disconnect wiring connector (C).

4. Remove lock nuts and cap screws (B) and voltage regulator.

NOTE: Make sure wiring lead (A) is installed between cap screw and voltage regulator.

5. Install new voltage regulator, cap screws and lock nuts.

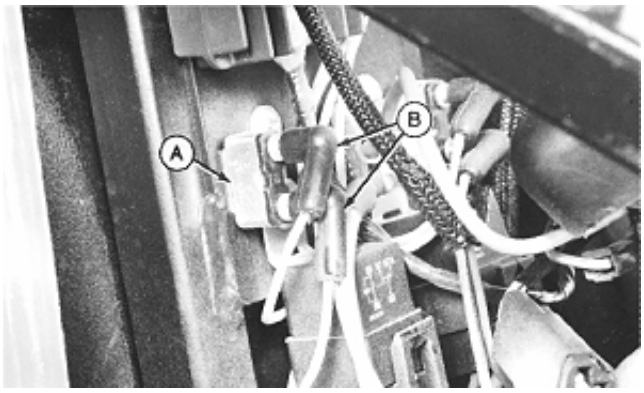
6. Connect wiring connector.

7. Install mud flap, if equipped.

8. Connect battery negative (—) cable and install cover.

MX,4010HE,A2 -19-27SEP91

REPLACE REGULATOR CIRCUIT BREAKER



1. Remove battery cover and disconnect battery negative (—) cable.

2. Remove front wheel mud flap, if equipped.

3. Disconnect wiring leads (B).

4. Remove screws, lock nuts and circuit breaker (A).

5. Install circuit breaker, lock nuts and screws.

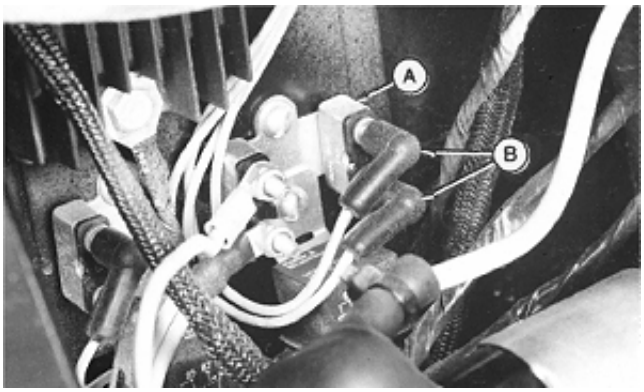
6. Connect wiring leads.

7. Install mud flap, if equipped.

8. Connect battery negative (—) cable and install cover.

MX,4010HE,A3 -19-27SEP91

REPLACE KEY SWITCH CIRCUIT BREAKER



M80683 -UN-07AUG91

1. Remove battery cover and disconnect battery negative (—) cable.
2. Remove front wheel mud flap, if equipped.
3. Disconnect wiring leads (B).
4. Remove screws, lock nuts and circuit breaker (A).
5. Install circuit breaker, lock nuts and screws.
6. Connect wiring leads.
7. Install mud flap, if equipped.
8. Connect battery negative (—) cable and install cover.

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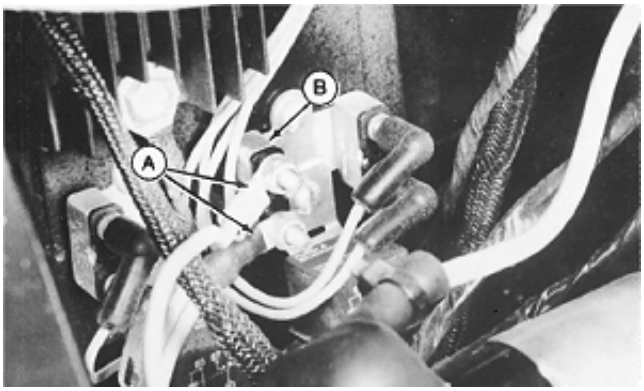
MX,4010HE,A4 -19-27SEP91

REPLACE HYDRAULIC PUMP CIRCUIT BREAKER (OPTIONAL)



M80706 -UN-20AUG91

1. Remove battery cover and disconnect battery negative (—) cable.
2. Remove front wheel mud flap, if equipped.
3. Disconnect wiring leads (A).
4. Remove screws, lock nuts and circuit breaker (B).
5. Install circuit breaker, lock nuts and screws.
6. Connect wiring leads.
7. Install mud flap, if equipped.
8. Connect battery negative (—) cable and install cover.

MX,4010HE,A4A -19-27SEP91

REPLACE HYDRAULIC PUMP RELAY(S)

NOTE: "Down" relay is located on left-hand side of machine, "Up" relay is located on right-hand side.

1. Remove battery cover and disconnect battery negative (—) cable.

2. Remove front wheel mud flap, if equipped.

3. Disconnect wiring connector (B).

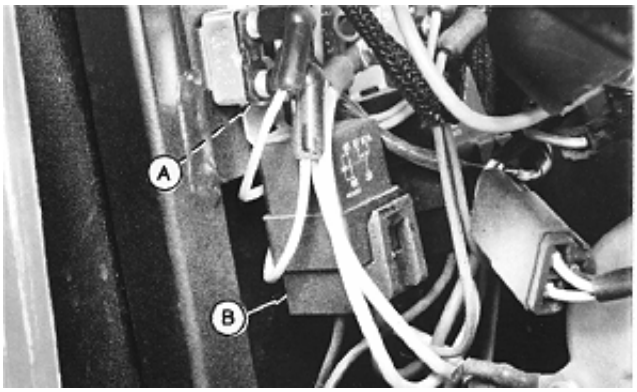
4. Remove lock nut and screw (A) and relay.

5. Install relay, screw and lock nut.

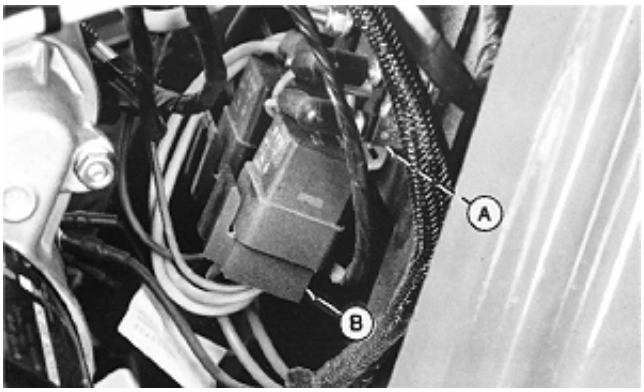
6. Connect wiring connector.

7. Install mud flap, if equipped.

8. Connect battery negative (—) cable and install cover.



"Down" Relay



"Up" Relay

MX,4010HE,A5 -19-27SEP91

REPLACE KEY SWITCH

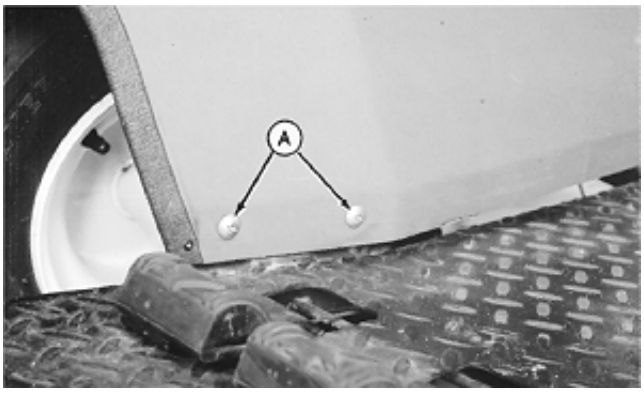
1. Remove battery cover and disconnect battery negative (—) cable.

NOTE: If not equipped with a front splash guard, go to step 5.

2. Remove steering wheel.

3. Remove lock nuts and screws (A) from each side.

4. Lift front hood.



MX,4010HE,A6 -19-27SEP91

5. Remove ring (A).

6. Disconnect wiring connectors (B).

7. Replace key switch.

8. Connect wiring connectors.

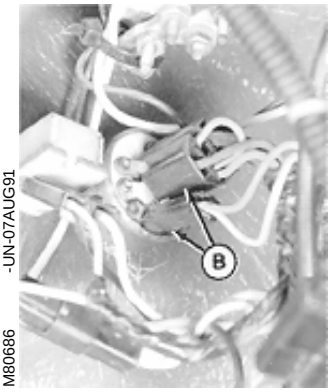
9. Install retaining ring.

10. Lower front hood.

11. Install screws and lock nuts.

12. Install steering wheel. Tighten nut to 197 N·m (145 lb-ft).

13. Connect battery negative (—) cable and install cover.



MX,4010HE,A7 -19-27SEP91

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REPLACE FRONT LIGHT SWITCH (OPTIONAL)

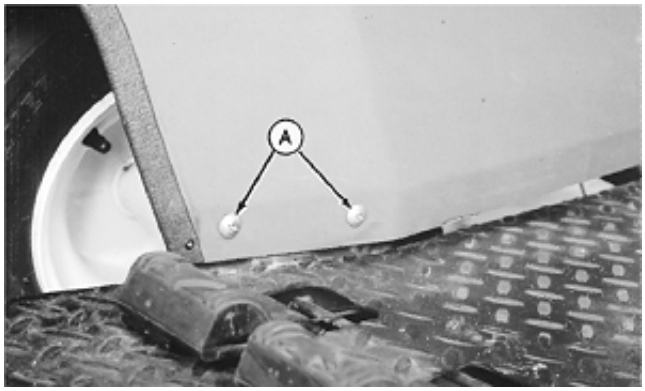
1. Remove battery cover and disconnect battery negative (—) cable.

NOTE: If not equipped with a front splash guard, go to step 5.

2. Remove steering wheel.

3. Remove lock nuts and screws ( ) from each side.

4. Lift front hood.



MX,4010HE,A8 -19-27SEP91

5. Loosen set screw (A) and remove knob.

6. Remove nut (B).

7. Disconnect wiring connectors (C).

8. Replace front light switch.

9. Connect wiring connectors.

10. Install nut.

11. Install knob and tighten set screw.

12. Lower front hood.

13. Install screws and lock nuts.

14. Install steering wheel. Tighten nut to 197 N·m (145 lb-ft).

15. Connect battery negative (—) cable and install cover.

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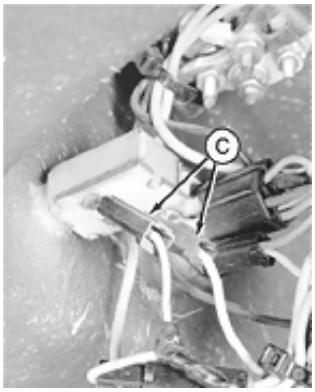

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M80689

MX,4010HE,A9 -19-27SEP91

REPLACE VOLTMETER

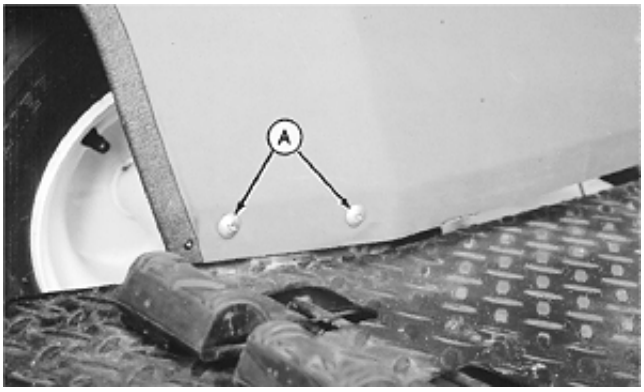
1. Remove battery cover and disconnect battery negative (—) cable.

NOTE: If not equipped with a front splash guard, go to step 5.

2. Remove steering wheel.

3. Remove lock nuts and screws (A) from each side.

4. Lift front hood.



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M80690

MX,4010HE,A10 -19-27SEP91

5. Remove tie straps as necessary.

6. Remove nuts, lock washers, wiring lead (A) and bracket (B).

7. Pull voltmeter (C) through top of hood.

8. Disconnect wiring lead (D).

9. Replace voltmeter.

10. Connect wiring lead and install voltmeter in hood.

NOTE: Install wiring lead (A) on voltmeter mount stud, between bracket and lock washer and nut.

11. Install bracket, wiring lead, lock washers and nuts.

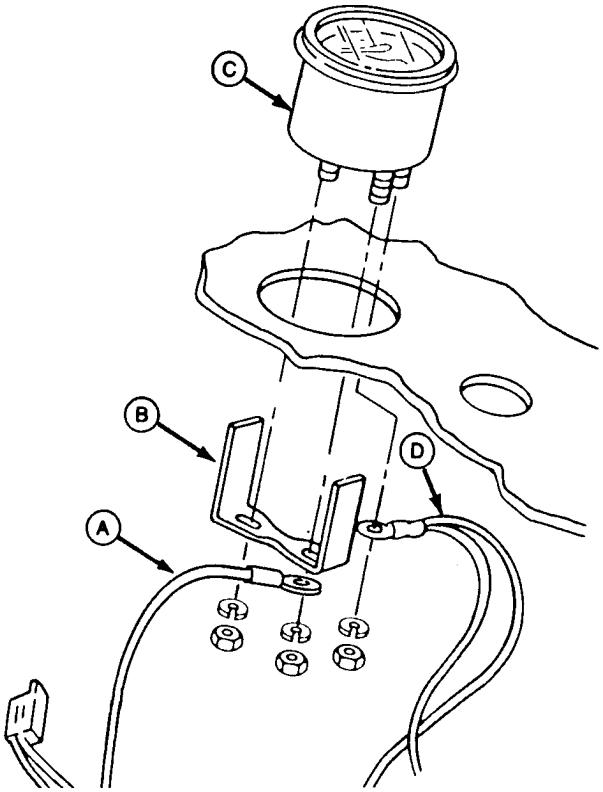
12. Install tie straps as necessary.

13. Lower front hood.

14. Install screws and lock nuts.

15. Install steering wheel. Tighten nut to 197 N·m (145 lb-ft).

16. Connect battery negative (—) cable and install cover.



M80691 -UN-07AUG91

A—Wiring Lead (Black)
B—Bracket
C—Voltmeter
D—Wiring Lead (Orange)

MX,4010HE,A11 -19-27SEP91

REPLACE HOURMETER

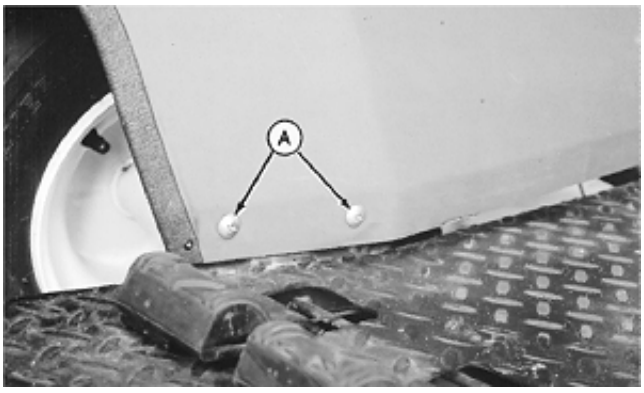
1. Remove battery cover and disconnect battery negative (—) cable.

NOTE: If not equipped with a front splash guard, go to step 5.

2. Remove steering wheel.

3. Remove lock nuts and screws (A) from each side.

4. Lift front hood.



M80690 -UN-07AUG91

MX,4010HE,A12 -19-27SEP91

5. Remove nut(s), lock washer(s) and bracket (A).

6. Pull hourmeter (B) through top of hood.

7. Disconnect wiring connectors (C and D).

8. Replace hourmeter.

9. Connect wiring connectors and install hourmeter in hood.

10. Install bracket, lock washer(s) and nut(s).

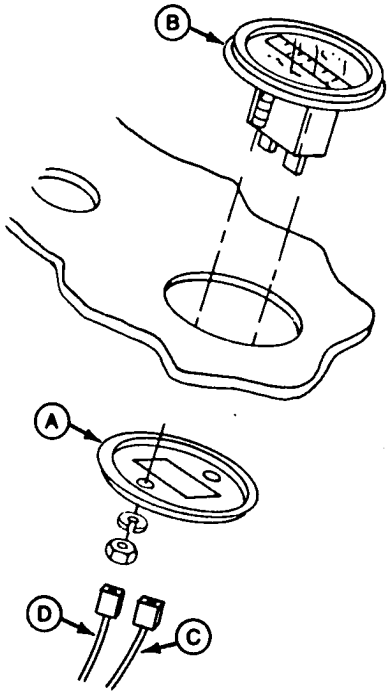
11. Lower front hood.

12. Install screws and lock nuts.

13. Install steering wheel. Tighten nut to 197 N·m (145 lb-ft).

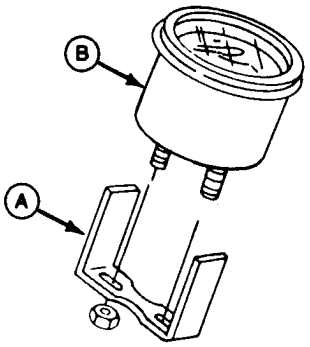
14. Connect battery negative (—) cable and install cover.

A—Bracket
B—Hourmeter
C—Wiring Connector
D—Wiring Connector



Machine S.N. —906250

M80692 -UN-07AUG91



Machine S.N. 906251—

M80693 -UN-07AUG91

MX,4010HE,A13 -19-27SEP91

REPLACE HYDRAULIC PUMP SWITCH (OPTIONAL)

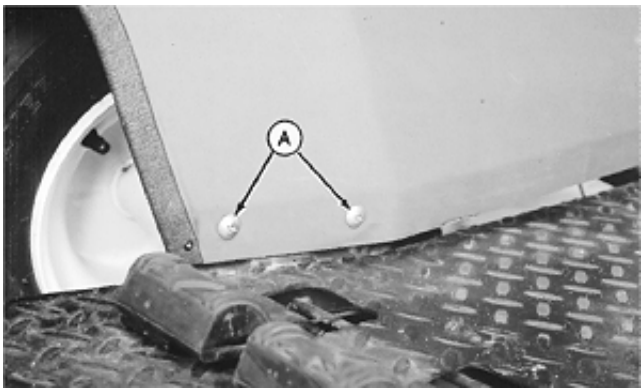
1. Remove battery cover and disconnect battery negative (—) cable.

NOTE: If not equipped with a front splash guard, go to step 5.

2. Remove steering wheel.

3. Remove lock nuts and screws (A) from each side.

4. Lift front hood.



MX,4010HE,A14 -19-27SEP91

5. Remove ring and washer (A).

6. Disconnect wiring leads (B, C and D).

7. Replace hydraulic pump switch.

8. Connect wiring leads.

9. Install washer and retaining ring.

10. Lower front hood.

11. Install screws and lock nuts.

12. Install steering wheel. Tighten nut to 197 N·m (145 lb-ft).

13. Connect battery negative (—) cable and install cover.

A—Retaining Ring and Washer
B—Wiring Lead (Blue with Black Stripe)
C—Wiring Lead (Yellow)
D—Wiring Lead (Green with Black Stripe)

MX,4010HE,A15 -19-27SEP91

REPLACE NEUTRAL START SWITCH

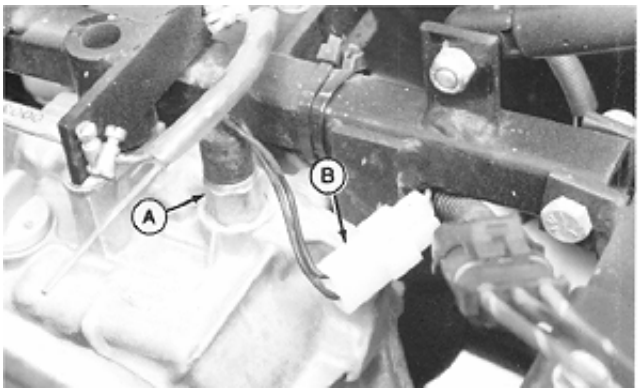
1. Remove battery cover and disconnect battery negative (—) cable.

2. Disconnect wiring connector (B).

3. Replace neutral start switch and O-ring (A). Tighten switch to 39 N·m (28 lb-ft).

4. Connect wiring connector.

5. Connect battery negative (—) cable and install cover.



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M80696

MX,4010HE,A16 -19-27SEP91

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11

REPLACE FRONT LIGHT

1. Remove battery cover and disconnect battery negative (—) cable.

2. Loosen nut (B).

3. Remove screws (A).

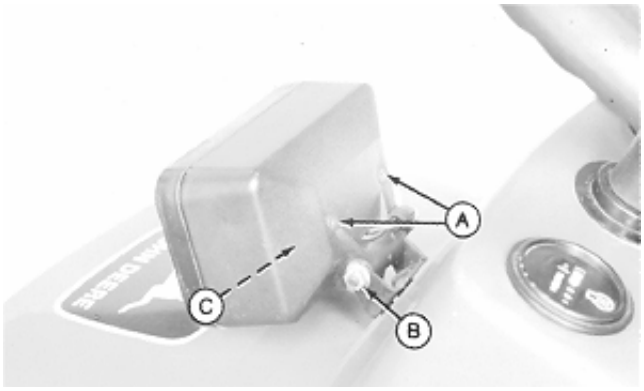
4. Disconnect wiring connector (C).

5. Replace front light.

6. Connect wiring connector.

7. Install screws and tighten nut.

8. Connect battery negative (—) cable and install cover.



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M80697

MX,4010HE,A17 -19-27SEP91

REPLACE HYDRAULIC PUMP MOTOR (OPTIONAL)

1. Remove battery cover and disconnect battery negative (—) cable.

2. Disconnect wiring connector (A).

3. Remove two cap screws (B).

4. Remove pump motor (C), O-ring (D) and coupler (E).

5. Apply multipurpose grease to shaft end and coupler.

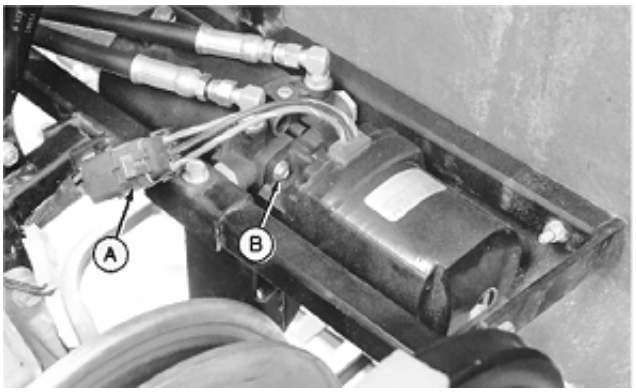
6. Install coupler, O-ring and motor.

7. Install cap screws.

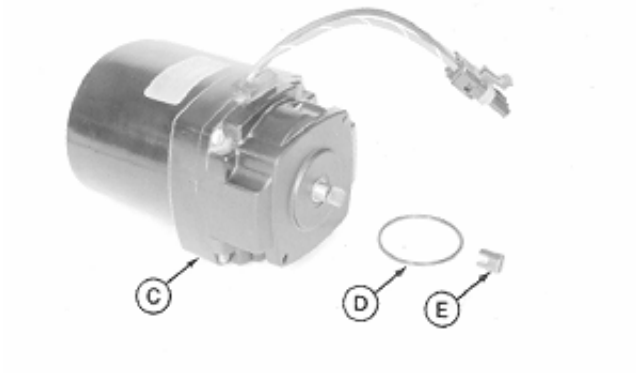
8. Connect wiring connector.

9. Connect battery negative (—) cable and install cover.

A—Wiring Connector
B—Cap Screw (2 used)
C—Hydraulic Pump Motor
D—O-Ring
E—Coupler



-UN-07AUG91
M80698



-UN-07AUG91
M80699

MX,4010HE,A18 -19-27SEP91

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10
12

SPECIAL OR ESSENTIAL TOOLS

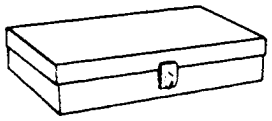
NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-05JUN91

TS446 -UN-22JUN89

Electrical Repair Tool Kit JDG155

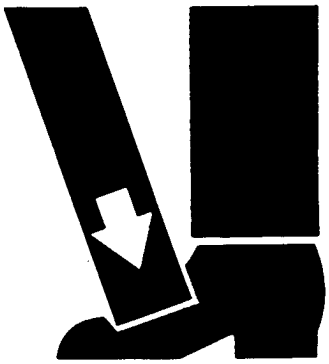
Repair and installation of wires into electrical connectors.



DX,JDG155 -19-05JUN90

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

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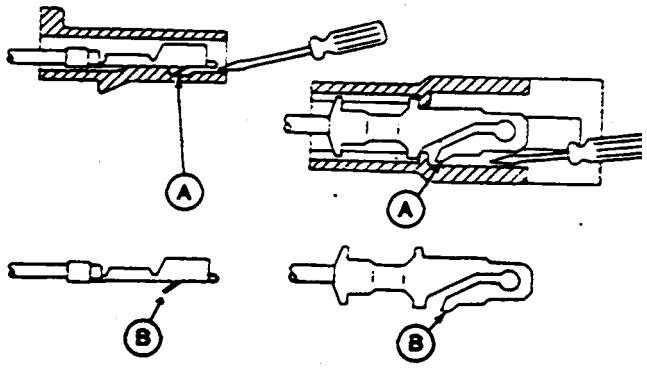
1

MX,LOW,AT -19-27SEP91

REPLACE CONNECTOR BODY—BLADE TERMINALS

1. Use a small screw driver 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.



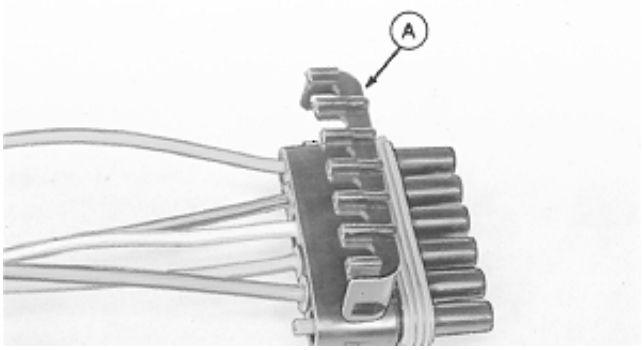
RW4218 -UN-23AUG88

MX,4025FH,A1 -19-15JAN91

REPLACE WEATHER PACK™ CONNECTOR

IMPORTANT: Identify wire color locations with connector terminal letters.

1. Open connector body (A).

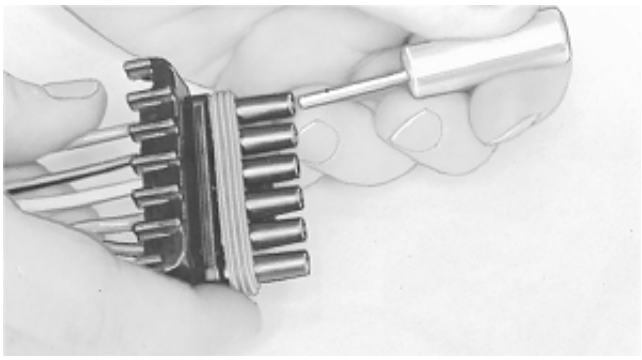


TS0127 -UN-23AUG88

WEATHER PACK is a trademark of PACKARD ELECTRIC

DX,ECONN,O -19-04JUN90

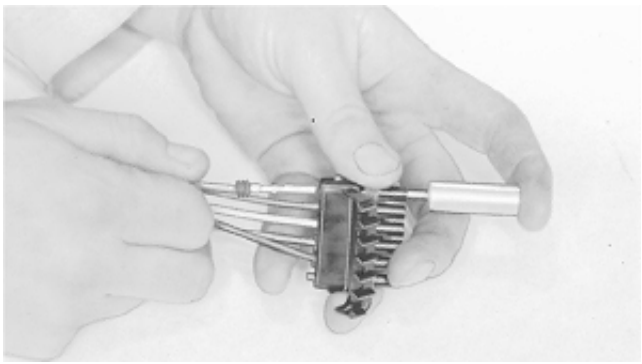
2. Insert JDG364 Extraction Tool over terminal contact in connector body.



DX,ECONN,P -19-04JUN90

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.



DX,ECONN,Q -19-04JUN90

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

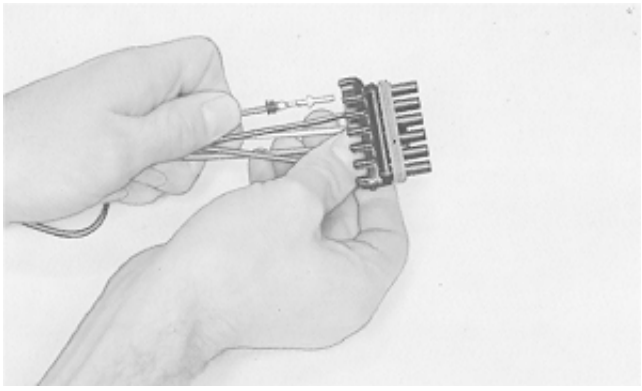
NOTE: Connector bodies are "keyed" for proper contact mating. Be sure contacts are in proper alignment.

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.

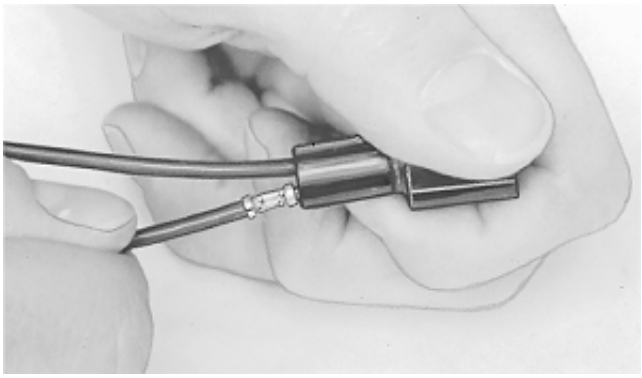
7. Close connector body.



DX,ECONN,R -19-04JUN90

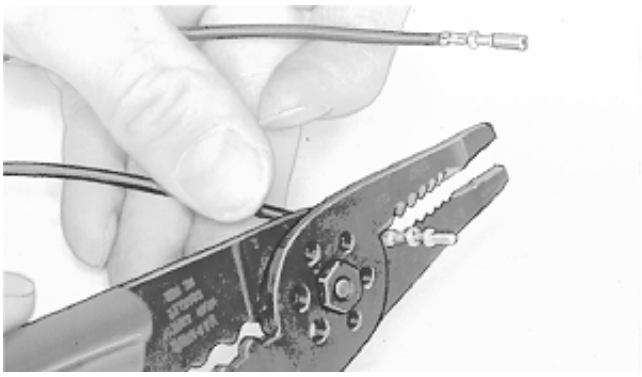
REPLACE SURE-SEAL™ CONNECTOR WITH WEATHER PACK CONNECTOR

1. Pull wire to remove contact from SURE-SEAL connector.



DX,ECONN,S -19-04JUN90

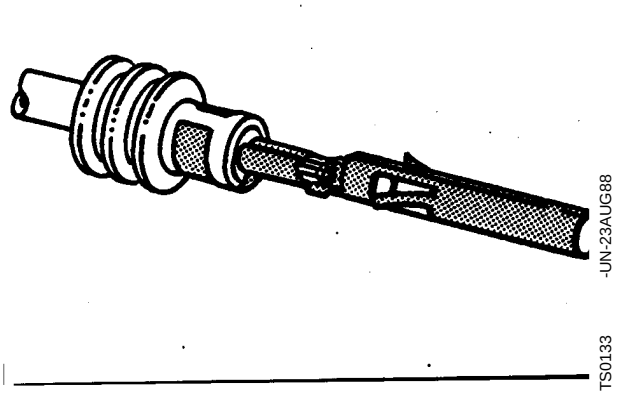
2. Use JDG145 Universal Electrical Plier to remove wire as close as possible to contact.



DX,ECONN,T -19-04JUN90

IMPORTANT: SURE-SEAL and WEATHER PACK connector bodies are “keyed” for proper contact mating. Be sure contacts are in proper alignment. SURE-SEAL connectors are keyed 1, 2, 3. WEATHER PACK connectors are keyed A, B, C. “A” matches 1, “B” matches 2 and “C” matches 3. See component replacement stories for any exceptions on connector codes.

3. Install WEATHER PACK contact on wire. (See install WEATHER PACK Contact in this section.)

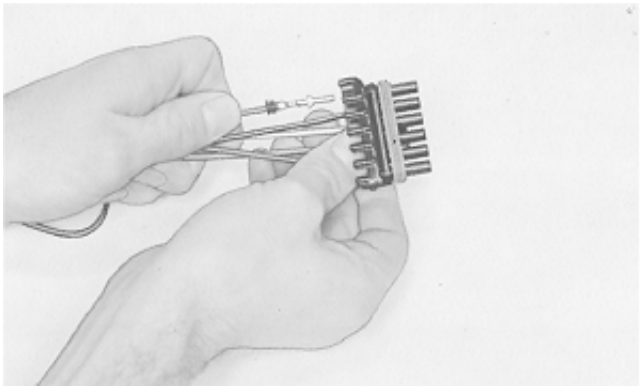


DX,ECONN,U -19-04JUN90

4. Push contact into WEATHER PACK connector body until fully seated.

5. Pull on wire slightly to be certain contact is locked in place.

6. Close connector body.



DX,ECONN,V -19-04JUN90

INSTALL WEATHER PACK CONTACT

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

- *a) Green - 18 to 20 gauge wire*
- *b) Gray - 14 to 16 gauge wire*
- *c) Blue - 10 to 12 gauge wire*

1. Slip correct size cable seal on wire.

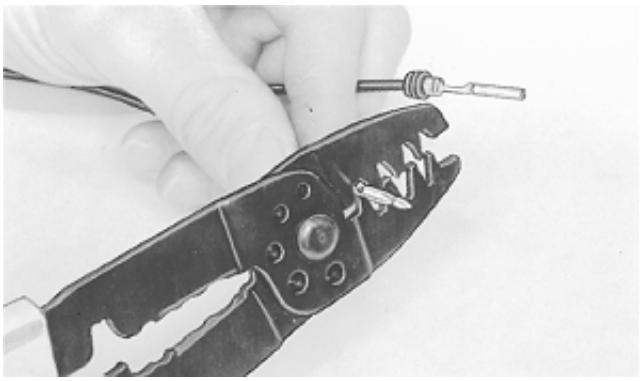
2. Strip insulation from wire to expose 6 mm (1/4 in.) and align cable seal with edge of insulation.

DX,ECONN,AA -19-04JUN90

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

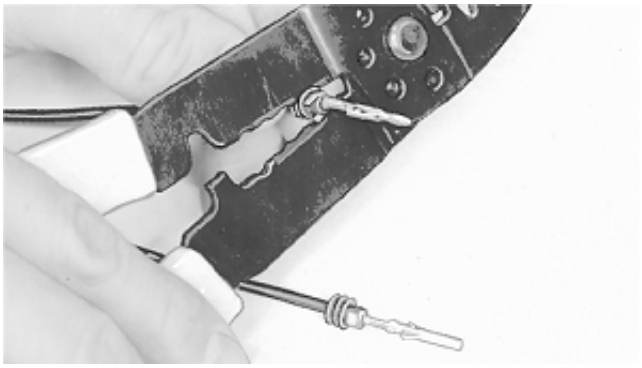
- *a) #15 for 14 to 16 gauge wire*
- *b) #19 for 18 to 20 gauge wire*

3. Place proper size contact on wire and use JDG144 Terminal Applicator to crimp contact in place with a “W” type crimp.



DX,ECONN,AB -19-04JUN90

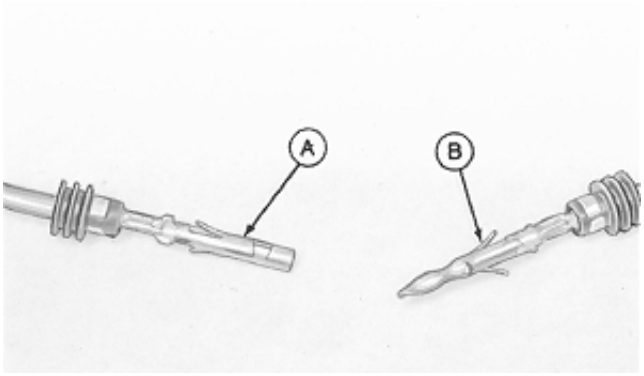
4. Use JDG144 Terminal Applicator to secure cable seal to contact as shown.



TS0138 -UN-23AUG88

DX,ECONN,AC -19-04JUN90

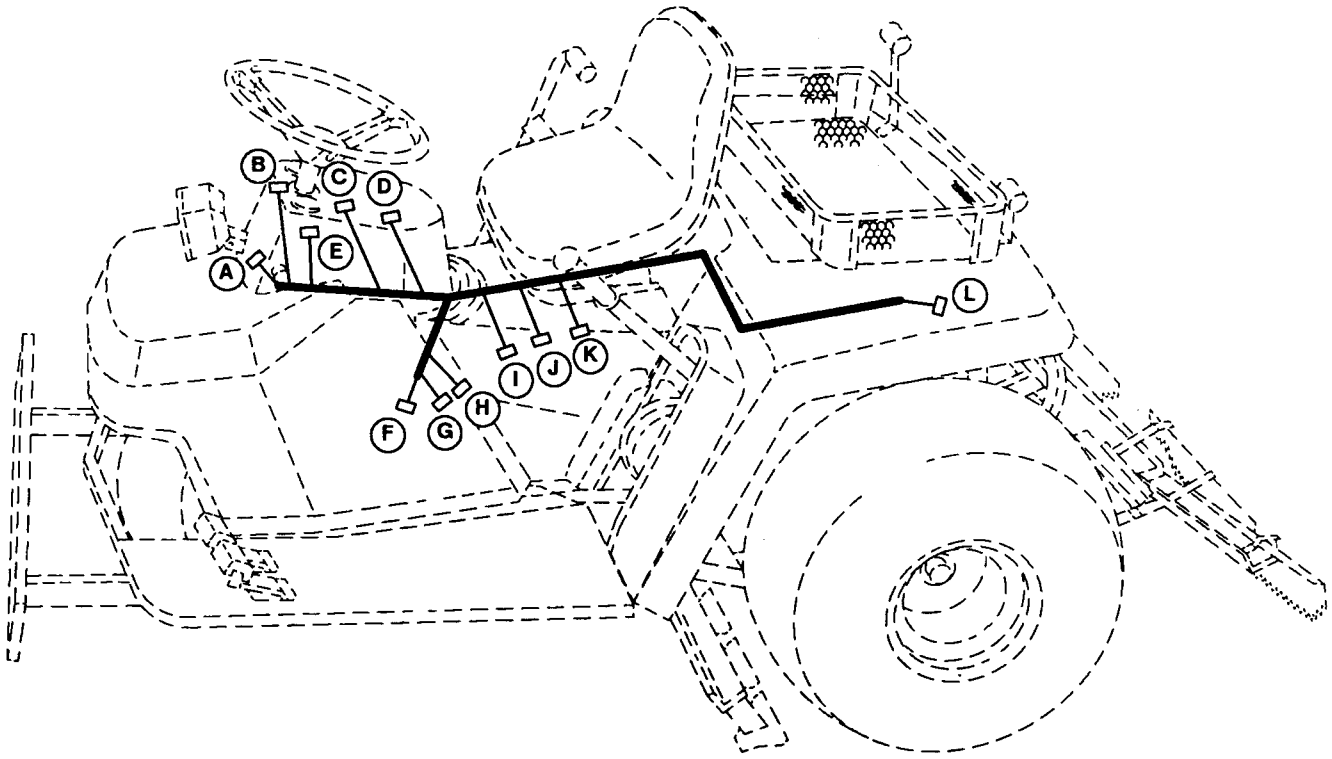
IMPORTANT: Proper contact installation for “sleeve” (A) and “pin” (B) is shown.



TS0139 -UN-02DEC88

DX,ECONN,AD -19-04JUN90

REPLACE MACHINE WIRING HARNESS



M80700AE -UN-07AUG91

A—Front Light
B—Voltmeter
C—Front Light Switch
D—Key Switch
E—Hourmeter
F—Voltage Regulator
G—Circuit Breaker (Left-Hand Side)
H—Circuit Breaker (Right-Hand Side)
I—Ground
J—Starter Solenoid
K—Engine Harness
L—Neutral Start Switch

1. Lift up rear body cowling.

2. Remove battery cover and disconnect battery negative (—) cable.

3. Cut all tie straps.

4. Disconnect wiring connectors (A—L).

5. Replace wiring harness.

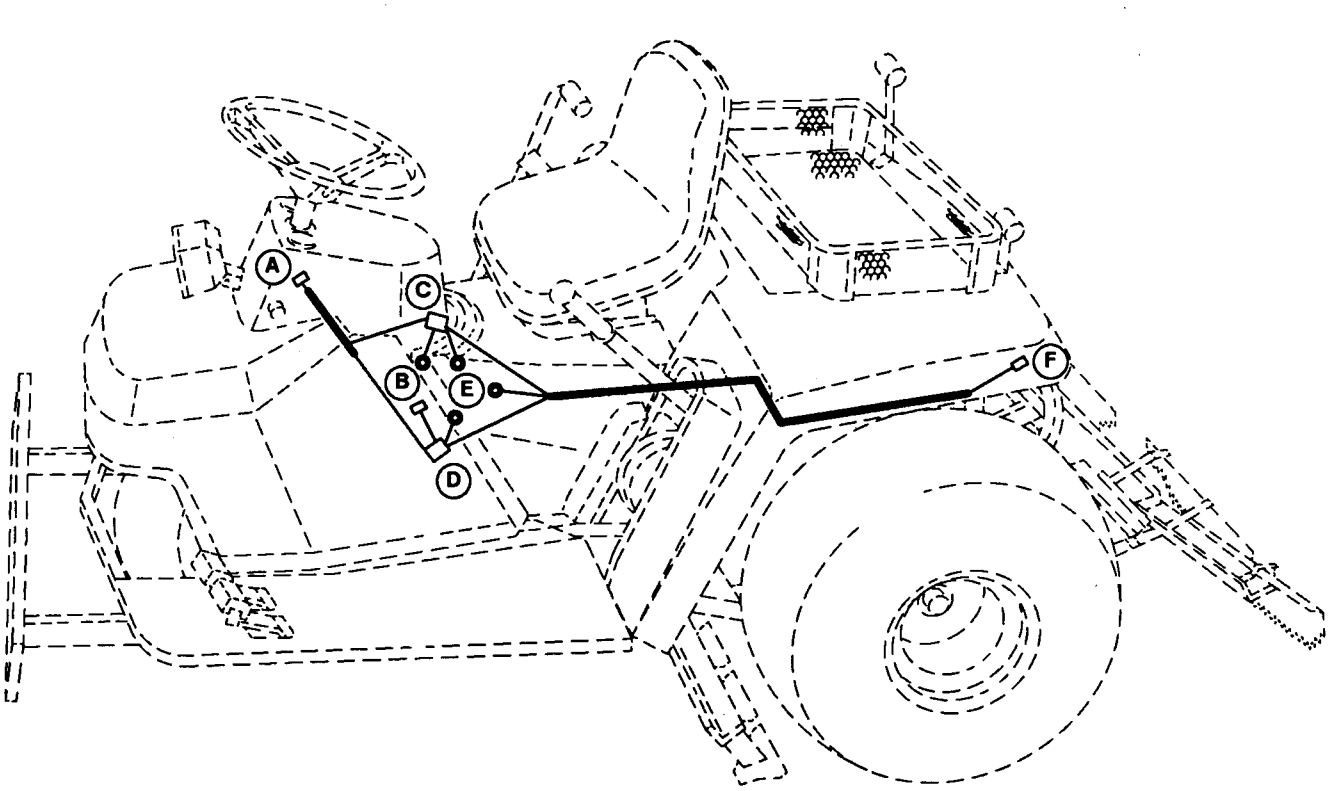
6. Connect wiring connectors.

7. Install tie straps as necessary.

8. Connect battery negative (—) cable and install cover.

MX,4015HE,A1 -19-27SEP91

REPLACE HYDRAULIC PUMP WIRING HARNESS (OPTIONAL)



M807701AE -UN-07AUG91

A—Hydraulic Pump Switch
B—Circuit Breaker (Center)
C—Hydraulic Pump "Up" Relay
D—Hydraulic Pump "Down" Relay
E—Ground Wiring Leads
F—Hydraulic Pump Motor

1. Lift up rear body cowling.
2. Remove battery cover and disconnect battery negative (—) cable.
3. Cut all tie straps.
4. Disconnect wiring connector and leads (A—F).
5. Replace wiring harness.
6. Connect wiring connectors and leads.
7. Install tie straps as necessary.
8. Connect battery negative (—) cable and install cover.

MX,4015HE,A2 -19-27SEP91

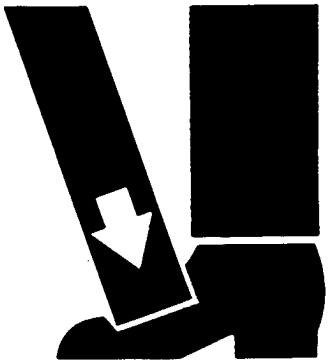
Section 50
POWER TRAIN REPAIR

Contents

50

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE WET REDUCTION CLUTCH

1. Disconnect spark plug wiring lead.

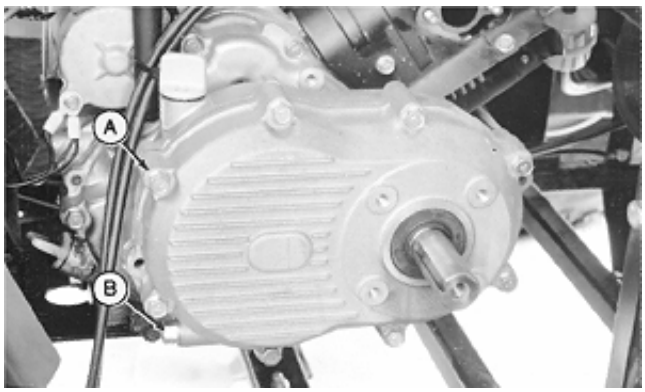
2. Remove drive clutch. (See Group 10.)

3. Remove muffler. (See Section 20, Group 10.)

NOTE: Approximate reduction clutch oil capacity is 0.6 L (1.3 U.S. pt).

4. Remove plug (B) to drain gear case.

5. Remove eight cap screws (A). Tap seam of case with a plastic hammer and remove case cover and gasket.



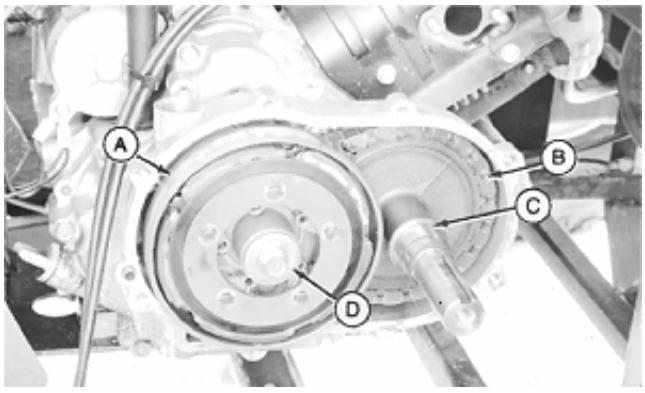
M80707 -UN-10SEP91

MX,5005HE,A1 -19-27SEP91

6. Remove cap screw and washer (D).

7. Remove clutch drum assembly (A) together with output shaft/gear (C) and roller chain (B).

A—Clutch Drum Assembly
B—Roller Chain
C—Output Shaft/Gear
D—Cap Screw and Washer



M80708 -UN-10SEP91

MX,5005HE,A2 -19-27SEP91

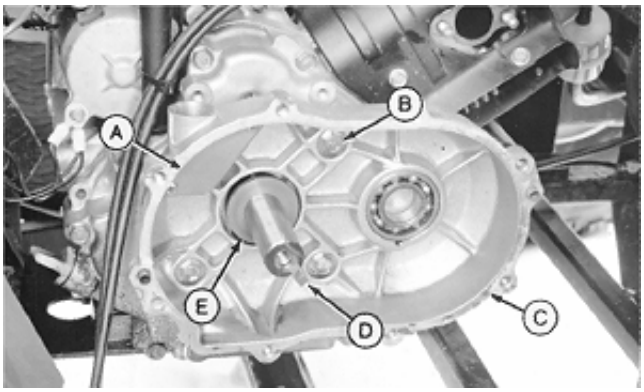
8. Remove key (D), spacer (E) and cover (A).

9. Remove four cap screws (B).

10. Remove case half (C) and gasket.

11. Make repairs as necessary. (See procedures in this group.)

A—Baffle Cover
B—Cap Screw (4 used)
C—Gear Case Half
D—Key
E—Spacer



M80709 -UN-10SEP91

MX,5005HE,A3 -19-27SEP91

DISASSEMBLE AND INSPECT WET REDUCTION CLUCTCH

1. Remove roller chain (B) from output shaft/gear (C) and clutch drum assembly (A).

M80710 -UN-10SEP91

MX,5005HE,A4 -19-27SEP91

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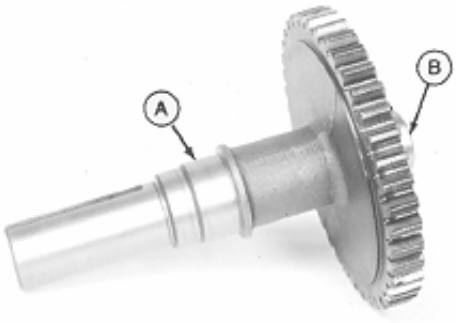
05
2

2. Inspect output shaft and gear for damage. Replace if necessary.

3. Measure output shaft/gear main bearing journals (A and B). Replace shaft if less than specifications.

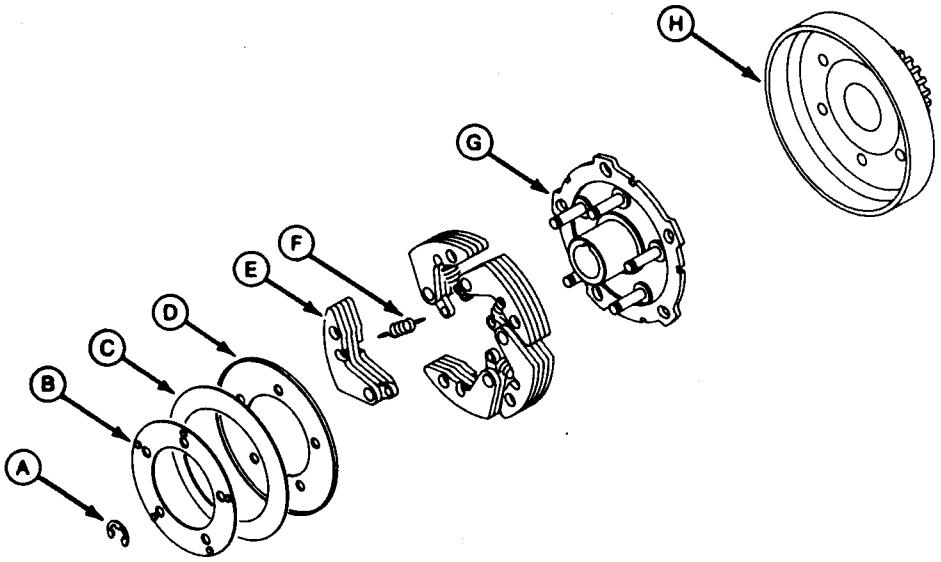
SPECIFICATIONS (MIN)

Gear Side Journal (B) . . . . . 0.25 mm (0.982 in)
Output Shaft Side Journal (A) . . . . . 31.94 mm (1.257 in.)



M80711 -UN-10SEP91

MX,5005HE,A5 -19-27SEP91



M80712 -UN-10SEP91

50 05 3

A—E-Clip
B—Washer
C—Spring Washer
D—Washer/Retainer
E—Clutch Shoe (5 used)
F—Spring (5 used)
G—Drive Hub
H—Clutch Drum

Clutch Drum Assembly

4. Remove clutch drum (H).

5. Push down on washer (B) and remove E-clips (A).

6. Disassemble parts (B—G).

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

MX,5005HE,A6 -19-27SEP91

8. Measure drive hub journal. Replace drive hub if diameter is less than 36.92 mm (1.453 in.).

M80713 -UN-10SEP91

Drive Hub

MX,5005HE,A7 -19-27SEP91

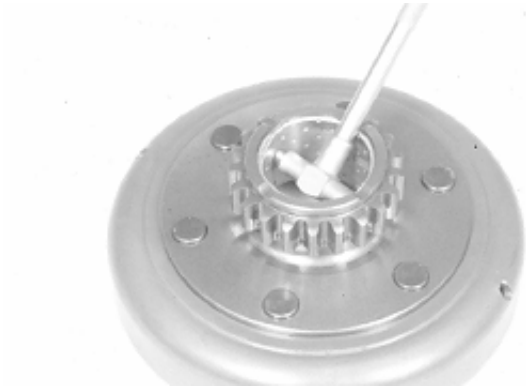
9. Measure clutch drum bushing. Replace bushing if diameter is greater than specifications.

Replace bushing using a bearing, bushing and seal driver set and a press. Align notches (C) on bushing with grooves (B) of clutch drum flange. Install bushing below clutch drum flange surface to specifications.

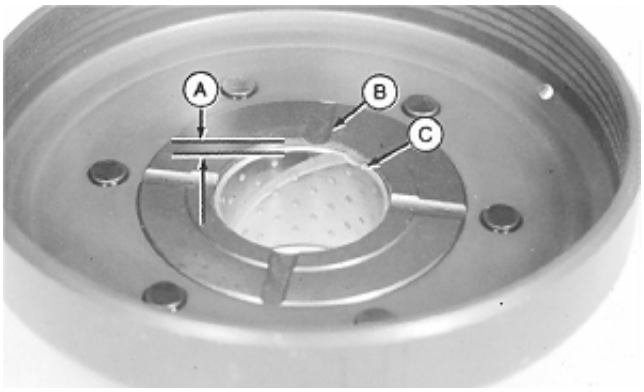
After bushing is installed, finish bushing to specifications.

SPECIFICATIONS

Bushing ID (MAX) . . . . . 37.08 mm (1.460 in.)
Bushing Depth (A) . . . . . 1.50 mm (0.060 in.)
Bushing Finished ID . . . . . 37.00—37.03 mm (1.457—1.458 in.)



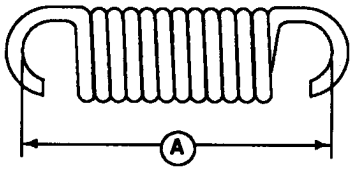
M80714 -UN-10SEP91



M80715 -UN-10SEP91

MX,5005HE,A8 -19-27SEP91

10. Measure clutch spring free length (A). Replace spring if free length is more than 22.70 mm (0.890 in.).



M80716AE -UN-10SEP91

MX,5005HE,A9 -19-27SEP91

11. Inspect parts (A—F) for wear or damage. Replace as necessary.

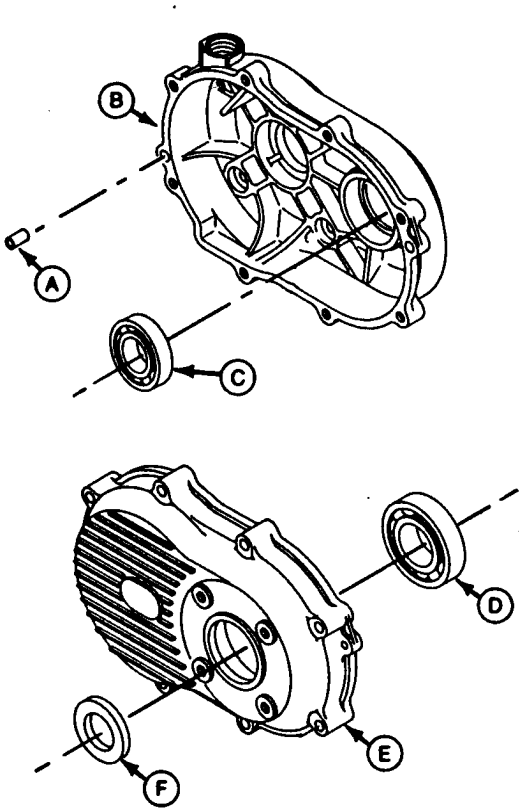
NOTE: Remove bearings only if replacement is necessary.

Replace bearing (D) and seal (F) using a bearing, bushing and seal driver set.

Apply multipurpose grease to lips of seal (F) before installation.

Remove bearing (C) using a blind-hole puller set. Install bearing flush to case half surface using a bearing, bushing and seal drive set and a press.

A—Alignment Pin (2 used)
B—Case Half
C—Ball Bearing
D—Ball Bearing
E—Case Half Cover
F—Seal

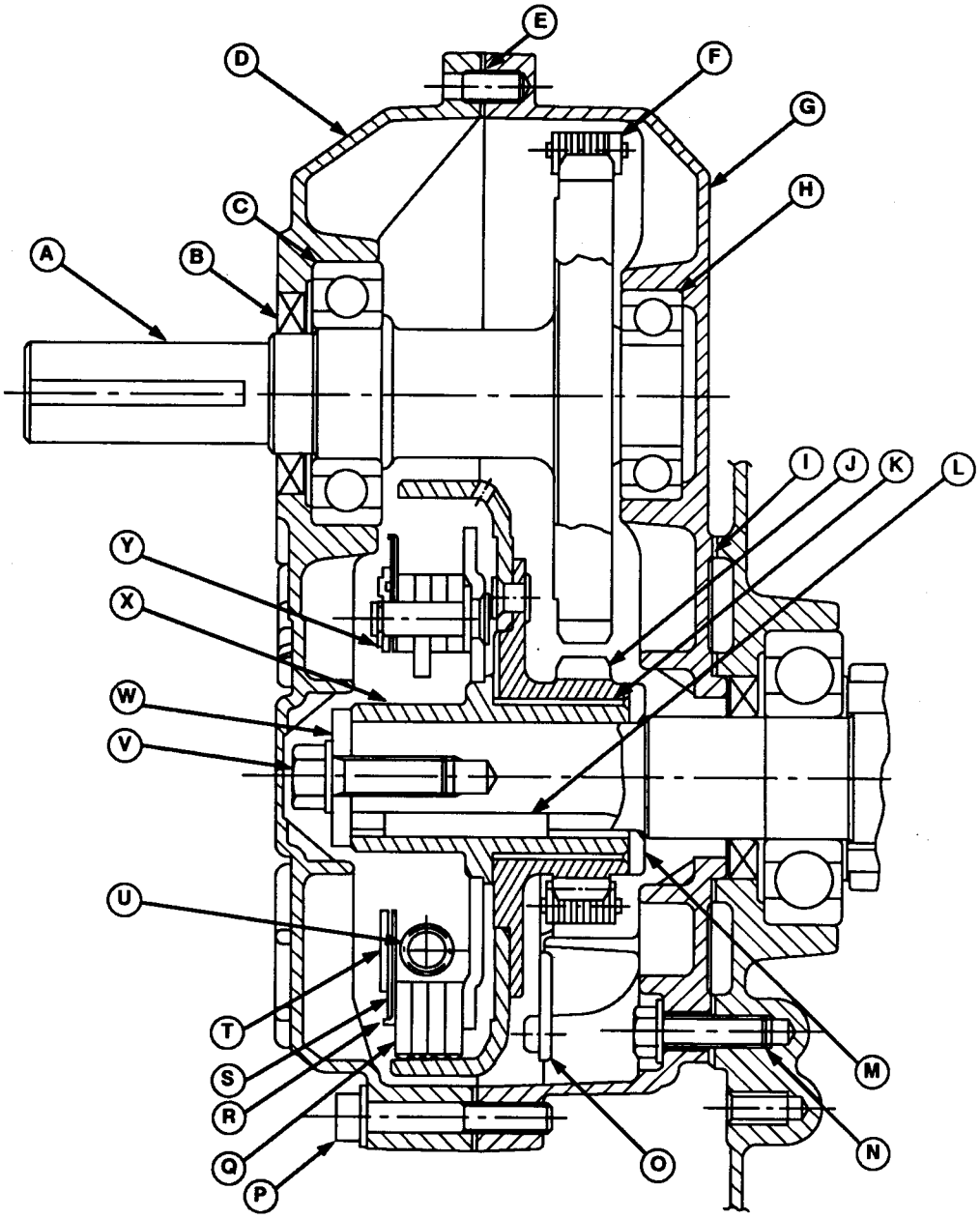


Case Halves

M80717 -UN-10SEP91

MX,5005HE,A10 -19-27SEP91

WET REDUCTION CLUTCH CROSS SECTION



M80660AE -UN-10SEP91

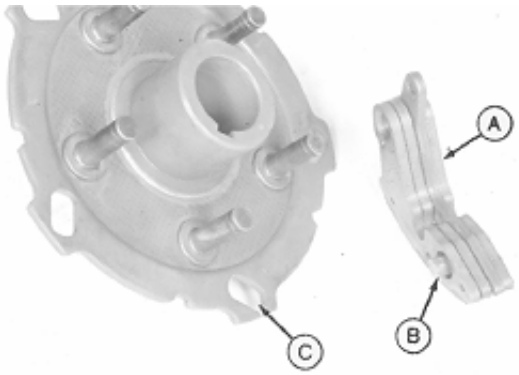
A—Output Shaft/Gear
B—Seal
C—Ball Bearing
D—Gear Case Cover
E—Gasket
F—Roller Chain
G—Gear Case Half
H—Ball Bearing
I—Gasket
J—Clutch Drum
K—Bushing
L—Key
M—Spacer
N—Cap Screw (4 used)
O—Baffle Cover
P—Cap Screw (8 used)
Q—Clutch Shoe (5 used)
R—Washer
S—Spring Washer
T—Washer
U—Shoe Spring (5 used)
V—Cap Screw
W—Washer
X—Drive Hub
Y—E-Clip (5 used)

MX,5005HE,A11 -19-27SEP91

ASSEMBLE WET REDUCTION CLUTCH

1. Install clutch shoes (A) with tab (B) into slot (C) of drive hub.

2. Install springs.



M80718 -UN-10SEP91

Drive Hub and Shoes

MX,5005HE,A12 -19-27SEP91

IMPORTANT: Do not reuse E-clips (A). Replace with new.

NOTE: Install washers (B and D) with flat side toward clutch shoes.

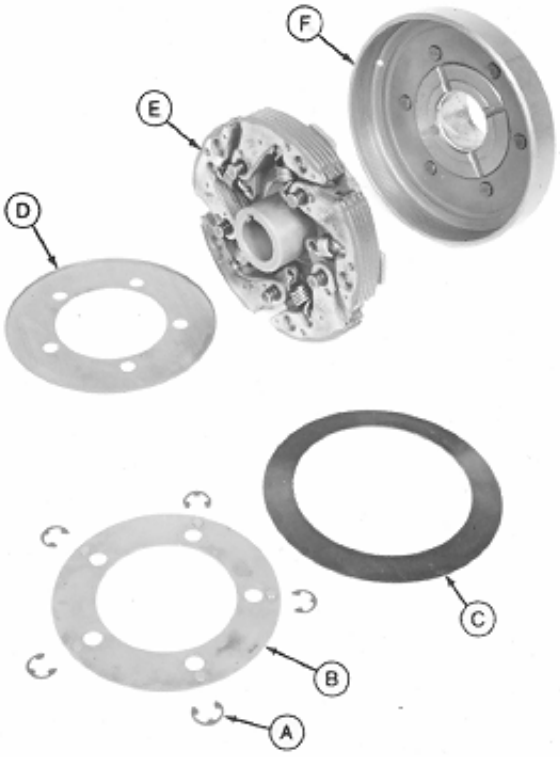
3. Install parts (B—E).

NOTE: Install spring washer (C) with concave side toward clutch shoes.

4. Push down on washer (B) and install E-clips (A).

5. Install drum (F).

A—E-Clip (5 used)
B—Washer
C—Spring Washer
D—Washer/Retainer
E—Clutch Assembly
F—Clutch Drum



M80719 -UN-10SEP91

MX,5005HE,A13 -19-27SEP91

6. Install roller chain (B) on output shaft/gear (C) and clutch drum assembly (A).

M80710 -UN-10SEP91

MX,5005HE,A14 -19-27SEP91

INSTALL WET REDUCTION CLUTCH

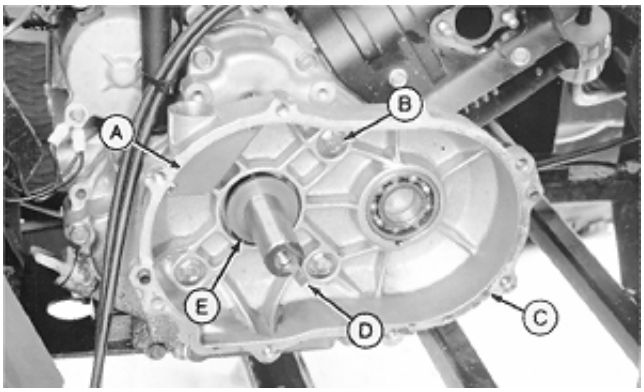
1. Install new gasket and case half (C).

2. Install cap screws (B). Tighten to 28 N·m (20 lb-ft).

IMPORTANT: Install spacer (E) with chamfered ID toward engine.

3. Install cover (A), spacer (E) and key (D).

A—Baffle Cover
B—Cap Screw (4 used)
C—Gear Case Half
D—Key
E—Spacer



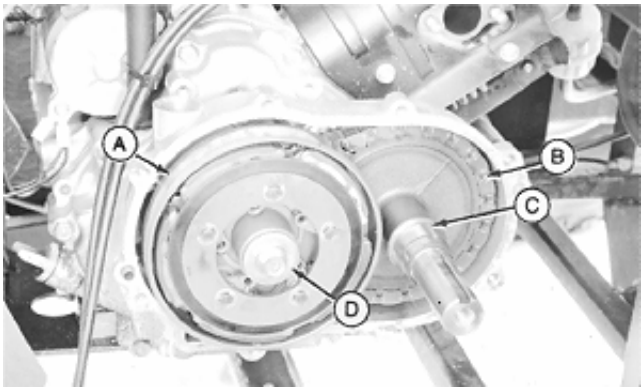
M80709 -UN-10SEP91

MX,5005HE,A15 -19-27SEP91

4. Install output shaft/gear (C) and roller chain (B) together with clutch drum assembly (A).

5. Install washer and cap screw (D). Tighten to 55 N·m (40 lb-ft).

A—Clutch Drum Assembly
B—Roller Chain
C—Output Shaft/Gear
D—Cap Screw and Washer



M80708 -UN-10SEP91

MX,5005HE,A16 -19-27SEP91

6. Install new gasket, case cover and cap screws (A). Tighten cap screws to 28 N·m (20 lb-ft).

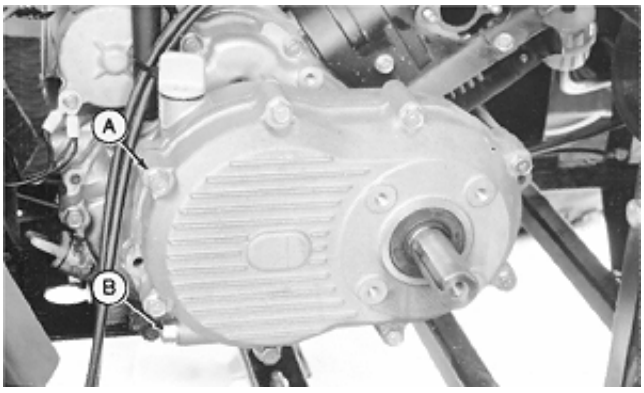
7. Install plug (B).

8. Fill clutch assembly with proper oil. (See Section 10, Group 20.)

9. Install muffler. (See Section 20, Group 10.)

10. Install drive clutch. (See Group 10.)

11. Connect spark plug wiring lead.



M80707 -UN-10SEP91

MX,5005HE,A17 -19-27SEP91

SPECIAL OR ESSENTIAL TOOLS

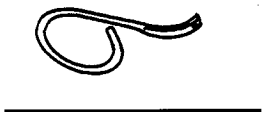
NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-05JUN91

RW12167 -UN-04MAY89

Salsbury Clutch Spring Tool JDM4-A

Release and seat clutch tension springs.



DX,JDM4A -19-27SEP91

OTHER MATERIAL

Number	Name	Use
PT569	John Deere NEVER-SEEZ® Lubricant	Prevents parts from seizing.

NEVER-SEEZ is a trademark of the Emhart Chemical Group.

MX,6005GC,A1 -19-15JAN91

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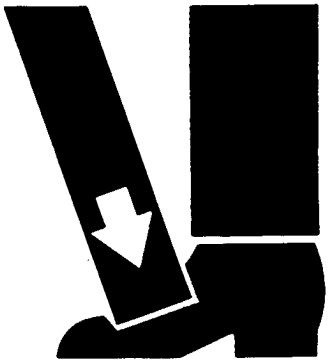
LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE DRIVE BELT

1. Remove battery cover and disconnect battery negative (—) cable.

2. Put machine in gear and lock park brake.

IMPORTANT: Do not pry sheave halves apart with tools. Damage to sheave surface or ramp shoes may result.

3. Rotate inner sheave half toward front of machine and outer sheave half toward rear.

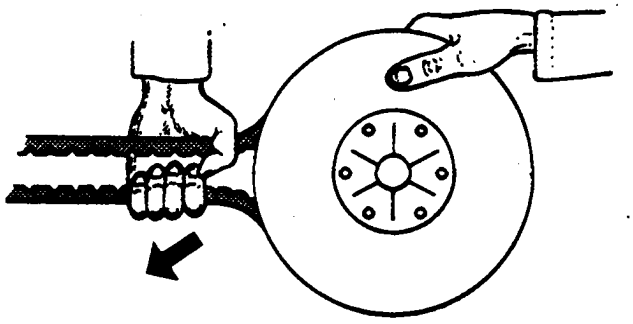
4. Center ramp shoe (A) between inner sheave ramps.

M80760 -UN-10SEP91

MX,5010HE,A1 -19-27SEP91

5. Hold outer sheave in rotated position with right hand.

6. Grasp belt in left hand pulling down and away while forcing belt into sheave with fingers of right hand.



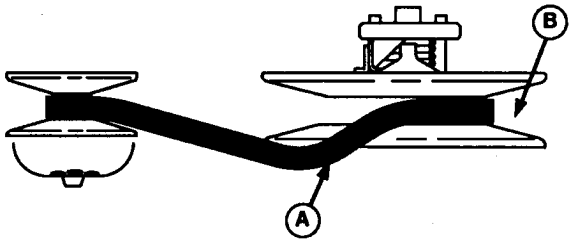
RW12117 -UN-04MAY89

MX,5010HE,A2 -19-27SEP91

7. Loop slack in belt (A) over outer sheave while holding belt in sheave (B).

8. Rotate sheave to remove belt from driven clutch.

9. Remove drive belt.



M80761AE -UN-10SEP91

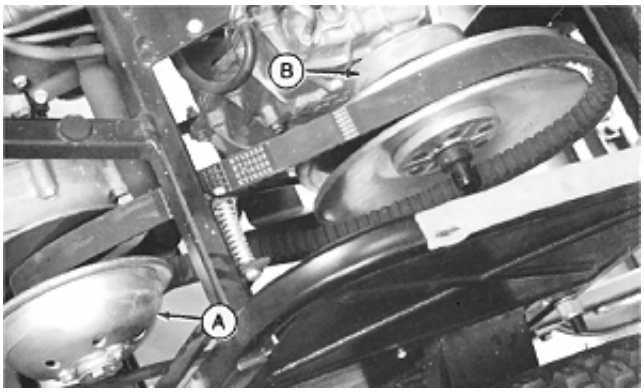
MX,5010HE,A3 -19-27SEP91

INSTALL DRIVE BELT

NOTE: Install belt so that printing on belt may be read from left side of vehicle.

1. Install belt on drive clutch (A).

2. Pull belt up to driven clutch (B) and place as much of the belt as possible between sheave halves.



-UN-10SEP91
M80762

MX,5010HE,A4 -19-27SEP91

IMPORTANT: Do not pry sheave halves apart with tools. Damage to sheave surface or ramp shoes may result.

NOTE: Sheave halves tend to bind and resist separation unless force is applied at points half way around the clutch.

3. From right side of machine, pull inner sheave half away from outer sheave half while turning sheave counterclockwise.

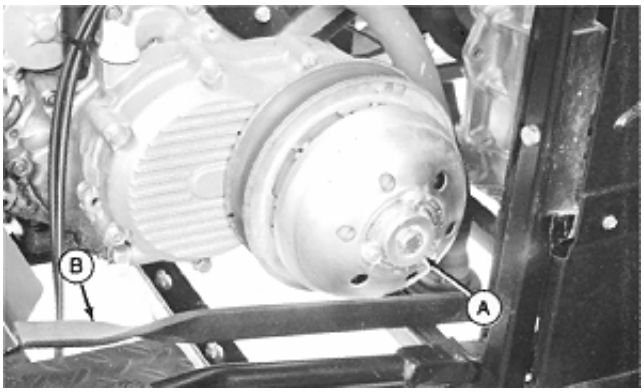
4. Rotate sheave to complete installation.

5. Connect battery negative (—) cable and install battery cover.

-UN-10SEP91
M80763

MX,5010HE,A5 -19-27SEP91

REMOVE AND INSTALL DRIVE CLUTCH



M80764 -UN-10SEP91

1. Remove drive belt. (See this group.)

2. Hold drive clutch using a strap wrench and remove cap screw and washers (A).

3. Push down and hold differential lock pedal (B).

4. Remove drive sheave, key and washer, if equipped.

5. Make repairs as necessary. (See procedures in this group.)

6. Apply NEVER-SEEZ lubricant or an equivalent to wet reduction clutch output shaft.

7. Install washer, if equipped, key and drive clutch.

8. Install washers and cap screw. Hold drive clutch using a strap wrench and tighten cap screw to 50 N·m (37 lb-ft).

9. Install drive belt.

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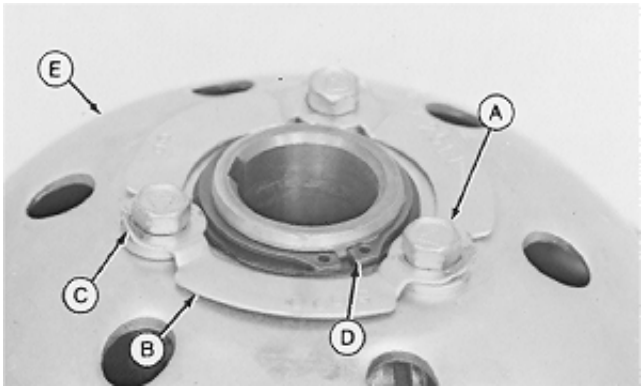
MX,5010HE,A6 -19-27SEP91

DISASSEMBLE DRIVE CLUTCH



RW12392 -UN-21NOV88

1. Bend lock tabs down and remove ramp plate retaining cap screw (A).

2. Remove lock ring (B) and washers (C).

3. Remove snap ring (D) and ramp plate (E).

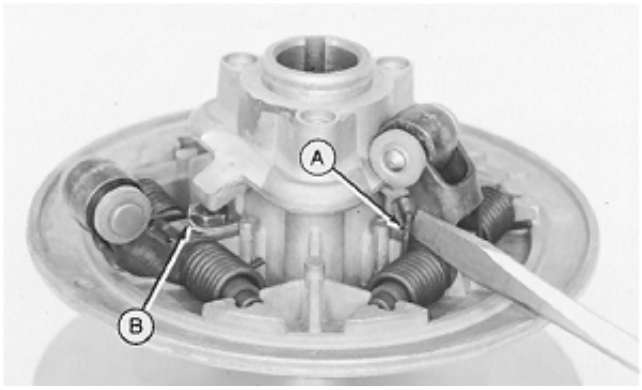
A—Cap Screws (3 used)
B—Lock Ring
C—Washers (3 used)
D—Snap Ring
E—Ramp Plate

MX,5010HE,A7 -19-27SEP91

4. Release springs (A), if equipped from roller arm.

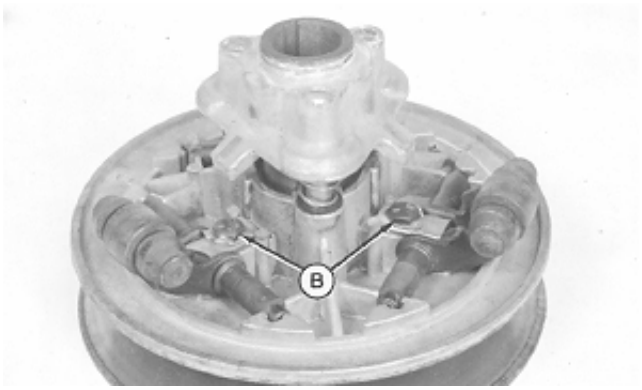
5. Bend lock tabs down and remove roller arm retaining cap screws (B).

6. Remove roller arm assemblies.



RW12164 -UN-21NOV88

(S.N. —840000)



M80765 -UN-10SEP91

(S.N. 840001—)

MX,5010HE,A8 -19-27SEP91

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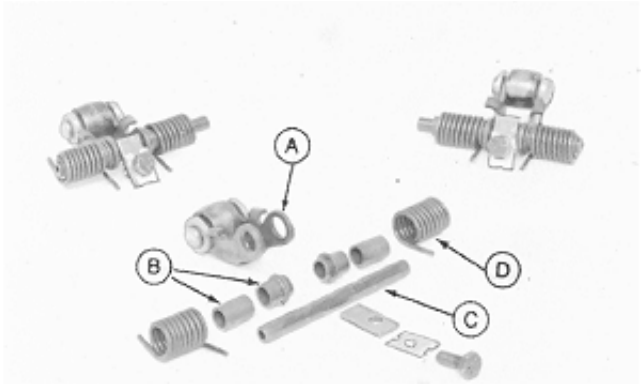
INSPECT AND REPAIR DRIVE CLUTCH

1. Disassemble and clean roller arm assemblies.

NOTE: Use complete service kits. Do not mix new and used parts of the same kind.

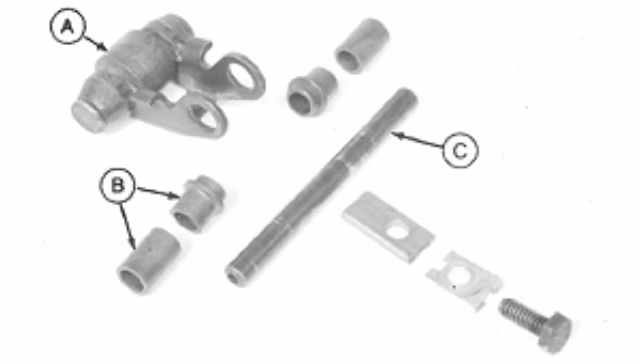
2. Inspect all parts for wear or damage. Replace as necessary.

A—Roller Arm
B—Sleeves (2 used)
C—Shaft
D—Spring (2 used)



RW12165 -UN-21NOV88

(S.N. —840000)



M80766 -UN-10SEP91

(S.N. 840001—)

MX,5010HE,A9 -19-27SEP91

3. Clean and inspect fixed sheave (A), movable sheave (B), and spider (C).

4. Check sheaves for wear with straight edge.

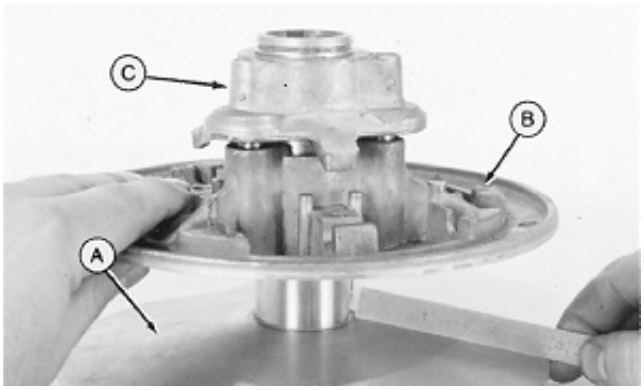
5. Check movable sheave bushing for excessive wobble.

NOTE: Spider must be removed to replace sheaves or springs (A) and retainers (E).

Spider is an interference fit. Any movement requires replacement.

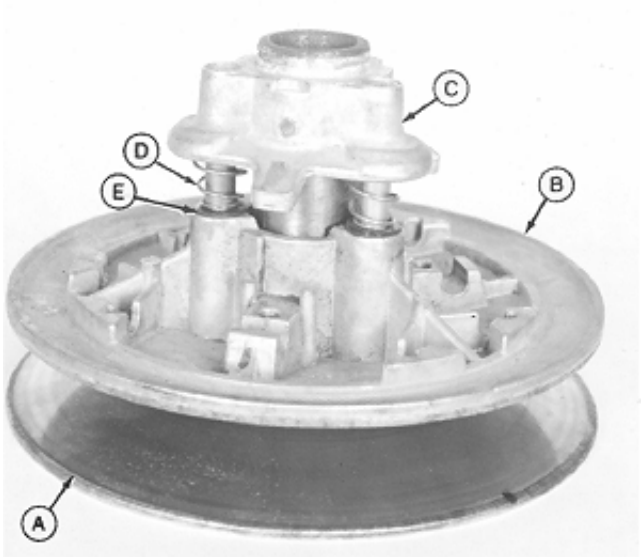
6. Inspect springs (D) and retainers (E), if equipped, for wear or damage. Replace if necessary.

A—Fixed Sheave
B—Movable Sheave
C—Spider
D—Spring (3 used)
E—Retainer (3 used)



RW12394 -UN-21NOV88

(S.N. —840000)



M80767 -UN-10SEP91

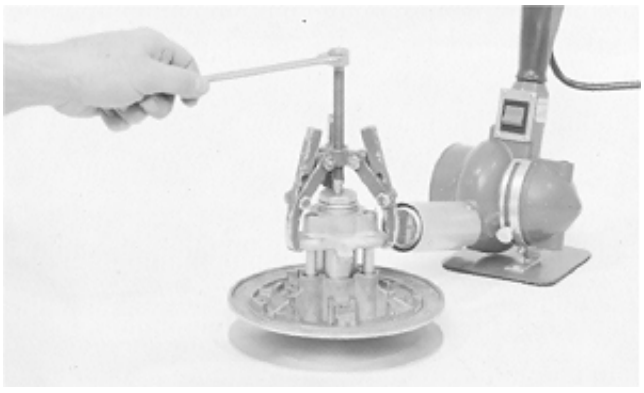
(S.N. 840001—)

MX,5010HE,A10 -19-27SEP91

IMPORTANT: If spider is removed, it must be replaced. Do not reuse spider.

NOTE: Apply heat to spider with heat gun during removal.

7. If spider must be removed, use a jaw puller and a disk from a bearing, bushing and seal driver kit.


RW12166 -UN-21NOV88

MX,5010HE,A11 -19-27SEP91

NOTE: Install springs with large end toward spider.

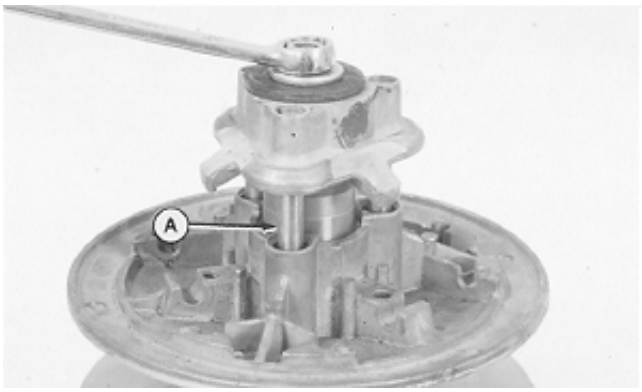
8. Install retainers and springs, if equipped, on spider legs (A).

9. Assemble spider hot and dry, heat new spider to 80—123˚C (180—250˚F).

IMPORTANT: Spider legs (A) must be engaged in movable pulley.

10. Press spider onto hub using a bolt or 300 mm (12 in.) threaded stock, four washers, and two nuts.

11. Tighten nut until spider is flush with top of hub.

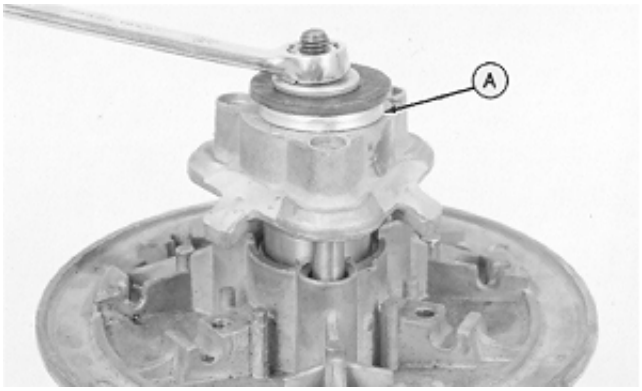


RW12395 -UN-21NOV88

MX,5010HE,A12 -19-27SEP91

12. Remove nut and washers, install clutch mounting cup washer (A) and reinstall washers and nut.

13. Tighten spider down until cup washer bottoms on hub.



RW12396 -UN-21NOV88

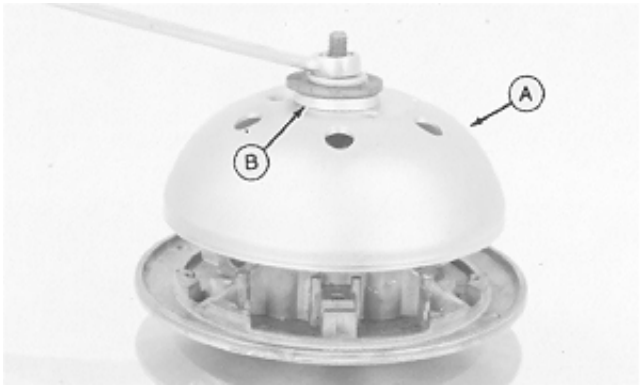
MX,5010HE,A12A -19-27SEP91

14. Remove nut, washers, and cup washer.

15. Install ramp plate (A), cup washer (B), washers and nut.

16. Tighten spider until cup washer bottoms on hub.

17. Remove nut, washers, and cup washer.



RW12397 -UN-21NOV88

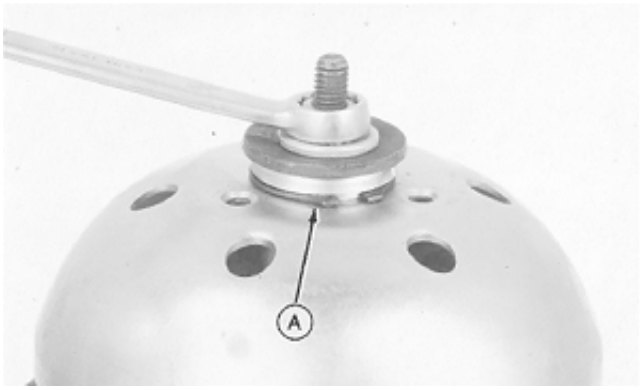
MX,5010HE,A12B -19-27SEP91

18. Install snap ring (A) cup washer, washers, and nut.

19. Tighten till snap ring seats in first groove.

20. Remove clamping device, snap ring, spacer, and ramp plate.

21. Movable face must slide freely on hub. Correct binding by lightly tapping spider on top of leg that binds in movable face bushing.



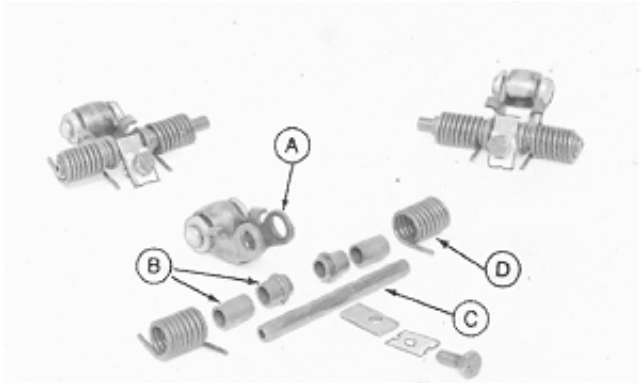
RW12398 -UN-21NOV88

WXA,050015,O -19-09MAY90

ASSEMBLE DRIVE CLUTCH

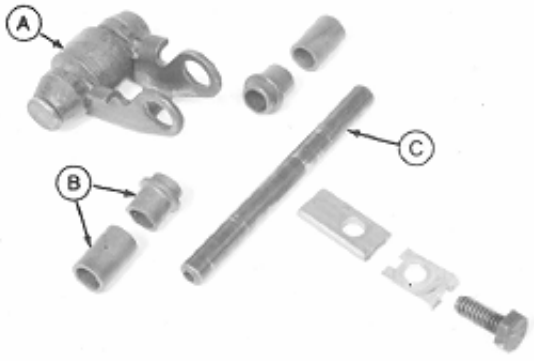
1. Assemble roller arm assemblies.

A—Roller Arm
B—Sleeves (2 used)
C—Shaft
D—Spring (2 used)



RW12165 -UN-21NOV88

(S.N. —840000)



M80766 -UN-10SEP91

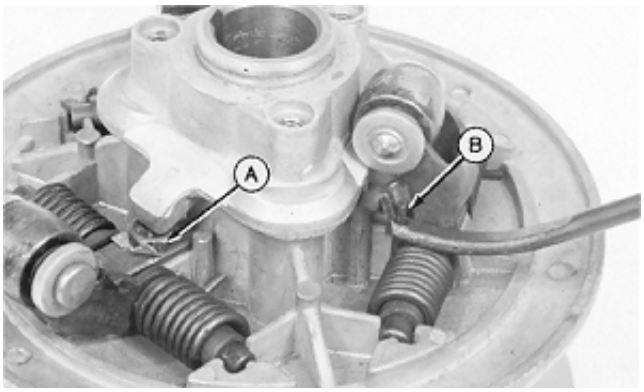
(S.N. 840001—)

MX,5010HE,A13 -19-27SEP91

2. Install roller arm assembly onto movable sheave half.

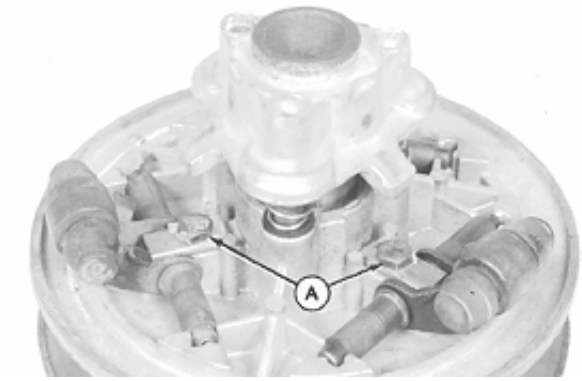
3. Tighten retaining cap screws (A) to 8 N·m (71 lb-in.) and bend tab to lock.

4. (S.N. —840000): Raise movable sheave against spider and hook springs (B) behind tab of roller arm with JDM4-A Clutch Spring Tool.



RW12399 -UN-21NOV88

(S.N. —840000)



M80768 -UN-10SEP91

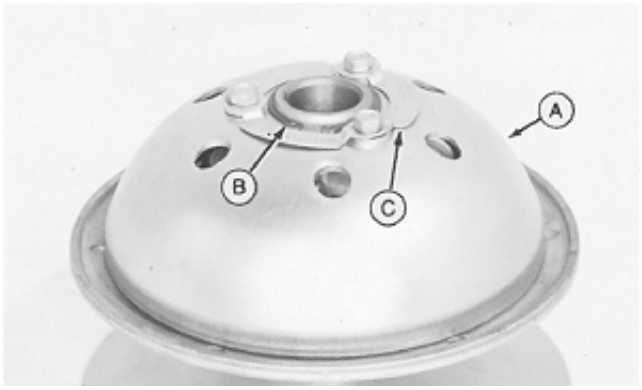
(S.N. 840001—)

MX,5010HE,A14 -19-27SEP91

5. Install ramp plate (A) and snap ring (B).

6. Install locking ring (C) between washers and cap screws.

7. Tighten cap screws to 12 N·m (107 lb-in.) and bend tab to lock.



RW12400 -UN-21NOV88

MX,5010HE,A14A -19-27SEP91

REMOVE AND INSTALL DRIVEN CLUTCH

1. Remove transaxle. (See Group 20.)

2. Loosen set screw (B).

3. Remove rubber cap, collar, driven clutch (C), key and spacer (A).

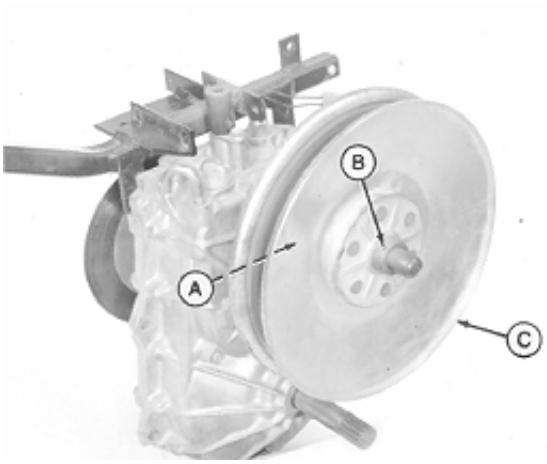
4. Make repairs as necessary. (See procedures in this group.)

5. Apply NEVER-SEEZ lubricant, or an equivalent to driven shaft.

6. Install spacer, key, driven clutch, collar and rubber cap.

7. Tighten set screw to 8 N·m (71 lb-in.).

8. Install transaxle.



-UN-10SEP91
M80769

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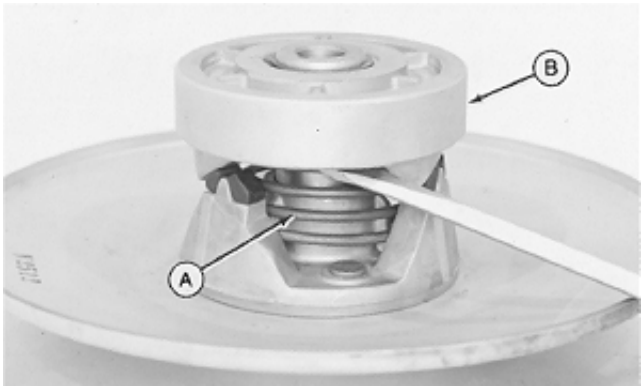
MX,5010HE,A15 -19-27SEP91

DISASSEMBLE DRIVEN CLUTCH

1. Release tension on spring (A) by prying spring away from anchor in cam (B).



-UN-21NOV88
RW12404

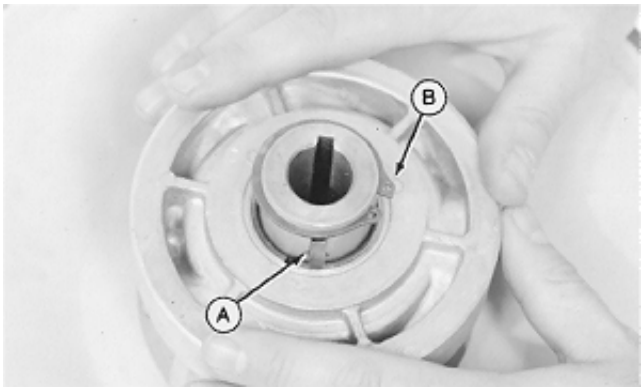
MX,5010HE,A16 -19-27SEP91

2. Press cam down to clear key (A) in hub. Turn to lock under key.

CAUTION: Hold cam securely to prevent sudden spring release.

3. Remove snap ring (B).

4. Turn cam to align key with keyway and slide cam up hub.



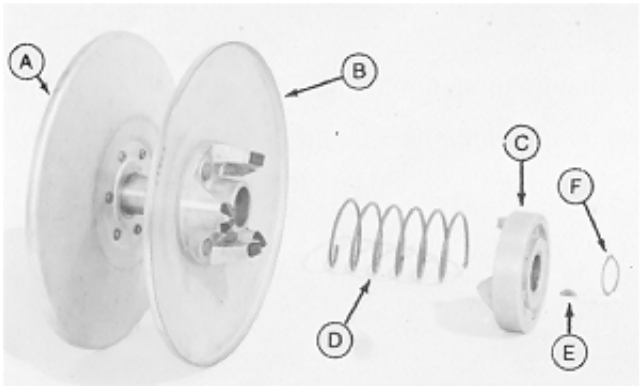
-UN-21NOV88
RW12405

WXA,050020,4 -19-09MAY90

INSPECT DRIVEN CLUTCH

1. Inspect parts (A—F) for wear or damage. Replace as necessary.

A—Fixed Sheave Half
B—Movable Sheave Half
C—Cam
D—Spring
E—Key
F—Snap Ring



-UN-21NOV88
RW12406

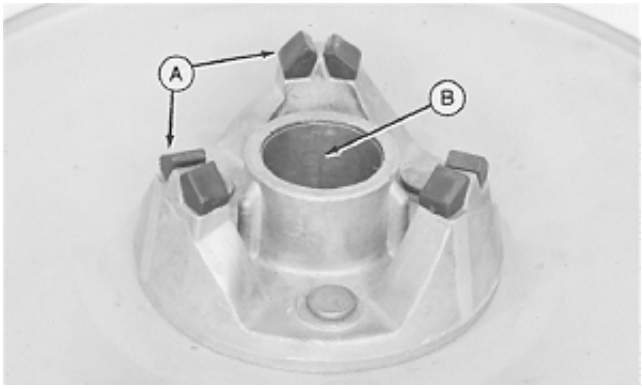
MX,5010HE,A17 -19-27SEP91

NOTE: Ramp shoes are installed with an interference fit.

2. Inspect ramp shoes (A) for wear or breakage. If ramp shoes must be replaced, carefully heat movable sheave ramp and pull ramp shoes off. If ramp shoe mounting tabs break off inside movable sheave ramp, remove tabs using a drill bit.

3. Install ramp shoe tabs into movable sheave ramp holes and press into position. If tabs are loose, apply thread lock and sealer (medium strength) on tabs and install ramp shoes.

4. Inspect movable sheave bushing (B) for excessive wear.



-UN-21NOV88
RW12408

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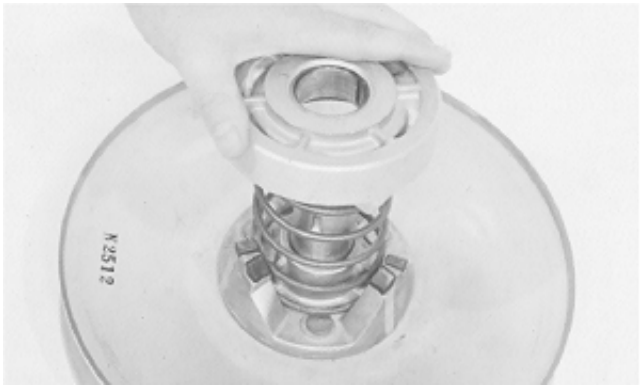
MX,5010HE,A18 -19-27SEP91

ASSEMBLE DRIVEN CLUTCH

NOTE: Do not lubricate parts for assembly.

1. Assemble sheave halves.

2. Install spring into notches on cam and movable sheave.



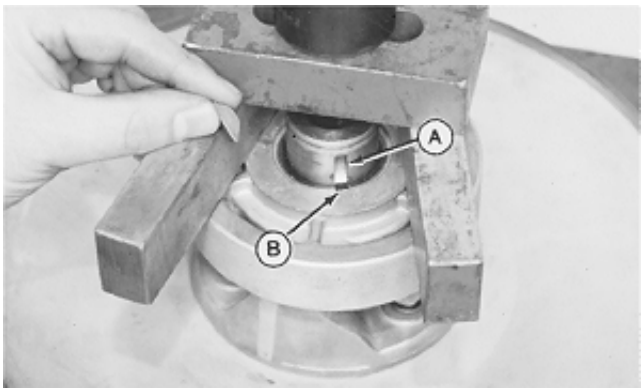
-UN-21NOV88
RW12409

MX,5010HE,A19 -19-27SEP91

3. Compress cam and spring over hub using a press.

4. Align keyway in hub (A) and cam (B).

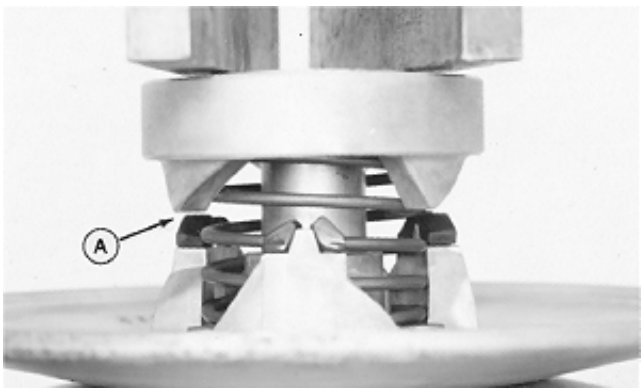
5. Install key.



RW12410 -UN-21NOV88

WXA,050020,9 -19-09MAY90

6. Release press enough to allow clearance (A) between ramp shoe and cam.



RW12411 -UN-21NOV88

WXA,050020,10 -19-09MAY90

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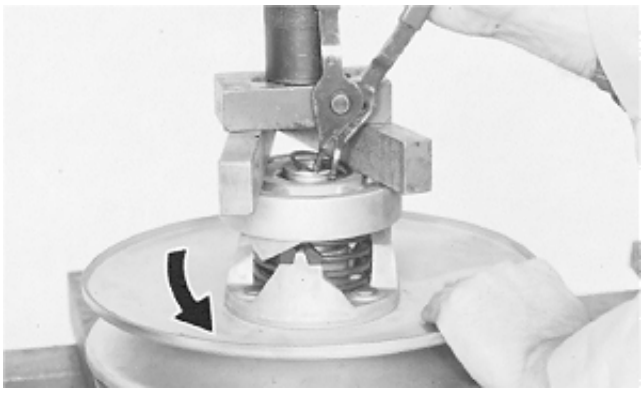
7. Rotate movable sheave 120˚ counterclockwise.

8. Hold sheave and press cam down until cam lobe holds movable sheave at ramp shoe.

9. Press cam down enough to install snap ring.

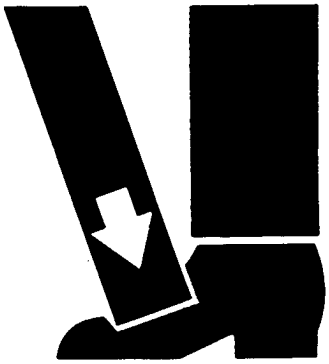


RW12412 -UN-21NOV88

MX,5010HE,A20 -19-27SEP91

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REPLACE TRANSAXLE SHIFT CABLES AND HOUSINGS

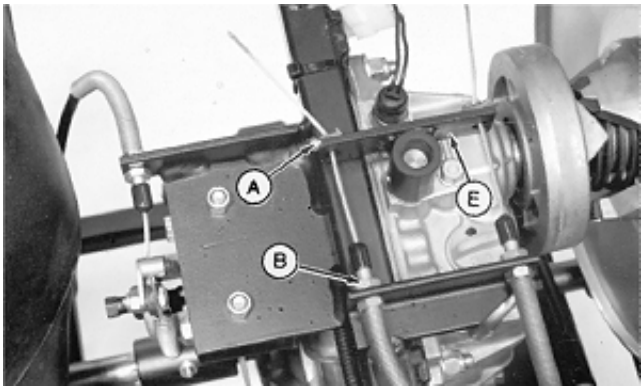
NOTE: Cables can be replaced separately.

1. Loosen screws (A).
2. Pull cable through housing and pedal.
3. Remove nuts (B) from both ends of housing.
4. Cut all tie straps.
5. Remove cable housing.

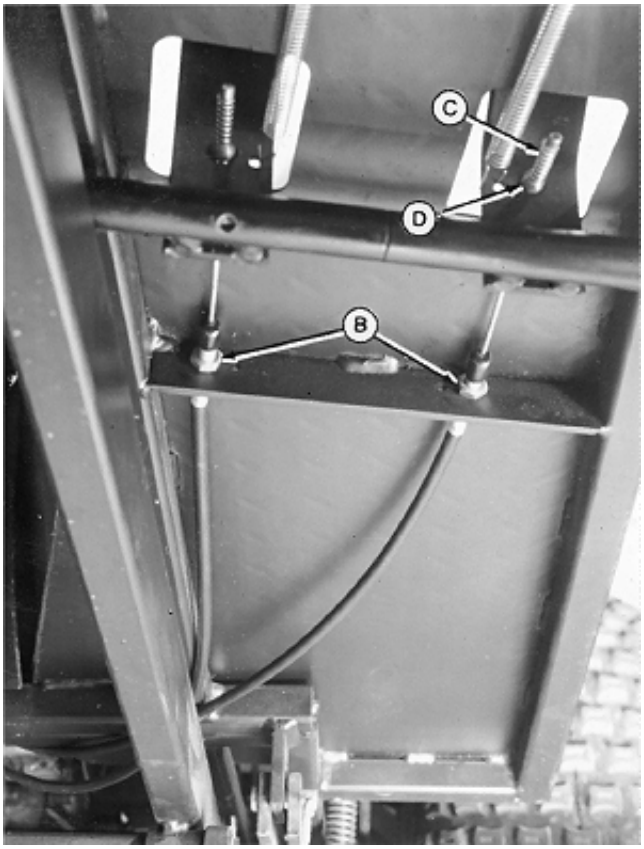
NOTE: Leave spring (C) and ball (D) on new cable.

6. Pull new cable out of new housing.
7. Install new cable housing.
8. Install nuts (B).
9. Pull new cable through pedal, housing and lever (E).
10. Tighten screws (A).
11. Install tie straps as necessary.
12. Adjust transaxle shift cables. (See Section 250, Group 15.)

A—Screws
B—Nuts
C—Spring
D—Ball
E—Shift Lever



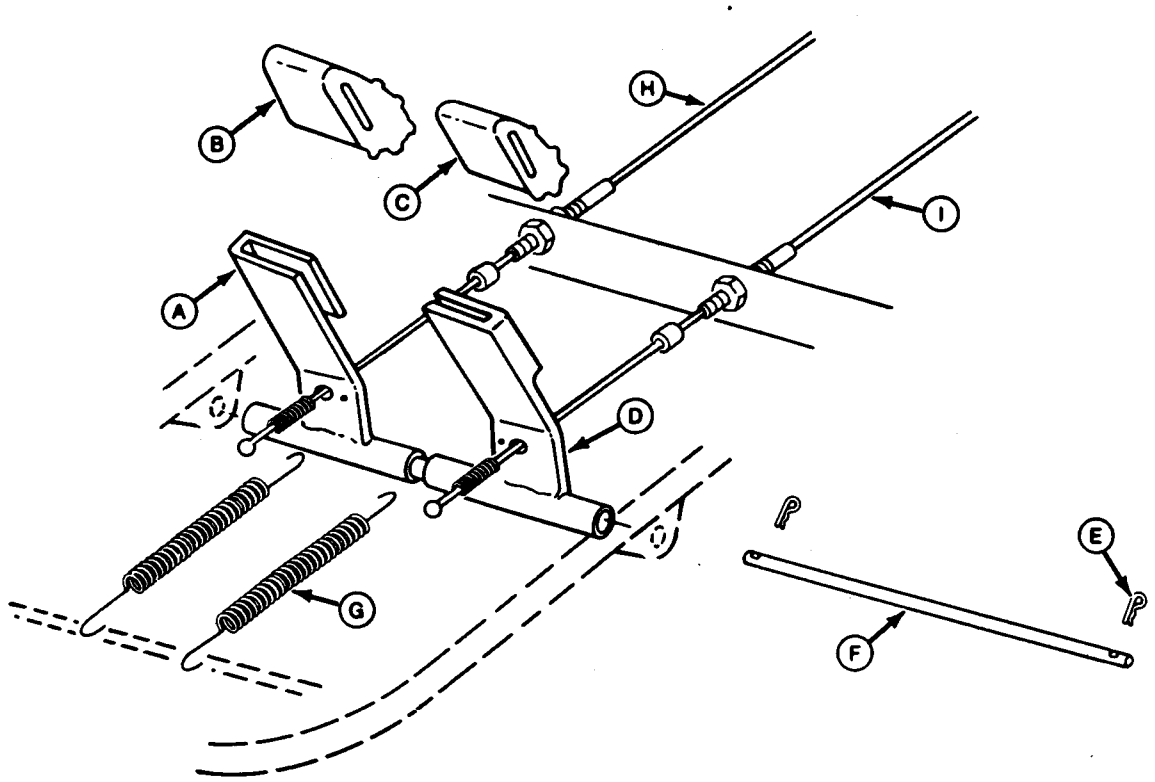
E33623 -UN-18SEP89



E33624 -UN-18SEP89

MX,5015HE,A1 -19-27SEP91

INSPECT AND REPAIR GEAR SHIFT PEDALS



M80770 -UN-10SEP91

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A—Forward Pedal
B—Pedal Pad
C—Pedal Pad
D—Reverse Pedal
E—Spring Pin (2 used)
F—Rod
G—Spring (2 used)
H—Forward Shift Cable
I—Reverse Shift Cable

1. Remove transaxle shift cables (H or I). (See Replace Transaxle Shift Cables in this group.)

2. Remove parts (A—G).

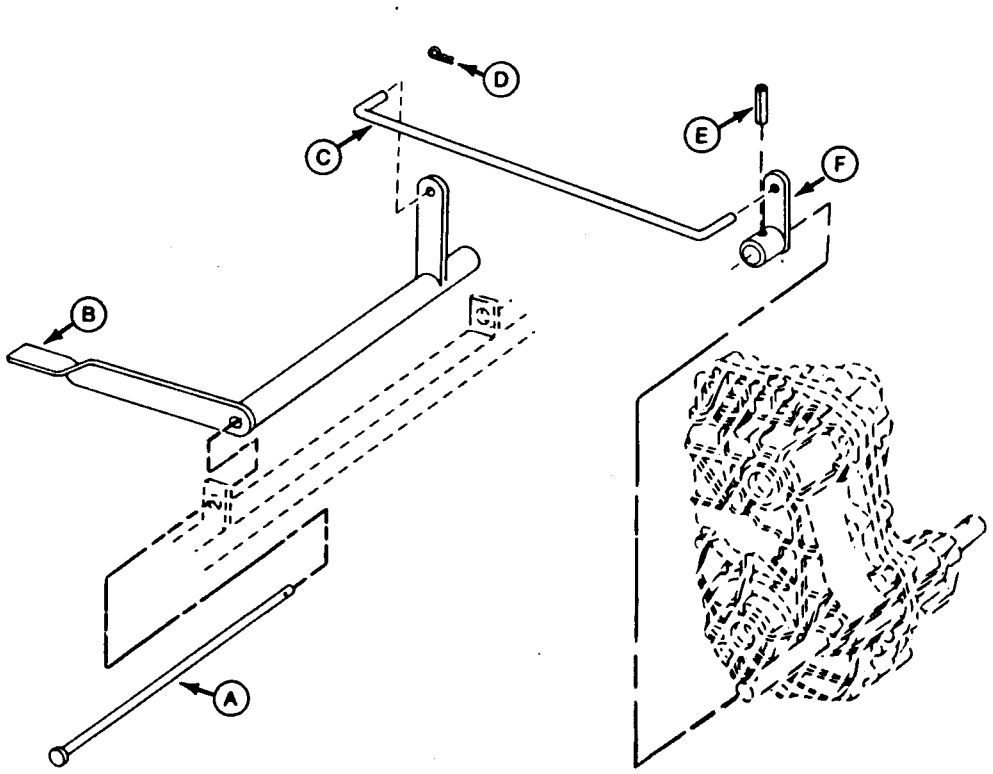
3. Inspect parts for wear or damage. Replace as necessary.

4. Install all parts.

5. Install transaxle shift cables.

MX,5015HE,A2 -19-27SEP91

INSPECT AND REPAIR DIFFERENTIAL LOCK PEDAL AND LINKAGE



M80771 -UN-10SEP91

A—Rod
B—Differential Lock Pedal
C—Link Rod
D—Spring Pin (2 used)
E—Roll Pin
F—Lever

1. Remove left-hand side panel.
2. Remove parts (A—F).
3. Inspect parts for wear or damage. Replace as necessary.
4. Install all parts.
5. Install side panel.

MX,5015HE,A3 -19-27SEP91

OTHER MATERIAL

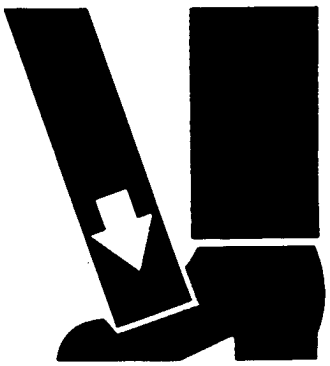
Number	Name	Use
T43512	John Deere Thread Lock and Sealer (medium strength)	Retain cap screws and fittings.
TY6305	John Deere Clean and Cure Primer	Cleans parts and speeds cure of sealant.
T43514	John Deere Plastic Gasket	Seals transaxle case halves.
PT569	John Deere NEVER-SEEZ® Lubricant	Prevents parts from seizing.

NEVER-SEEZ is a trademark of the Emhart Chemical Group.

MX,5020HE,A1 -19-27SEP91

LOWER ALL ATTACHMENTS

N **CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.**



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

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REMOVE TRANSAXLE

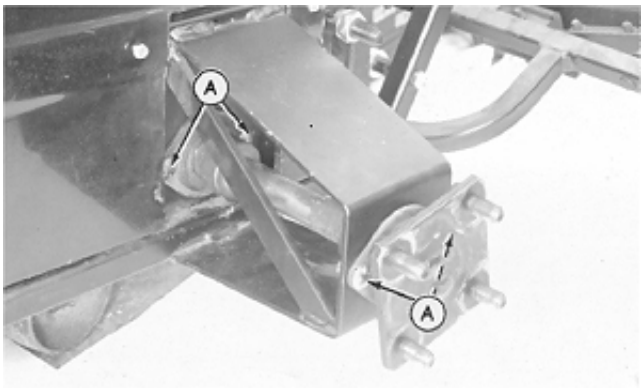
1. Remove drive belt. (See Group 10.)

2. Remove brake caliper. (See Section 60, Group 10.)

3. Remove rear wheels. (See Section 80, Group 10.)

4. Remove four carriage bolts and nuts (A) from axle bearing flangettes, both sides.

5. Pull axle shaft out of coupler, both sides.



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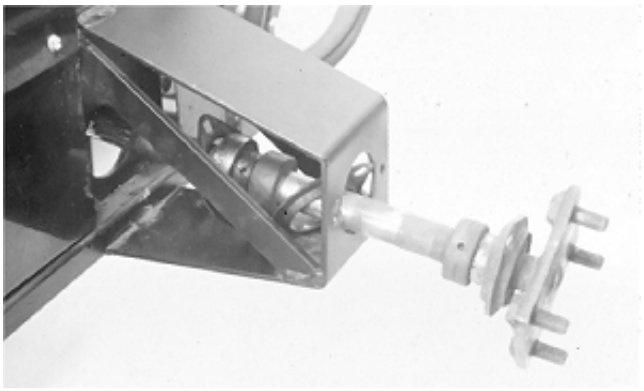
E33563



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MX,5020HE,A2 -19-27SEP91

NOTE: Approximate transaxle oil capacity is 2.3 L (2.5 U.S qt).

6. Drain transaxle.

7. Remove spring pin and disconnect rod (J).

8. Disconnect wiring connectors (G and H).

9. Remove lock nut (E). Lower rear body cowling.

10. Remove lever (A), nut (B) and brake cable.

11. Remove tube (D).

12. Loosen screws and remove clamps (C).

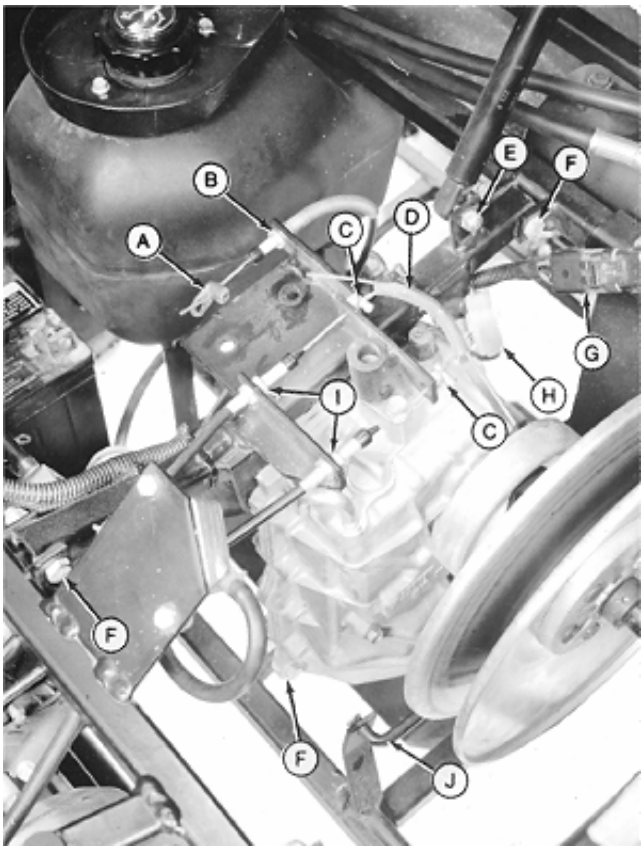
13. Remove nuts (I). Pull shaft cables/housing away from transaxle.

14. Cut all tie straps.

15. Remove three cap screws, washers and nuts (F).

16. Remove transaxle.

17. Make repairs as necessary. (See procedures in this group.)



M80772 -UN-10SEP91

A—Brake Caliper Lever
B—Nut
C—Clamps (4 used)
D—Tube
E—Lock Nut
F—Cap Screw, Washer and Nut (3 used)
G—Hydraulic Pump Wiring Connector
H—Neutral Start Switch Wiring Connector
I—Nuts
J—Differential Lock Rod

MX,5020HE,A3 -19-27SEP91

REMOVE TRANSAXLE EXTERNAL COMPONENTS

1. Remove driven clutch. (See Group 10.)

2. Remove roll pin and lever (F).

3. Remove snap ring, washer, brake disc (A) and key.

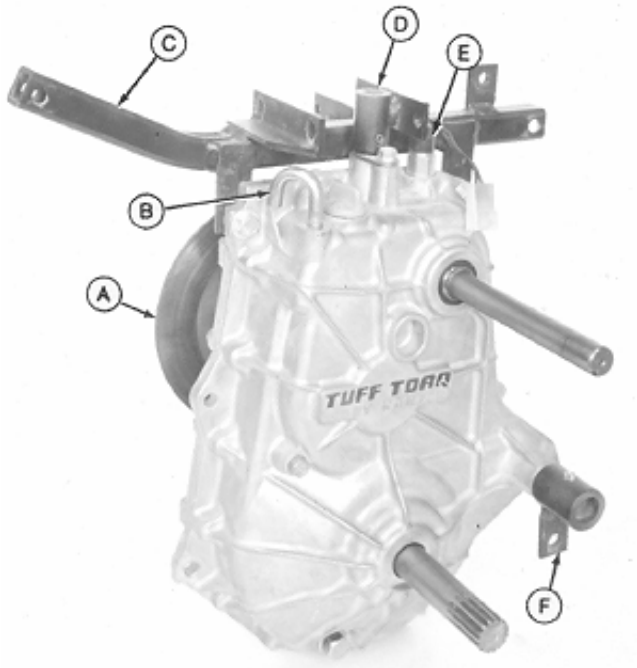
4. Remove bracket (C).

5. Remove switch (E) and O-ring.

6. Remove roll pin and lever (D).

7. Remove vent tube (B).

A—Brake Disc
B—Vent Tube
C—Mount Bracket
D—Gear Shift Lever
E—Neutral Start Switch
F—Differential Lock Lever



M80773 -UN-10SEP91

MX,5020HE,A4 -19-27SEP91

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DISASSEMBLE AND INSPECT TRANSAXLE

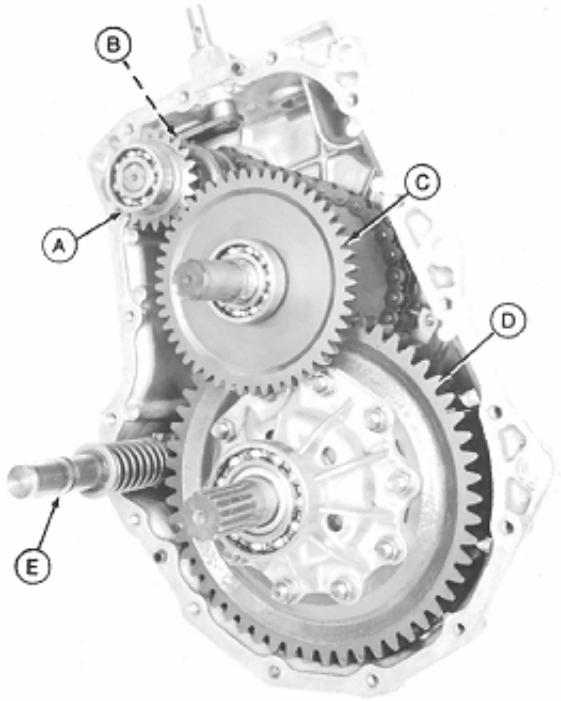
1. Remove 16 cap screws. Tap seam of case with a plastic hammer and separate case halves.

NOTE: Make sure not to lose shift block (B) when removing input shaft (A).

2. Remove input shaft (A) and secondary shaft (C) together as an assembly.

3. Remove differential (D) and differential lock shaft (E) together as an assembly.

A—Input Shaft
B—Shift Block
C—Secondary Shaft
D—Differential
E—Differential Lock Shaft

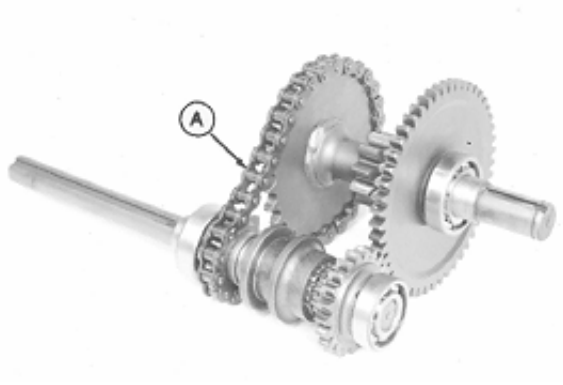


M80774 -UN-10SEP91

MX,5020HE,A5 -19-27SEP91

4. Remove reverse drive chain (A).

5. Inspect chain for wear or damage. Replace if necessary.



MX,5020HE,A6 -19-27SEP91

NOTE: Bearings (B and M) and sleeve (A) are press fit.

6. Remove sleeve (A) and bearings (B and M) using a knife-edged puller and a press.

CAUTION: Balls (H) and spring (G) will shoot from holes in shaft when collar (J) is removed.

7. Remove parts (C—L).

8. Inspect parts for wear or damage. Replace as necessary.

9. Measure thickness of washers (D and L). Replace washers if not within specifications.

10. Measure ID of sprocket (F) and gear (K). Replace sprocket, gear and shaft (I) if not within specifications.

11. Measure OD of shaft (I). Replace shaft and sprocket (F) and gear (K) if not within specifications.

12. Measure width of shift groove in collar (J). Replace collar if not within specifications.

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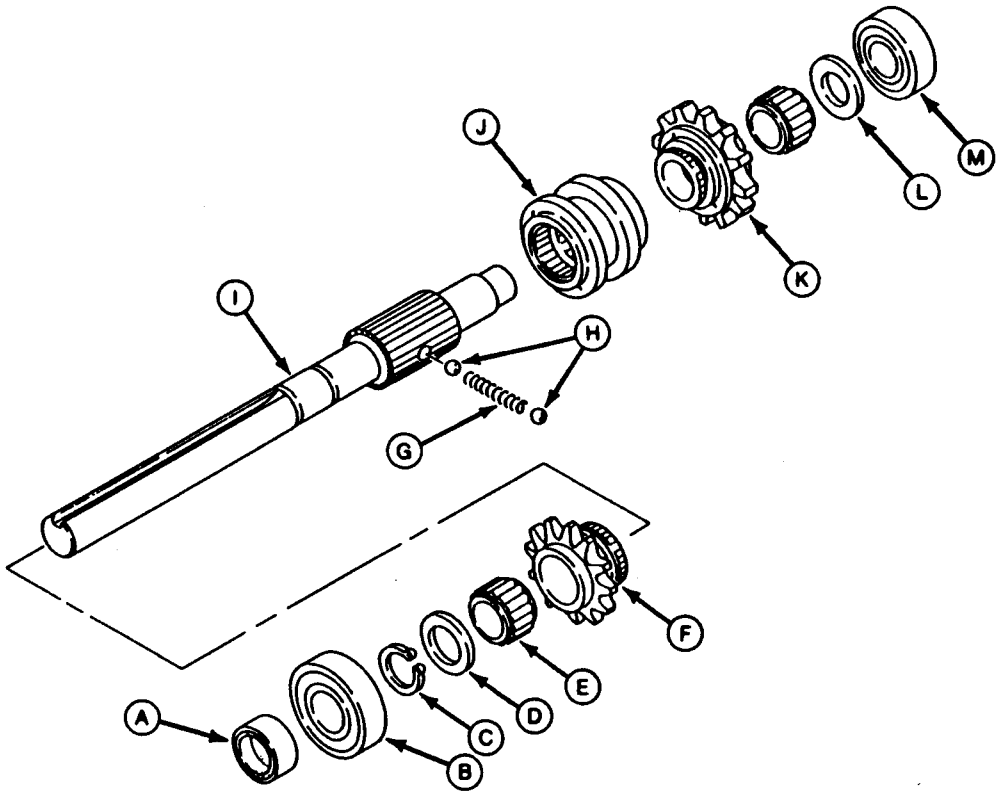
13. Measure free length and working load length of spring (G). Replace if not according to specifications.

SPECIFICATIONS

Washer (D) Thickness	1.55—1.65 mm (0.061—0.064 in.)
Washer (L) Thickness	1.45—1.55 mm (0.057—0.061 in.)
Sprocket (F) ID	24.01—24.03 mm (0.945—0.946 in.)
Gear (K) ID	24.01—24.03 mm (0.945—0.946 in.)
Shaft (I) OD	19.99—20.01 mm (0.787—0.788 in.)
Collar (J)	
Shift Groove Width	14.10—14.30 mm (0.550—0.560 in.)
Collar-to-Lock Fork Finger Clearance (MAX)	2 mm (0.080 in.)
Spring (G)	
Free Length	24.20 mm (0.950 in.)
Minimum	20 mm (0.790 in.)
Working Lead	15.80 mm at 53 N (0.620 in. at 12 lbs)

MX,5020HE,A7 -19-27SEP91

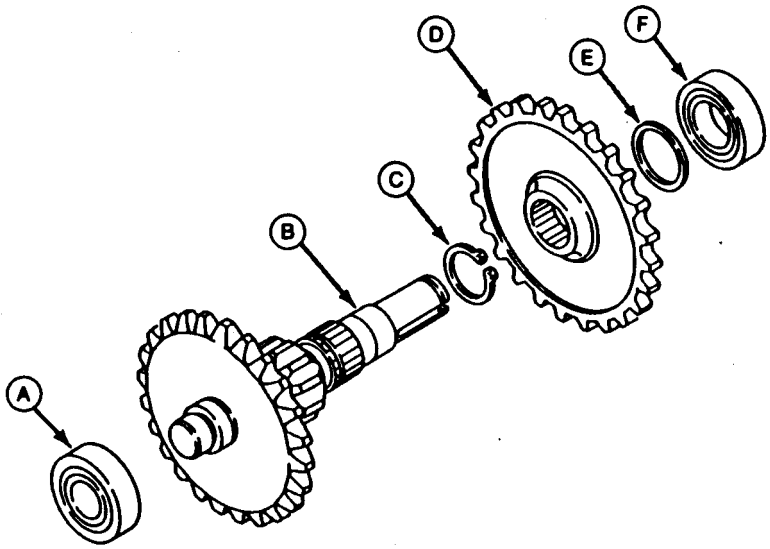


M80776 -UN-10SEP91

A—Sleeve
B—Ball Bearing
C—Snap Ring
D—Washer
E—Needle Bearing (2 used)
F—Reverse Drive Sprocket
G—Spring
H—Balls
I—Input Shaft
J—Shift Collar
K—Forward Drive Gear
L—Washer
M—Ball Bearing

Input Shaft

MX,5020HE,A7A -19-27SEP91



M80777 -UN-10SEP91

A—Ball Bearing
B—Secondary Shaft
C—Snap Ring
D—Forward Driven Gear
E—Washer
F—Ball Bearing

Secondary Shaft

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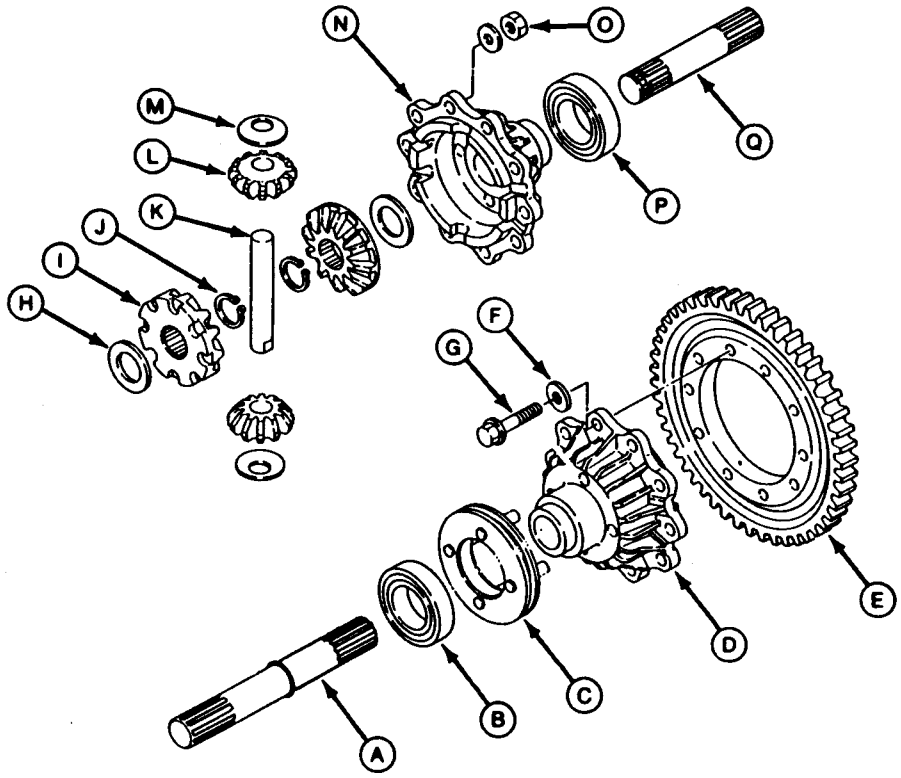
NOTE: Bearings (A and F) are press fit.

14. Remove bearings (A and F) using a knife edged puller and a press.

15. Remove parts (B—E).

16. Inspect parts for wear or damage. Replace as necessary.

MX,5020HE,A8 -19-27SEP91



M80778 -UN-10SEP91

A—Long Output Shaft
B—Ball Bearing
C—Differential Lock Collar
D—Differential Housing Half
E—Final Drive Gear
F—Washer (20 used)
G—Cap Screw (10 used)
H—Washer (2 used)
I—Bevel Gear (2 used)
J—Snap Ring (2 used)
K—Bevel Pinion Shaft
L—Pinion Gear (2 used)
M—Washer (2 used)
N—Differential Housing Half
O—Nut (10 used)
P—Ball Bearing
Q—Short Output Shaft

Differential

17. Disassemble parts (A—Q).

NOTE: Bearings (B and P) are press fit.

18. Remove bearings (B and P) using a knife-edged puller and a press.

19. Remove collar (C).

20. Inspect parts for wear or damage. Replace as necessary.

21. Measure groove width of lock collar (C). Replace collar if not within specifications.

22. Measure thickness of washers (H and M). Replace washers if not within specifications.

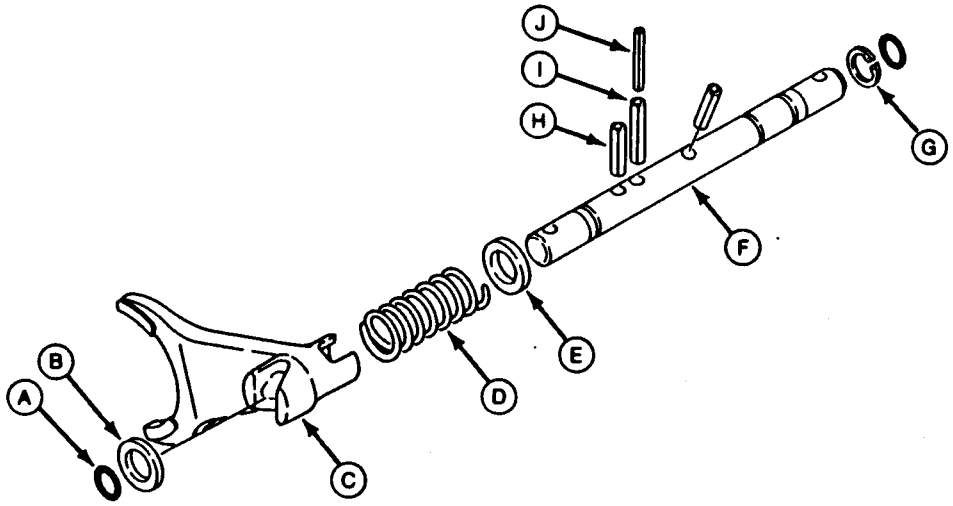
23. Measure ID of bevel pinions (L). Replace pinions and shaft (K) if not within specifications.

24. Measure OD of shaft (K). Replace shaft and pinions (L) if not within specifications.

SPECIFICATIONS

Groove Width of Lock Collar (C)	7.10—7.30 mm (0.280—0.290 in.)
Washer (H) Thickness	0.74—0.86 mm (0.029—0.033 in.)
Washer (M) Thickness	0.96—1.04 mm (0.038—0.041 in.)
Pinion Gear (L) ID	16.03—16.05 mm (0.631—0.632 in.)
Shaft (K) OD	15.95—15.97 mm (0.628—0.629 in.)
Shaft-to-Pinion Gear Clearance (MAX)	0.20 mm (0.010 in.)

MX,5020HE,A9 -19-27SEP91



M80779 -UN-10SEP91

A—O-Ring (2 used)
B—Washer
C—Differential Lock Fork
D—Spring
E—Washer
F—Differential Lock Shaft
G—Snap Ring
H—Roll Pin (2 used)
I—Large Roll Pin
J—Small Roll Pin

Differential Lock Shaft

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25. Remove O-rings (A) and washer (B).

26. Place fingers of fork (C) in a vise. Compress spring (D) using a valve spring compressor on ends of fork (C) and shaft (F).

27. Drive out roll pins (H, I and J).

28. Disassemble parts (C—G).

29. Inspect parts for wear or damage. Replace as necessary.

30. Measure thickness of lock fingers on fork (C). Replace fork if not within specifications.

31. Measure ID of fork (C). Replace fork and shaft (F) if not within specifications.

32. Measure OD of shaft (F). Replace shaft and fork (C) if not according to specifications.

33. Measure free length and working load length of spring (D). Replace if not according to specifications.

SPECIFICATIONS

Differential Lock Fork (C)	
Finger Thickness	6.70—6.90 mm (0.260—0.270 in.)
Finger-to-Collar Groove Clearance (MAX)	2 mm (0.080 in.)
Fork ID	20.05—20.10 mm (0.789—0.791 in.)
Differential Lock Shaft (F)	
Shaft OD	19.95—20.00 mm (0.785—0.787 in.)
Shaft-to-Fork Clearance (MAX)	0.50 mm (0.020 in.)
Spring (D)	
Free Length	77.60 mm (3.060 in.)
Working Load	52 mm at 511 N (2.070 in. at 115 lbs)

MX,5020HE,A10 -19-27SEP91

34. Remove parts (A—F).

35. Inspect parts for wear or damage. Replace as necessary.

36. Measure width of shifter block (F). Replace block if not within specifications.

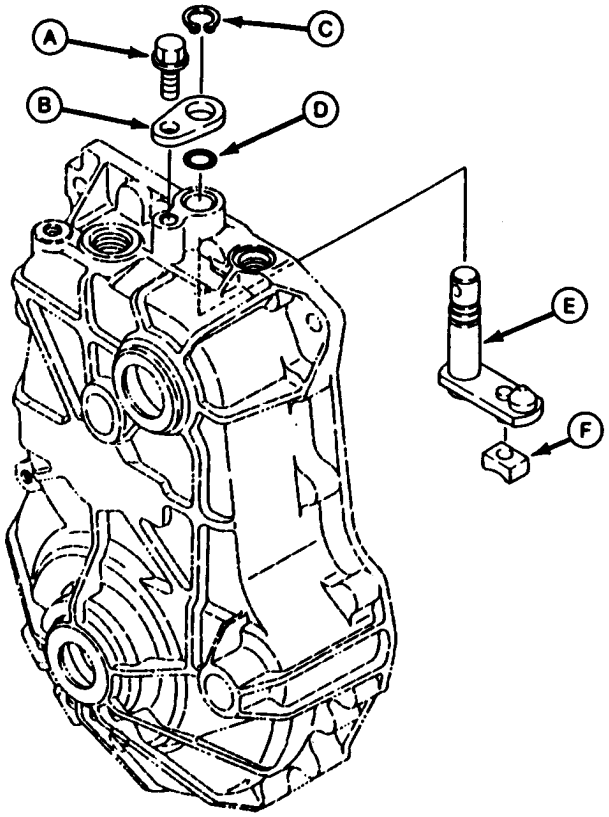
37. Measure OD of shifter arm shaft. Replace arm if not within specifications.

38. Measure ID of shifter bore in case. Replace transaxle case half if not within specifications.

SPECIFICATIONS

Shifter Block (F)	
Width	13.70—13.90 mm (0.540—0.550 in.)
Block-to-Collar Groove Clearance (MAX)	2 mm (0.080 in.)
Shaft OD	16.96—17.00 mm (0.668—0.669 in.)
Case Bore ID	17.02—17.04 mm (0.670—0.671 in.)
Shaft-to-Case Bore Clearance (MAX)	0.20 mm (0.010 in.)

A—Cap Screw
B—Retaining Plate
C—Snap Ring
E—Shifter Arm
F—Shifter Block



Shifter Arm

M80780 -UN-10SEP91

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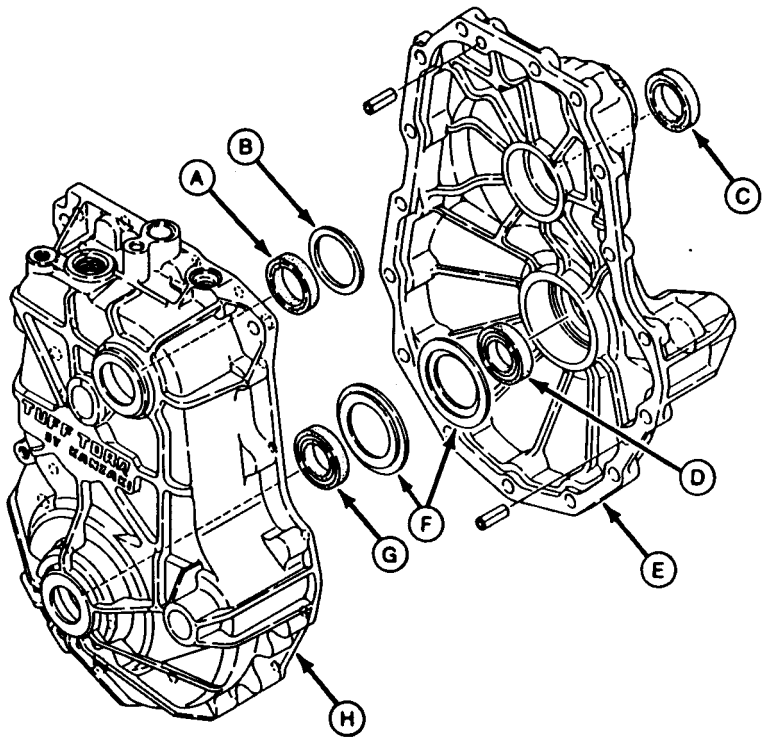
MX,5020HE,A11 -19-27SEP91



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A—Seal
B—Spacer
C—Seal
D—Seal
E—Transaxle Case Half
F—Spacers
G—Seal
H—Transaxle Case Half

39. Inspect case halves (E an H) for cracks or damage. Replace halves if necessary.

40. Remove spacers (B and F).

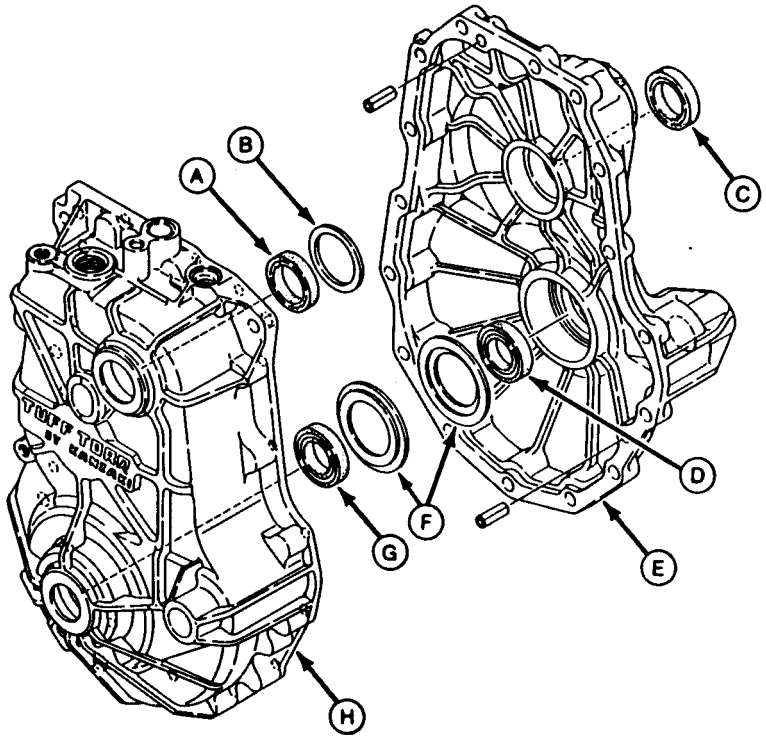
IMPORTANT: Replace all seals. Damaged seals will leak.

41. Replace seals (A, D and G) using a bushing, bearing and seal driver set. Install seals flush to case bearing bores.

Remove seal (C) using a screwdriver. Install seal into case bore until it stops, using a bushing, bearing and seal driver set.

MX,5020HE,A12 -19-27SEP91

ASSEMBLE TRANSAXLE



M80781 -UN-10SEP91

A—Seal
B—Spacer
C—Seal
D—Seal
E—Transaxle Case Half
F—Spacers
G—Seal
H—Transaxle Case Half

NOTE: Lubricate all internal parts with clean oil during assembly.

IMPORTANT: Use new seals and O-rings during assembly. Damaged seals or O-ring will leak.

1. Apply multipurpose grease to inside lips of seals (A, C, D and G).

2. Apply multipurpose grease to spacers (B and F) to hold in place.

NOTE: Install spacers (F), as shown.

3. Install spacers (B and F).

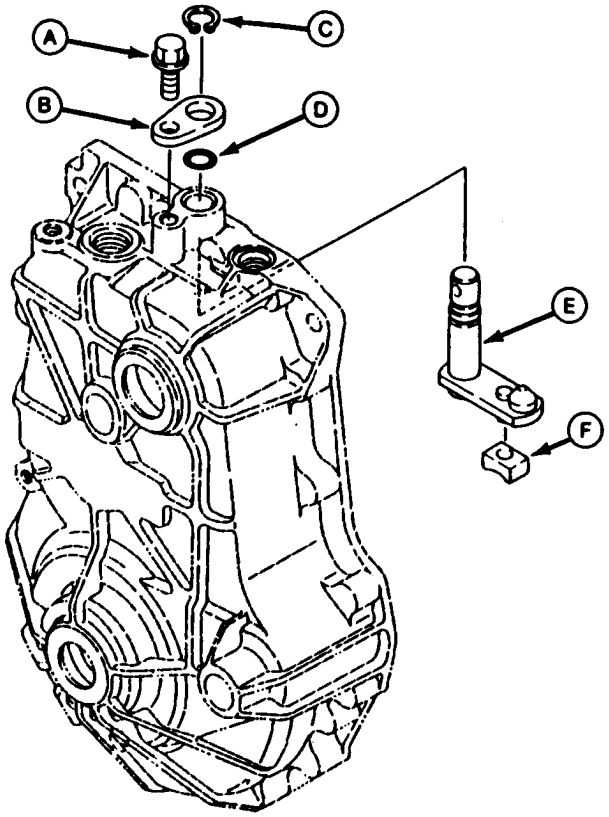
MX,5020HE,A13 -19-27SEP91

4. Apply multipurpose grease to shifter arm shaft and new O-ring (D).

5. Install parts (A—E). Tighten cap screw to 25 N·m (221 lb-in.).

6. Apply multipurpose grease to shifter block (F) to hold in place. Install shifter block.

A—Cap Screw
B—Retaining Plate
C—Snap Ring
D—O-Ring
E—Shifter Arm
F—Shifter Block



M80780 -UN-10SEP91

Shifter Arm

MX,5020HE,A14 -19-27SEP91

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7. Install snap ring (B), washer (C) and spring (D).

8. Install fork (E) and mount assembly in a vise.

9. Compress spring using a valve spring compressor.

10. Install double roll pin (G) with split facing away from shaft fork.

11. Install roll pin (F) with split facing spring.

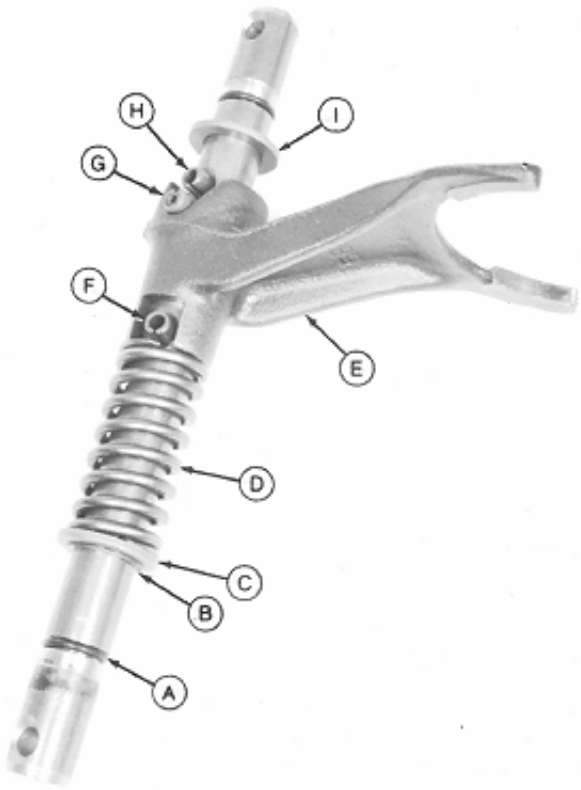
12. Install spring pin (H) with split facing toward fork.

13. Install washer (I).

14. Install new O-rings (A).

15. Apply multipurpose grease to O-rings and shaft ends.

A—O-Ring (2 used)
B—Snap Ring
C—Washer
D—Spring
E—Differential Lock Fork
F—Roll Pin
G—Double Roll Pin
H—Roll Pin
I—Washer



M80782 -UN-10SEP91

Differential Lock Shaft

MX,5020HE,A15 -19-27SEP91

16. Assemble differential lock collar (A) onto differential housing half.

17. Press carrier bearings (B) onto both differential housing halves.

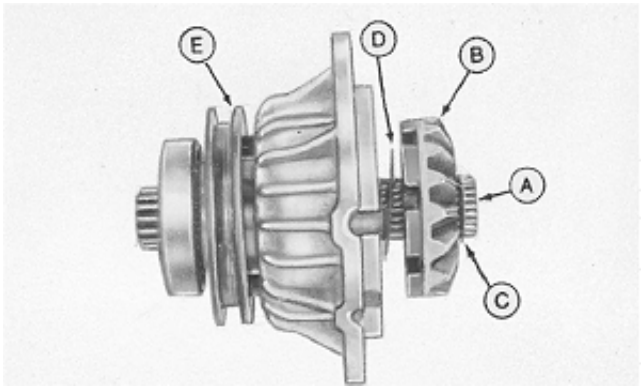
RW12091 -UN-21NOV88

Differential

MX,5020HE,A16 -19-27SEP91

18. Install long output shaft (A) and notched bevel gear (B) with snap ring (C) and washer (D) into housing half with lock collar (E).

19. Install short output shaft, gear, washer, and snap ring assembly into other housing half.

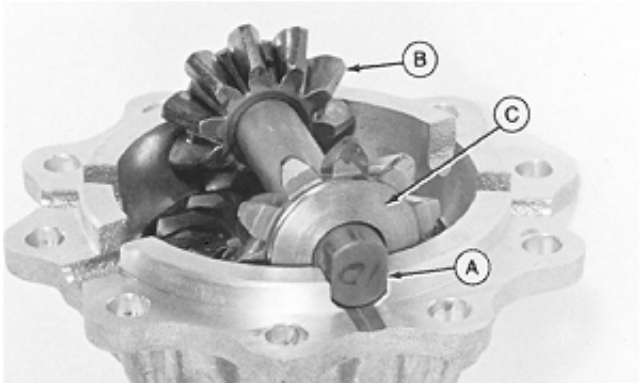


RW12092 -UN-21NOV88

MX,5020HE,A17 -19-27SEP91

NOTE: Be sure bevel pinion shaft (A) is seated into correct housing notch.

20. Install bevel pinion shaft (A) with pinion gears (B) and washers (C) into differential carrier half with lock collar.



RW12136 -UN-21NOV88

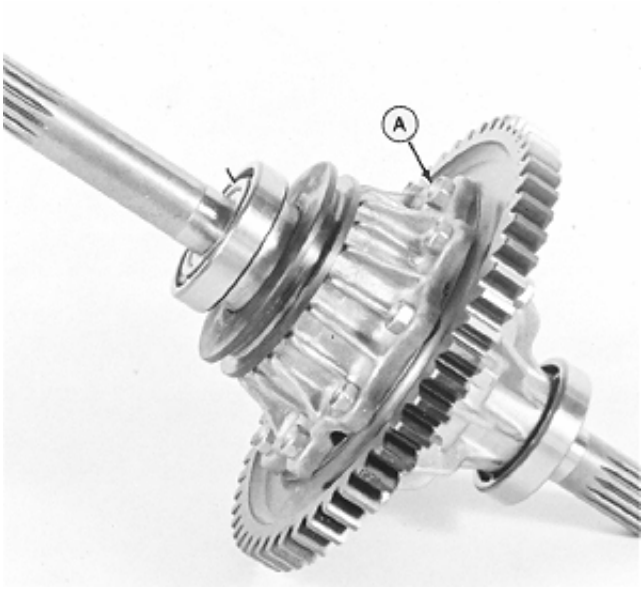
MX,5020HE,A18 -19-27SEP91

21. Assemble two differential halves to final drive gear.

NOTE: Use new cap screws and nuts to secure differential halves.

22. Apply thread lock and sealer (medium strength) to threads of cap screws.

23. Install cap screws, washers and nuts (A). Tighten nuts to 25 N·m (221 lb-in.).



RW12137 -UN-21NOV88

MX,5020HE,A19 -19-27SEP91

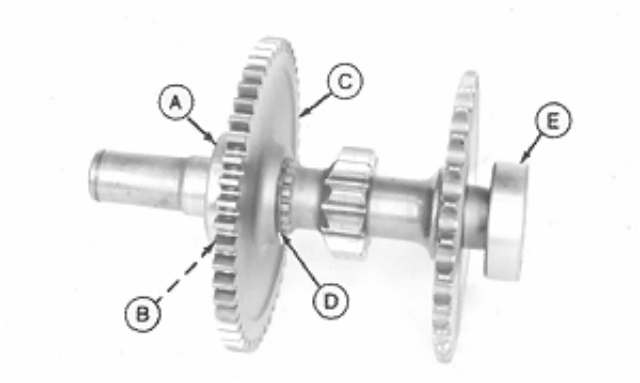
NOTE: Install gear (C) with shoulder facing snap ring.

24. Install parts (B—D).

25. Install bearing (E) on shaft using a bearing, bushing and seal driver set.

26. Install bearing (A) using a piece of pipe and a press.

A—Ball Bearing
B—Washer
C—Forward Driven Gear
D—Snap Ring
E—Ball Bearing



M80783 -UN-10SEP91

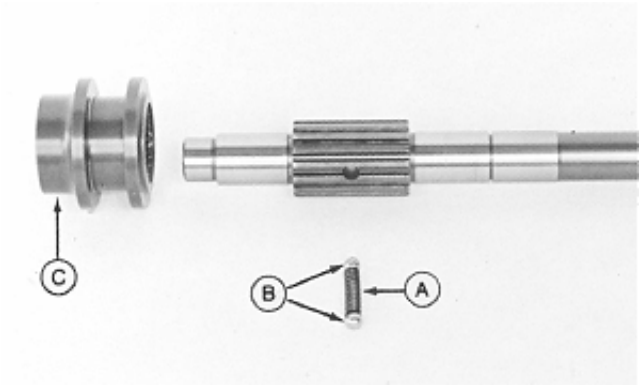
Secondary Shaft

MX,5020HE,A20 -19-27SEP91

27. Apply multipurpose grease to balls (B) and spring (A).

28. Position spring (A) and balls (B) through input shaft.

29. Install shift collar to neutral position with shoulder (C) toward short end of input shaft.



RW12128 -UN-21NOV88

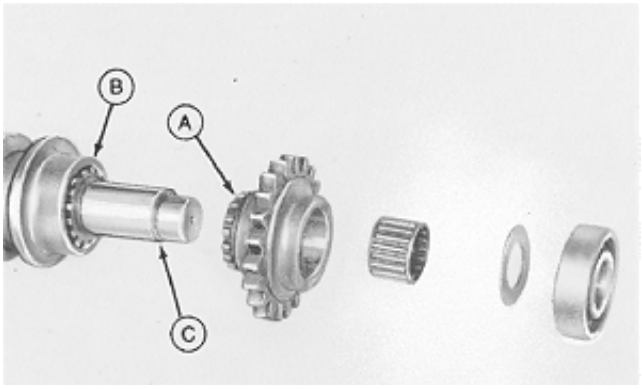
Input Shaft

MX,5020HE,A21 -19-27SEP91

30. Install forward drive gear onto short end of input shaft with shift splines (A) facing shift collar (B).

31. Install needle bearing and washer.

32. Press bearing tight against shoulder (C) of input shaft.

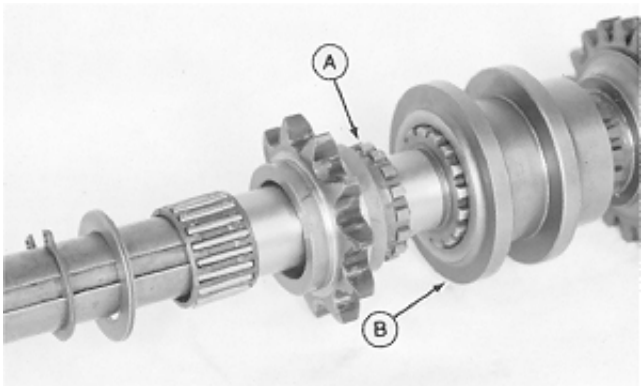


RW12099 -UN-21NOV88

MX,5020HE,A22 -19-27SEP91

33. Install reverse drive sprocket to keyed end of input shaft with shift splines (A) facing shift collar (B).

34. Install needle bearing, washer, and snap ring.



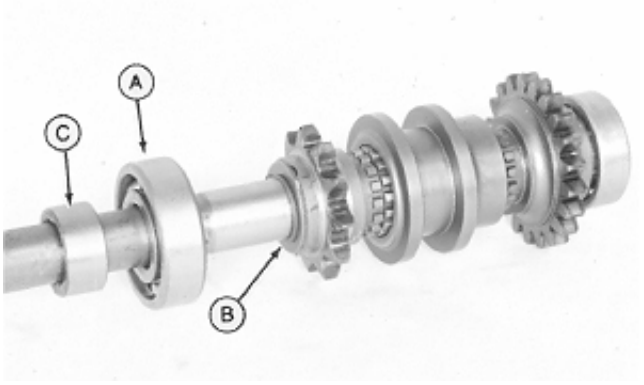
RW12100 -UN-21NOV88

MX,5020HE,A23 -19-27SEP91

35. Install bearing (A) onto shaft against snap ring (B) using a piece of pipe and a press.

36. Apply multipurpose grease to shaft and wear sleeve (C).

37. Install wear sleeve onto shaft against bearing using a piece of pipe and a press.

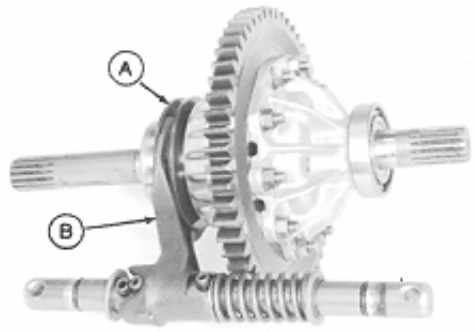


RW12101 -UN-21NOV88

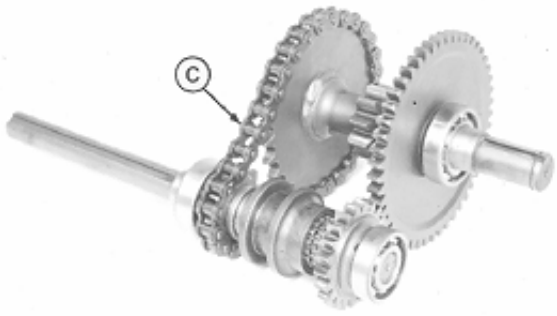
MX,5020HE,A24 -19-27SEP91

38. Assemble differential lock shaft fork (B) into differential lock collar (A).

39. Assemble input shaft and secondary shaft with reverse drive chain (C).



M80784 -UN-10SEP91



M80785 -UN-10SEP91

MX,5020HE,A25 -19-27SEP91

NOTE: Coat input and output shafts with grease to avoid damaging seal lips.

40. Install differential (D) and differential lock shaft (E) into case half.

41. Start input shaft (A) through case while installing secondary shaft and chain (C) behind differential gear.

42. Align shifter block (B) with shift collar.

43. Align secondary shaft with case bore.

44. Tap secondary and input shafts with a rubber hammer to seat bearings.

45. Clean mating surfaces of transaxle case halves using Clean and Cure Primer. Apply a coat of John Deere Plastic Gasket, or an equivalent to case halves.

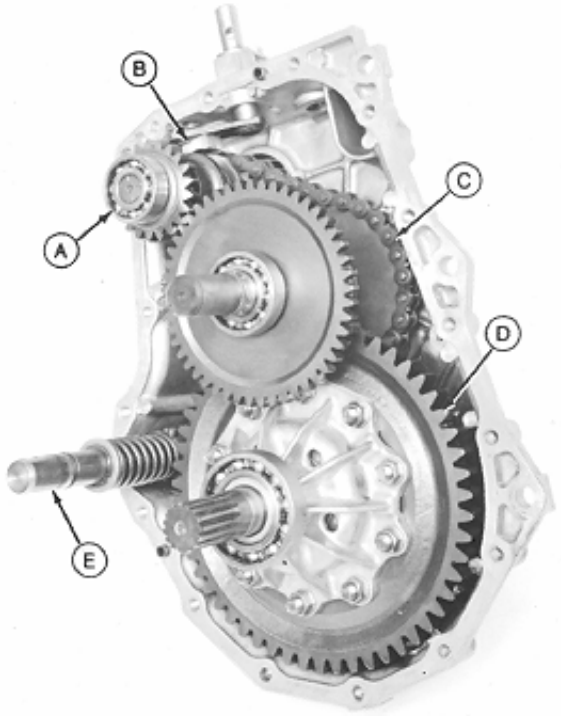
46. Apply multipurpose grease to shafts.

47. Assemble case halves.

48. Install cap screws and tighten to specifications.

TORQUE SPECIFICATIONS

Case Cap Screws
- Same Case . . . . . 25 N·m (221 lb-in.)
- New Case . . . . . 29 N·m (257 lb-in.)



M80786 -UN-10SEP91

A—Input Shaft
B—Shifter Block
C—Secondary Shaft and Chain
D—Differential
E—Differential Lock Shaft

MX,5020HE,A26 -19-27SEP91

INSTALL TRANSAXLE EXTERNAL COMPONENTS

1. Apply thread lock and sealer (medium strength) to threads of tube (B).

2. Install tube (B). Tighten to specifications.

3. Apply NEVER-SEEZ lubricant or an equivalent to all shafts.

4. Install lever and roll pin (D).

5. Install new O-ring and switch (E). Tighten to specifications.

6. Install bracket (C).

7. Install key, brake disc (A), washer and snap ring.

8. Install lever and roll pin (F).

9. Install driven clutch. (See Group 10).

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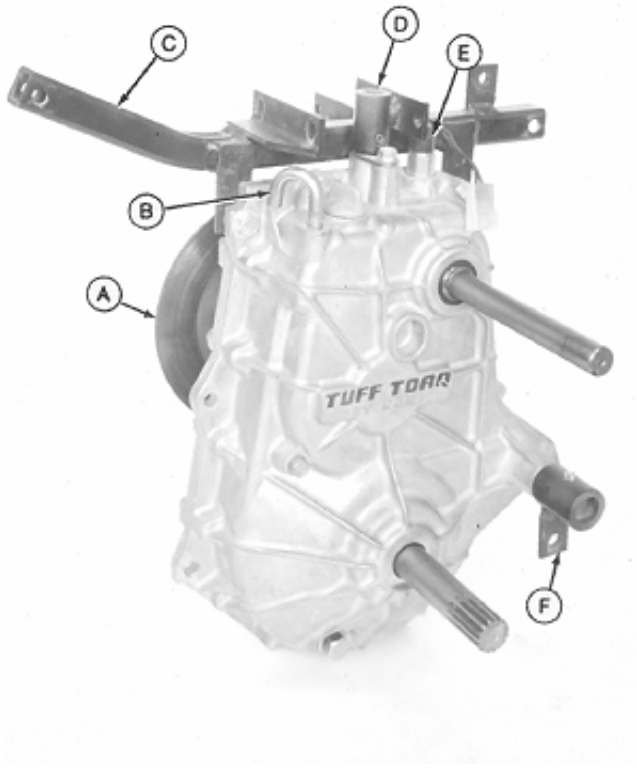
TORQUE SPECIFICATIONS

Vent Tube (B)	10 N·m (88 lb-in.)
Neutral Start Switch	39 N·m (28 lb-ft)



M80773 -UN-10SEP91

A—Brake Disc
B—Vent Tube
C—Mount Bracket
D—Gear Shift Lever
E—Neutral Start Switch
F—Differential Lock Lever

MX,5020HE,A27 -19-27SEP91

INSTALL TRANSAXLE

IMPORTANT: Bottom mounting hole: Install transaxle on left-hand side of frame mount tab.

1. Install transaxle, cap screws, washers and nuts (F). Tighten cap screws to 50 N·m (37 lb-ft).

2. Install shift cables/housing through transaxle mount bracket. Install nuts (I).

3. Install shift cables through transaxle shift lever. Install clamps (C) and tighten screws.

4. Install tube (D).

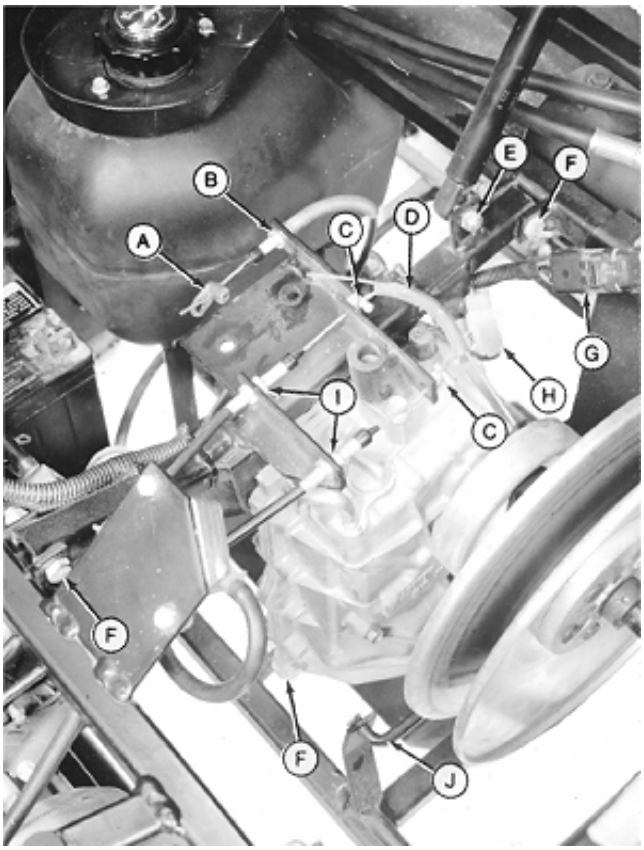
5. Install brake cable, nut (B) and lever (A).

6. Raise rear body cowling and install lock nut (E).

7. Connect wiring connectors (G and H).

8. Connect rod (J) and install spring pin.

9. Install tie straps as necessary.



M80772 -UN-10SEP91

A—Brake Caliper Lever
B—Nut
C—Clamps (4 used)
D—Tube
E—Lock Nut
F—Cap Screw, Washer and Nut (3 used)
G—Hydraulic Pump Wiring Connector
H—Neutral Start Switch Wiring Connector
I—Nuts
J—Differential Lock Rod

MX,5020HE,A28 -19-27SEP91

10. Apply multipurpose grease to splines of axle shafts.

11. Install axle shaft into coupler, both sides.

12. Install four carriage bolts and nuts (A). Tighten flangette nuts to 25 N·m (216 lb-in.).

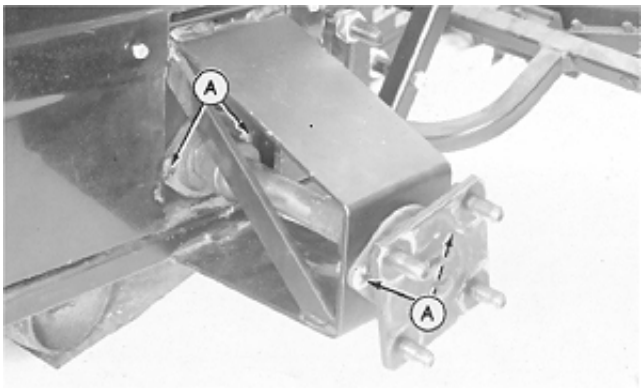
13. Install rear wheels. (See Section 80, Group 10.)

14. Install brake caliper. (See Section 60, Group 10.)

15. Install drive belt. (See Group 10.)

16. Adjust transaxle shift cables. (See Section 250, Group 15.)

17. Fill transaxle with proper oil. (See Section 10, Group 20.)



E33563 -UN-18SEP89

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MX,5020HE,A29 -19-27SEP91

REMOVE, INSPECT AND INSTALL DRIVE AXLES AND BEARINGS

1. Remove battery cover and disconnect battery negative (—) cable.

2. Remove rear wheels. (See Section 80, Group 10.)

3. Loosen set screws (G) on collars (F).

NOTE: Rotate collars (F) using a punch in blind hole in collar.

4. Rotate locking collars opposite direction of shaft rotation using a punch and hammer. Slide collars off of bearings (E).

5. Clean corrosion from axle shaft using an emery cloth or fine sand paper.

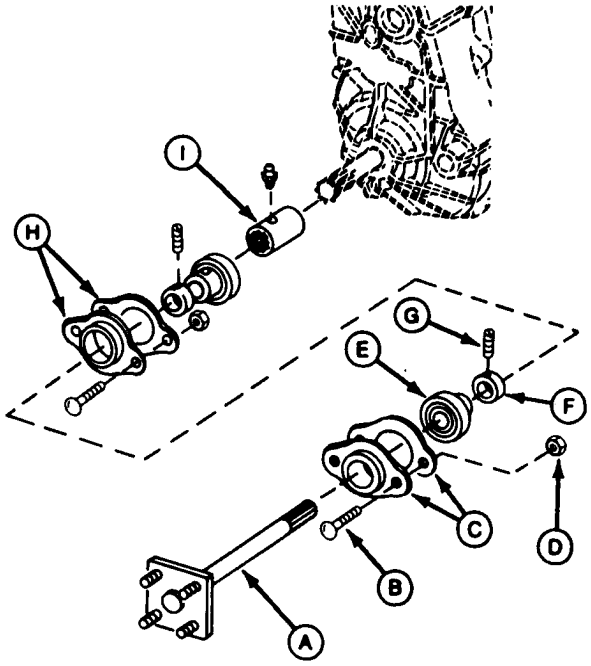
6. Remove drive axle (A) using a jaw puller and a slide hammer.

7. Remove parts (B—I).

8. Inspect parts for wear or damage. Replace as necessary.

9. Apply multipurpose grease to ID of coupler (I).

10. Install all parts. Leave nuts (D) loose.



M80787 -UN-10SEP91

MX,5025HE,A1 -19-27SEP91

11. Rotate axle shaft several times to center bearings.

12. Adjust axle so distance (A) is according to specifications.

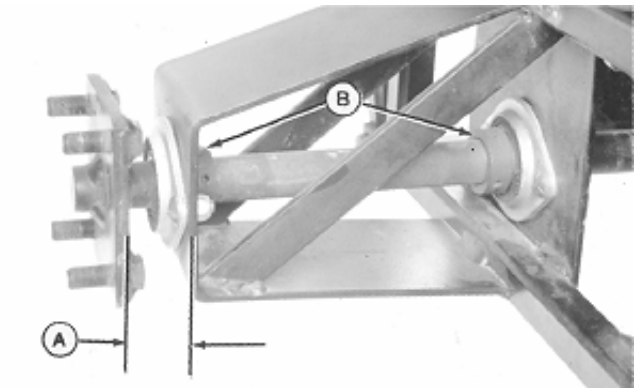
13. Tighten bearing flangette lock nuts to specifications.

14. Slide eccentric locking collars (B) over bearings. Rotate and lock collars in direction of shaft rotation using a punch and hammer.

15. Tighten locking collar set screws to specifications.

16. Install rear wheels.

17. Connect battery negative (—) cable and install cover.



-UN-10SEP91

M80788

SPECIFICATIONS

Distance (A)	30.15 mm (1.187 in.)
Bearing Flangette Lock Nut Torque	25 N·m (216 lb-in.)
Locking Collar Set Screw Torque	8 N·m (64 lb-in.)

50
25
2

MX,5025HE,A2 -19-27SEP91

Section 60
STEERING AND BRAKE REPAIR

Contents

OTHER MATERIAL

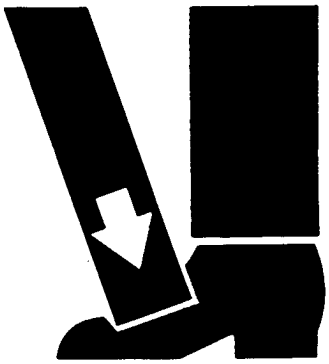
Number	Name	Use
PT569	John Deere NEVER-SEEZ® Lubricant	Prevents parts from seizing.
TY6240	John Deere Chain Lube	Lubricate steering chain.

NEVER-SEEZ is a trademark of the Emhart Chemical Group.

MX,6005HE,A1 -19-27SEP91

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.

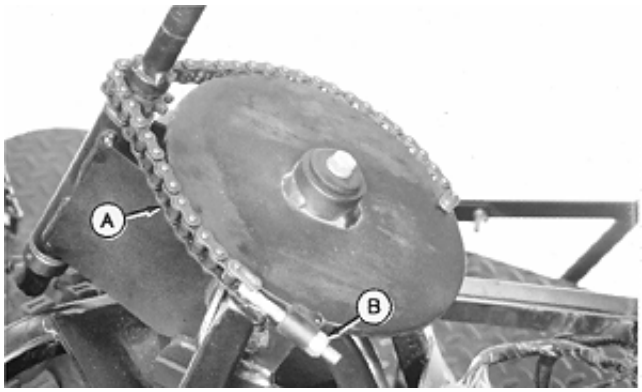


TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE, INSPECT AND INSTALL STEERING SHAFT

1. Remove front hood. (See Section 80, Group 05.)
2. Remove lock nut (B) and disconnect chain (A).



M80863 -UN-19SEP91

MX,6005HE,A2 -19-27SEP91

3. Remove cap (G).

4. Loosen set screw (F) and remove collar (E).

5. Remove shaft (A), spacer (B) and washer (C).

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

NOTE: Remove bushings only if replacement is necessary.

7. Inspect bushings (D) for wear or damage. Replace if necessary.

Remove bushings using a blind hole puller set. Install bushings using a bearing, bushing and seal driver set.

8. Apply NEVER-SEEZ lubricant on lower half of steering shaft.

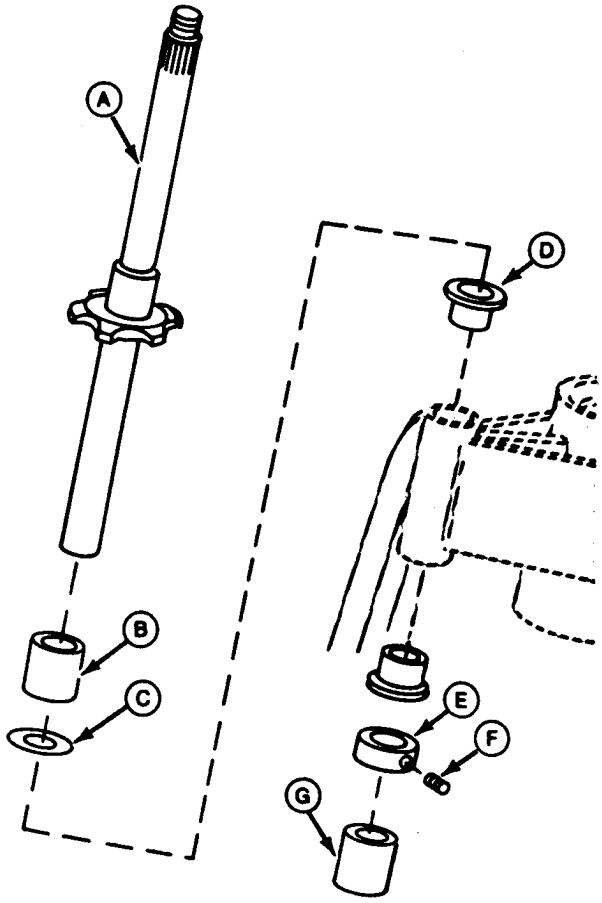
9. Install washer, spacer and steering shaft.

NOTE: Install collar (E) with recessed side facing down.

Do not install collar tight against frame.

10. Install eccentric collar (E) and tighten set screw to 8 N·m (64 lb-in.).

11. Install cap.



M80864 -UN-19SEP91

A—Steering Shaft
B—Spacer
C—Washer
D—Bushing (2 used)
E—Eccentric Collar
F—Set Screw
G—Cap

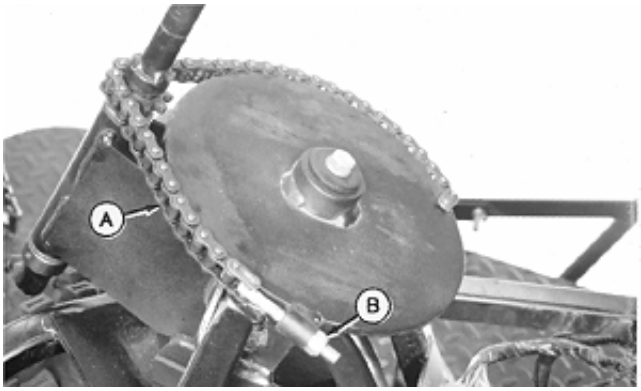
MX,6005HE,A3 -19-27SEP91

IMPORTANT: Do not over tighten lock nut (B). Steering fork will not rotate.

12. Connect chain (A) and install lock nut (B). Tighten lock nut until snug. Rotate steering fork to check for smooth operation.

13. Apply John Deere Chain Lube, or an equivalent, to chain.

14. Install front hood. (See Section 80, Group 05.)



M80863 -UN-19SEP91

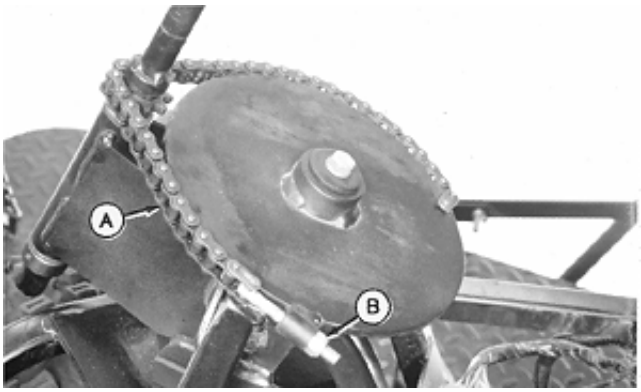
MX,6005HE,A4 -19-27SEP91

REMOVE, INSPECT AND INSTALL STEERING FORK ASSEMBLY

1. Remove front hood. (See Section 80, Group 05.)

2. Remove front wheel. (See Section 80, Group 10.)

3. Remove lock nut (B) and disconnect chain (A).



-UN-19SEP91
M80863

MX,6005HE,A5 -19-27SEP91

4. Support steering fork (G).

5. Remove parts (A—G).

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

NOTE: Bearings (F) are press fit. Remove only if replacement is necessary.

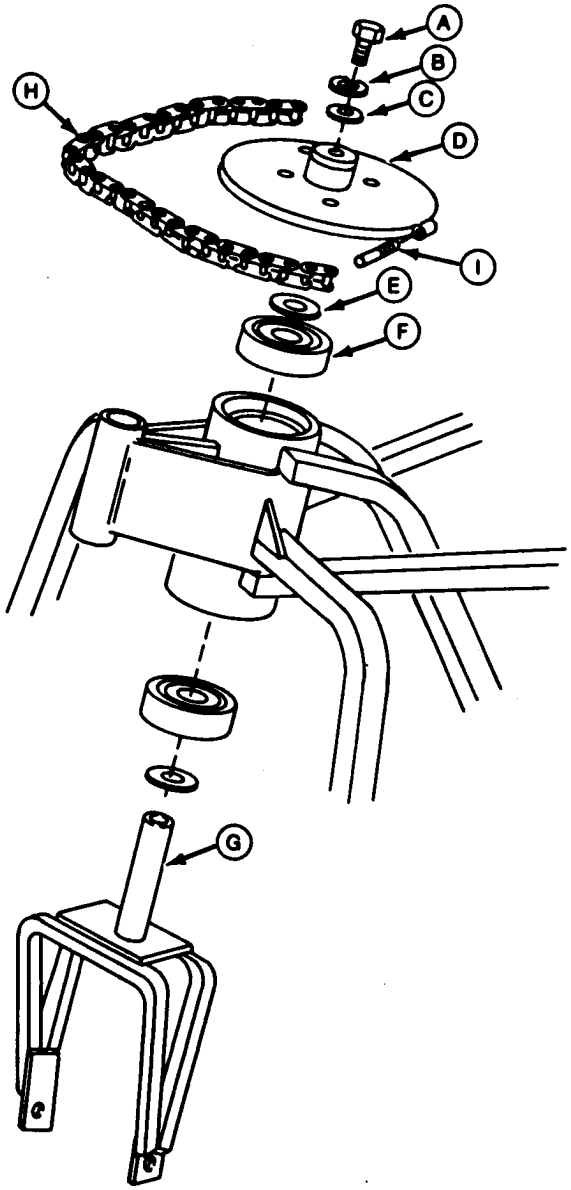
7. Inspect bearings (F) for wear or damage. Replace if necessary.

Replace bearings using a bearing, bushing and seal driver set.

8. Apply NEVER-SEEZ lubricant to steering fork shaft.

9. Install fork (G) and washers (E). Support steering fork.

A—Cap Screw
B—Lock Washer
C—Washer
D—Steering Disk
E—Washer (2 used)
F—Bearings (2 used)
G—Steering Fork
H—Chain
I—Stud



-UN-19SEP91
M80865

MX,6005HE,A6 -19-27SEP91

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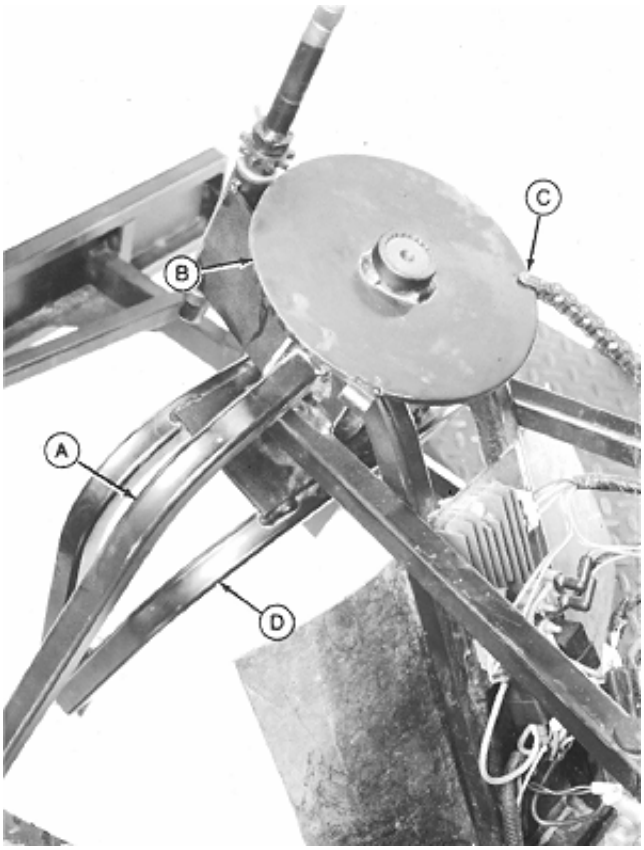
05
3

10. Rotate steering fork (D) until forks are parallel to frame (A) as shown.

11. Position disk (B) with chain end (C) in 4 o'clock position as shown.

12. Align disk ID splines with steering fork shaft and install.

A—Frame
B—Disk
C—Chain End
D—Steering Fork



-UN-19SEP91
M80866

MX,6005HE,A7 -19-27SEP91

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05
4

13. Install washer, lock washer and cap screw (B).

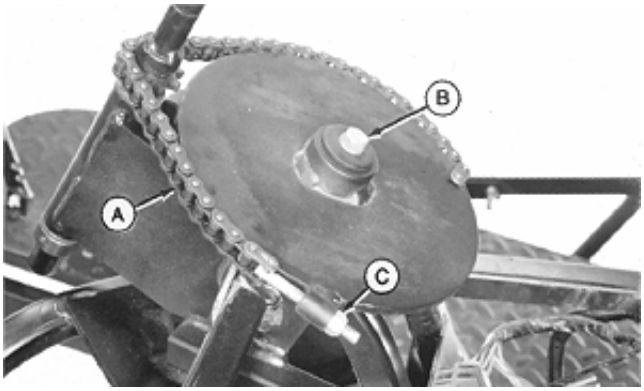
IMPORTANT: Do not over tighten lock nut (C). Steering fork will not rotate.

14. Connect chain (A) and install lock nut (C). Tighten lock nut until snug. Rotate steering fork to check for smooth operation.

15. Apply John Deere Chain Lube, or an equivalent, to chain.

16. Install front wheel. (See Section 80, Group 10.)

17. Install front hood. (See Section 80, Group 05.)



-UN-19SEP91
M80867

MX,6005HE,A8 -19-27SEP91

OTHER MATERIAL

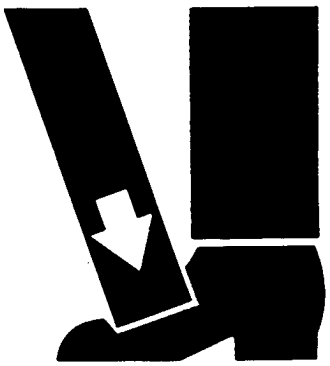
Number	Name	Use
AR85792	John Deere Multi-Purpose Adhesive	Apply to brake lining half to hold in place.
PT569	John Deere NEVER-SEEZ® Lubricant	Prevents parts from seizing.

NEVER-SEEZ is a trademark of the Emhart Chemical Group.

MX,6010HE,A1 -19-27SEP91

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

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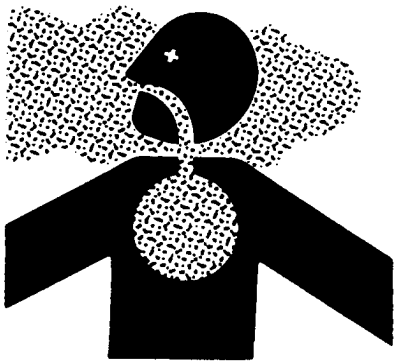
1

REMOVE AND INSTALL BRAKE CALIPER

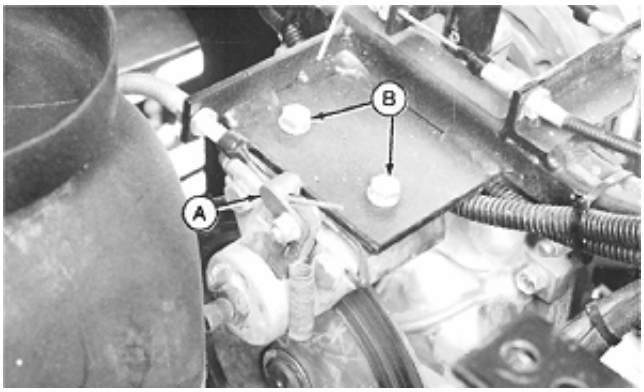


TS220 -UN-23AUG88

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



M80789 -UN-19SEP91

1. Remove lock nut and lever (A).

2. Remove cap screws and lock washers (B).

3. Rotate brake caliper toward rear of machine. Remove brake caliper.

4. Make repairs as necessary. (See procedures in this group.)

60 10 2

5. Install brake caliper and rotate into position.

6. Install lock washers and cap screws.

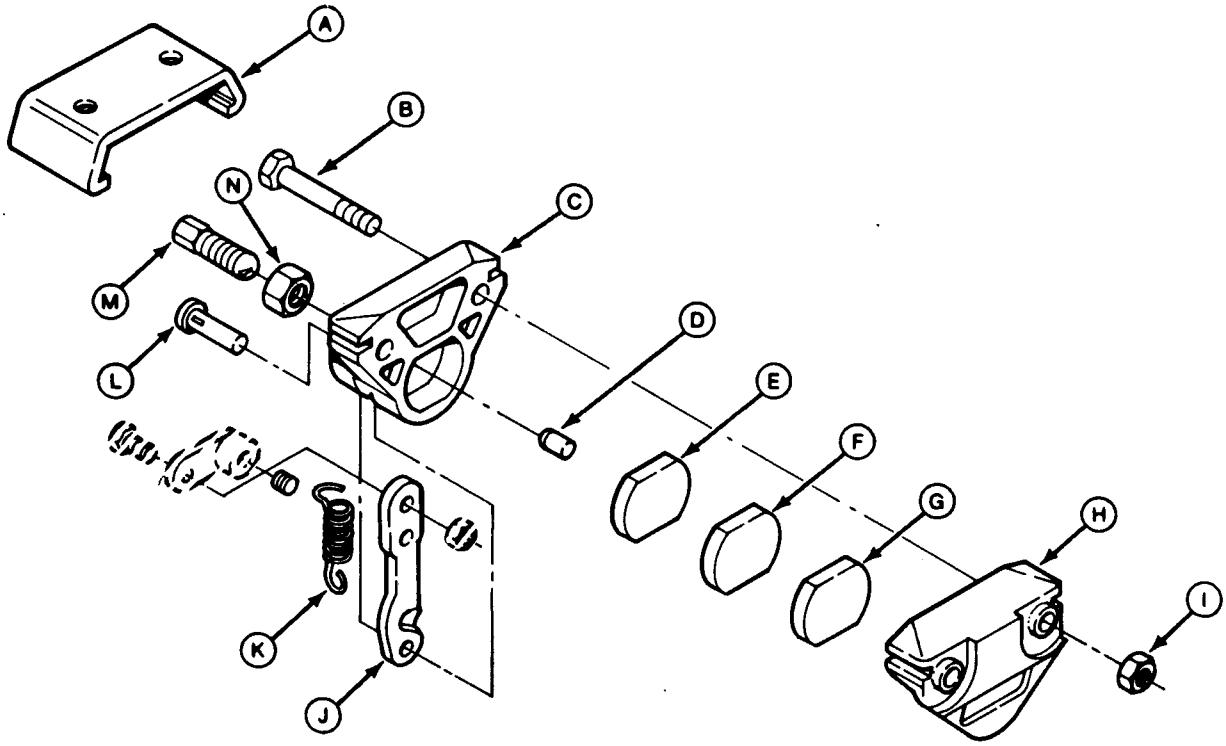
7. Install lever and lock nut.

8. Adjust brake pad contact. (See procedure in this group.)

9. Adjust brake cable. (See Section 260, Group 15.)

MX,6010HE,A2 -19-27SEP91

DISASSEMBLE, INSPECT AND ASSEMBLE BRAKE CALIPER



M80790 -UN-19SEP91

NOTE: Lining (G) is glued in housing half (H). Replace only if necessary.

Remove pin (L) using a hammer and punch.

1. Disassemble parts (A—N).

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

3. Inspect linings (F and G) for excessive wear. Replace if necessary.

4. Apply John Deere Multi-Purpose Adhesive, or an equivalent to lining (G).

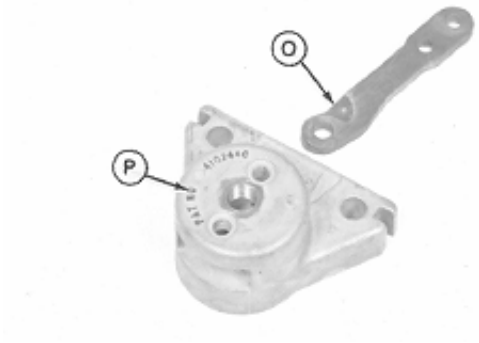
5. Apply NEVER-SEEZ lubricant on pin (D).

NOTE: Install lever (J) with thin part (O) toward PAT No. characters (P).

6. Assemble all parts.

7. Leave screw (M) loose.

8. Tighten cap screws (B) to 33 N·m (24 lb-ft).



M80791 -UN-19SEP91

A—Bracket
B—Cap Screw (2 used)
C—Housing Half
D—Actuator Pin
E—Wear Plate
F—Lining
G—Lining
H—Housing Half
I—Lock Nut (2 used)
J—Lever
K—Spring
L—Pin
M—Screw
N—Jam Nut
O—Thin Part of Lever
P—PAT No. Characters

MX,6010HE,A3 -19-27SEP91

REMOVE, INSPECT AND INSTALL BRAKE DISK

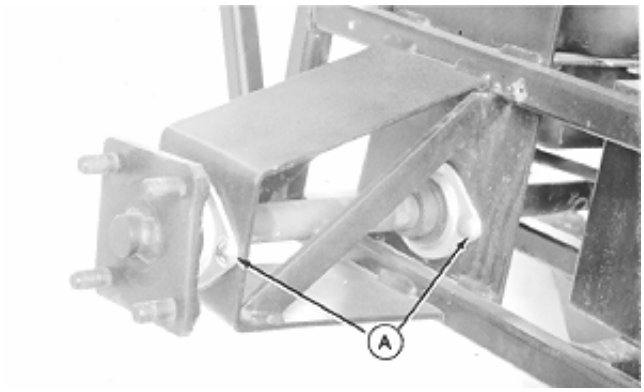
1. Remove brake caliper. (See procedure in this group.)

2. Remove right-hand side rear wheel. (See Section 80, Group 10.)

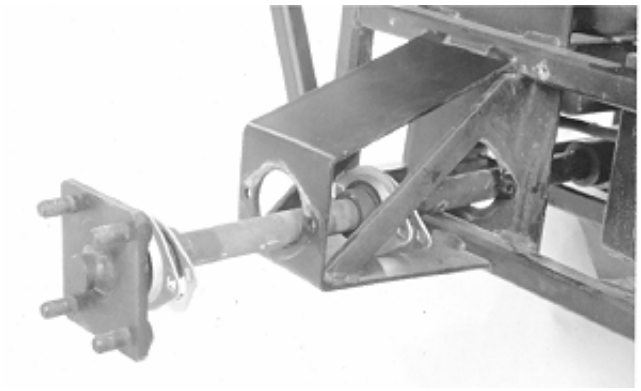
3. Remove right-hand side panel.

4. Remove four lock nuts and bolts (A).

5. Pull axle shaft assembly out of coupler.



M80792 -UN-19SEP91



M80793 -UN-19SEP91

MX,6010HE,A4 -19-27SEP91

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4

6. Remove snap ring (A) and washers.

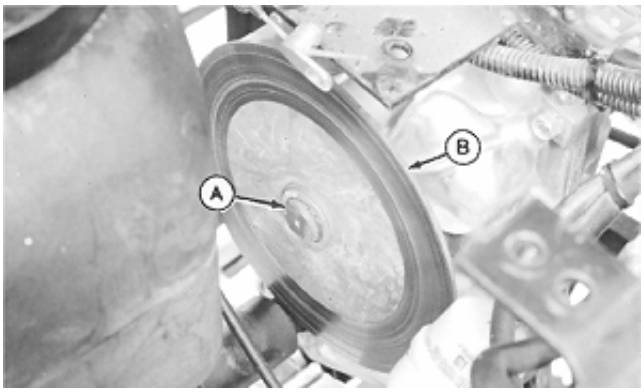
7. Remove brake disk (B) and key.

8. Inspect parts for wear or damage. Replace as necessary.

9. Apply NEVER-SEEZ or an equivalent to transaxle shaft.

10. Install key and brake disk.

11. Install washers and snap ring.



M80794 -UN-19SEP91

MX,6010HE,A5 -19-27SEP91

12. Apply multipurpose grease to splined end of axle shaft.

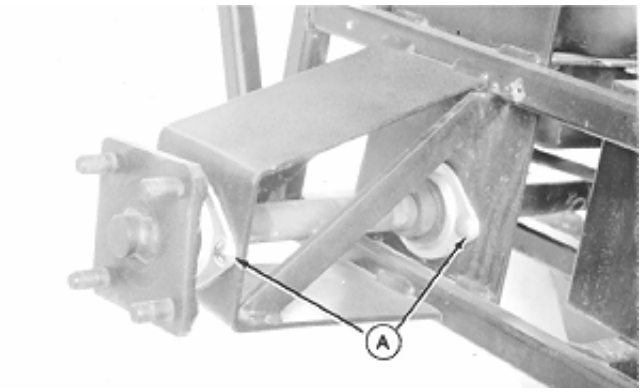
13. Install axle shaft into coupler.

14. Install bolts and lock nuts (A). Tighten nuts to 25 N·m (216 lb-in.)

15. Install right-hand side panel.

16. Install rear wheel. (See Section 80, Group 10.)

17. Install brake caliper. (See procedure in this group.)



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MX,6010HE,A6 -19-27SEP91

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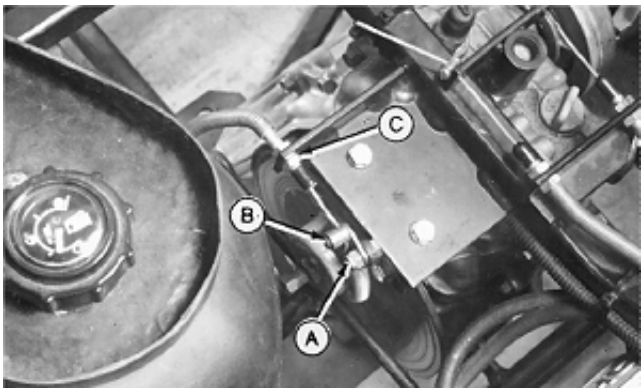
REPLACE BRAKE CABLE AND HOUSING

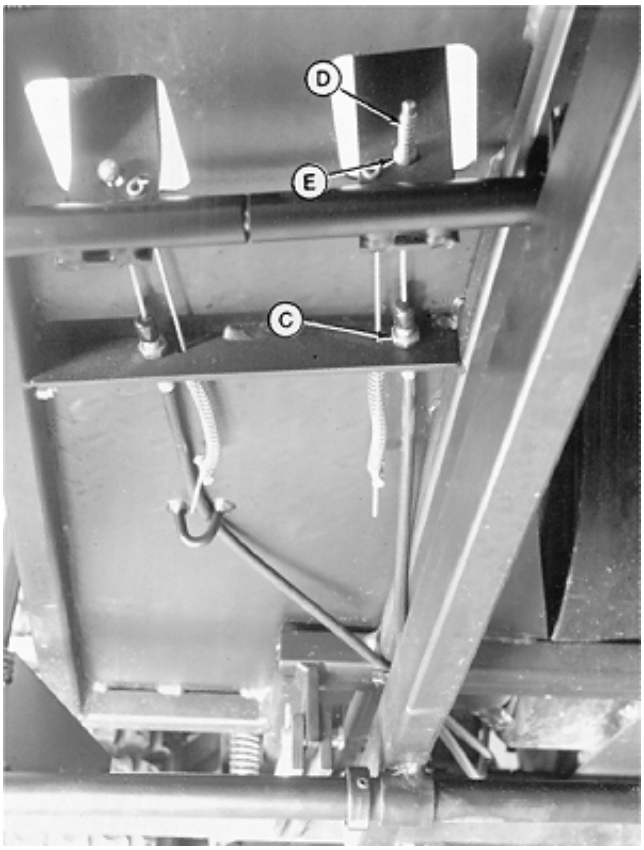
NOTE: Brake cable can be replaced separately.

1. Remove cap screw and nut (A).
2. Loosen set screw (B) and remove adapter from cable.
3. Pull cable through housing and pedal.
4. Remove nuts (C) from both ends of housing.
5. Remove cable housing.
6. Pull new cable cut of new housing. Leave spring (D) and ball (E) on cable.
7. Install new cable housing and nuts (C).
8. Put new cable through pedal, housing and bracket.
9. Install cap screw and nut (A). Tighten cap screw.
10. Adjust brake cable. (See Section 260, Group 15.)

A—Cap Screw and Nut
B—Set Screw
C—Nuts
D—Spring
E—Ball



E33626 -UN-18SEP89



E33627 -UN-18SEP89

MX,6010HE,A7 -19-27SEP91

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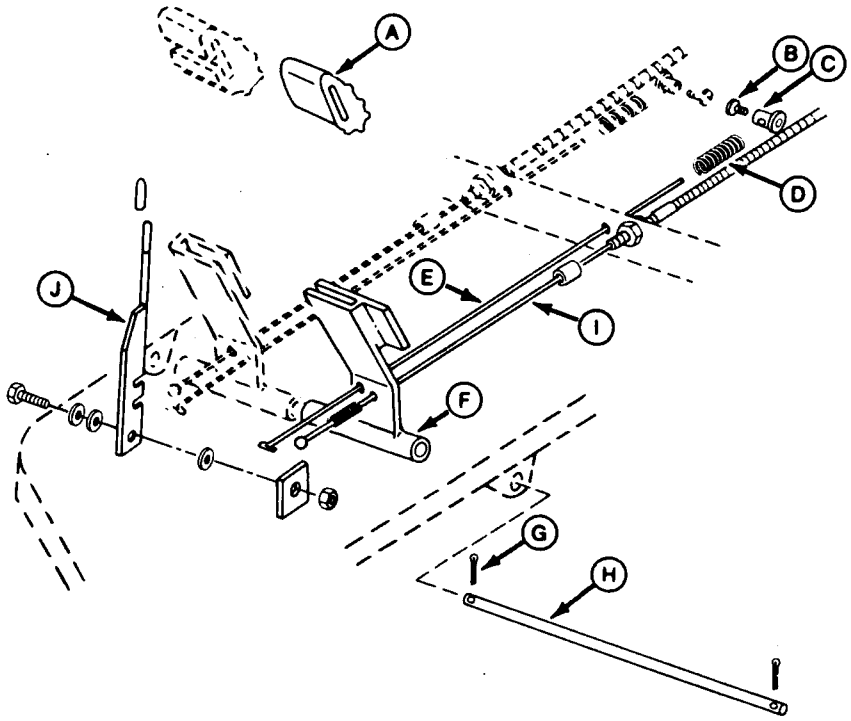
6

INSPECT AND REPAIR BRAKE PEDAL ASSEMBLY



M80795 -UN-19SEP91

A—Pedal Pad
B—Screw
C—Clamp
D—Extension Spring
E—Cable
F—Brake Pedal
G—Cotter Pin (2 used)
H—Rod
I—Brake Cable
J—Park Brake Lock Lever

60 10 7

1. Remove brake cable (I). (See Replace Brake Cable and Housing in this group.)

2. Remove parts (A—H).

3. Inspect parts for wear or damage. Replace as necessary.

4. Install all parts.

5. Install brake cable.

MX,6010HE,A8 -19-27SEP91

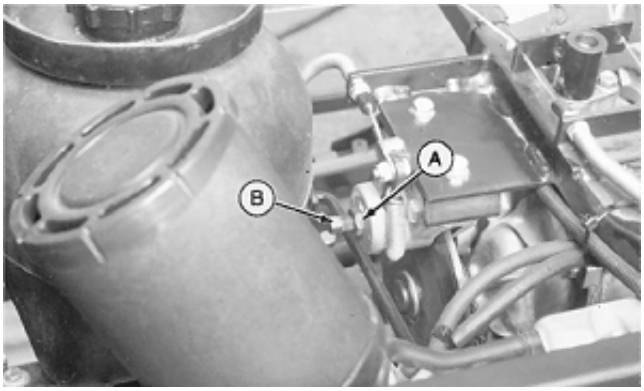
BRAKE PAD CONTACT ADJUSTMENT

1. Loosen jam nut (A).

2. Turn screw (B) clockwise until tight.

3. Turn screw counterclockwise 1/2 turn.

4. Tighten jam nut.



E33540 -UN-12SEP89

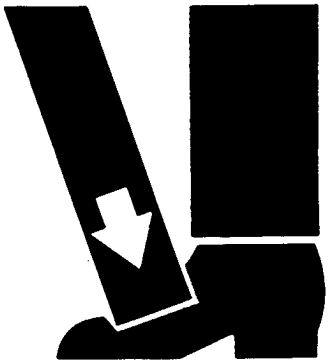
MX,6010HE,A9 -19-27SEP91

Section 70
HYDRAULIC REPAIR

Contents

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.

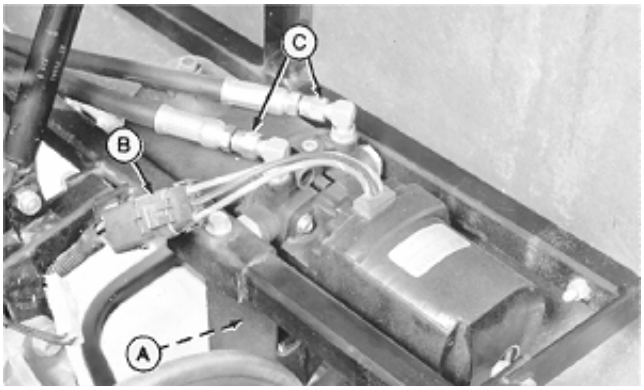


TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE AND INSTALL HYDRAULIC PUMP (OPTIONAL)

1. Disconnect wiring connector (B).
2. Disconnect hoses (C). Close all openings using caps and plugs.
3. Remove two cap screws and washers (A).
4. Remove hydraulic pump.
5. Make repairs as necessary. (See this group.)
6. Install hydraulic pump.
7. Install washers and cap screws.
8. Connect hoses.
9. Connect wiring connector.



M80702 -UN-07AUG91

MX,7005HE,A1 -19-27SEP91

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05
1

DISASSEMBLE AND INSPECT HYDRAULIC PUMP

1. Remove motor. (See Replace Hydraulic Pump Motor in Section 40, Group 10.)

NOTE: Reservoir oil capacity is 367 mL (12.4 oz).

2. Remove breather/plug (19) and drain reservoir.

3. Remove parts (17—21).

NOTE: Gear pump (25), relief valves (15, 16 and 27) and adapter assembly (6) are serviced as assemblies.

IMPORTANT: Mark the position of the relief valves before removal. Failure to install the relief valves in their original position will change the relief pressures, which may damage components.

4. Make a mark on relief valves (15, 16, and 27), nuts (14), and adapter (6) for each relief valve assembly prior to removal to aid in assembly. Also measure the length of each relief valve from the adapter to the end of the relief valve in case the relief valve must be replaced.

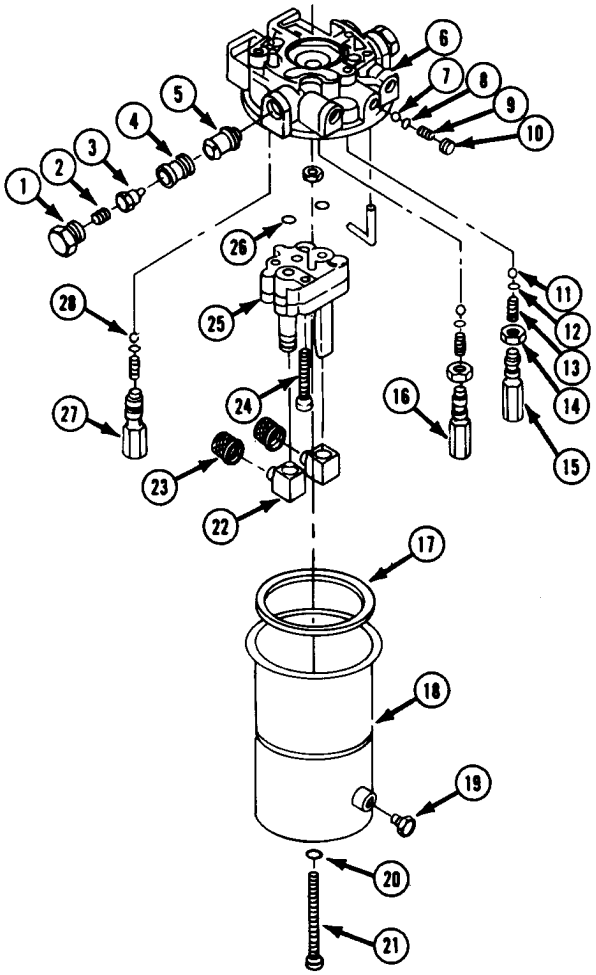
5. Inspect relief valve springs (13), balls (11, and 28), and seat for debris, cracks, wear or damage.

6. Inspect gear pump (25) teeth for nicks or burrs. Inspect pump housing for wear or damage.

7. Check shuttle valve (5) for free movement in bore and O-ring for damage.

8. Inspect passages for plugged condition.

9. Clean components in solvent and dry with compressed air. Be sure all passages are clear.



M80705 -UN-07AUG91

1—Hex Plug
2—Spring
3—Lift Check Assembly
4—Lift Check Body
5—Shuttle Valve
6—Adapter
7—Ball
8—Eyelet
9—Spring
10—Set Screw
11—Steel Ball (2 used)
12—Eyelet (3 used)
13—Spring (3 used)
14—Nut (2 used)
15—Lower Relief Valve
16—Raise Relief Valve
17—Seal
18—Reservoir
19—Breather/Plug
20—O-Ring
21—Screw
22—Fitting (2 used)
23—Suction Screen (2 used)
24—Screw
25—Gear Pump
26—O-Ring (2 used)
27—Thermal Relief Valve (2 used)
28—Plastic Ball (2 used)

MX,7005HE,A2 -19-27SEP91

ASSEMBLE HYDRAULIC PUMP

1. Apply a light coating of hydraulic oil to all internal parts before assembly.

NOTE: Install fittings (22) and screens (23) pointing 180° to set screw (10).

Install reservoir (18) with breather/plug (19) in alignment with set screw (10).

2. Assemble all parts.

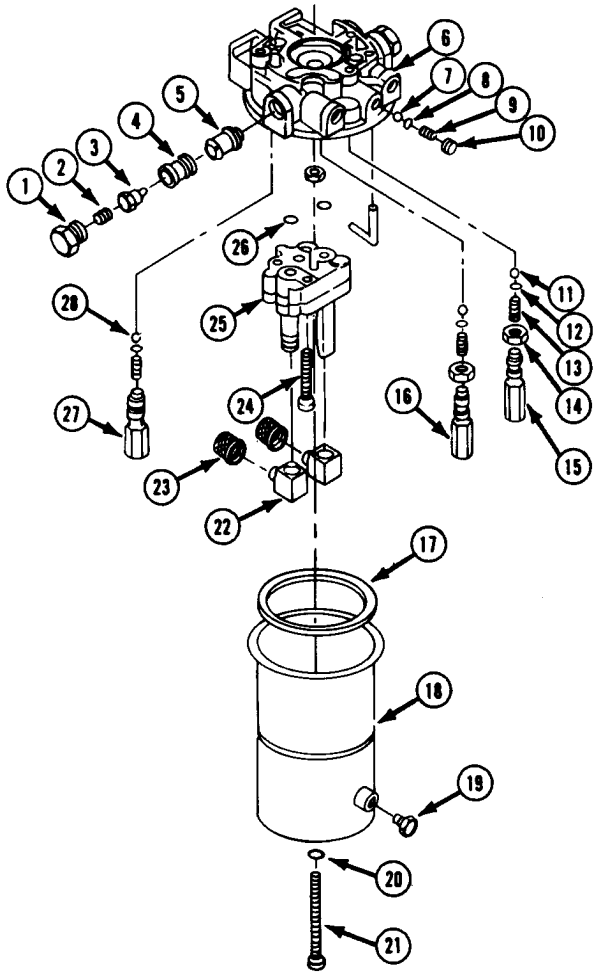
3. Tighten components to specifications.

4. Fill reservoir with proper oil. (See Section 10, Group 20.)

5. Install motor. (See Replace Hydraulic Pump Motor in Section 40, Group 10.)

TORQUE SPECIFICATIONS

ITEM	SPECIFICATION
19—Reservoir screw	5 N·m (45 lb-in.)
24—Gear pump screw	8 N·m (70 lb-in.)
1—Hex plug	59 N·m (44 lb-ft)
14—Lower (16) and raise (15) relief valve nut	2 N·m (20 lb-in.)
27—Thermal relief valve	7 N·m (60 lb-in.)



M80705 -UN-07AUG91

1—Hex Plug
2—Spring
3—Lift Check Assembly
4—Lift Check Body
5—Shuttle Valve
6—Adapter
7—Ball
8—Eyelet
9—Spring
10—Set Screw
11—Steel Ball (2 used)
12—Eyelet (3 used)
13—Spring (3 used)
14—Nut (2 used)
15—Lower Relief Valve
16—Raise Relief Valve
17—Seal
18—Reservoir
19—Breather/Plug
20—O-Ring
21—Screw
22—Fitting (2 used)
23—Suction Screen (2 used)
24—Screw
25—Gear Pump
26—O-Ring (2 used)
27—Thermal Relief Valve (2 used)
28—Plastic Ball (2 used)

MX,7005HE,A2A -19-27SEP91

REMOVE AND INSTALL LIFT CYLINDER

1. Retract lift cylinder.

2. Remove left-hand side panel.

3. Disconnect hoses (B and C). Close all openings using caps and plugs.

4. Remove pin (D).

5. Remove nut (A) and cylinder.

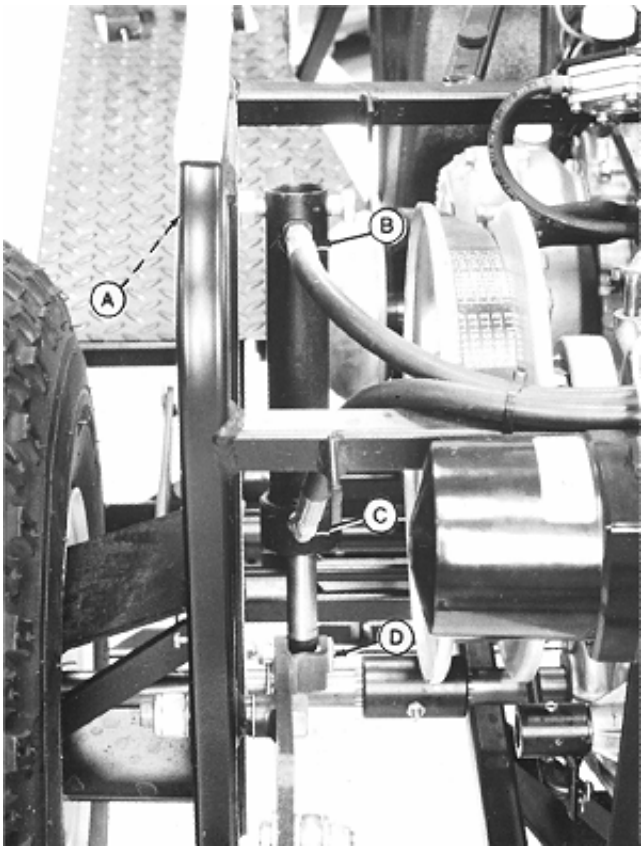
NOTE: Lift cylinder is not serviceable.

6. Install lift cylinder, nut and pin.

7. Connect hoses.

8. Install left-hand side panel.

A—Flange Nut
B—Hydraulic Hose-to-Cylinder Head End
C—Hydraulic Hose-to-Cylinder Rod End
D—Pin



MX,7005HE,A3 -19-27SEP91

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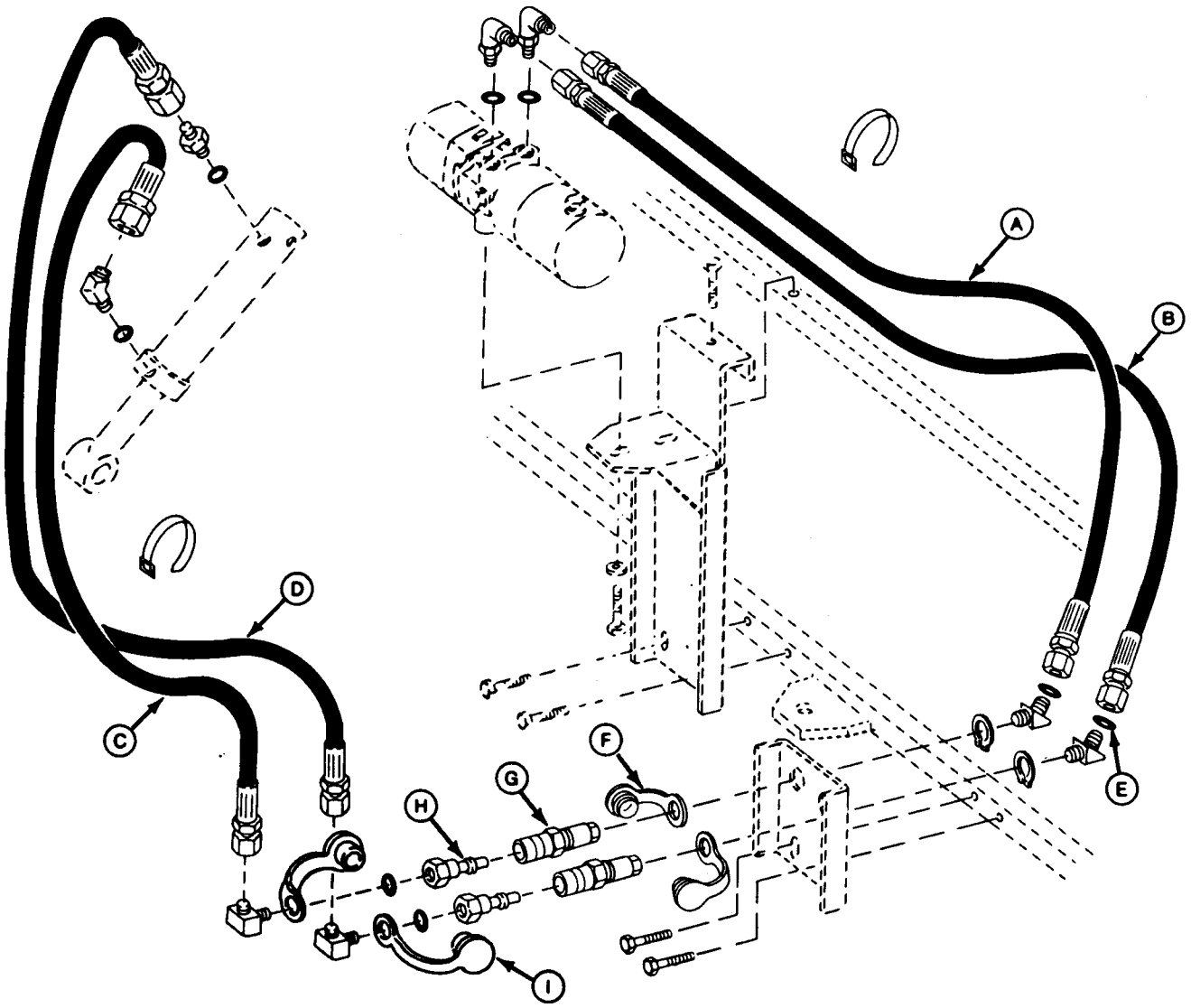
INSPECT AND REPLACE HYDRAULIC HOSES AND COUPLERS



M80704 -UN-07AUG91

70 05 5

A—Hydraulic Hose from Pump
B—Hydraulic Hose from Pump
C—Hydraulic Hose to Lift Cylinder
D—Hydraulic Hose to Lift Cylinder
E—O-Ring (8 used)
F—Cap (2 used)
G—Quick Coupler—Female (2 used)
H—Quick Coupler—Male (2 used)
I—Cap (2 used)

1. Remove all tie straps.

2. Disconnect hoses (A—D). Close openings using caps and plugs.

3. Inspect parts for wear or damage. Replace as necessary.

4. Apply petroleum jelly to O-rings (E).

5. Connect hoses.

IMPORTANT: When installing tie straps, tie hoses to frame to keep away from driven clutch and fuel tank spill tray. Hoses may split or spill tray will crack.

6. Install tie straps as necessary.

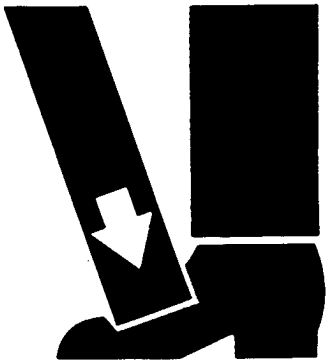
MX,7005HE,A4 -19-27SEP91

Section 80
MISCELLANEOUS REPAIR

Contents

LOWER ALL ATTACHMENTS

CAUTION: Always lower all attachments or implements 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. Failure to do so may result in serious injury.



TS226 -UN-23AUG88

MX,LOW,AT -19-27SEP91

REMOVE AND INSTALL FRONT HOOD

1. Remove steering wheel.

2. Remove choke knob and cable. (See Section 30, Group 05.)

3. Remove key, front light, and hydraulic pump switches. (See Section 40, Group 10.)

4. Remove voltmeter and hourmeter. (See Section 40, Group 10.)

5. Disconnect front light wiring connector (A).

6. Remove front hood.

7. Install front hood.

8. Connect front light wiring connector.

9. Install hourmeter, voltmeter and switches.

10. Install choke knob and cable.

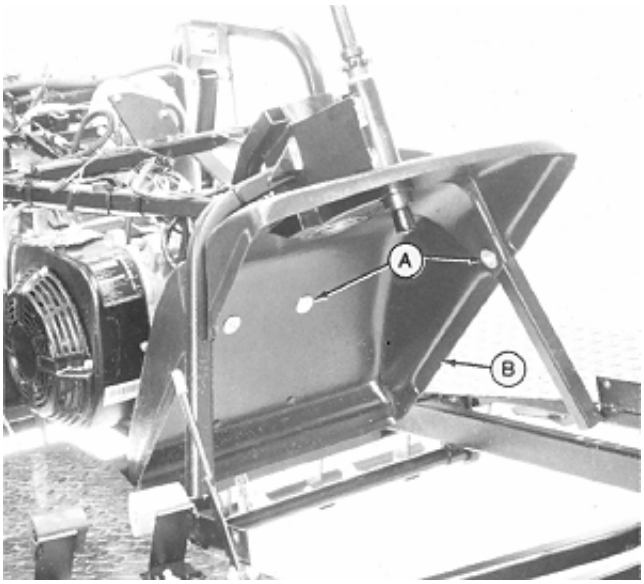
11. Install steering wheel. Tighten nut to 197 N·m (145 lb-ft).

M80796 -UN-20SEP91

MX,8005HE,A1 -19-27SEP91

REMOVE AND INSTALL FRONT SPLASH GUARD—IF EQUIPPED

1. Remove steering fork. (See Section 60, Group 05.)
2. Remove four screws and washers (A).
3. Remove splash guard (B).
4. Install splash guard.
5. Install screws and washers.
6. Install steering fork.

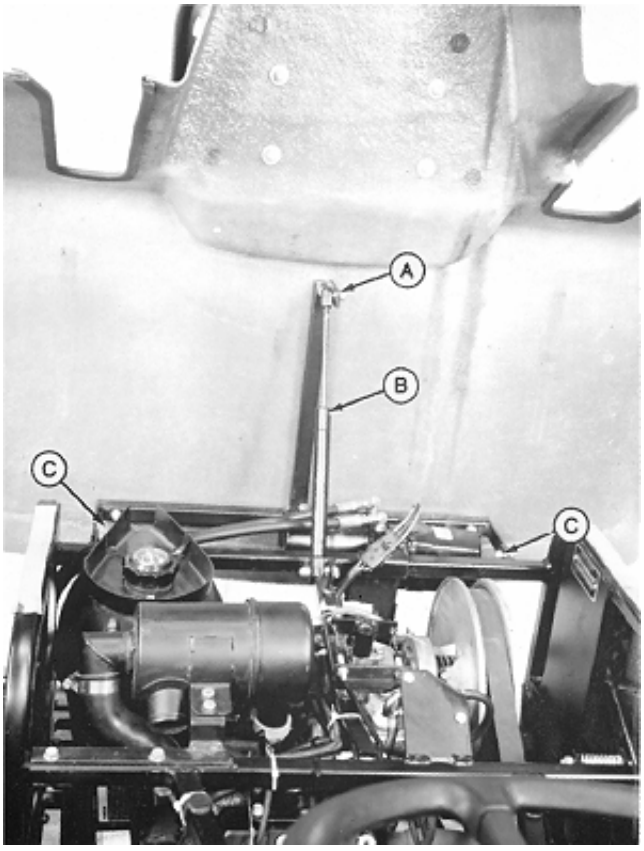


-UN-20SEP91
M80860

MX,8005HE,A2 -19-27SEP91

REMOVE AND INSTALL REAR BODY COWLING

1. Raise rear body cowling. Attach a lifting strap to support cowling.
2. Remove lock nut (A) and disconnect support cylinder (B).
3. Remove cap screws and lock nuts (C).
4. Remove rear body cowling.
5. Install rear body cowling, cap screws and lock nuts.
6. Connect support cylinder and install lock nut.



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M80797

MX,8005HE,A3 -19-27SEP91

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2

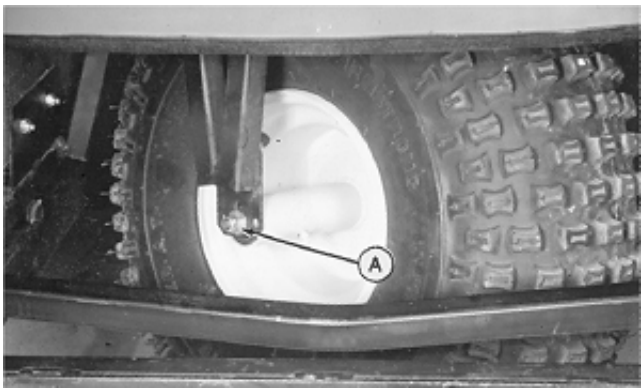
REMOVE AND INSTALL FRONT WHEEL

1. Raise and support machine.

2. Remove lock nut (A), cap screw and front wheel.

3. Inspect wheel bearings for wear or damage. Replace if necessary. (See this group.)

4. Install wheel, cap screw and lock nut.



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E32487

MX,8010HE,A1 -19-27SEP91

INSPECT AND REPLACE FRONT WHEEL BEARINGS

1. Remove front wheel. (See this group.)

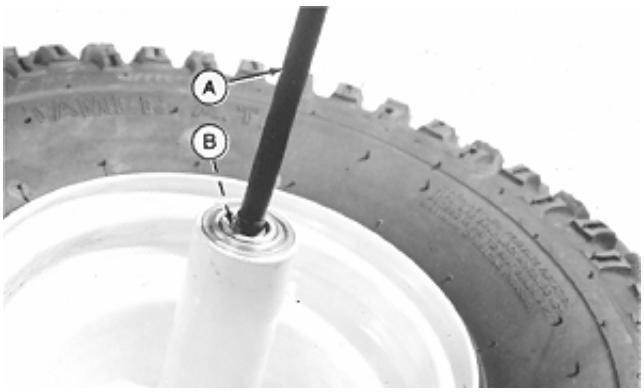
NOTE: Remove bearings only if replacement is necessary.

2. Inspect bearings for wear or damage. Replace if necessary.

NOTE: Bearings are press fit in wheel and slip fit on axle tube.

3. Remove wheel bearing from one side of wheel by driving axle tube (B) from opposite side using a bearing, bushing and seal driver (A).

4. Remove remaining bearing from opposite end using axle tube and bearing driver.



-UN-20SEP91
M80798

MX,8010HE,A2 -19-27SEP91

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NOTE: Install bearings with raised side (A) facing away from wheel.

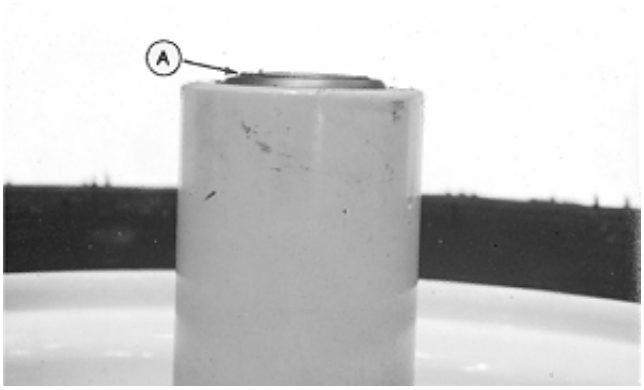
Press bearings on outer race only.

5. Install one bearing in wheel until seated using a bearing, bushing and seal driver set.

6. From opposite end, install axle tube and remaining bearing. Install bearing until seated using a bearing, bushing and seal driver set.

7. Install front wheel.

8. Apply multipurpose grease to lubrication fitting.



M80799 -UN-20SEP91

MX,8010HE,A3 -19-27SEP91

REMOVE AND INSTALL REAR WHEELS

1. Loosen cap screws (A).

2. Raise and support machine.

3. Remove cap screws and wheel.

4. Inspect wheel and tire for wear or damage. Make repairs as necessary.

NOTE: Valve stem must face outside of machine.

5. Install wheel and cap screws.

6. Lower machine.

7. Tighten cap screws to 100 N·m (75 lb-ft).

M80861 -UN-20SEP91

MX,8010HE,A4 -19-27SEP91

80 10 2

REMOVE AND INSTALL RAKE

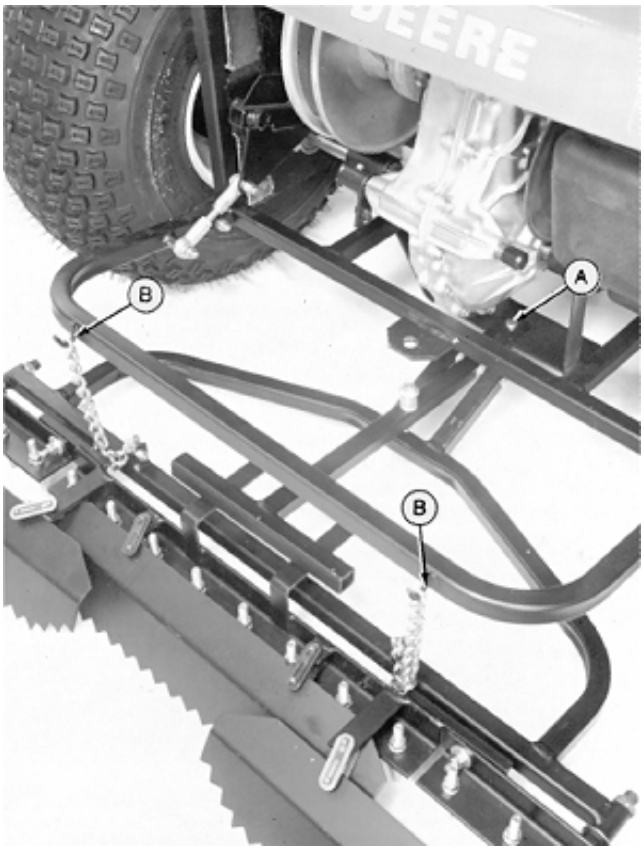
1. Lower rake.

2. Remove chains from lift hooks (B).

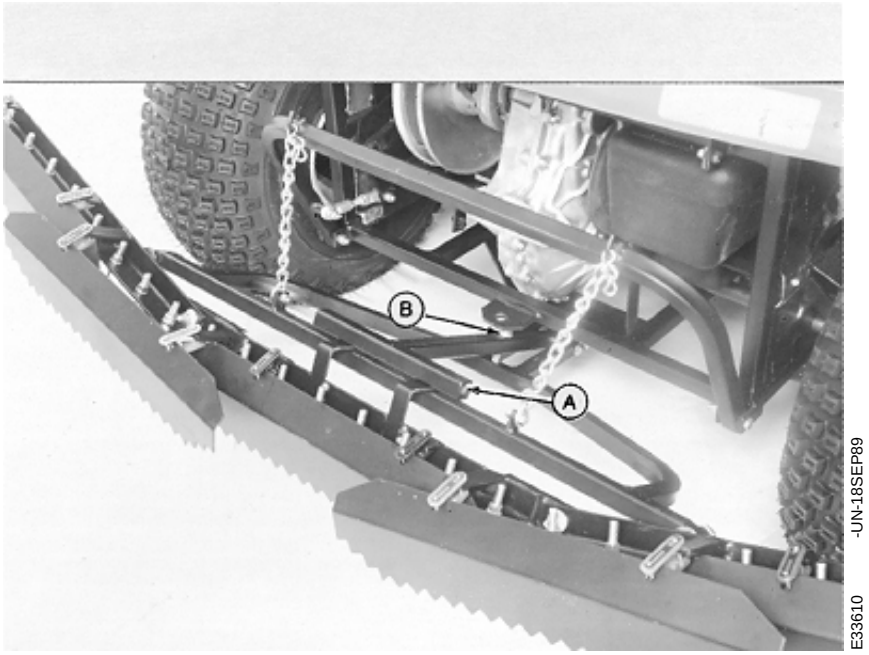
3. Remove pin (A). Remove rake hitch from frame.

4. Install rake hitch to frame using pin (A) and spring-locking pin.

5. Install chains on lift hooks.



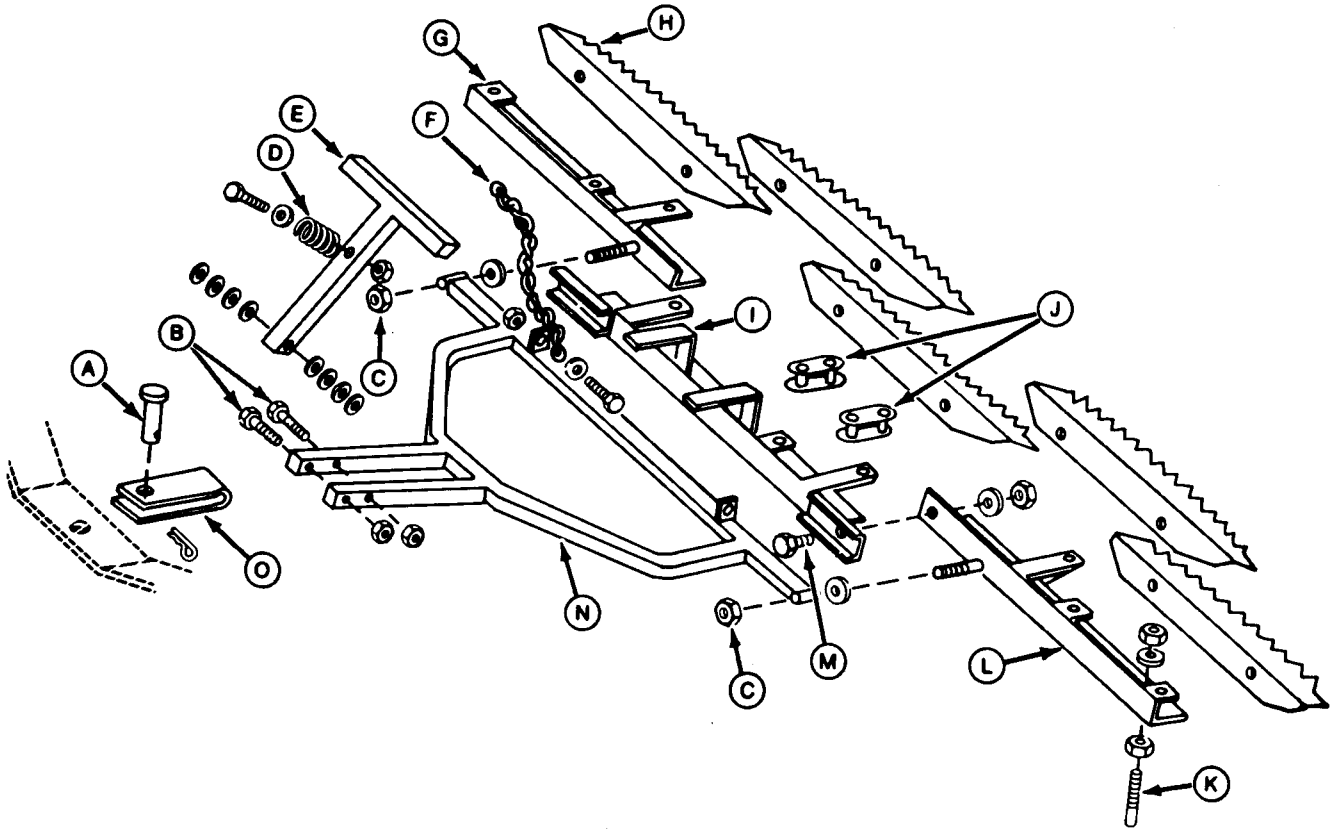
MX,8015HE,A1 -19-27SEP91



6. Raise rake. Guide (A) must have spring (B) compressed and touching frame. Adjust chain length, if necessary.

MX,8015HE,A2 -19-27SEP91

INSPECT AND REPAIR RAKE



M80862 -UN-20SEP91

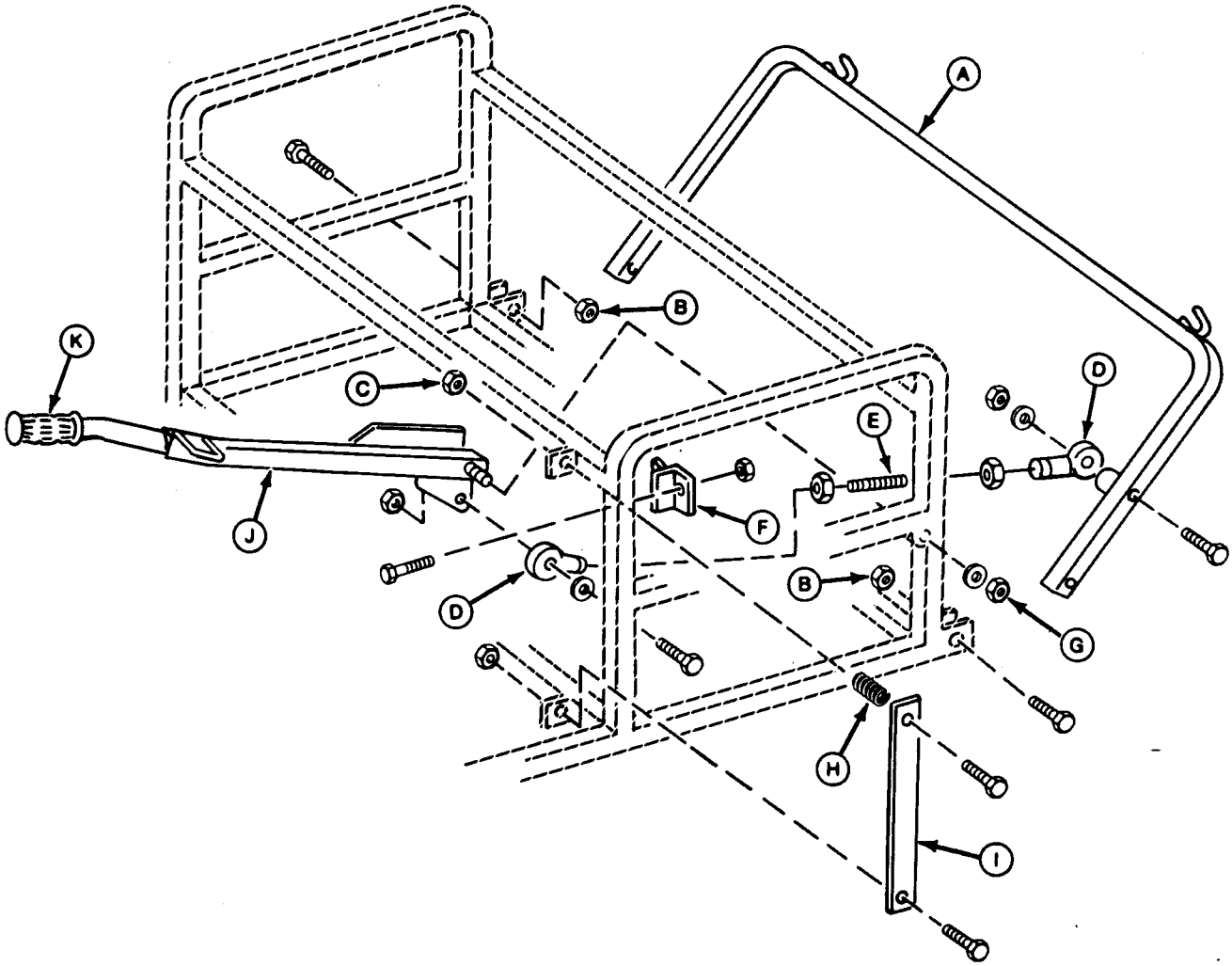
A—Pin
B—Cap Screws
C—Lock Nut (2 used)
D—Compression Spring
E—Guide
F—Chain (2 used)
G—R.H. Angle
H—Rake Blade (5 used)
I—Center Angle
J—Chain Link (10 used)
K—Prong Rake Bolt (24 used)
L—L.H. Angle
M—Cap Screw (2 used)
N—Frame
O—Hitch

Inspect parts for wear or damage. Replace as necessary.

Do not over tighten cap screws (B and M) or lock nuts (C). Parts must be free to pivot.

MX,8015HE,A3 -19-27SEP91

INSPECT AND REPAIR MANUAL RAKE LIFT LEVER AND LINKAGE ASSEMBLY



A—Support
B—Lock Nut
C—Lock Nut
D—Ball Joint
E—Stud
F—Latch
G—Lock Nut
H—Compression Spring
I—Strap
J—Handle
K—Grip

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

Do not over tighten lock nuts (B and G). Parts must be free to pivot.

Tighten lock nut (C) until tension of spring (H) allows smooth engagement of handle (J) on latch (F).

Adjust ball joints (D) as necessary.

MX,8015HE,A4 -19-27SEP91

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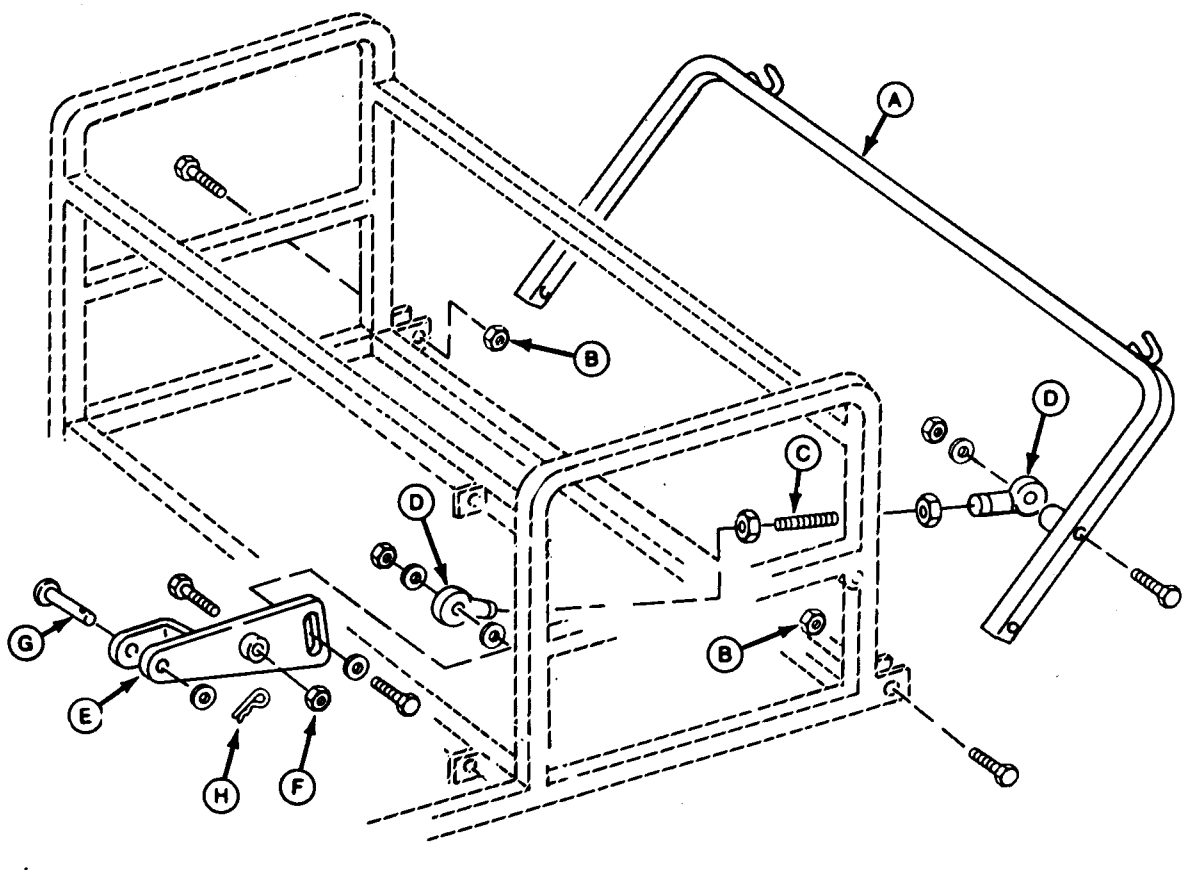
INSPECT AND REPAIR HYDRAULIC RAKE LIFT LINKAGE ASSEMBLY



M80869 -UN-20SEP91

A—Support
B—Lock Nut
C—Stud
D—Ball Joint
E—Lift Bracket
F—Lock Nut
G—Pin
H—Quick-Lock Pin

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

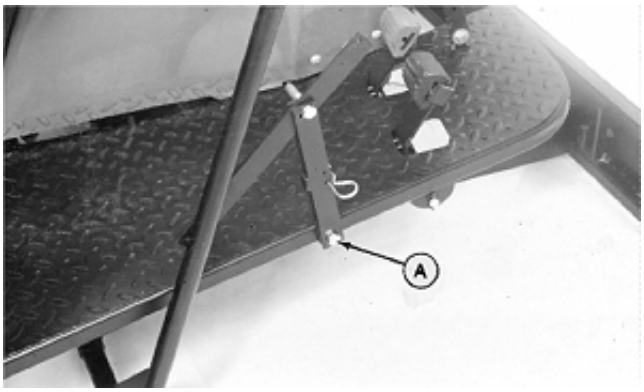
Do not over tighten lock nuts (B and F). Parts must be free to pivot.

Adjust ball joints (D), as necessary.

MX,8015HE,A5 -19-27SEP91

REMOVE FRONT BLADE

1. Remove cap screw (A) washers and lock nut.

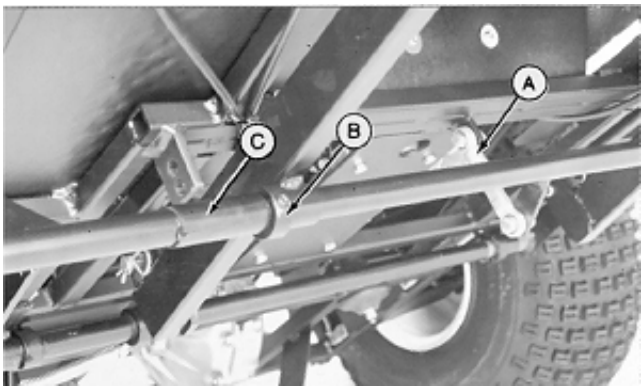


MX,8020HE,A1 -19-27SEP91

2. Slide cover (C) away from locking collar (B).

3. Loosen set screw. Remove locking collar.

4. Disconnect turnbuckle (A) from frame.

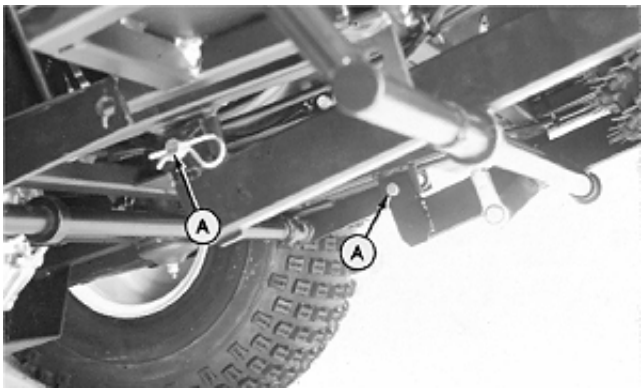


MX,8020HE,A2 -19-27SEP91

5. Remove pins (A).

6. Raise handle above platform.

7. Remove front blade and framework from under machine.

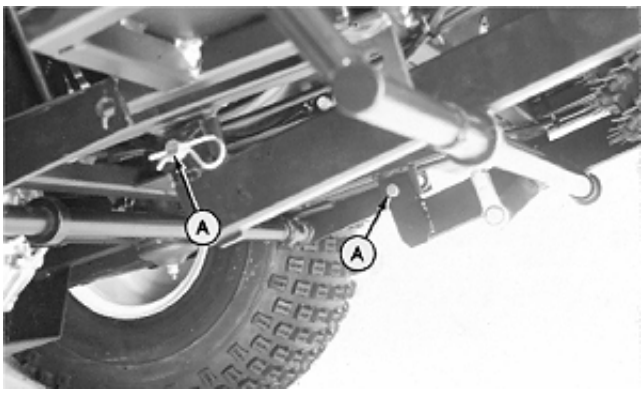


MX,8020HE,A3 -19-27SEP91

INSTALL FRONT BLADE

1. Install front blade and framework under machine. Raise handle above platform.

2. Install pins (A) and quick-lock pins through holes in blade framework and welded tab.

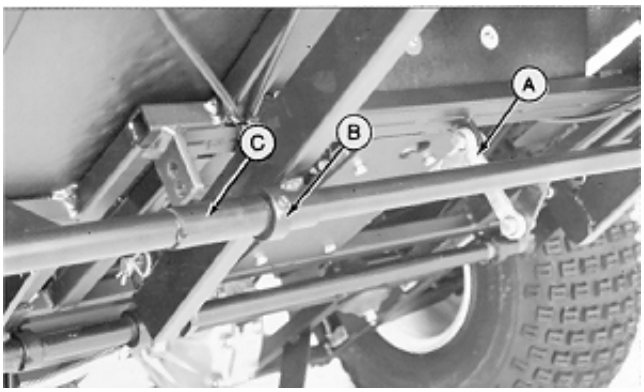


MX,8020HE,A4 -19-27SEP91

3. Connect turnbuckle (A) to frame.

4. Install locking collar (B) against frame to lock pivot in position. Tighten setscrew.

5. Slide cover (C) against locking collar (B).



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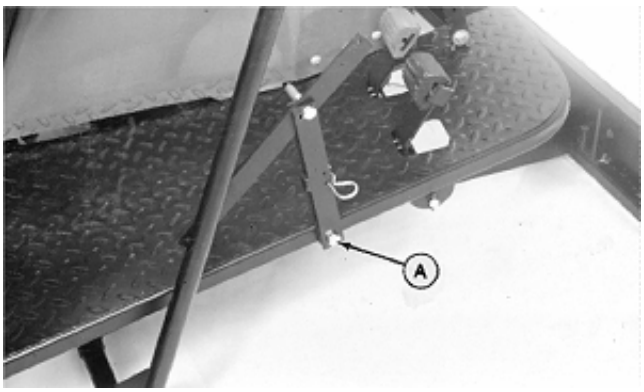
E33618

MX,8020HE,A5 -19-27SEP91

6. Connect lockout lever to machine platform using cap screw (A), washers and lock nut.

NOTE: Storage hole (C) is used to store quick-lock pin during blade operation.

7. Raise and lockout blade using quick-lock pin (B).



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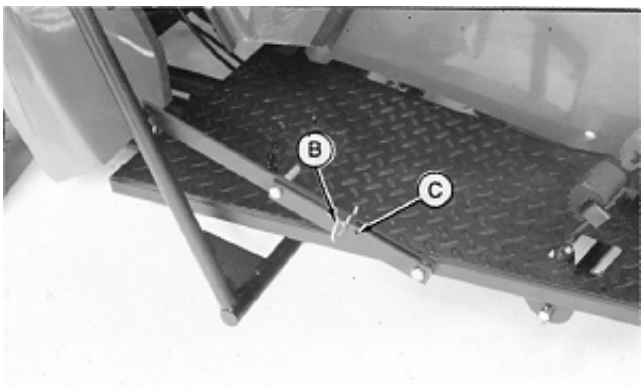

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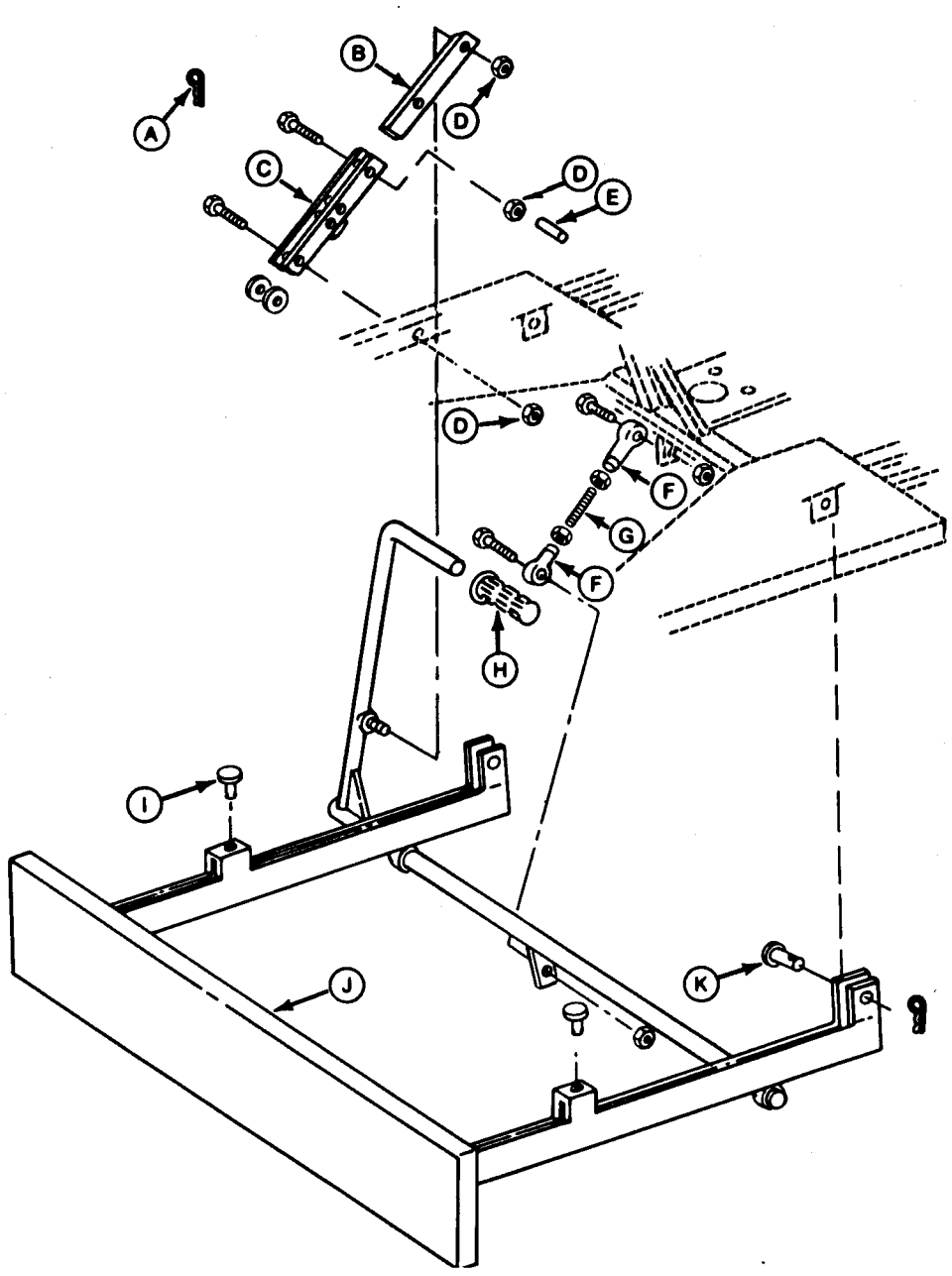
MX,8020HE,A6 -19-27SEP91

INSPECT AND REPAIR FRONT BLADE



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M80870 80 20 3

A—Quick-Lock Pin (3 used)
B—Strap
C—Bracket
D—Lock Nut (3 used)
E—Cover
F—Ball Joint (2 used)
G—Stud
H—Grip
I—Bumper (2 used)
J—Front Blade
K—Pin (2 used)

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

Do not over tighten lock nuts (D). Parts must be free to pivot.

Adjust ball joints (F), as necessary.

MX,8020HE,A7 -19-27SEP91

REMOVE AND INSTALL CULTIVATOR

1. Remove pin (D) and disconnect bolt (C) from pivot strap. Repeat on opposite side.

2. Remove quick-lock pin (D) and drilled pin from strap (A). Repeat on opposite side.

3. Lower cultivator and remove from under machine.

4. Make repairs as necessary. (See procedure in this group.)

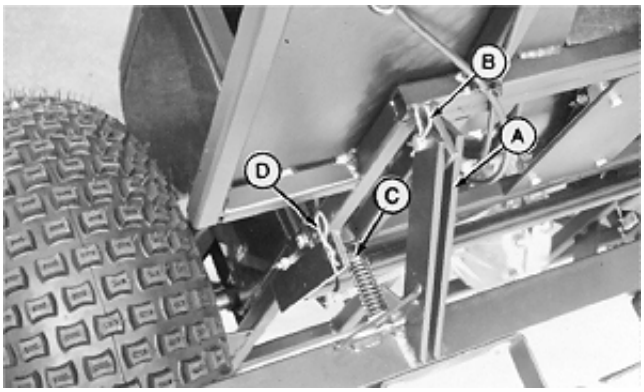
5. Install cultivator under machine.

6. Connect strap (A) to top hole of frame. Install pins and quick-lock pins (B) on both sides of cultivator.

NOTE: If hook bolt does not line up with pivot strap, move left-hand collar (E) to adjust pivot shaft.

7. Connect bolt to pivot strap. Install pin (D).

A—Strap
B—Quick-Lock Pin
C—Hook Bolt
D—Quick-Lock Pin
E—Locking Collar



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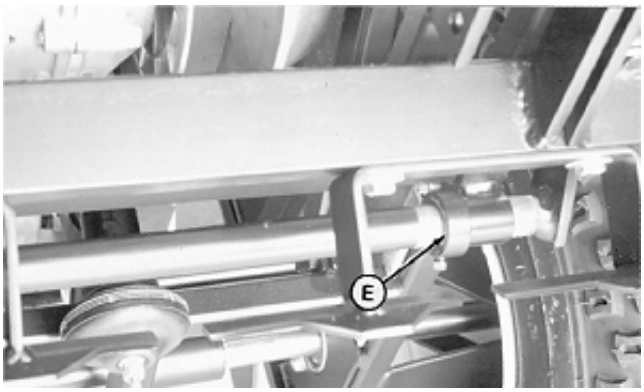

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MX,8025HE,A1 -19-27SEP91

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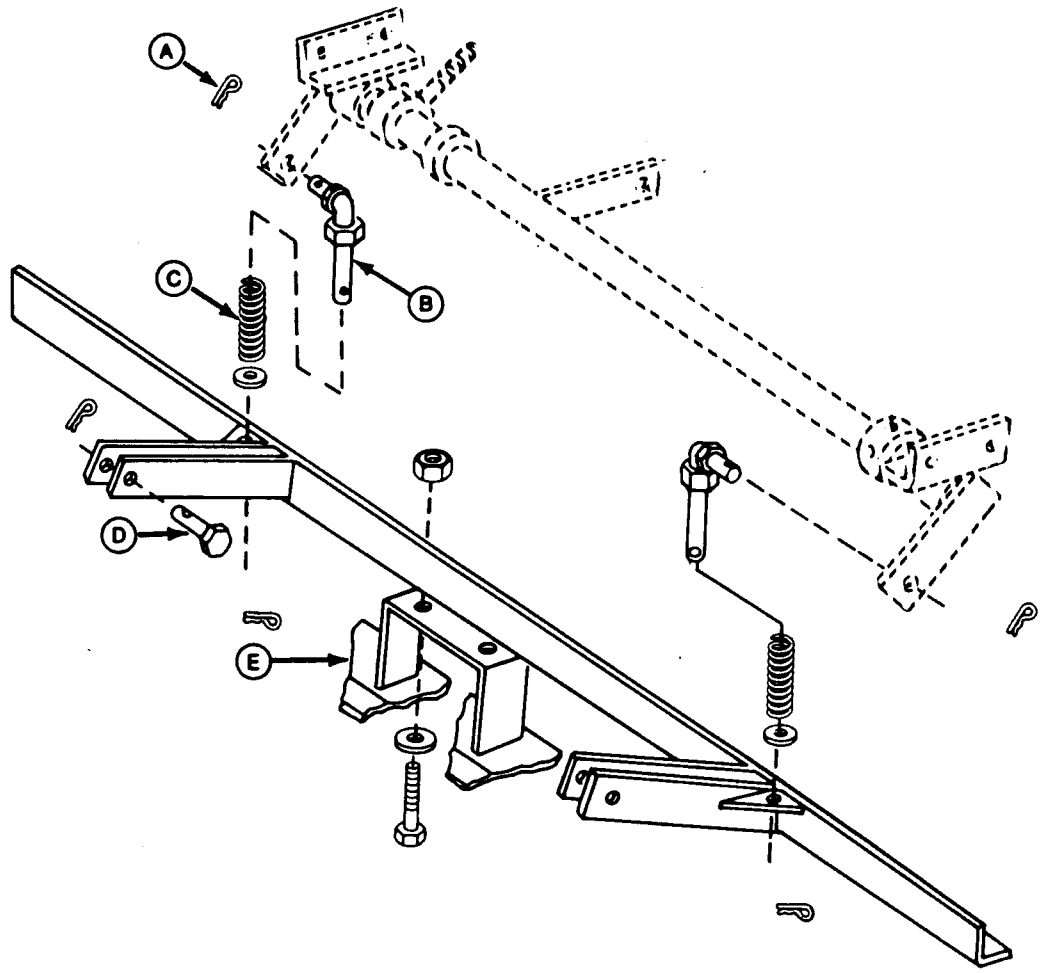
INSPECT AND REPAIR CULTIVATOR



M80871 -UN-20SEP91

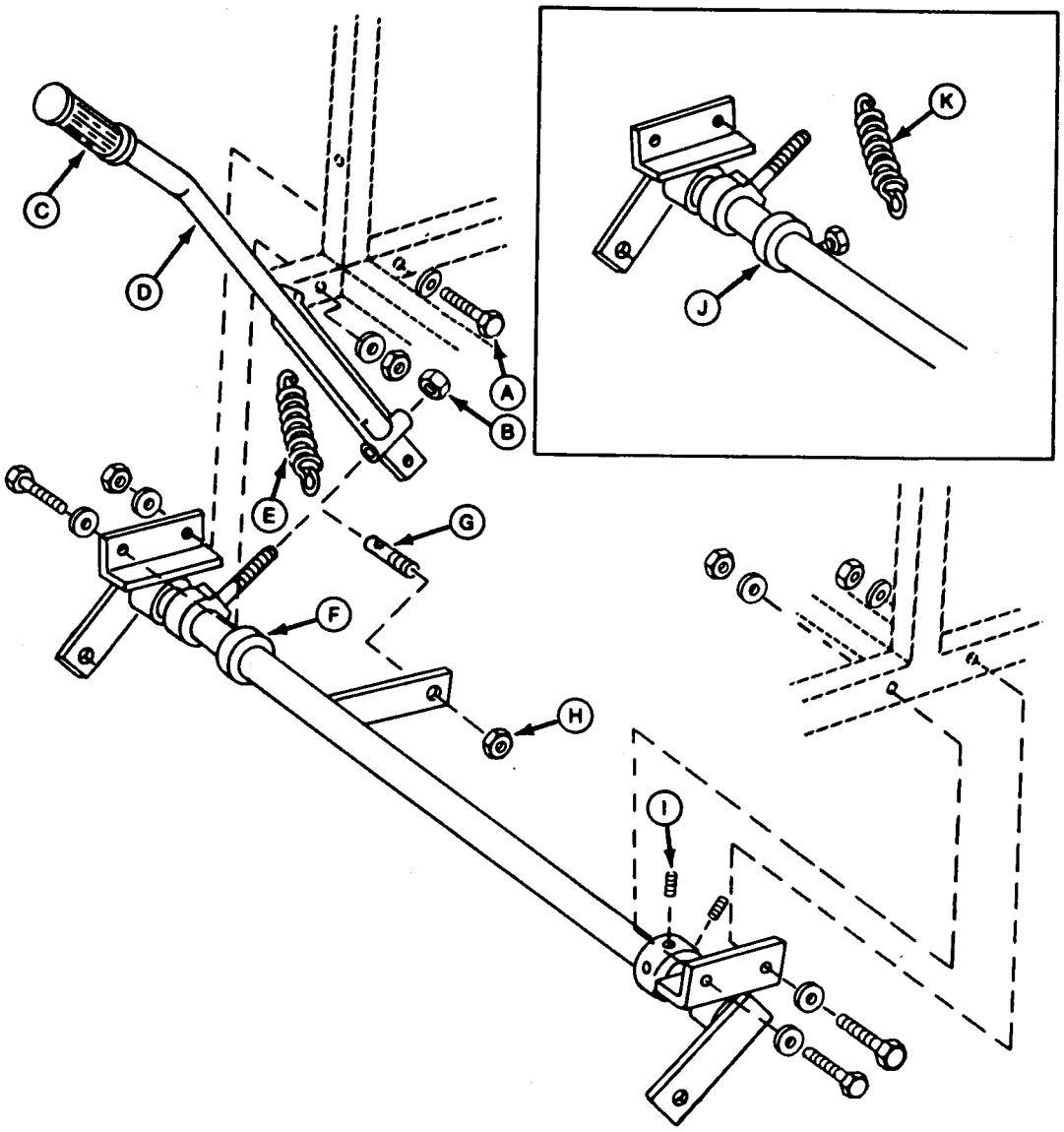
A—Quick-Lock Pin (6 used)
B—Hook Bolt (2 used)
C—Compression Spring (2 used)
D—Pin (2 used)
E—Blade (5 used)

Inspect parts for wear or damage. Replace as necessary.

80 25 2

MX,8025HE,A2 -19-27SEP91

INSPECT AND REPAIR CULTIVATOR LIFT LEVER AND LINKAGE



M80872 -UN-20SEP91

A—Cap Screw (4 used)
B—Lock Nut
C—Grip
D—Handle
E—Spring (S.N. 840001—)
F—Support (S.N. 840001—)
G—Adjustment Pin (S.N. 840001—)
H—Lock Nut (S.N. 840001—)
I—Set Screw (2 used)
J—Support (S.N. —840000)
K—Spring (S.N. —840000)

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

Do not over tighten lock nut (B). Handle (D) must pivot freely.

Install R.H. rear cap screw (A) with head to inside of frame.

Machine (S.N. 840001—): Adjust lock nut (H) until length of spring (E) is 89 mm (3.500 in.).

MX,8025HE,A3 -19-27SEP91

Section 210
TEST & ADJUSTMENT SPECIFICATIONS/OPERATIONAL CHECKOUT PROCEDURES

Contents

TEST AND ADJUSTMENT SPECIFICATIONS

ITEM	SPECIFICATION
ENGINE	
Fast Idle Limiter Screw Setting	3800 rpm
Slow Idle Stop Screw Setting	1300 rpm
Slow Idle Limiter Screw Setting	1300—1500 rpm
Compression (Min.)	490 kPa (71 psi)
Intake and Exhaust Valve Clearance (Cold)	
Range Specification	0.10—0.15 mm (0.004—0.006 in.)
Adjustment Specification	0.125 ± 0.025 mm (0.005 ± 0.001 in.)
Compression Release Lift	0.25 mm (0.010 in.)
Crankcase Vacuum (Min.)	30 mm (1.2 in.) water
Fuel Pump Pressure (Min.)	6.12 kPa (0.9 psi)
Fuel Pump Flow (Min.)	80 mL/15 sec. (2.7 oz./15 sec.)
ELECTRICAL	
Regulated Voltage Output	13 amps (Min.) at 12.2—13.8 V
Unregulated Voltage Output (Min.)	34 V
Stator Resistance	0.24—0.4 ohms
Starter Amp Draw (Max.)	51 amps at 750 rpm
Starter No-Load Amperage (Max.)	50 amps at 6000 rpm
Starter No-Load rpm	6000 rpm
Ignition Coil Air Gap	
Standard Setting	0.3 mm (0.012 in.)
Misfire Condition Setting	0.25 mm (0.010 in.)
Ignition Module Resistance	
One Direction	1—5 K ohms
Opposite Direction	2—6 K ohms
Ignition Coil Resistance	
Primary Lead and Core	0.67—1.10 ohms
Spark Plug Lead and Core	6—10 K ohms
Spark Plug Gap	0.64 mm (0.025 in.)
Spark Plug Torque	25 N·m (18 lb-ft)
POWER TRAIN	
Drive Clutch Upshift (dimension from clutch edge to belt)	2 mm (1/16 in.)
Driven Clutch Spring Force	27—80 N (6—18 lb)
HYDRAULIC	
Pressure at Couplers (High Pressure Side)	5171 ± 690 kPa (750 ± 100 psi)
Pressure at Couplers (Low Pressure Side)	2758 kPa (400 ± 50 psi)
Raise Relief Valve Pressure	5171 kPa (750 psi)
Lower Relief Valve Pressure	2758 kPa (400 psi)
Thermal Relief Valve Pressure	17237—20684 kPa (2500—3000 psi)
Minimum Pump Flow at 750 psi (High Pressure Side)	2.8 L/min (.75 gpm)
Minimum Pump Flow at 400 psi (Low Pressure Side)	3.2 L/min (.85 gpm)

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MX,21005HE,1A -19-27SEP91

OPERATIONAL CHECKOUT PROCEDURES

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 -19-27SEP91

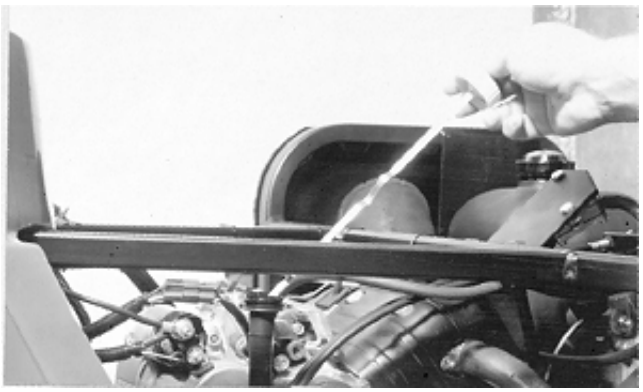
ENGINE OIL LEVEL AND CONDITION CHECK

CONDITIONS:
•Machine parked on level surface.
•Key switch in off position.
•Park brake locked.
•Engine oil cold.

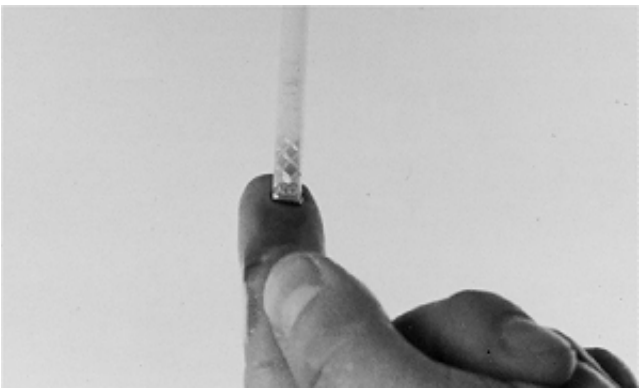
PROCEDURE:
•Clean dirt from area around dipstick.
•Remove engine oil dipstick and wipe off.
•Install dipstick in engine but do not thread dipstick onto dipstick tube.
•Remove dipstick and check level and condition of oil.

NORMAL:
•Level between full and add marks of dipstick.
•Oil not thick.
•Oil not diluted with fuel (should not be thin looking or smell of fuel).
•No metal or dirt particles in oil.

IF NOT NORMAL:
•Add oil of proper weight to raise level to full mark on dipstick.
•Go to Section 220, Group 15 for engine diagnosis, tests, and adjustments.


E32466 -UN-12OCT88

Oil Level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Oil Condition

MX,21010HE,2A -19-19JUL91

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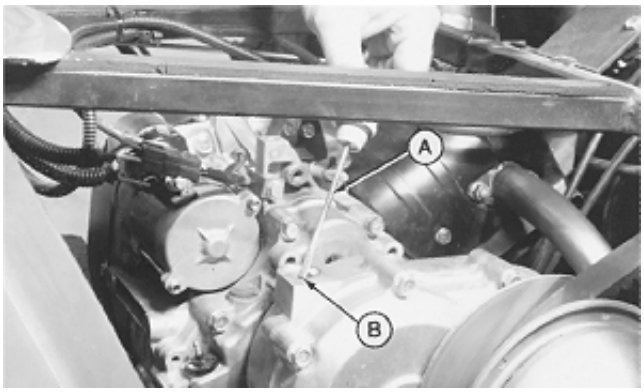
WET REDUCTION CLUTCH OIL LEVEL AND CONDITION CHECK

CONDITIONS:
•Machine parked on level surface.
•Key switch in off position.
•Park brake locked.
•Wet clutch oil cold.

PROCEDURE:
•Clean dirt from area around dipstick (A).
•Remove wet clutch oil dipstick and wipe off.
•Install dipstick in clutch housing (B) but do not thread dipstick into dipstick tube.
•Remove dipstick and check level and condition of oil.

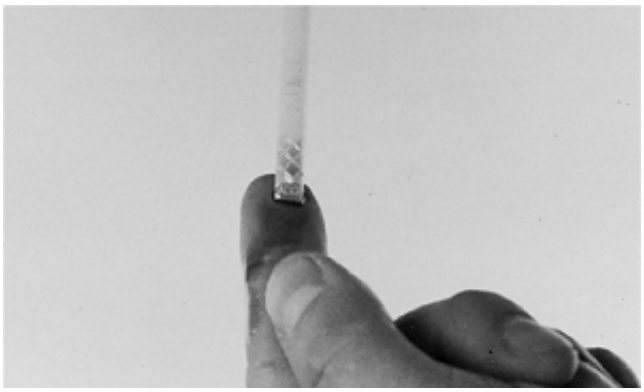
NORMAL:
•Level between full and add marks of dipstick.
•Oil not thick.
•No water, metal or dirt particles in oil.

IF NOT NORMAL:
•Add oil of proper weight to raise level to full mark on dipstick.
•Go to Section 250, Group 15 for wet clutch diagnosis, be sure this appears in 250-15.
•Go to Section 50, Group 05 for wet clutch inspection.



E32613 -UN-14NOV88

Oil Level


M45603 -UN-06AUG90

Oil Condition

MX,21010HE,3A -19-27SEP91

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OPTIONAL FRONT LIGHT TEST

CONDITIONS:
•Park brake locked.
•Gear shift pedals in neutral position.

PROCEDURE:
•Turn key switch to run position.
•Pull front light knob out.

NORMAL:
•Front light lamp must be on.

IF NOT NORMAL:
•Go to Section 240, Group 15 for electrical diagnosis, tests, and adjustments.

MX,21010HE,4A -19-27SEP91

NEUTRAL—START TEST

CONDITIONS:
•Park brake locked.
•Operator on seat.

PROCEDURE:
•Move forward shift pedal down.
•Turn key switch to start position.

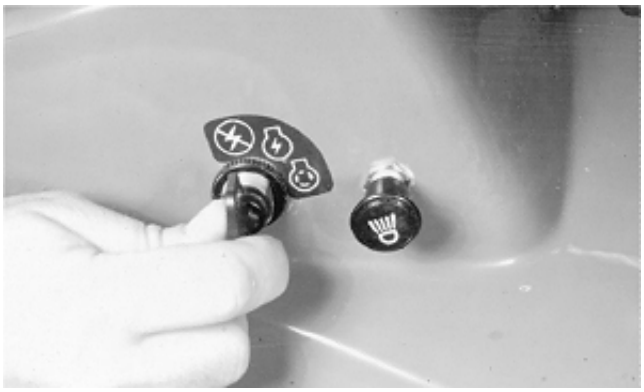
NORMAL:
•Starting motor does NOT turn and engine does NOT start.

Transaxle Engaged

CONDITIONS:
•Park brake locked.
•Operator on seat.

PROCEDURE:
•Move reverse shift pedal down.
•Turn key switch to start position.

NORMAL:
•Starting motor does NOT turn and engine does NOT start.



CONDITIONS:
•Park brake engaged.
•Operator on seat.

PROCEDURE:
•Move gear shift pedals to neutral position.
•Turn key switch to start position.

NORMAL:
•Starting motor turns.

IF NOT NORMAL:
•Go to Section 240, Group 15 for electrical diagnosis, tests, and adjustments.
•Go to Section 250, Group 15 for power train diagnosis, tests and adjustments.

MX,21010HE,5A -19-19JUL91

ENGINE START TEST

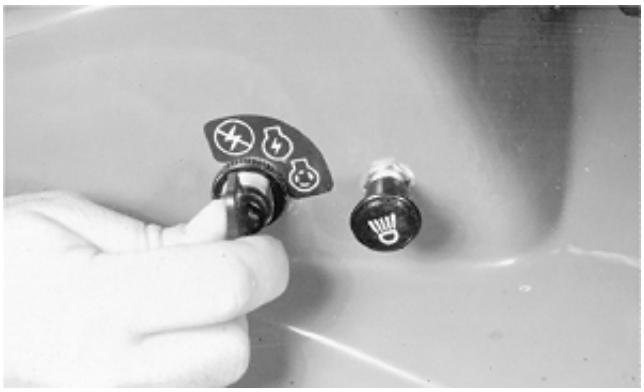
CONDITIONS:
•Machine parked on level surface.
•Park brake locked.
•Operator on seat.
•Gear shift pedals in neutral position.
•Pull choke knob out if engine is cold.

PROCEDURE:
•Turn key switch to start position.

NORMAL:
•Engine cranks and should start. With choke off, engine runs smoothly in all throttle positions.

IF NOT NORMAL:
•Go to Section 220, Group 15 for engine and fuel/air diagnosis, tests, and adjustments.
•Go to Section 240, Group 15 for ignition and electrical diagnosis, tests, and adjustments.

E32442 -UN-12OCT88



E32443 -UN-12OCT88

MX,21010HE,6A -19-27SEP91

ENGINE FAST AND SLOW IDLE TEST


E32441 -UN-12OCT88

CONDITIONS:
•Machine parked on level surface.
•Park brake locked.
•Operator on seat.

PROCEDURE:
•Start engine and warm up for 2 minutes at fast idle.
•Move accelerator pedal from slow idle to fast idle and back to slow idle 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 Section 220, Group 15 for engine and fuel/air diagnosis, tests, and adjustments.
•Go to Section 240, Group 15 for ignition diagnosis, tests, and adjustments.

MX,21010HE,7A -19-19JUL91

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TRANSAXLE FORWARD/REVERSE TEST

CONDITIONS
•Operator on seat.
•Engine warmed up and operating at slow idle
•Park brake disengaged.

PROCEDURE:
•Push inner, (forward) pedal down and accelerate engine slightly.
•Push outer, (reverse) pedal down and accelerate engine slightly.
•Push both pedals until they are even (neutral) and accelerate engine slightly.

NORMAL:
•Machine should start to move smoothly (in forward and reverse) with little or no shifter clash.
•Machine should not move in neutral position.

IF NOT NORMAL:
•Go to Section 250, Group 15 for power train diagnosis, tests, and adjustments.

Forward

Reverse

Neutral

MX,21010HE,8A -19-27SEP91

DRIVE ENGAGEMENT AND SHIFT TEST


E32441 -UN-12OCT88

CONDITIONS:
•Operator on seat.
•Machine on large clear area for driving.
•Engine warmed up and operating at slow idle.

PROCEDURE:
•Push inner (forward) pedal down.
•Push accelerator pedal slowly.

NORMAL:
•Drive must engage smoothly.

PROCEDURE:
•Push inner, (forward) pedal down.
•Push accelerator pedal to wide open throttle.

NORMAL:
•Engine should accelerate to full rpm immediately.
•Vehicle should increase to full speed smoothly.

PROCEDURE:
•Push inner, (forward) pedal down.
•Drive vehicle onto hilly or soft ground to slow vehicle travel.

NORMAL:
•Engine rpm must remain constant as vehicle speed slows.

IF NOT NORMAL:
•Go to Section 250, Group 15 for power train diagnosis, tests, and adjustments.

MX,21010HE,9A -19-27SEP91

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BRAKE/PARK BRAKE TEST

CONDITIONS:
•Machine parked on a level surface.
•Engine operating at slow idle.
•Operator on seat.

PROCEDURE:
•Depress brake pedal.
•Engage park brake lever.
•Push inner, forward pedal down.
•Move throttle pedal to 1/4 throttle position.

NORMAL:
•Brake pedal remains engaged.
•Vehicle does not move.

PROCEDURE:
•Push outer, reverse pedal down.
•Move throttle pedal to 1/4 throttle position.

NORMAL:
•Brake pedal remains engaged.
•Vehicle does not move.

IF NOT NORMAL:
•Go to Section 260, Group 15 for brake diagnosis, tests, and adjustments.


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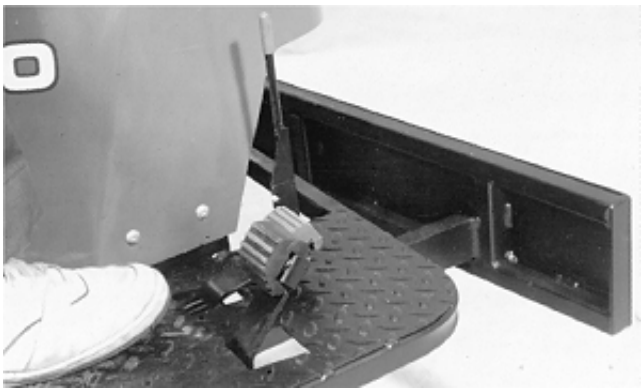
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MX,21010HE,10A -19-19JUL91

DIFFERENTIAL LOCK TEST

-UN-12OCT88
E32452

CONDITIONS:
•Machine on level surface with large clear area for driving.
•Operator on seat.
•Engine warmed up and running at slow idle.
•Inner, forward pedal pushed down.

PROCEDURE:
•Depress accelerator pedal to start machine moving slowly.
•Turn steering wheel to make a tight turn (direction not important).
•Depress differential lock pedal.

NORMAL:
•Differential lock engages.
•Vehicle will resist turning and try to push straight ahead.

IF NOT NORMAL:
•Go to Section 250, Group 15 for power train diagnosis, tests, and adjustments.

MX,21010HE,11A -19-19JUL91

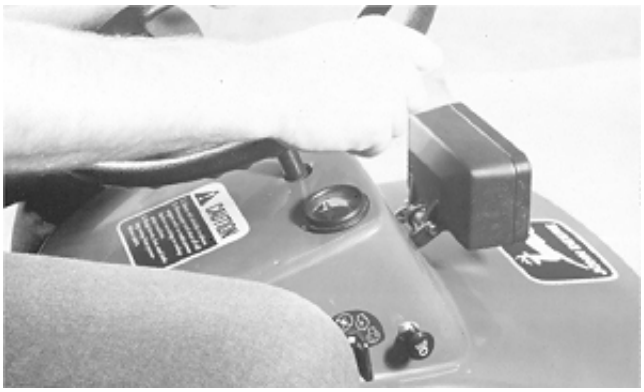
STEERING TEST

CONDITIONS:
•Machine on a hard level surface.
•Operator on seat.
•Engine stopped.

PROCEDURE:
•Turn steering wheel to stops, both left and right.

NORMAL:
•Steering wheel should move easily to stops in both directions.

IF NOT NORMAL:
•Go to Section 260, Group 15 for steering diagnosis, tests, and adjustments.



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MX,21010HE,12A -19-27SEP91

Section 220
ENGINE OPERATION, TESTS & ADJUSTMENTS

Contents

COMPONENT LOCATION INFORMATION

This group contains component location drawings for the following engine system components:
•Engine Internal Components
•Engine Lubrication System Components

Use the drawings when diagnosing an engine problem to help locate the components to be tested.

MX,22005HE,1A -19-19JUL91

ENGINE INTERNAL COMPONENTS

A—Governor Control
B—Governor Arm
C—Governor Shaft
D—Crankcase
E—Balancer Connecting Rod
F—Balancer Pin
G—Balancer
H—Drain Plug
I—Crankshaft
J—Tappets
K—Compression Release Tab
L—Compression Release Weight
M—Camshaft
N—Push Rods
O—Crankcase Cover
P—Governor Weights
Q—Connecting Rod
R—Piston
S—Exhaust Valve
T—Cylinder Head
U—Valve Springs
V—Rocker Arms
W—Intake Valve

Slide M80540

MX,22005HE,2A -19-27SEP91

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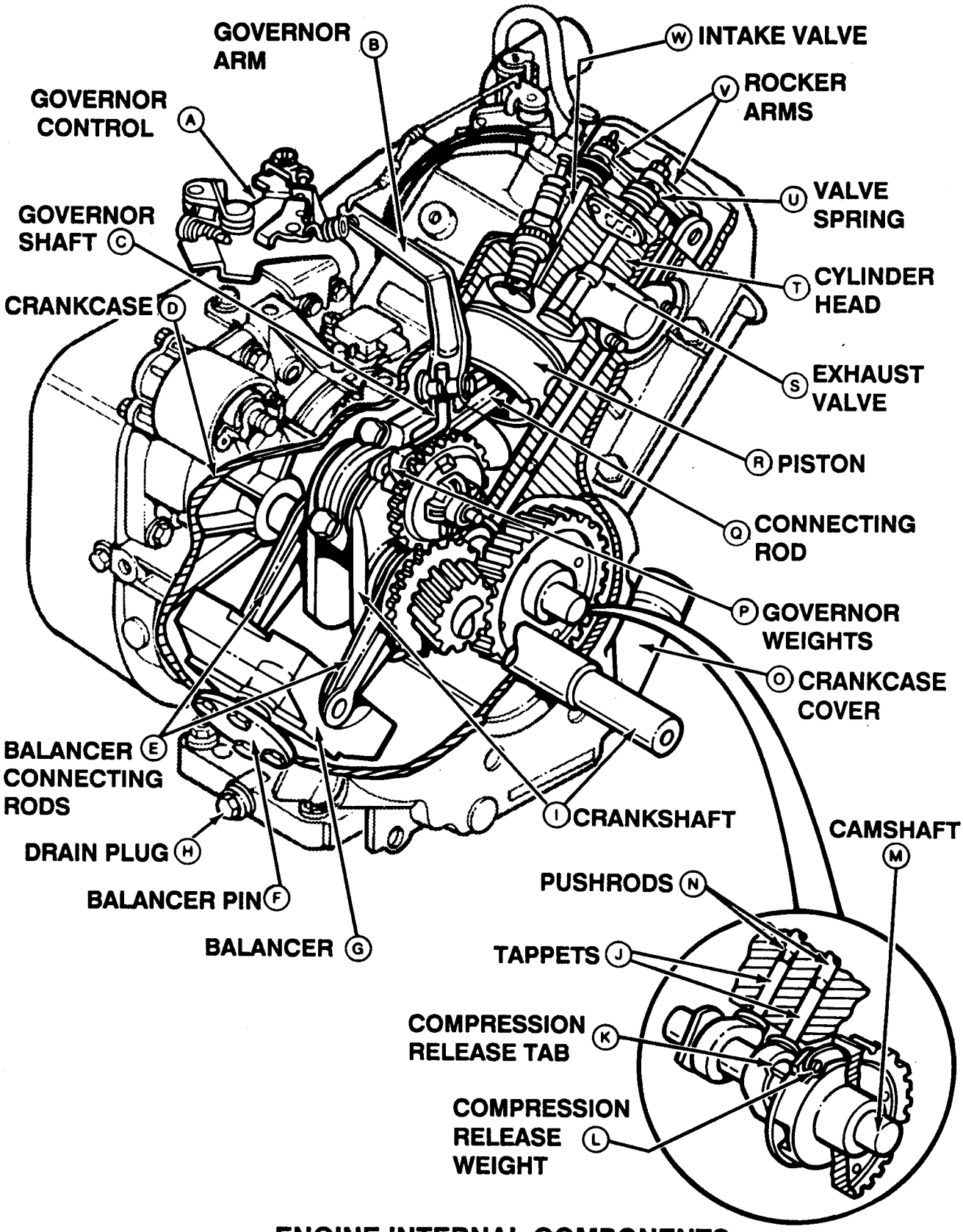

ENGINE INTERNAL COMPONENTS

MX,22005HE,3A -19-27SEP91

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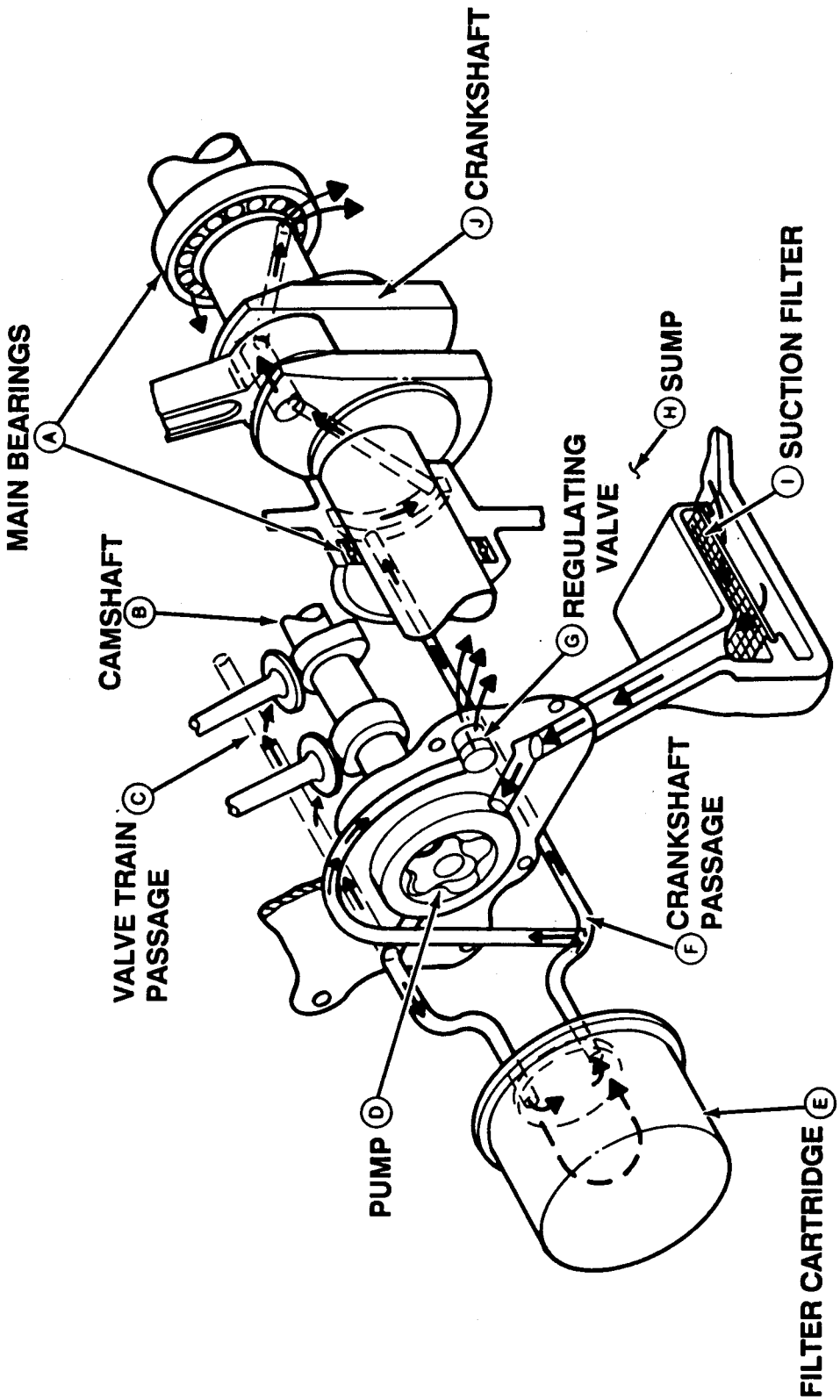
3

ENGINE LUBRICATION SYSTEM COMPONENTS

A—Main Bearings
B—Camshaft
C—Valve Train Passage
D—Pump
E—Filter Cartridge
F—Crankshaft Passage
G—Regulating Valve
H—Sump
I—Suction Filter
J—Crankshaft

MX,22005HE,4A -19-27SEP91



Slide M80541

M80541 -19-29AUG91

220 05

MX,22005HE,5A -19-27SEP91

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
•Crankcase Breather
•Cooling System
•Governor
•Automatic Compression Release

The slide number reference under the art is used for service training purposes only.

MX,22010HE,1A -19-27SEP91

LUBRICATION SYSTEM OPERATION

A—Flywheel Main Bearing
B—Camshaft
C—Tappets
D—Camshaft Passage
E—Filter Cartridge
F—Crankshaft Passage
G—Pump
H—Suction Filter
I—Regulating Valve
J—Sump
K—Balancer Weight Journals
L—Crankshaft
M—Connecting Rod Journal
N—PTO Main Bearing
O—Return Passages
P—Push Rods
Q—Rocker Arms
R—Valves
S—Passage
T—Cylinder Head
U—Low Pressure Oil
V—Pressure Free Oil
W—Oil Laden Air

FUNCTION:
Lubricate internal engine parts.

MAJOR COMPONENTS:
•Suction Filter
•Pump
•Regulating Valve
•Internal Passages
•Filter Cartridge

THEORY OF OPERATION:
The engine has a pressure type lubrication system. The pump is driven directly off the end of the camshaft. Oil is drawn from the sump (J) through the suction filter (H) by the gerotor pump (G). Oil then goes to the camshaft passage (D) and crankshaft passage (F). The oil in the camshaft passage is sprayed on to the camshaft (B) and tappets (C) and drains back to the sump. The oil in the crankshaft passage is routed through the filter cartridge (E), into the crankshaft (K), to the flywheel end main bearing (A), past one of the balancer weight journals (K), onto the connecting rod journal (M), past the other balancer weight journal and on to the PTO main bearing (N). The rocker arms (Q), valves (R) and push rods (P) are lubricated by oil rich air carried to the cylinder head (T) through passage (S). This oil drains back to the sump through return passages (O). Oil pressure is controlled by regulating valve (I) which is located in the crankshaft passage.

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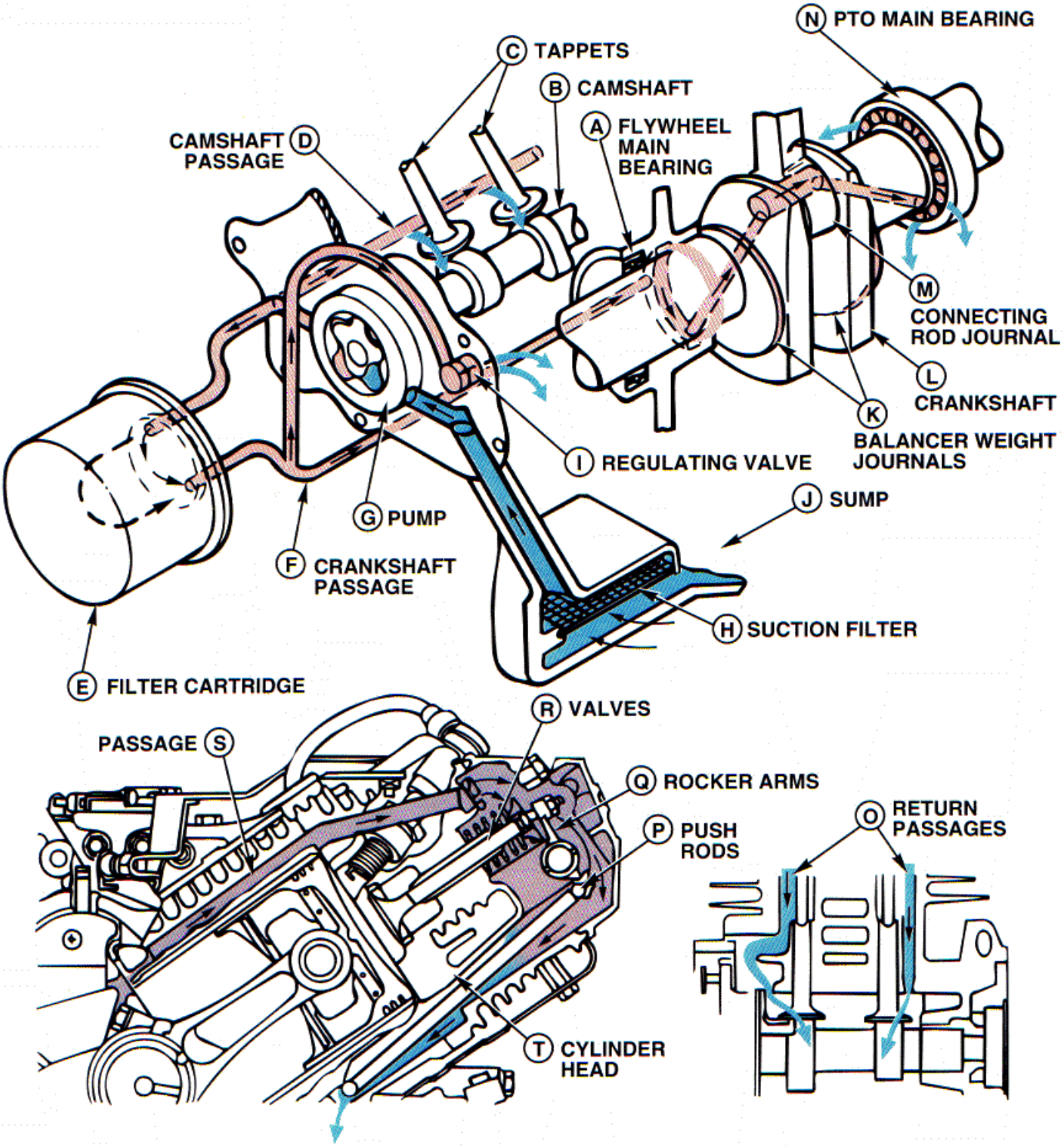

MXC80542AE

LUBRICATION SYSTEM OPERATION

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BREATHER SYSTEM OPERATION

A—Return Passage Restrictions
B—Breather Tube
C—Maze
D—Reed Valve
E—Breather
F—Passage
G—Crankcase
H—Piston
I—Return Passages
J—Rocker Cover

FUNCTION:
Maintain a vacuum in the crankcase to prevent oil leaks.

MAJOR COMPONENTS:
•Reed Valve
•Maze
•Return Restrictors

THEORY OF OPERATION:
The engine is equipped with a breather system that allows air to escape easily from the engine, but restricts air coming in. As the piston (H) moves downward during power and intake strokes the volume of the crankcase (G) decreases. To prevent a build up of pressure, oil laden air passes freely up passage (F) and through breather (E) into the space under the rocker cover (J). In order to prevent excess oil loss, the air is routed through a maze (C) in the rocker cover where the oil separates out. The non-oily air then passes through breather tube (B) and into the air intake system between the air filter and the carburetor. The separated oil lubricates the valve train and returns to the crankcase through passages (I). When the piston moves upward during compression and exhaust strokes, the volume of the crankcase increases. But air cannot freely come in as reed valve (D) in the breather closes and restrictions (A) in the return oil passages limit air flow. The result is a small vacuum maintained in the crankcase.

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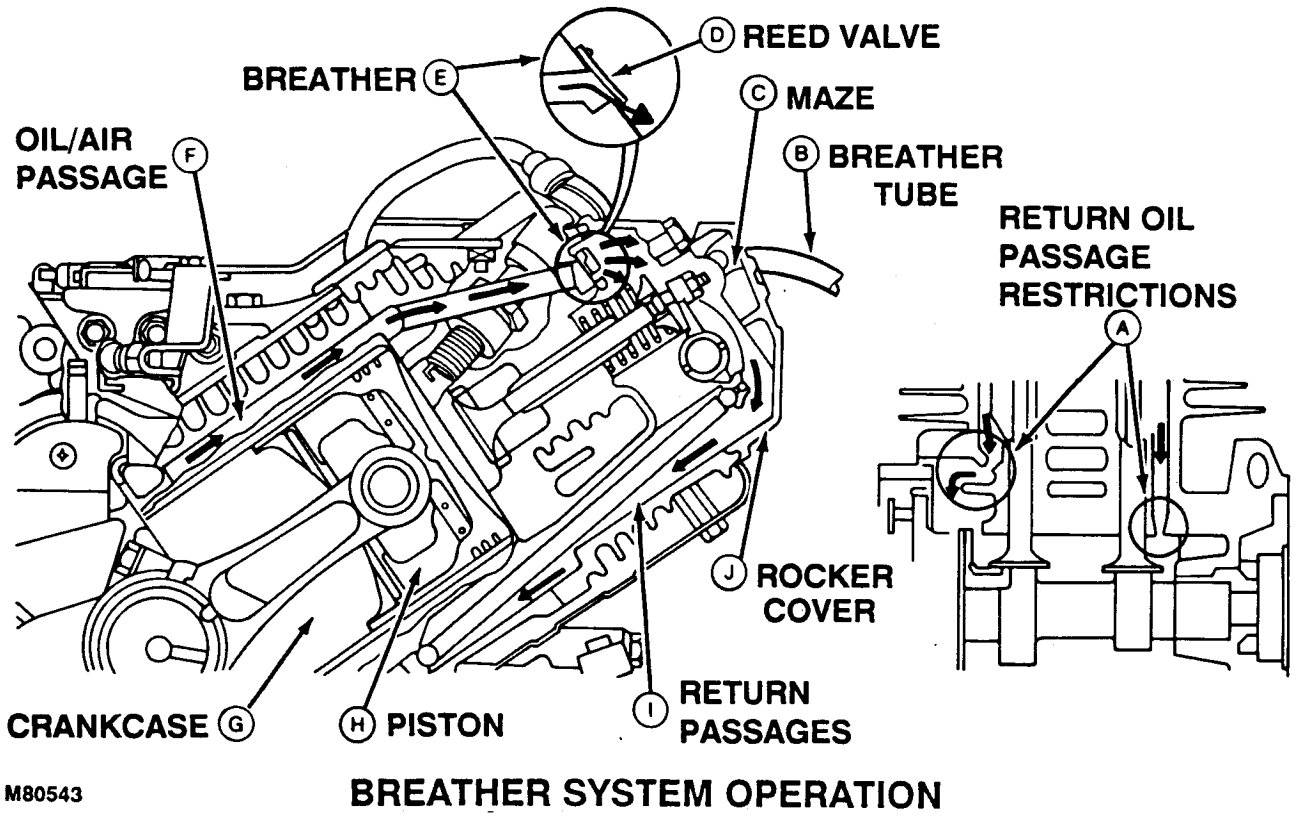

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COOLING SYSTEM OPERATION

A—Cylinder Cover
B—Cooling Fins
C—Head Cover
D—Air Flow
E—Intake Screen
F—Fan
G—Flywheel
H—Fan Housing

FUNCTION:
Remove heat from engine.

MAJOR COMPONENTS:
•Intake Screen
•Flywheel Fins
•Flywheel and Engine Covers
•Cooling Fins

THEORY OF OPERATION:
The engine is air cooled with air flow provided by a fan (F) that is a part of the flywheel (G). During operation, the fan draws air in through the intake screen (E). The fan housing (H), cylinder cover (A) and head cover (C) then direct the air flow (D) past the cooling fins (B) of the cylinder block and head. The cooling fins are cast into the engine block and cylinder head to increase their surface area, allowing more of the heat generated by the engine to be transferred to the cooling air.

It is important that the intake screen remains free from debris for proper air flow. The engine covers should not be removed or altered, as cooling capacity will be reduced. Cylinder block and head cooling fins must remain clean to properly dissipate heat. On this engine, debris build-up on the intake screen or fins will not affect the volume of air to the carburetor.

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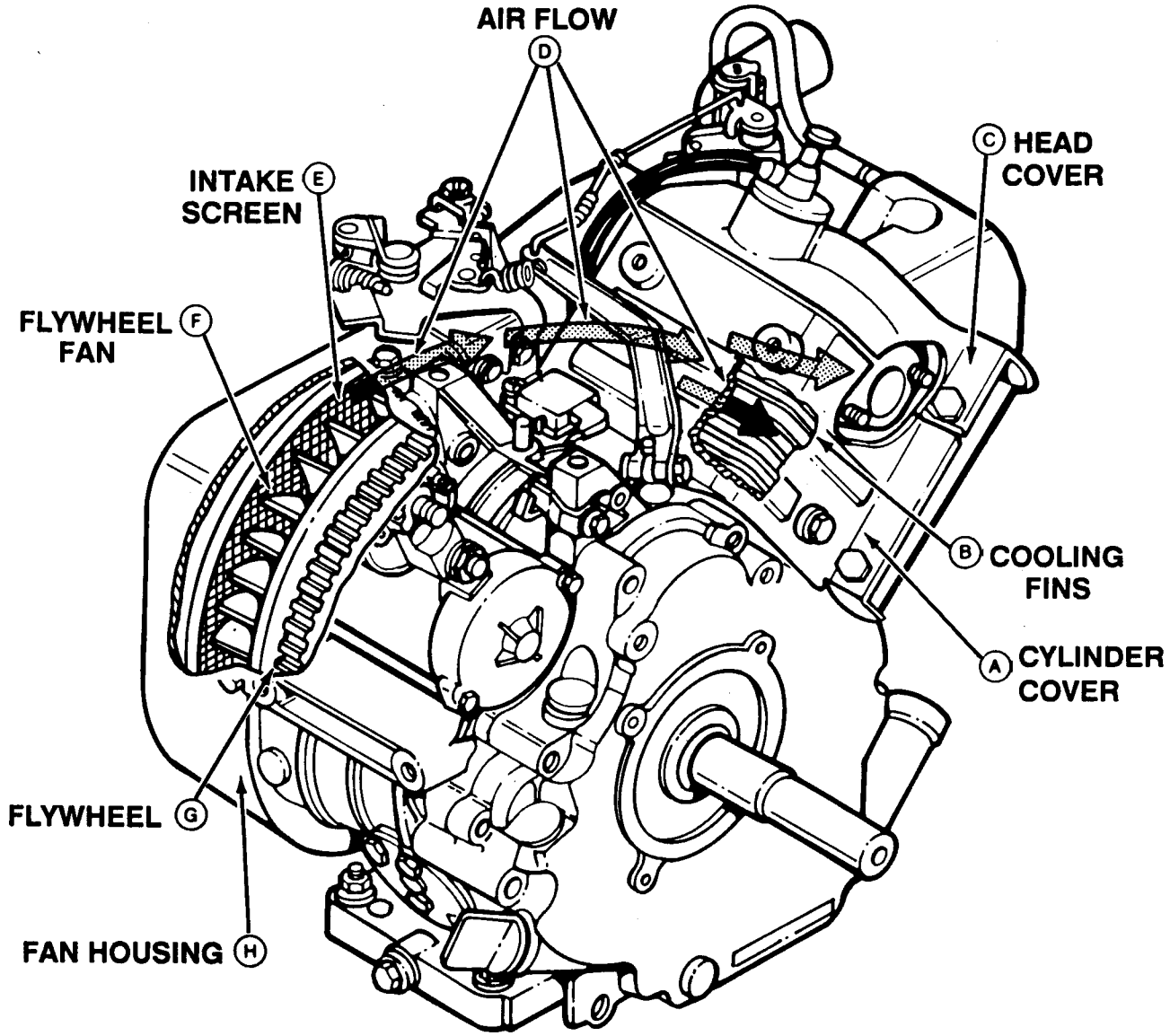

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COOLING SYSTEM OPERATION

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MX,22010HE,7A -19-27SEP91

GOVERNOR OPERATION

A—Governor Lever
B—Throttle Lever
C—Carburetor
D—Throttle Link
E—Low Idle Adjustment Screw
F—Control Lever
G—Control Panel
H—High Idle Adjustment Screw
I—Governor Spring
J—Sleeve
K—Fly-weights
L—Governor Gear
M—Governor Shaft

FUNCTION:
Limit the maximum speed of the engine and regulate throttle valve position to match the engine load.

MAJOR COMPONENTS:
•Fly-Weights
•Governor Lever
•Sleeve
•Control Panel
•Spring

THEORY OF OPERATION:
The governor is of fly-weight design. The fly-weights (K) are attached to the governor gear (L) and is driven by a gear on the crankshaft.

When the engine starts and speed increases, centrifugal force causes the fly-weights to pivot outward. The fly-weights push against sleeve (J) which pushes against governor shaft (M) causing it to rotate. Governor lever (A), which is clamped to the governor shaft, also begins to rotate in a counter-clockwise direction (when viewed from the top of the engine looking down). Connected at the outer end of the governor lever is the throttle link (D) and the governor spring (I). The throttle link is connected to the throttle lever (B) which controls the throttle valve of carburetor (C). The throttle plate closes the further the governor lever rotates counter-clockwise. The governor spring is connected to the control lever (F) on the control panel (G).

Pressing on the foot throttle (accelerator) rotates the control lever which pulls on the governor spring. The increased tension of the governor spring pulls the governor lever clockwise which opens the throttle valve. The engine speed is stabilized when the spring force matches the governor fly-weight force.

Low idle engine speed is controlled by low idle adjustment screw (E). High idle and maximum engine speed is controlled by high idle adjustment screw (H).

When the engine is stopped, the governor spring pulls on the governor arm and throttle control link to open the throttle valve completely. Since the engine is not operating, the governor arm and shaft rotate and push the fork against the sleeve. The sleeve pushes the flyweights inward. The fly-weights and the throttle valve are now in the engine start position.

When the engine is at a “no load” condition, the fly-weight force is greater than the governor spring force. In this condition, the fly-weight linkage moves the throttle valve to partially closed position to reduce engine speed.

When the engine is at a “load” condition, the fly-weight force decreases as engine rpm decreases, so the governor spring force is greater than the fly-weight force. Now the governor spring force determines throttle valve position. The governor spring moves the throttle valve open slightly which increases engine speed to match the load.

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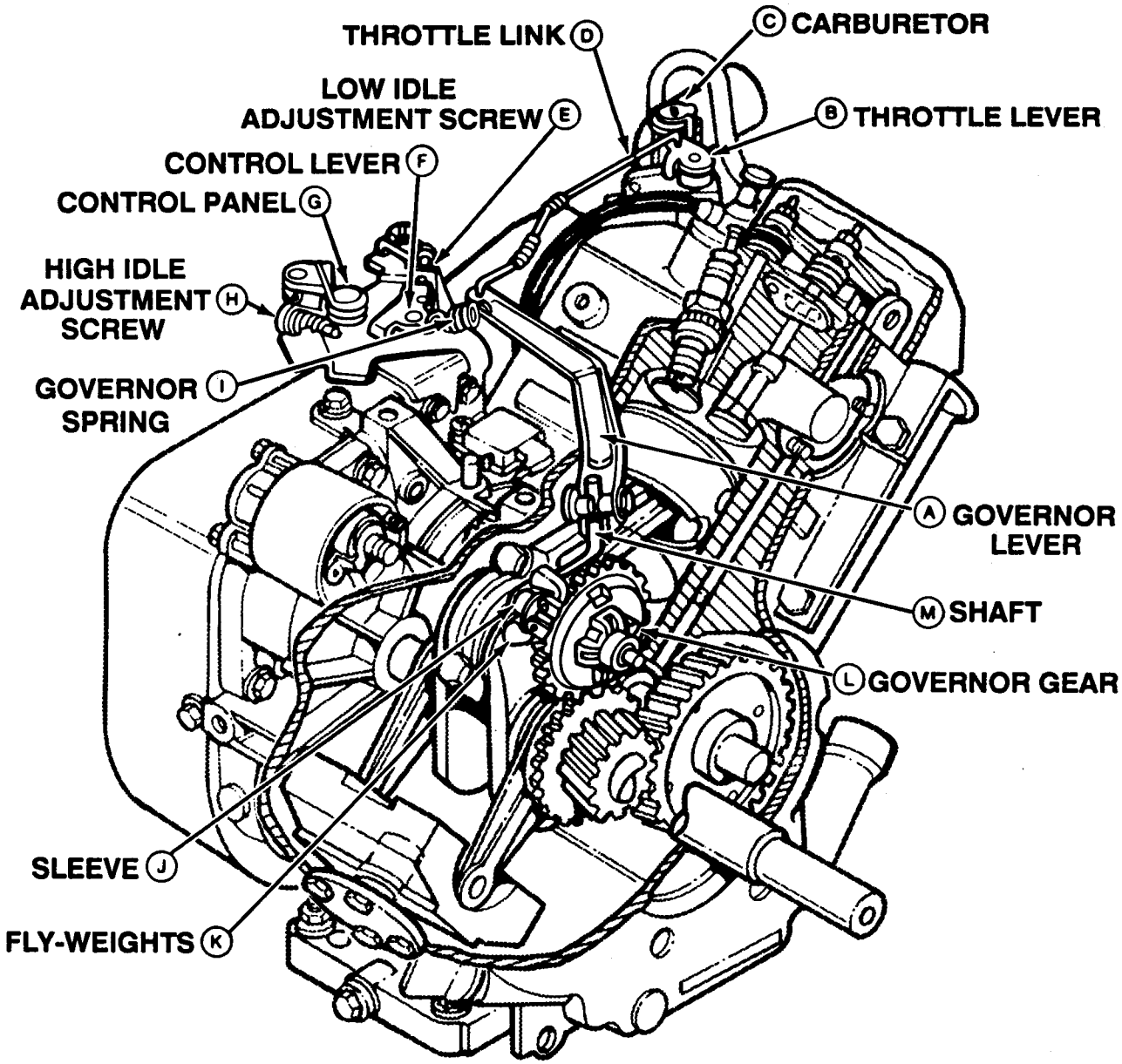

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GOVERNOR OPERATION

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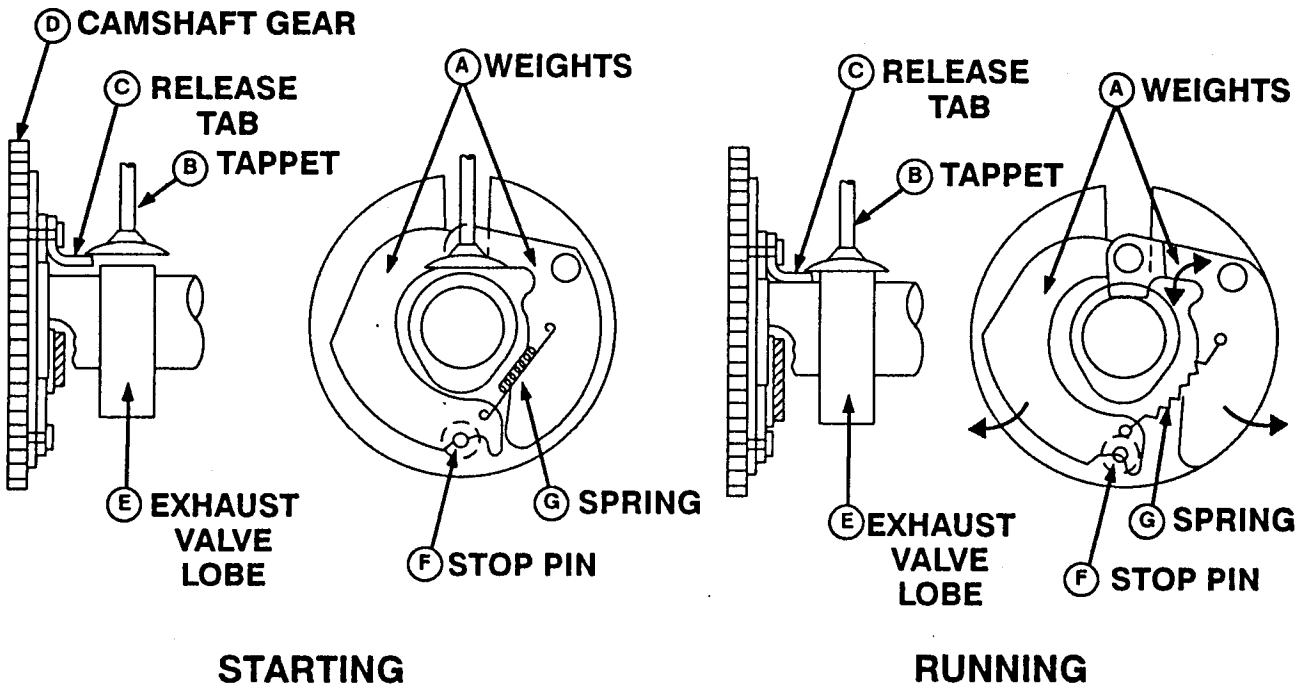
MX,22010HE,11A -19-27SEP91

AUTOMATIC COMPRESSION RELEASE OPERATION



A—Weights
B—Tappet
C—Release Tab
D—Camshaft Gear
E—Camshaft
F—Stop Pin
G—Spring

Slide M80546AE

FUNCTION:
To lower engine compression for easier starting.

MAJOR COMPONENTS:
•Weights
•Spring
•Release Tab

THEORY OF OPERATION:
To allow the engine to spin over easier when starting, the engine is equipped with an automatic compression release. On the compression stroke, when starting the engine, the exhaust valve tappet (B) is held off the camshaft lobe (E) by release tab (C) for a small amount until just before TDC. The release tab is connected to one of weights (A) which are held in by spring (G). As the engine starts to run and increase its speed, the weights overcome the force of the spring and pivot out until they contact stop pin (F). The release tab moves inward until it no longer holds up the exhaust valve tappet and the engine runs with full compression.

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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 cranks but will not start or starts hard
•Engine will not stay running or runs rough
•Engine spins slow or kicks back
•Engine has black smoke at start or during operation
•Engine has blue smoke at start or during operation
•Engine uses too much oil
•Engine surges
•Engine has uneven or uncontrolled rpm
•Engine has low power
•Engine floods
•Engine stops when hot
•Engine backfires through carburetor
•Engine backfires at shutdown

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.

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 shows the exact point where the test is to be made.

The slide number reference under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

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ENGINE CRANKS BUT WILL NOT START OR STARTS HARD

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests in Section 240 Group 15.
- •Power train tests in Sections 250 Group 15.

Test Location	Normal	If Not Normal
1. Spark plug.	Plug dry.	Check carburetor inlet needle seating. Check adjustment of choke cable. See ENGINE FLOODING in this group.
	Consistent blue spark. (Key switch in start position.)	Check for faulty key switch. Check for faulty coil and/or module. Check for shorted ignition wire or high tension lead.
2. Head.	Compression of 490 kPa (71 psi) minimum.	Check condition of rings, piston and cylinder walls. Check for sticking or damaged compression release components. Check for sticking or damaged valve. Check for misadjusted valves.
3. Crankcase.	Crankcase vacuum of 30 mm (1.2 in.) of water. (Engine running at 3800 rpm.)	Check for leaking crankcase seals and gaskets. Check for sticking or damaged breather components. Check condition of rings, piston, cylinder walls and valves.
4. Carburetor drain screw.	Free flow of fuel when screw is removed from carburetor float bowl.	Check for plugged tank vent. Check for plugged filter. Check for plugged or pinched hoses. Check fuel pump pressure and flow.
5. Carburetor.	Fuel not leaking from float bowl. Choke linkage free and choke fully closed when choke knob is in choke position.	Check for dirty or sticking inlet needle. Check choke cable adjustment.
6. Air filter elements.	Not dirty or oil soaked.	Clean or replace as needed.
7. Crankshaft.	Wet reduction clutch not dragging. (Engine at slow idle.)	Check oil level and condition of wet reduction clutch. clutch internal components.
8. Starter motor.	Starter motor turning engine at a minimum of 350 rpm.	Check battery for minimum of 12.5 VDC. Check wiring, key switch, and solenoid contacts. Check for correct weight of engine oil. Check compression release operation.

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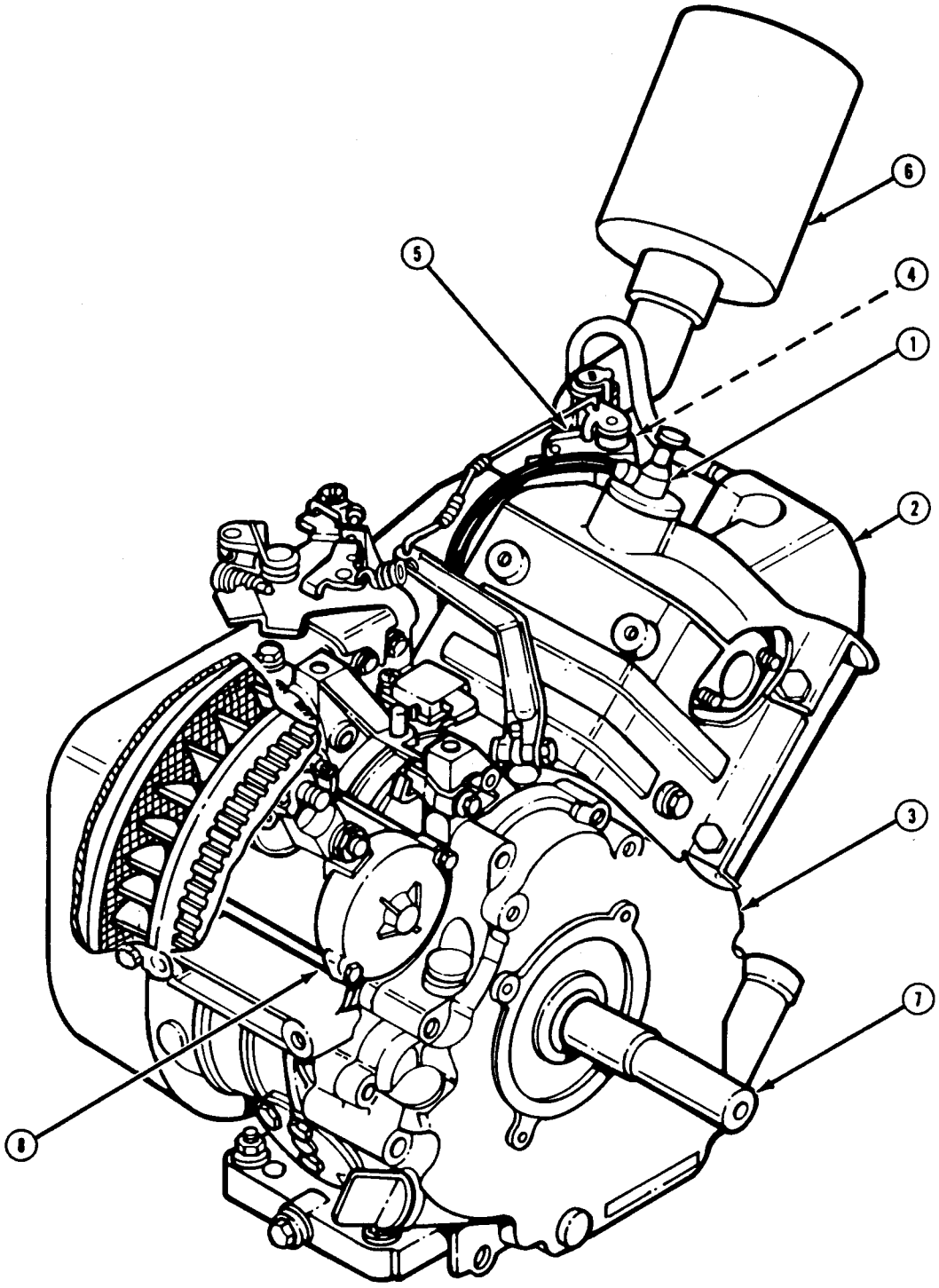

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ENGINE CRANKS BUT WILL NOT START OR STARTS HARD

-19-29AUG91

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Slide M80563

MX,22015HE,3A -19-19JUL91

ENGINE WILL NOT STAY RUNNING OR RUNS ROUGH

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests found in Section 240 Group 15.
- •Power train tests in Section 250 Group 15.

Test Location	Normal	If Not Normal
1. Spark plug.	Plug dry.	Check for inlet needle seating in carburetor. Check adjustment of choke cable.
	Consistent blue spark. (Key switch in start position.)	Adjust gap. Check for faulty key switch. Check for faulty coil and/or module. Check for shorted ignition wire or high tension lead.
2. Head.	Minimum compression of 490 kPa (71 psi).	Check condition of rings, piston and cylinder walls. Check for sticking or damaged compression release components. Check for sticking or damaged valve. Check for misadjusted valves.
3. Crankcase.	Crankcase vacuum of 30 mm (1.2 in.) of water. (Engine running at 3800 rpm)	Check for leaking crankcase seals and gaskets. Check for sticking or damaged breather components. Check condition of rings, piston, cylinder walls and valves.
4. Carburetor drain screw.	Free flow of fuel when screw is removed from carburetor float bowl.	Check for plugged tank vent. Check for plugged filter. Check for plugged or pinched hose. Check fuel pump pressure and flow.
5. Carburetor.	Fuel not leaking from float bowl. Choke linkage free and choke fully open when choke knob is not in choke position.	Check for dirty or sticking inlet needle. Check for secure tube connection to carburetor vent port. Check for correct adjustment of choke. Adjust mixture and slow idle screw. Check float for leakage and correct position.
6. Air filter elements.	Not dirty or oil soaked.	Clean or replace as needed.
7. Crankshaft.	Wet reduction clutch not dragging. (Engine at slow idle.)	Check oil level and condition of wet reduction clutch. Check wet reduction clutch internal components.
8. Governor control panel.	Engine operating at specified 3800 rpm.	Adjust governor and idle speeds.

MX,22015HE,4A -19-27SEP91

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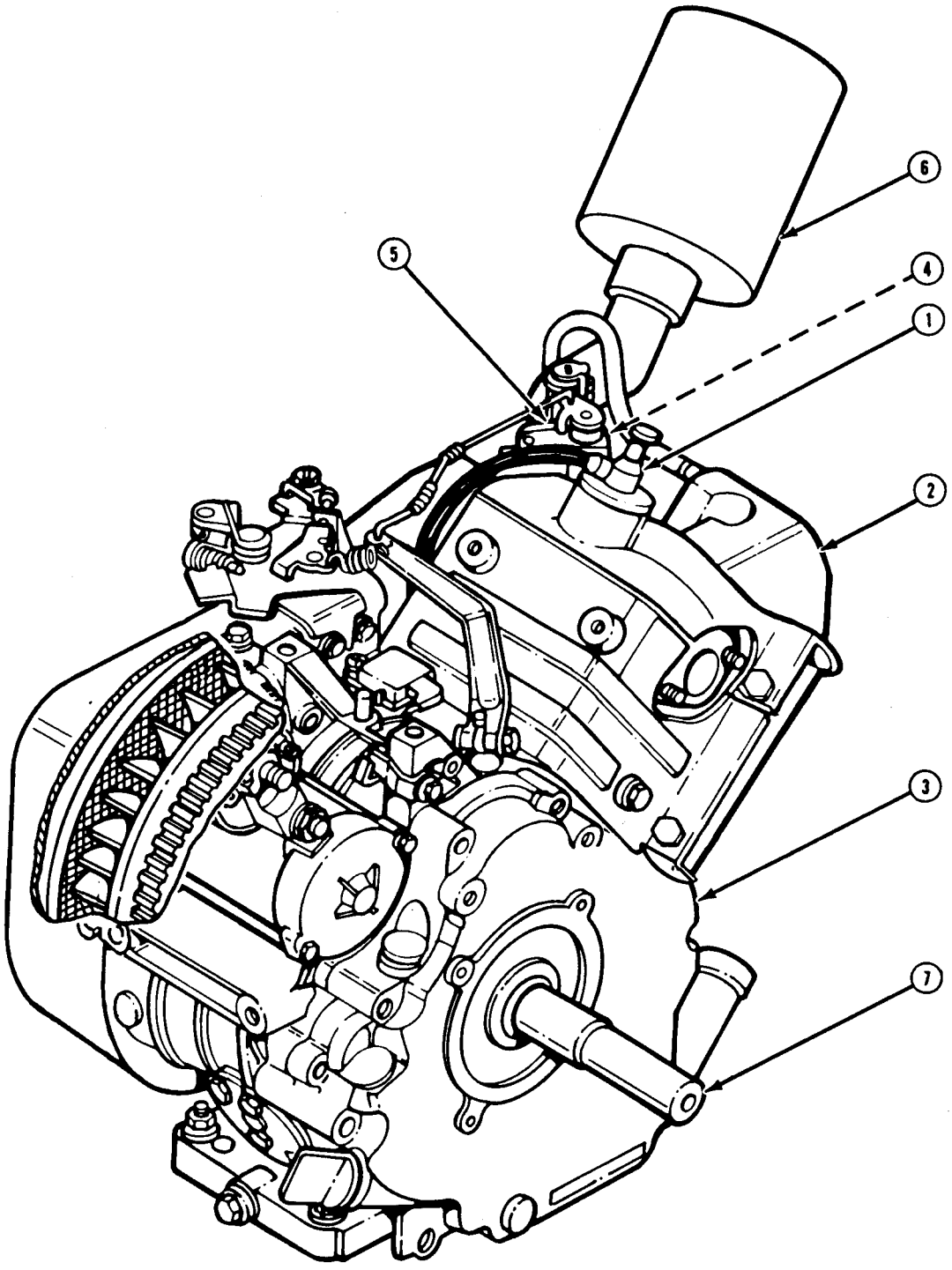

M80564

ENGINE WILL NOT STAY RUNNING OR RUNS ROUGH

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-19-29AUG91

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MX,22015HE,5A -19-19JUL91

ENGINE SPINS SLOW OR KICKS BACK

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests in Section 240 Group 15.
- •Power train tests in Section 250 Group 15.

Test Location	Normal	If Not Normal
1. Flywheel.	Crankshaft nut tight.	Check for sheared flywheel key. Tighten nut to 85 N·m (63 lb-ft).
	Coil air gap 0.3 mm (0.012 in.)	Adjust coil air gap.
2. Crankshaft.	Wet reduction clutch not dragging. (Engine at slow idle.)	Check wet reduction clutch oil level and condition. Check wet reduction clutch internal components.
3. Head.	Valve clearance of 0.125 mm (0.005 in.).	Check components for binding or damage. Adjust valve clearance.
	Compression release holding exhaust valve off seat 0.25 mm (0.010 in.) for part of compression stroke. Minimum compression 490 kPa (71 psi).	Adjust valve clearance. Check for sticking or damaged compression release components.

MX,22015HE,6A -19-19JUL91

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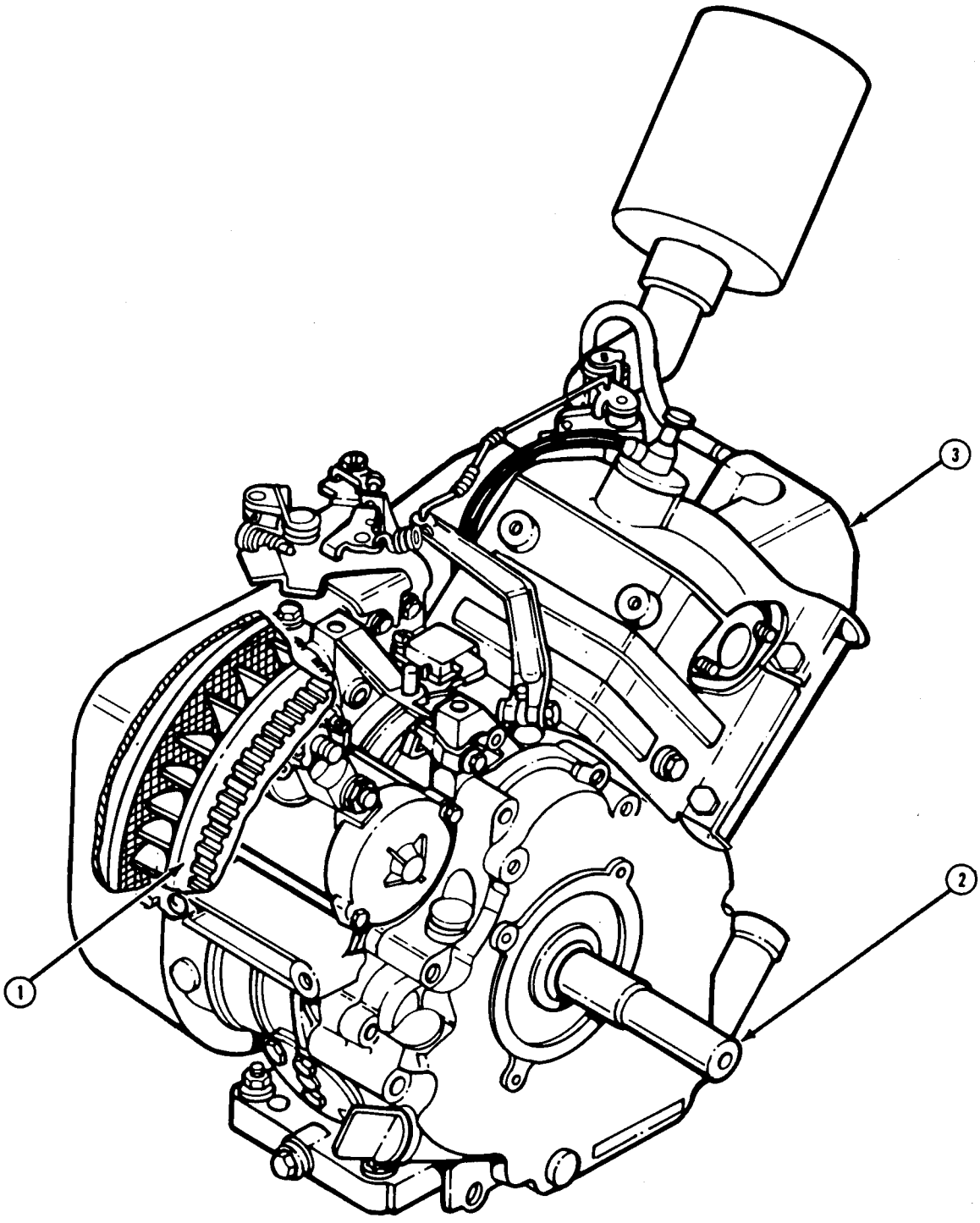

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ENGINE SPINS SLOW OR KICKS BACK

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Slide M80565

MX,22015HE,7A -19-19JUL91

ENGINE HAS BLACK SMOKE AT START OR DURING OPERATION

CONDITIONS:
•Key switch in off position.
•Spark plug wire removed and grounded.
•Transaxle in neutral.
•Park brake locked.
•Engine and fuel/air tests found in this group.

Test Location	Normal	If Not Normal
1. Air filter elements.	Not dirty or oil soaked.	Clean or replace filter elements.
2. Fuel tank.	No pressure released from tank when cap removed.	Check tank vent, clean and replace faulty cap.
3. Carburetor.	Carburetor clean. Fuel not leaking.	Clean carburetor. Check for dirty or damaged inlet needle and seat. Check float for leakage and correct position. Check slow idle mixture screw for damage and adjustment. Check for correct size, damaged, or missing main jet.
	Choke fully open with choke knob pushed in.	Adjust choke.
4. Fuel pump.	Output pressure of 6 kPa (0.9 psi) at fast idle.	Check crankcase vacuum. Check vacuum hose and connections for leaks. Repair or replace fuel pump.

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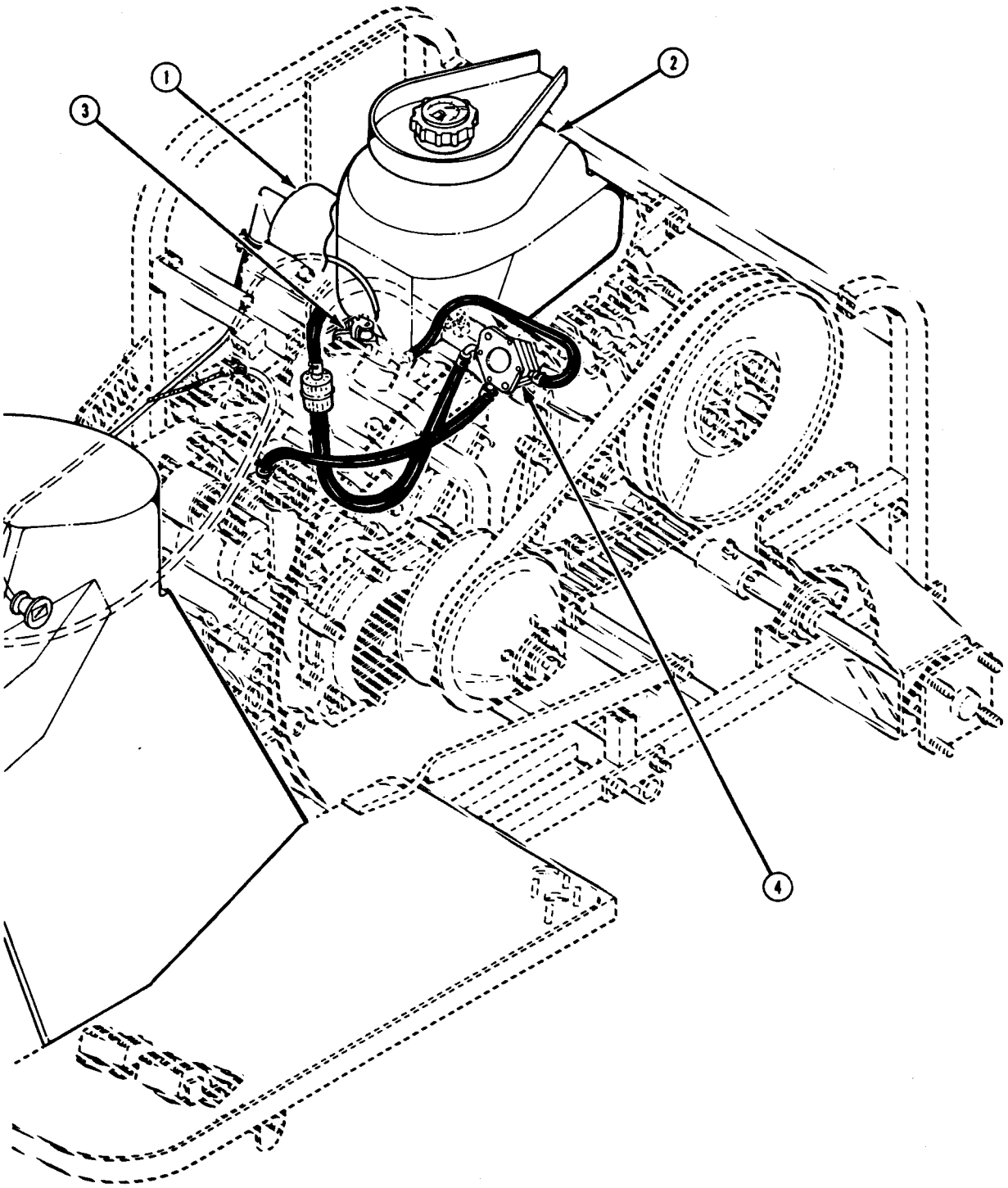

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ENGINE HAS BLACK SMOKE AT START OR DURING OPERATION

-19-29AUG91

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MX,22015HE,9A -19-19JUL91

ENGINE HAS BLUE SMOKE AT START OR DURING OPERATION

CONDITIONS:
•Key switch in off position.
•Spark plug wire removed and grounded.
•Transaxle in neutral.
•Park brake locked.
•Engine and fuel/air tests found in this group.

Test Location	Normal	If Not Normal
1. Air filter elements.	Not dirty or oil soaked.	Clean or replace filter elements.
2. Engine cooling fins.	Not plugged or dirty.	Remove debris.
3. Dipstick	Gasket not cut or damaged.	Replace gasket.
4. Crankcase.	Proper weight and grade of oil being used.	Change oil.
	Oil level not above full mark on dipstick.	Remove excess oil. Check for fuel contamination of oil.
5. Head.	Valve stem to valve guide clearance within specifications.	Repair or replace components as needed.

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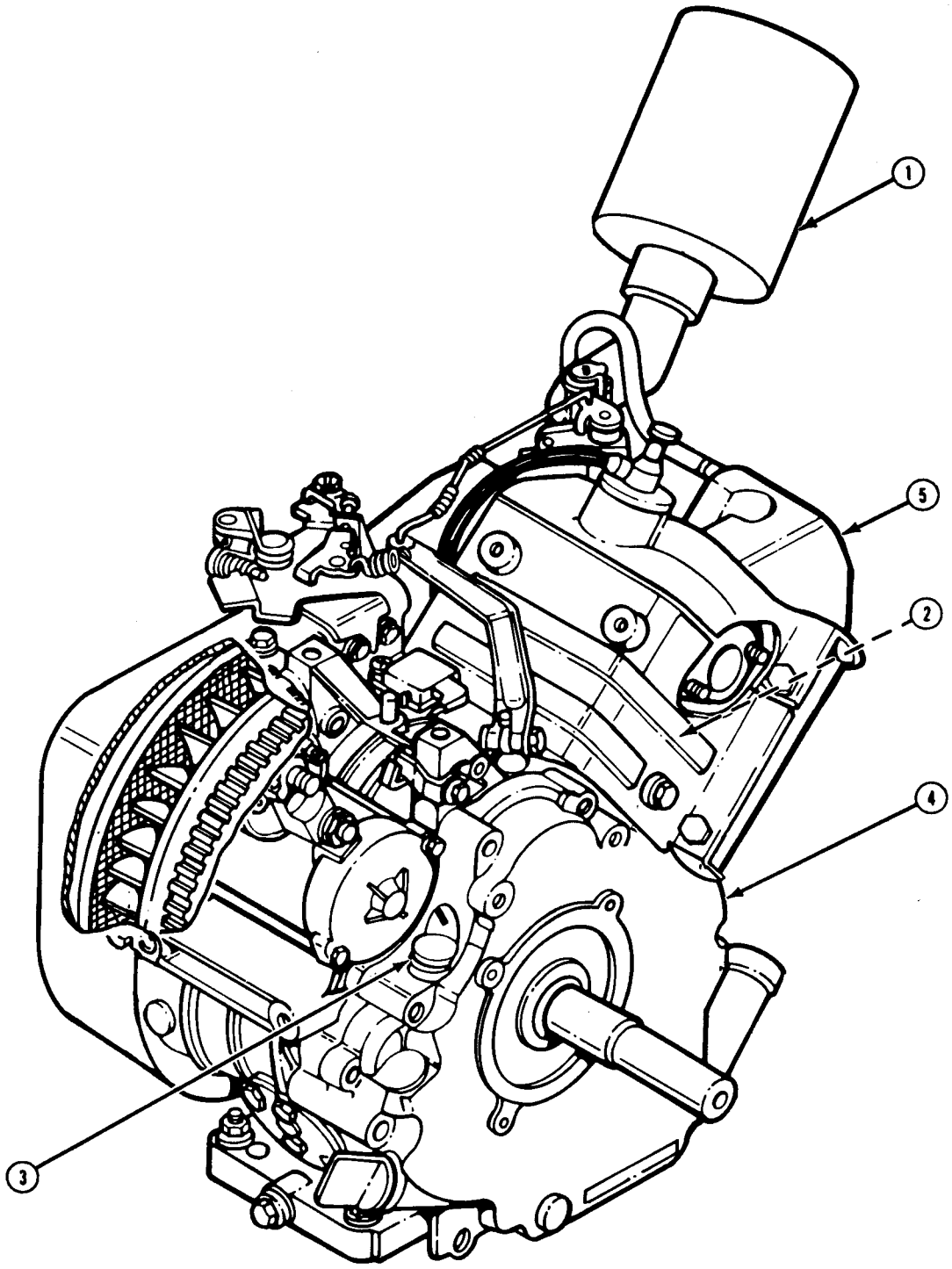

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ENGINE HAS BLUE SMOKE AT START OR DURING OPERATION

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MX,22015HE,11A -19-19JUL91

ENGINE USES TOO MUCH OIL

NOTE: Oil level should always be checked after the engine has been run long enough to warm the oil. If the oil is checked cold, then recheck after warm up. It is normal for the oil level to raise as much as 2 mm (0.08 in.) on the dipstick because of expansion.

Oil consumption is too high if the oil level moves from FULL to ADD in less than 18 hours.

CONDITIONS:
•Key switch in off position.
•Spark plug wire removed and grounded.
•Transaxle in neutral.
•Park brake locked.
•Engine and fuel/air tests found in this group.

Test Location	Normal	If Not Normal
1. Air filter elements.	Not dirty or oil soaked.	Clean or replace filter elements.
2. Engine cooling fins.	Not plugged or dirty.	Remove debris.
3. Dipstick.	Gasket not cut or damaged.	Replace gasket.
4. Crankcase.	Proper weight and grade of oil being used.	Change oil.
	Oil level not above full mark on dipstick.	Remove excess oil. Check for fuel contamination of oil.
	Crankcase vacuum of 30 mm (1.2 in.) of water. (Engine running at 3800 rpm.)	Check breather operation. Check vent chamber oil drain hole for obstruction. Check breather reed valve clearance. Check compression.
5. Head.	Valve stem to valve guide clearance within specification.	Repair or replace components as needed.
6. Engine.	Internal components worn within specification.	Repair or replace components as necessary

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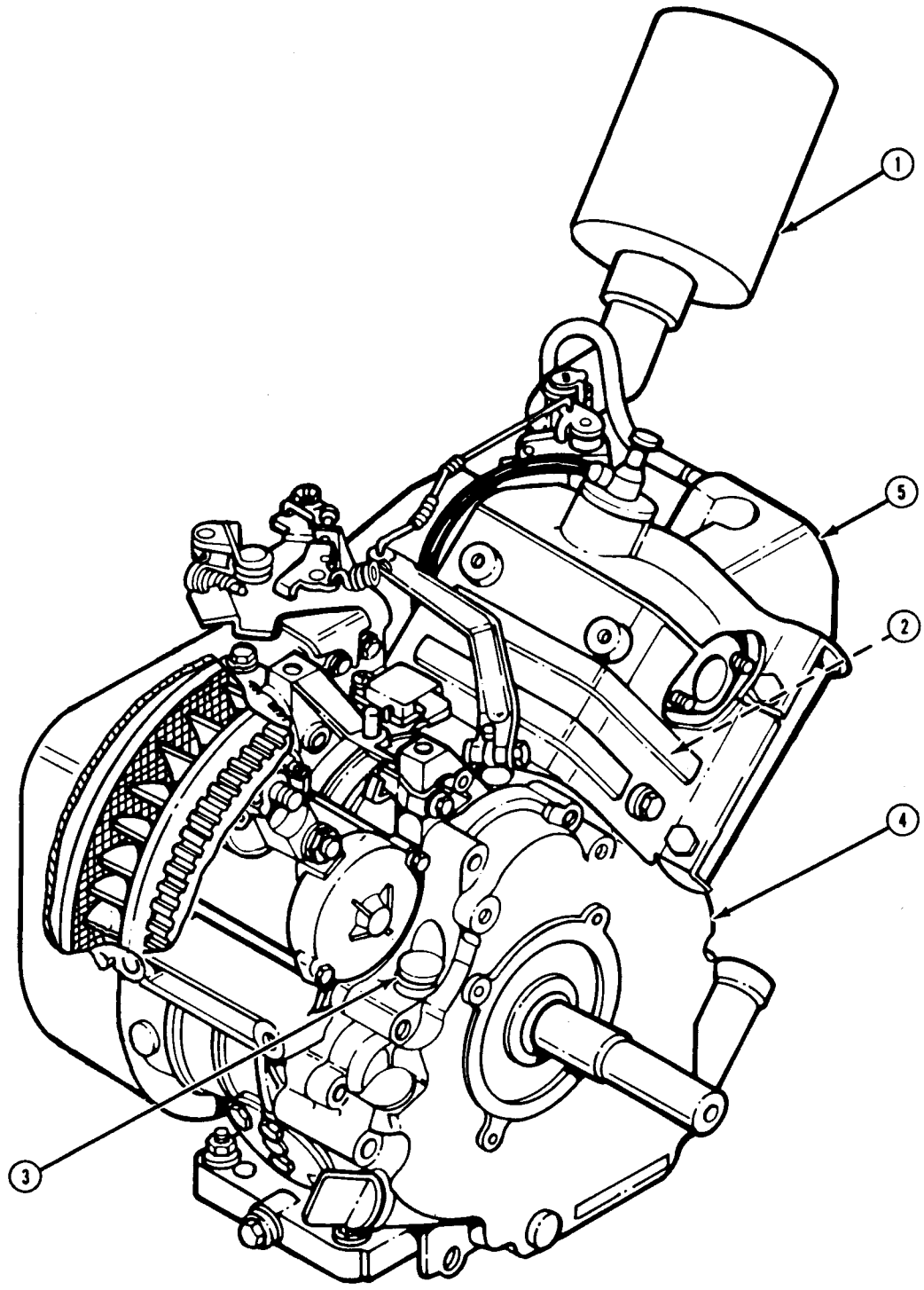

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ENGINE USES TOO MUCH OIL

-19-29AUG91

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Slide M80568

MX,22015HE,13A -19-19JUL91

ENGINE SURGES

NOTE: Surging is usually the result of a lean mixture (not enough fuel or too much air).

CONDITIONS:
•Key switch in off position.
•Spark plug wire removed and grounded.
•Transaxle in neutral.
•Park brake locked.
•Engine and fuel/air tests found in this group.

Test Location	Normal	If Not Normal
1. Fuel tank cap.	No change in engine performance when cap is removed.	Clean or replace cap.
2. Carburetor inlet hose.	Free flow of fuel when hose removed from carburetor inlet fitting. (Engine at slow idle.)	Check for plugged filter. Check for plugged or pinched hose. Check fuel pump pressure and flow. Check crankcase vacuum.
3. Carburetor.	Fuel in flow bowl.	Check for dirty or sticking inlet needle. Check float and correct position. Check for secure tube connection to carburetor vent port.
	Choke cable free and choke fully open when choke knob is pushed in.	Check for binding cable. Check for correct adjustment of choke cable.
	Smooth idle at 1300—1500 rpm.	Adjust mixture and slow idle screws.
4. Crankcase.	Governor arm tight on governor shaft.	Adjust governor and tighten clamp nut.
	Governor arm and governor shaft both rotated as far counterclockwise as possible.	Adjust governor.

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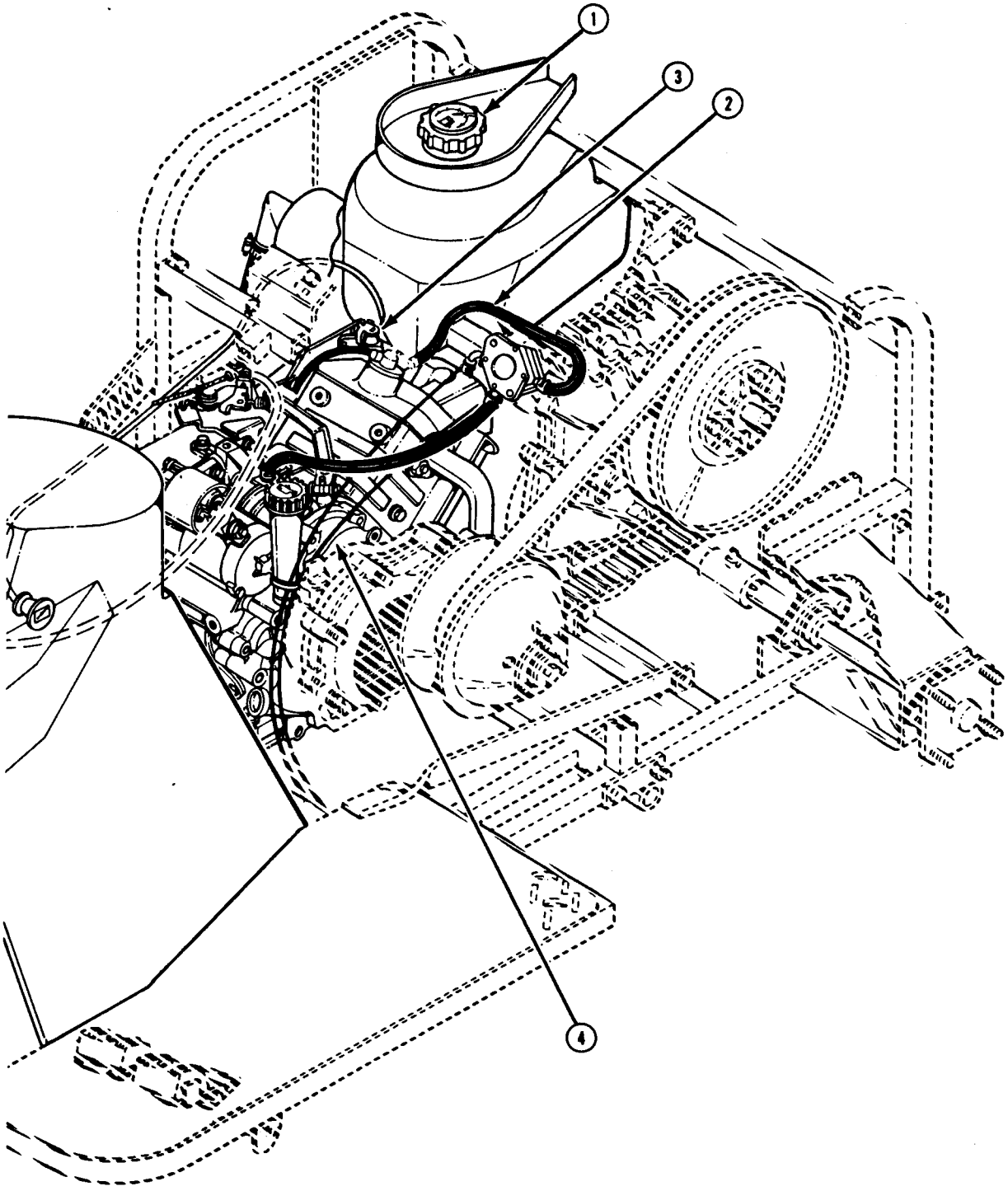

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ENGINE SURGES

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MX,22015HE,15A -19-19JUL91

ENGINE HAS UNEVEN OR UNCONTROLLED RPM

CONDITIONS:
•Key switch in off position.
•Spark plug wire removed and grounded.
•Transaxle in neutral.
•Park brake locked.
•Engine and fuel/air tests found in this group.

Test Location	Normal	If Not Normal
1. Crankcase.	Governor arm tight on governor shaft.	Adjust governor and tighten clamp nut.
	Governor arm and governor shaft both rotated as far counterclockwise as possible.	Adjust governor.
	Resistance to movement of governor arm. (Engine running at fast idle.)	Disassemble engine and check governor components.
2. Governor control panel.	Linkage not binding or damaged.	Repair or replace components as needed.
	Governor spring installed and not stretched.	Repair or replace spring as needed.
3. Carburetor.	Throttle valve and linkage not binding.	Repair or replace components as needed.
	Slow idle screw adjusted correctly.	Adjust slow idle.

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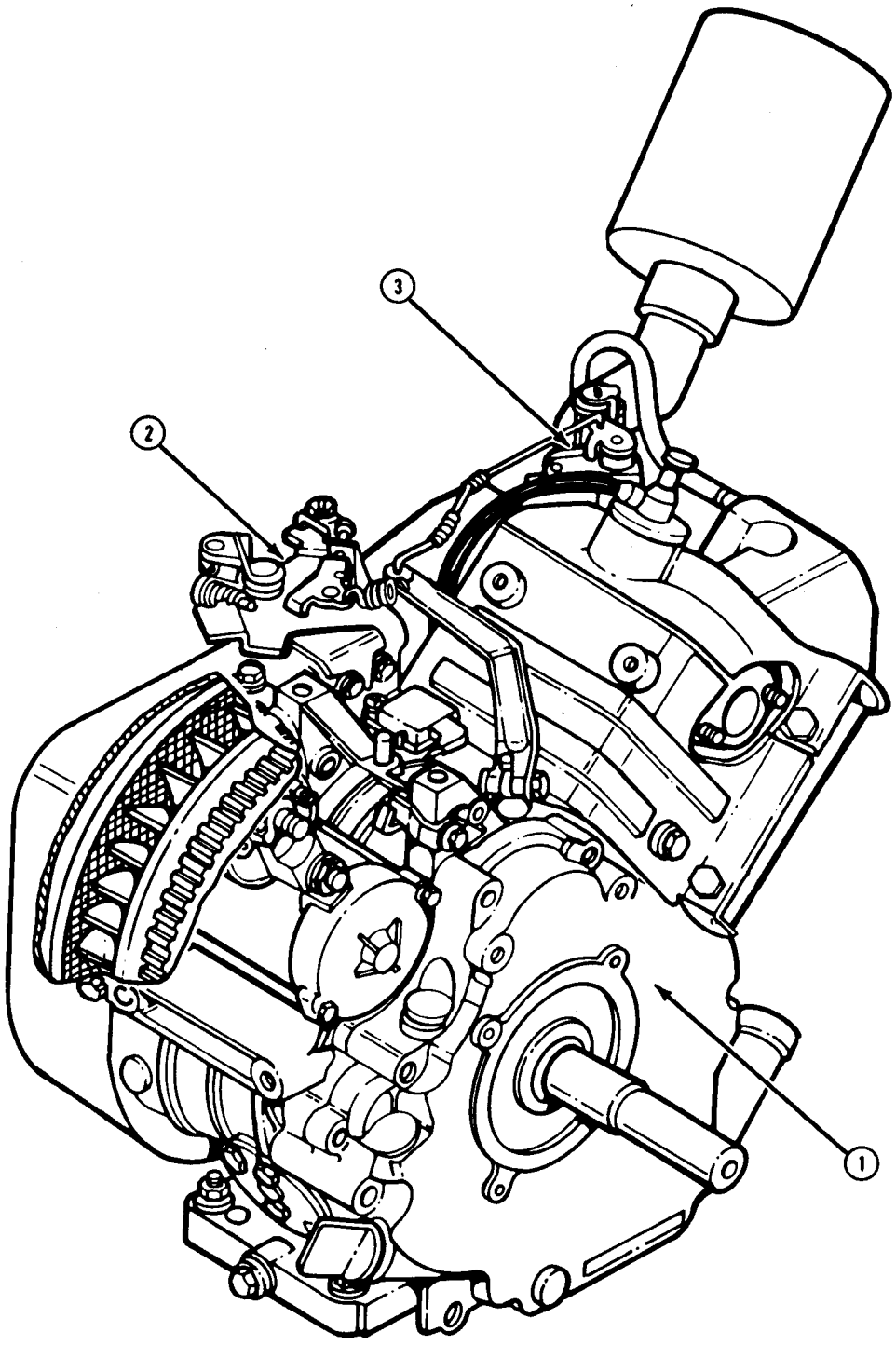

M80570

ENGINE HAS UNEVEN OR UNCONTROLLED RPM

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MX,22015HE,19A -19-19JUL91

ENGINE HAS LOW POWER

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests in Section 240, Group 15.
- •Power train tests in Section 250, Group 15.

Test Location	Normal	If Not Normal
1. Air filter elements.	Not dirty or oil soaked.	Clean or replace elements as needed.
2. Fuel tank cap.	No change in engine performance when cap is removed.	Clean or replace cap.
3. Fuel pump.	6 kPa (0.9 psi) at 3800 rpm	Test crankcase vacuum. Replace pump.
4. Carburetor inlet hose.	Free flow of fuel when hose is removed from carburetor inlet fitting. (Engine at slow idle.)	Check for plugged filter. Check for plugged or pinched hose.
	No air bubbles.	Insulate fuel line. Try different fresh fuel.
5. Spark plug.	Plug dry.	Check for inlet needle seating on carburetor. Check for correct adjustment of choke cable.
	Consistent blue spark. (Key switch in start position.)	Check for faulty key switch. Check for faulty coil and/or ignition module. Check for shorted ignition wire or high tension lead.
6. Carburetor.	Fuel not leaking from float bowl.	Check for dirty or sticking inlet needle. Check float for leaks and correct position.
	Choke cable free and choke fully open when choke knob is pushed in.	Check for correct adjustment of choke cable.
7. Governor control plate.	Engine operating at specified 3800 rpm.	Adjust governor.
8. Head.	Minimum compression of 490 kPa (71 psi).	Check condition of rings, piston and cylinder walls. Check for sticking or damaged compression release components. Check for sticking or damaged valve. Check for misadjusted valves.

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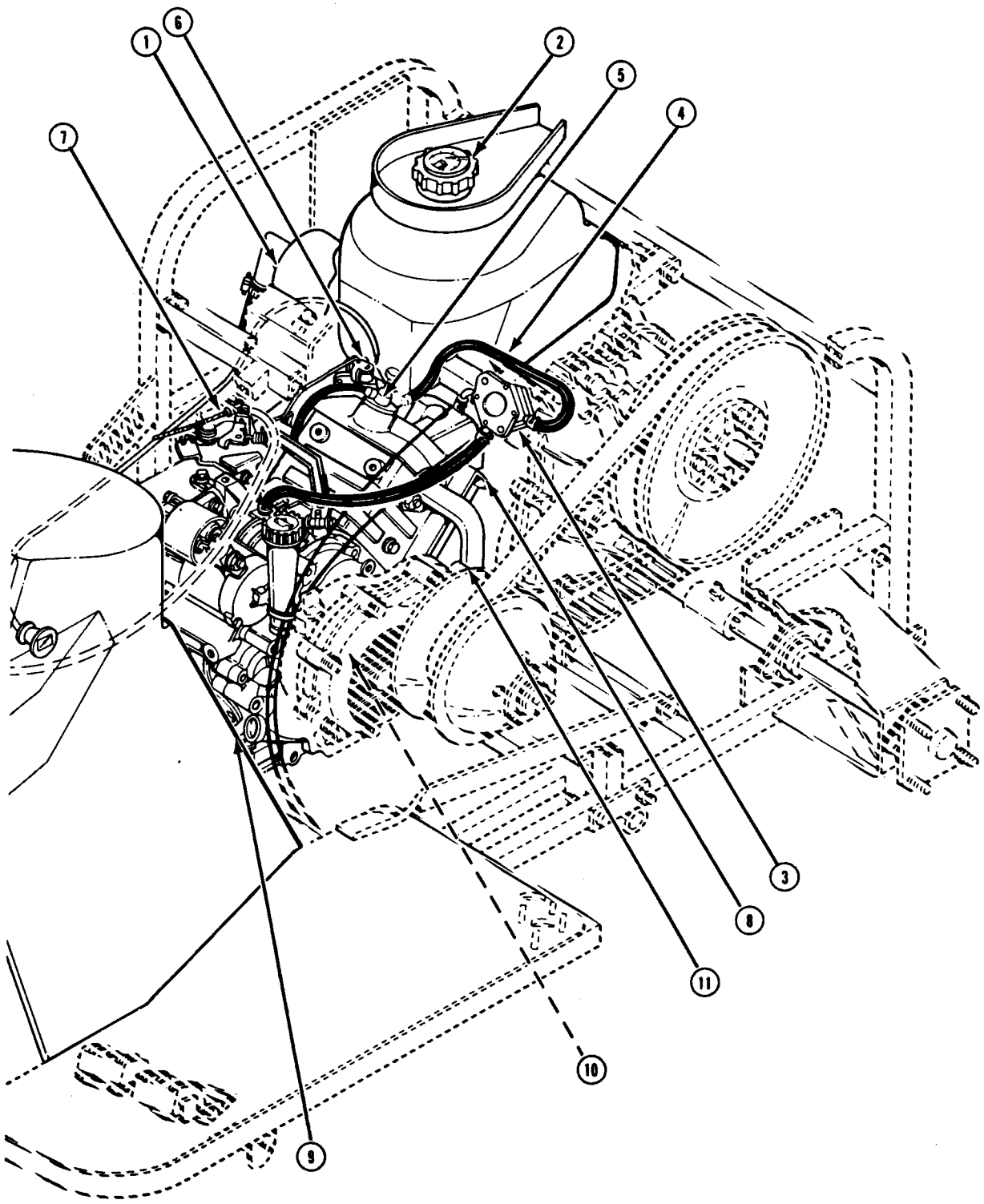
MX,22015HE,20A -19-27SEP91



M80571

ENGINE HAS LOW POWER

-19-29AUG91

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MX,22015HE,21A -19-19JUL91

ENGINE HAS LOW POWER—CONTINUED

Test Location	Normal	If Not Normal
9. Crankcase.	Crankcase vacuum of 30 mm (1.2 in.) of water. (Engine running at 3800 rpm.)	Check for leaking crankcase seals and gaskets. Check for sticking or damaged breather components. Check condition of rings, piston, cylinder walls and valves.
10. Crankshaft.	Wet reduction clutch not dragging. (Engine at slow idle.)	Check wet reduction clutch oil level and condition. Check wet reduction clutch internal components.
11. Muffler.	No restrictions or rattles.	Replace muffler.

MX,22015HE,21AA-19-19JUL91

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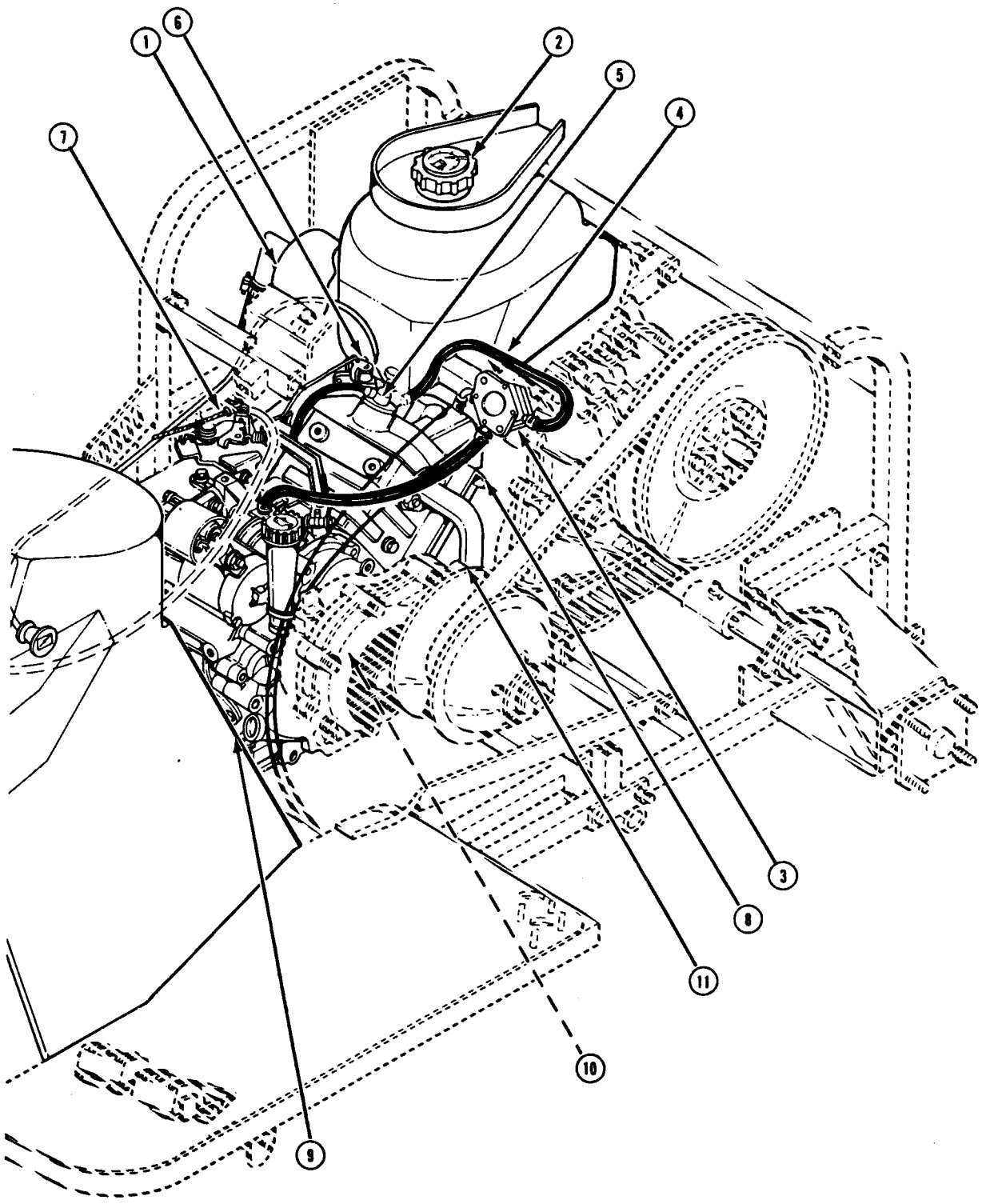

M80571

ENGINE HAS LOW POWER

-19-29AUG91

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MX,22015HE,21A -19-19JUL91

ENGINE FLOODING

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests in Section 240 Group 15.

Test Location	Normal	If Not Normal
1. Air cleaner.	Not restricted or damaged.	Replace filter elements.
2. Spark plug.	Plug dry.	Check for inlet needle seating in carburetor. Check for correct adjustment of choke cable.
	Consistent blue spark. (Key switch in start position.)	Check for faulty ignition coil or module Check for shorted ignition wire or high tension lead.
3. Carburetor.	Fuel not leaking from float bowl.	Check for dirty or sticking inlet needle. Check throttle cable adjustment. Check float for leakage and correct position.
	Smooth idle at 1300 rpm.	Adjust mixture and slow idle screw.
4. Fuel pump.	Output pressure of 6 kPa (0.9 psi) at fast idle.	Check crankcase vacuum. Repair or replace fuel pump

MX,22015HE,22A -19-27SEP91

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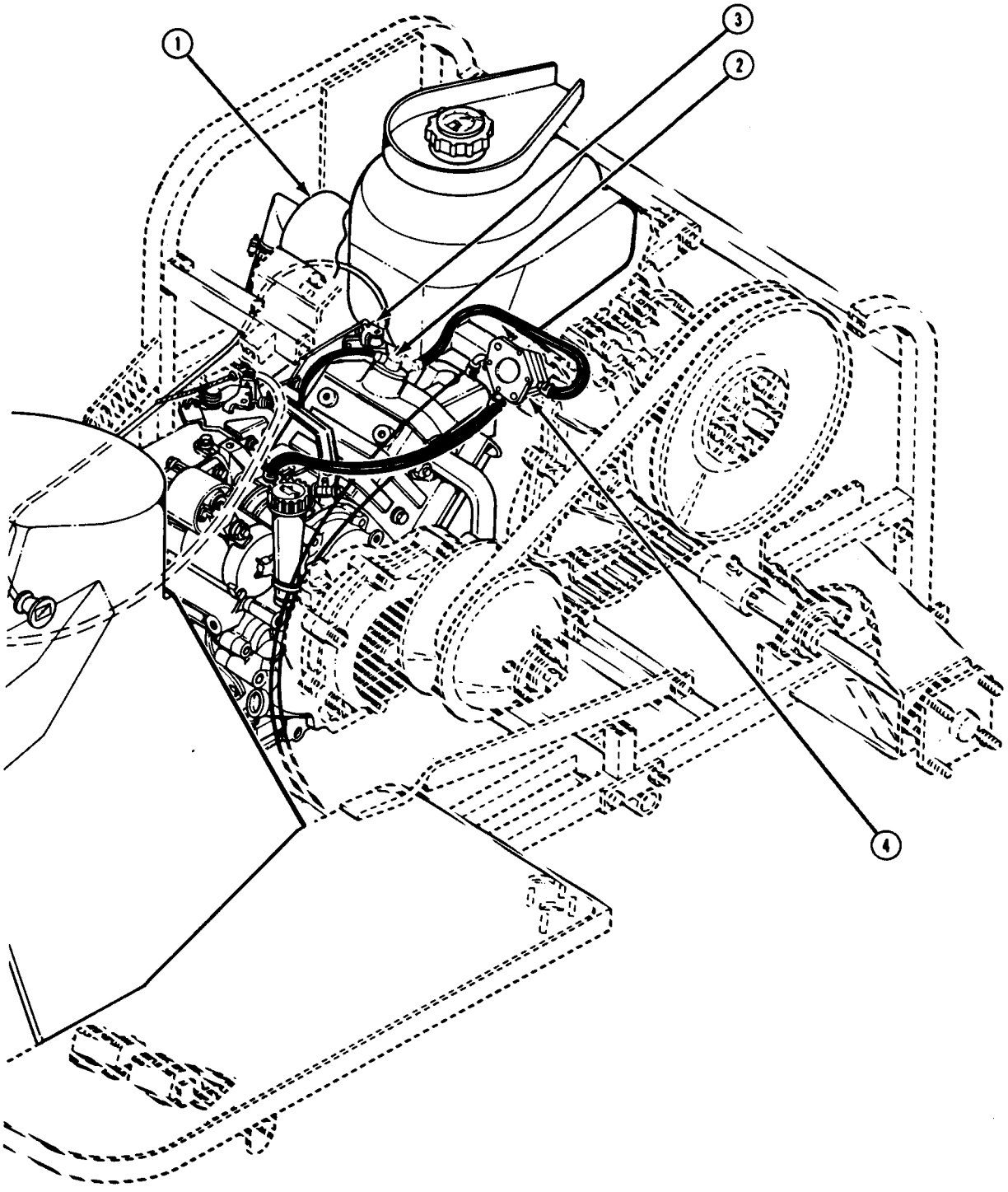

ENGINE FLOODING

-19-29AUG91

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MX,22015HE,23A -19-19JUL91

ENGINE STOPS WHEN HOT

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Spark plug.	Consistent blue spark. (Key switch in start position.)	Check for faulty ignition coil or module. Check for shorted ignition wire or high tension lead.
2. Carburetor.	Free flow of fuel when float bowl drain screw is removed.	Check for plugged tank vent. Check for plugged filter. Check for plugged or pinched hoses. Check fuel pump flow and pressure. Check for fuel contamination.
3. Head.	Minimum compression of 490 kPa (71 psi).	Adjust valve clearance. Check for sticking or damaged valves. Check for sticking or damaged compression release components. Check conditions of rings, piston, and cylinder wall.
4. Flywheel.	Crankshaft flywheel nut tight.	Check for sheared flywheel key. Tighten nut to 85 N·m (63 lb-ft).

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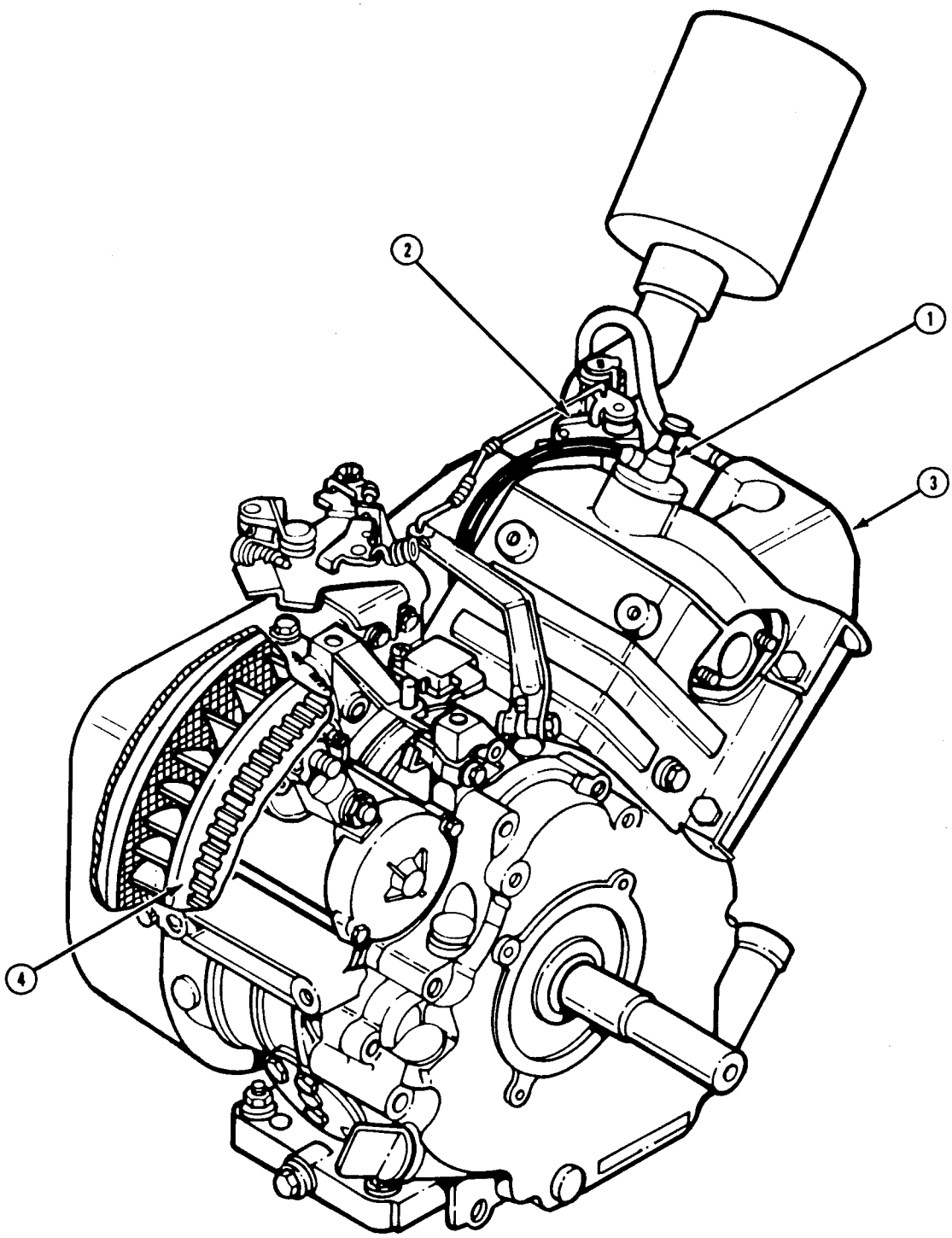

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ENGINE STOPS WHEN HOT

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-19-29AUG91

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MX,22015HE,25A -19-19JUL91

ENGINE BACKFIRES THROUGH CARBURETOR

CONDITIONS:
- •Key switch in off position.
- •Spark plug wire removed and grounded.
- •Transaxle in neutral.
- •Park brake locked.
- •Engine and fuel/air tests found in this group.
- •Ignition and electrical tests in Section 240 Group 15.

Test Location	Normal	If Not Normal
1. Spark plug.	Consistent blue spark. (Key switch in start position.)	Check for faulty ignition coil or module.
2. Carburetor.	Choke cable free and choke fully open when choke knob is pushed in. Smooth slow idle.	Check for binding cable. Check for correct choke cable adjustment. Adjust mixture and slow idle screws.
3. Head.	Valve clearance of 0.125 mm (0.005 in.) Both valves open the same distance.	Check valves for binding or damage. Adjust valve clearance. Replace valves and/or camshaft
4. Flywheel.	Crankshaft flywheel nut tight.	Check for sheared flywheel key. Tighten nut to 85 N·m (63 lb-ft).

MX,22015HE,26A -19-19JUL91

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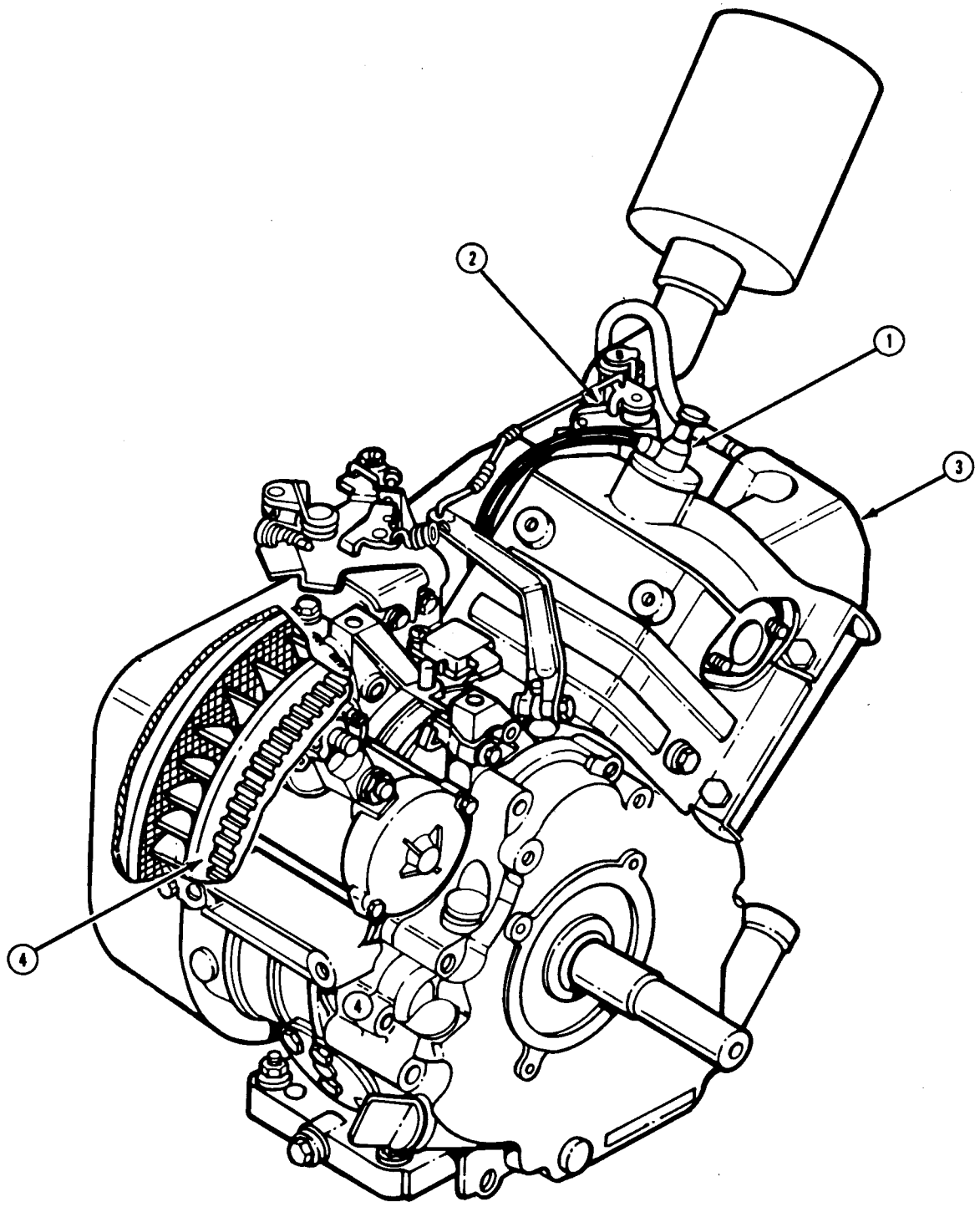

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ENGINE BACK FIRES THROUGH CARBURETOR

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-19-29AUG91

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MX,22015HE,27A -19-19JUL91

ENGINE BACKFIRES AT SHUT-DOWN

NOTE: Normal operation of engine should allow engine to operate at slow idle for 15 seconds before stopping engine.

CONDITIONS:
- Key switch in off position.
- Spark plug wire removed and grounded.
- Transaxle in neutral.
- Park brake locked.
- Engine and fuel/air tests found in this group.
- Ignition and electrical tests in Section 240, Group 15.

Test Location	Normal	If Not Normal
1. Air cleaner.	Not restricted or damaged.	Replace filter element
2. Carburetor.	Carburetor clean.	Clean carburetor.
	Fuel not leaking.	Clean carburetor, check for damaged inlet needle and seat. Check float for leaks. Check idle mixture screw for damage and adjustment. Adjust slow idle. Check for correct size, damaged or missing main jet.
	Throttle valve linkage free.	Repair or replace components as needed. Check for binding linkage at carburetor and governor panel.
	Choke linkage free and choke fully open when choke knob is pushed in.	Check for correct adjustment of choke cable.
3. Crankcase.	Governor arm tight on governor shaft.	Adjust governor and tighten clamp nut.
	Governor arm and governor shaft both rotated as far counterclockwise as possible.	Adjust governor.
4. Flywheel.	Crankshaft flywheel nut tight.	Check for sheared flywheel key. Tighten nut to 85 N·m (63 lb-ft)
5. Ignition coil.	Ignition coil air gap 0.3 mm (0.012 in.).	Adjust coil air gap.
	Primary winding resistance 0.67—1.10 ohms, secondary winding resistance 6000—10000 ohms.	Replace ignition coil.
6. Ignition module.	Resistance of 1000—5000 ohms and 2000—6000 ohms when test leads are switched.	Replace ignition module.
7. Muffler.	No damage or hot spots, no rattle if shaken.	Replace muffler.

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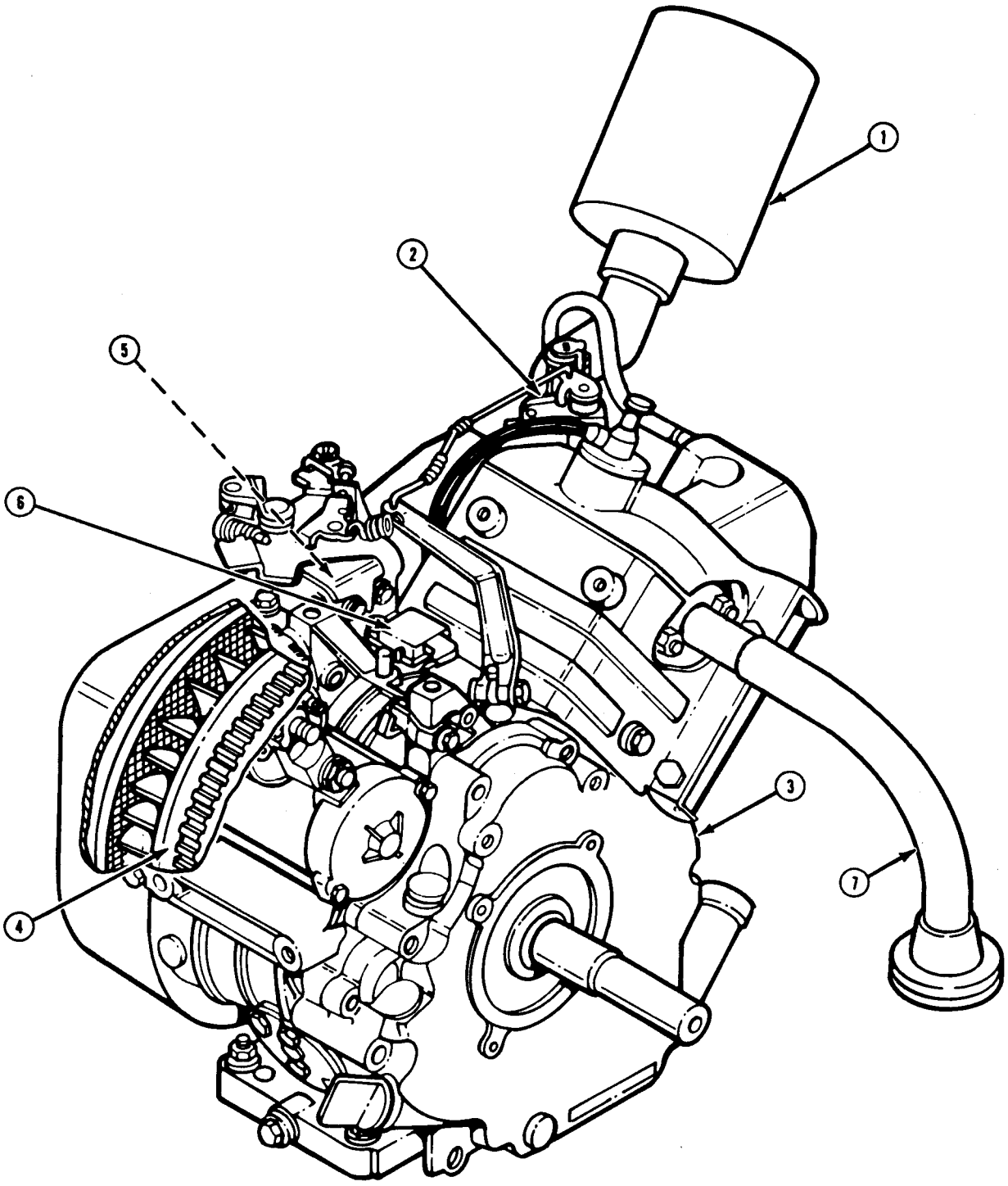

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ENGINE BACK FIRES AT SHUT-DOWN

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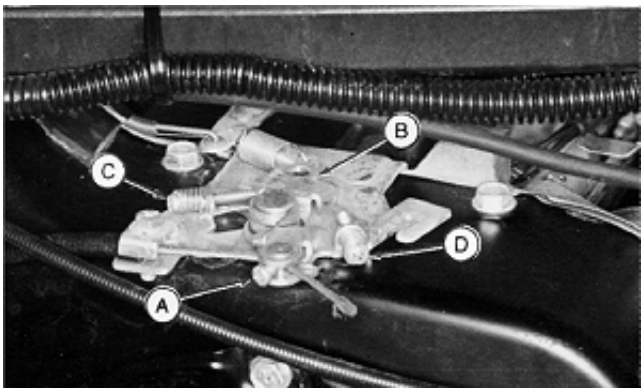
ACCELERATOR CABLE ADJUSTMENT

REASON:
Make sure throttle valve of carburetor is adjusted correctly in relation to the accelerator pedal.

PROCEDURE:
1. Loosen cable screw (A).

2. Adjust cable length so governor control lever (B):
   —contacts stop screw (C) when accelerator pedal is NOT pressed.
   —contacts stop screw (D) when accelerator pedal is fully pressed.

3. Tighten cable screw.



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A—Cable Retaining Screw
B—Governor Control Lever
C—Slow Idle Stop Screw
D—Fast Idle Stop Screw

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CHOKE ADJUSTMENT

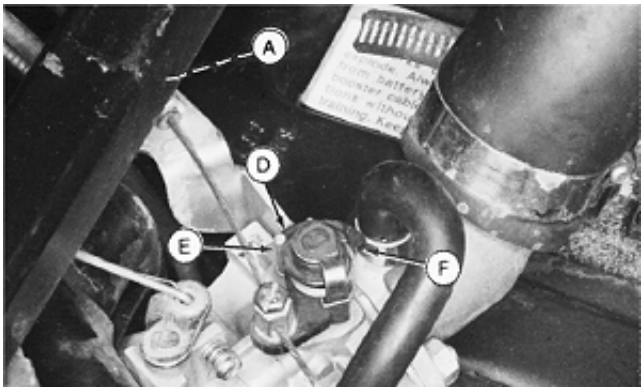
REASON:
Make sure choke valve opens and closes completely when knob is pushed and pulled.

PROCEDURE:
1. Loosen cable clamp (A).

2. Adjust cable position so:
   —there is 2—3 mm (0.08—0.12 in.) clearance between choke knob (B) and cable mount (C) when choke open stop (D) contacts pin (E).
   —choke close stop (F) contacts pin (E) when choke knob is pulled out.

3. Tighten cable clamp.

A—Cable Clamp
B—Choke Knob
C—Cable Mount
D—Choke Open Stop
E—Pin
F—Choke Close Stop



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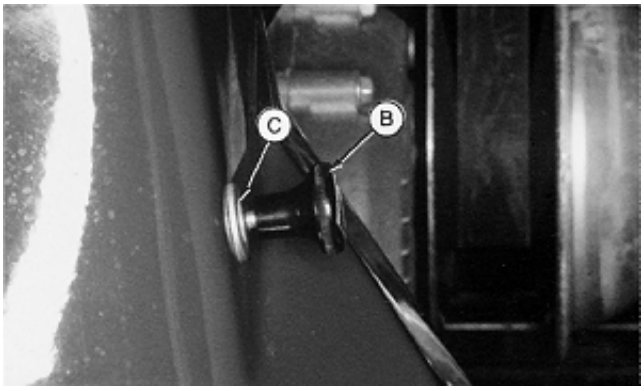

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GOVERNOR ADJUSTMENT

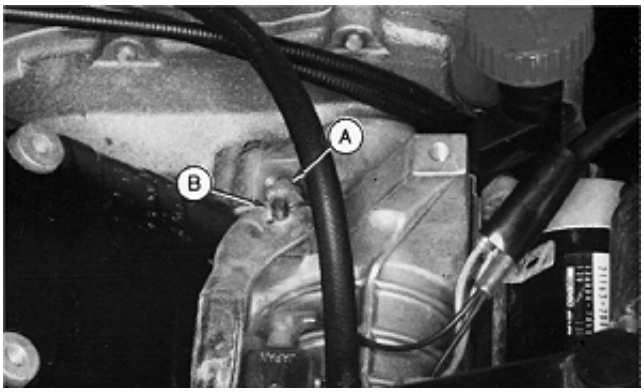
NOTE: For correct governor adjustment, adjust throttle cable first.

REASON:
To make sure the governor is adjusted for full engine rpm operating range.

PROCEDURE:
1. Move accelerator pedal to fast idle position.

2. Loosen nut (A). Turn governor shaft (B) counterclockwise until governor shaft stops. Tighten nut.

3. Move accelerator pedal through full range to be sure linkage is not binding.



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FAST IDLE SPEED ADJUSTMENT

REASON:
Check and adjust engine fast idle rpm.

EQUIPMENT:
•JDM-71 Vibration Tachometer

PROCEDURE:
1. Move gear shift pedals to neutral position and lock park brake.

2. Start and operate engine at medium speed for 10 minutes.

CAUTION: Engine will be HOT. Be careful around hot components.

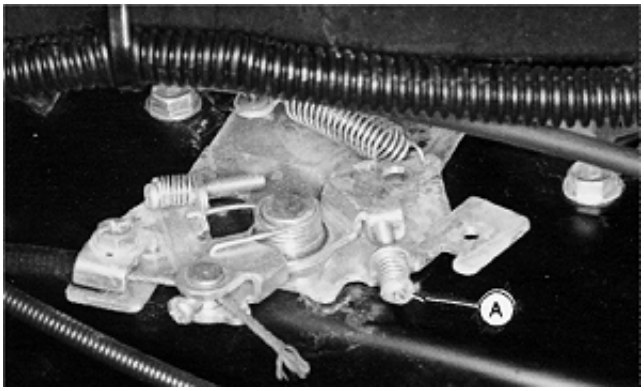
3. Move accelerator pedal to fast idle position.

4. Check engine speed using vibration tachometer.

5. Set tachometer to 3800 rpm and put on flat surface of engine or on frame close to engine.

6. Turn screw (A) until 3800 rpm is achieved.

SPECIFICATIONS:
•Fast idle .. 3800 rpm



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SLOW IDLE SPEED ADJUSTMENT

REASON:
Check and adjust engine slow idle rpm.

EQUIPMENT:
•JDM-71 Vibration Tachometer

PROCEDURE:
IMPORTANT: Forcing the idle mixture screw tight will damage needle and seat. Tighten screw lightly.

1. Turn idle mixture screw (A) clockwise until lightly seated, then turn counterclockwise 1-3/4 turns.

2. Make sure gear shift pedals are in neutral position and park brake is locked.

3. Operate engine at medium speed for 5 minutes.

4. Move accelerator pedal to slow idle position.

5. Turn slow idle stop screw (B) on governor control out until screw does not contact governor lever.

6. Check engine speed using vibration tachometer.

7. Set tachometer to 1300 rpm and put on flat surface of engine or on frame close to engine.

8. Turn slow idle stop screw (C) on carburetor until slow idle speed is 1300 rpm.

9. Turn idle mixture screw in and out until engine speed is maximum.

10. Turn idle mixture screw out an additional 1/4 turn.

11. Turn slow idle stop screw on carburetor until idle speed of engine is 1300 rpm.

12. Set tachometer to 1400 rpm.

13. Turn slow idle stop screw on governor control panel until engine is operating at 1400 rpm.

14. Move accelerator pedal from slow to fast idle several times. If engine does not accelerate smoothly, turn slow idle mixture screw about 1/8 turn out (richer).

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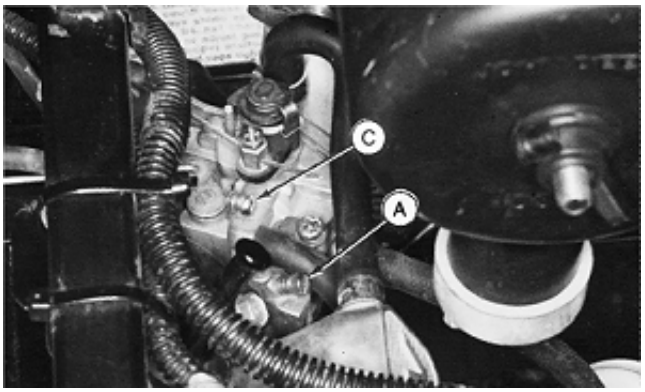
SPECIFICATIONS:
•Slow idle (at carburetor) .. 1300 rpm
•Slow idle (governor control panel) .. 1300—1500 rpm



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COMPRESSION AND CYLINDER LEAKAGE TEST

REASON:
Determine the condition of the rings, piston, valves and cylinder wall.

EQUIPMENT:
•JDM-59 Compression Gauge

CONNECTIONS:
1. Lock park brake. Put gear shift pedals in neutral position.

2. Remove high tension lead (A) and spark plug.

IMPORTANT: Next step must be done to protect ignition module.

3. Connect spark plug and high tension lead to ground.

4. Connect pressure gauge (B) and hose to spark plug port.

5. Move accelerator pedal to fast idle position.

PROCEDURE:
1. Use starter to turn engine for 5 seconds.

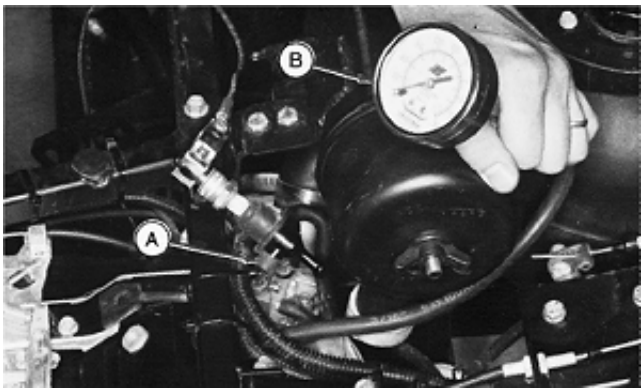
2. Record gauge reading.

SPECIFICATIONS:
•Minimum compression .. 490 kPa (71 psi)

RESULTS:
•If compression is low, remove gauge and squirt a small amount of engine oil into spark plug port. Repeat compression test.

•If compression improves with oil in cylinder, rings, piston or cylinder wall are faulty. Go to CTM-5 and repair engine as necessary.

•If compression remains low with oil in cylinder, valves are faulty. Go to CTM-5 and repair valves as necessary.



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VALVE CLEARANCE ADJUSTMENT

REASON:
Check and adjust valve clearance for proper engine operation. Proper valve clearance is critical for operation of the compression release system.

EQUIPMENT:
•Feeler Gauge (blade type)
•Torque Wrench
•Crows Foot Wrench

PROCEDURE:
IMPORTANT: Make adjustment when engine is cold.

1. Lock park brake. Put gear shift pedals in neutral position.

2. Remove high tension lead (A) and spark plug. Connect high tension lead to engine ground.

3. Remove rocker cover.

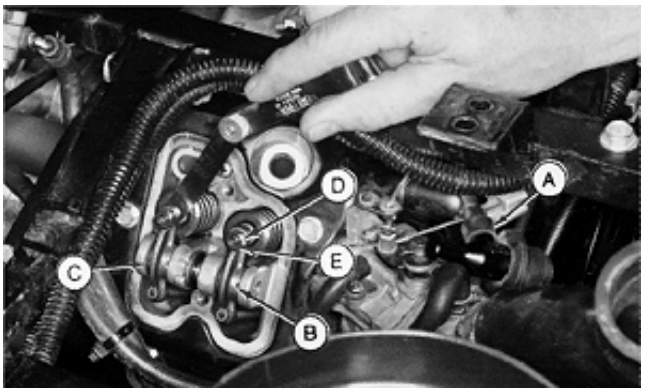
4. Turn crankshaft until piston is at TDC (top dead center) on the compression stroke (intake and exhaust valves are closed).

5. Use feeler gauge to measure clearance between valve stem and rocker arm for both valves.

NOTE: Before installing rocker cover and spark plug, do the compression release check. (See procedure in this group.)

SPECIFICATIONS:
•Intake and exhaust valve
clearance (cold) .. 0.125 ± 0.025 mm
(0.005 ± 0.001 in.)
•Adjuster lock Nut .. 20 N·m (180 lb-in.)
•Rocker cover cap screw torque .. 6 N·m (53 lb-in.)
•Spark plug torque .. 20 N·m (180 lb-in.)

RESULTS:
•If valve clearance is not to specification, loosen lock nut (D) and turn adjustment screw (E) as necessary. Tight lock nut to specification.



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A—High Tension Lead (grounded)
B—Intake Rocker Arm
C—Exhaust Rocker Arm
D—Lock Nut (2 used)
E—Adjustment Screw (2 used)

MX,22015HE,34A -19-27SEP91

COMPRESSION RELEASE CHECK

REASON:
To verify operation of the compression release system.

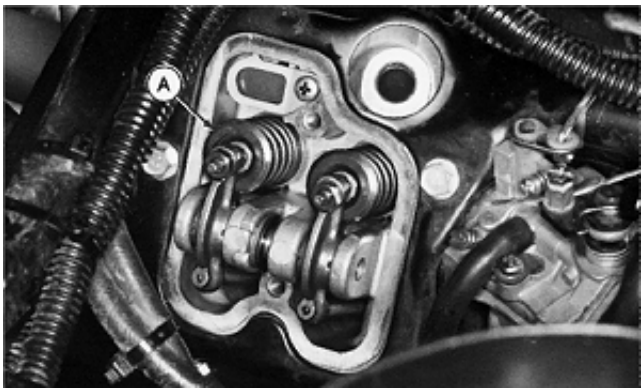
PROCEDURE:
1. Do valve clearance adjustment. (See procedure in this group.)

2. Park brake locked. Gear shift pedals in neutral position.

3. Slowly turn crankshaft and watch valves. Exhaust valve (A) should lift briefly just as intake valve closes.

SPECIFICATIONS:
•Automatic compression release lift .. 0.25 mm (0.010 in.)

RESULTS:
•If lift is less than specification, or not at all, compression release is not operating. Disassemble engine and repair or replace as needed.



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CRANKCASE VACUUM TEST

REASON:
To determine operation of breather, condition of seals, gaskets, rings, piston and cylinder wall.

EQUIPMENT:
•JTO5698 U-Tube Manometer
•AHT8741-F66 Plug
•JTO5703 Barb Fitting
•JTO5699 Clear Fuel Line

CONNECTIONS:
1. Park brake locked. Gear shift pedals in neutral position.

2. Remove dipstick.

3. Install barb fitting (A) in plug (B). Push plug and fitting into dipstick tube (C).

PROCEDURE:
IMPORTANT: Do not make connections between manometer and engine before engine is operating. Water from the manometer can be drawn into the engine crankcase at start-up.

1. Operate engine at fast idle.

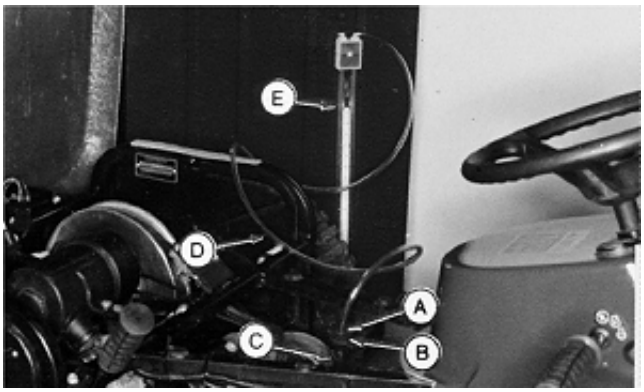
2. Install clear line (D) on barb fitting and to manometer (E).

3. Record water level of manometer.

4. Disconnect line from barb fitting before stopping engine.

SPECIFICATIONS:
•Minimum crankcase vacuum at fast idle (3800 rpm) .. 30 mm (1.2 in.) water column

RESULTS:
•If crankcase vacuum is less than specification, check for:
—Sticky of faulty breather assembly
—Leaking crankcase seals or gaskets
—Worn rings, piston or cylinder wall



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A—Barb Fitting
B—Plug
C—Dipstick Tube
D—Clear Line
E—Manometer

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FUEL PUMP TESTS

REASON:
To check for proper operation of fuel pump.

EQUIPMENT:
•JDG356 Pressure Gauge
•Graduated Container in milliliters (ounces)
•Watch or timer in seconds

PRESSURE TEST PROCEDURE:
1. Park brake locked. Gear shift pedals in neutral position.

2. Operate engine at slow idle 1 minute to be sure carburetor is filled.

3. Disconnect fuel pump outlet hose (A) from fuel pump outlet fitting. Install plug in hose.

4. Connect gauge hose (B) to fuel pump outlet.

5. Operate engine at fast idle for 15 seconds. Record gauge pressure reading.

6. Stop engine. Connect outlet hose to outlet fitting.

FLOW TEST PROCEDURE:
1. Operate engine at slow idle 1 minute to be sure carburetor is filled.

2. Stop engine. Disconnect fuel outlet hose from pump.

3. Put short piece of hose (C) on pump outlet and into graduated container. Operate engine at fast idle for 15 seconds.

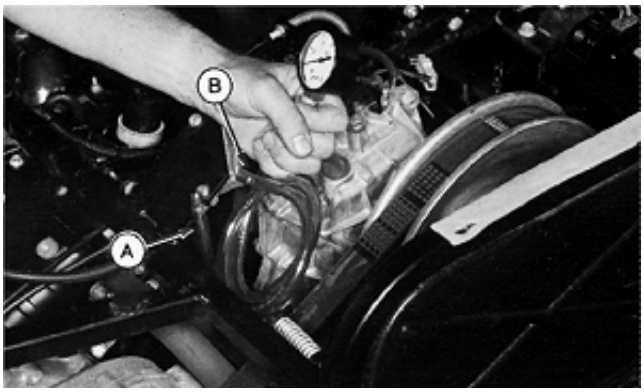
4. Stop engine. Record fuel quantity in container.

5. Connect fuel hose to carburetor.

SPECIFICATIONS:
•Minimum fuel pump pressure .. 6.12 kPa (0.9 psi)
•Minimum fuel pump flow
in 15 seconds .. 90 mL (2.7 oz)

RESULTS:
•If pressure or flow is below specification, do the following and test fuel pump again:
—Check crankcase vacuum (See procedure in this group.)
—Inspect and clean fuel pump

•If pressure or flow is still below specification, replace fuel pump.



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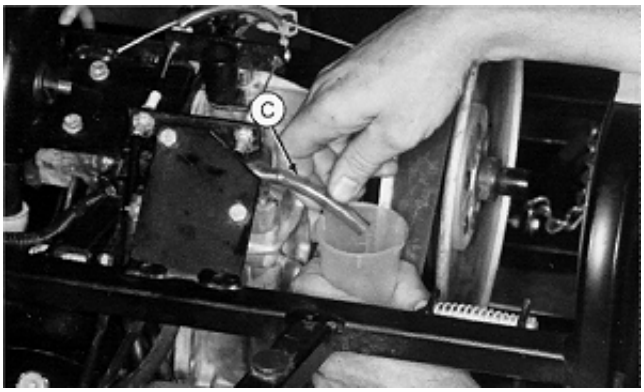

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Section 230
FUEL/AIR OPERATION, TESTS & ADJUSTMENTS

Contents

Page

COMPONENT LOCATION INFORMATION

This group contains component location drawings for the following fuel/air system components:
•Engine Fuel and Air Components
•Fuel System Components
•Carburetor Components

Use the drawings when diagnosing a fuel/air problem and to help locate the components to be tested.

MX,23005HE,1A -19-19JUL91

ENGINE FUEL AND AIR COMPONENTS

A—Air Cleaner
B—Crankcase Vent Hose
C—Carburetor
D—Throttle Link
E—Governor Arm
F—Governor Control
G—Flywheel Screen
H—Flywheel Housing
I—Flywheel Fins
J—Flywheel
K—Cylinder Block Cover
L—Cylinder Head Cover

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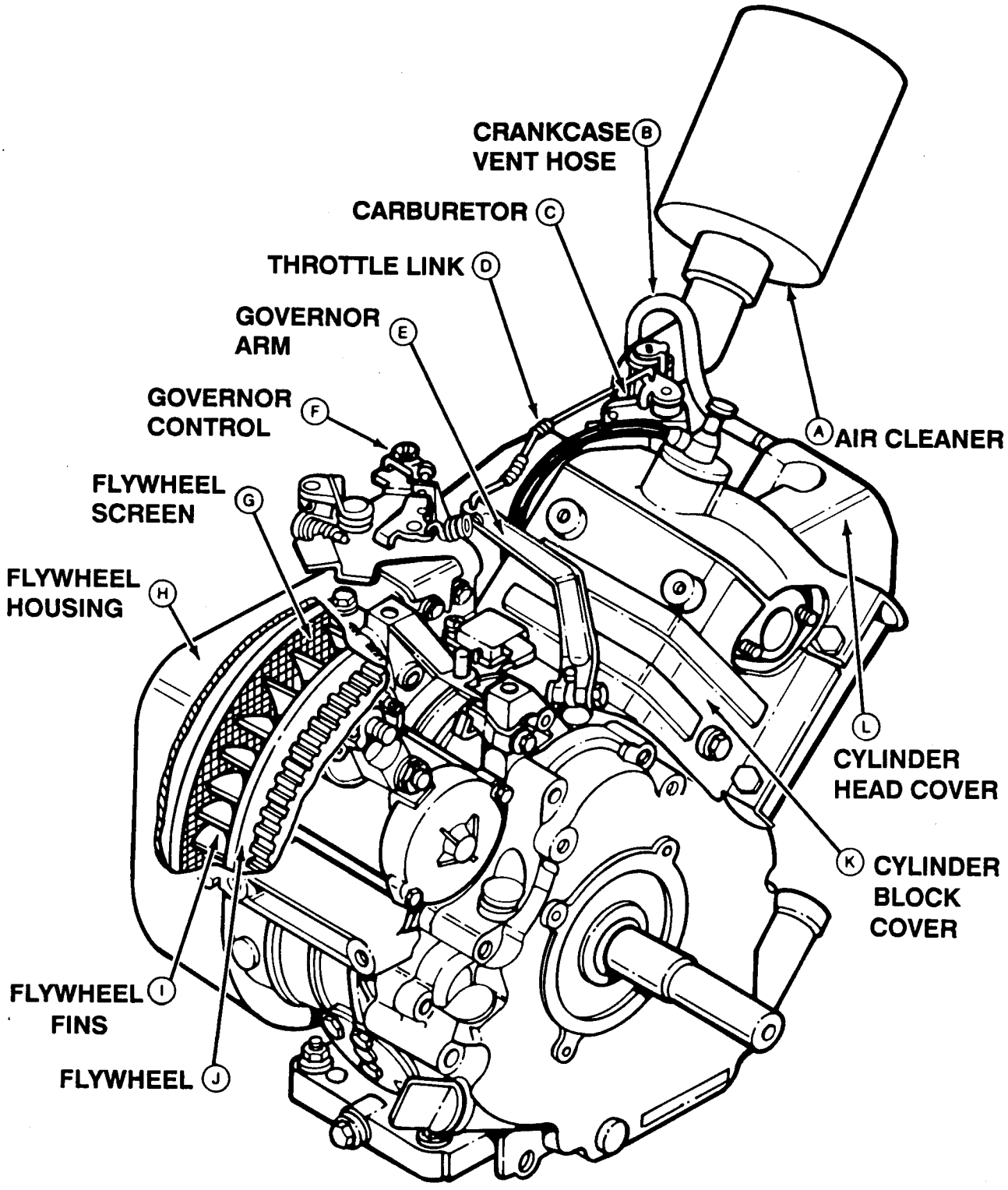

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ENGINE FUEL AND AIR COMPONENTS

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FUEL SYSTEM COMPONENTS

A—Fuel Tank Cap
B—Fuel Filter
C—Fuel Pump Outlet Hose
D—Fuel Pump Inlet Hose
E—Fuel Pump
F—Fuel Pump Impulse Hose
G—Throttle Cable
H—Foot Throttle/Accelerator
I—Fuel Filter Inlet Hose
J—Fuel Tank

MX,23005HE,4A -19-19JUL91

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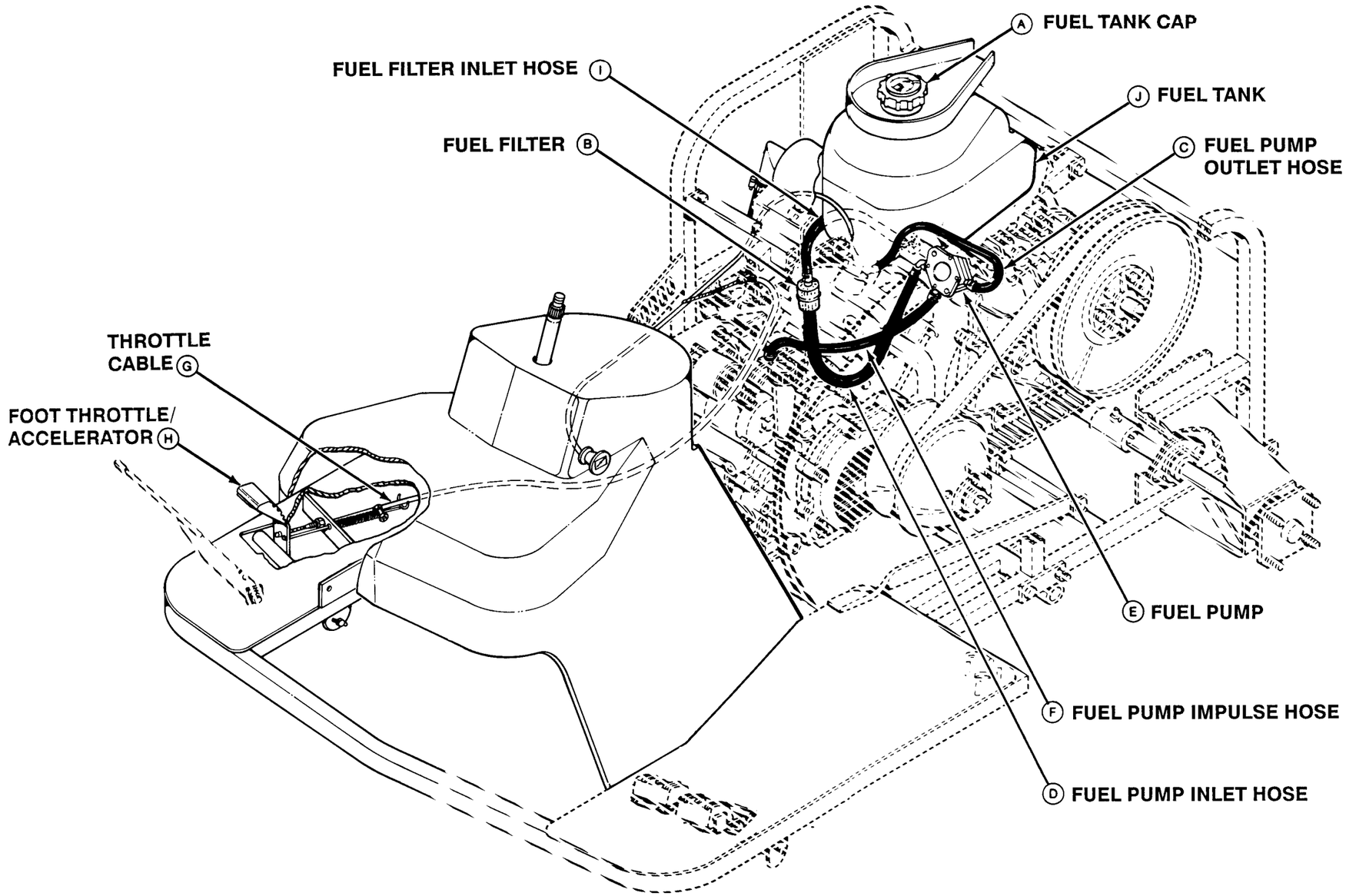
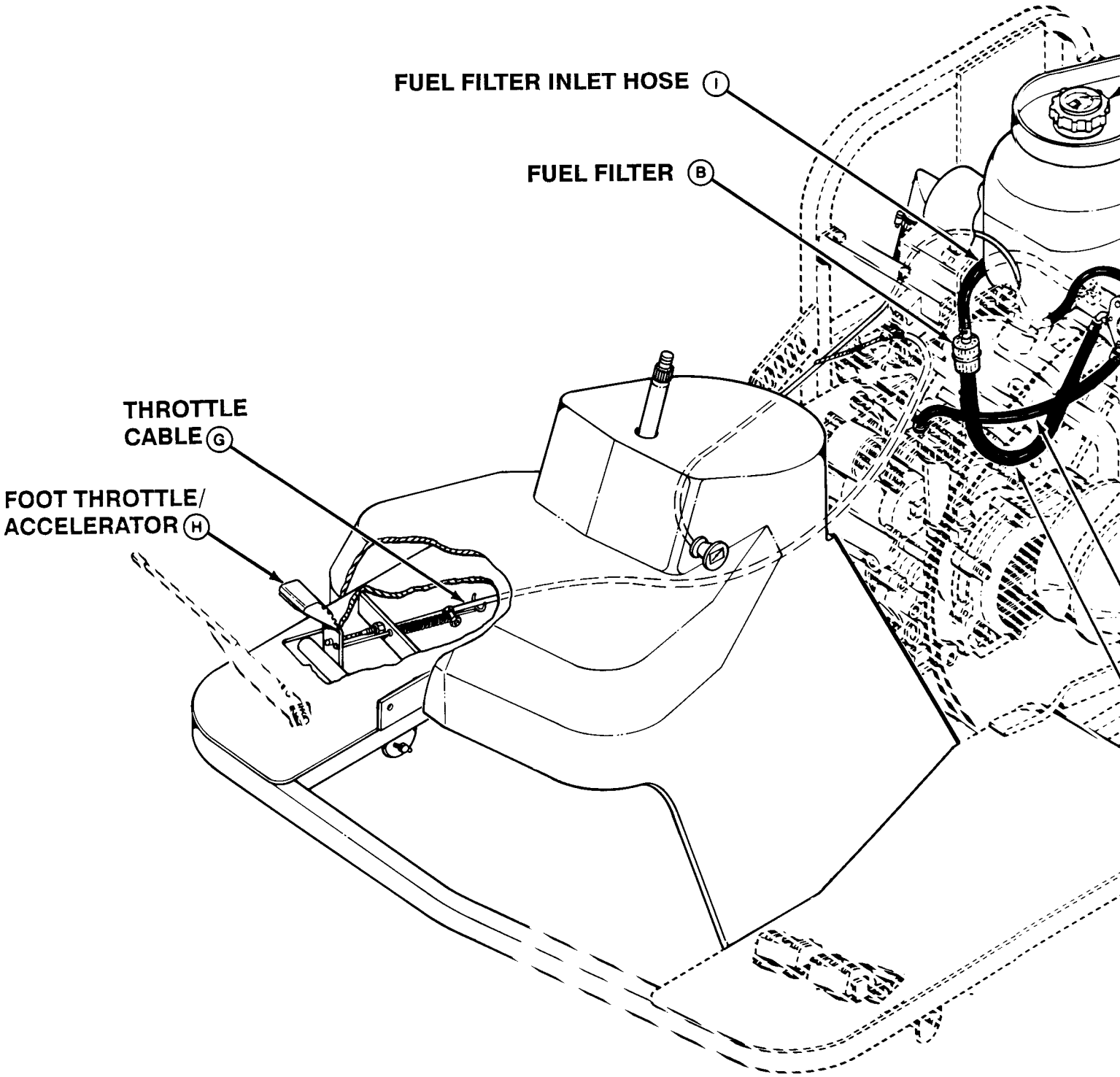


M80548

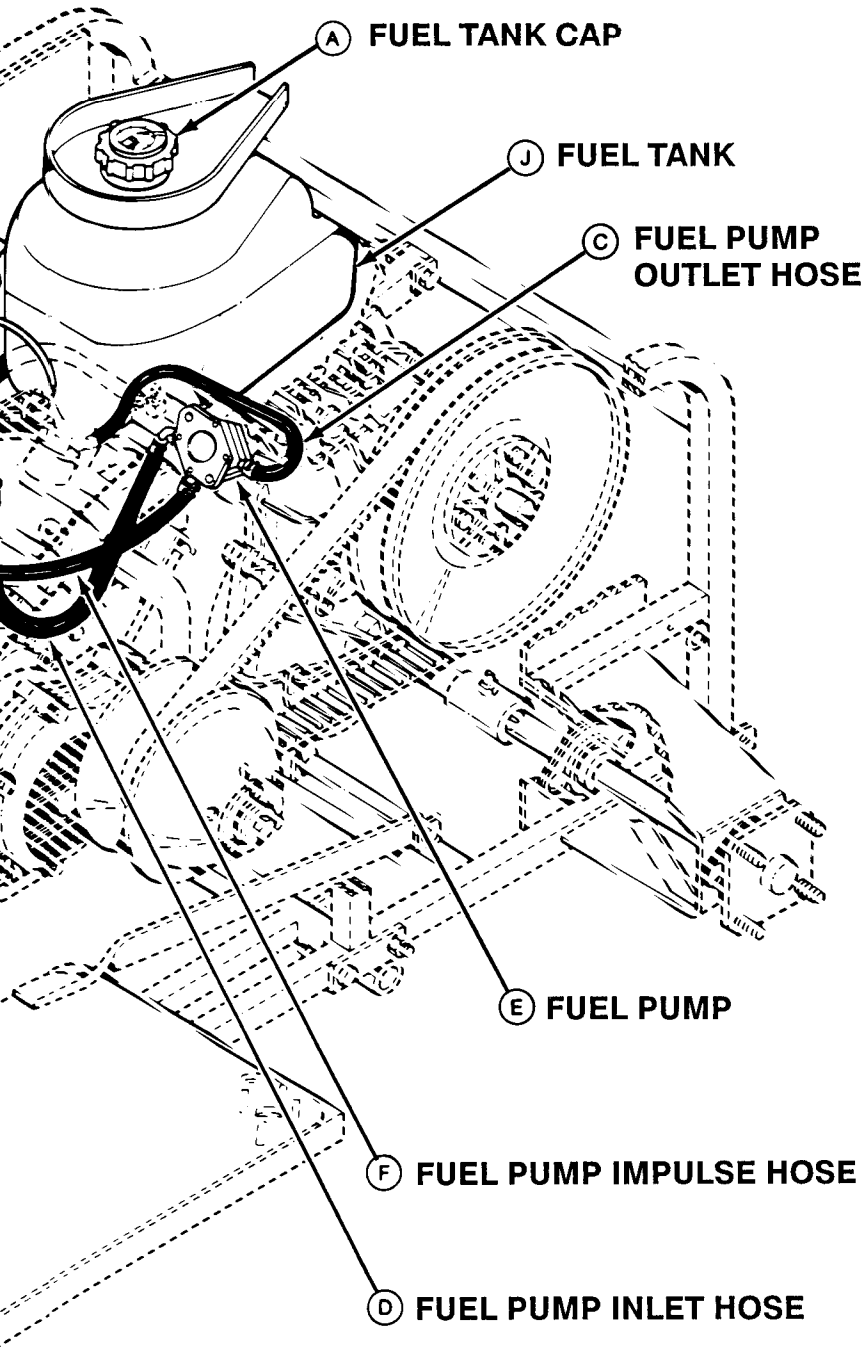
FUEL SYSTEM COMP0NENTS

Slide M80548



M80548

FUEL SYSTEM COMPONENTS


A FUEL TANK CAP
J FUEL TANK
C FUEL PUMP OUTLET HOSE
E FUEL PUMP
F FUEL PUMP IMPULSE HOSE
D FUEL PUMP INLET HOSE

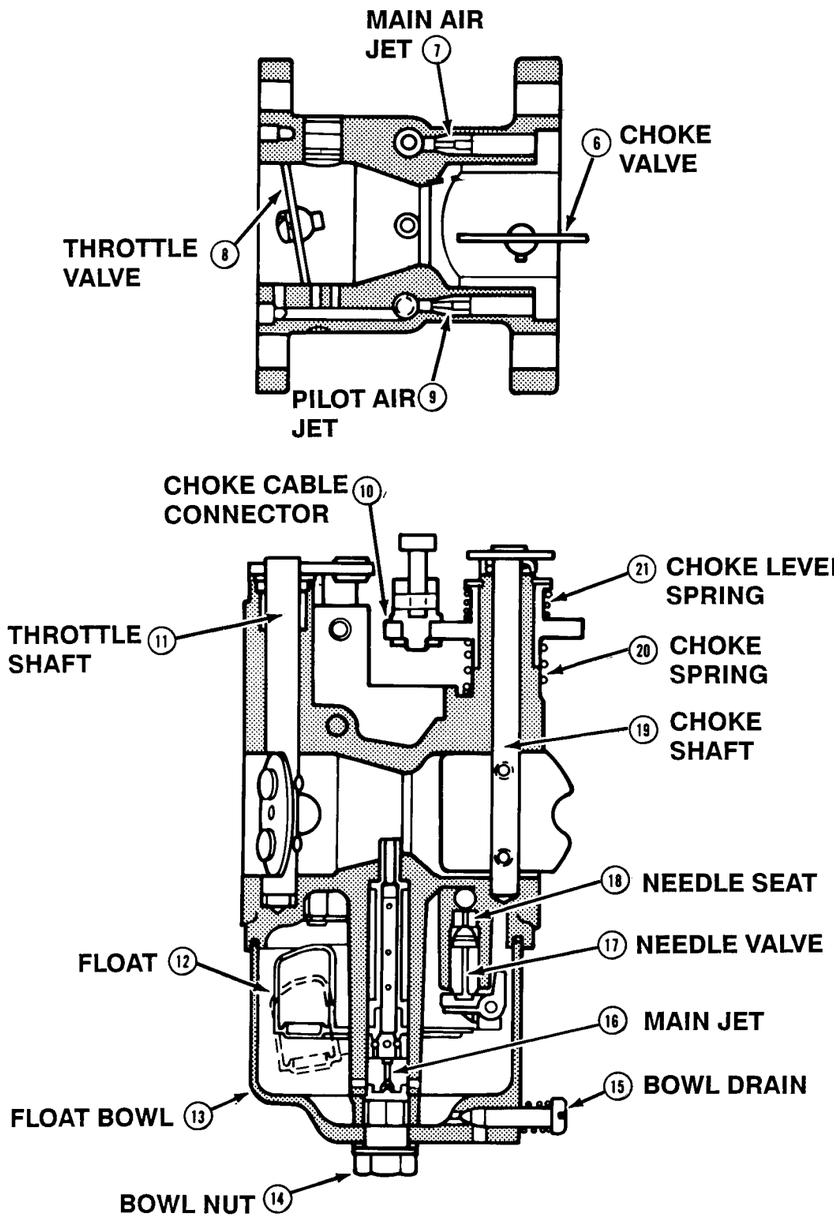
MPONENTS

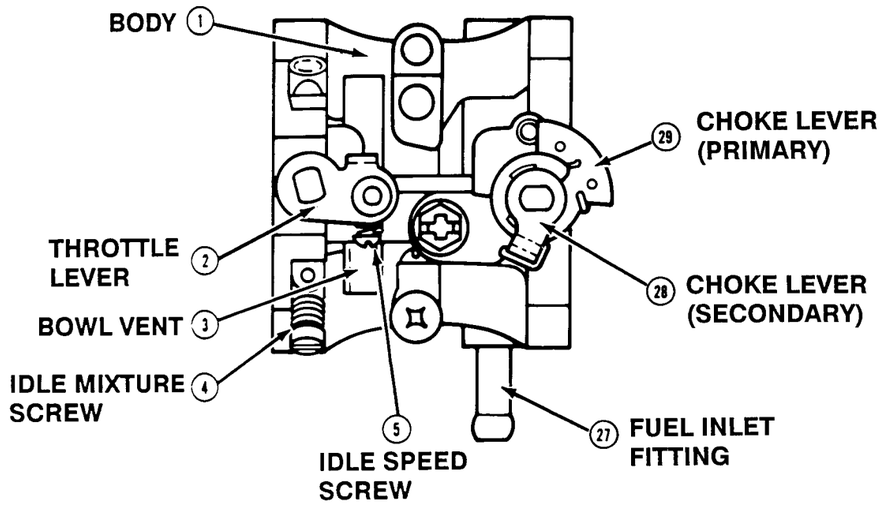
CARBURETOR COMPONENTS

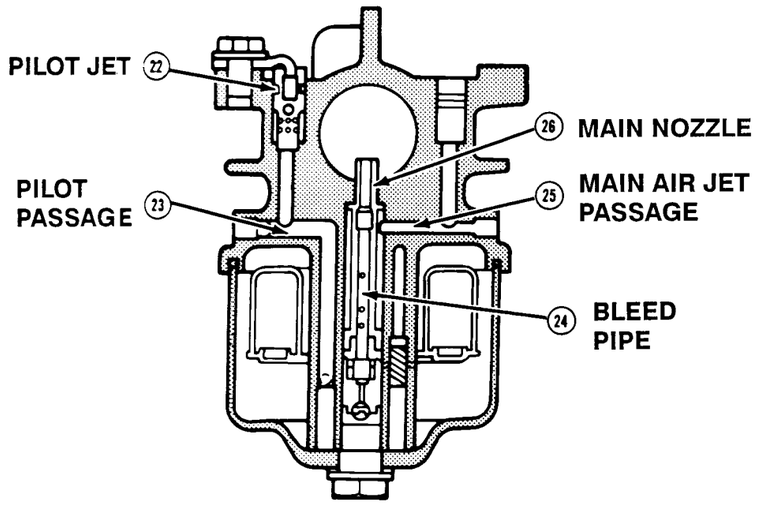
1—Body
2—Throttle Lever
3—Bowl Vent
4—Idle Mixture Screw
5—Idle Speed Screw
6—Choke Valve
7—Main Air Jet
8—Throttle Valve
9—Plot Air Jet
10—Choke Cable Connector
11—Throttle Shaft
12—Float
13—Float Bowl
14—Bowl Nut
15—Bowl Drain
16—Main Jet
17—Needle Valve
18—Needle Seat
19—Choke Shaft
20—Choke Spring
21—Choke Lever Spring
22—Pilot Jet
23—Pilot Passage
24—Bleed Pipe
25—Main Air Jet Passage
26—Main Nozzle
27—Fuel Inlet Fitting
28—Choke Lever (Primary)
29—Choke Lever (Secondary)

MX,23005HE,6A -19-19JUL91

Slide M80549







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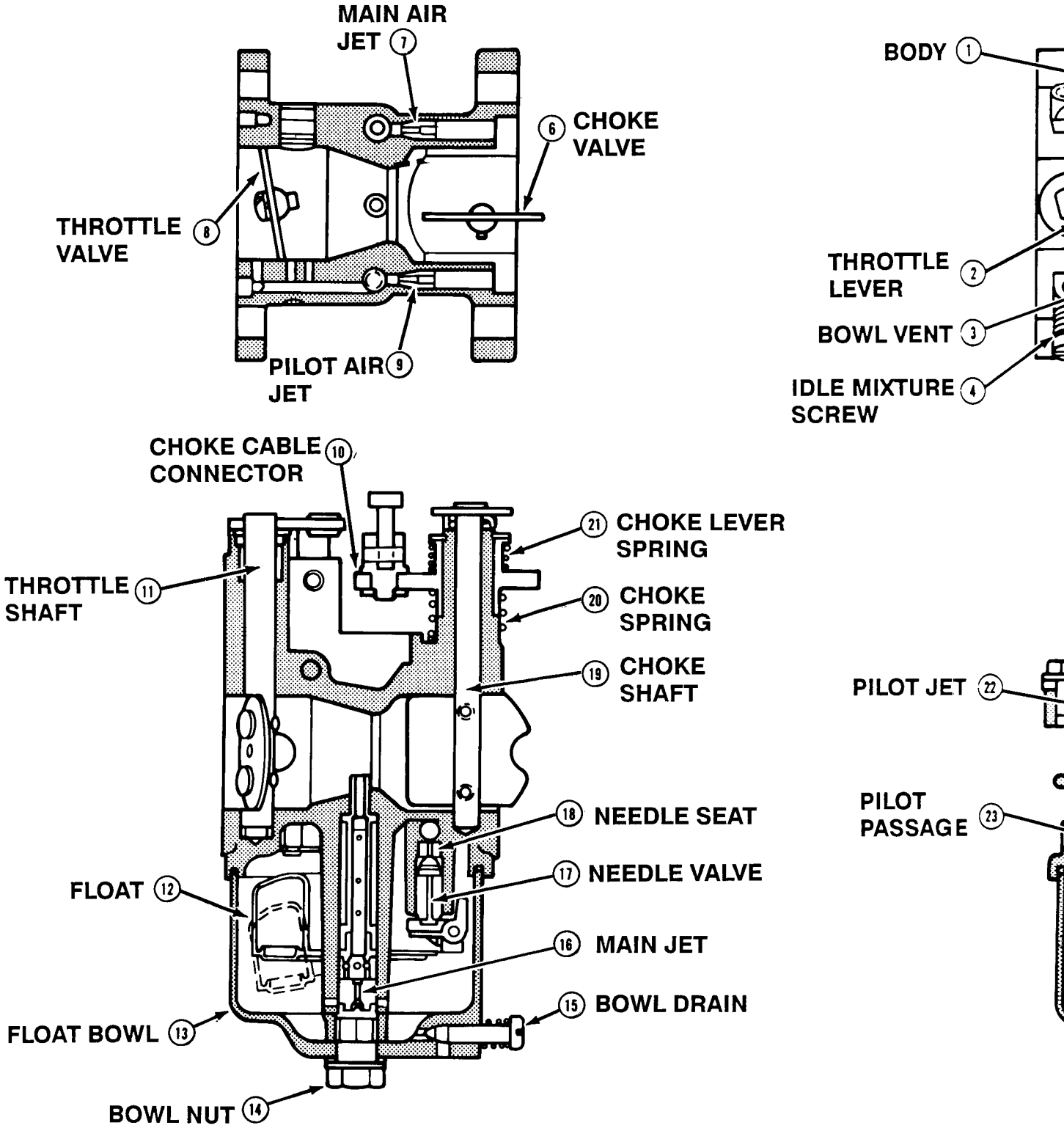
CARBURETOR COMPONENTS

Slide M80549



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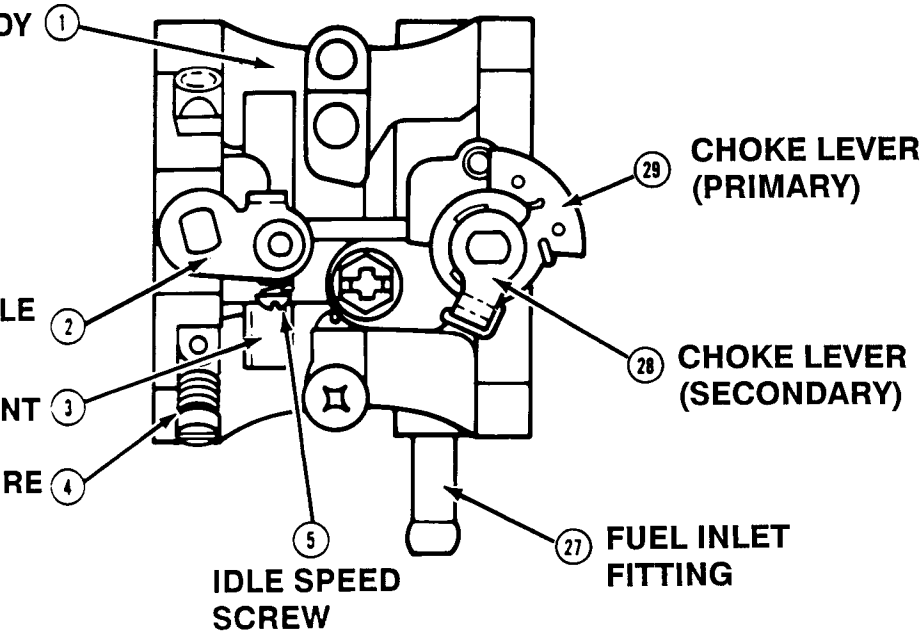
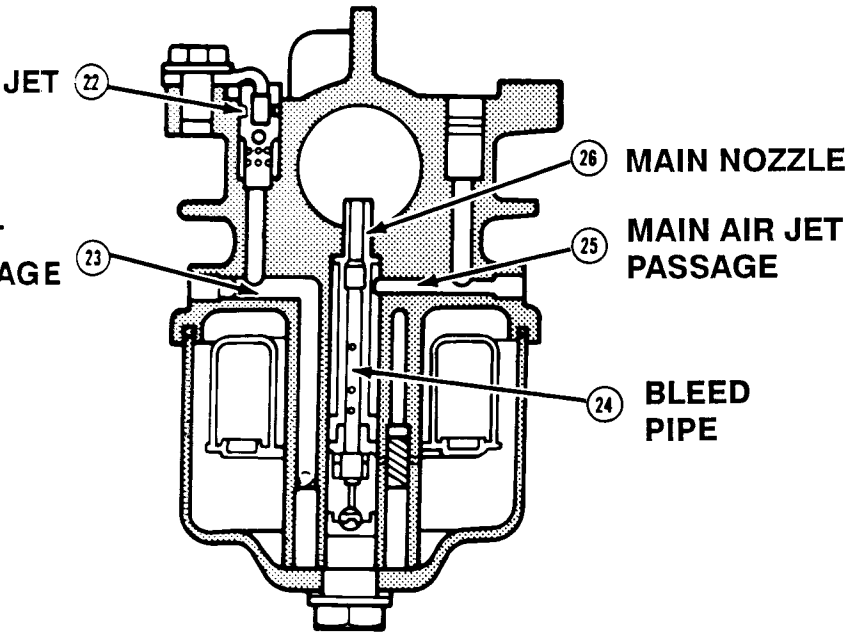
CARBURETOR COMPONENTS


DY 1
LE 2
NT 3
RE 4
5
IDLE SPEED SCREW
29
CHOKE LEVER (PRIMARY)
28
CHOKE LEVER (SECONDARY)
27
FUEL INLET FITTING


JET 22
AGE 23
26
MAIN NOZZLE
25
MAIN AIR JET PASSAGE
24
BLEED PIPE

ITS

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 Operation
•Carburetor Float and Main Circuit
•Carburetor Idle Circuit (No Load)
•Carburetor Choke Circuit
•Fuel Pump Operation

The slide number reference under the art is used for service training purposes only.

MX,23010HE,1A -19-27SEP91

FUEL SYSTEM OPERATION

A—Fuel Tank Vent
B—Fuel Tank Cap
C—Fuel Tank
D—Fuel Filter
E—Fuel Pump Inlet Hose
F—Carburetor
G—Fuel Pump Outlet Hose
H—Fuel Pump
I—Fuel Pump Impulse Line
J—Fuel Filter Inlet Hose

FUNCTION:
Supply pressure fuel to the carburetor for engine operation.

MAJOR COMPONENTS:
•Carburetor
•Fuel Filter
•Fuel Tank
•Fuel Tank Cap
•Fuel Pump
•Fuel Lines

THEORY OF OPERATION:
Fuel is supplied to the carburetor (F) by a pressurized fuel system. The fuel tank vent (A) is through the fuel tank cap (B). The fuel pump (H) draws fuel from the fuel tank (C) through the fuel filter (D) to the fuel pump inlet. The fuel filter uses a paper element to remove debris from the fuel and is clear to facilitate service. Pressure fuel from the outlet of the fuel pump flows to the carburetor inlet. Fuel pressure is maintained at the carburetor inlet needle until the float allows more fuel in the bowl.

MX,23010HE,2A -19-27SEP91

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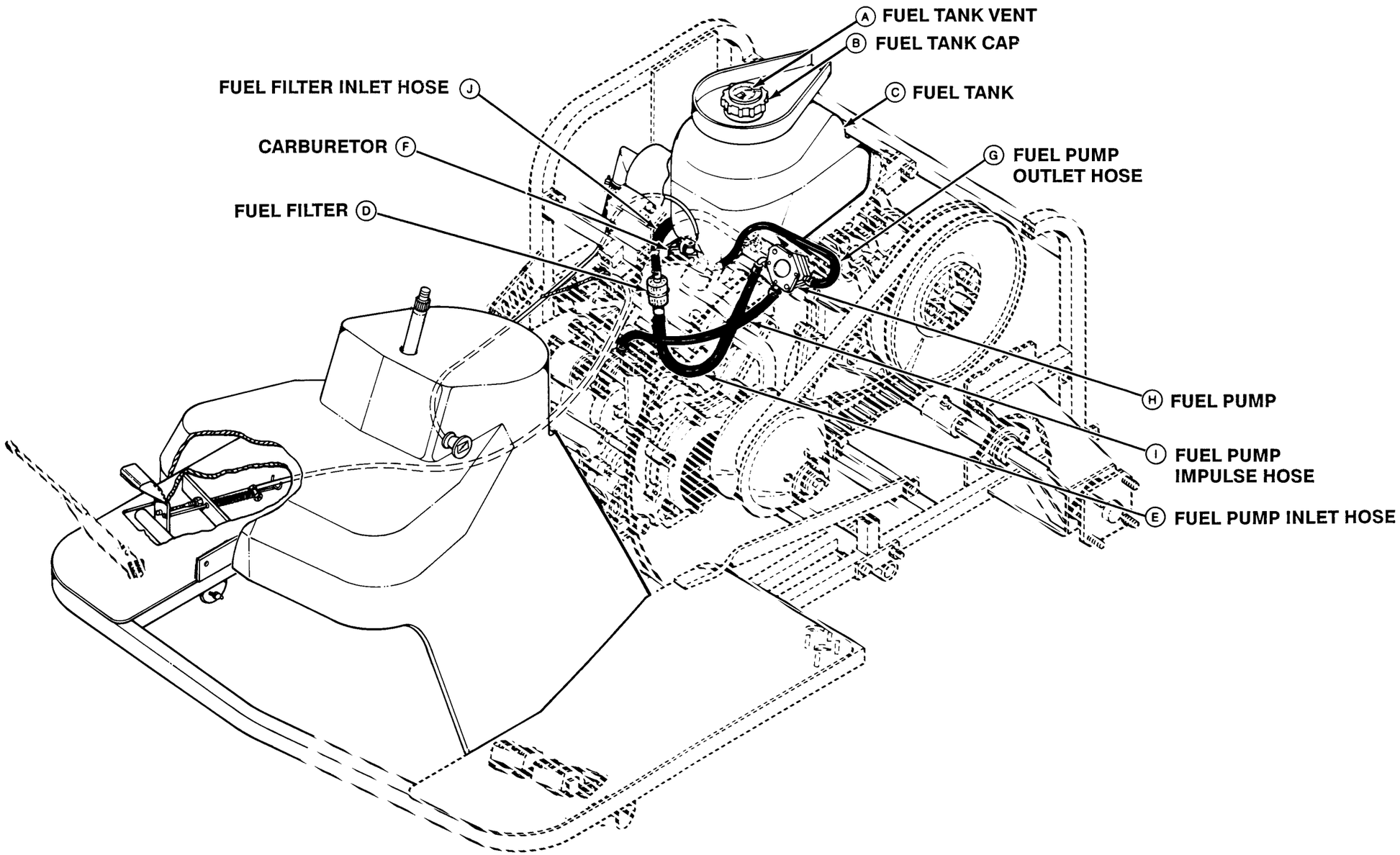

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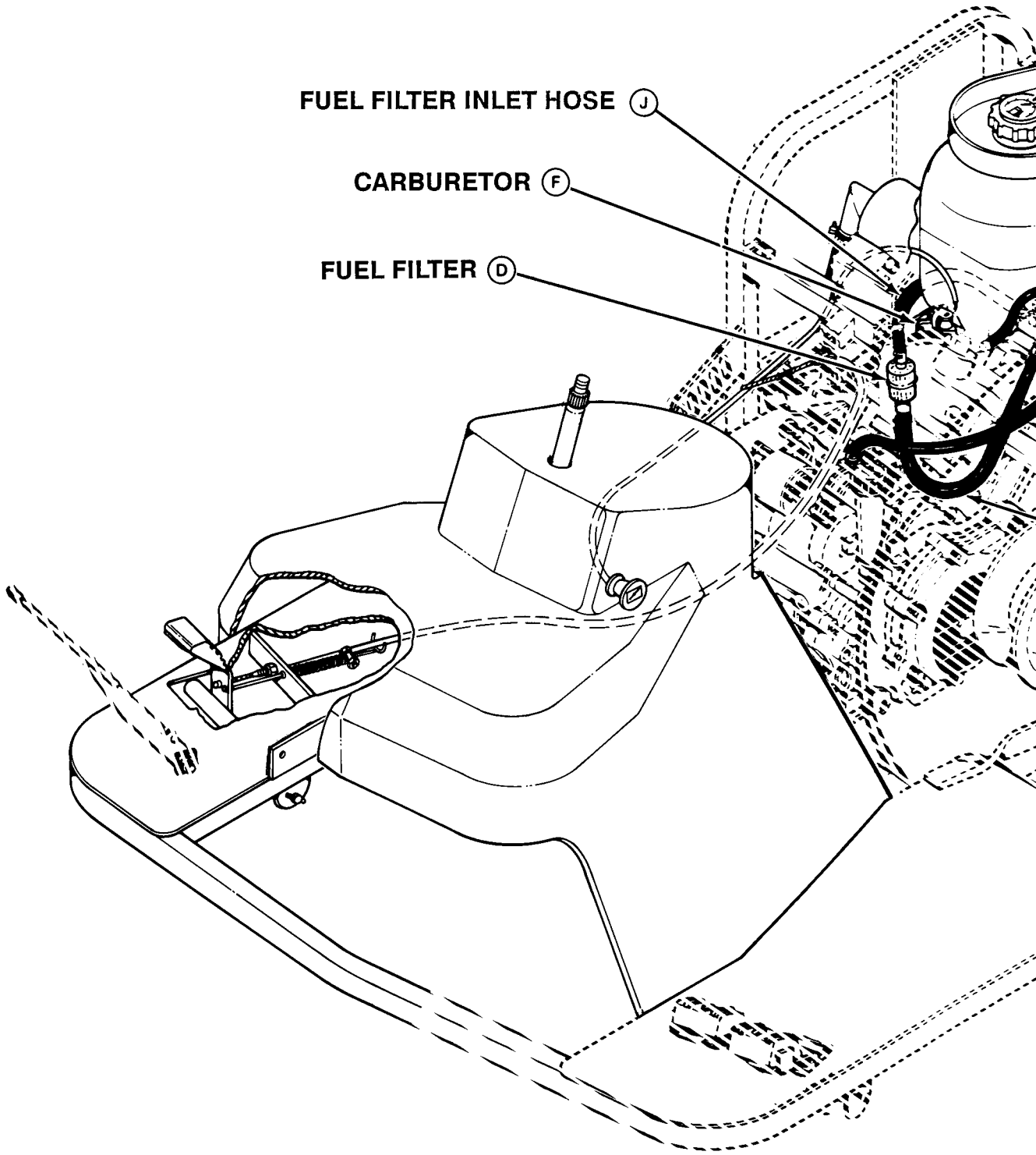

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FUEL SYSTEM OPERATION

MX,23010HE,3A -19-27SEP93

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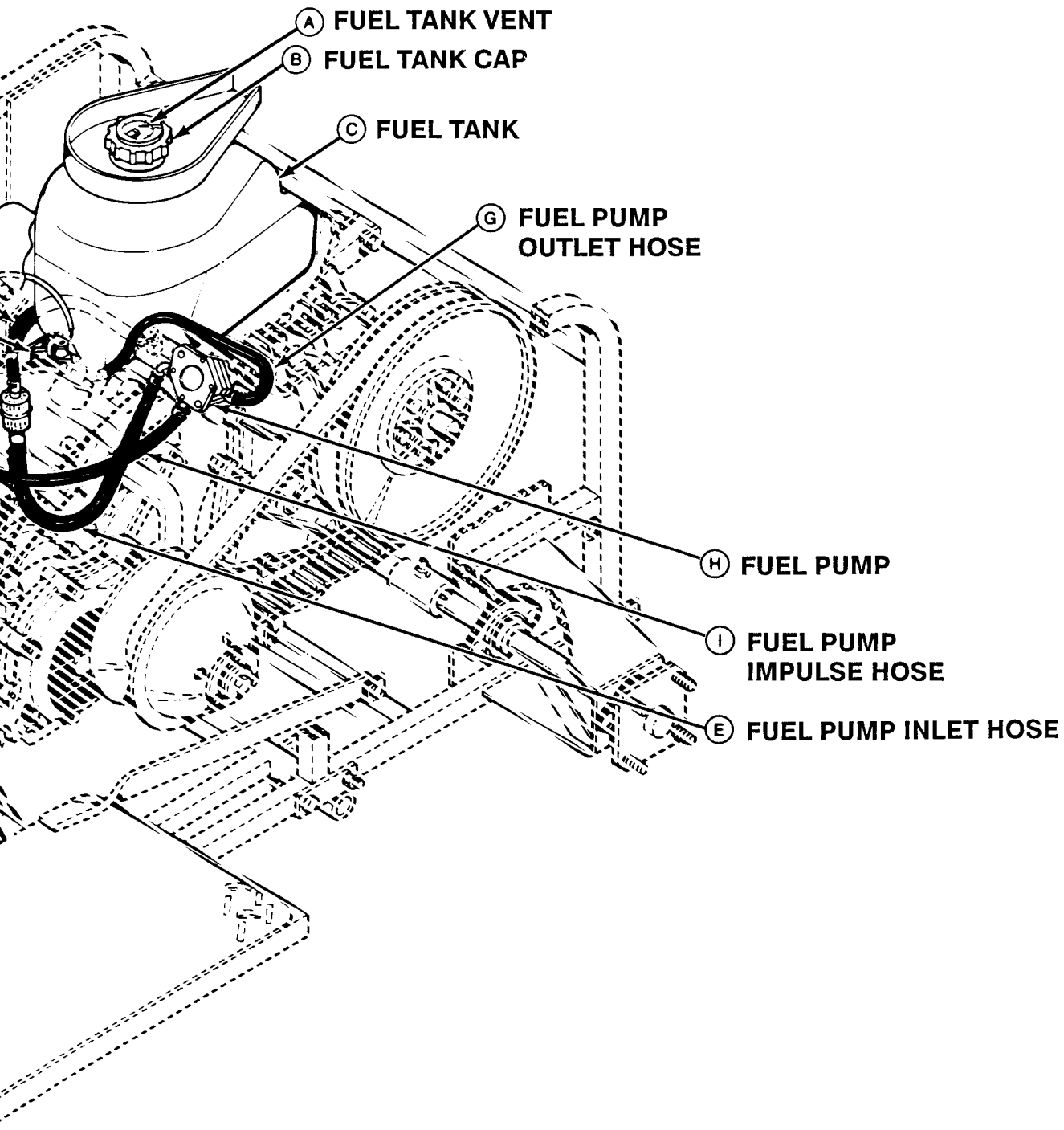
A FUEL TANK VENT
B FUEL TANK CAP
C FUEL TANK
G FUEL PUMP OUTLET HOSE
H FUEL PUMP
I FUEL PUMP IMPULSE HOSE
E FUEL PUMP INLET HOSE

OPERATION

CARBURETOR FLOAT AND MAIN CIRCUITS OPERATION

A—Carburetor Inlet
B—Main Air Jet
C—Throttle Valve
D—Venturi
E—Fuel
F—Air
G—Fuel/Air Mixture
H—Float
I—Float Bowl
J—Main Jet
K—Needle Valve
L—Needle Seat
M—Bleed Pipe
N—Main Nozzle
O—Choke Valve
P—Main Air Jet Passage
Q—Fuel Inlet

FUNCTION:
Float Circuit - To keep the fuel level in the float bowl at a specific level while the engine is operating.

Main Circuit - To supply fuel to operate the engine from partial to full throttle. The main circuit uses a fixed main jet to meter the fuel.

MAJOR COMPONENTS:
•Float
•Needle Valve
•Main Jet
•Main Nozzle
•Throttle Valve

THEORY OF OPERATION:
Float Circuit
Pressure fuel from the fuel pump flows to the fuel inlet (Q), past the needle valve (K) to the float bowl (I). As the fuel level increases, the float (H) which is attached to the needle valve moves upward and closes the needle valve against the needle seat (L). When the fuel level decreases, the needle valve opens allowing more fuel into the float bowl. The float functions to provide the carburetor with a constant fuel supply at specific level. The engine will malfunction if the proper fuel level is not maintained. The float is continually moving up and down as the engine operates, opening and closing off fuel flow into the bowl. Atmospheric pressure (blue area) on the fuel in the bowl combines with the design of the carburetor to provide both the atomization and transfer of fuel through the passages of the carburetor.

Main Circuit
The main circuit functions when the engine is operating with a load, at partial (not idle) to full throttle and with the choke valve (O) fully open. The position of the throttle valve (C) determines the volume of air flow through the carburetor. Throttle position is controlled by the operator or determined by the governor as it responds to a load placed on the engine. With the throttle lever in the full throttle position, and a load on the engine, the throttle valve will be open. In this condition, air flows from the carburetor inlet (A) through the venturi (D) of the carburetor very fast. The venturi further accelerates air movement and a low pressure condition is created inside the carburetor, neat the top of the main nozzle (N). The top of the main nozzle is centered in the venturi. High velocity, low pressure air draws fuel through the main jet (J) into the main nozzle. The main jet controls the volume of fuel entering the main nozzle.

At the same time, air also flows from the main air jet (B), through the main air jet passage (P) and into the cavity surrounding the bleed pipe (M). Here, the fuel is mixed with air bubbles created by the small holes in the bleed pipe and main nozzle tubes. Raw fuel and air are atomized into a mixture light enough to be drawn up the main nozzle into the venturi. The fast moving air flow in the venturi further atomizes the mixture to obtain the optimum air-fuel mixture needed for combustion.

The main air jet and the main jet are not adjustable. The main jet can be removed to be cleaned and is available in different sizes for higher or lower altitude operation.

MX,23010HE,4A -19-27SEP91

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Slide MXC80551AE

MX,23010HE,5A -19-27SEP91

SLOW AND FAST IDLE CIRCUITS OPERATION (NO LOAD)

A—Carburetor Inlet
B—Throttle Valve (Low Idle)
C—Throttle Valve (High Idle)
D—Low Idle Feed
E—Pilot Air Jet
F—Transition Feed
G—Fuel
H—Air
I—Fuel/Air Mixture
J—Float
K—Float Bowl
L—Main Jet
M—Needle Valve
N—Needle Seat
O—Main Nozzle
P—Choke Valve
Q—Pilot Passage
R—Pilot Jet
S—Venturi
T—Idle Mixture Screw
U—Fuel Inlet
V—Idle Speed Screw

FUNCTION:
To supply fuel to operate the engine at low and high idle speeds with no load on the engine.

MAJOR COMPONENTS:
•Pilot Air Jet
•Pilot Jet
•Idle Mixture Screw
•Throttle Valve
•Main Jet

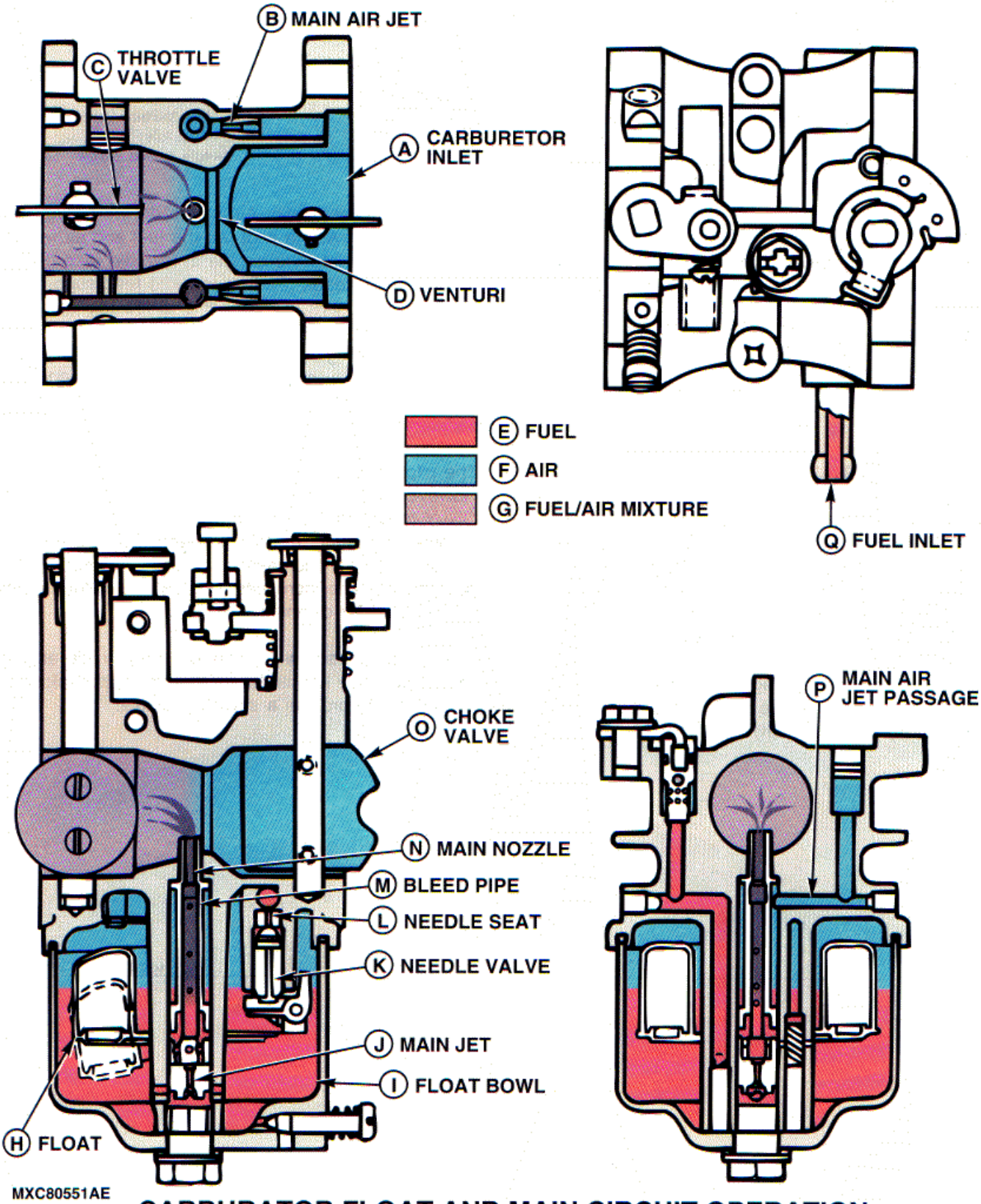
THEORY OF OPERATION:
When the engine operates at low or high idle, only a relatively small amount of fuel is required. When there is no load on the engine the position of the throttle valve (low idle) (C) or throttle valve (high idle) (B) is almost closed. Air flow through the venturi (S) is not enough to draw fuel from the main nozzle (O), but is enough to draw fuel from the idle circuit.

The intake stroke of the engine creates a vacuum on the back side of the throttle valve. This vacuum draws fuel from the bowl (K) through pilot passage (Q) through pilot jet (R). Air is also drawn through the pilot air jet (E). At the pilot jet, the fuel and air mix and are drawn into the engine at low idle feed (D) and transition feeds (F). The low idle feed supplies the fuel/air mixture to the engine at low idle and is adjusted by the idle mixture screw (T). When the engine is running at high idle, the fuel/air mixture is supplied by both the low idle feed and transition feeds. The transition feeds also help during engine acceleration.

The pilot jet and the pilot air jet are NOT adjustable. However, the idle mixture screw may be adjusted but ONLY to control the VOLUME of mixture entering the carburetor through the low idle feed. Turning the screw clockwise decreases the flow, while turning it counterclockwise increases the flow. The pilot jet can be removed for cleaning.

The idle speed screw (V) controls the low idle engine rpm. The screw keeps the throttle valve from closing completely to provide a smooth low idle.

MX,23010HE,6A -19-27SEP91



CARBURATOR FLOAT AND MAIN CIRCUIT OPERATION

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MX,23010HE,5A -19-27SEP91

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CARBURETOR CHOKE CIRCUIT OPERATION

A—Choke Valve
B—Main Air Jet
C—Throttle Valve
D—Low Idle Feed
E—Transition Feeds
F—Pilot Air Jet
G—Fuel
H—Air
I—Fuel/Air Mixture
J—Float
K—Float Bowl
L—Main Jet
M—Needle Valve
N—Bleed Pipe
O—Needle Seat
P—Main Nozzle
Q—Choke Spring
R—Choke Lever (Secondary)
S—Choke Lever Spring
T—Choke Lever (Primary)
U—Pilot Jet
V—Venturi
W—Fuel Inlet

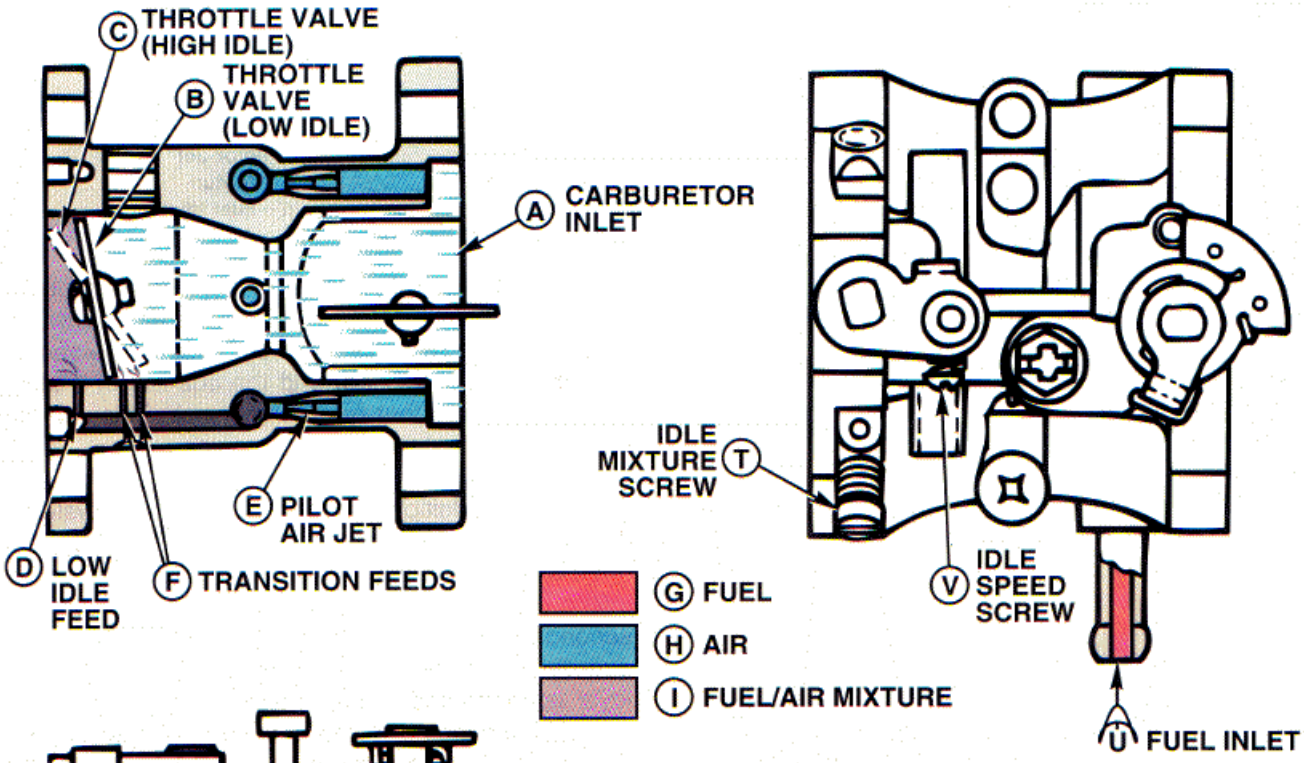
FUNCTION:
To provide a rich fuel mixture to aid in starting the engine.

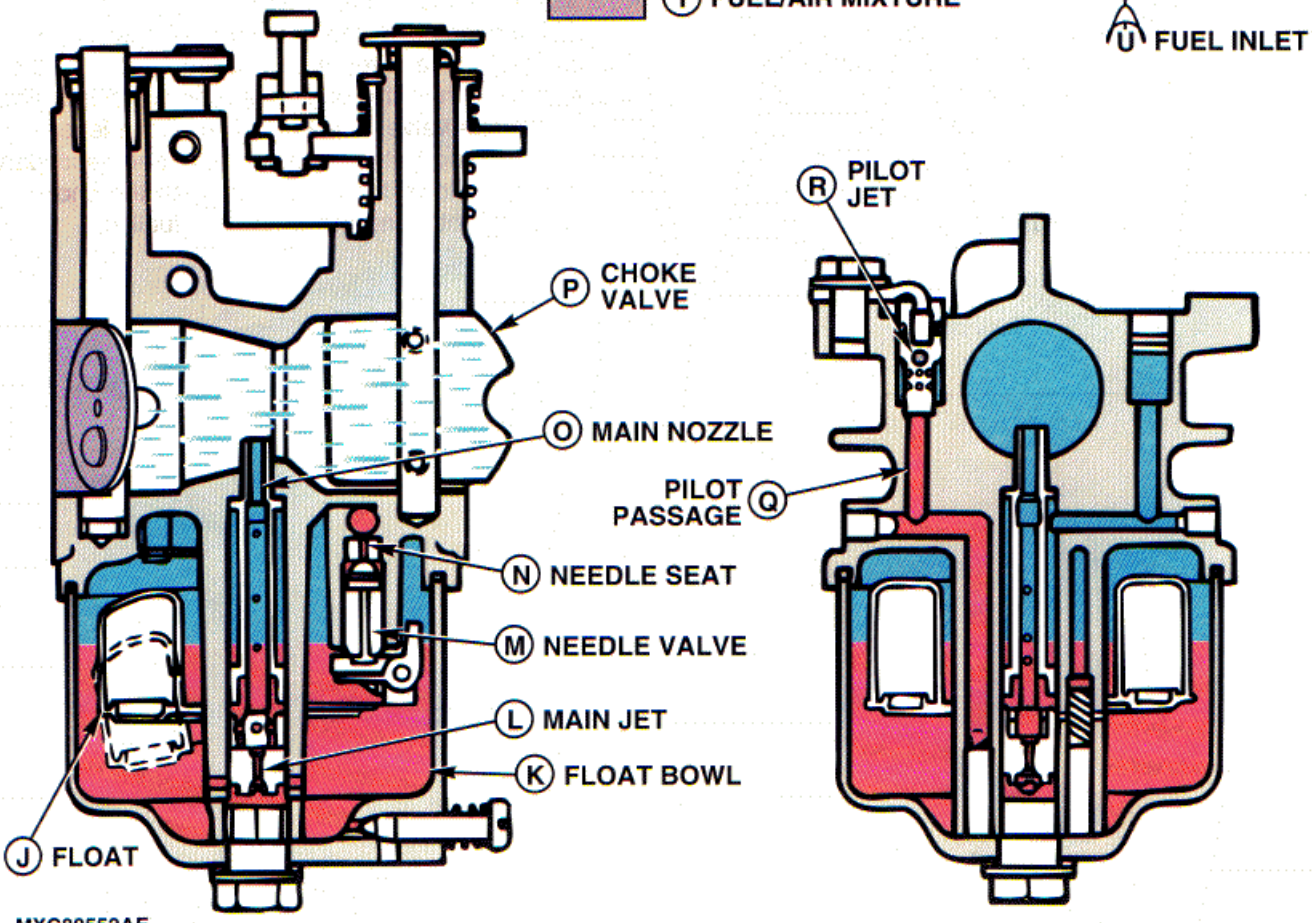
MAJOR COMPONENTS:
•Choke Valve
•Throttle Valve
•Main Jet
•Main Nozzle
•Pilot Jet
•Idle Mixture Screw

THEORY OF OPERATION:
During choke operation, the choke valve (A) is closed and the throttle valve (C) is open. The choke valve has some openings to allow a small amount of air flow to the main air jet (B) and the pilot air jet (F). The partial vacuum created by the intake stroke draws fuel through the main jet (L) and the pilot jet (T). This fuel mixes with the air flow through the main air jet at the bleed pipe (N) and the pilot air jet at the pilot jet. The fuel/air mixture is then drawn through the main nozzle (P), low idle feed (D) and transition feeds (E). The restricted air flow through the venturi (U) (choke valve closed) and the quantity of mixture drawn in, makes that mixture very rich. This very rich mixture aids in starting a cold engine.

There is an additional feature of the choke system. If the choke is left on after starting, the choke plate will open slightly to prevent over fueling during warm up of the engine. The choke cable connects to the secondary choke lever (R) which is not connected directly to the choke valve. The secondary choke lever is connected to the choke lever spring (S) which is connected to the primary choke lever (T). The primary choke lever is connected directly to the choke valve. When the engine is running, the air flow past the choke valve increases. The choke lever spring connected between the primary and secondary choke levers allows the air flow to push the choke plate open slightly and prevents over fueling.

MX,23010HE,8A -19-19JUL91





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SLOW AND FAST IDLE CIRCUITS OPERATION

Slide MXC80552AE

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MX,23010HE,7A -19-27SEP91

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FUEL PUMP OPERATION

A—Crankcase Inlet
B—Suction Valve
C—Fuel Inlet
D—Inlet Chamber
E—Rubber Diaphragm
F—Outlet Chamber
G—Pump Chamber
H—Pressure Valve
I—Base
J—Body
K—Fuel Outlet
L—Cover
M—Vent
N—Air Chamber
O—Pump Diaphragm
P—Pressure Fuel
Q—Suction Fuel
R—Air

FUNCTION:
To supply pressure fuel to the carburetor.

MAJOR COMPONENTS:
•Pump Diaphragm
•Suction Valve
•Pressure Valve
•Rubber Diaphragm
•Inlet Chamber
•Outlet Chamber

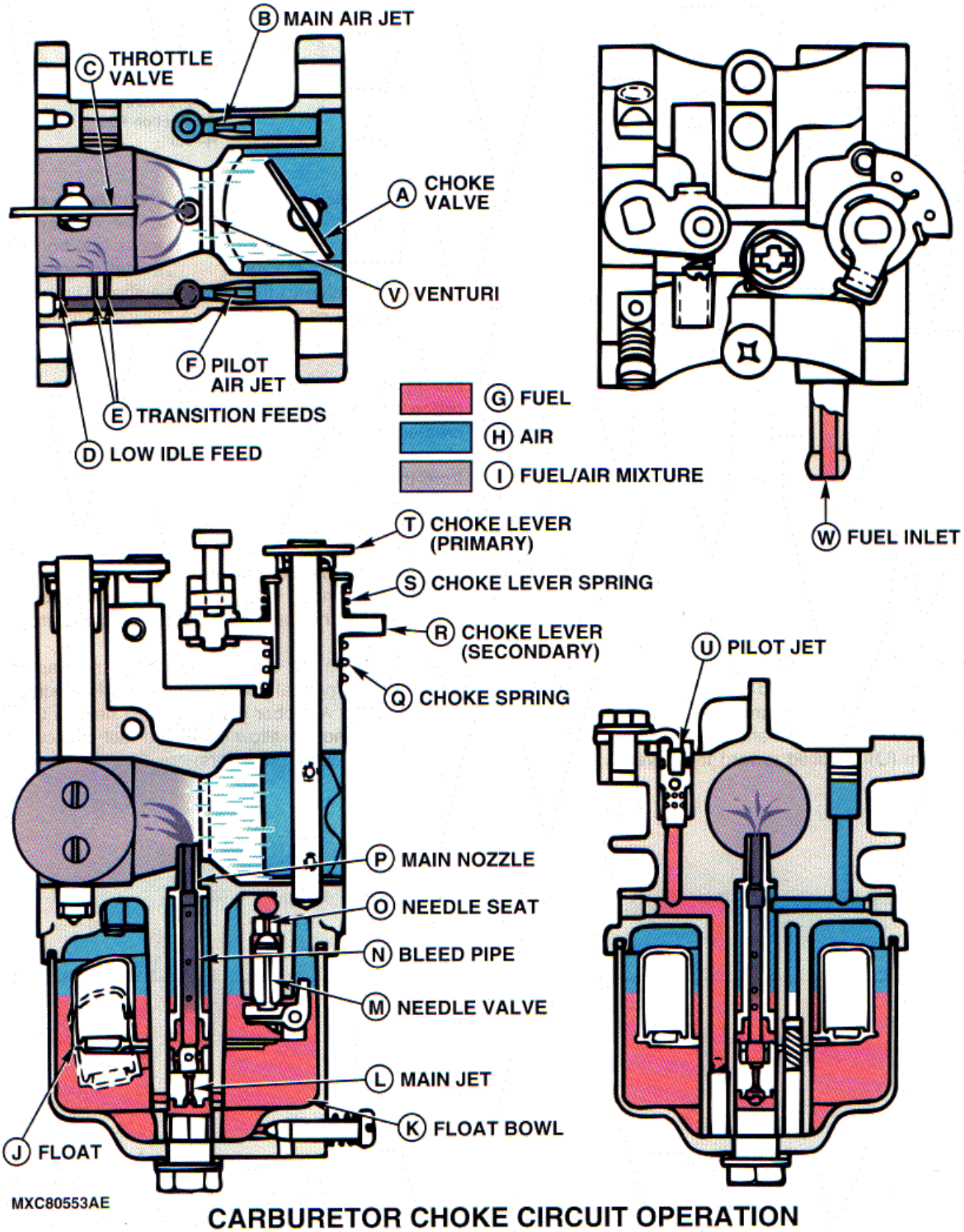
THEORY OF OPERATION:
The fuel pump is a pressure/vacuum operated diaphragm pump. The pump operates using the changes in vacuum that occur in the crankcase during engine operation. Fuel pump pressure is about 6 kPa (1 psi).

During the fuel pump vacuum pulse, the engine piston moves upward and a vacuum is created in the crankcase due to the operation of the breather system. A hose connected to the crankcase transfers this vacuum to the fuel pump crankcase inlet (A). Air is drawn out of the air chamber (N) and the pump diaphragm (O) is pulled toward the cover (L). This produces a vacuum in the pump chamber (G) on the other side of the pump diaphragm. The vacuum opens the suction valve (B) and draws fuel from the fuel filter through the fuel inlet (C), inlet chamber (D), and suction valve to the pump chamber. The suction valve only allows fuel flow from the inlet chamber to the pump chamber.

During the fuel pump pressure pulse, the engine piston moves downward and slight pressure is created in the crankcase. Air is forced into the air chamber and the pump diaphragm is pushed away from the cover. This produces pressure in the pump chamber full of suction fuel. The pressure closes the suction valve, opens the pressure valve (H) and forces fuel into the outlet chamber (F). The pressure valve only allows fuel flow from the pump chamber to the outlet chamber. Fuel from the outlet chamber flows through the fuel outlet (K) to the carburetor.

The vent (M) in the cover allows the pump diaphragm to return to a neutral position when the fuel pump is not operating. A rubber diaphragm (E) next to the base (I) expands to allow increased fuel capacity in the inlet and outlet chambers.

MX,23010HE,10A -19-27SEP91



CARBURETOR CHOKE CIRCUIT OPERATION

Slide MXC80553AE

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MX,23010HE,9A -19-27SEP91

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.

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 point the test is to be made.

The slide number reference under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

MX,23015HE,A1A -19-27SEP91

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 -19-19JUL91

Section 240
ELECTRICAL OPERATION, TESTS & ADJUSTMENTS

Contents

COMPONENT LOCATION INFORMATION

This group contains component location drawings for the following electrical components:

•1200 Bunker Rake
•FE290 Engine
•Optional Hydraulic Lift
•Optional Front Light

Use the drawings when troubleshooting an electrical problem to help locate the electrical components to be tested.

MX,24005HE,1 -19-27SEP91

1200 BUNKER RAKE ELECTRICAL COMPONENT LOCATION

A—Starter
B—Solenoid Start Terminal
C—Solenoid Battery Terminal
D—Engine Connector
E—Wiring Harness Ground
F—Battery Negative Terminal
G—Battery
H—Battery Positive Terminal
I—Transaxle Neutral Switch
J—Engine Ground
K—Ignition Module
L—Starter Solenoid
M—Rectifier/Regulator
N—Key Switch
O—Circuit Breaker
P—Hourmeter
Q—Voltmeter
R—Connector for Opt. Front Light
S—Connectors for Opt. Front Light Switch

Slide M44876

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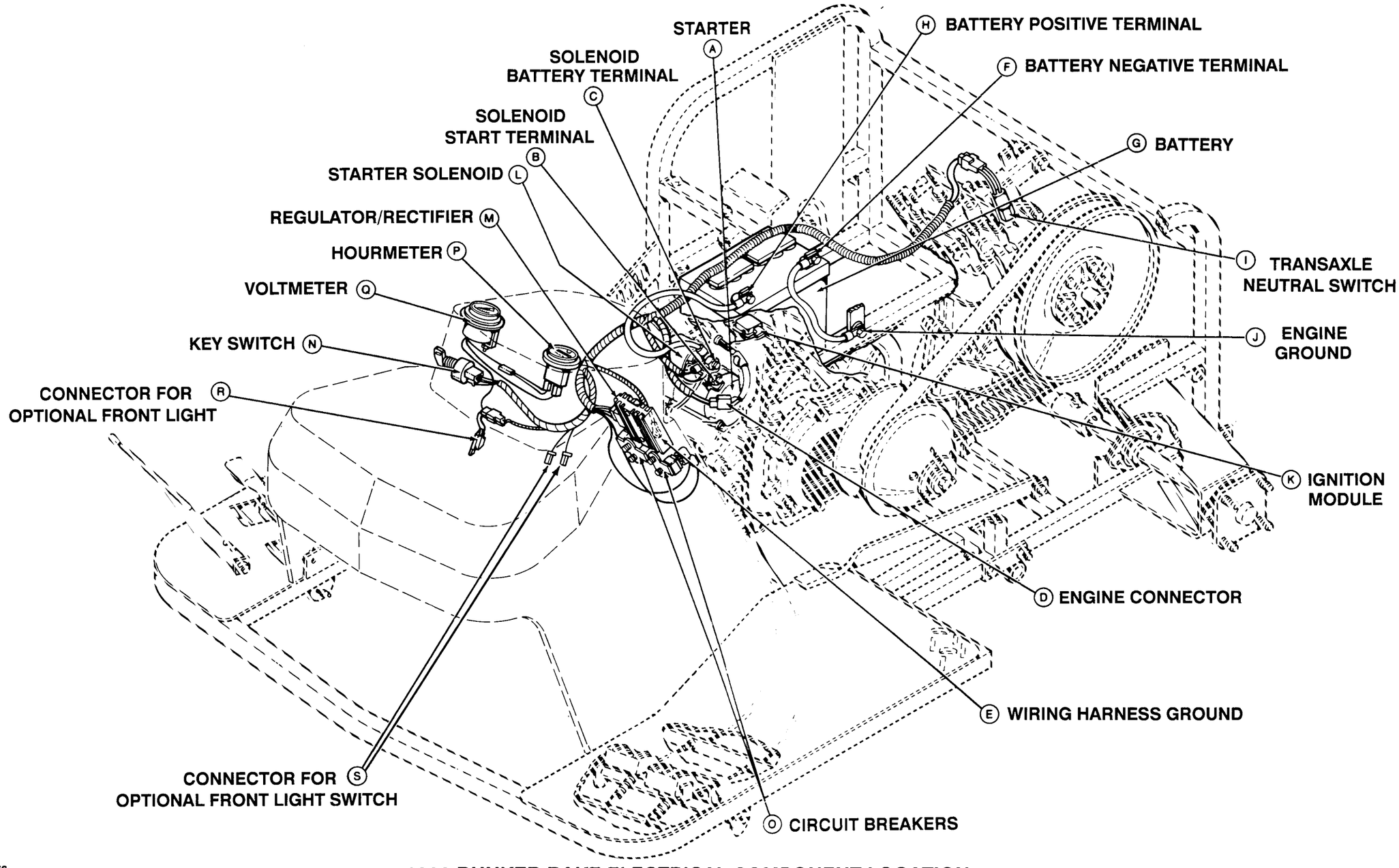
2

Optional Front Light and Optional Hydraulic Lift located later in this group.

MX,24005HE,2 -19-27SEP91



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1200 BUNKER RAKE ELECTRICAL COMPONENT LOCATION

MX,24005HE,3 -19-27SEP91

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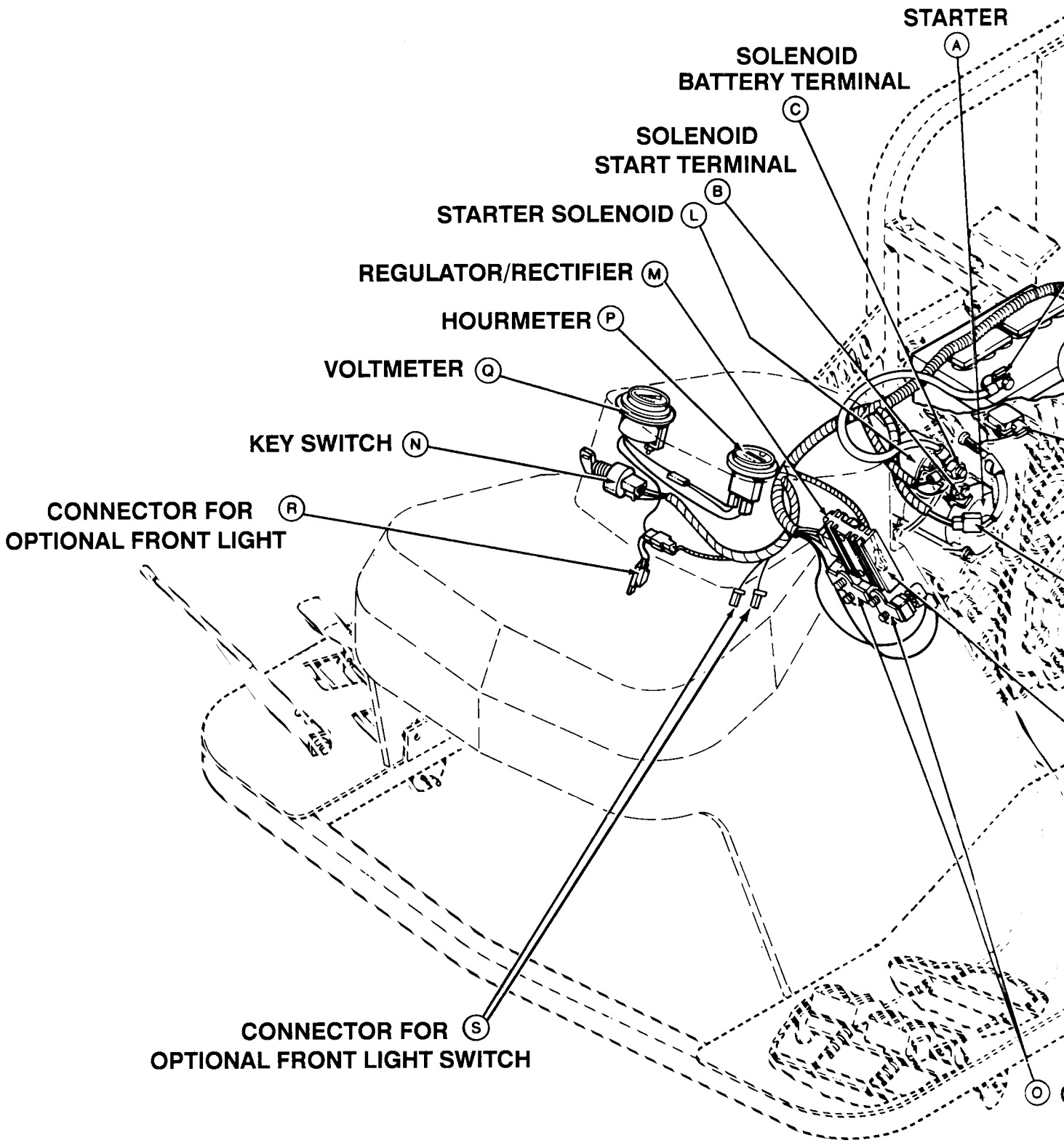

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1200 BUNKER RAKE ELECTRICAL COMP

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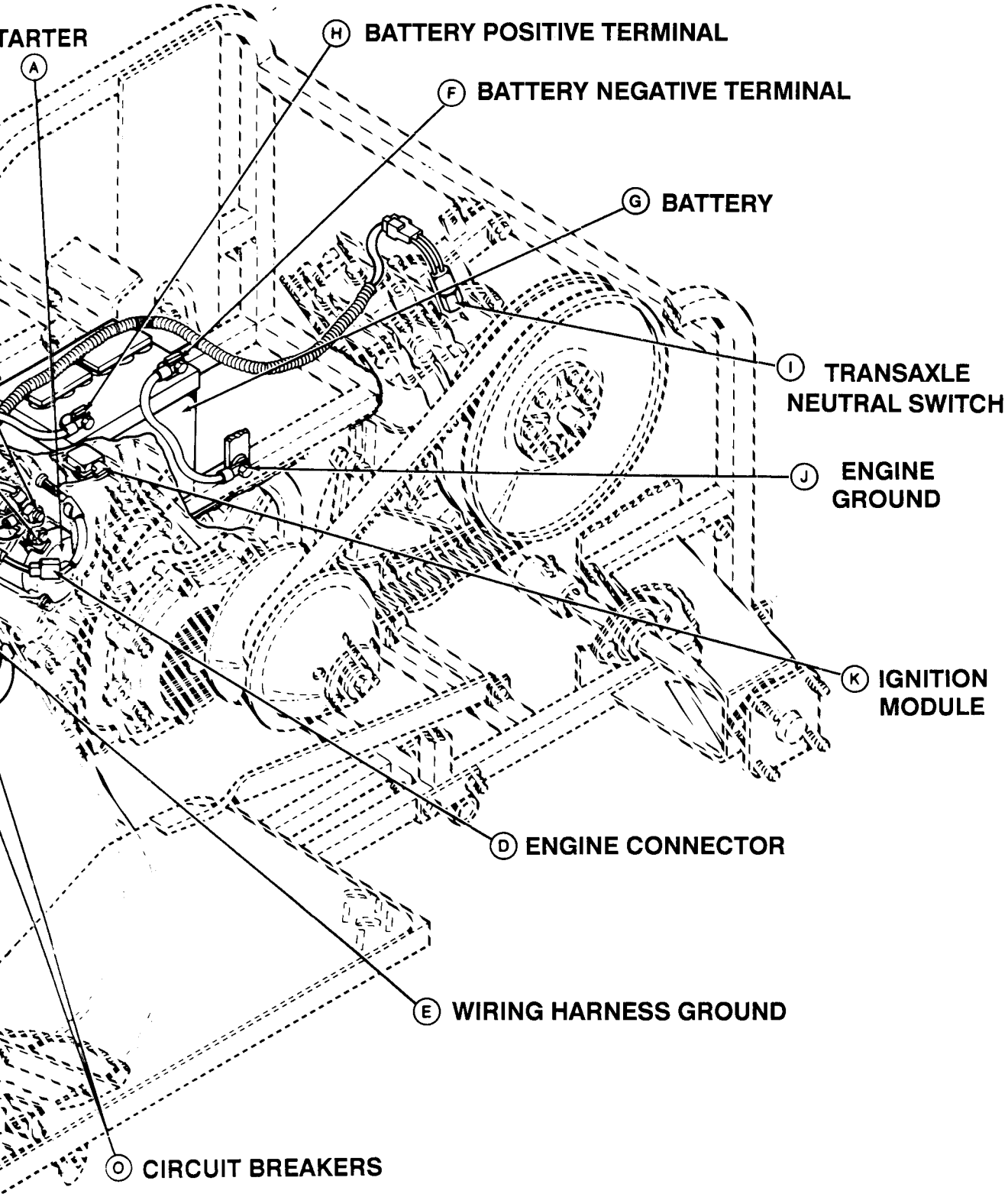


CAL COMPONENT LOCATION

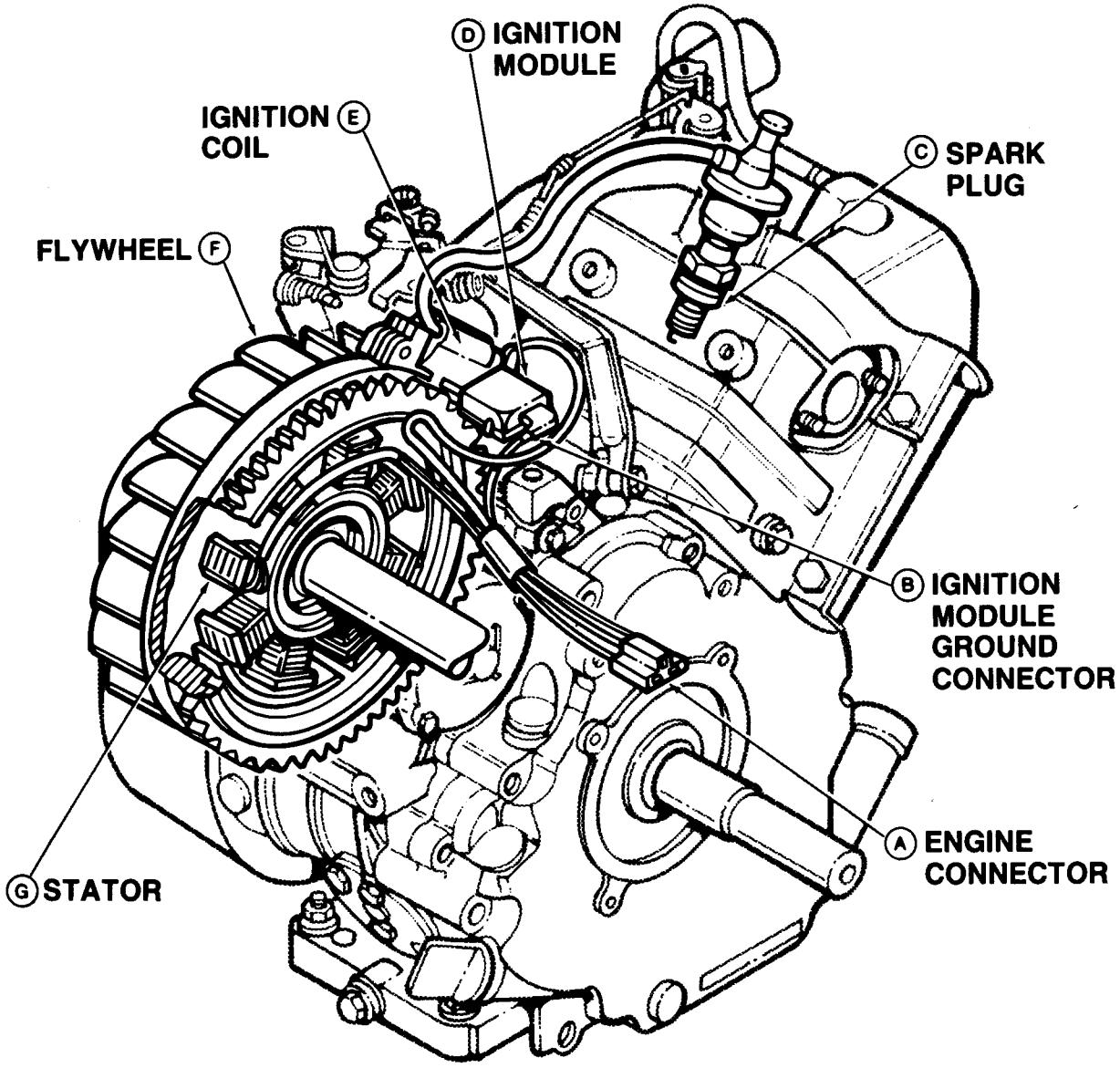
EPG1

FE290 ENGINE ELECTRICAL COMPONENT LOCATION

A—Engine Connector
B—Ignition Module Ground Connector
C—Spark Plug
D—Ignition Module
E—Ignition Coil
F—Flywheel
G—Stator

Slide M44847

MX,24005HE,4 -19-27SEP91



FE290 ENGINE ELECTRICAL COMPONENT LOCATION

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MX,24005HE,5 -19-27SEP91

HYDRAULIC LIFT AND FRONT LIGHT COMPONENT LOCATION

A—Lift Switch
B—Lift Relay Ground Cables
C—Lift/Lower Relays
D—Lift Motor
E—Lift Relay Positive Cable
F—Front Light
G—Key Switch
H—Front Light Switch

Slide M44848

240
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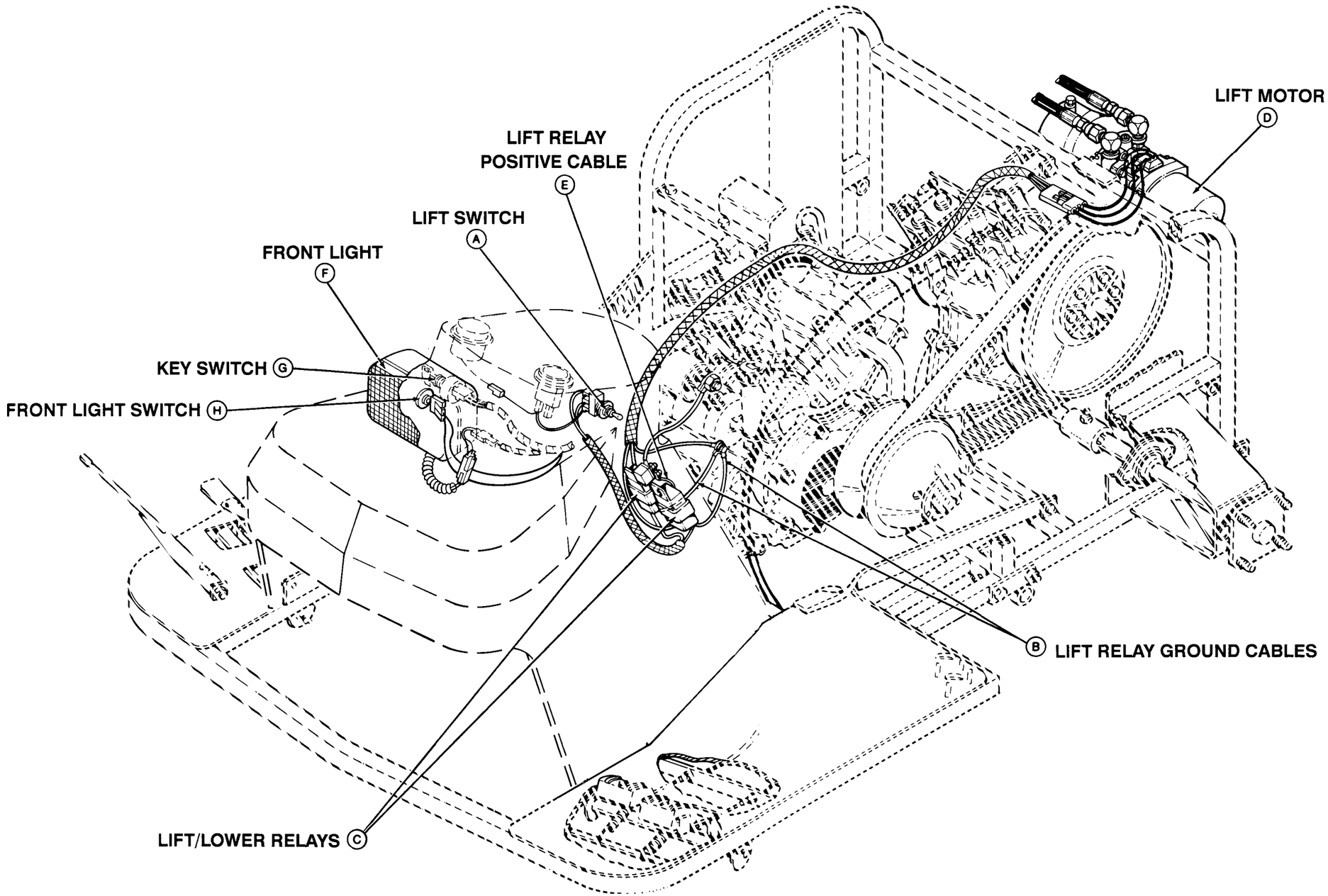
6

MX,24005HE,6 -19-27SEP91



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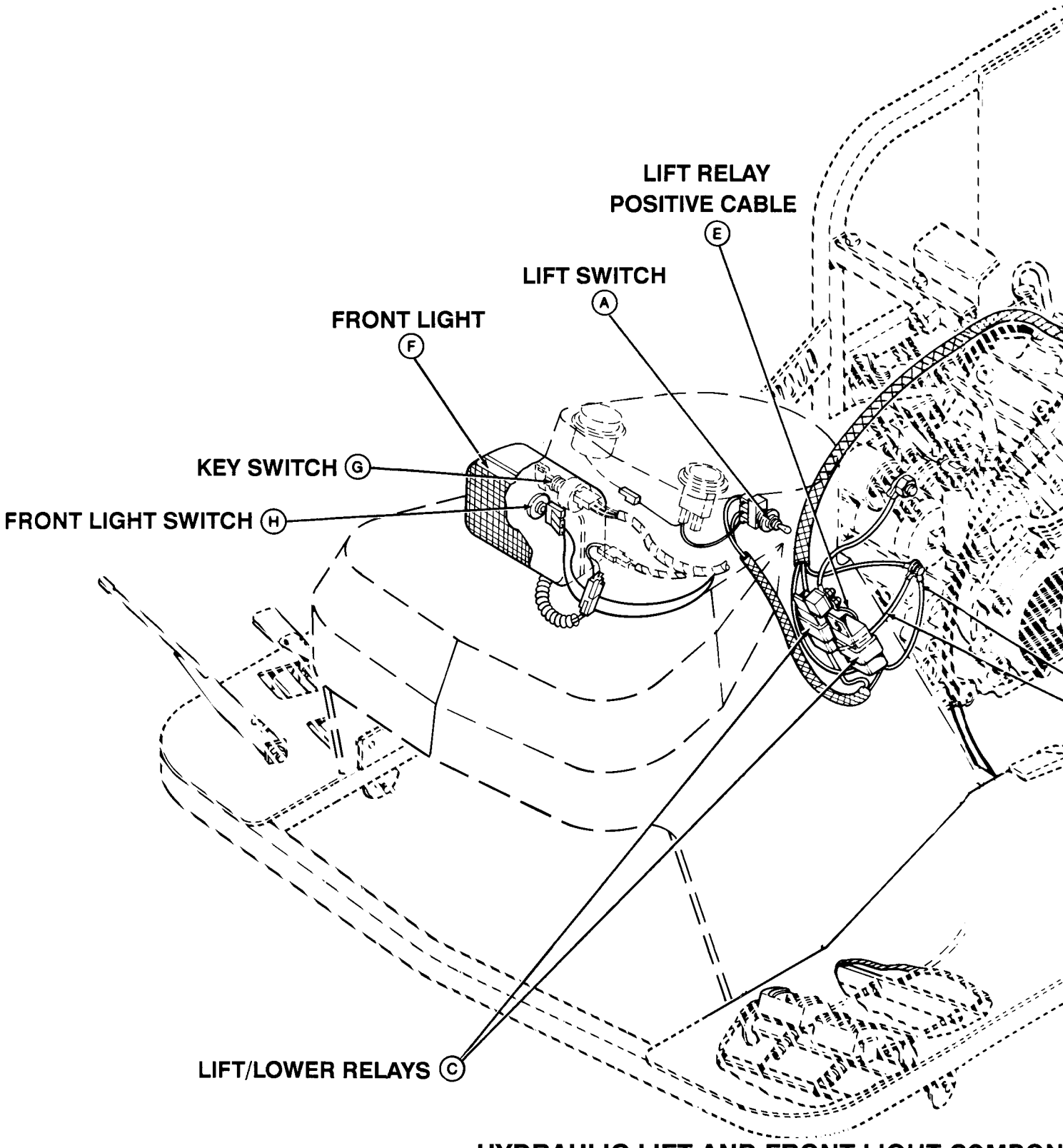
HYDRAULIC LIFT AND FRONT LIGHT COMPONENT LOCATION



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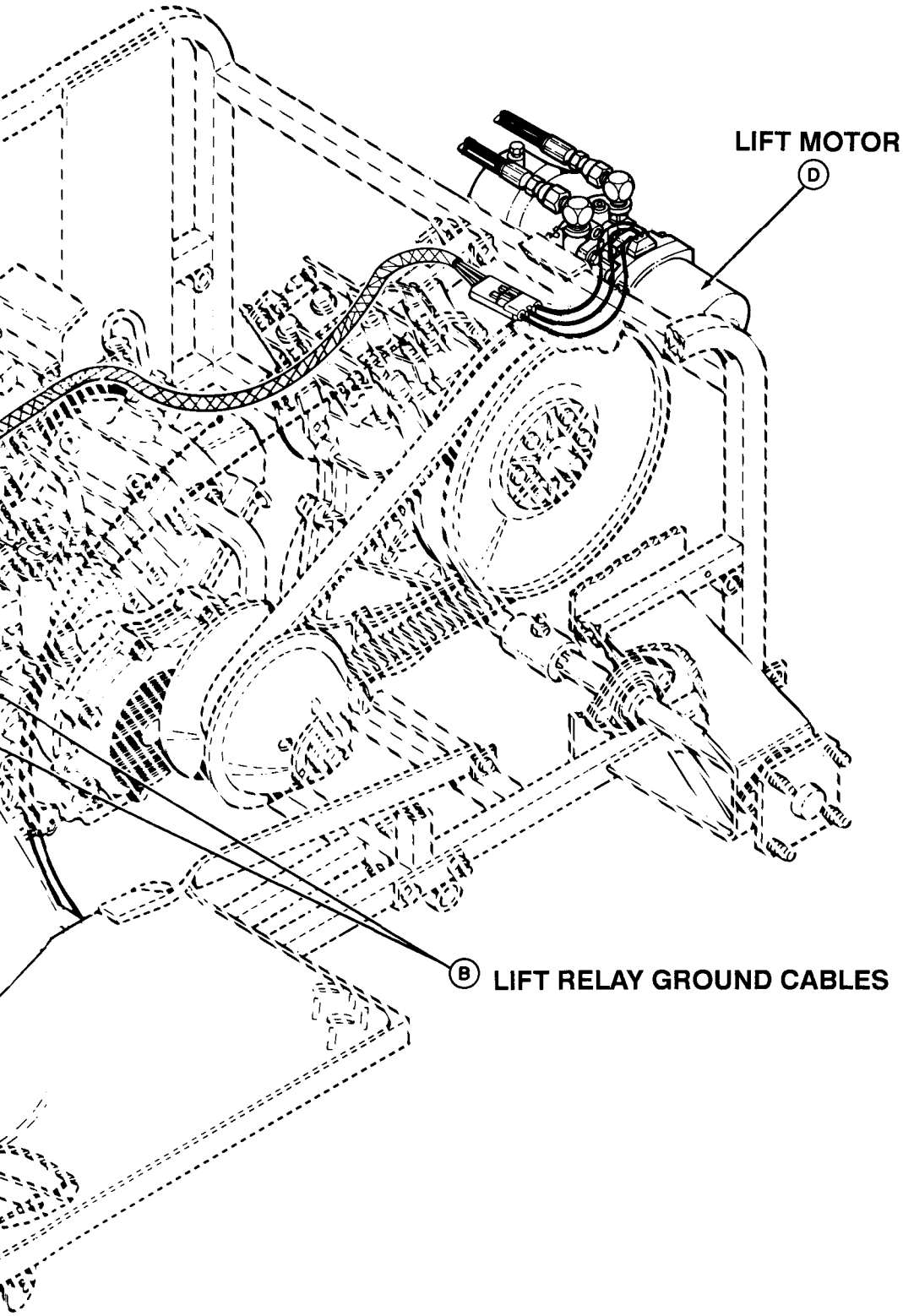
HYDRAULIC LIFT AND FRONT LIGHT COMPON



T COMPONENT LOCATION

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, operation conditions, components used, and current flow.

The circuit schematic that accompanies each theory story is drawn in 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 IS NOT NECESSARILY THE COLOR OF THE WIRE LEAD.

The following systems or components are covered:

- Cranking System
- Ignition System—Engine Running
- Ignition System—Engine Shutting Off
- Ignition System—Engine Shutting Off
- Charging System
- Optional Front Light System
- Hourmeter/Voltmeter System
- Optional Electric—Hydraulic Lift System—Lift
- Optional Electric—Hydraulic Lift System—Lower

The slide number reference under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

MX,24010HE,1 -19-27SEP91

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
Yel/Red	Yellow/Red
Yel/Wht	Yellow/White

MX,24010HE,2 -19-27SEP91

CRANKING SYSTEM OPERATION

A—Power Circuit
B—Neutral Start Circuit
C—Starter Power Circuit
D—Ground Circuit
F1—20 Amp Circuit Breaker
G1—Battery
K1—Starter Solenoid
M1—Starter Motor
S1—Transaxle Neutral Start Switch
S4—Key Switch
W1—Engine Ground

FUNCTION:
The cranking system is used to energize the starting motor.

OPERATING CONDITIONS:
In order to crank the engine, the key switch must be in the start position and the transaxle must be in neutral (transaxle switch closed).

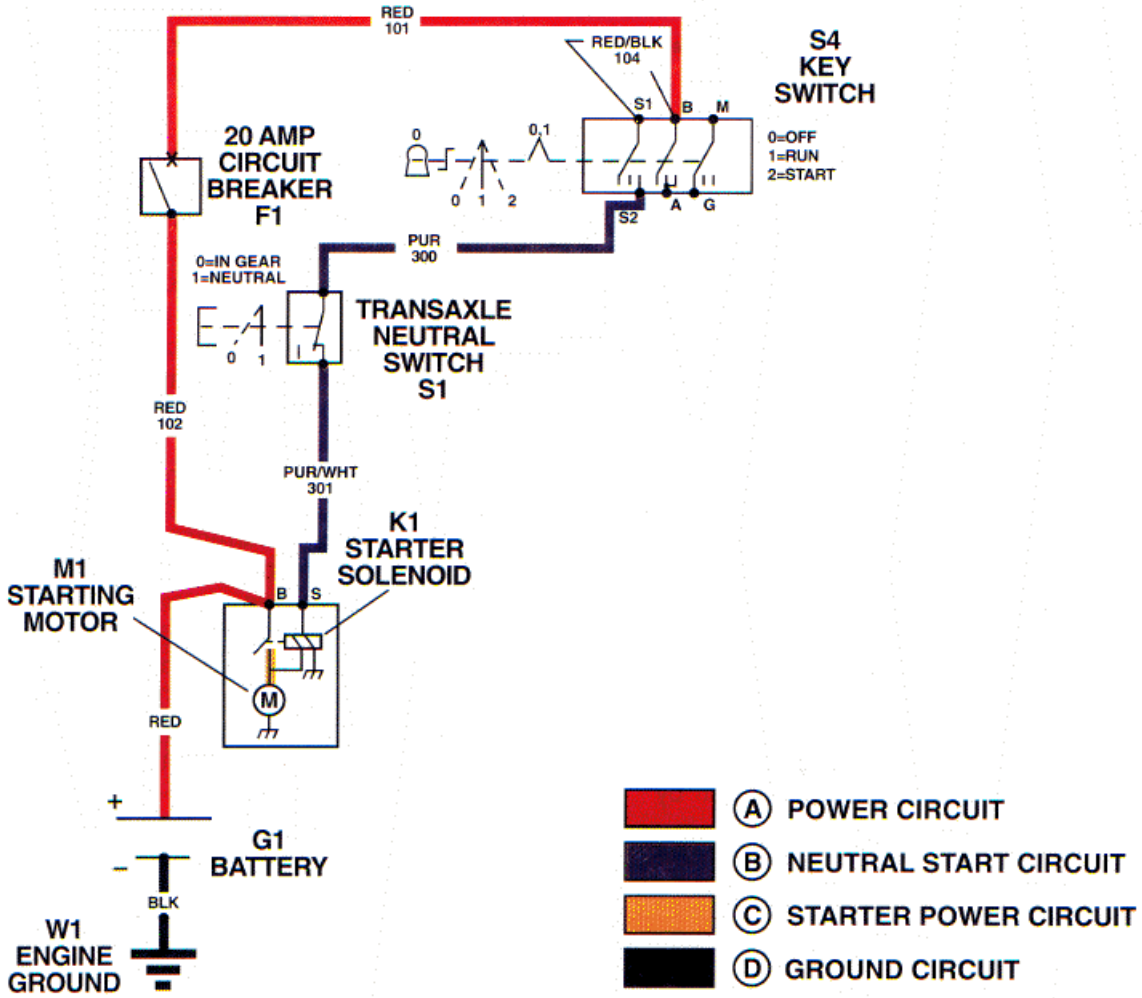
MAJOR COMPONENTS:
•Battery
•Key Switch
•20 Amp Circuit Breaker
•Transaxle Neutral Switch
•Starter Solenoid
•Starter

SYSTEM OPERATION:
The starting motor is a solenoid shift design. The power circuit provides current to the key switch and protects the cranking circuit with a 20 amp circuit breaker. Current flows from the battery positive terminal to the starter solenoid battery terminal, 20 amp circuit breaker, and key switch. With the key switch in the START position, current flows to the transaxle neutral switch.

The transaxle neutral switch is used in the neutral start circuit to prevent the engine from cranking if the transaxle is in gear. With the transaxle neutral switch closed (transaxle in neutral), current flows to the starter solenoid and engages the solenoid. The solenoid is engaged by current flowing through both pull-in and hold-in windings, pulling the plunger inward. The plunger closes the solenoid main contacts. When the main contacts are closed, both ends of the pull-in windings have the same voltage so current through the pull-in windings stops. Current continues through the hold-in windings, keeping the solenoid engaged.

With the solenoid main contacts closed, high current from the battery flows across the main contacts to the starter motor causing it to turn.

MX,24010HE,3 -19-27SEP91



MXC44849

CRANKING SYSTEM OPERATION

Slide MXC44849

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MX,24010HE,4 -19-27SEP91

IGNITION SYSTEM OPERATION—ENGINE RUNNING

A—Primary Coil
B—Ground Path
C—Transistor Base
D—Resistor
E—Resistor
F—Transistor Base
G—Ground Path
H—Secondary Coil

FUNCTION:
To create a spark that ignites the fuel/air mixture in the engine.

OPERATING CONDITIONS:
To produce a spark, the key switch must be in the run or start position. The operator does not have to be on the seat.

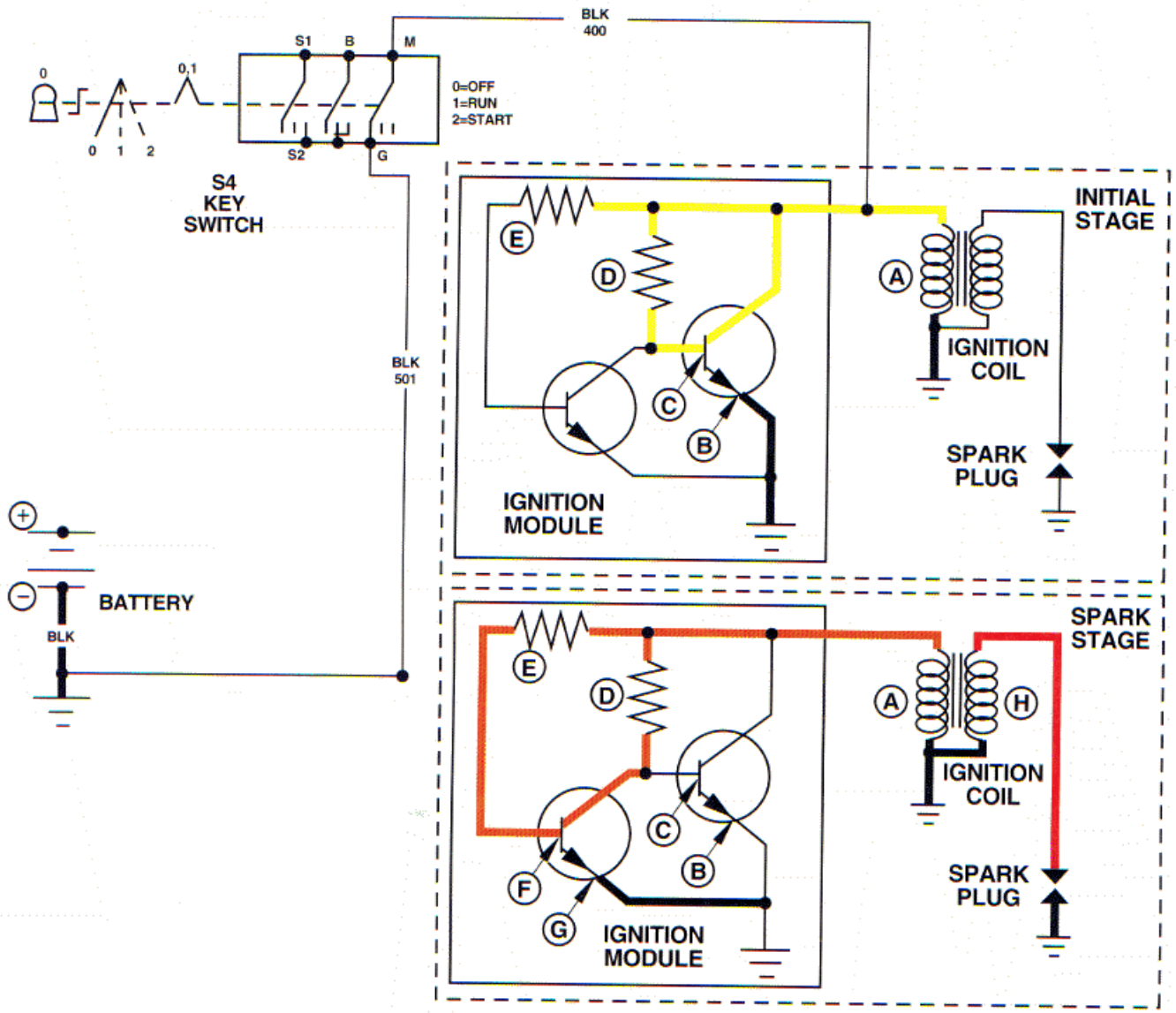
MAJOR COMPONENTS:
•Battery
•Key Switch
•Flywheel
•Ignition Module
•Ignition Coil
•Spark Plug

SYSTEM OPERATION:
The ignition system is a transistor-controlled magneto design. Ignition timing is controlled by the transistor and is not adjustable. The engine is shut off by grounding the ignition coil.

With the key switch in the start or run position, the key switch eliminates the path to ground for ignition current, so a spark can be produced. As the flywheel turns, a magnet in the flywheel starts to align with the ignition coil and produces current in the primary coil (A) by electromagnetic induction. In the initial stage low voltage current is produced. The low voltage current flows to transistor (C), and resistors (D and E). Resistor (E) has high resistance so current must flow through resistor (D) to transistor (C). The transistor base (C) is energized which closes the transistor and provides a path (B) to ground for ignition coil current flow.

In the spark stage (spark produced), the flywheel magnet is fully aligned with the ignition coil and high voltage (maximum) current is induced in the primary coil (A). The high voltage current can now flow through resistor (E) to transistor (F). The transistor base (F) is energized which closes the transistor and provides a path (G) to ground for current that was flowing to transistor base (C). With current no longer applied to transistor base (C), the transistor opens breaking the path (B) to ground. The sudden reduction of current flow, because transistor (B) is open and all current must flow through transistor (F), induces high voltage current in the secondary coil (H). The high voltage current flows through the ignition coil wire to the spark plug. The voltage is now high enough to jump the spark plug gap and a spark is produced.

MX,24010HE,5 -19-27SEP91



MXC44850

IGNITION SYSTEM - ENGINE RUNNING

Slide MXC44850

MXC44850 -19-

MX,24010HE,6 -19-27SEP91

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7

IGNITION SYSTEM OPERATION—ENGINE SHUTTING OFF

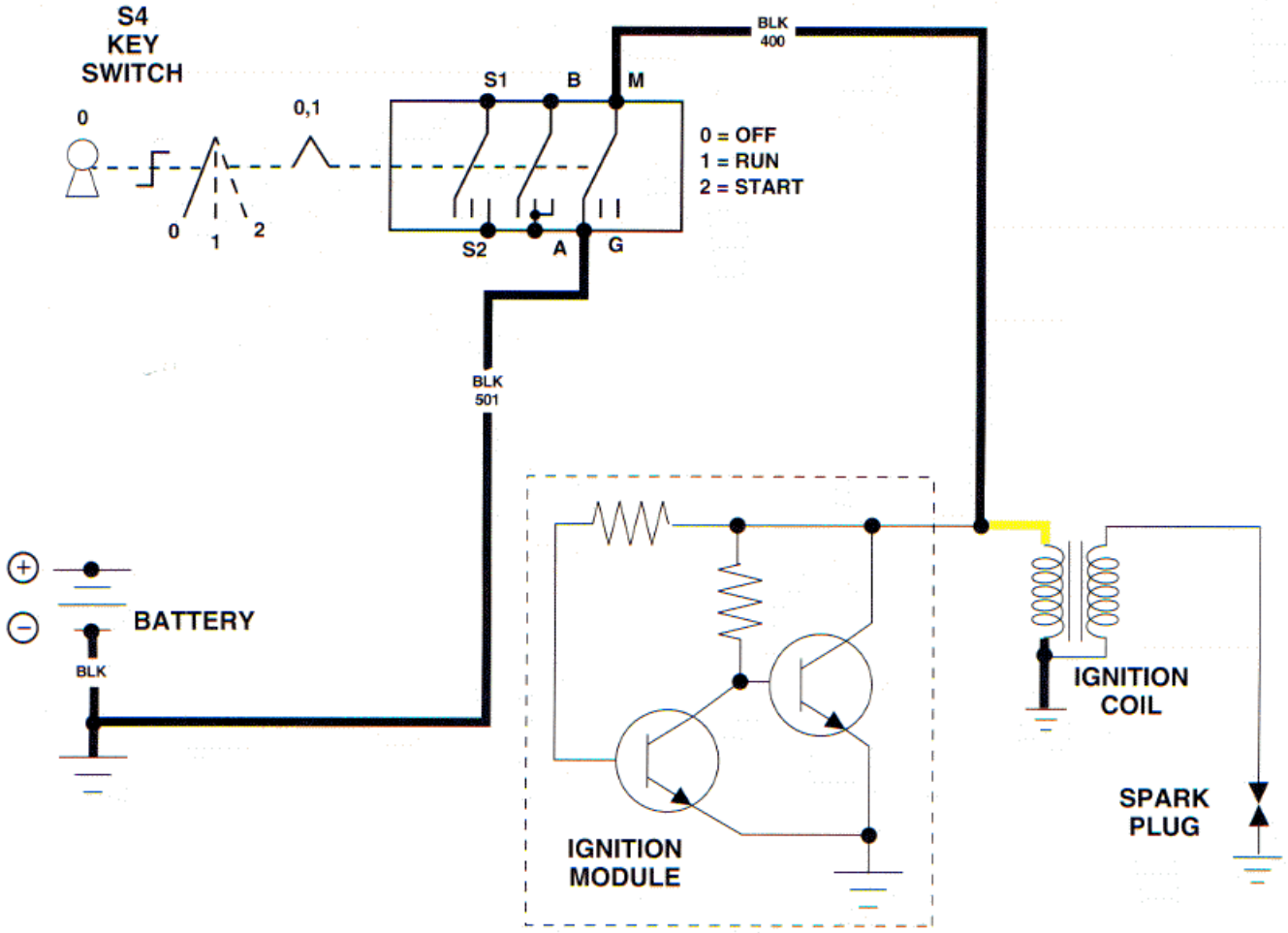
FUNCTION:
To shut the engine off when desired by the operator.

CONDITIONS:
Key switch turned to off position.

MAJOR COMPONENTS:
•Battery
•Key Switch
•Ignition Coil

SYSTEM OPERATION:
When the key switch is turned to the off position, a path to ground is provided for ignition coil current. The low voltage current produced in the ignition coil now flows to the key switch and then ground instead of the ignition module. Since no voltage is induced in the secondary coil, no spark occurs and the engine stops.

MX,24010HE,7 -19-27SEP91



MXC44851

IGNITION SYSTEM – ENGINE SHUTTING OFF

Slide MXC44851

MXC44851 -19-

MX,24010HE,8 -19-27SEP91

CHARGING SYSTEM OPERATION

FUNCTION:
To maintain battery voltage between 11.8 and 13.2.

OPERATING CONDITIONS:
The key switch must be in the run position with the engine running for the charging system to operate.

MAJOR COMPONENTS:
•Battery
•20 Amp Circuit Breakers
•Key Switch
•Regulator-Rectifier
•Stator

SYSTEM OPERATION:
The charging system is a permanent magnet and stator design. Charging output is controlled by a regulator-rectifier.

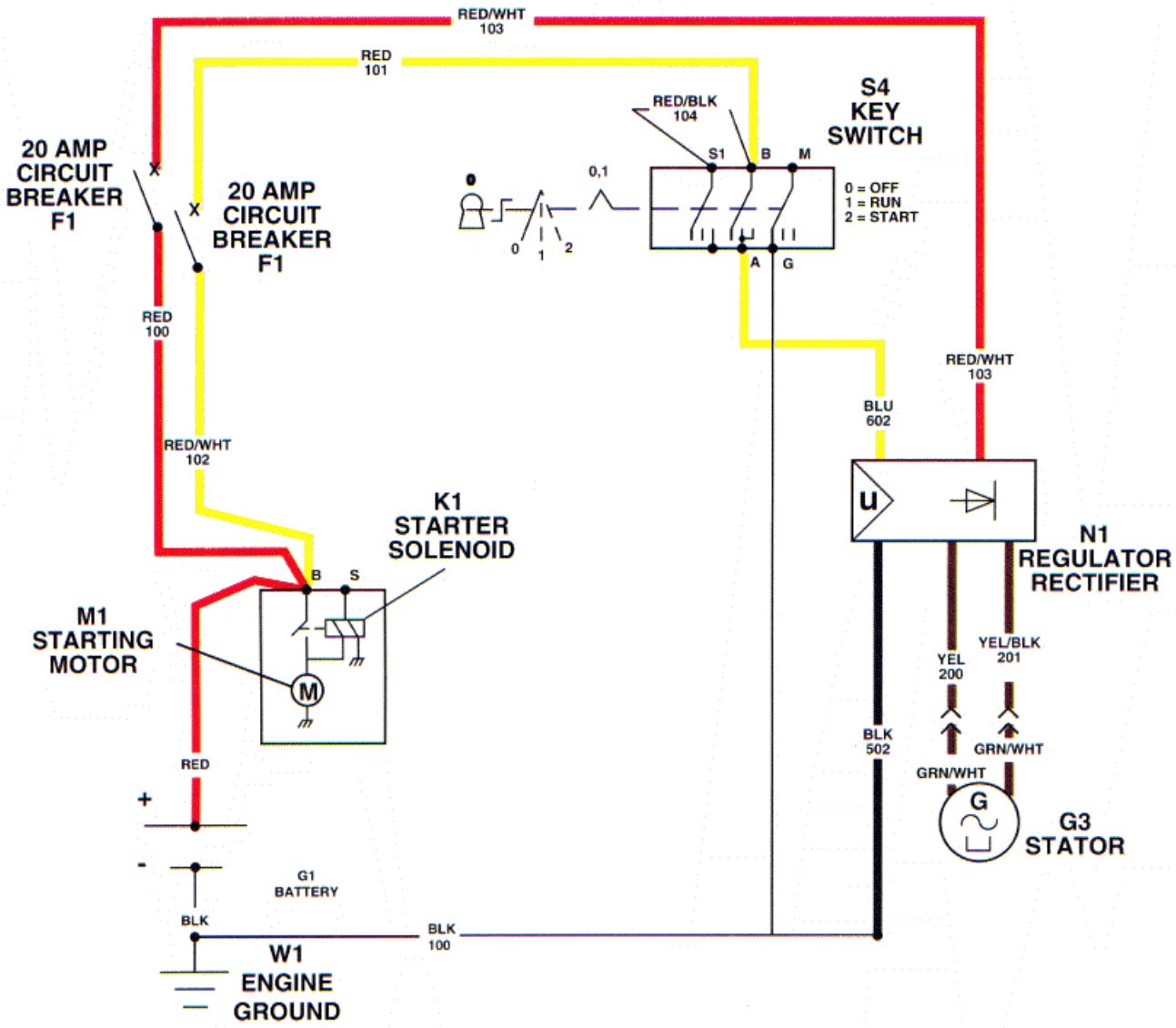
With the key switch in the run position, battery sensing circuit current flows from battery positive terminal to starter terminal, 20 amp circuit breaker, key switch, and regulator-rectifier. The battery sensing circuit allows the regulator-rectifier to monitor battery voltage.

As the flywheel turns, a permanent magnet located in the flywheel induces AC current in the stator. The AC current flows to the regulator-rectifier. The regulator-rectifier converts AC current to DC current needed to charge the battery.

If battery voltage is low, the regulator-rectifier allows DC current to flow to the battery to charge it through the battery charging circuit. When the battery is fully charged, the regulator stops current flow to the battery. The battery charging circuit is protected by a 20 amp circuit breaker.

The ground circuit provides a path to ground for the regulator-rectifier.

MX,24010HE,9 -19-27SEP91



MXC44852

CHARGING SYSTEM OPERATION

Slide MXC44852

MXC44852 -19-

MX,24010HE,10 -19-27SEP91

240 10 11

OPTIONAL FRONT LIGHT SYSTEM OPERATION

FUNCTION:
To provide power to the front light for illumination if desired by the operator.

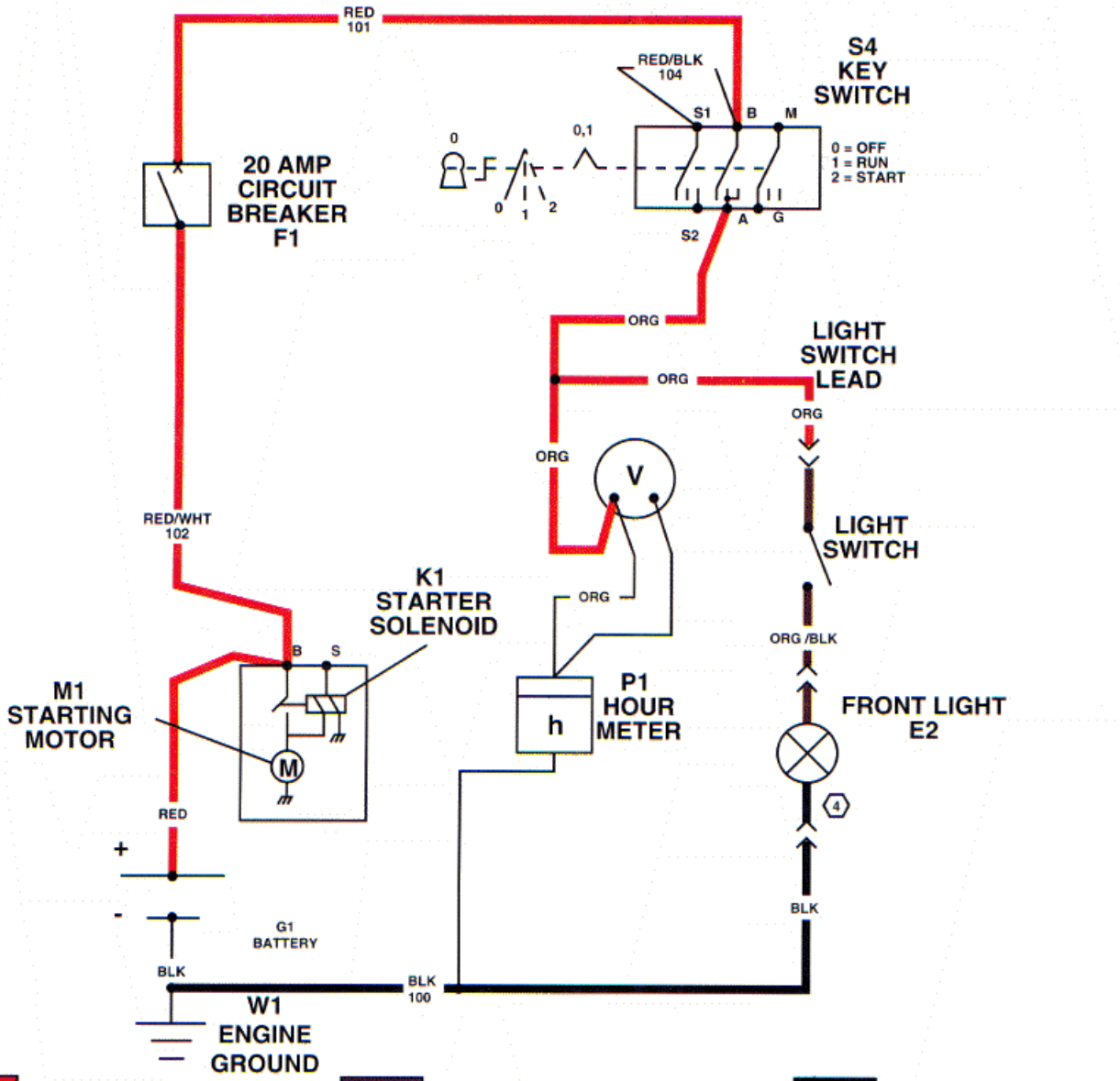
OPERATING CONDITIONS:
The key switch must be in the run position and the light switch on (switch closed).

MAJOR COMPONENTS:
- Battery
- 20 Amp Circuit Breaker
- Key Switch
- Light Switch
- Front Light

SYSTEM OPERATION:
With the key switch in the run position, current flows from the battery positive terminal to the starter terminal, 20 amp circuit breaker, key switch and light switch. With the light switch on (switch closed), current flows to the front light and illuminates the lamp.

The ground circuit provides a path to ground for the front light through the key switch “G” terminal.

MX,24010HE,11 -19-27SEP91



MXC44853

FRONT LIGHT SYSTEM

Slide MXC44853

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MX,24010HE,12 -19-27SEP91

HOURMETER/VOLTMETER SYSTEM OPERATION

FUNCTION:

Hourmeter—To record the number of hours the key switch is in the run position.

Voltmeter—To inform the operator if battery is being charged by charging system.

OPERATING CONDITIONS:

The key switch must be in the run position for the hourmeter to run.

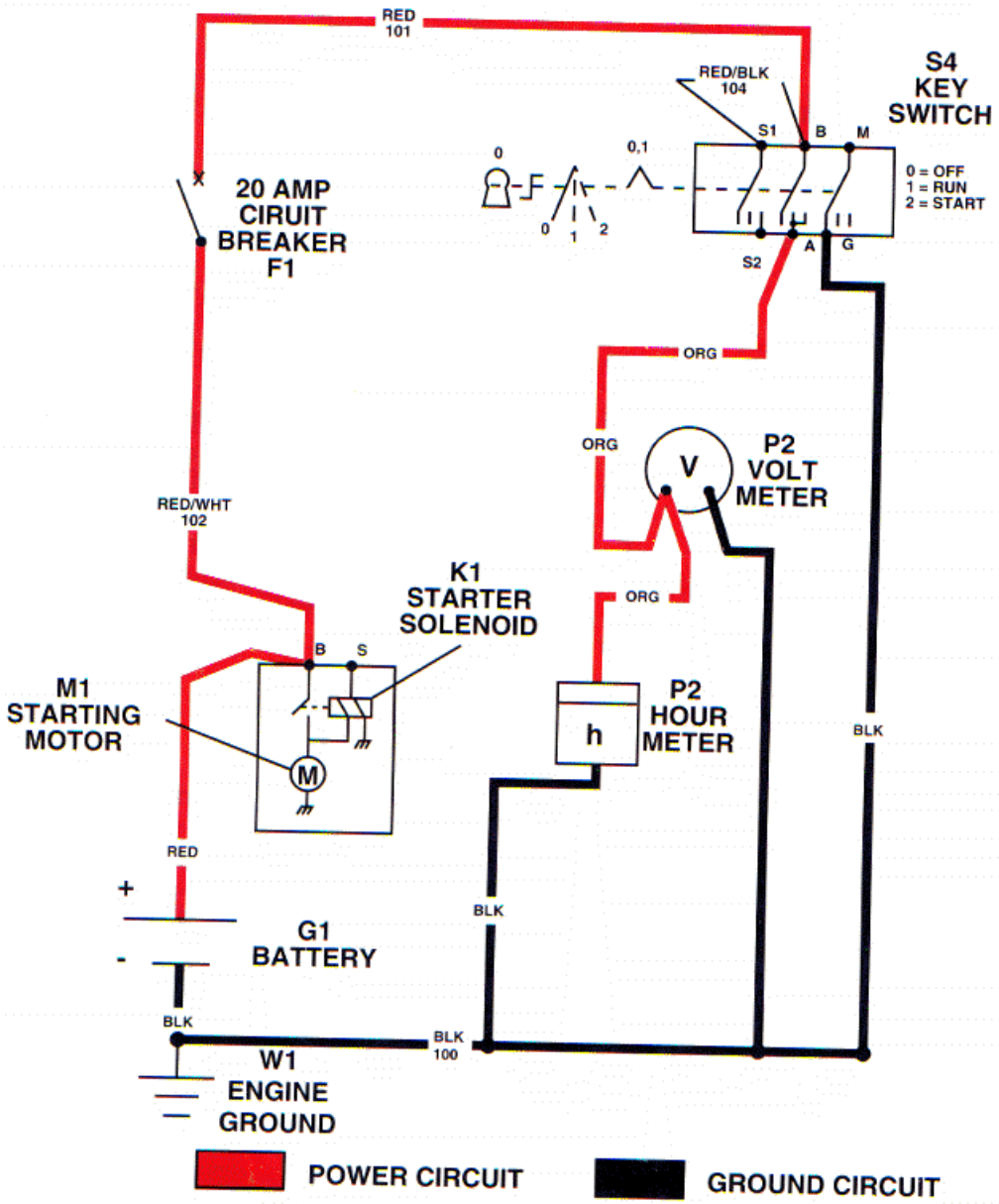
MAJOR COMPONENTS:

- Battery
- 20 Amp Circuit Breaker
- Key Switch
- Hourmeter
- Voltmeter

SYSTEM OPERATION:

With the key switch in the run position, current flows from the battery positive terminal to the starter terminal, 20 amp circuit breaker, key switch, voltmeter, then to the hourmeter. The hourmeter continues to run as long as the key switch is in the run position. The voltmeter gives battery voltage as long as key switch is in the run position.

MX,24010HE,13 -19-27SEP91



MXC44854

VOLTMETER AND HOURMETER OPERATION

Slide MXC44854

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MX,24010HE,14 -19-27SEP91

OPTIONAL ELECTRIC-HYDRAULIC LIFT SYSTEM OPERATION—LIFT

FUNCTION:
To provide power to a hydraulic pump used for lifting rear rake or pulled implement.

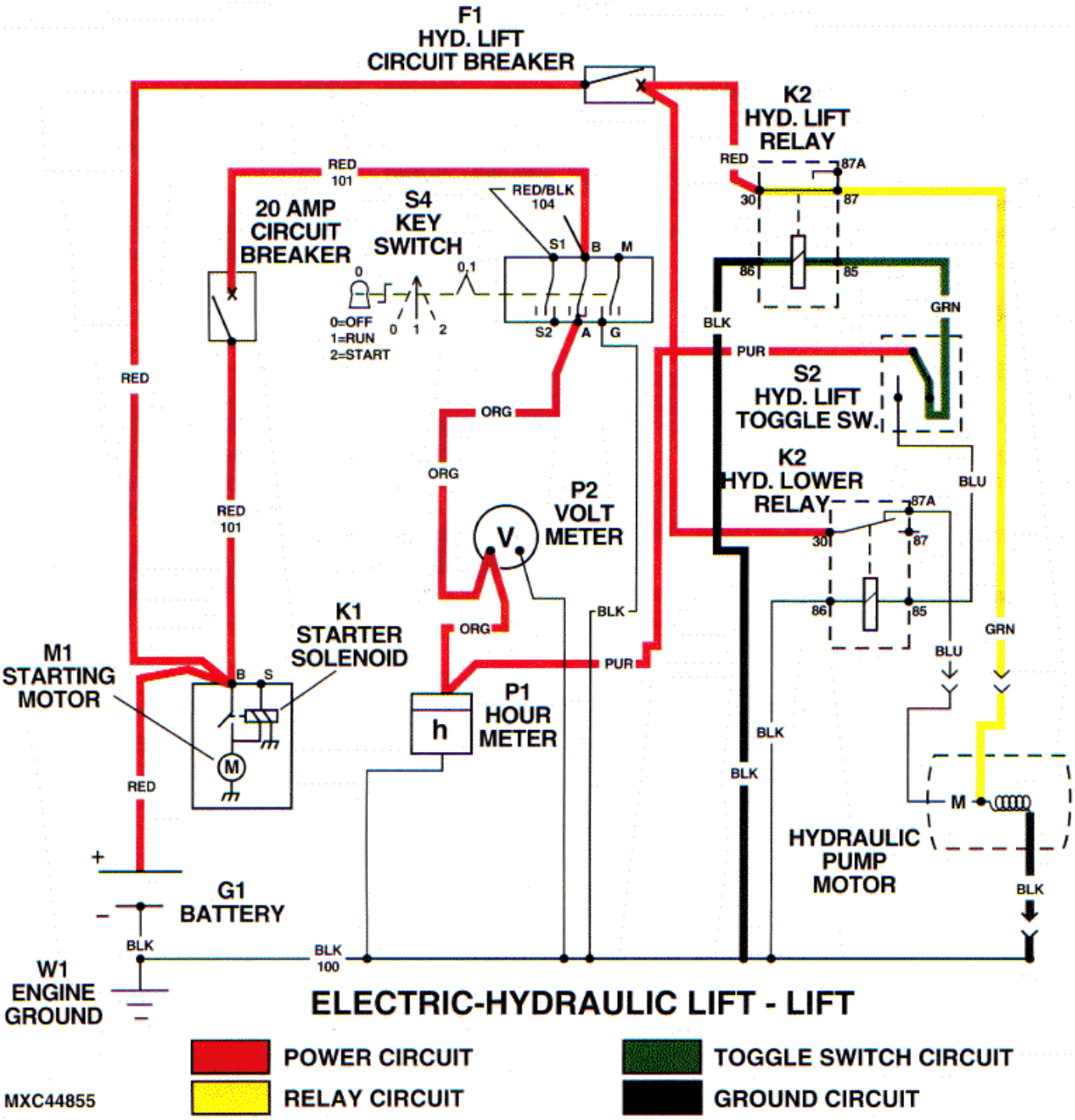
OPERATION CONDITIONS:
The key switch must be in the run position and the hydraulic pump toggle switch must be in raise position for hydraulic lift to operate.

MAJOR COMPONENTS:
•Battery
•30 Amp Circuit Breaker
•Key Switch
•Hydraulic Pump Toggle Switch
•Hydraulic Pump Relay
•Hydraulic Pump Motor

SYSTEM OPERATION:
The power circuit provides current to the hydraulic lift toggle switch. With the KEY switch in the run position, current flows from the battery positive terminal to starter terminal, 30 amp circuit breaker, key switch, voltmeter,hourmeter, and hydraulic lift toggle switch (RED HIGHLIGHT). Current cannot flow through the LIFT relay until the switch is manually closed.

The power circuit also provides current to the LIFT relay at terminal 30 (RED HIGHLIGHT). Current cannot flow to the hydraulic pump motor until the LIFT relay solenoid is energized. With the hydraulic lift toggle switch moved to the lift position (switch closed), current flows to the LIFT relay solenoid and energizes and allows current to flow from terminal 85 to 86 (GREEN HIGHLIGHT) and then to ground, closing the circuit. With the lift relay solenoid now energized, current that was once stopped at terminal 30 can now flow to terminal 87 and then to the hydraulic pump motor causing the motor to rotate (YELLOW HIGHLIGHT). The motor continues to operate until the hydraulic pump switch is manually moved to the off position.

MX,24010HE,15 -19-27SEP91



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MX,24010HE,16 -19-27SEP91

OPTIONAL ELECTRIC-HYDRAULIC LIFT SYSTEM OPERATION—LOWER

FUNCTION:
To provide power to a hydraulic pump used for lowering rear rake or a pulled implement.

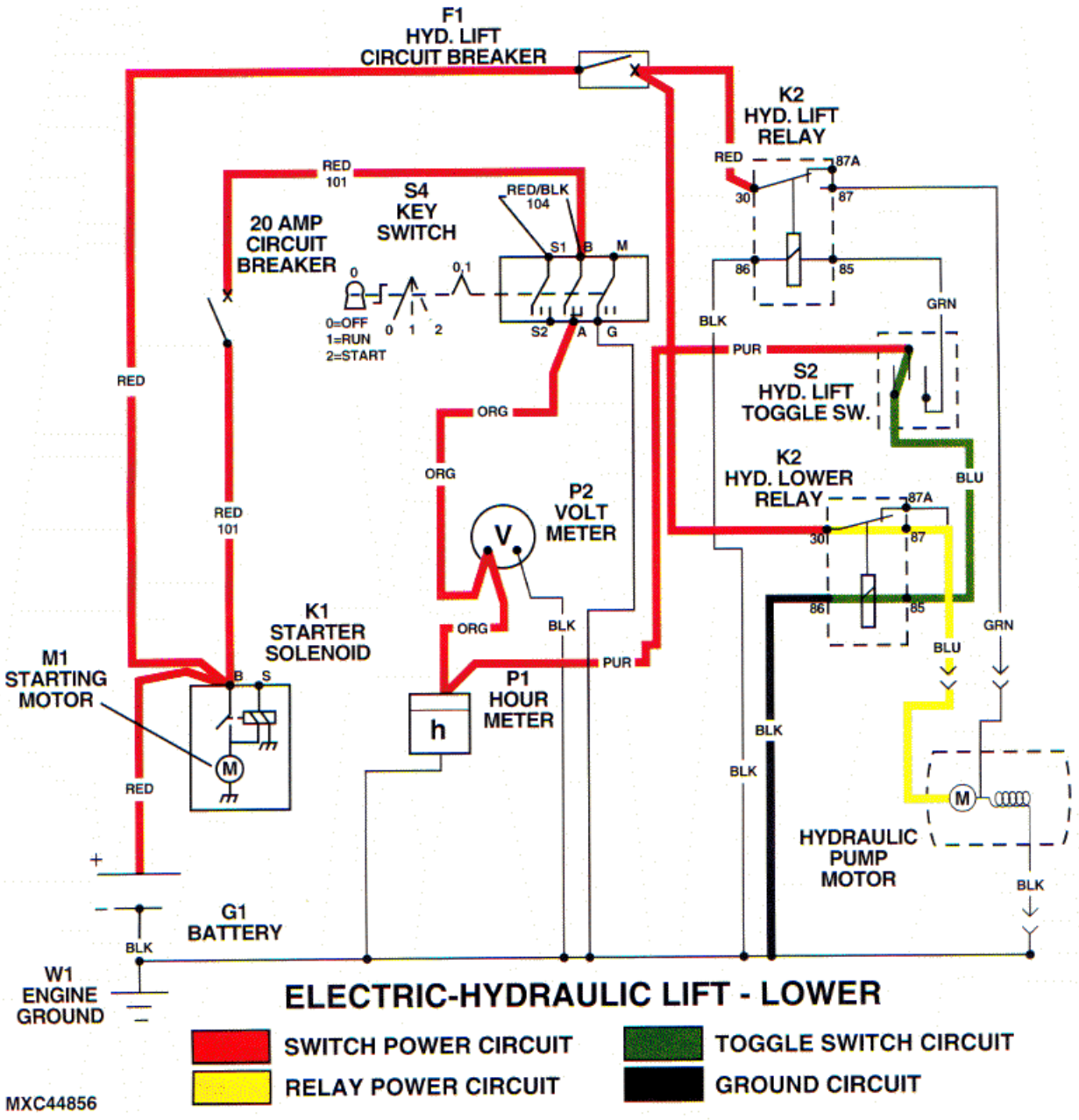
OPERATION CONDITIONS:
The key switch must be in the run position and the hydraulic pump toggle switch must be in the LOWER position for hydraulic pump to operate.

MAJOR COMPONENTS:
•Battery
•30 Amp Circuit Breaker
•Key Switch
•Hydraulic Pump Toggle Switch
•Hydraulic Pump Relay
•Hydraulic Pump Motor

SYSTEM OPERATION:
The switch power circuit provides current to the hydraulic pump switch. With the KEY switch in the run position, current flows from the battery positive terminal, starter terminal, 30 amp circuit breaker, key switch, voltmeter, hourmeter then to hydraulic lift toggle switch (RED HIGHLIGHT). Current cannot flow through the LOWER relay until the toggle switch is manually closed.

The power circuit also provides current to the LOWER relay at terminal 30 (RED HIGHLIGHT). Current cannot flow to the hydraulic pump motor until the LOWER relay solenoid is energized. With the hydraulic lift toggle switch moved to the LOWER position (switch closed), current flows to the LOWER relay solenoid and energizes and allows current to flow from terminal 85 to 86 (GREEN HIGHLIGHT) and then to ground, closing the circuit. With the LOWER relay solenoid now energized, current that was once stopped at terminal 30 can now flow to terminal 87 and then to the hydraulic pump motor causing the motor to rotate (YELLOW HIGHLIGHT). The motor continues to operate until the hydraulic pump switch is manually moved to the off position.

MX,24010HE,17 -19-27SEP91



Slide MXC44856

MX,24010HE,18 -19-27SEP91

DIAGNOSTIC INFORMATION

The diagnostics in this group test individual circuits by function rather than a specific problem. Select the appropriate functional heading that applies to your problem and follow the test procedures under that heading. The functional headings are:

•Cranking
•Ignition
•Charging
•Front Light
•Hourmeter/Voltmeter
•Electric Hydraulic Lift System

The diagnostic procedure lists:
•Test conditions
•Test sequence
•Test/check point
•Normal reading
•Checks 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 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 circuit diagram that accompanies each test procedure is drawn to resemble machine components. The key number on the art determines test sequence and the arrow points to the exact point the test is to be made.

The slide number references under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

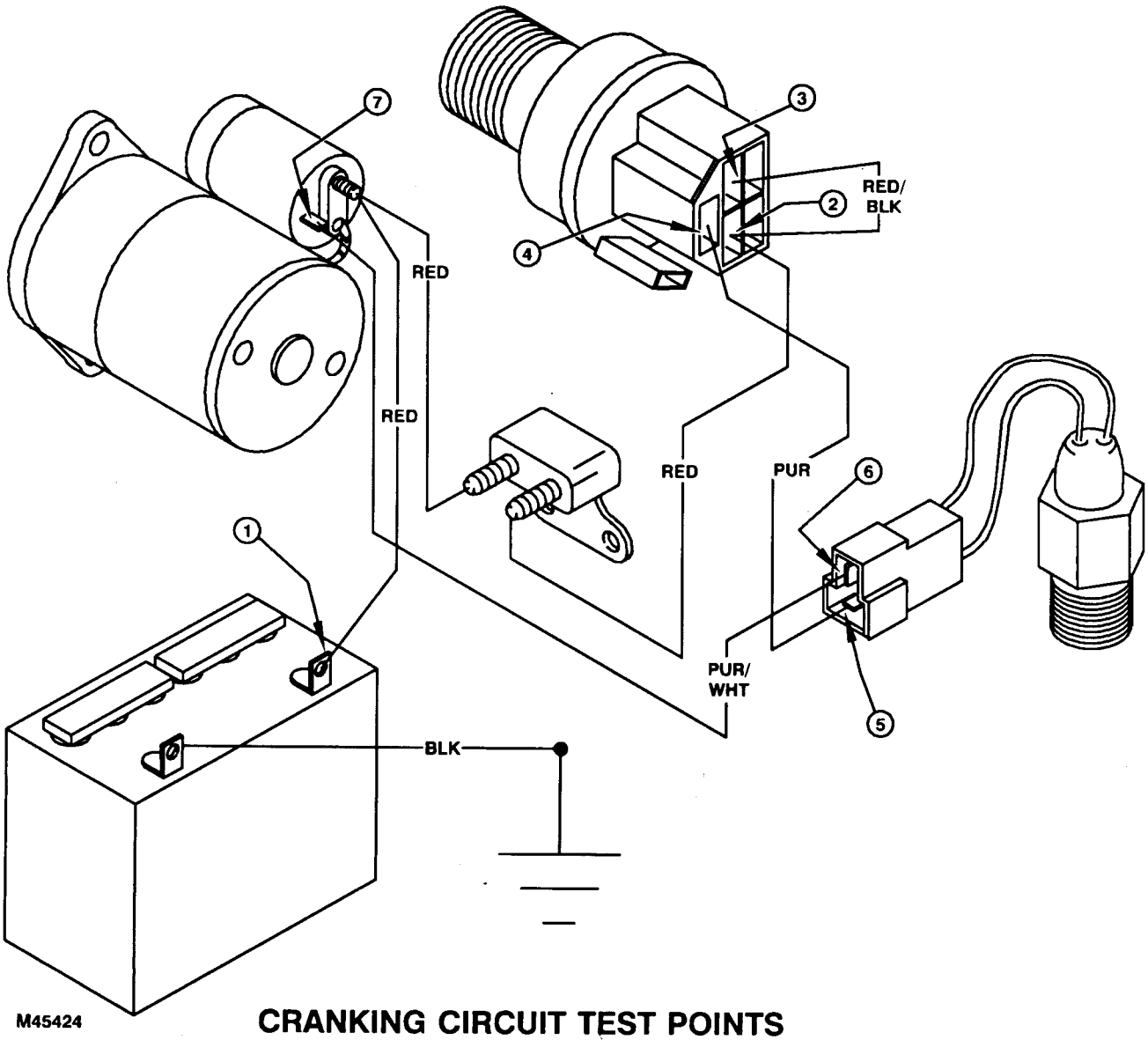
MX,24015HE,1 -19-27SEP91

CRANKING CIRCUIT TEST POINTS

TEST CONDITIONS UNLESS SPECIFIED OTHERWISE:
•Park brake engaged
•Key switch in start position
•Transaxle in neutral
•Meter negative (—) lead on battery negative (—) terminal
•Meter positive (+) lead on numbered test point

Test/Check Points	Normal	If Not Normal
1. Battery positive terminal.	11.8—13.2 volts.	Test battery.
2. Key switch terminal 'B'.	Battery voltage.	Check battery cable connection, starter battery terminal connection, 20 amp circuit breaker, and red wires.
3. Key switch terminal 'S1'.	Battery voltage.	Check red/black wire.
4. Key switch terminal 'S2' switch.	Battery voltage.	Test key.
5. Transaxle neutral switch.	Battery voltage.	Test purple wire.
6. Transaxle neutral switch.	Battery voltage.	Test transaxle neutral switch.
7. Starter solenoid terminal.	Battery voltage.	Test purple/white wire and connection 12 volts - test starter solenoid and starter.

MX,24015HE,2 -19-27SEP91



CRANKING CIRCUIT TEST POINTS

M45424 -19-29JAN90

Slide M45424

MX,24015HE,3 -19-27SEP91

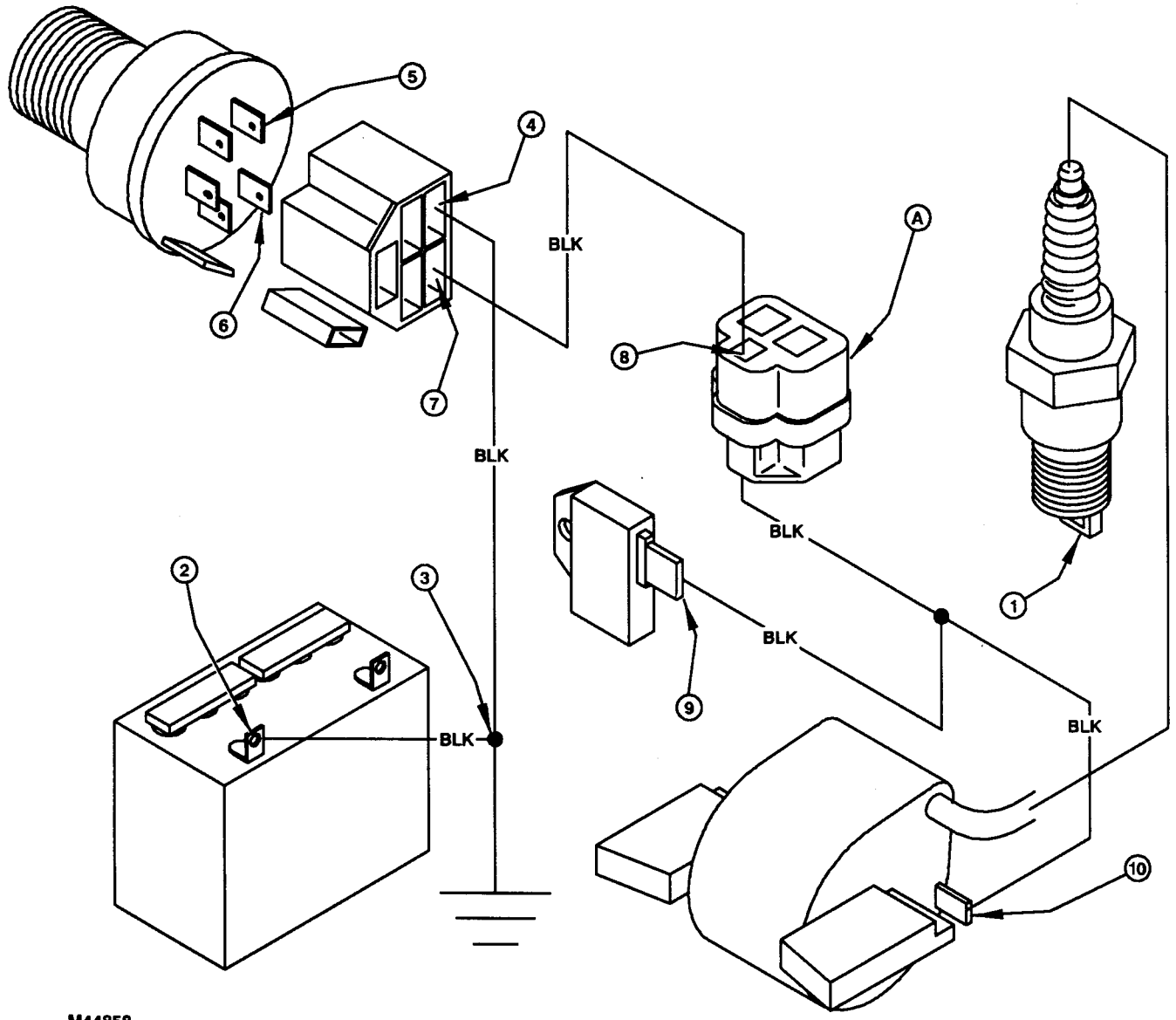
IGNITION CIRCUIT TEST POINTS

When diagnosing an ignition problem, isolate the magneto circuit from the ground circuit by separating the engine connector. If the engine will not start, check the magneto circuit first and then check the ground circuit. If the engine will not shut off, check the ground circuit. Remember the engine is stopped by grounding the ignition coil.

TEST CONDITIONS UNLESS SPECIFIED OTHERWISE:
- Park brake engaged
- Transaxle in neutral
- Engine connector (A) disconnected
- Spark plug lead connected to D05351ST Spark Tester
- Key switch in start position

Test/Check Points	Normal	If Not Normal
1. Spark tester.	Spark at tester.	Test spark plug, test ignition coil, check armature air gap, test ignition module, check flywheel magnets.
TEST CONDITIONS: •Key switch off. •Engine connector (A) connected 2 to 3. Battery ground to engine ground.	Continuity.	Check black wire.
3 to 4. Engine ground to key switch terminal 'G'.	Continuity.	Check black wire.
TEST CONDITIONS: •Key switch disconnected 5 to 6. Key switch terminal 'G' to key switch terminal 'M'.	Continuity.	Replace key switch.
TEST CONDITIONS: •Key switch in on position 5 to 6. Key switch terminal 'G' to key switch terminal 'M'.	No Continuity.	Replace key switch.
TEST CONDITIONS: •Key switch in off position. •Key switch connected 7 to 8. Key switch terminal 'M' to engine connector.	Continuity.	Check black wire.
8 to 9. Engine connector to ignition module.	Continuity.	Check black wires and connection.
8 to 10. Engine connector to ignition coil.	Continuity.	Check black wires and connection.

MX,24015HE,4 -19-27SEP91



IGNITION CIRCUIT TEST POINTS

Slide M44858

-19-23JUL91
M44858

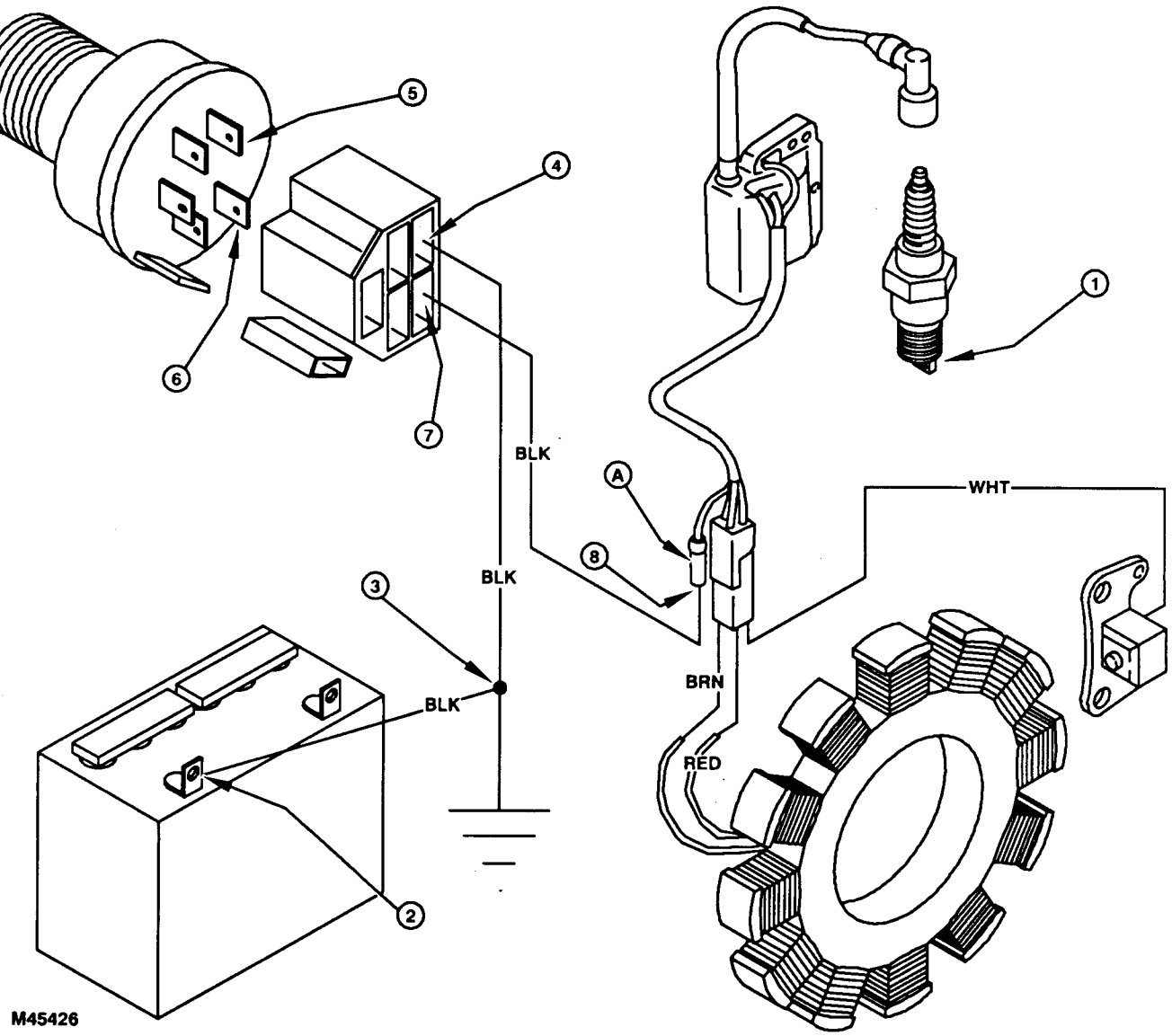
MX,24015HE,5 -19-27SEP91

CHARGE SYSTEM TEST POINTS

TEST CONDITIONS UNLESS SPECIFIED OTHERWISE:
•Park brake engaged
•Transaxle in neutral
•Stator connector (A) disconnected
•Key switch in run position
•Engine running

Test/Check Points	Normal	If Not Normal
1. Battery positive terminal.	11.8—13.2 volts.	Test battery.
2. Stator or connector (see unregulated voltage output test).	34 VAC (min).	Test stator, check flywheel magnets.
TEST CONDITIONS: •Stator connector (A) connected.		
3. Starter battery terminal.	Battery voltage.	Test red wire.
4. Key switch terminal 'B'.	Battery voltage.	Test circuit breaker and red wires.
5. Key switch terminal 'A'.	Battery voltage.	Test key switch.
6. Regulator/rectifier.	Battery voltage.	Test blue wire.
7. Regulator/rectifier.	Battery voltage.	Test circuit breaker and red/white wire.
8. Regulator/rectifier.	Greater than 0-less than 0.2 volts.	Greater than 0.2 volts - test regulator/rectifier ground circuit. 0 volts - test regulator/rectifier.
9. Regulator/rectifier wire (see regulated output test).	12A @ 12.2—13.8 volts (min).	Test regulator/rectifier.

MX,24015HE,6 -19-27SEP91



IGNITION CIRCUIT TEST POINTS - AMT600

-19-29JAN90

M45427

Slide M45429

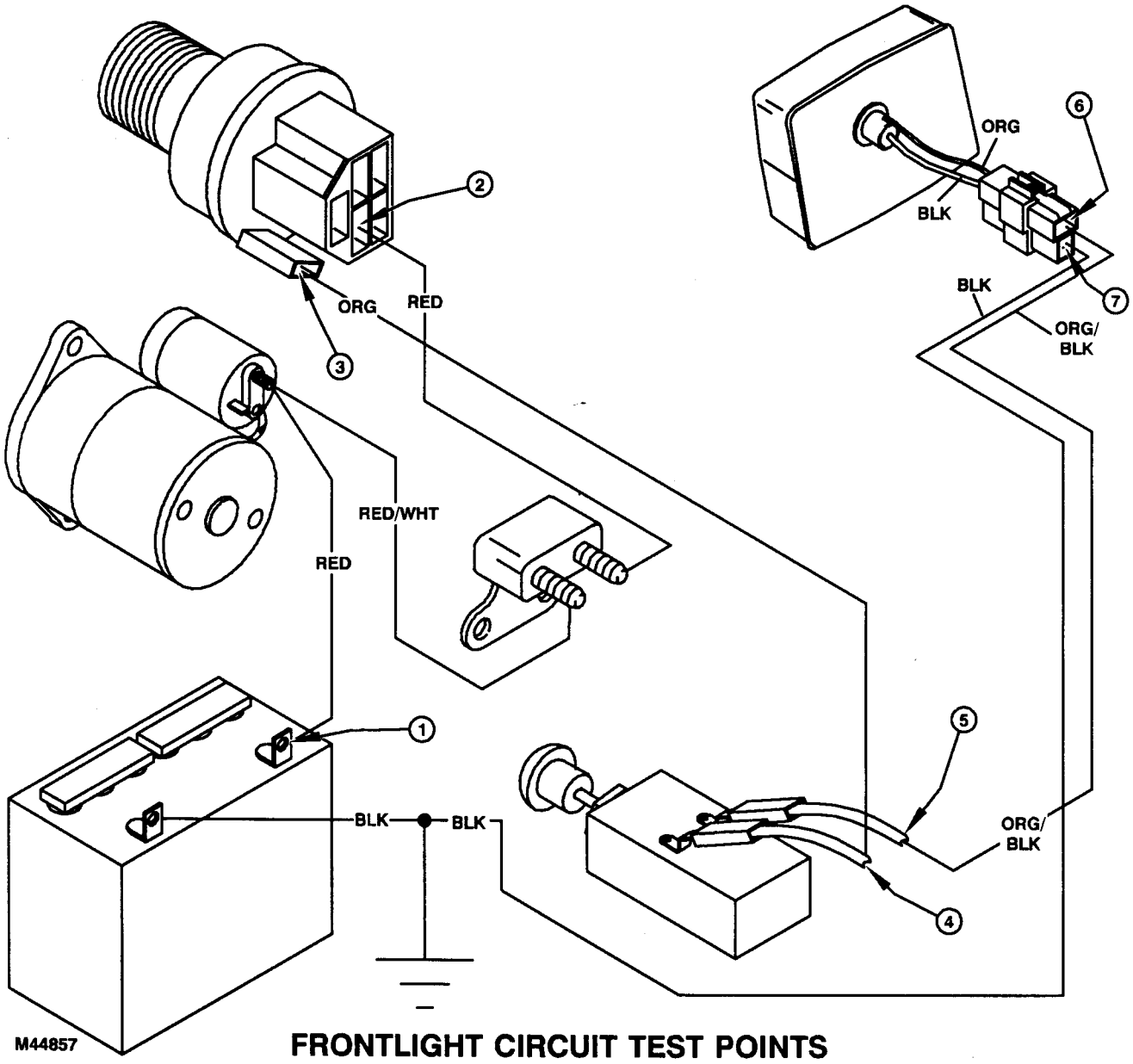
MX,24015HE,7 -19-27SEP91

FRONT LIGHT CIRCUIT TEST POINTS

TEST CONDITIONS UNLESS SPECIFIED OTHERWISE:
•Park brake engaged
•Transaxle in neutral
•Key switch in “on” position
•Front light switch in “on” position

Test/Check Points	Normal	If Not Normal
1. Battery positive terminal.	11.8—13.2 volts.	Test battery.
2. Key switch terminal ’B’.	Battery voltage.	Test red wires, and circuit breaker.
3. Key switch terminal ’A’.	Battery voltage.	Test key switch.
4. Light switch.	Battery voltage.	Test orange wire.
5. Light switch.	Battery voltage.	Test front light switch.
6. Front light.	Battery voltage.	Test orange/black wires.
7. Front light ground.	Greater than 0 - less than 0.2 volts.	Greater than 0.2 volts - test front light ground circuit. 0 volts - test lamp.

MX,24015HE,8 -19-27SEP91



FRONTLIGHT CIRCUIT TEST POINTS

M44857 -19-23JUL91

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MX,24015HE,9 -19-27SEP91

HOURMETER/VOLTMETER CIRCUIT TEST POINTS

TEST CONDITIONS UNLESS SPECIFIED OTHERWISE:
•Park brake engaged
•Transaxle in neutral
•Key switch in “on” position

Test Points	Normal	If Not Normal
1. Battery positive terminal.	11.8—13.2 volts.	Test battery.
2. Key switch terminal ’B’.	Battery voltage.	Test red wires, and circuit breaker.
3. Key switch terminal ’A’.	Battery voltage.	Test key switch.
4. Voltmeter orange lead.	Battery voltage.	Test orange wire to voltmeter.
5. Hourmeter orange lead.	Battery voltage.	Test orange wire to hourmeter.
6. Hourmeter ground.	Greater than 0 - less than 0.2 volts.	Greater than 0.2 volts - check hourmeter ground circuit. 0 volts - replace hourmeter.
7. Voltmeter ground.	Greater than 0 - less than 0.2 volts.	Greater than 0.2 volts - check voltmeter ground circuit. 0 volts - replace voltmeter.

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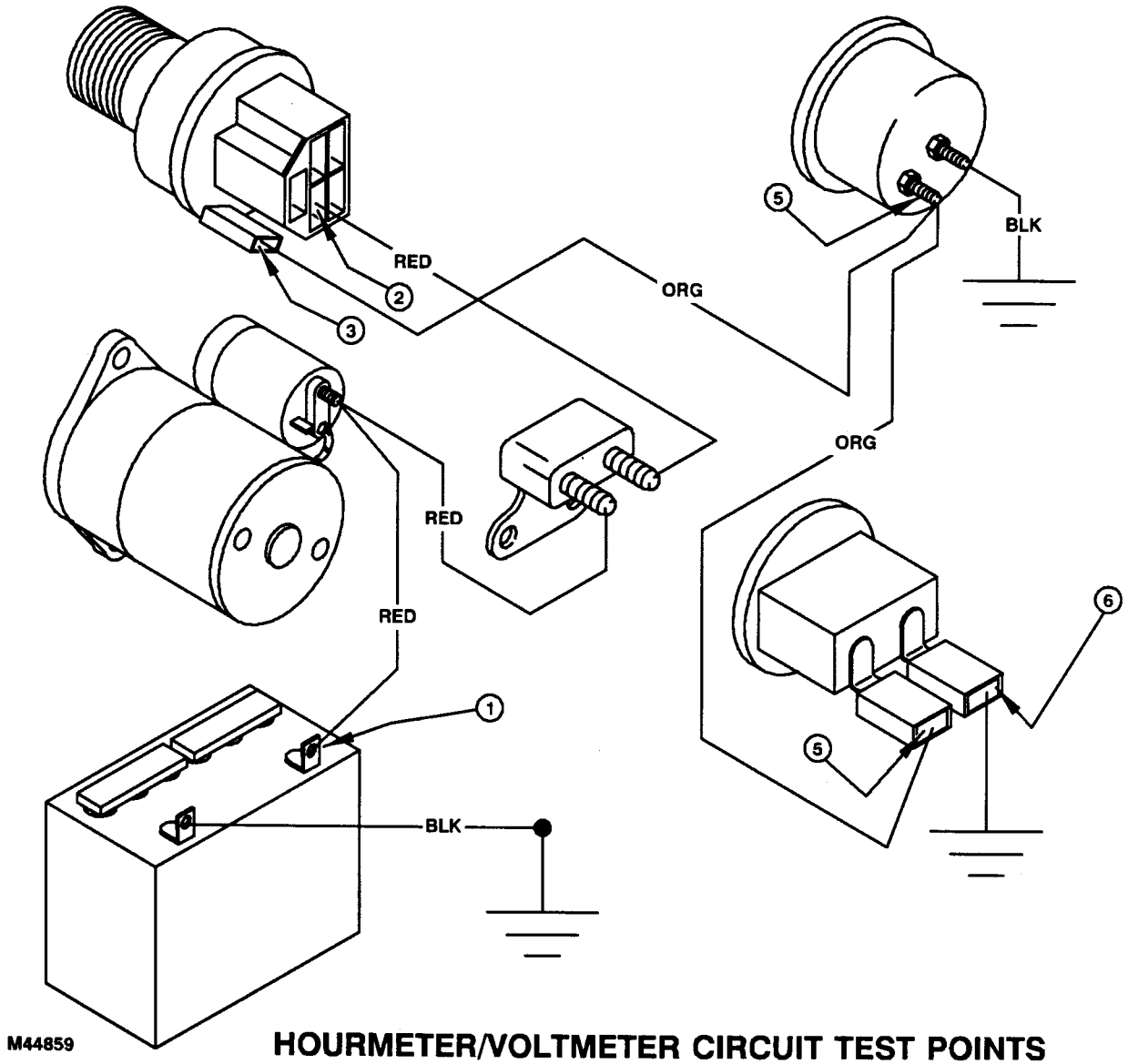


HOURMETER/VOLTMETER CIRCUIT TEST POINTS

M44859 -19-23JUL91

Slide M44859

MX,24015HE,11 -19-27SEP91

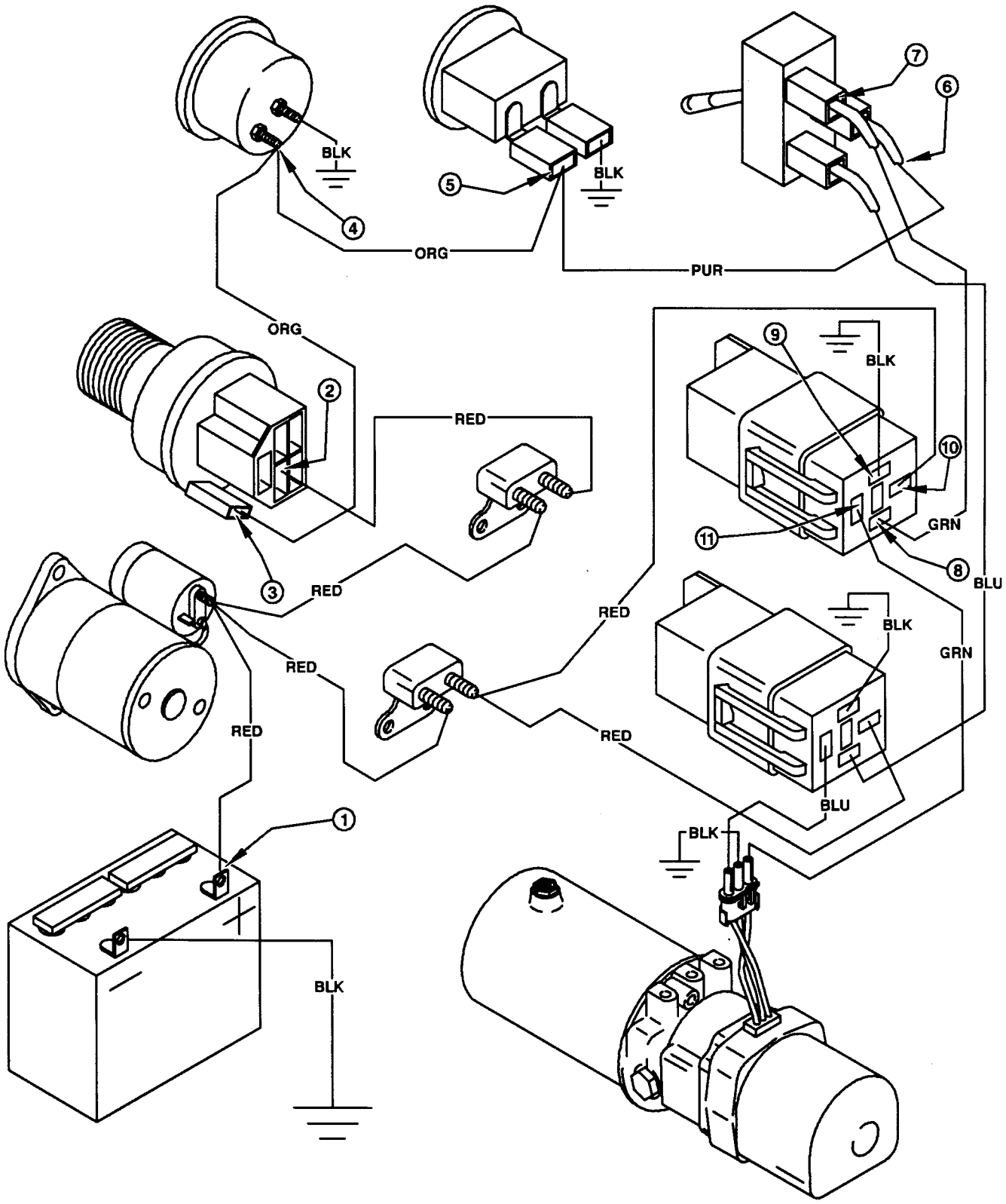
ELECTRIC-HYDRAULIC LIFT CIRCUIT TEST POINTS

TEST CONDITIONS UNLESS SPECIFIED OTHERWISE:
•Park brake engaged
•Transaxle in neutral
•Key switch on position
•Hydraulic pump switch raise position

Test/Check Points	Normal	If Not Normal
1. Battery positive terminal.	11.8—13.2 volts.	Test battery.
2. Key switch terminal 'B'.	Battery voltage.	Test red wires, and circuit breaker.
3. Key switch terminal 'A'.	Battery voltage.	Test key switch.
4. Voltmeter orange lead.	Battery voltage.	Test orange wire.
5. Hourmeter orange & purple lead.	Battery voltage.	Test orange wire to voltmeter.
6. Hydraulic pump switch purple lead.	Battery voltage.	Test purple wires.
7. Hydraulic pump switch green lead.	Battery voltage.	Test hydraulic pump switch.
8. Hydraulic pump LIFT relay terminal 85 (green lead).	Battery voltage.	Test green wire.
9. Hydraulic pump LIFT relay ground terminal 86 (black lead) circuit.	Greater than 0 - less than 0.2 volts.	Greater than 0.2 volts - test hydraulic pump relay ground. 0 volts - test hydraulic pump relay.
10. Hydraulic pump lift relay terminal 30 (red lead).	Battery voltage.	Test red wire to relay.
11. Hydraulic pump relay terminal 87 (larger green lead).	Battery voltage.	Test/replace hydraulic pump relay.

Slide M44860

MX,24015HE,12 -19-27SEP91



M44860

HYDRAULIC LIFT TEST POINTS - LIFT

M44860 -19-23JUL91

MX,24015HE,13 -19-27SEP91

ELECTRIC-HYDRAULIC LOWER CIRCUIT TEST POINTS

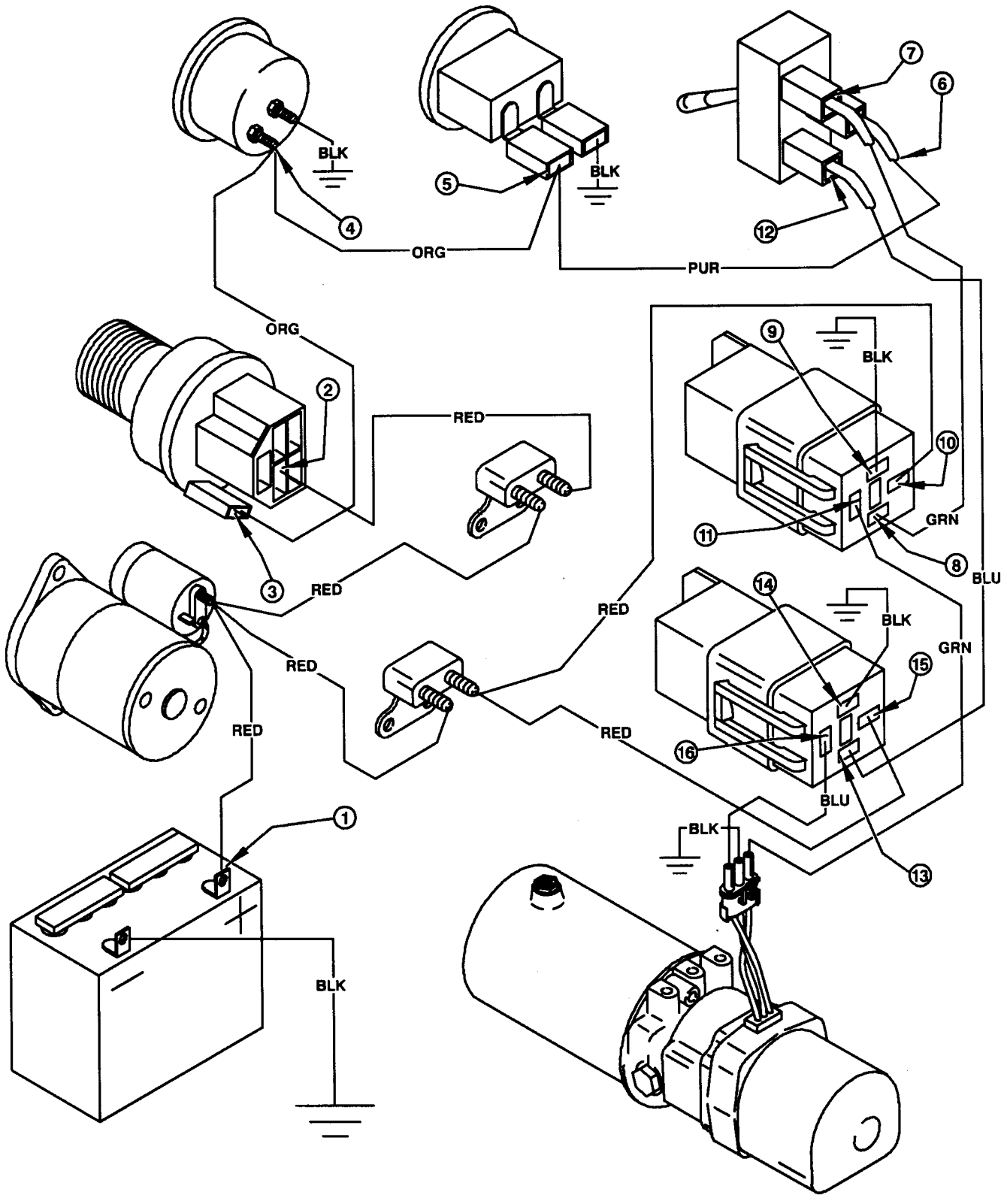
TEST CONDITIONS:
•Hydraulic pump switch in lower position

Test/Check Points	Normal	If Not Normal
12. Hydraulic pump switch blue lead.	Battery voltage.	Test hydraulic pump switch.
13. Hydraulic pump lower relay terminal 85 (blue lead).	Battery voltage.	Test blue wire.
14. Hydraulic pump lower relay ground terminal 86 (black lead).	Greater than 0 - less than 0.2 volts.	Greater than 0.2 - test hydraulic pump relay ground circuit. 0 volts - test/replace hydraulic pump relay.
15. Hydraulic pump lower relay terminal 30 (red lead).	Battery voltage.	Test red wire.
16. Hydraulic pump lower relay terminal 87 (larger blue lead).	Battery voltage.	Test/replace hydraulic pump relay.

240
15
14

Slide M44861

MX,24015HE,14 -19-27SEP91



M44861

HYDRAULIC LIFT TEST POINTS - LOWER

M44861 -19-23JUL91

MX,24015HE,15 -19-27SEP91

BATTERY VOLTAGE & SPECIFIC GRAVITY TESTS

REASON:
To check voltage and determine condition of battery.

EQUIPMENT:
•Voltmeter or JTO5685 Battery Tester
•Hydrometer

240
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16

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 added, charge battery for 20 minutes at 10 amps.

4. Remove surface charge by placing a small load on the battery for 15 seconds.

5. Check battery voltage with voltmeter or JTO5685 Battery Tester.

6. Check specific gravity of each cell with a hydrometer.

SPECIFICATIONS:
•Minimum battery 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. See CHARGE BATTERY in this Group.

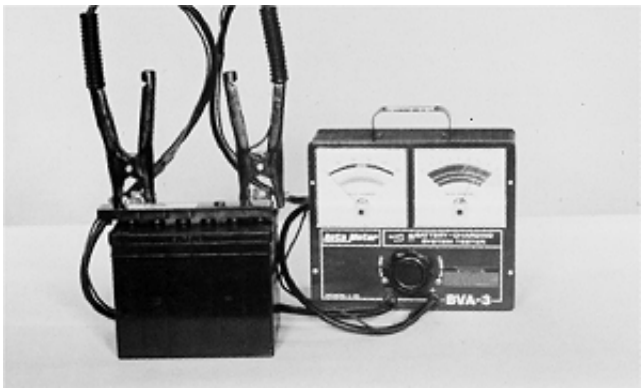
•Battery voltage more than 12.4 VDC, test specific gravity.

•All cells less than 1.175, charge battery at 10 amp rate. See CHARGE BATTERY in this Group.

•All cells less than 1.225 with less than 50 point variation, charge battery at 10 amp rate. See CHARGE BATTERY in this Group.

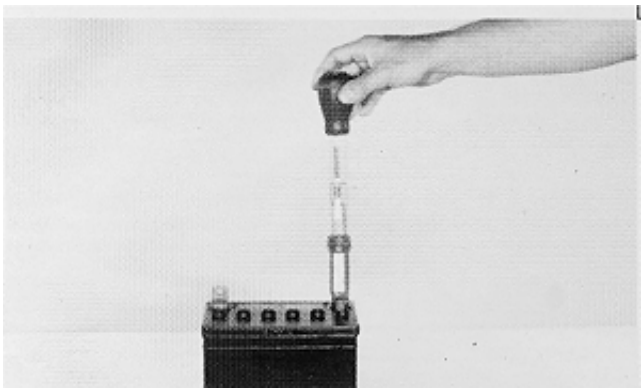
•All cells more than 1.225 with less than 50 point variation, load test battery. See LOAD TEST BATTERY in this Group.

•More than 50 point variation: replace battery.



-UN-18SEP90
M49595

Slide M49595



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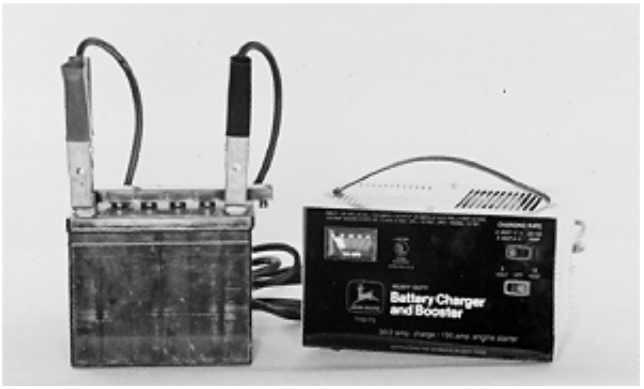
MX,24015HE,15A -19-27SEP91

CHARGE BATTERY



Slide M49598

REASON:
To increase battery charge after battery has been discharged.

EQUIPMENT:
•Battery charger (variable rate)

PROCEDURE:

NOTE: See BATTERY TEST in this group before charging battery.

1. Connect variable rate charger to battery.

NOTE: Maximum charge time at boost setting is 10 minutes. Allow an additional 5 minutes for each 10 degrees below 70 degrees F.

2. Start charger at slow rate. Increase charge rate one setting at a time. Check charger ammeter after 1 minute at each setting. Maintain 10 amp charge rate. Use boost setting as necessary.

3. Check if battery is accepting a 10 amp charge after 10 minutes at boost setting.

—Battery will not accept 10 amp charge after 10 minutes at boost setting: replace battery.

—Battery is accepting 10 amp charge after 10 minutes at boost setting, and battery did not need water: go to steps 6 and 7.

—Battery is accepting 10 amp charge after 10 minutes at boost setting, but battery did need water or all cells were below 1.175: 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.

—Less than 50 point variation between cells: go to steps 6 and 7.

NOTE: If battery was discharged at 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 1.230-1.265 points.

7. Load test battery. See LOAD TEST BATTERY in this Group.

MX,24015GC,39 -19-27SEP91

LOAD TEST BATTERY

REASON:
To check condition of battery under load.

EQUIPMENT:
•JTO5685 Battery Tester

CONNECTIONS:
1. Turn load knob (A) of tester counter-clockwise to off.

2. Connect tester red cable (B) to battery positive post.

3. Connect tester black cable (C) to battery negative post.

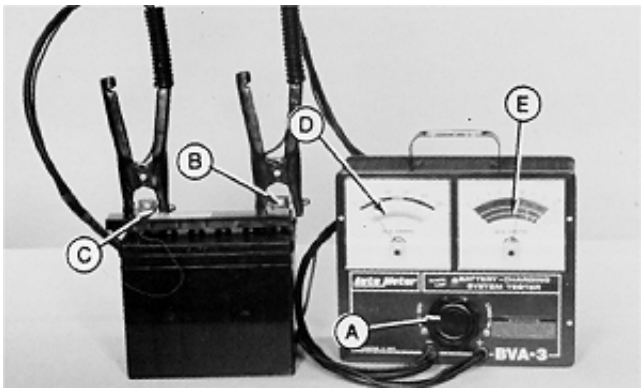
PROCEDURE:
1. Turn load knob of tester clockwise until amperage reading (D) is equal to:
   A. Cold cranking amperage rating (use blue scale).
   —OR—
   B. Three times ampere hour rating (use black scale).

2. Hold for 15 seconds and turn load knob of tester off.

3. Repeat procedure steps 1 and 2 from above and read condition of battery at DC Volts scale (E).

RESULTS:
•If the battery does not pass the test and has not been charged, charge battery and retest. See CHARGE BATTERY in this Group.

•If the battery does not pass the test and has been charged, replace battery.



M49597 -UN-18SEP90

Slide M49597

A—Tester Load Knob
B—Tester Red Cable
C—Tester Black Cable
D—Amperage
E—Voltage

MX,24015HE,15B -19-27SEP91

REGULATED VOLTAGE TEST

REASON:
To determine DC voltage output of charging system.

EQUIPMENT:
•Voltmeter

CONNECTIONS:
1. Park brake engaged. PTO disengaged.

2. Remove surface charge on battery by placing a small load on it for about 15 seconds.

3. Set voltmeter for 25 or 50 DC volts scale.

4. Connect meter red lead (A) to battery positive post.

5. Connect meter black lead (B) to battery negative post.

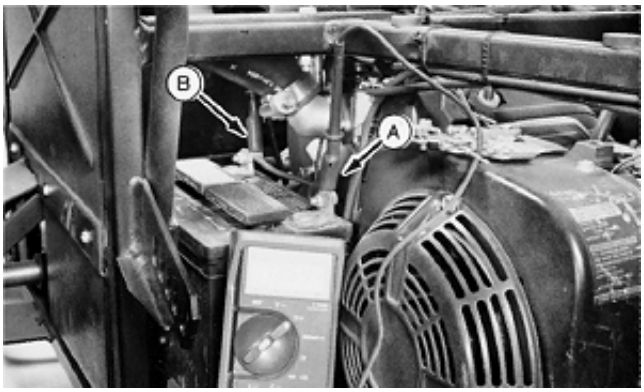
PROCEDURE:
1. Start engine and run at fast idle (3800 rpm).

2. Read meter several times during 5 minutes of running time.

SPECIFICATIONS:
•Regulated voltage .. 12.2—15.0 VDC at 3800 rpm.

RESULTS:
•If the DC voltage stays below the minimum specification, run the Stator Unregulated Output Test. (See procedure in this group.)

•If the DC voltage goes above the maximum specification, replace the regulator.



M44864 -UN-05SEP91

Slide M44864

MX,24015HE,20 -19-27SEP91

STATOR UNREGULATED OUTPUT TEST

REASON:
To determine the AC voltage output of stator.

EQUIPMENT:
•Voltmeter

CONNECTIONS:
1. Park brake engaged. PTO disengaged.

2. Separate stator wire connector.

3. Connect meter leads (A) to terminals of engine side of stator wire connector.

PROCEDURE:
1. Start engine and run at fast idle (3800 rpm).

2. Read meter.

SPECIFICATIONS:
•Stator unregulated voltage .. minimum 34 VAC at 3800 rpm.

RESULTS:
•If the unregulated voltage is below minimum specification, replace stator and retest.

•If the unregulated voltage is still below specification after replacing the stator, replace flywheel.

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MX,24015HE,21 -19-27SEP91

AMPERAGE OUTPUT TEST

REASON:
To determine amperage output of the charging system.

EQUIPMENT:
•JTO5712 Current Gun or equivalent
•JTO5685 Battery Tester

CONNECTIONS:
1. Park brake engaged. PTO disengaged.

2. Place current gun (A) over red wires (B) to starter.

3. Turn load knob (C) of battery tester (D) off (fully counter-clockwise).

4. Connect red battery tester clamp (E) to positive post of battery.

5. Connect black battery tester clamp to frame.

PROCEDURE:
1. Start engine and run at fast idle (3800 rpm).

NOTE: Perform this test as quickly as possible to prevent damage to the electrical system components. DO NOT apply a full load to the battery for more than 10 seconds.

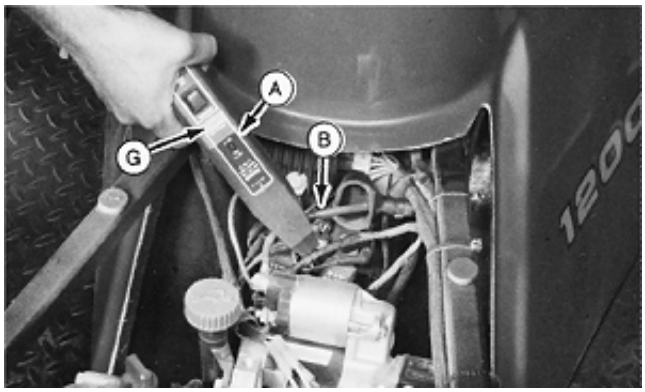
2. Turn load knob clockwise until voltage (F) reads 11 VDC.

3. Read amperage (G) at current gun.

4. Turn load knob off (fully counter-clockwise).

SPECIFICATIONS:
•Amperage .. Minimum 13 amps at 3800 rpm.

RESULTS:
•If the amperage output is below minimum specification, perform the Stator Unregulated Output Test. (See procedure in this group.)



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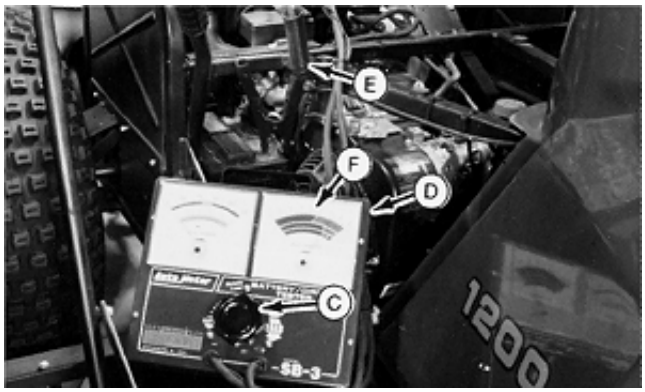
Slide M44885



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M44886

Slide M44886

A—Current Gun
B—Red Wires
C—Load Knob
D—Battery Tester
E—Red Clamp
F—Voltage
G—Amperage

MX,24015HE,22 -19-27SEP91

STARTER SOLENOID TEST

REASON:
To determine if starter solenoid or starter motor is defective.

EQUIPMENT:
•Jumper Wire

CONNECTIONS:
1. Put transaxle/transmission is neutral. Move key switch to off position.

2. Engage park brake.

3. Disconnect and ground spark plug lead.

4. Disconnect purple wire (A) from starter solenoid terminal (B).

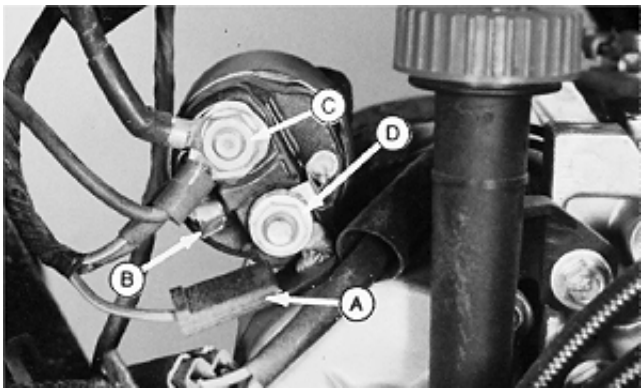
PROCEDURE:
1. Connect jumper wire to positive battery terminal and briefly jump to starter solenoid terminal (B).
   —Starter runs: solenoid is good, check circuit wiring. (See Cranking Circuit Test Points in this group.)
   —Starter does not run: go to step 2.

2. Remove red and black rubber boot from terminals (C) and (D).

NOTE: Before performing below test, make certain to place transaxle in neutral and key switch in OFF position.

3. Connect jumper wire between starter solenoid large terminals (C) and (D).
   —Starter runs: Replace solenoid.
   —Starter does not run: Check battery cables, then replace starter.

4. Turn load knob off (fully counter-clockwise).



Slide M44867

A—Purple Wire
B—Starter Solenoid Terminal
C—Terminal
D—Terminal

MX,24015HE,23 -19-27SEP91

STARTER LOADED AMPERAGE AND RPM TESTS

REASON:
To determine proper operation of starting motor.

EQUIPMENT:
•JTO5685 Battery Tester
•JTO5719 Photo Tachometer

CONNECTIONS:
1. Park brake engaged. PTO disengaged.

2. Turn knob (A) of battery tester (B) off (fully counter-clockwise).

3. Connect tester red clamp (C) to battery positive post and tester black clamp to frame of unit.

4. Remove flywheel screen and install tachometer reflective tape on flywheel.

5. Remove spark plug high tension lead and ground to engine.

PROCEDURE:
1. Crank engine with starter and read engine rpm (D) and DC voltage (E).

2. Turn key switch to OFF position.

NOTE: Conduct the following procedure as quickly as possible to prevent damage to electrical components.

3. Turn battery tester load knob clockwise until voltage matches cranking voltage.

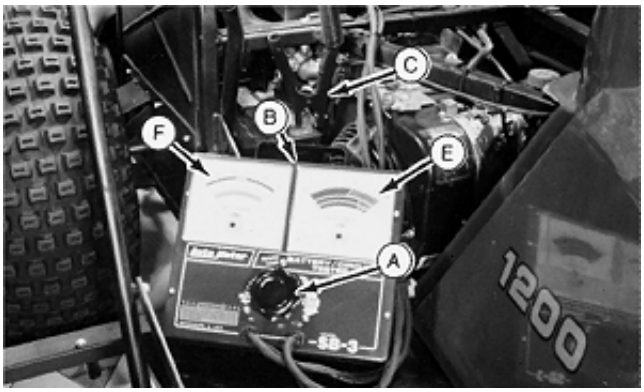
4. Read DC amperage (F) on battery tester.

5. Turn knob of battery tester off (fully counter-clockwise).

SPECIFICATIONS:
•Engine speed .. minimum 350 rpm.
•Starter draw .. maximum 85 amps @ minimum 500 rpm.

RESULTS:
•If engine rpms and amperage draw are both below specifications, check for excessive drag in engine or drive train.

•If amperage draw is above specifications, perform the Starter No Load Amperage Test. (See procedure in this group.)



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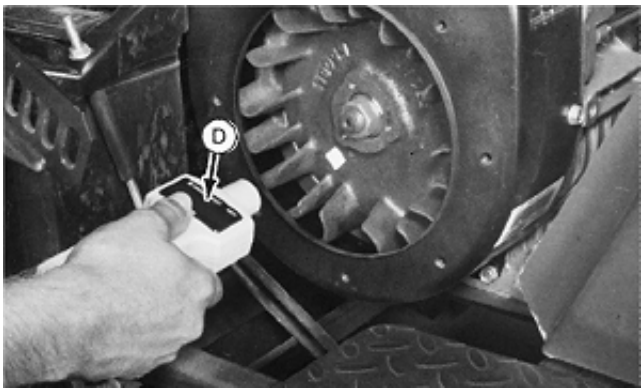
M44868

Slide M44868



-UN-05SEP91
M44883

Slide M44883

A—Knob
B—Battery Tester
C—Tester Rod Clamp
D—Engine RPM
E—DC Voltage
F—DC Amperage

MX,24015HE,24 -19-27SEP91

STARTER NO-LOAD AMPERAGE TEST

REASON:
To determine proper function of starting motor.

EQUIPMENT:
•JTO5712 Current Gun or equivalent
•12 Volt Battery
•Battery Jumper Cables
•Jumper Wire

CONNECTIONS:
1. Remove starter from engine.

2. Clamp starter in vise.

3. Connect one jumper cable between battery positive terminal and starter battery terminal (A).

4. Place current gun over cable between battery positive and starter.

5. Connect other jumper cable between battery negative terminal and body of starter.

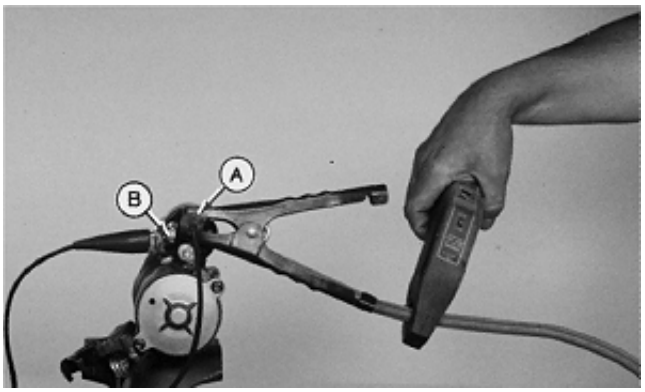
6. Connect one end of jumper wire to terminal (A) of starter.

PROCEDURE:
1. Touch free end of jumper wire to starter solenoid engagement terminal (B) of starter.

2. Read amperage draw.

SPECIFICATIONS:
•Starter no-load draw .. maximum 60 amps DC.

RESULTS:
•If the starter does not pass the test, disassemble and repair as required. See Group 60 of CTM-5.

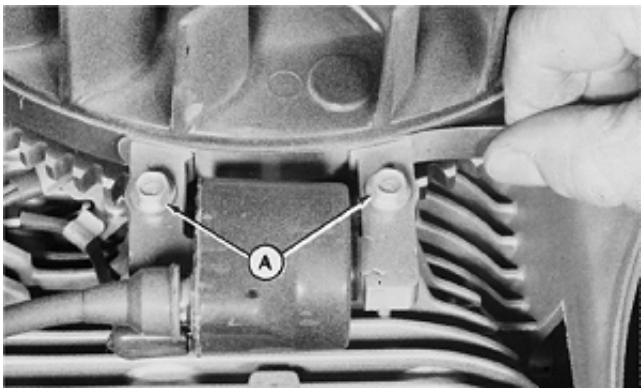


Slide M45867

A—Starter Battery Terminal
B—Solenoid Engagement Terminal

MX,24015HE,25 -19-27SEP91

ADJUST IGNITION COIL AIR GAP



Slide M45869

REASON:
To adjust the air gap between the ignition coil and the flywheel to a specific dimension needed for proper ignition timing.

EQUIPMENT:
•0.3 mm (0.012 in.) feeler gauge

CONNECTIONS:
1. Put transaxle/transmission in neutral.

2. Put key switch in off position.

3. Remove blower housing.

PROCEDURE:
1. Turn flywheel magnet away from coil.

2. Loosen coil mounting screws (A).

IMPORTANT: Both coil legs must have the same air gap as the engine is very sensitive to this adjustment.

3. Insert a feeler gauge between flywheel and coil legs. Align flywheel magnet with coil. Adjust gap to 0.3 mm (0.012 in.), or if a misfire conditions exists, adjust gap to 0.25 mm (0.010 in.).

4. Hold coil in this position and tighten coil mounting screws. Turn flywheel to remove feeler gauge.

SPECIFICATIONS:
•Ignition coil air gap .. 0.3 mm (0.012 in.)

MX,24015HE,25A -19-27SEP91

IGNITION COIL TEST

REASON:
To determine condition of ignition coil windings.

EQUIPMENT:
•Ohmmeter

PROCEDURE:
1. Put transaxle/transmission in neutral. Put key switch in OFF position.

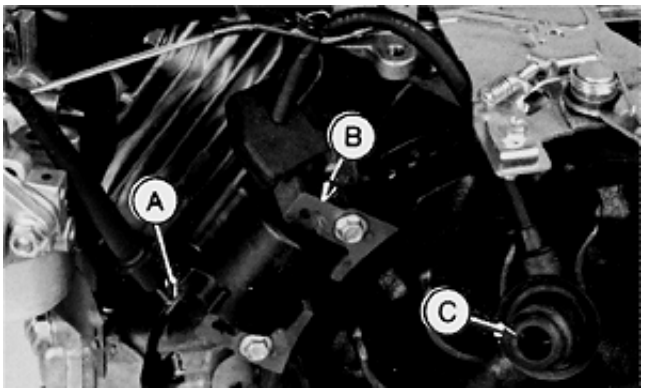
2. Remove spark plug cap from spark plug wire.

3. Disconnect primary lead wire.

4. Measure resistance between primary lead (A) and core (B), and between spark plug lead (C) and core (B).

SPECIFICATIONS:
•Primary lead and core resistance .. 0.67—1.10 ohms
•Spark plug lead and core resistance .. 6—10 K ohms

RESULTS:
•If resistance does not meet specifications, replace the ignition coil.



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MX,24015HE,28 -19-27SEP91

IGNITION MODULE TEST

REASON:
To check if ignition module is good.

EQUIPMENT:
•No special equipment required.

PROCEDURE:
Due to variations in meters; that the ignition module is very sensitive to the type of meter used; and that the possible tests do not cover all malfunctions; the best way to determine if the ignition module is good is to replace the questionable ignition module with a known good ignition module.

RESULTS:
•If the new ignition module does not solve the problem, check the other ignition components for the cause of the malfunction.

MX,24015HE,29 -19-27SEP91

SPARK PLUG GAP ADJUSTMENT

REASON:
To maintain the correct gap between the center electrode and the tab needed to produce a good spark.

EQUIPMENT:
•0.64 mm (0.025 in.) Feeler Gauge

PROCEDURE:

IMPORTANT: Do not clean spark plug with sand paper or abrasives. Engine scoring can result.

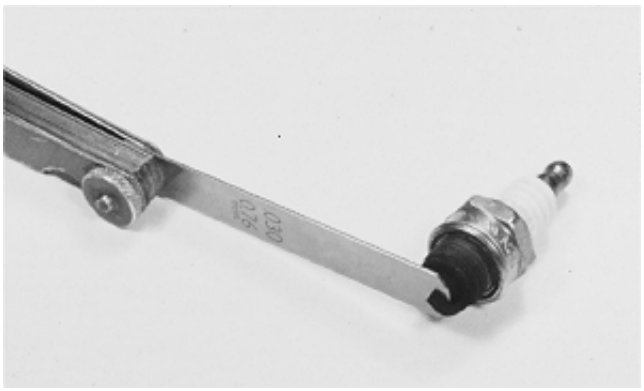
1. Scrape or wire brush deposits from spark plug.

2. Inspect spark plug for:
   —Cracked porcelain.
   —Pitted or damaged electrodes.

3. Check spark plug gap (A) using a feeler gauge. Set gap to 0.64 mm (0.025 in.).

4. Install and tighten spark plug to 25 N·m (18 lb-ft).

SPECIFICATIONS:
•Spark plug gap .. 0.6—0.7 mm (0.023—0.028 in.)
•Spark plug torque .. 25 N·m (18 lb-ft).



Slide M48365

MX,24015HE,30 -19-27SEP91

KEY SWITCH TEST

REASON:
Determine proper operation of key switch.

EQUIPMENT:
•Ohmmeter.

CONNECTIONS:
1. Set ohmmeter to 1X ohms scale.

NOTE: On analog (swing needle) ohmmeters, set zero point before every test.

2. Remove connectors from back of key switch.

3, Remove key switch from machine.

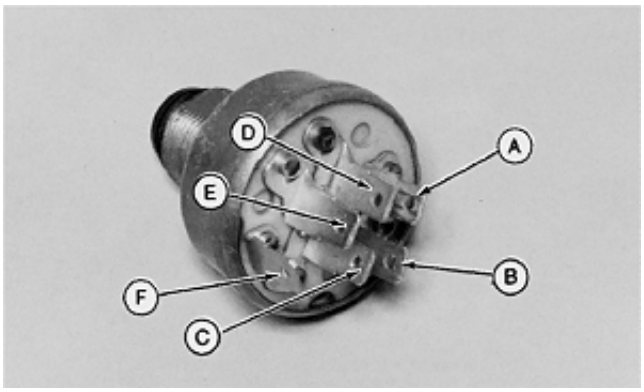
4. Connect meter leads to pairs of switch posts and compare to specifications.

PROCEDURE:
1. For ignition circuit, turn key switch from off to run position.

2. For starting circuit, turn key switch from run to start position.

SPECIFICATIONS:
•Key switch in off position .. continuity between posts A and B.
•Key switch in off position .. no continuity between any other pairs of posts.
•Key switch in run position .. no continuity between posts A and B.
•Key switch in run position .. continuity between posts C and F.
•Key switch in run position .. no continuity between posts D and E.
•Key switch in start position .. no continuity between posts A and B.
•Key switch in start position .. continuity between posts C and F.
•Key switch in start position .. continuity between posts D and E.

RESULTS:
•If the key switch does not pass all tests, replace switch.



M49684 -UN-27SEP90

Slide M49684

A—Magneto Post
B—Ground Post
C—Battery Post
D—S1 Post
E—S2 Post
F—Accessory Post

MX,24015HE,31A -19-27SEP91

FLYWHEEL MAGNET TEST

REASON:
To check strength of flywheel magnets.

NOTE: This is a rough test and should only be used to determine flywheel magnet strength only if no other cause for weakness or no spark is found.

EQUIPMENT:
•No special equipment needed

CONNECTIONS:
1. Park brake engaged. PTO disengaged. Key switch in OFF position.

2. Remove air duct and fan housing.

3. Rotate flywheel so magnet is away from coil.

PROCEDURE:
1. Loosely hold handle of steel shaft screwdriver so that shaft is about 25 mm (1 in.) away from magnet.

RESULTS:
•If screwdriver shank is not pulled into magnet, flywheel will need to be replaced.

Slide M45476

MX,24015HE,32 -19-27SEP91

TRANSAXLE NEUTRAL SWITCH TEST

REASON:
To make sure the transaxle neutral switch has continuity when the transaxle is in neutral.

EQUIPMENT:
•Ohmmeter or continuity tester

CONNECTIONS:
1. Turn key switch off.

2. Put transaxle lever in neutral position.

3. Disconnect transaxle neutral switch connector.

PROCEDURE:
1. Check continuity across terminals (A).

2. Put transaxle lever in gear.

3. Check continuity across terminals.

SPECIFICATIONS:
•Switch should have continuity only when the transaxle lever is in neutral.

RESULTS:
•If the continuity is not correct, replace switch.
•Also check transaxle shift linkage for wear at point of switch contact.

M44871 -UN-27AUG91

Slide M44871

MX,24015HE,33 -19-27SEP91

OPTIONAL HYDRAULIC LIFT/LOWER RELAYS TEST

REASON:
To check relay terminal continuity in the energized and de-energized condition.

EQUIPMENT:
•Ohmmeter or continuity tester
•Jumper wire

240
15
32

PROCEDURE:
1. Put transaxle in neutral.

2. Turn key switch to off position.

3. Disconnect relay connector.

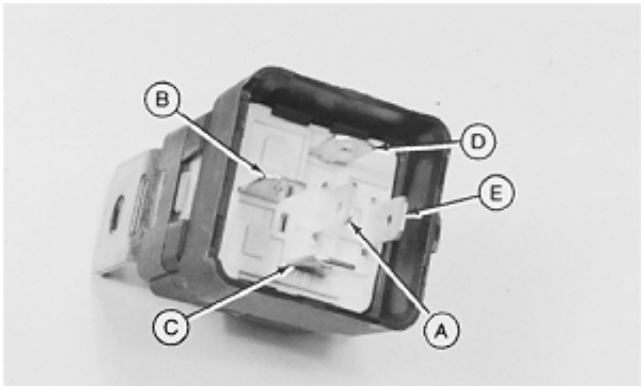
4. Check terminal continuity using an ohmmeter or continuity tester.

5. There should be continuity between relay terminals 87A-30 (A and B) and 85-86 (C and D). There should be no continuity between relay terminals 87-30 (E and B).

6. Connect a jumper wire from battery positive terminal to relay terminal 85 (C). Connect a jumper wire from relay terminal 86 (D) to battery negative terminal.

7. There should be continuity between relay terminals 87-30 (E and B).

RESULTS:
•If continuity is not correct, replace relay.



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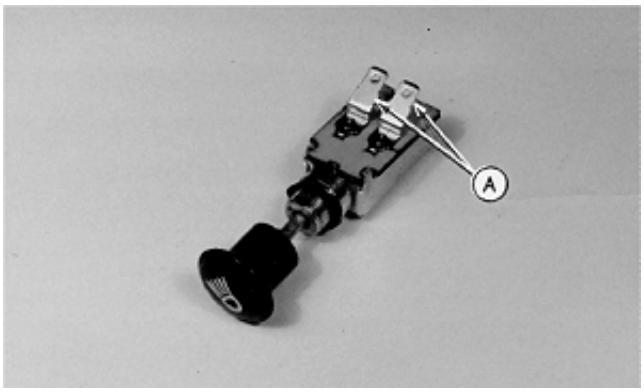
MX,24015HE,34 -19-27SEP91

OPTIONAL FRONT LIGHT SWITCH TEST



M45479 -UN-29JAN90

Slide M45479

REASON:
To make sure the front light switch terminals have continuity when the front light switch is on.

EQUIPMENT:
•Ohmmeter or continuity tester

CONNECTIONS:
1. Put transaxle/transmission in neutral.

2. Put key switch in OFF position.

3. Disconnect front light switch connector.

PROCEDURE:
1. Move front light switch to the ON position.

2. Check continuity across switch terminals (A). Terminals should have continuity.

3. Move front light switch to the OFF position. Terminals should not have continuity.

SPECIFICATIONS:
•Terminals should have continuity only when the switch is ON.

RESULTS:
•If continuity is not correct, replace front light switch.

MX,24015HE,35 -19-27SEP91

GROUND CIRCUIT TEST

REASON:
To check for opens or poor connections in the ground circuit.

EQUIPMENT:
•Ohmmeter or continuity tester

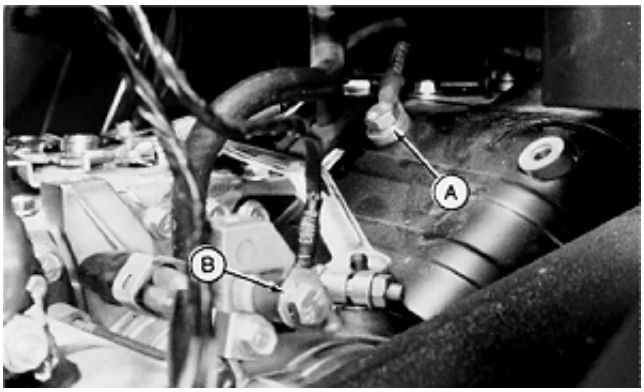
PROCEDURE:
1. Turn key switch to OFF position.

2. Put transaxle/transmission in neutral.

3. Connect ohmmeter or continuity tester to negative terminal of battery and ground terminal of circuit or component to be tested.

4. Check for continuity.

RESULTS:
•If continuity is not indicated, check for open wiring or poor connections.



A—Battery Negative Terminal To Engine Ground
B—Wiring Harness To Engine Ground

MX,24015HE,36 -19-27SEP91

SCHEMATICS INFORMATION

The wiring schematics are drawn with the power in, or 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 the off position.

MX,24020HE,1 -19-27SEP91

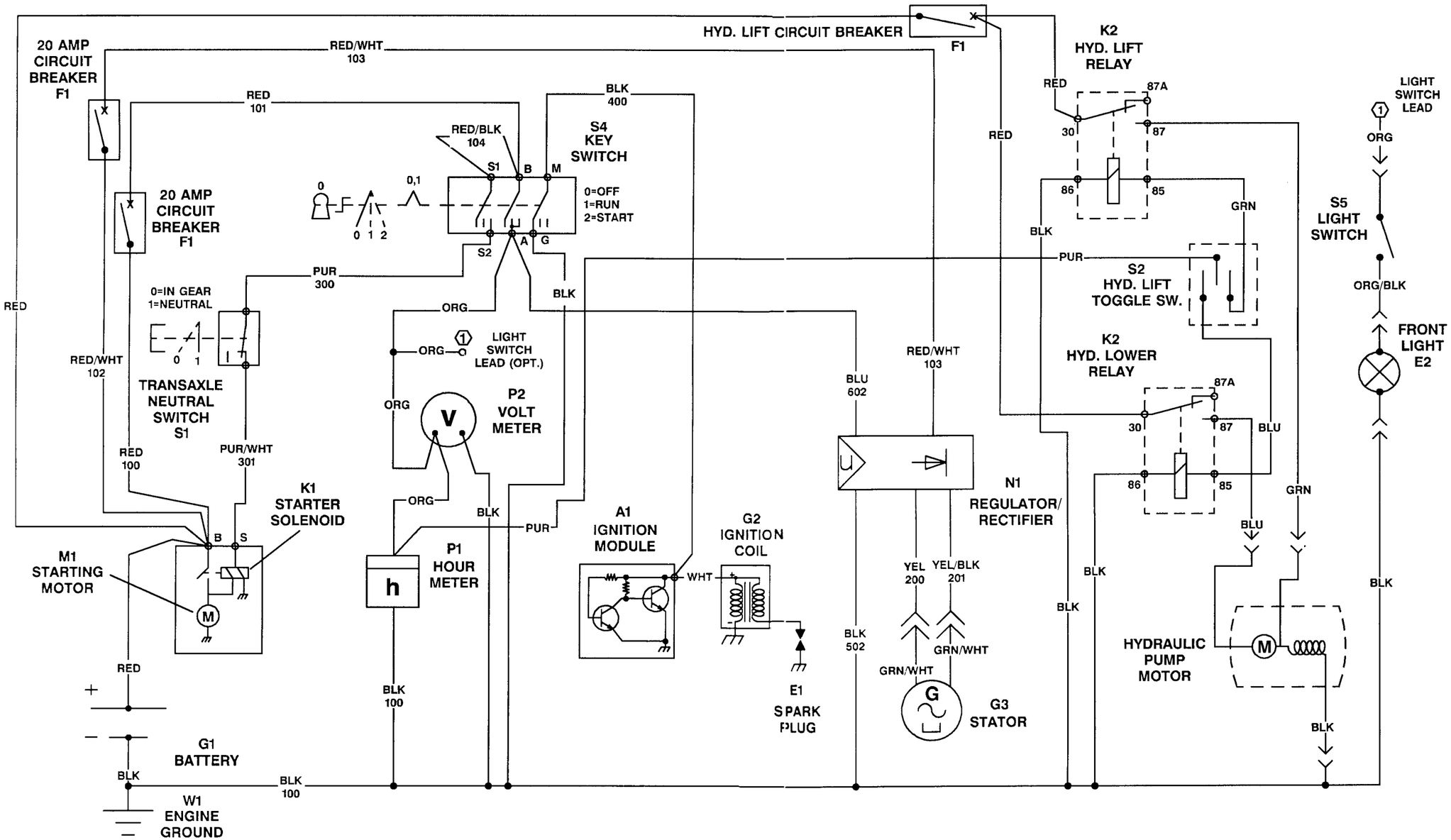
LEGEND FOR 1200 BUNKER RAKE ELECTRICAL SCHEMATIC

A1—Ignition Module
E1—Spark Plug
E2—Front Light
F1—20 Amp Circuit Breaker
G1—Battery
G2—Ignition Coil
G3—Stator
K1—Starter Solenoid
K2—Hydraulic Lift Relays
M1—Starter Motor
N1—Regulator-Rectifier
P1—Hourmeter
S1—Transaxle Neutral Switch
S2—Hydraulic Lift Toggle Switch
S4—Key Switch
S5—Front Light Switch
W1—Engine Ground
SE1—Power and Cranking Circuits
SE2—Key Switch, Voltmeter, Hourmeter
SE3—Ignition Circuit
SE4—Charging Circuit
SE5—Hydraulic Lift and Light Switch Circuit

240
20
2

Slide M44846

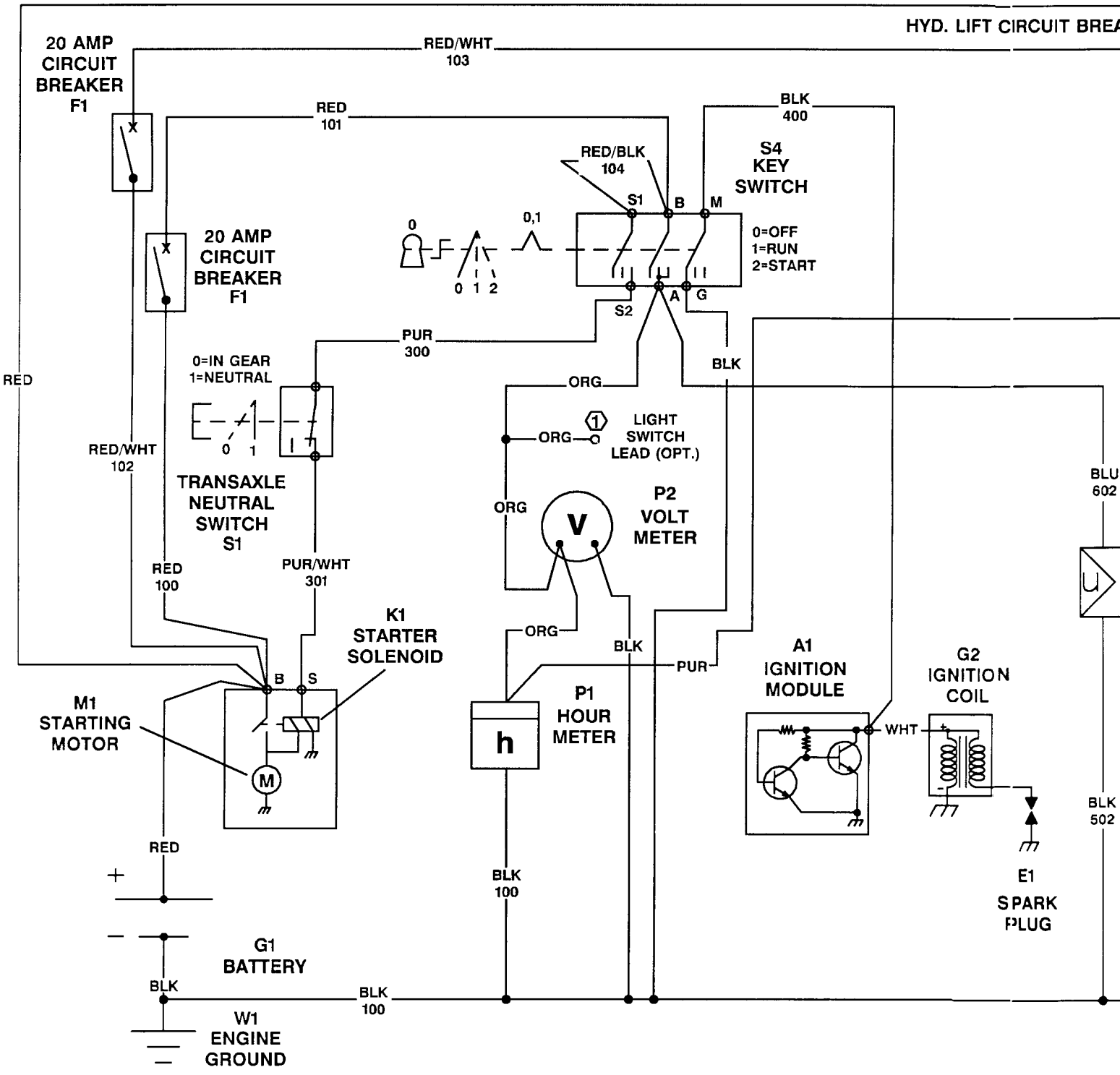
MX,24020HE,2 -19-27SEP91



SE1-POWER AND CRANKING CIRCUIT	SE2-KEY SWITCH	SE3-IGNITION CIRCUIT	SE4-CHARGING CIRCUIT	SE5-HYDRAULIC LIFT AND LIGHT SWITCH CIRCUITS (OPT.)

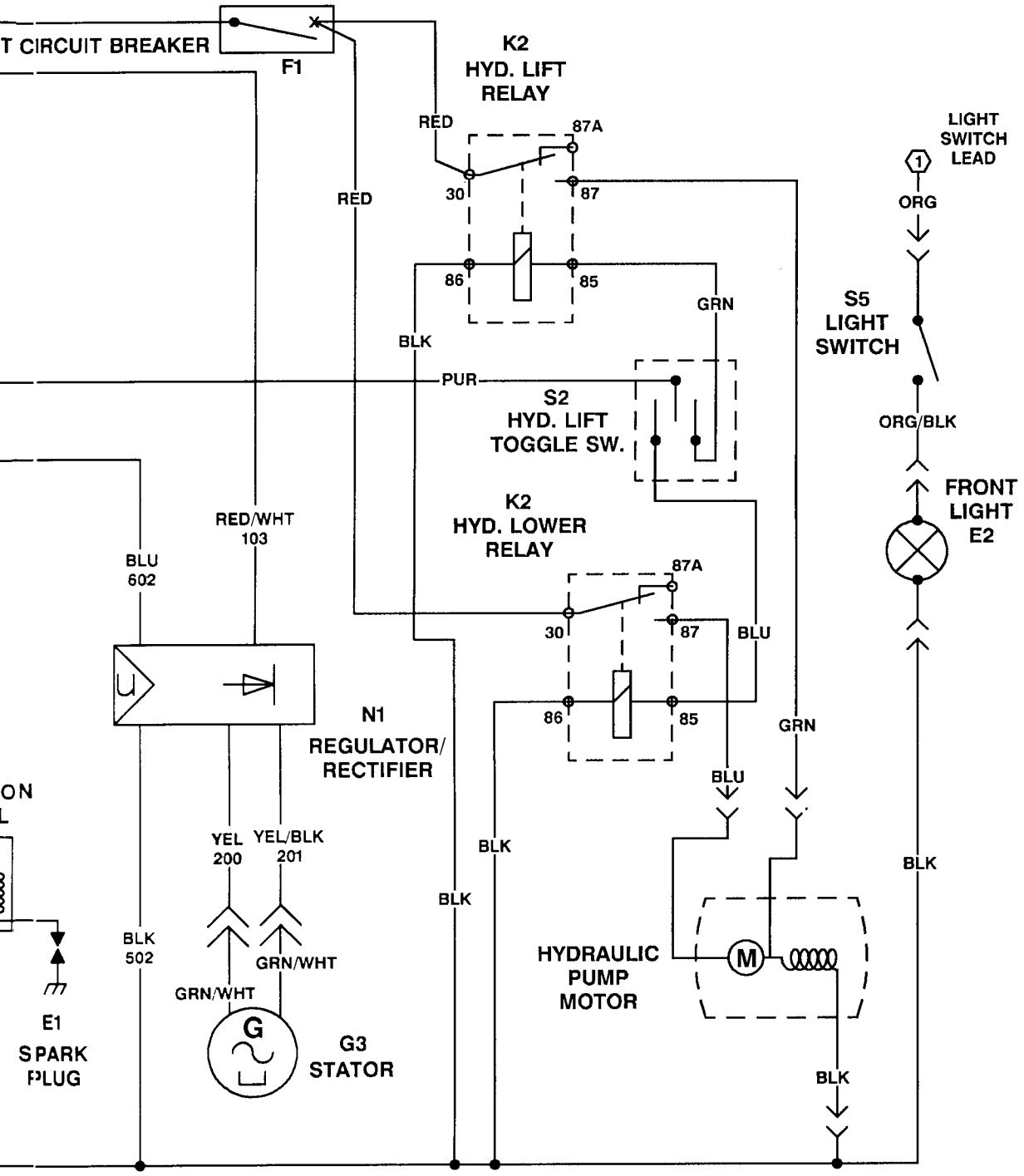
M44846

1200 BUNKER RAKE - ELECTRICAL SCHEMATIC (WITH OPTIONAL HYDRAULIC LIFT AND FRONT LIGHT)



M44846

1200 BUNKER RAKE - ELECTRICAL SCHEMATIC (WITH OPT

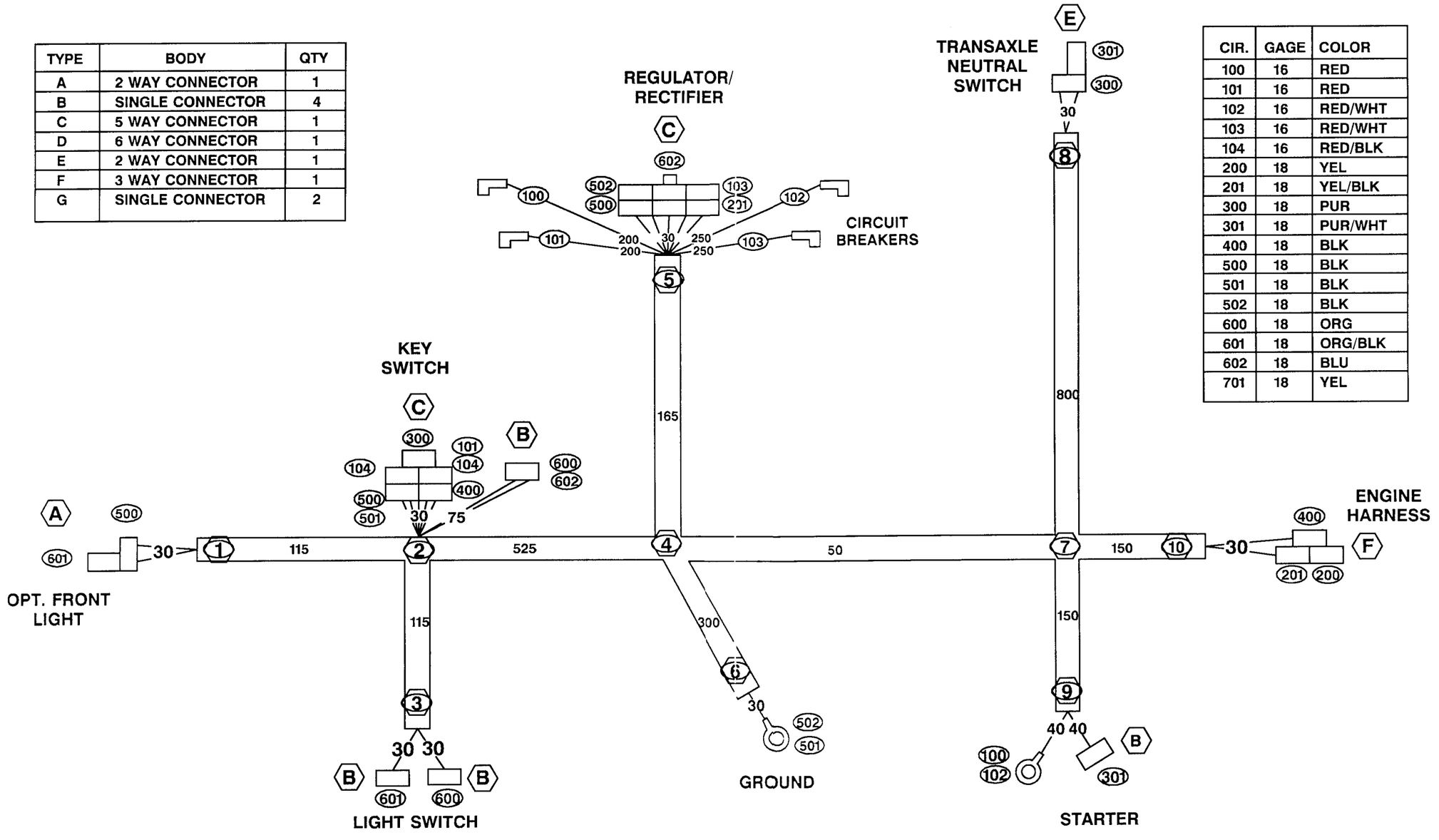


	SE4-CHARGING CIRCUIT	SE5-HYDRAULIC LIFT AND LIGHT SWITCH CIRCUITS (OPT.)

(WITH OPTIONAL HYDRAULIC LIFT AND FRONT LIGHT)

Slide M44879

TYPE	BODY	QTY
A	2 WAY CONNECTOR	1
B	SINGLE CONNECTOR	4
C	5 WAY CONNECTOR	1
D	6 WAY CONNECTOR	1
E	2 WAY CONNECTOR	1
F	3 WAY CONNECTOR	1
G	SINGLE CONNECTOR	2

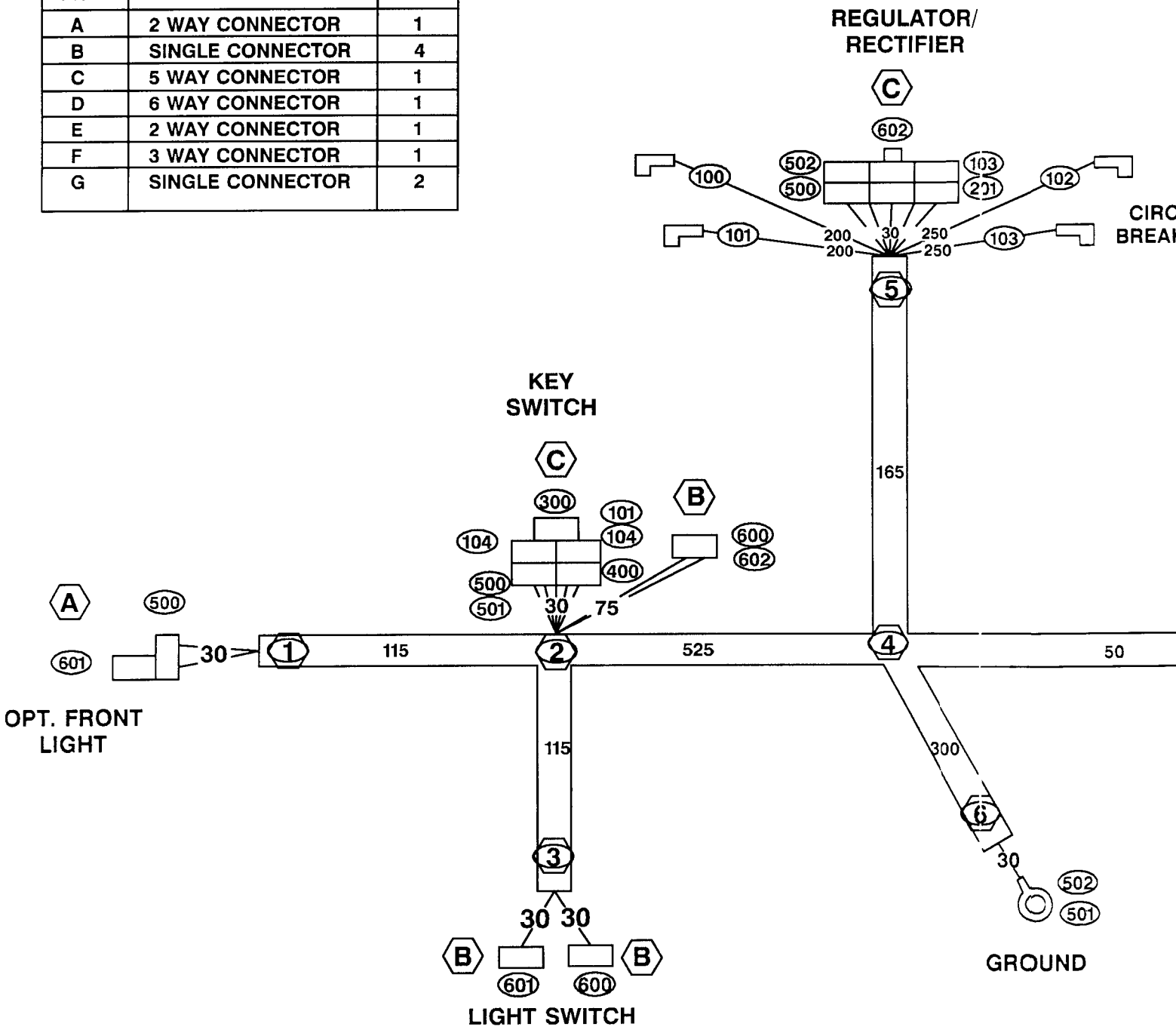


CIR.	GAGE	COLOR
100	16	RED
101	16	RED
102	16	RED/WHT
103	16	RED/WHT
104	16	RED/BLK
200	18	YEL
201	18	YEL/BLK
300	18	PUR
301	18	PUR/WHT
400	18	BLK
500	18	BLK
501	18	BLK
502	18	BLK
600	18	ORG
601	18	ORG/BLK
602	18	BLU
701	18	YEL

M44879

1200 BUNKER RAKE WIRING HARNESS

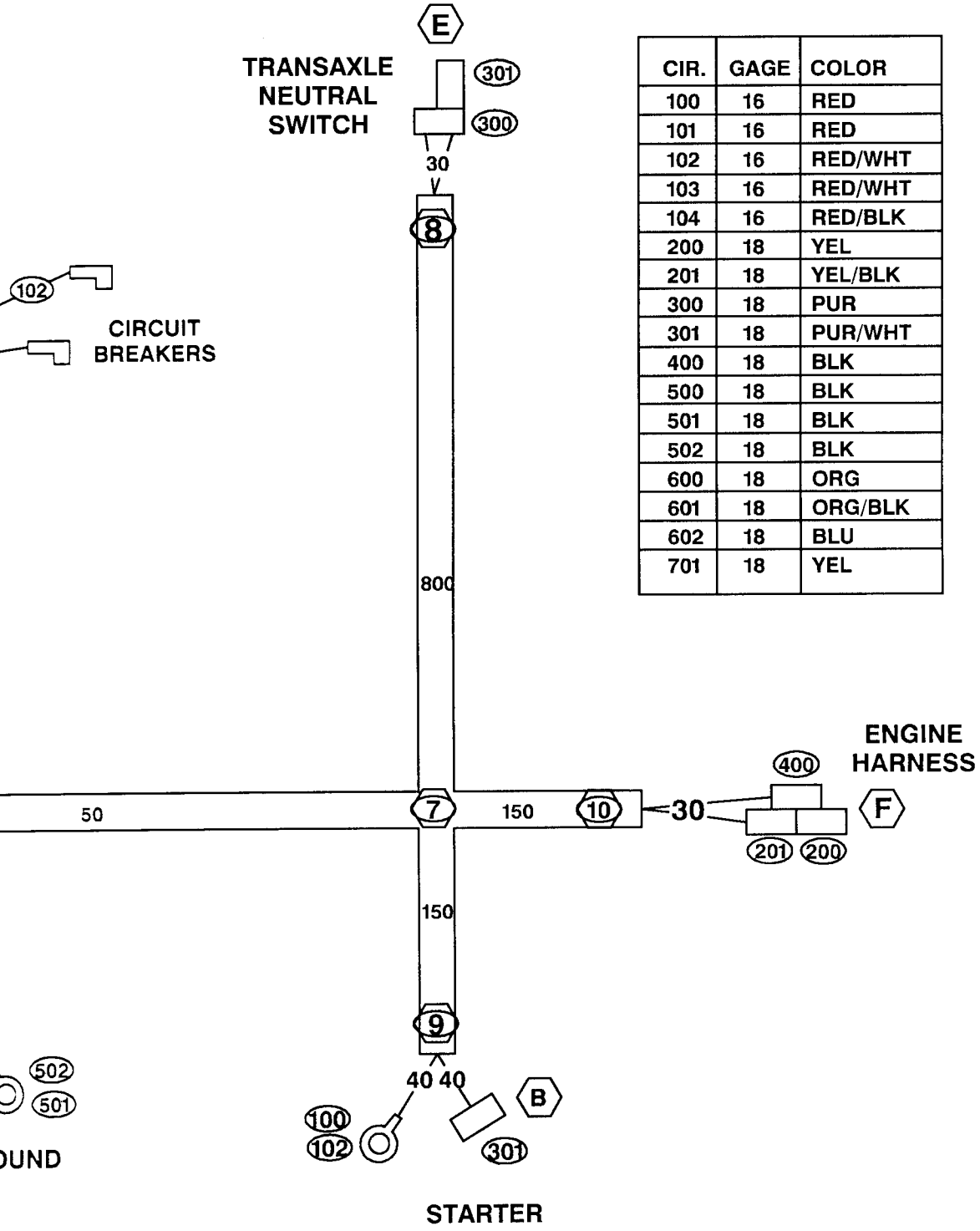
TYPE	BODY	QTY
A	2 WAY CONNECTOR	1
B	SINGLE CONNECTOR	4
C	5 WAY CONNECTOR	1
D	6 WAY CONNECTOR	1
E	2 WAY CONNECTOR	1
F	3 WAY CONNECTOR	1
G	SINGLE CONNECTOR	2



M44879

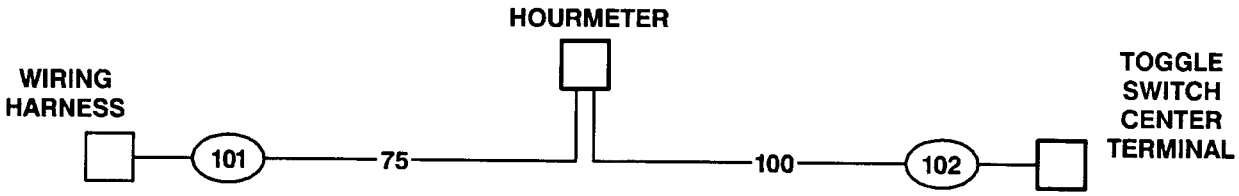
1200 BUNKER RAKE WIRING HARNESS

Slide M44879



CIR.	GAGE	COLOR
100	16	RED
101	16	RED
102	16	RED/WHT
103	16	RED/WHT
104	16	RED/BLK
200	18	YEL
201	18	YEL/BLK
300	18	PUR
301	18	PUR/WHT
400	18	BLK
500	18	BLK
501	18	BLK
502	18	BLK
600	18	ORG
601	18	ORG/BLK
602	18	BLU
701	18	YEL

G HARNESS



NMBR	COLOR	DESCRIPTION
101	ORANGE	HR. METER TO WIRING HARNESS
102	PURPLE	HR. METER TO SWITCH

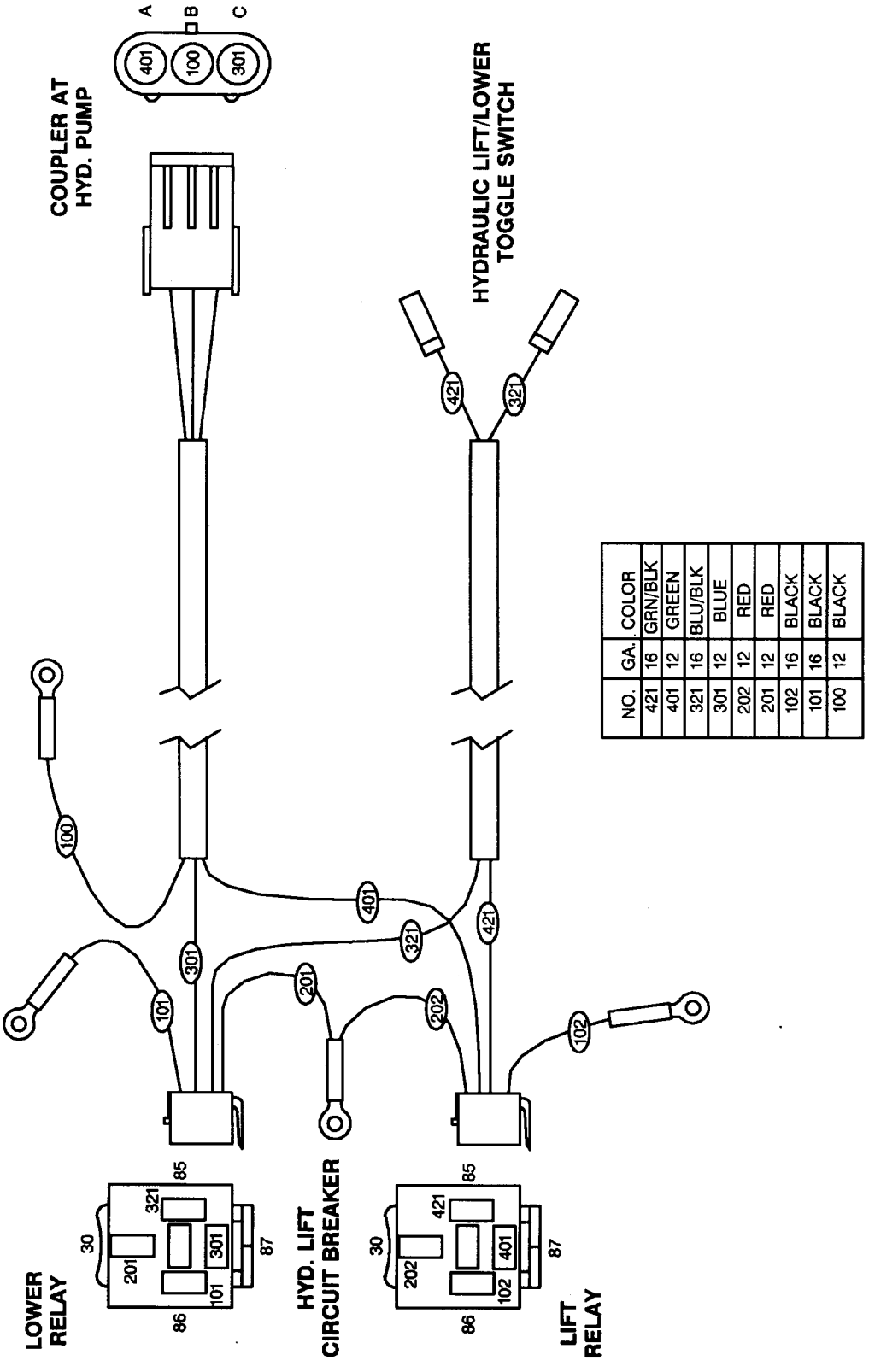
M44872

1200 BUNKER RAKE - OPTIONAL HYDRAULIC LIFT SWITCH WIRING HARNESS (HOURMETER TO TOGGLE SWITCH HARNESS)

Slide M44872

-19-23JUL91
M44872

MX,24020HE,5 -19-27SEP91



NO.	GA.	COLOR
421	16	GRN/BLK
401	12	GREEN
321	16	BLU/BLK
301	12	BLUE
202	12	RED
201	12	RED
102	16	BLACK
101	16	BLACK
100	12	BLACK

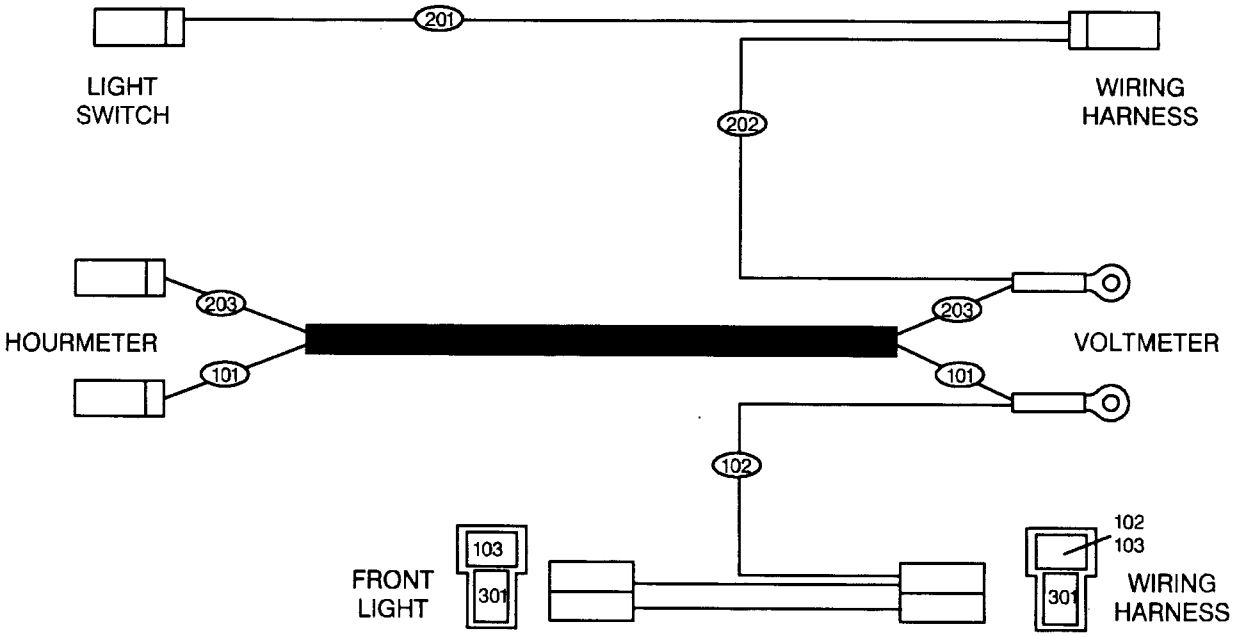
1200 BUNKER RAKE - OPTIONAL HYDRAULIC LIFT PUMP WIRING HARNESS

M44873 -19-05SEP91

M44873

Slide M44873

MX,24020HE,6 -19-27SEP91



NO.	GA.	COLOR
301	16	ORG/BLK
203	16	ORG
202	16	ORG
201	16	ORG
103	16	BLK
102	16	BLK
101	16	BLK

M44874

1200 BUNKER RAKE - OPTIONAL FRONT LIGHT KIT WIRING HARNESS

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M44874 -19-23JUL91

MX,24020HE,7 -19-27SEP91

Section 250
POWER TRAIN OPERATION, TESTS & ADJUSTMENTS

Contents

Page

COMPONENT LOCATION INFORMATION

This group contains component location drawings for the following power train components:
•Power Train System
•Wet Reduction Clutch
•Transaxle
•Drive Clutch
•Driven Clutch

Use the drawings when diagnosing a power train problem and to help locate the components to be tested.

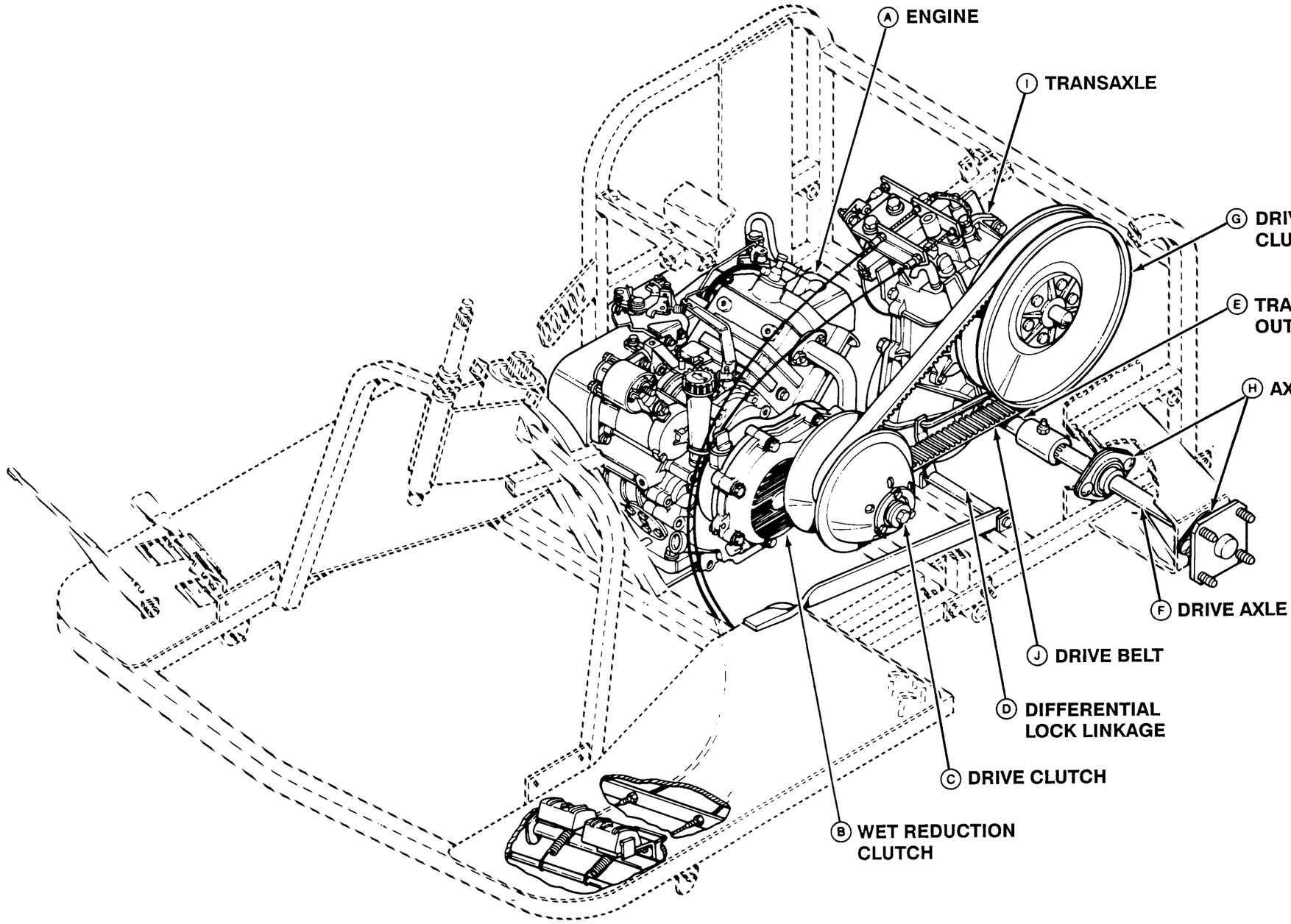
MX,25005HE,1A -19-19JUL91

POWER TRAIN COMPONENTS

A—Engine
B—Wet Reduction Clutch
C—Drive Clutch
D—Differential Lock Linkage
E—Transaxle Output Shaft
F—Drive Axle
G—Driven Clutch
H—Axle Bearings
I—Transaxle
J—Drive Belt
K—Transaxle Linkage

MX,25005HE,2A -19-27SEP91

Slide M80554



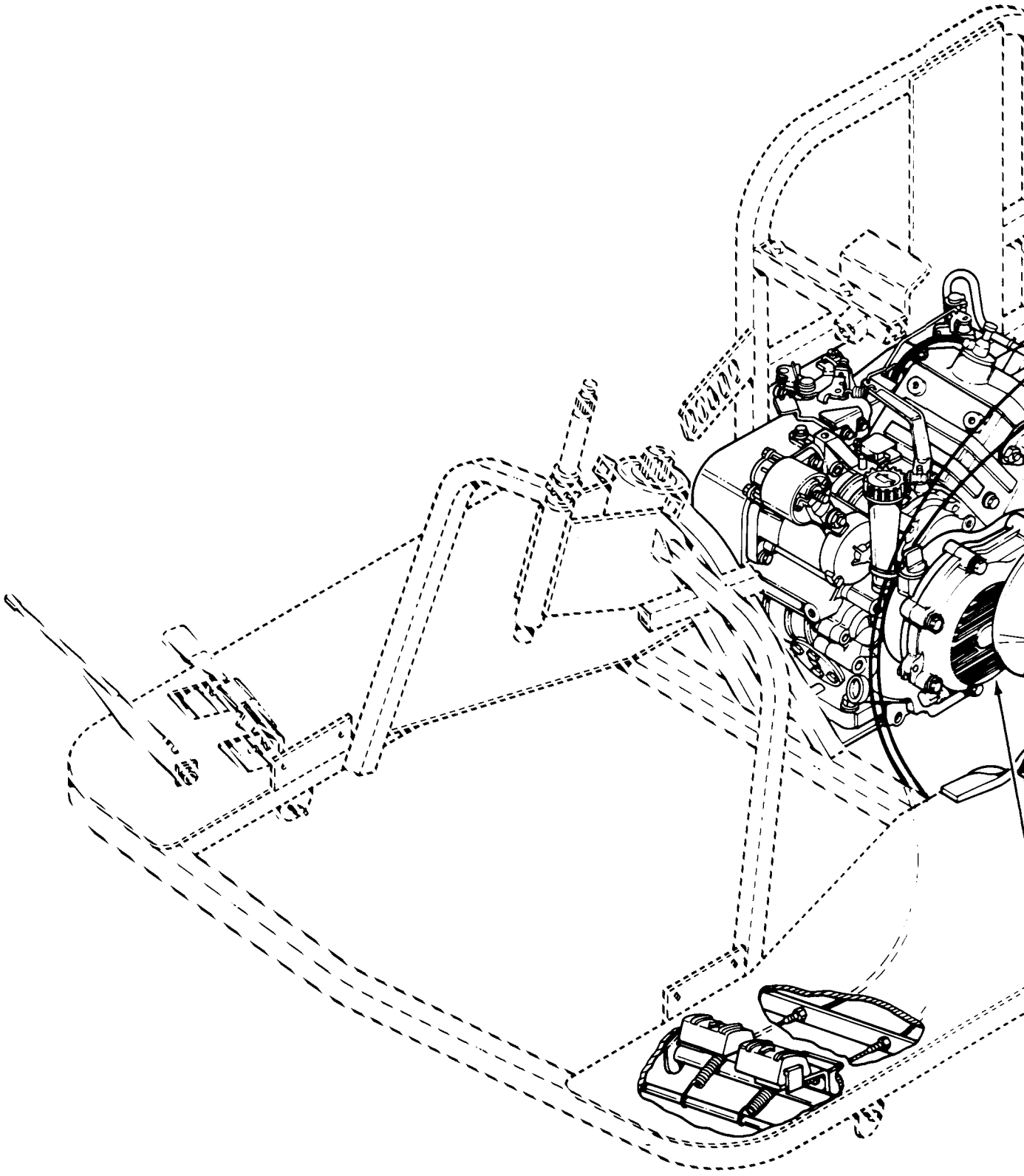
M80554

POWER TRAIN COMPONENTS

MX,25005HE,3A -19-27SEP9

30099

Slide M80554

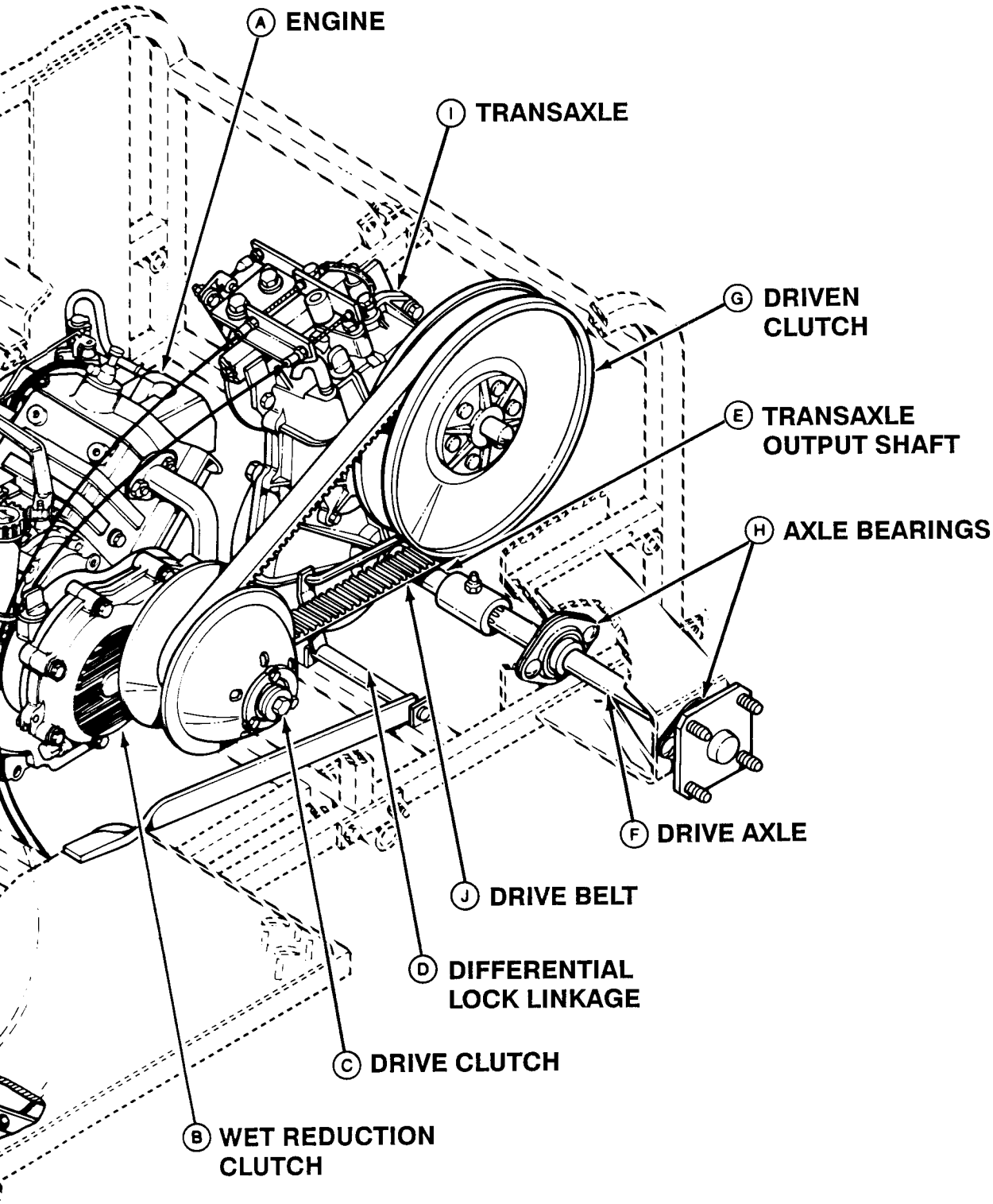


M80554

POWER TRAIN COMPONENTS

MX,25005HE,3A -19-27SEP97

300295

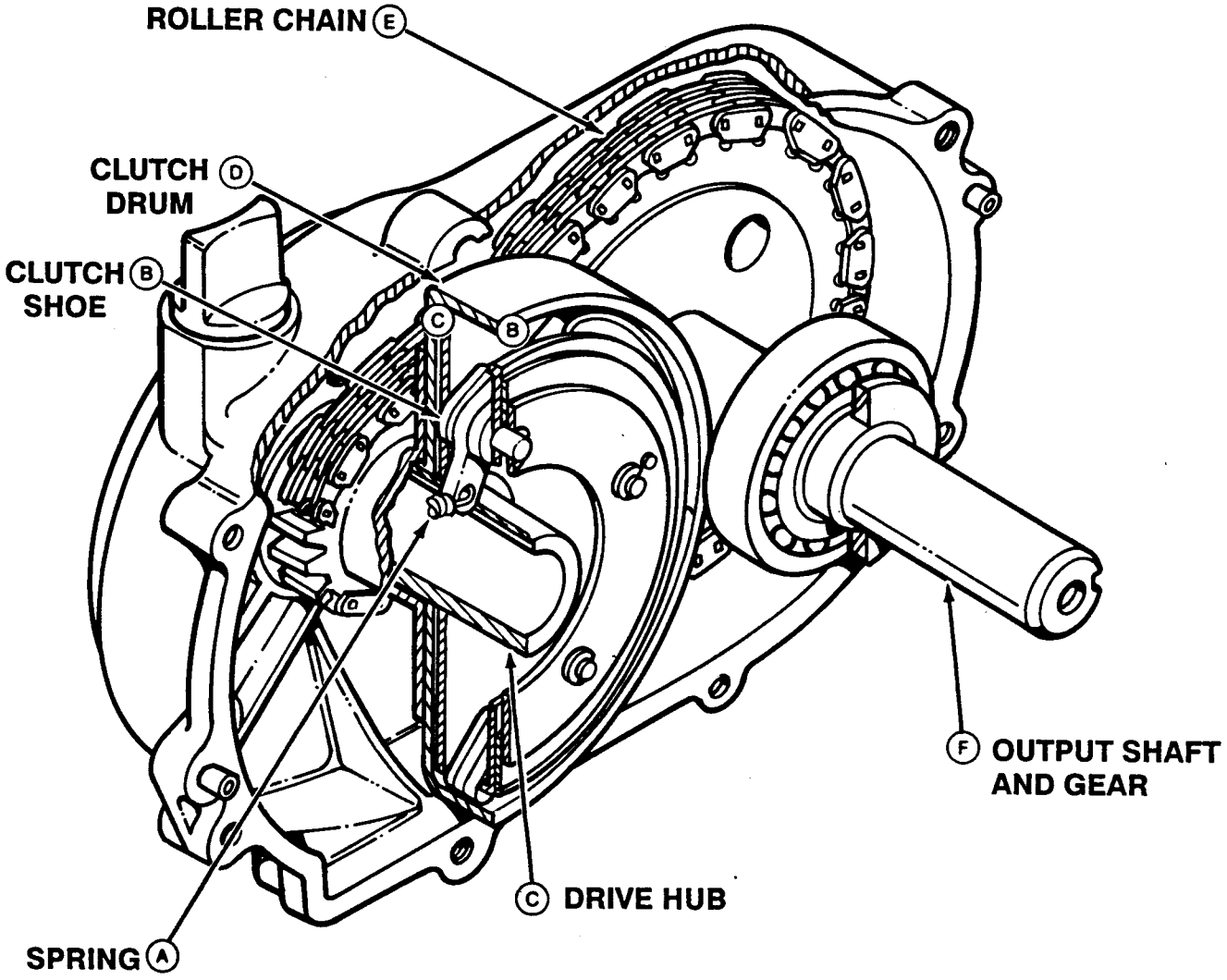

A ENGINE
I TRANSAXLE
G DRIVEN CLUTCH
E TRANSAXLE OUTPUT SHAFT
H AXLE BEARINGS
F DRIVE AXLE
J DRIVE BELT
D DIFFERENTIAL LOCK LINKAGE
C DRIVE CLUTCH
B WET REDUCTION CLUTCH

MPONENTS

WET REDUCTION CLUTCH COMPONENTS

A—Spring (5 used)
B—Clutch Shoe (5 used)
C—Drive Hub
D—Clutch Drum
E—Roller Chain
F—Output Shaft and Gear

MX,25005HE,4A -19-27SEP91



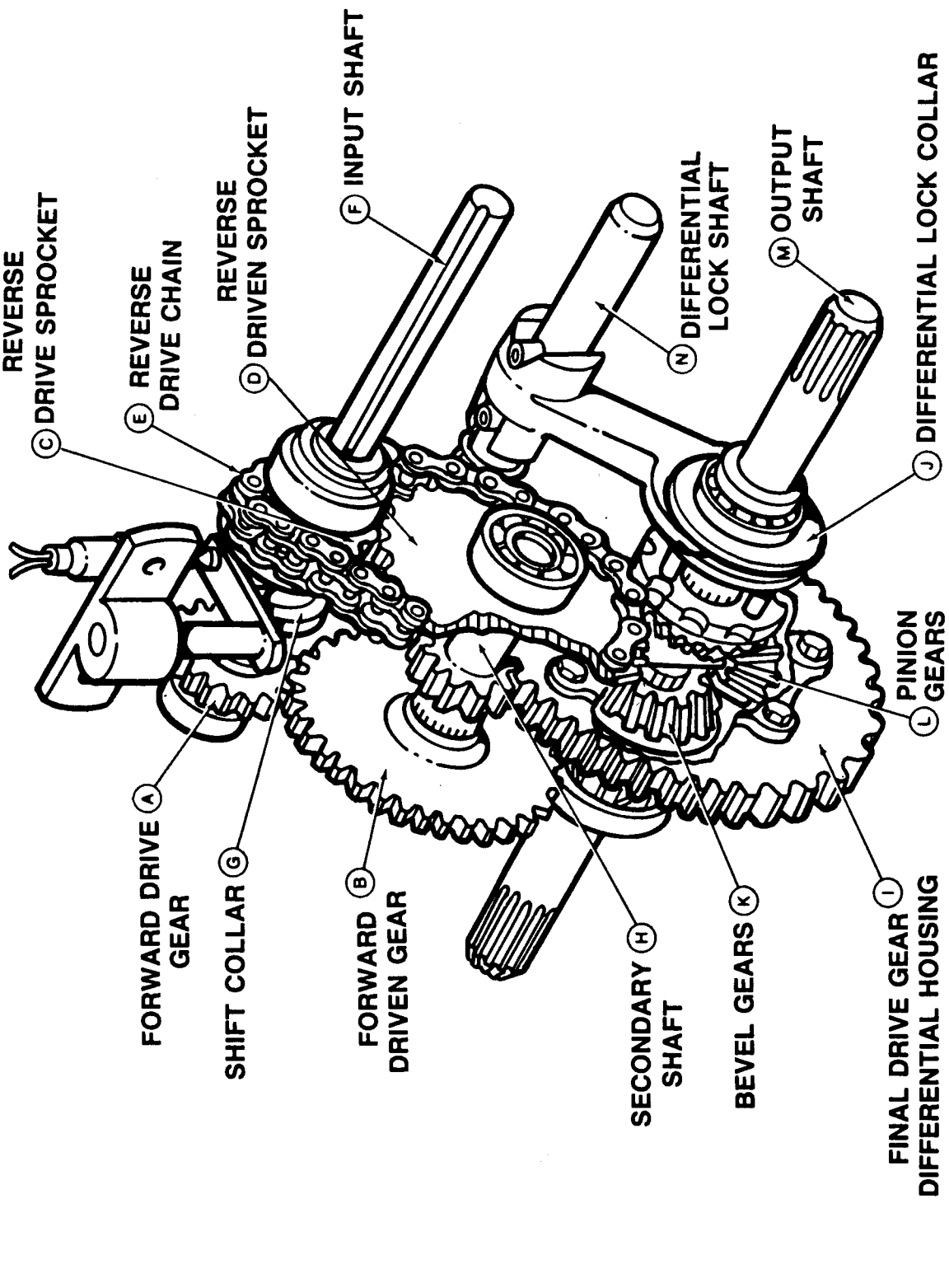
Slide M80555

MX,25005HE,5A -19-19JUL91

TRANSAXLE COMPONENTS

A—Forward Drive Gear
B—Forward Driven Gear
C—Reverse Drive Sprocket
D—Reverse Driven Sprocket
E—Reverse Drive Chain
F—Input Shaft
G—Shift Collar
H—Secondary Shaft
I—Final Drive Gear, Differential Housing
J—Differential Lock Collar
K—Bevel Gear
L—Pinion Gear
M—Output Shaft
N—Differential Lock Shaft

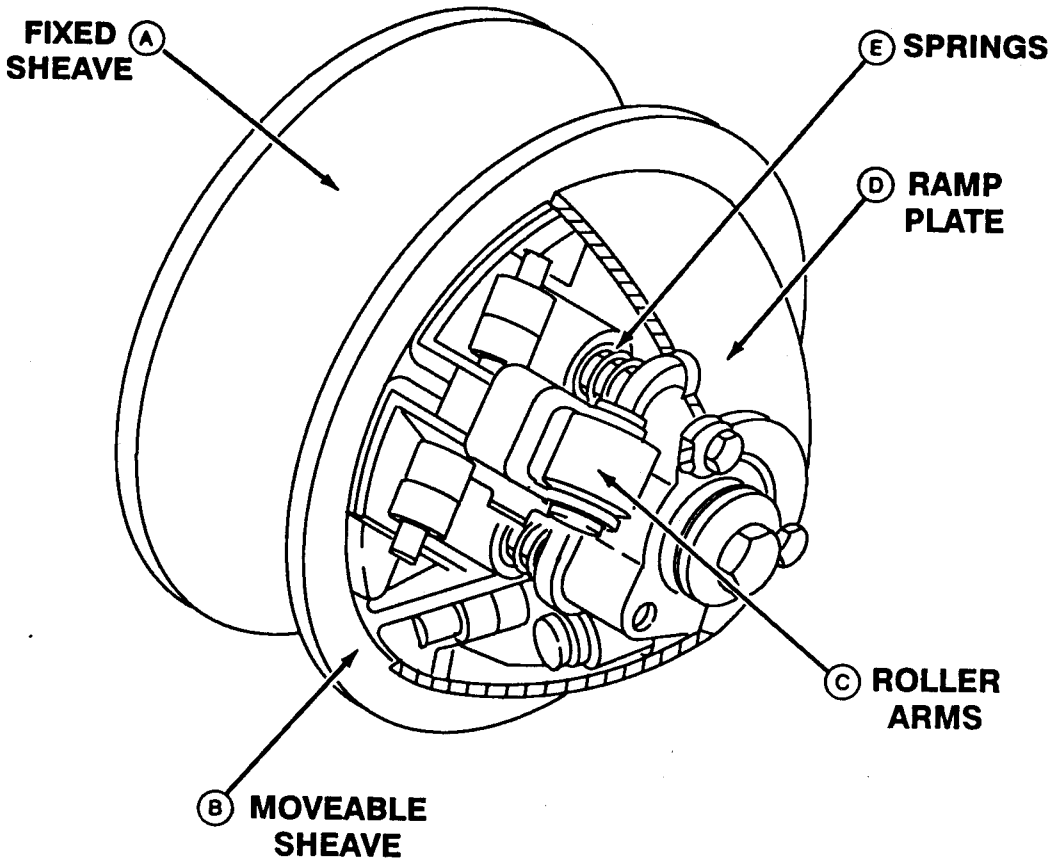
MX,25005HE,6A -19-19JUL91



Slide M80556

MX,25005HE,7A -19-19JUL91

DRIVE CLUTCH COMPONENTS



M80624

-19-29AUG91

M80624

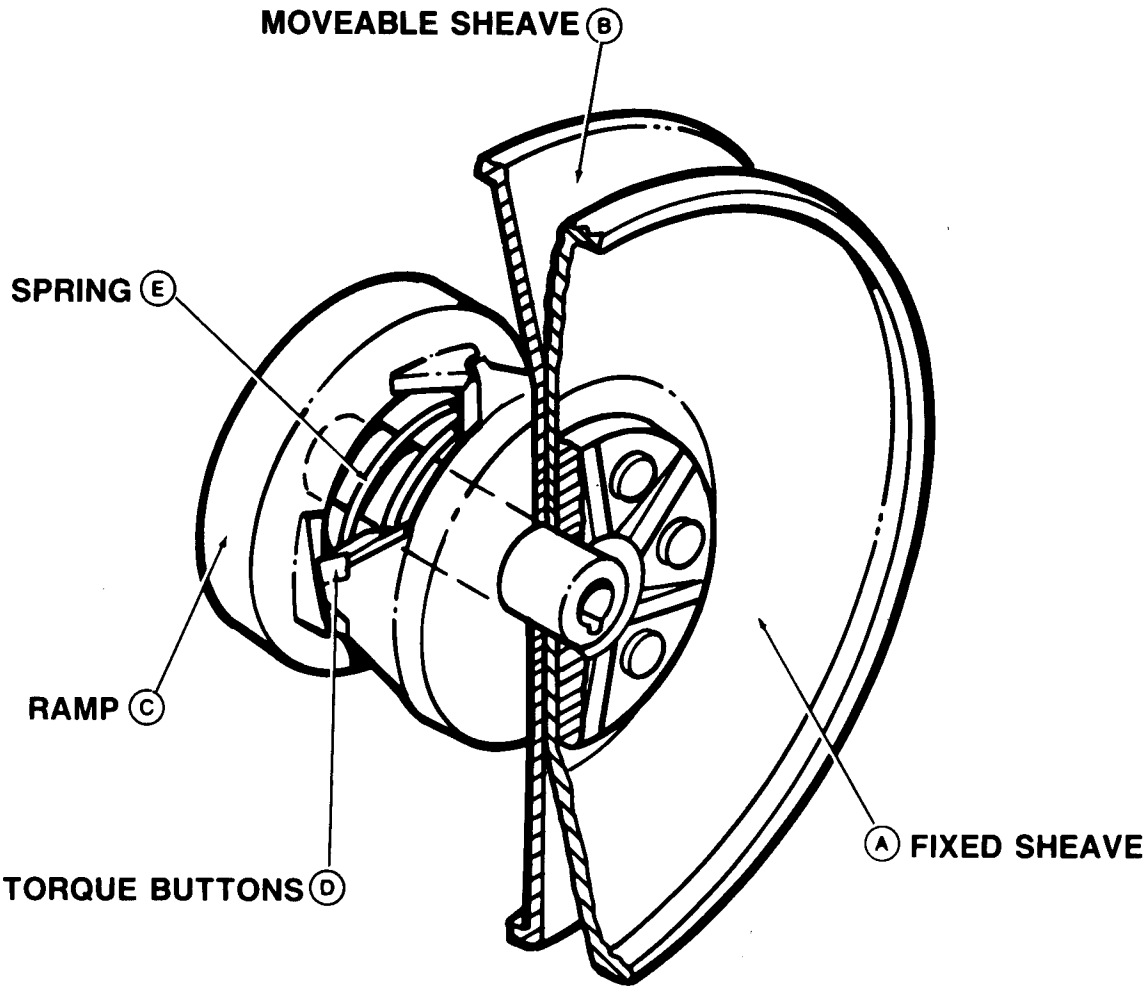
DRIVE CLUTCH COMPONENTS

A—Fixed Sheave
B—Moveable Sheave
C—Roller Arms
D—Ramp Plate
E—Springs

Slide M80624

MX,25005HE,8A -19-27SEP91

DRIVEN CLUTCH COMPONENTS



M48601

DRIVEN CLUTCH COMPONENTS

-19-29JAN90

M48601

A—Fixed Sheave
B—Moveable Sheave
C—Ramp
D—Torque Buttons
E—Spring

Slide M48601

MX,25005HE,9A -19-27SEP91

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:
•Wet Reduction Clutch
•Drive Clutch
•Driven Clutch
•Clutch System - Upshift and Downshift
•Transaxle - Forward, Reverse and Differential Lock

The slide number reference under the art is used for service training purposes only.

MX,25010HE,1A -19-19JUL91

WET REDUCTION CLUTCH OPERATION

A—Drive Hub
B—Clutch Shoe
C—Shoe Spring
D—Clutch Drum
E—Roller Chain
F—Output Shaft and Gear

FUNCTION: Connects and disconnects power between the engine and the drive clutch. The gears of the wet clutch provide a 2:1 reduction.

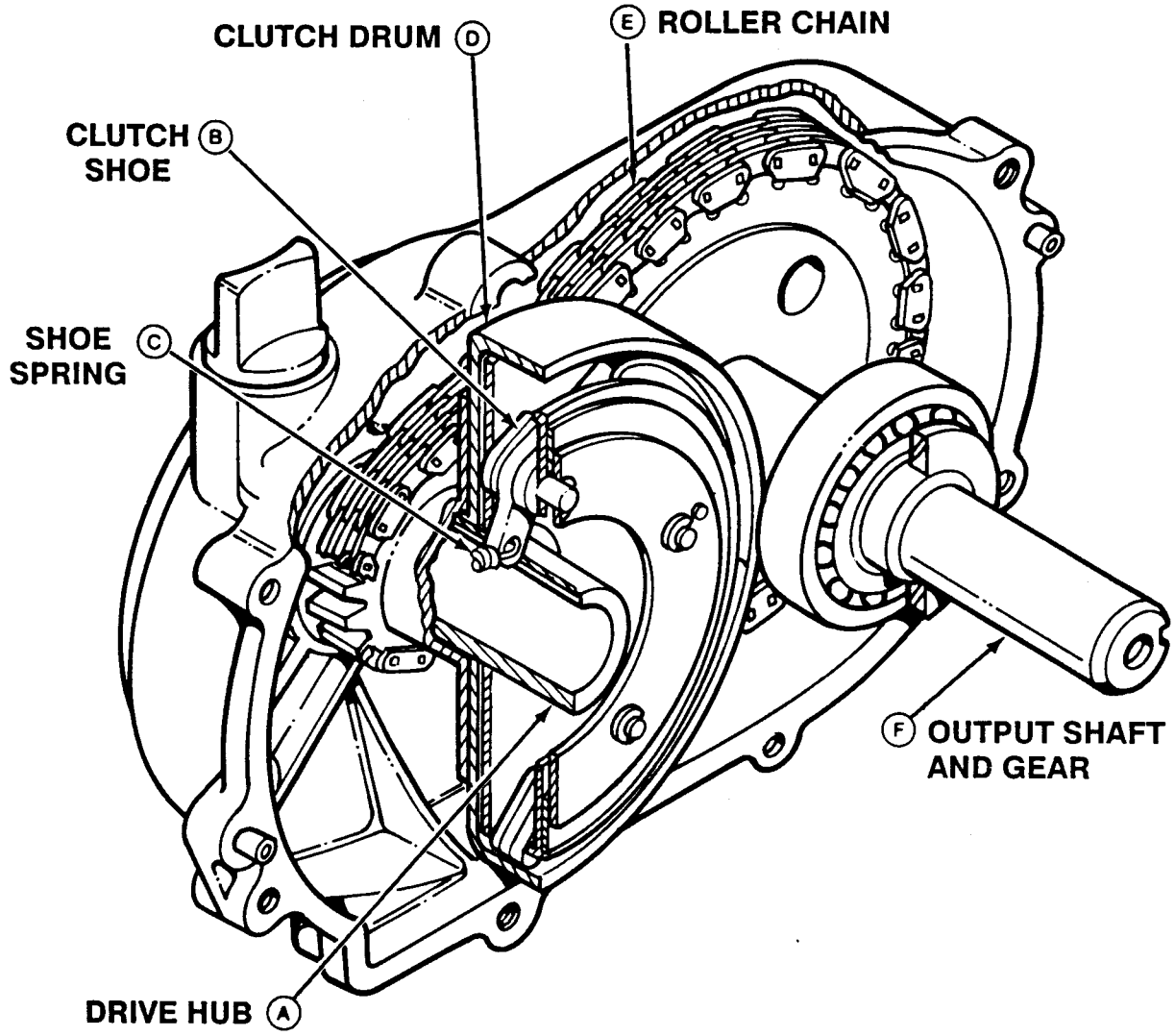
MAJOR COMPONENTS:
•Drive Hub
•Clutch Shoe
•Shoe Spring
•Clutch Drum
•Roller Chain
•Output Shaft and Gear

THEORY OF OPERATION:
The drive is keyed to the engine crankshaft. Five laminated metal shoes are mounted on the drive hub and are connected to one another by springs. A clutch drum surrounds the shoes and is free to rotate around a bushing on the engine crankshaft. A roller chain connects gear of drum to gear on output shaft.

The wet clutch operates using centrifugal force. As the engine rpm increases, the spring-loaded shoes pivot out due to the centrifugal force. The shoes contact the drum. When the centrifugal force is great enough, friction between the drum and shoes causes the drum to turn with the shoes. The drum turns the roller chain which turns the output shaft. Due to the different size gears in the wet clutch the output shaft turns half as fast as the engine crankshaft. This reduction in speed allows for increase in pulling power of vehicle.

Oil in the clutch case provides lubrication and cooling for bearings and clutch.

MX,25010HE,2A -19-27SEP91



M80557

WET REDUCTION CLUTCH OPERATION

Slide M80557

MX,25010HE,3A -19-19JUL91

250 10 3

-19-29AUG91

M80557

DRIVE CLUTCH OPERATION

A—Belt
B—Fixed Sheave
C—Roller Arms
D—Rollers
E—Moveable Sheave
F—Ramp Plate

FUNCTION:
To engage the drive belt at a specified rpm and vary the pully diameter depending on engine rpm.

MAJOR COMPONENTS:
•Fixed Sheave Face
•Ramp Plate
•Moveable Sheave
•Roller Arms
•Rollers

THEORY OF OPERATION:
The fixed sheave face (B) is keyed to the output shaft of the wet clutch. Attached to the fixed sheave at the other end of the clutch hub is the ramp plate (F). The moveable sheave (E) and the roller arm assembly ride on the clutch hub between the fixed sheave and the ramp plate.

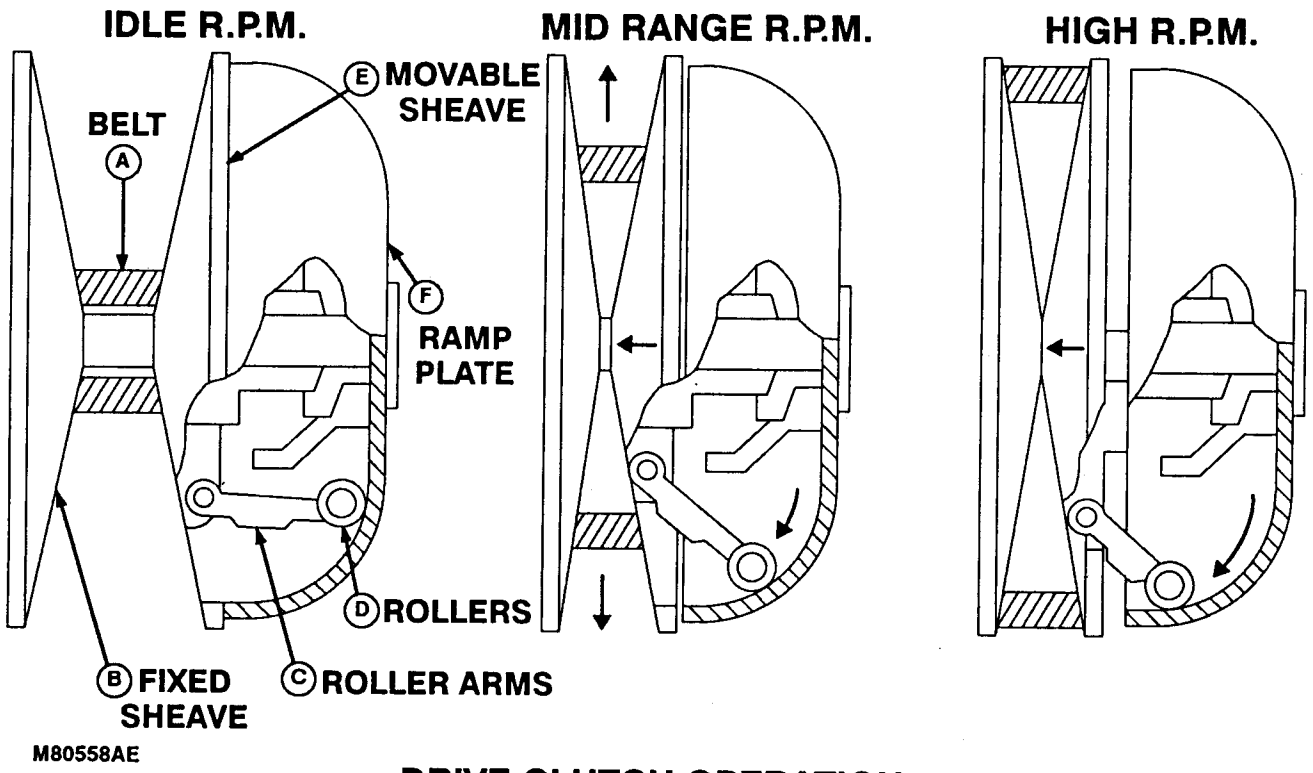
The drive clutch is rpm sensitive and operates using the principal of centrifugal force. Increasing engine rpm causes the roller arms (C) and rollers (D) to swing out due to centrifugal force. The roller arms are attached to the moveable sheave. As these roller arms are forced out they contact the ramp plate. The roller arms follow the contour of the ramp plate and force the moveable sheave toward the fixed sheave. This action causes the belt (A) to ride up between the two sheave surfaces in effect changing the working diameter of the drive clutch.

Idle rpm: The clutch sheaves are farthest apart and the drive belt is located at the bottom of the sheave halves. The sheave halves make contact with the drive belt but there is no movement since wet clutch has not allowed drive clutch to turn due to low rpm.

Midrange rpm: The roller arm assemblies have moved further down the ramp plate causing the moveable sheave to move closer to the fixed sheave. This forces the belt further toward the top of the clutch assembly.

High rpm: The roller arms have moved against the ramp plate the full extent of their travel forcing the sheave halves together. This results in the drive belt being moved to the largest diameter of the drive clutch.

MX,25010HE,4A -19-27SEP91



DRIVE CLUTCH OPERATION

Slide M80558AE

M80558AE -19-29AUG91

MX,25010HE,5A -19-19JUL91

250 10 5

DRIVEN CLUTCH OPERATION

A—Drive Belt
B—Moveable Sheave
C—Stationary Sheave
D—Ramp
E—Transaxle Input Shaft
F—Hub
G—Clutch Spring
H—Wear Buttons
I—Key

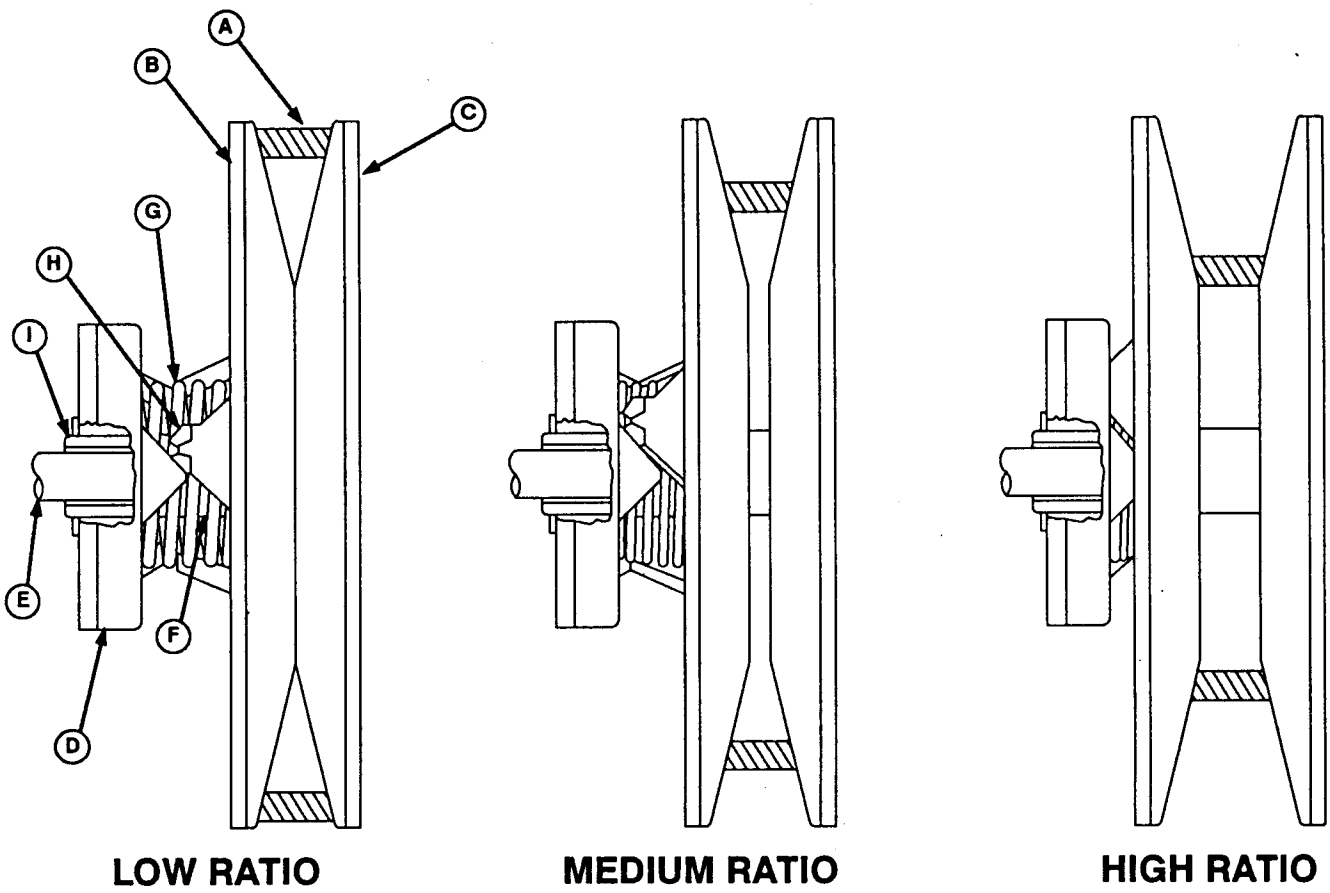
FUNCTION:
To maintain belt tension and vary the drive and shift ratio depending on load and torque.

MAJOR COMPONENTS:
•Stationary Sheave
•Moveable Sheave
•Ramp Plate
•Clutch Buttons

THEORY OF OPERATION:
Belt tension must be maintained for optimum efficiency. If the belt is too loose it will slip, and if it's too tight it will become pinched in the driven sheave.

The shift pattern is controlled in order for the engine to operate efficiently throughout the entire speed range. The shift ratio limits engine rpm. If engine speed is too high, it will be operating over the engine power peak. If engine rpm is too low, the power will be inadequate for the load.

MX,25010HE,6A -19-27SEP91



M80559AE

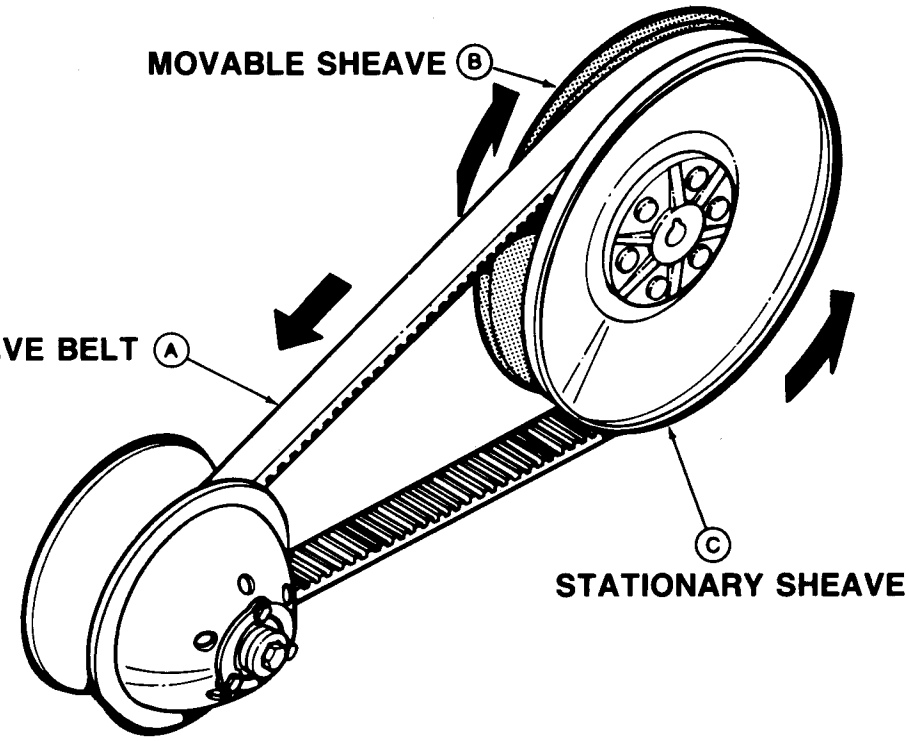
DRIVEN CLUTCH OPERATION

M80559AE -19-29AUG91

Slide M80559AE

MX,25010HE,7A -19-19JUL91

DRIVEN CLUTCH OPERATION—CONTINUED



M45433

DRIVEN CLUTCH MOVEMENT

-19-31JAN90

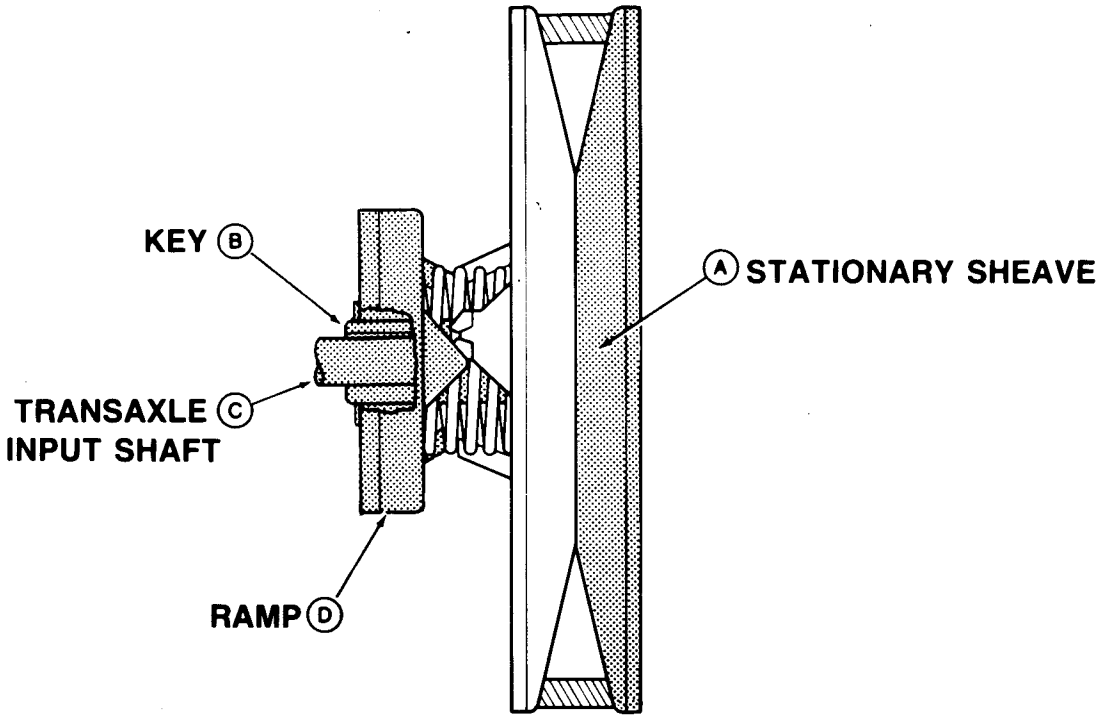
M45433

Slide M45433

Whenever the drive belt (A) is engaged, torque from the belt is felt on the movable sheave (B), and torque from the resistance of the wheels is felt on the stationary sheave (C).

MX,25010HE,16A -19-27SEP91

DRIVEN CLUTCH OPERATION—CONTINUED



M45434 **DRIVEN CLUTCH - STATIONARY COMPONENTS**

-19-31JAN90

M45434

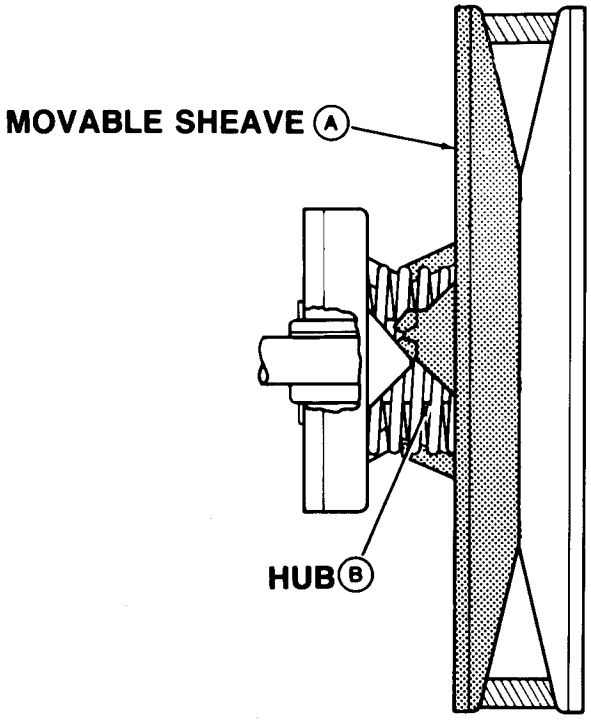
A—Stationary Sheave **B—Key** **C—Transaxle Input Shaft** **D—Ramp**

Slide M45434

The stationary sheave (A) and ramp (D) are keyed to the transaxle input shaft (C). Wheel resistance is felt on these two components.

MX,25010HE,17A -19-27SEP91

DRIVEN CLUTCH OPERATION—CONTINUED



M45435

DRIVEN CLUTCH - MOVEABLE COMPONENTS

-19-31JAN90

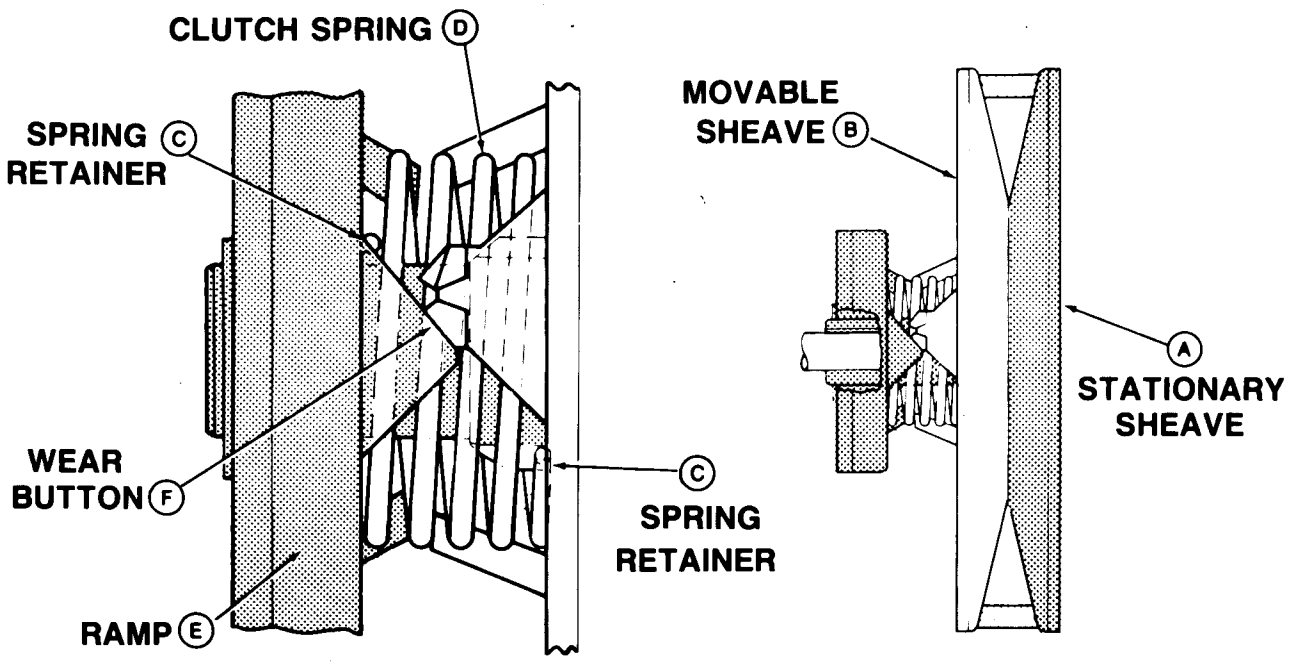
M45435

Slide M45435

Torque from the belt is felt on the movable sheave (A). The movable sheave floats freely on the hub (B) between the stationary sheave and the ramp.

MX,25010HE,18A -19-27SEP91

DRIVEN CLUTCH OPERATION—CONTINUED



M45436

DRIVEN CLUTCH-RAMP

A—Stationary Sheave
B—Movable Sheave
C—Spring Retainer
D—Clutch Spring
E—Ramp
F—Wear Button

Slide M45436

250
10
11

-19-31JAN90

M45436

There are two components that control belt tension and shift pattern. These are the clutch spring (D) and the ramp (E).

One end of the clutch spring is attached to the ramp which is keyed to the stationary sheave (A) and the other end of the spring is attached to the movable sheave (B) half. The spring is causing a resistance when the driven clutch is opening and is assisting when the clutch is closing.

The movable sheave rides along the ramp as it opens and closes. Attached to the movable sheave are wear buttons (F) that allow these two components to move smoothly. The ramp is attached to the stationary sheave. It assists in controlling the shift pattern depending on load.

MX,25010HE,19A -19-27SEP91

CLUTCH SYSTEM OPERATION

A—Stationary Sheave
B—Moveable Sheave
C—Driven Clutch
D—Drive Clutch
E—Ramp
F—Spring

FUNCTION:
To vary drive and driven clutch ratios in response to changing loads while providing engine efficiency.

MAJOR COMPONENTS:
•Drive Belt
•Drive Clutch
•Driven Clutch

THEORY OF OPERATION:

UPSHIFT:
At approximately 1600—1800 rpm, the wet clutch engages the drive clutch (D). The belt applies torque to the driven clutch (C). At engagement rpm the ratio between the drive sheave and the driven sheave is highest.

As the belt begins to turn, torque from the belt is felt on the moveable sheave (B) and torque from the resistance of the wheels is felt on the stationary sheave (A).

As engine rpm increases the action of the drive clutch forcing the belt to its outside diameter overcomes the spring (F) in the driven clutch and the moveable sheave rides down the ramp (E) opening the driven sheave halves. This in effect, reduces the working diameter of the driven clutch and at the same time increases the working diameter of the drive clutch. The drive ration from engagement rpm to wide open throttle rpm changes from high, to low.

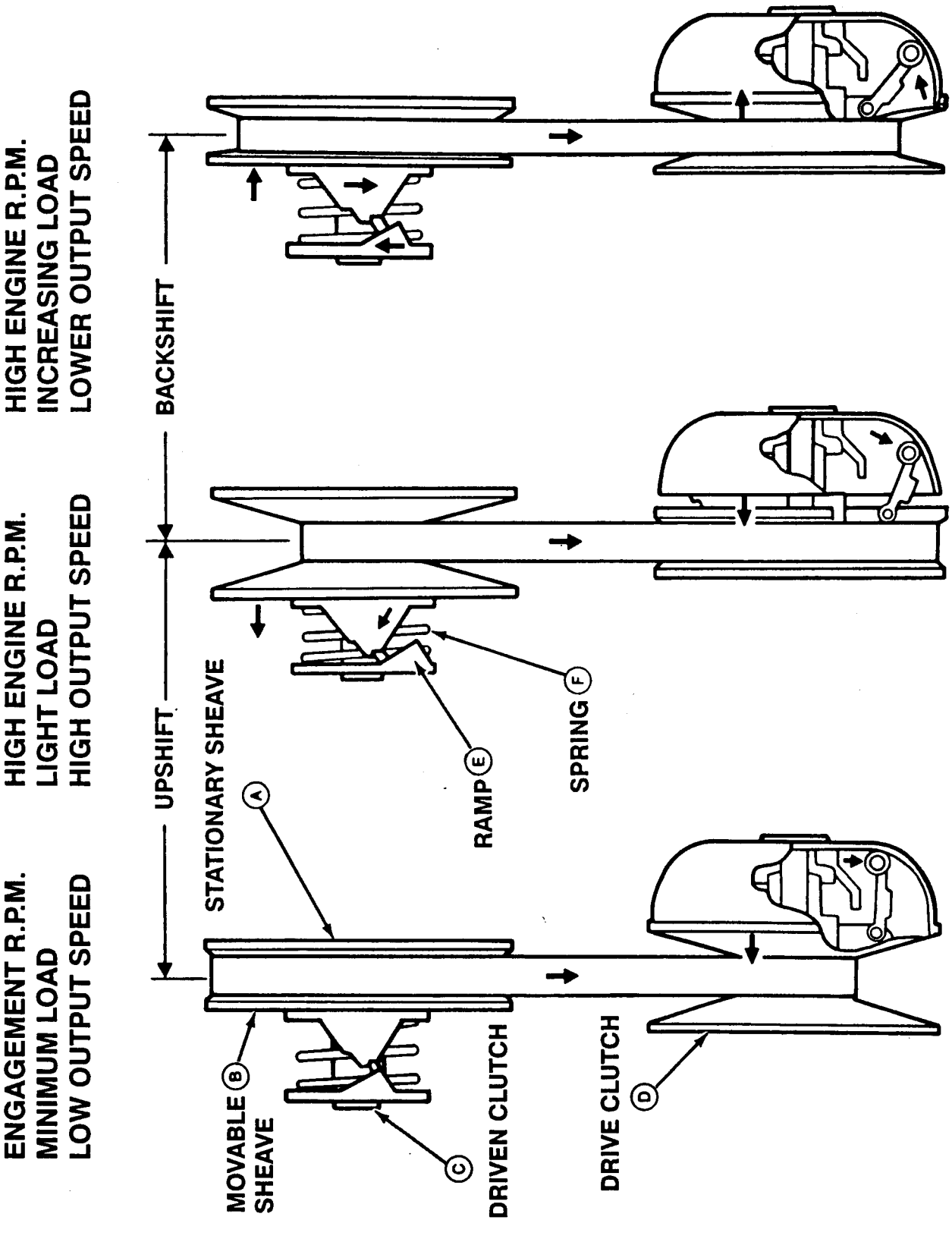
This action will continue until the clutches have reached the lowest drive ratio. This action is referred to as upshift.

BACKSHIFT:
Whenever a load is encountered the clutch system reacts and automatically changes the drive ratio to a higher ration. This allows the engine to operate at optimum efficiency at the peak of its power curve. Load is increased by anything that adds resistance to the wheels. Examples include going from flat to hilly terrain, or from hard surface to soft terrain.

As soon as increased load is encountered the stationary sheave of the driven clutch starts to resist forward movement. At the same time the moveable sheave continues to have forward torque applied the belt. The moveable sheave of the driven clutch moves forward assisted by the spring. As it moves forward, the ramp causes it to move toward the stationary sheave forcing the belt toward the outside diameter of the sheave halves increasing the drive ratio and belt tension is maintained, while vehicle speed is reduced. This action is referred to as backshift. The clutches will continue to backshift until the load stabilizes.

As the load is reduced, the clutches will again upshift to a ratio dependant on engine rpm. Upshift and backshift occur continually throughout operation dependant on load, or engine rpm changes.

MX,25010HE,8A -19-27SEP91



Slide M45437

MX,25010HE,9A -19-19JUL91

TRANSAXLE FORWARD OPERATION

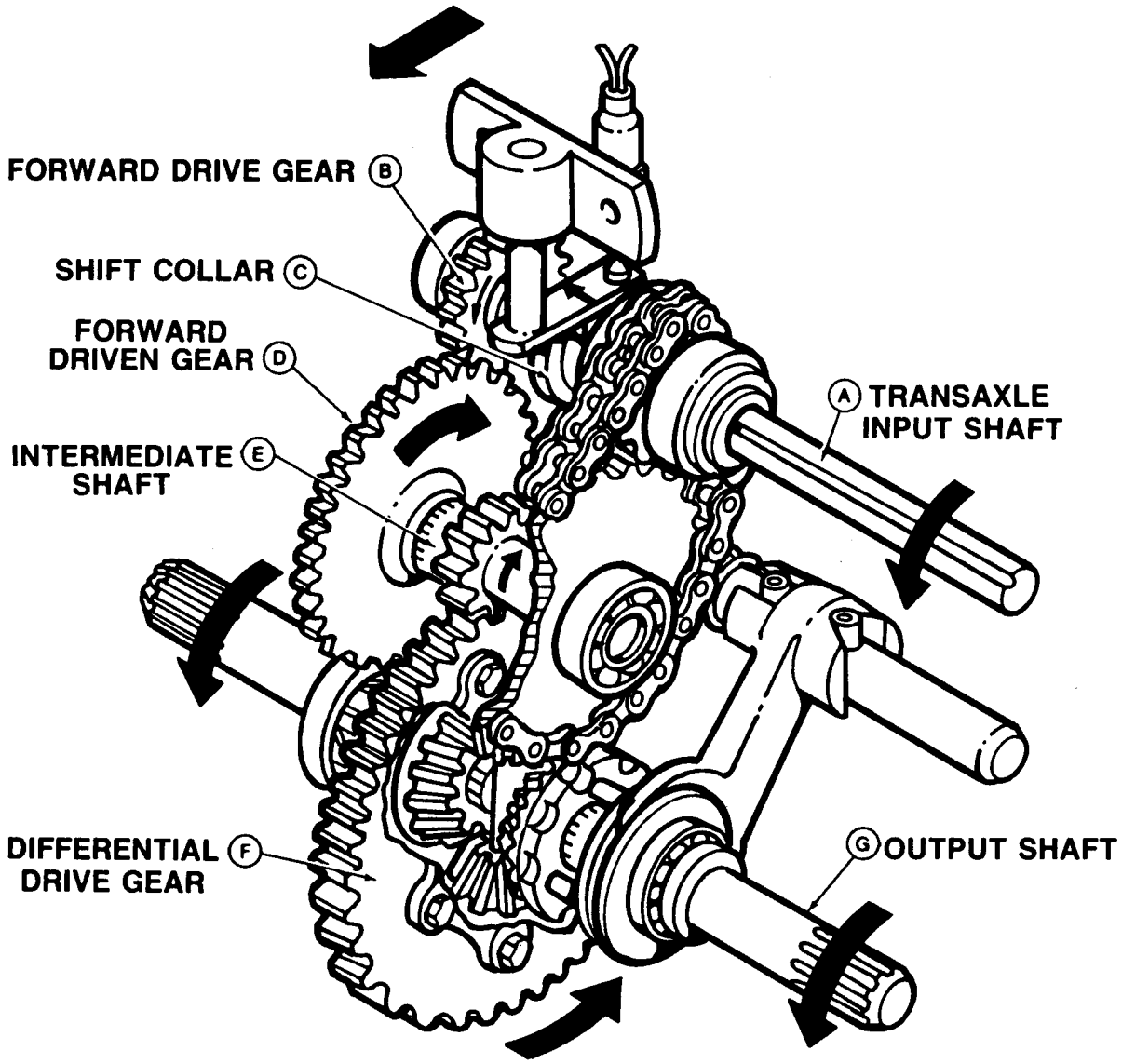
A—Transaxle Input Shaft
B—Forward Drive Gear
C—Shift Collar
D—Forward Driven Gear
E—Intermediate Shaft
F—Differential Drive Gear
G—Output Shafts

FUNCTION:
The transaxle provides forward, neutral and reverse operating capabilities. It also allows for differential action around turns.

MAJOR COMPONENTS:
•Input Shaft
•Shift Collar
•Forward Drive and Driven Gears
•Intermediate Shaft
•Differential Assembly
•Output Shafts

THEORY OF OPERATION:
Power to the transaxle is supplied by the clutch system. The driven clutch is splined to the transaxle input shaft (A). Splined to the input shaft is the shift collar (C). When the transaxle is shifted to the forward position the shift collar moves toward the forward drive gear (B) and engages the splines on the forward gear. Power is now transmitted from the input shaft through the shift collar to the forward drive gear. The forward drive gear is in constant mesh with the forward driven gear (D) and power is transmitted to it. The driven gear is splined to the intermediate shaft (E) which transmits power to the differential assembly (F) and through the output shafts (G).

MX,25010HE,10A -19-19JUL91



TRANSAXLE FORWARD OPERATION

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-19-29AUG91

M80560

MX,25010HE,11A -19-19JUL91

TRANSAXLE REVERSE OPERATION

A—Reverse Drive Chain
B—Transaxle Input Shaft
C—Reverse Sprocket
D—Reverse Driven Sprocket
E—Intermediate Shaft
F—Differential Drive Gear
G—Output Shafts
H—Shift Collar

FUNCTION:
The transaxle provides forward, neutral, and reverse operating capabilities. It also allows for differential action around turns.

MAJOR COMPONENTS:
•Input Shaft
•Shift Collar
•Reverse Drive Sprocket, Driven Sprocket, and Drive Chain
•Intermediate Shaft
•Differential Assembly
•Output Shafts

THEORY OF OPERATION:
With the shift collar (H) in reverse position, power is transmitted from the input shaft (B) through the shift collar to the reverse sprocket (C). From the reverse drive sprocket power flows through the reverse drive chain (A) to the reverse driven sprocket (D). This sprocket is splined to the intermediate shaft (E) which drives the differential assembly (F). The differential transmits power to the output shafts (G).

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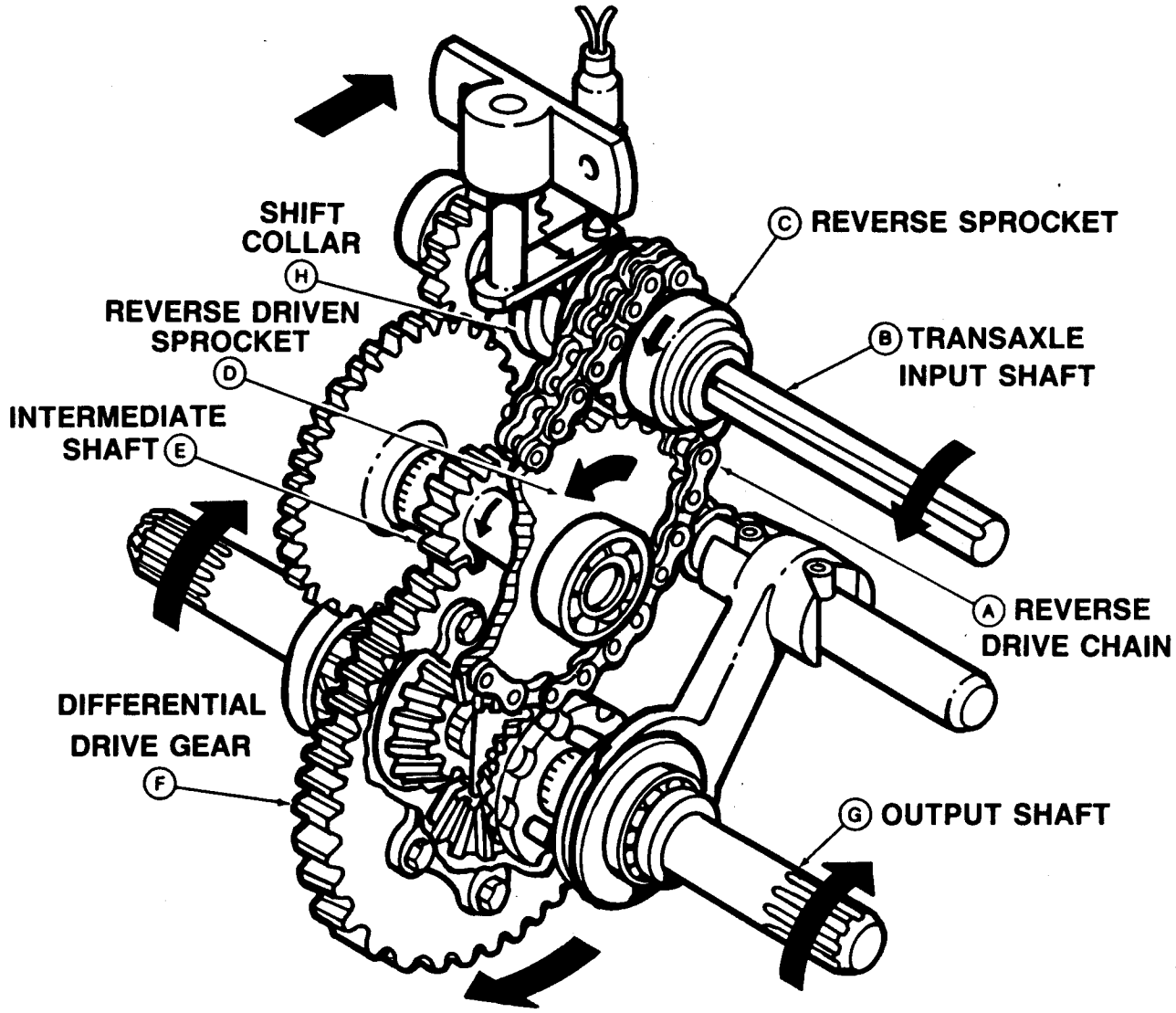
MX,25010HE,12A -19-19JUL91



Slide M80561

MX,25010HE,13A -19-19JUL91

DIFFERENTIAL LOCK OPERATION

A—Shaft Pin
B—Differential Lock Shaft
C—Locking Fork
D—Locking Collar
E—Locking Collar Pins
F—Differential Housing
G—Bevel Gear

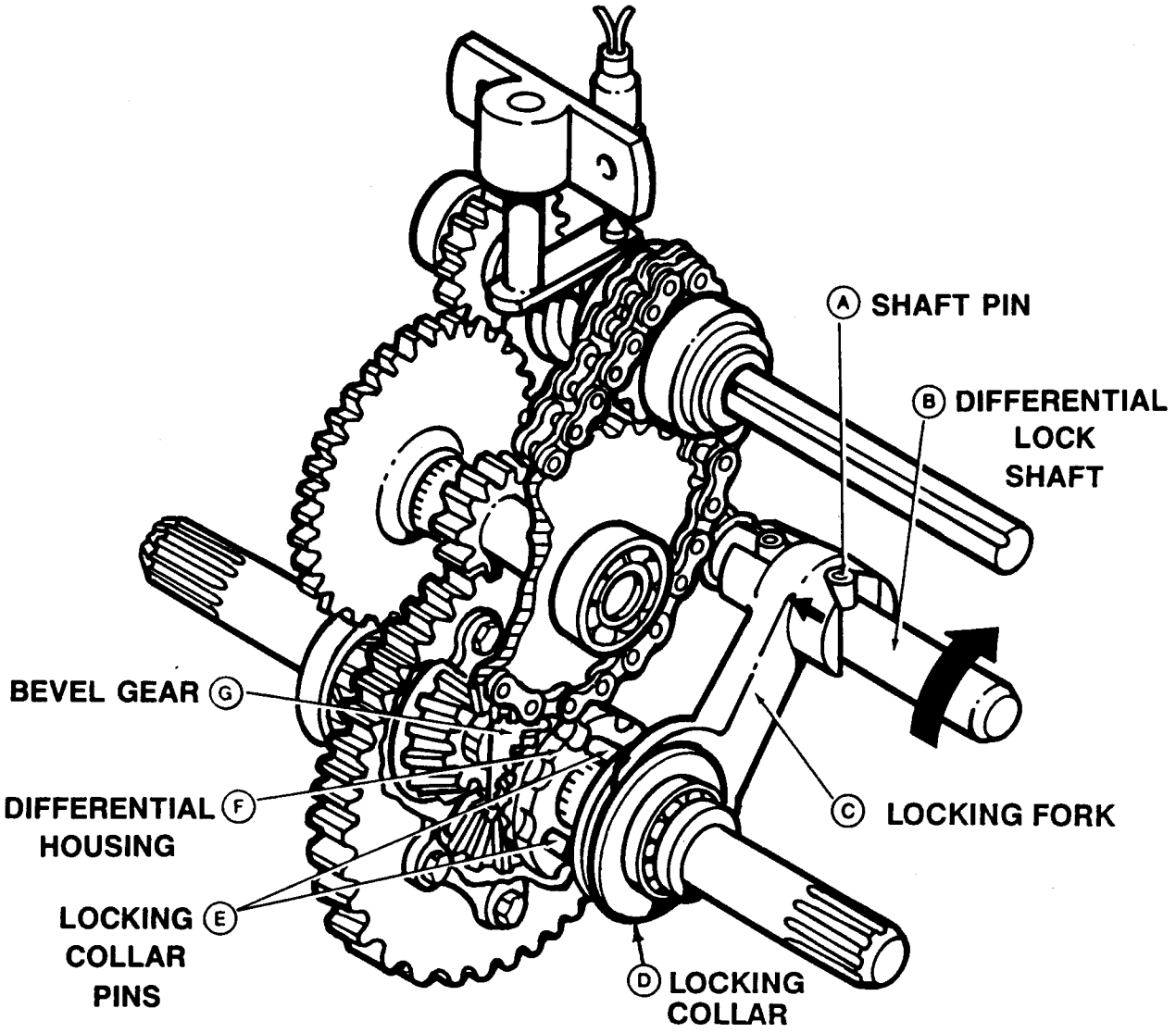
FUNCTION:
Connects right and left output shafts together for equal traction of both wheels.

MAJOR COMPONENTS:
•Differential Lock Shaft and Pins
•Locking Fork
•Locking Collar and Pins
•Differential Housing
•Left Bevel Gear

THEORY OF OPERATION:
Differential lock is engaged by depressing the pedal at the operators station. As the pedal is depressed, the differential lock shaft (B) turns. As the shaft turns, the shaft pins (A) ride against the locking fork (C) cam and push the locking collar (D) and pins (E) inward.

The locking collar pins slide through the differential housing (F) and into the left bevel gear (G). This locks the differential gears to the housing resulting in both axles turning the same speed. As the pedal is released, the pedal return spring disengages the locking collar pins by pushing the fork outward.

MX,25010HE,14A -19-19JUL91



DIFFERENTIAL LOCK OPERATION

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MX,25010HE,15A -19-19JUL91

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:

•Lack of Drive - One Direction
•Lack of Drive - Both Directions
•Noisy Operation - One or Both Directions
•Vehicle Creeps In Gear At Idle
•Jerky - Aggressive Engagement
•Slow Erratic Acceleration
•Premature Belt Wear
•Differential Lock Will Not Operate

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 point the test is to be made.

The slide number reference under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

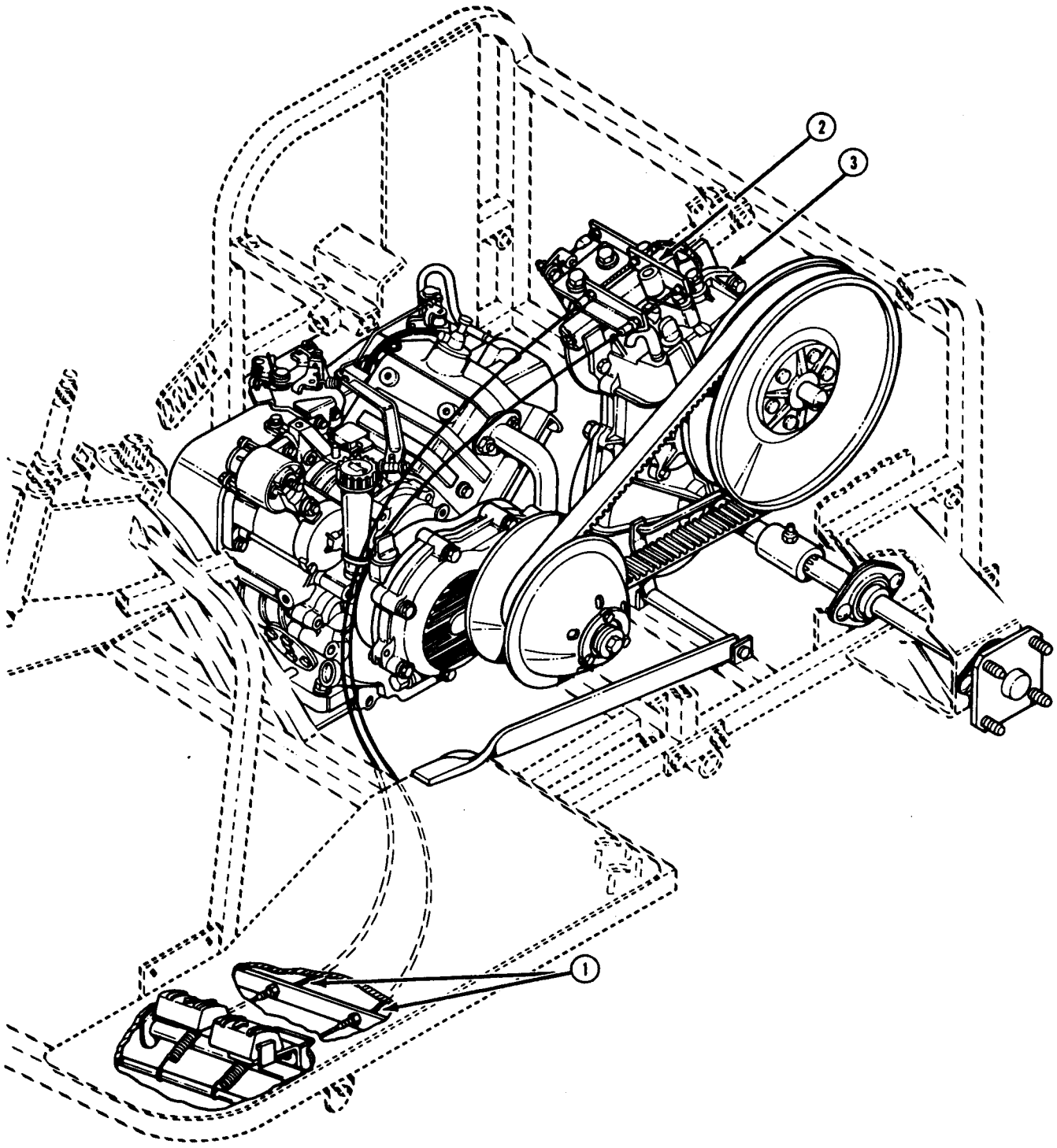
MX,25015HE,1A -19-27SEP91

LACK OF DRIVE—ONE DIRECTION

CONDITIONS:
•Vehicle on level surface.
•Park brake locked.
•Engine operating at slow idle.
•Power train tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Shift cables.	Cables installed correctly, ends not broken, and all hardware tight.	Inspect and adjust shift cables.
	Cable does not bind and has full travel.	Repair or replace shift cables.
2. Transmission shift lever (cables disconnected).	Moves into three distinct positions —forward —neutral —reverse	Inspect lever to transaxle shift shaft roll pin. Disassemble and inspect transaxle shifter components.
3. Transaxle.	Transaxle components not worn or damaged.	Repair or replace internal components.

MX,25015HE,2A -19-19JUL91



M80596

LACK OF DRIVE – ONE DIRECTION

M80596 -19-29AUG91

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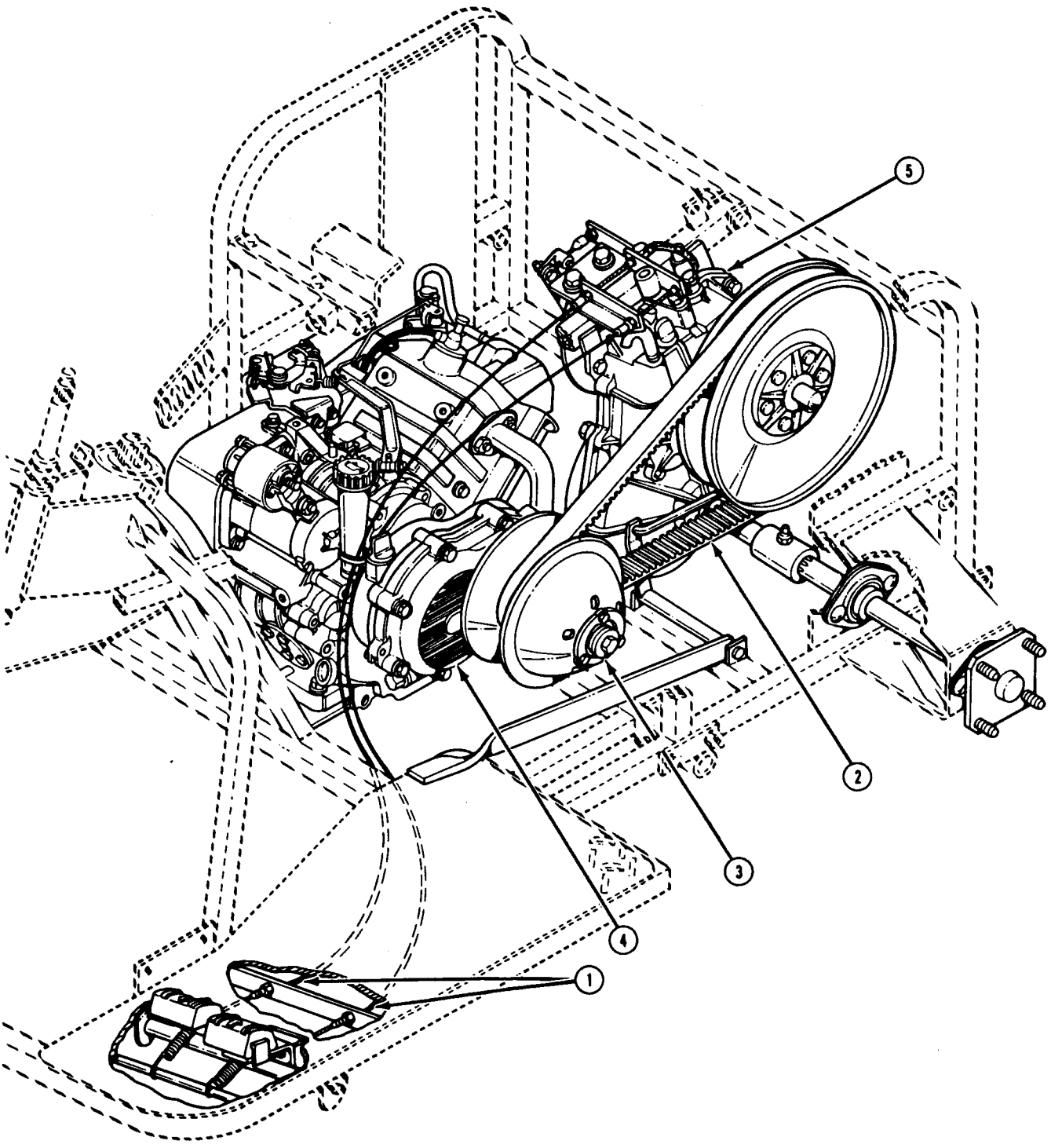
MX,25015HE,3A -19-27SEP91

LACK OF DRIVE—BOTH DIRECTIONS

CONDITIONS:
•Vehicle on level surface.
•Park brake locked.
•Engine operating at slow idle.
•Power train tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Shift cables.	Cables installed correctly, ends not broken and all hardware tight. Cable does not bind and has full travel.	Inspect and adjust shift cables. Repair or replace shift cables.
2. Drive belt.	Belt in good condition and within specifications.	Replace drive belt.
3. Drive clutch.	Turns drive belt upon wet clutch engagement.	Clean drive clutch using compressed air. Disassemble and inspect drive clutch components.
4. Wet reduction clutch.	Correct quantity and type of oil in clutch. Wet clutch engages drive clutch at 1600—1800 rpm.	Fill with specified oil to proper level. Disassemble and inspect wet clutch components.
5. Transaxle.	Correct quantity and type of oil in transaxle. Transmits power from input shaft to output shaft.	Fill with specified oil to correct level. Disassemble, inspect and repair transaxle components.

MX,25015HE,4A -19-27SEP91



M80597

LACK OF DRIVE – BOTH DIRECTIONS

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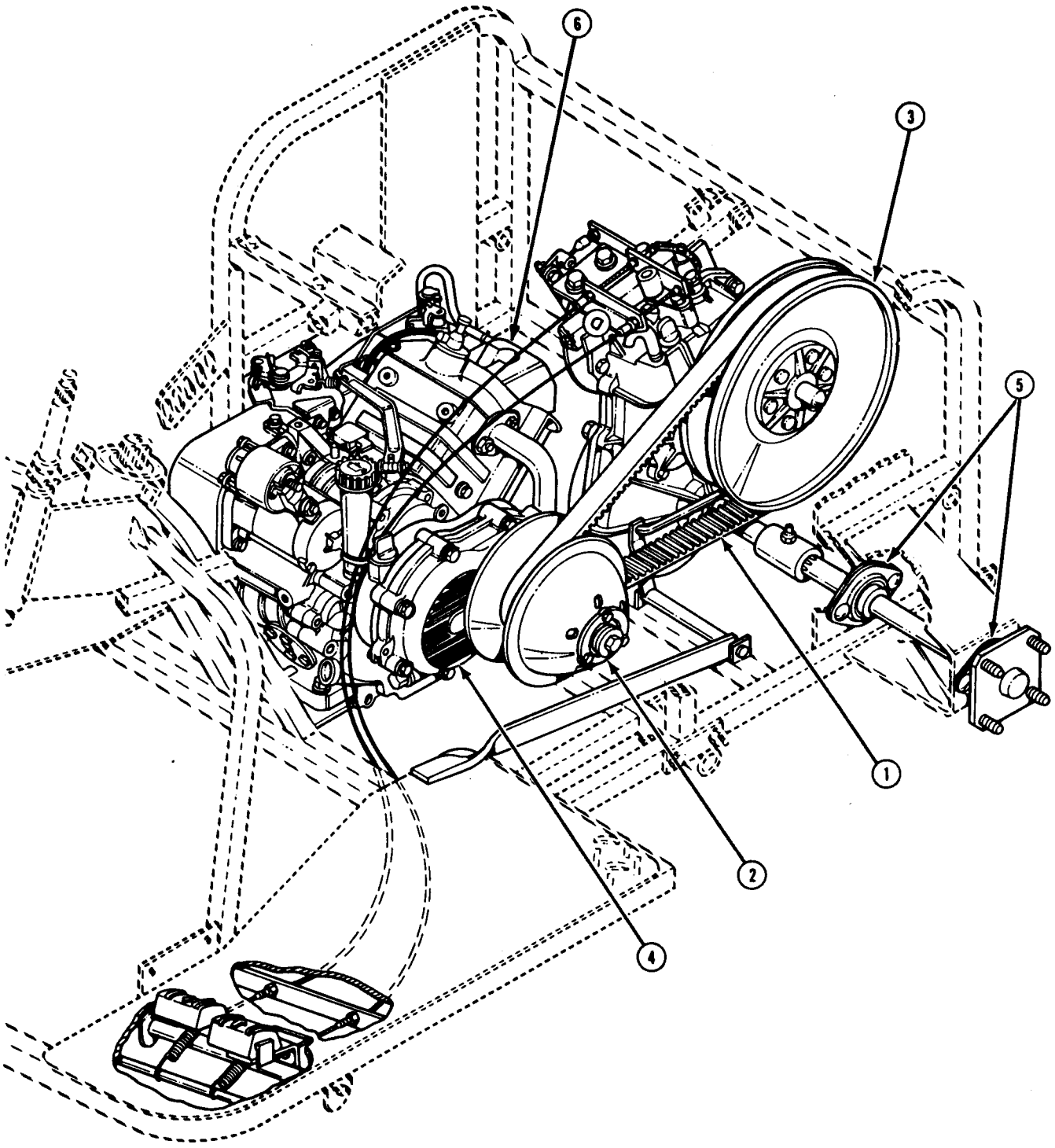
MX,25015HE,5A -19-19JUL91

NOISY OPERATION—ONE OR BOTH DIRECTIONS

CONDITIONS:
•Vehicle on level surface.
•Gear shift pedals in neutral position.
•Park brake locked.
•Engine operating at slow idle.
•Power train tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Drive belt.	Belt wear within specification. Belt not cut, frayed or damaged.	Replace drive belt.
2. Drive clutch.	Drive clutch constantly engages belt and completes upshift when engine is accelerated	Clean drive clutch using compressed air. Disassemble and inspect drive clutch. Replace worn components.
3. Driven clutch.	Belt engages driven clutch. Driven clutch completes upshift and backshifts smoothly as engine is accelerated and decelerated.	Disassemble and inspect driven clutch. Adjust driven clutch torsion spring. Replace worn components.
4. Wet reduction clutch.	Smooth clutch engagement between engine and drive clutch. Little or no slippage under load.	Disassemble and inspect wet clutch. Replace worn components.
5. Axle bearings.	Rotate smoothly with little or no end play.	Lubricate bearings. Replace if worn or damaged.
6. Engine.	With drive belt and drive clutch removed, engine accelerates and decelerates smoothly, without abnormal noise.	Inspect internal components of engine.

MX,25015HE,6A -19-27SEP91



M80598

NOISY OPERATION – ONE OR BOTH DIRECTIONS

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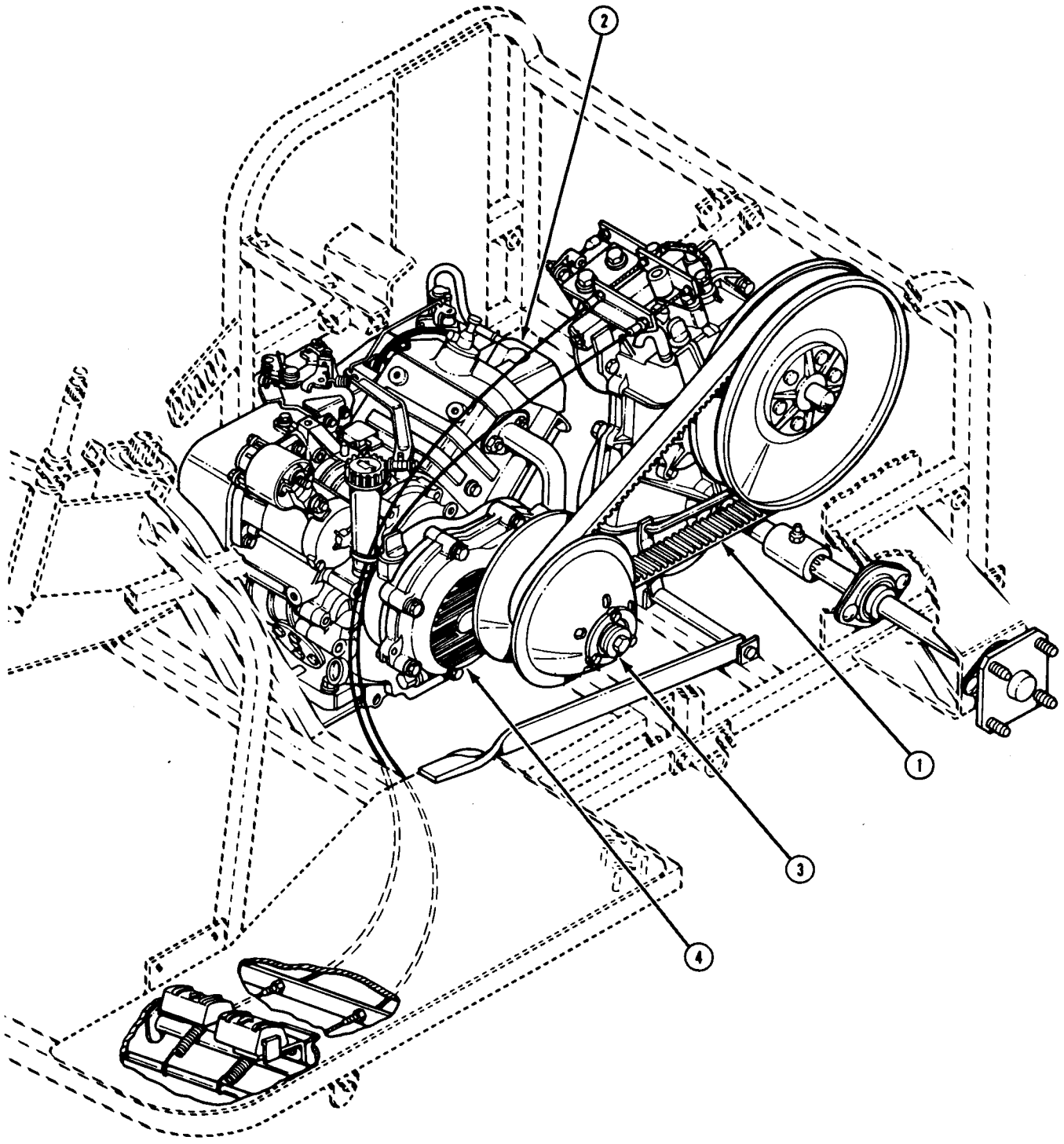
MX,25015HE,7A -19-19JUL91

VEHICLE CREEPS—IN GEAR AT IDLE

CONDITIONS:
•Vehicle on level surface.
•Engine operating at slow idle.
•Attachments raised.
•Gear shift pedals in forward or reverse position.
•Power train tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Drive belt.	Belt in good condition and within specifications.	New belt can cause slight creeping.
2. Engine.	Engine slow idle below wet clutch engagement rpm.	Adjust engine rpm to specification.
3. Drive clutch.	Upshifts and backshifts smoothly with change in engine rpm.	Disassemble and inspect drive clutch components.
4. Wet reduction clutch.	Correct quantity and type of oil. Wet clutch engages drive clutch at 1600—1800 rpm.	Fill with specified oil to proper level. Disassemble and inspect wet clutch components.

MX,25015HE,8A -19-27SEP91



M80599

VEHICLE CREEPS—IN GEAR AT IDLE

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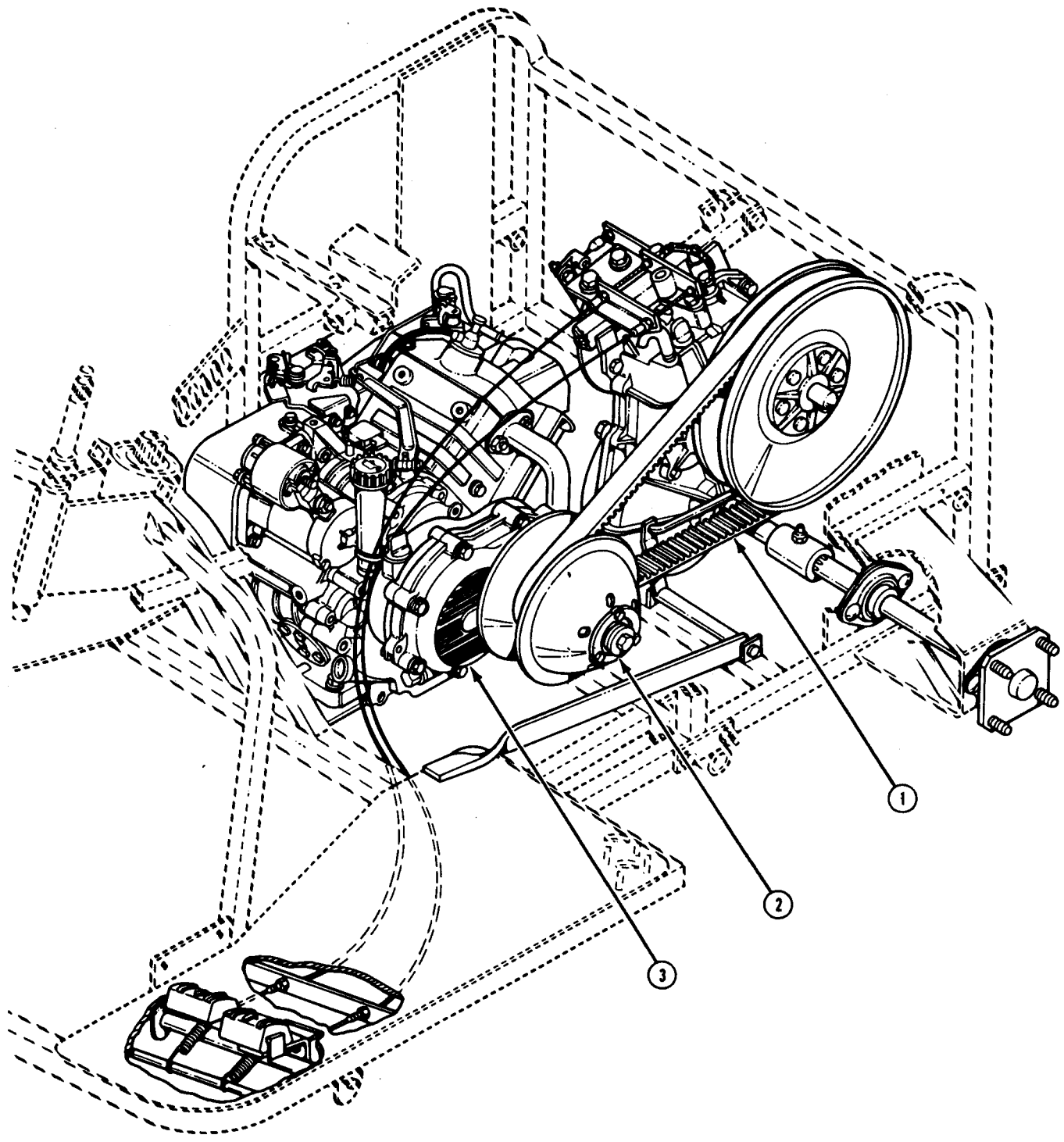
MX,25015HE,9A -19-19JUL91

JERKY OR AGGRESSIVE ENGAGEMENT

CONDITIONS:
•Vehicle on level surface.
•Engine operating at slow idle.
•Gear shift pedal in forward position.
•Accelerate engine to engage wet clutch.

Test Location	Normal	If Not Normal
1. Drive belt.	Belt in good condition and within specifications.	Replace drive belt.
2. Drive clutch.	Clutch engages smoothly at specified wet clutch rpm. Upshifts and backshifts smoothly.	Clean drive clutch. Disassemble and inspect drive clutch components.
3. Wet reduction clutch.	Correct quantity and type of oil. Wet clutch engages drive clutch at 1600—1800 rpm.	Fill with specified oil to proper level. Disassemble and inspect wet clutch components.

MX,25015HE,10A -19-27SEP91



M80620

JERKY OR AGGRESSIVE ENGAGEMENT

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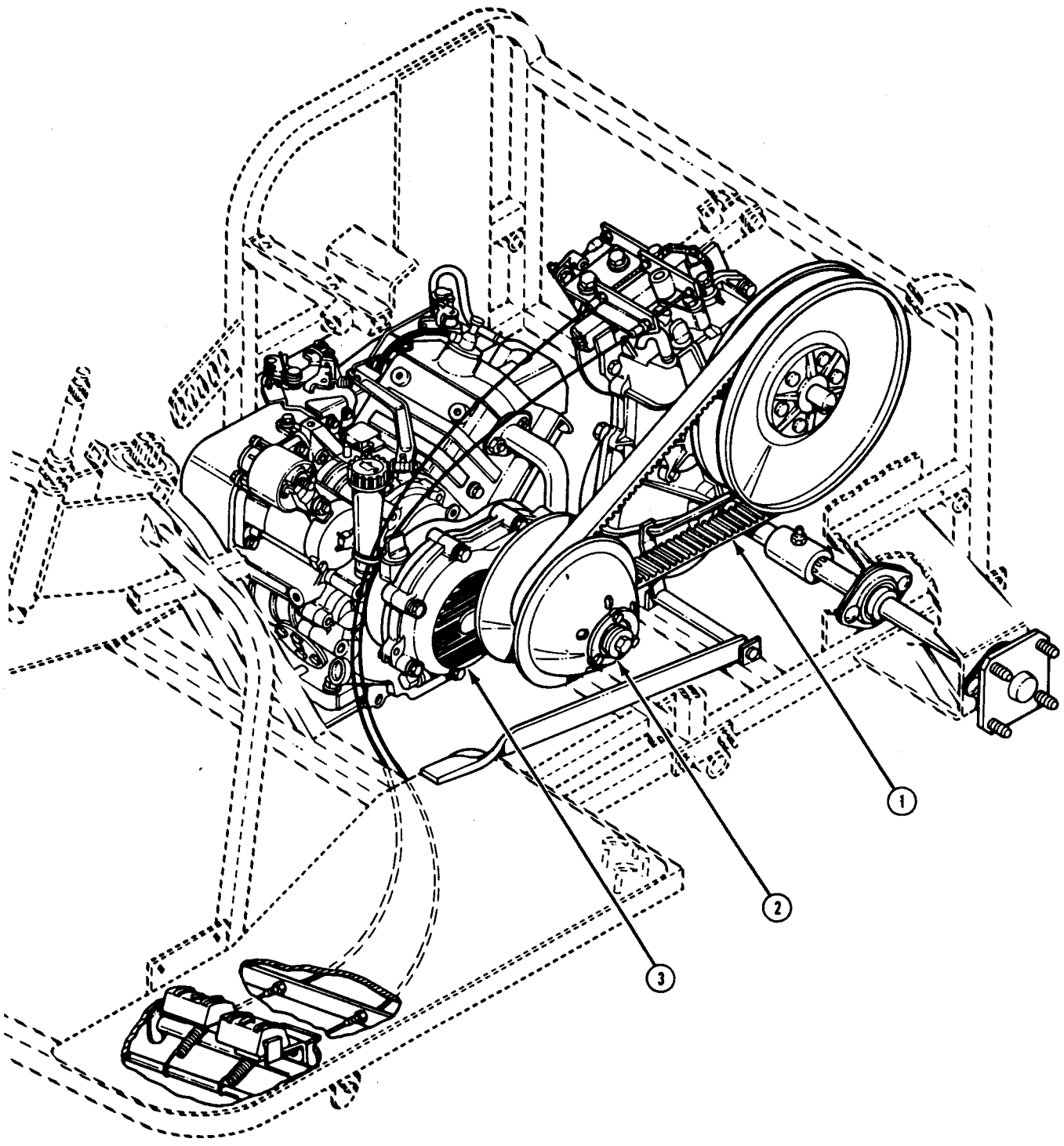
MX,25015HE,11A -19-19JUL91

SLOW ERRATIC ACCELERATION

CONDITIONS:
- Vehicle on level surface.
- Engine operating.
- Gear shift pedal in forward position.
- Push throttle pedal to accelerate engine.
- Power train tests and adjustments in this section and group.
- Engine tests and adjustments in Section 220, Group 15.

Test Location	Normal	If Not Normal
1. Vehicle performance	Smooth upshift with operator and pulling load added to vehicle.	Vehicle pulling/pushing power exceeded. Reduce load to vehicle.
2. Drive belt.	Belt in good condition and within specification.	Check belt alignment. Replace drive belt.
3. Drive clutch.	Upshifts and backshifts smoothly.	Clean drive clutch using compressed air. Disassemble and inspect drive clutch components.
4. Wet reduction clutch.	Correct quantity and type of oil. Wet clutch engages drive clutch at 1600—1800 rpm. Little or no slippage under load.	Fill wet clutch with specified oil to proper level. Disassemble and inspect wet clutch components. Replace worn components.
5. Driven clutch.	Belt engages driven clutch. Driven clutch completes upshift and backshift smoothly as engine is accelerated and decelerated.	Disassemble and inspect driven clutch. Replace worn components.
6. Axle bearings.	Rotate smoothly with little or no end play.	Lubricate bearings. Replace worn bearings.
7. Transaxle.	Correct quantity and type of oil in transaxle. Transmits power from input shaft to output shaft.	Fill with specified oil to correct level. Disassemble, inspect and repair transaxle.
8. Engine.	Good performance. RPM within specification.	Test, adjust, and/or repair engine as necessary.

MX,25015HE,12A -19-27SEP91



M80620

JERKY OR AGGRESSIVE ENGAGEMENT

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MX,25015HE,13A -19-19JUL91

PREMATURE BELT WEAR

CONDITIONS:
•Park brake locked.
•Engine stopped.
•Power train tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Vehicle performance.	Smooth upshift with operator and pulling load added to vehicle.	Vehicle pulling/pushing power causing belt to slip excessively. Reduce load. Replace belt as necessary.
2. Drive and driven clutches.	Clutches in alignment.	Check and correct clutch alignment.
3. Drive clutch.	Engages at specified wet clutch rpm. Upshifts and backshifts smoothly with change in engine rpm.	Clean drive clutch using compressed air. Disassemble, inspect and repair worn drive clutch components.
4. Driven clutch.	Upshifts and backshifts smoothly with change in engine rpm.	Clean and inspect driven clutch components. Adjust spring tension as necessary.

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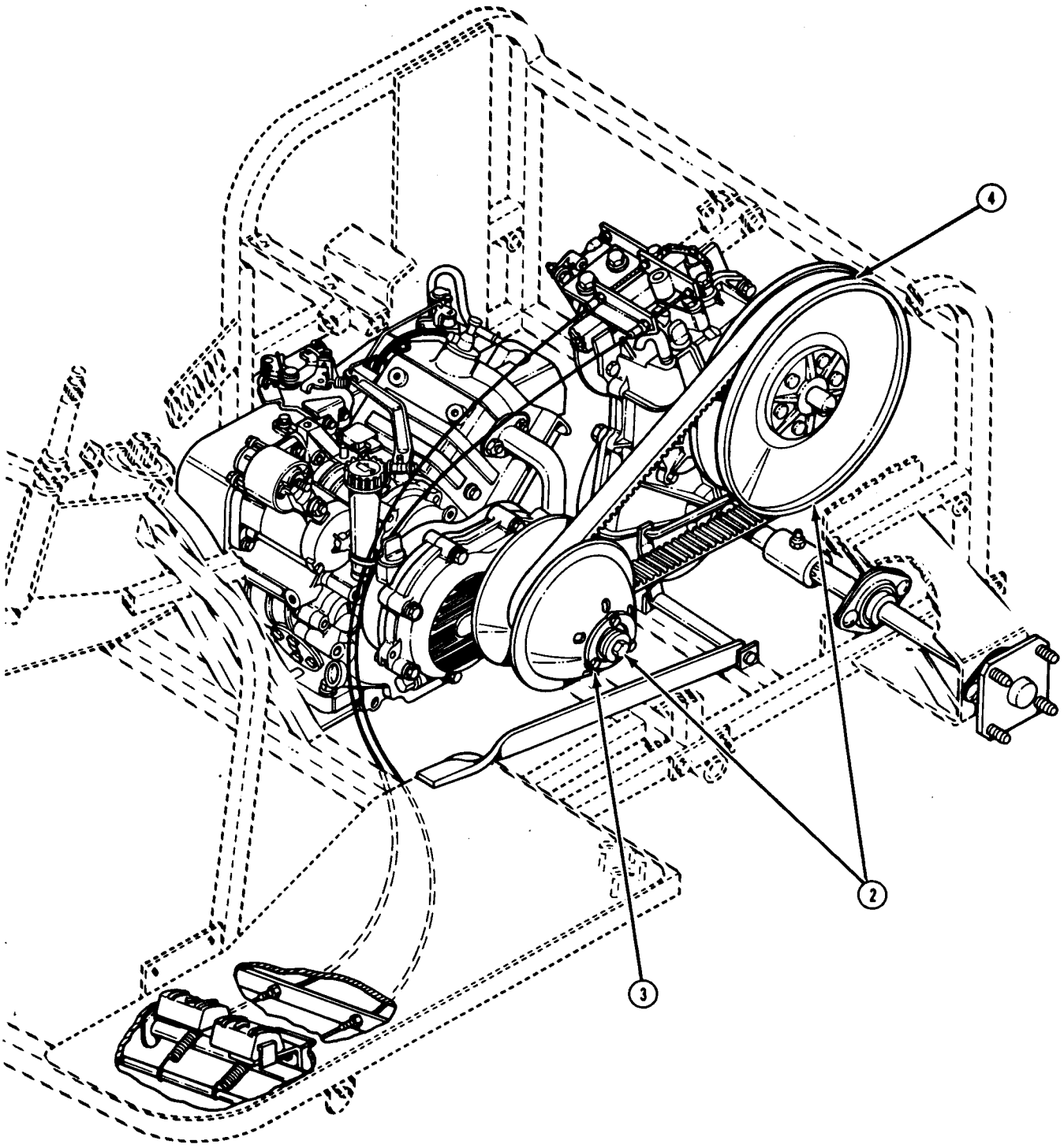

M80622

PREMATURE BELT WEAR

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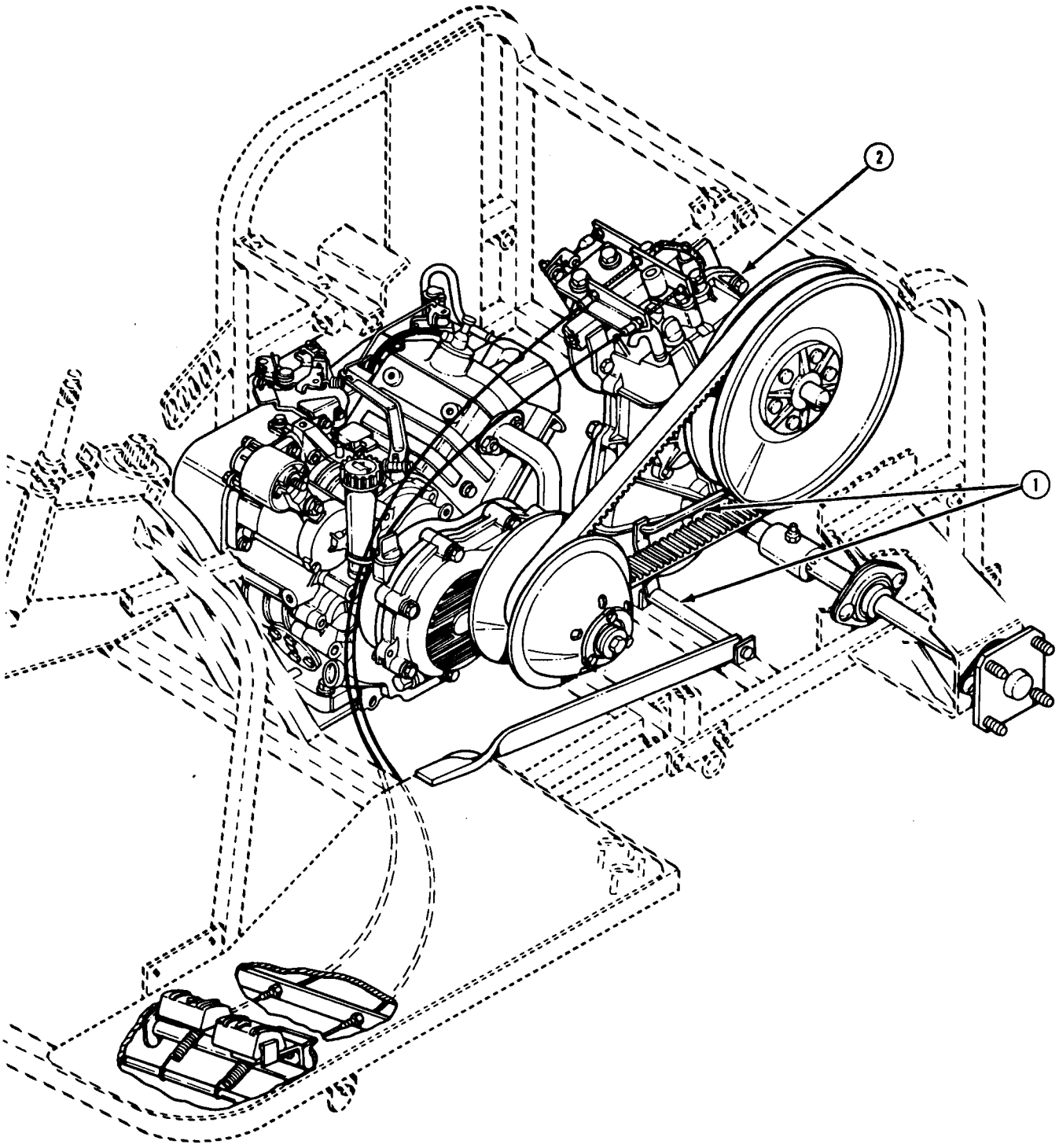
MX,25015HE,15A -19-19JUL91

DIFFERENTIAL LOCK WILL NOT OPERATE

CONDITIONS:
•Vehicle on level surface.
•Engine operating at slow idle.
•Power train tests and adjustments in this section and group.

Test Location	Normal	If Not Normal
1. Control linkage.	Linkage installed correctly and hardware secure.	Repair or replace linkage as necessary.
2. Transaxle.	Transaxle internal components wear within specification.	Repair or replace internal components.

MX,25015HE,16A -19-19JUL91



M80623

DIFFERENTIAL LOCK WILL NOT OPERATE

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MX,25015HE,17A -19-19JUL91

DRIVE BELT INSPECTION

REASON:
Make sure drive belt is within specifications for proper machine operation.

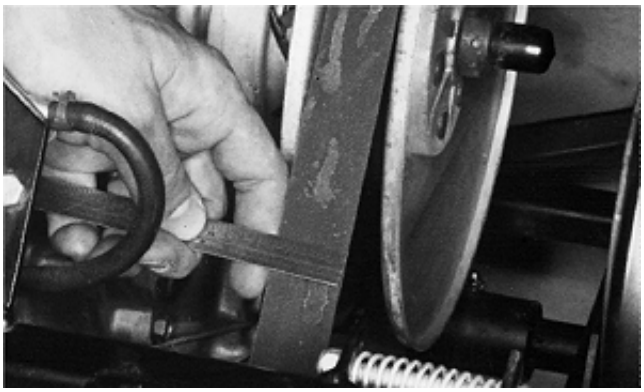
PROCEDURE:
1. Measure drive belt across the top width.

2. Check belt for cracking, signs of wear or fatigue.

3. Check belt for slipping.

SPECIFICATIONS:
•Minimum belt width .. 27 mm (1-1/16 in.)

RESULTS:
•If belt is not within specifications, replace drive belt.
•If belt is excessively loose to the point where it's slipping, replace drive belt.



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MX,25015HE,17AA-19-10SEP91

TRANSAXLE SHIFT CABLES ADJUSTMENT

REASON:
Make sure shift pedals are adjusted correctly in relation to transaxle shift shaft.

PROCEDURE:
1. Shift transaxle into forward using forward shift pedal.

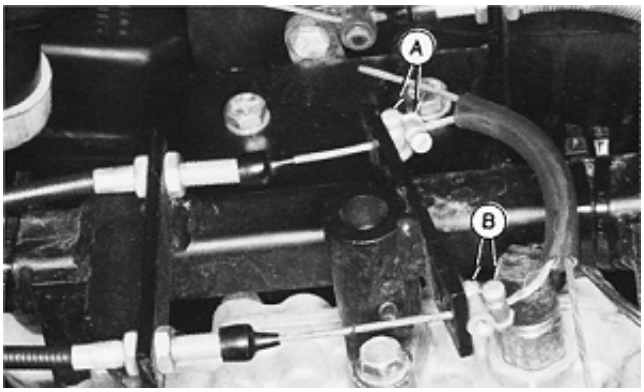
2. Make sure transaxle is in forward detent position by moving transaxle control arm from forward detent to neutral and back to forward detent.

3. Check forward pedal position. The stop on the pedal must be a distance (C) of 3 mm (1/8 in.) above the floor plate.

4. If pedal position is not within specification:
   - •Loosen cable clamps (A).
   - •Adjust cable length until pedal stop is to Specification.
   - •Keep cable tight and slide cable clamps tight against control arm.
   - •Tighten cable clamps.

5. Shift transaxle into reverse using reverse shift pedal.

6. Repeat steps 1—4 for the reverse cable and clamps (B).



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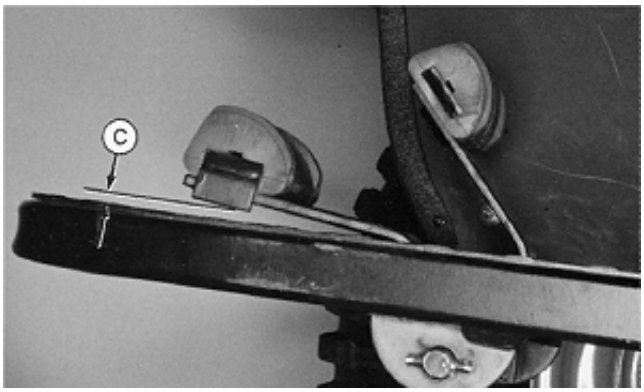

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MX,25015HE,18A -19-19JUL91

FULL UPSHIFT CHECK

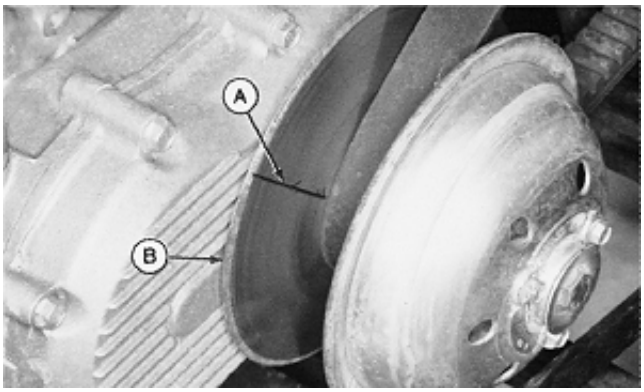
REASON:
Verify the full upshift of the clutching system.

PROCEDURE:
1. Draw a line (A) on face of drive sheave (B), extending from the center to the outer edge. Use an all purpose marker or equivalent.

2. With the transmission in neutral and the park brake locked, accelerate the engine to wide open throttle for a couple of seconds, then release accelerator pedal.

3. Stop engine. Measure the length of the line (A) that remains on the sheave face. The belt should upshift to within 2 mm (1/16 in.) of the outer edge of the sheave face.

RESULTS:
•If full upshift is not achieved, check the following possible problems:
—Low engine RPM
—Slipping wet clutch
—Sticking or binding drive or driven clutch due to worn parts
—Worn belt



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MX,25015HE,19A -19-27SEP91

DRIVEN CLUTCH SPRING TORSION CHECK

REASON:
To determine the condition of the driven clutch spring.

EQUIPMENT:
•Spring Scale
•Vise Grip Pliers

PROCEDURE:
1. Put transaxle in forward or reverse position and lock the park brake.

2. Remove drive belt.

3. Put a 3 mm (1/8 in.) drill bit (A) or round screwdriver shank between the fixed and moveable sheave faces to reduce friction between the two sheave surfaces.

4. Clamp a vise grip pliers to lip of moveable sheave.

5. Attach a spring scale to the pliers.

6. Pull against the moveable sheave to measure to measure spring force. Spring force should be 27—80 N (6—18 lb).

SPECIFICATIONS:
•Driven clutch spring
torsional force .. 27—80 N (6—18 lb)

RESULTS:
•If spring force is less than specification, engine RPM is reduced and the upshift occurs faster.

•If the spring force is greater than specification, higher engine RPM is required and upshift occurs slower.

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DRIVEN CLUTCH SPRING TORSION ADJUSTMENT

REASON:
To increase or decrease torsional force of the driven clutch spring.

PROCEDURE:
1. Remove and disassemble driven clutch. (See procedure in Section 50, Group 05.)

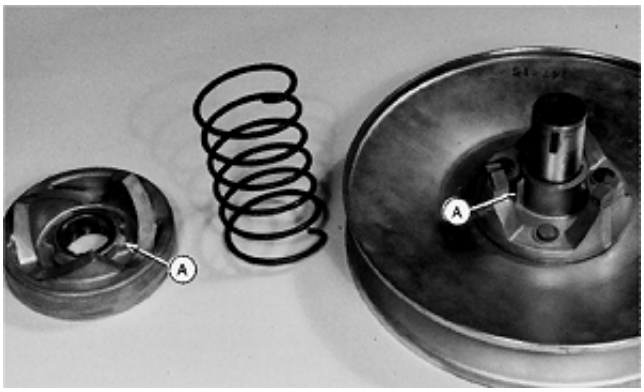
2. Put spring between cam and moveable sheave with ends of spring against retaining tabs (A).

3. Adjust spring torsion:

- Standard Torsion—rotate cam and moveable sheave 120˚ counterclockwise from static position of spring.

- Increase Torsion—rotate cam and moveable sheave in 120˚ increments counterclockwise additionally from the standard position.

- Decrease Torsion—rotate cam and moveable sheave clockwise from original position. Do not rotate clockwise beyond the static position.



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MX,25015HE,21A -19-27SEP91

Section 260
STEERING & BRAKES OPERATION, TESTS & ADJUSTMENTS

Contents

Page

COMPONENT LOCATION INFORMATION

This group contains component location drawings for the following steering and brake system components:
•Steering
•Brakes
•Brake Caliper
•Brake Pedal

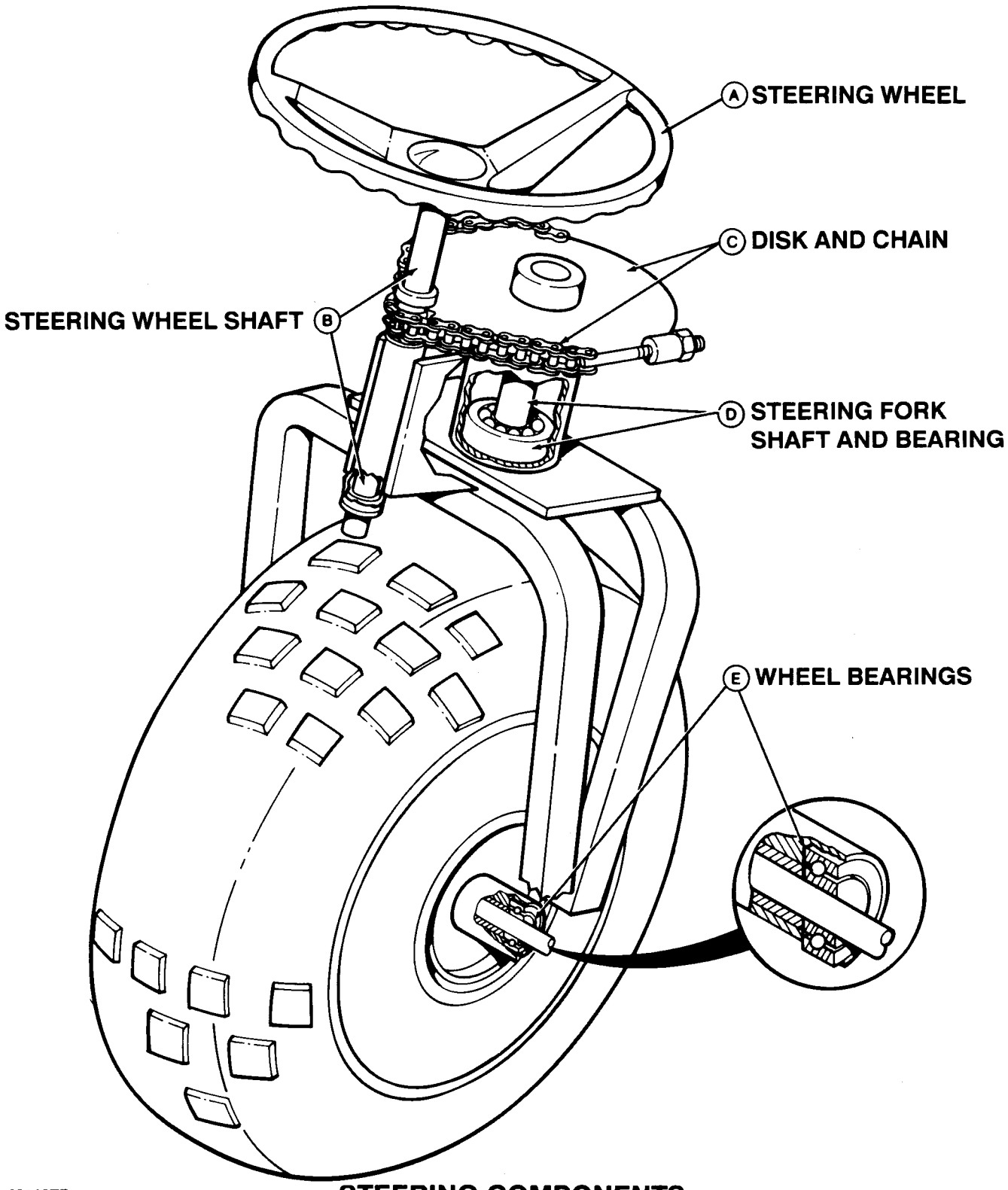
Use the drawings when troubleshooting steering and brake problems to help locate the components to be tested.

MX,26005HE,1 -19-27SEP91

STEERING COMPONENTS

A—Steering Wheel
B—Steering Wheel Shaft
C—Disk and Chain
D—Steering Fork Shaft and Bearing
E—Wheel Bearings

MX,26005HE,2 -19-29AUG91



STEERING COMPONENTS

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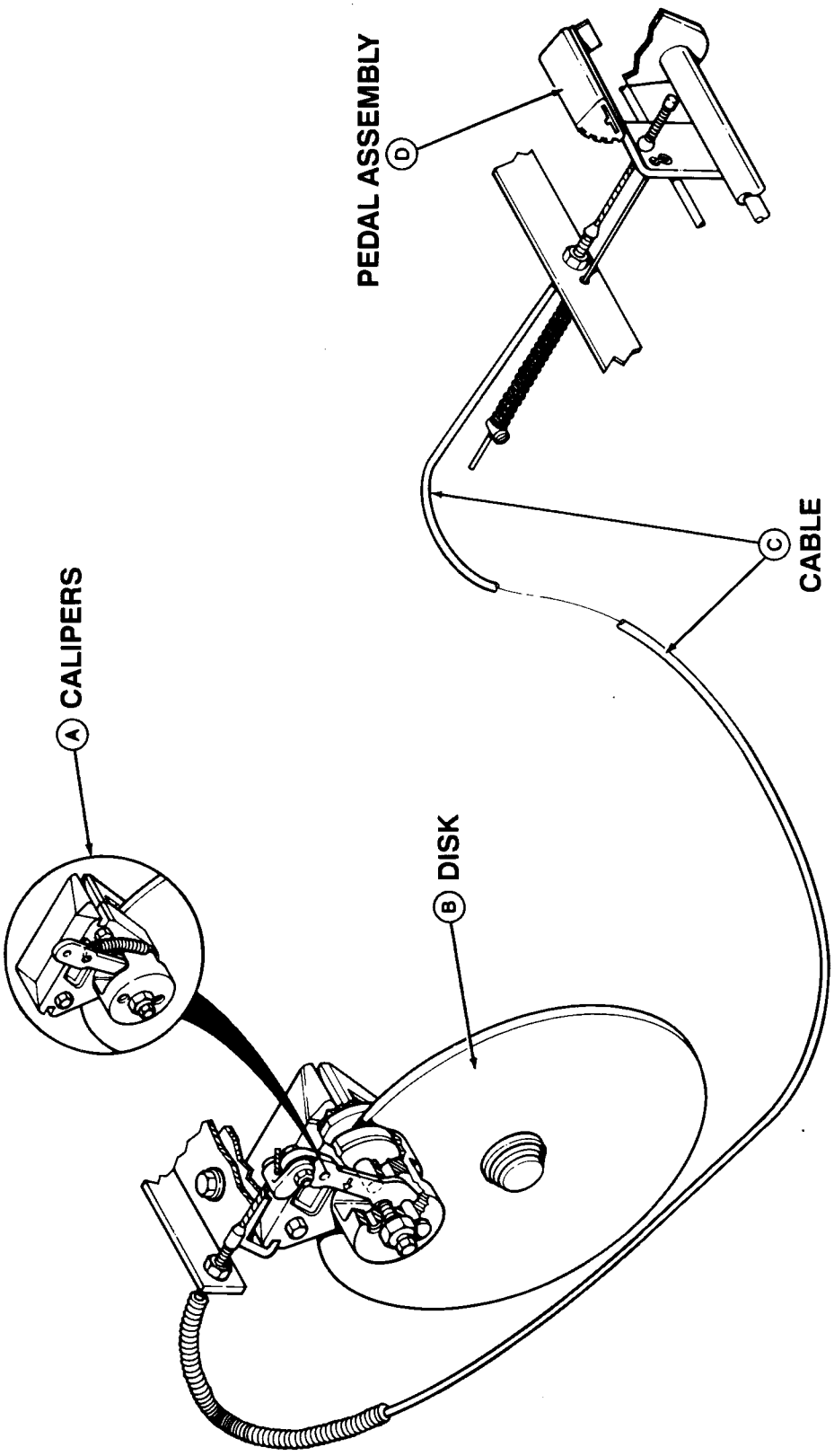
MX,26005HE,2A -19-29AUG91

BRAKE COMPONENTS

A—Calipers **B—Disk** **C—Cable** **D—Pedal Assembly**

MX,26005HE,3 -19-29AUG91



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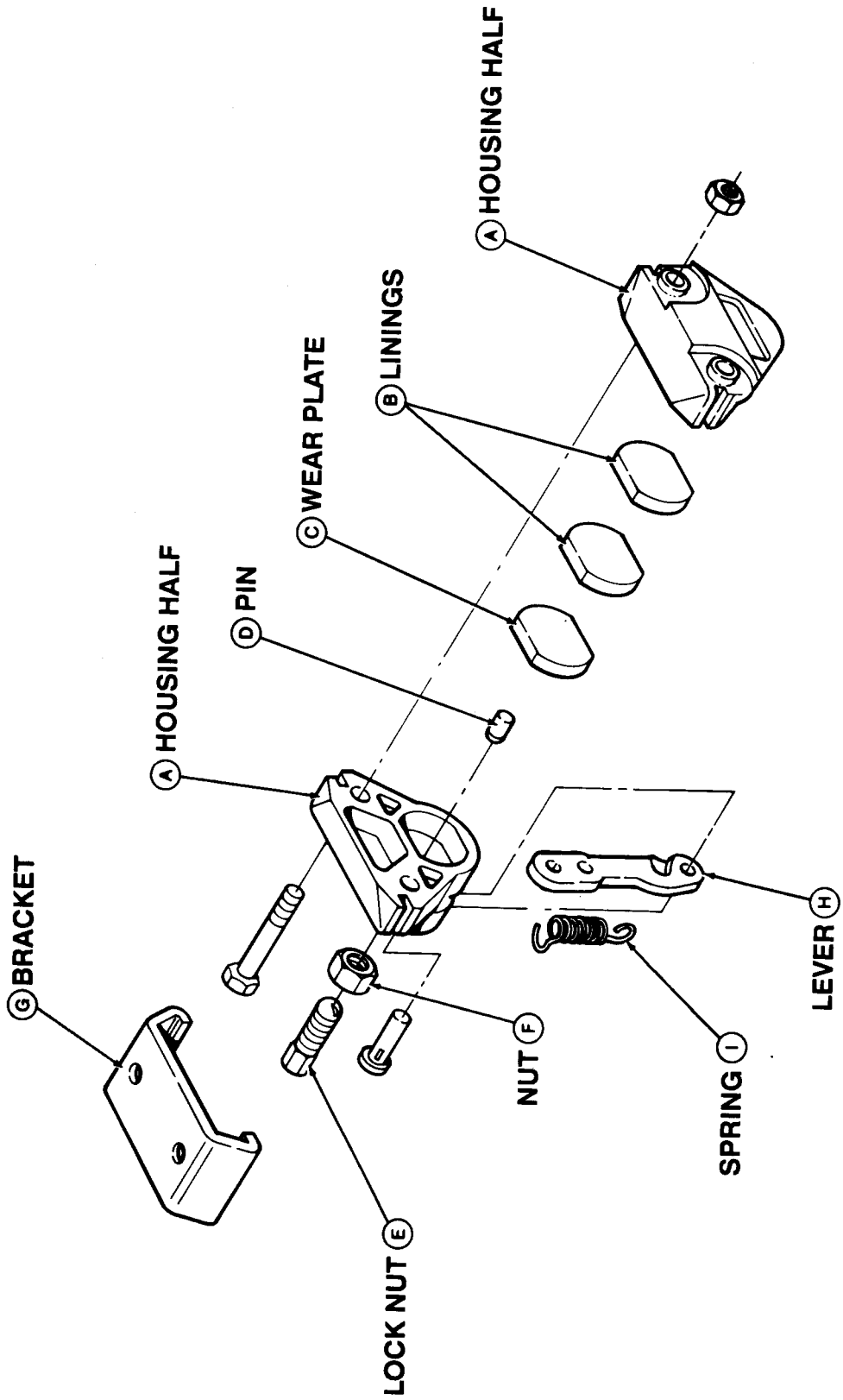
MX,26005HE,4 -19-27SEP91

BRAKE CALIPER COMPONENTS

A—Housing Halves
B—Linings
C—Wear Plate
D—Pin
E—Lock Nut
F—Nut
G—Bracket
H—Lever
I—Spring

MX,26005HE,6 -19-29AUG91



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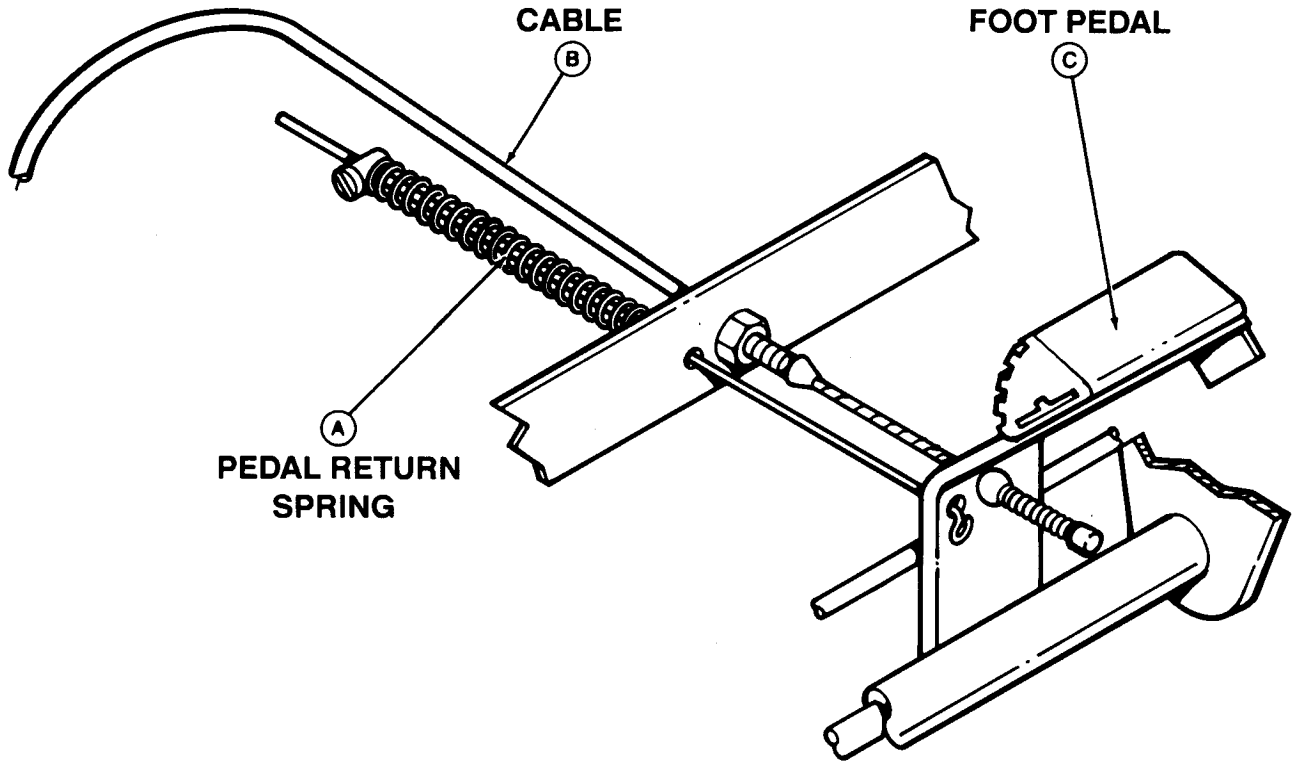
MX,26005HE,6A -19-29AUG91

BRAKE PEDAL COMPONENTS



M44844 -19-06SEP91

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BRAKE PEDAL COMPONENTS

A—Pedal Return Spring **B—Cable** **C—Foot Pedal**

Slide M44844

MX,26005HE,5 -19-29AUG91

THEORY OF OPERATION INFORMATION

This group divides the 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:
•Steering System
•Brake System

The slide number reference under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

MX,26010HE,1 -19-27SEP91

STEERING SYSTEM OPERATION

FUNCTION:
To direct movement of machine in forward or reverse.

MAJOR COMPONENTS:
•Steering Wheel
•Steering Shaft
•Disk and Chain
•Steering Fork and Bearings

THEORY OF OPERATION:
Steering of the 1200 Bunker Rake is controlled by a gear on the steering shaft which is connected to a large disk by a chain. The disk is splined to the steering fork, which turns the front wheel.

Steering effort is quite low due to the 6 to 1 reduction between the steering shaft and the fork shaft. There are two mechanical stops between the fork and frame which limits the diameter of the vehicles turning radius. The 1200 Bunker Rake has a 12 inch turning radius.

MX,26010HE,1A -19-27SEP91

BRAKE OPERATION

A—Pedal
B—Cable
C—Cable Adjusters
D—Lever
E—Pin
F—Wear Plate
G—Linings
H—Rotating Disk

FUNCTION:
Slow down or stop the machine.

MAJOR COMPONENTS:
•Brake Pedal
•Brake Cable
•Brake Caliper
•Brake Disk

THEORY OF OPERATION:
The brakes are a mechanical, disk and floating caliper type. The foot pedal is connected to the brake caliper assembly with a cable. As the pedal (A) pulls the cable (B), a lever (D) is moved rearward. As the lever moves rearward, a bevel in the lever contacts the pin (E) and drives the pin into the wear plate (F), which in-turn, forces the wear linings (G) to contact the rotating disk, stopping the vehicle.

To adjust cable freeplay, there are adjusters (C) at the lever and pedal end of the cable. A spring at the lever end of the cable disengages the wear linings from the rotating disk when foot pressure is released from the pedal. A spring at the pedal also helps return pedal to the disengaged position.

The park lock is a toothed lever that locks the brake pedal when manually applied by operator. When the lever is pulled toward the brake pedal, & locked in the engaged position, the brakes stay engaged until the pedal is pressed and lever is moved forward.

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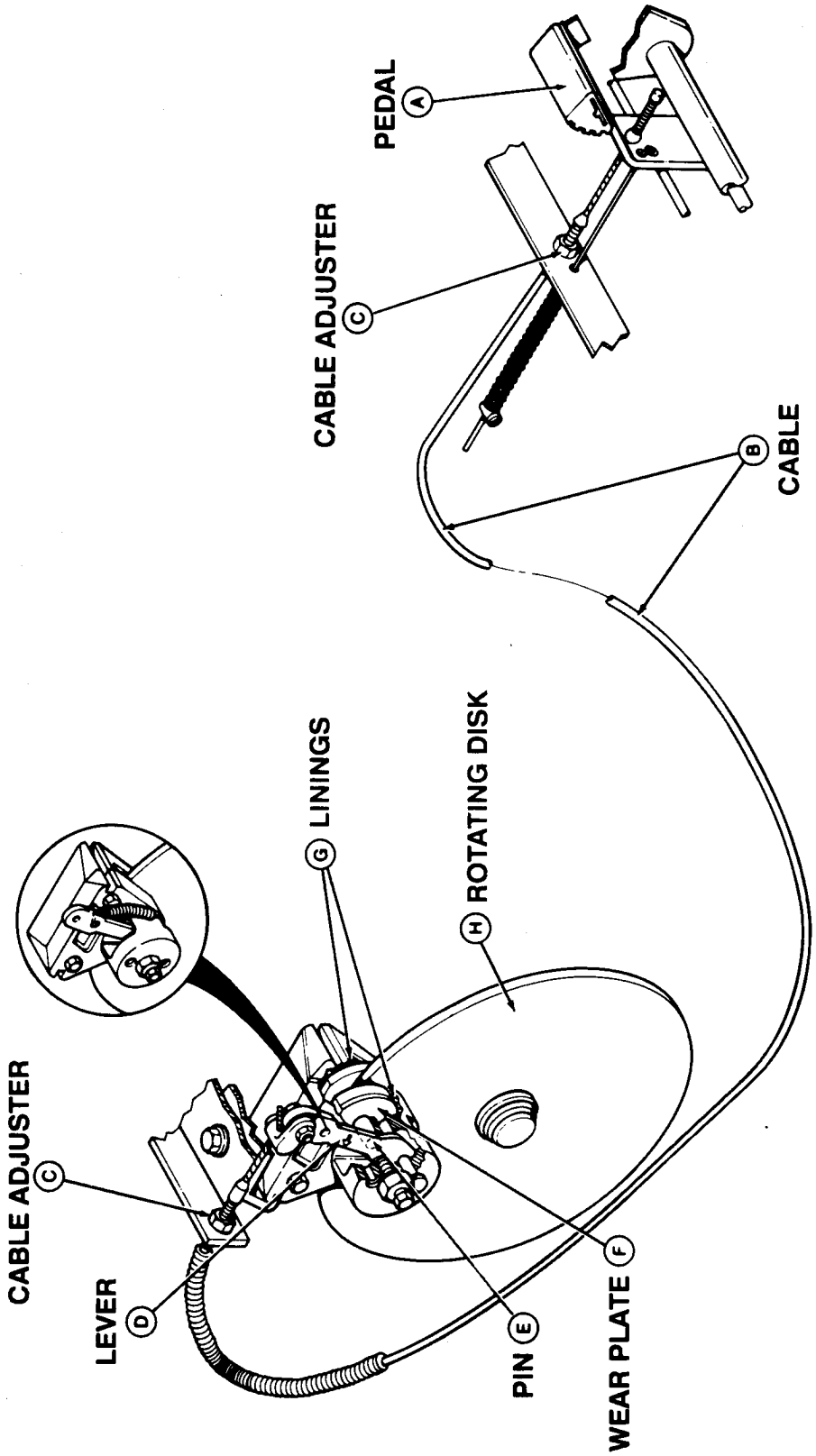
MX,26010HE,2 -19-27SEP91



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MX,26010HE,3 -19-27SEP91

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 vibration or noise
•Brake effort, noise, wear or adjustment

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.

The system diagram that accompanies each test procedure is drawn to resemble machine components. The key number on the art determines test sequence and the arrow points to the exact point the test is to be made.

The slide number references under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

MX,26015HE,1 -19-27SEP91

STEERING VIBRATION OR NOISE

CONDITIONS:
•Park brake engaged.
•Front wheel raised off ground.

Test/Location	Normal	If Not Normal
1. Rim.	Runout less than 3 mm (1/8 in.).	Replace rim.
2. Tire.	Runout less than 10 mm (3/8 in.).	Remount tire on rim. Replace tire.
3. Wheel bearings.	Wheel rotates freely without rough spots, axle bolt tight.	Replace bearings. Tighten axle bolt.
4. Steering wheel shaft.	Bushings tight in tube, pivots freely but not worn at inner tube, locking collar tight.	Clean and lubricate bushings and tube. Replace worn components. Tighten locking collar.
5. Fork shaft.	Fork turns freely without rough spots, no end-play in pivot.	Replace roller bearings. Tighten pivot bolt to 125 N·m (92 lb-ft).
6. Steering Wheel Play.	No play in steering wheel, chain and disk adjusted tight.	Replace chain and/or disk.

MX,26015HE,2 -19-27SEP91

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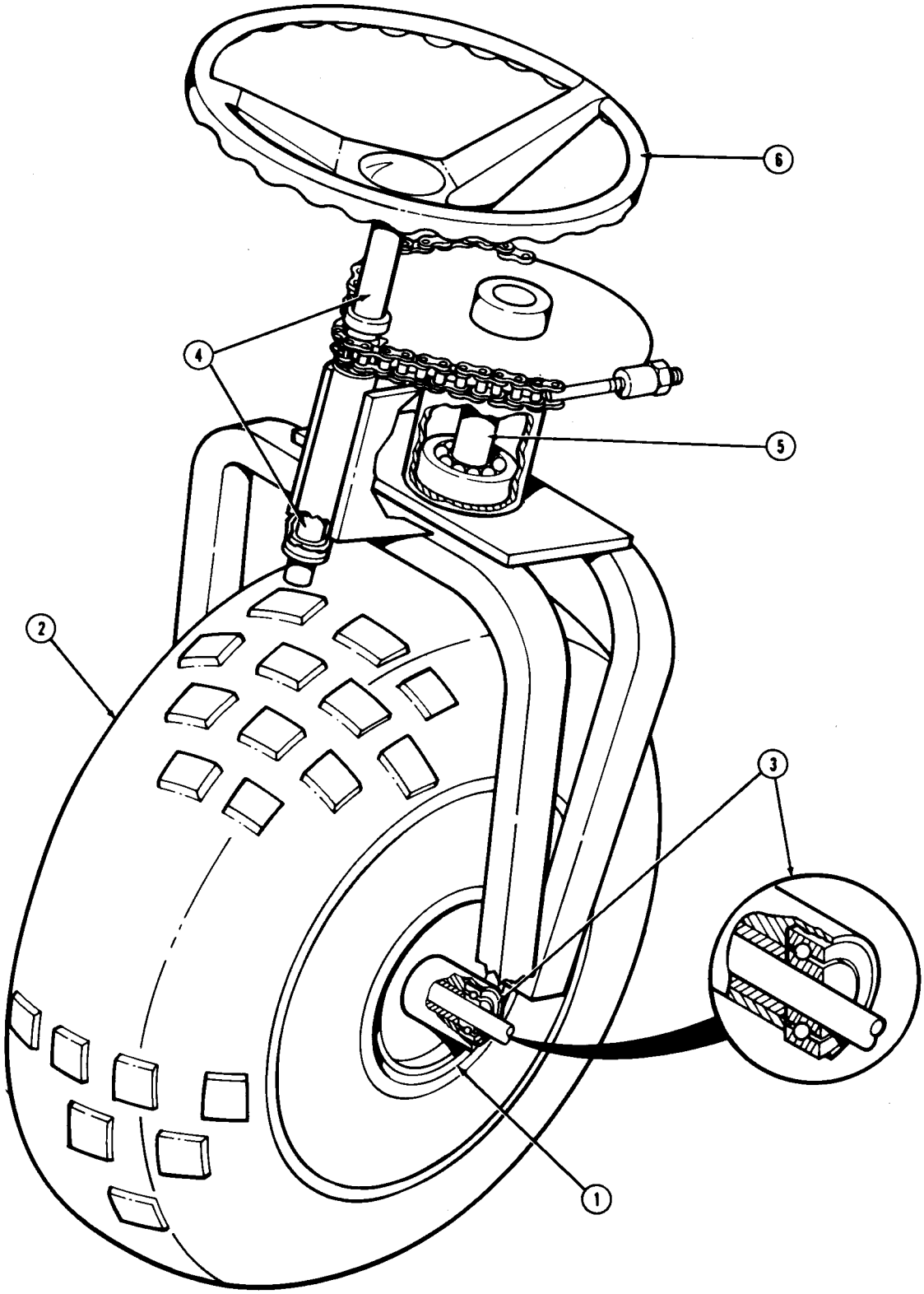

M44842

STEERING DIAGNOSTICS

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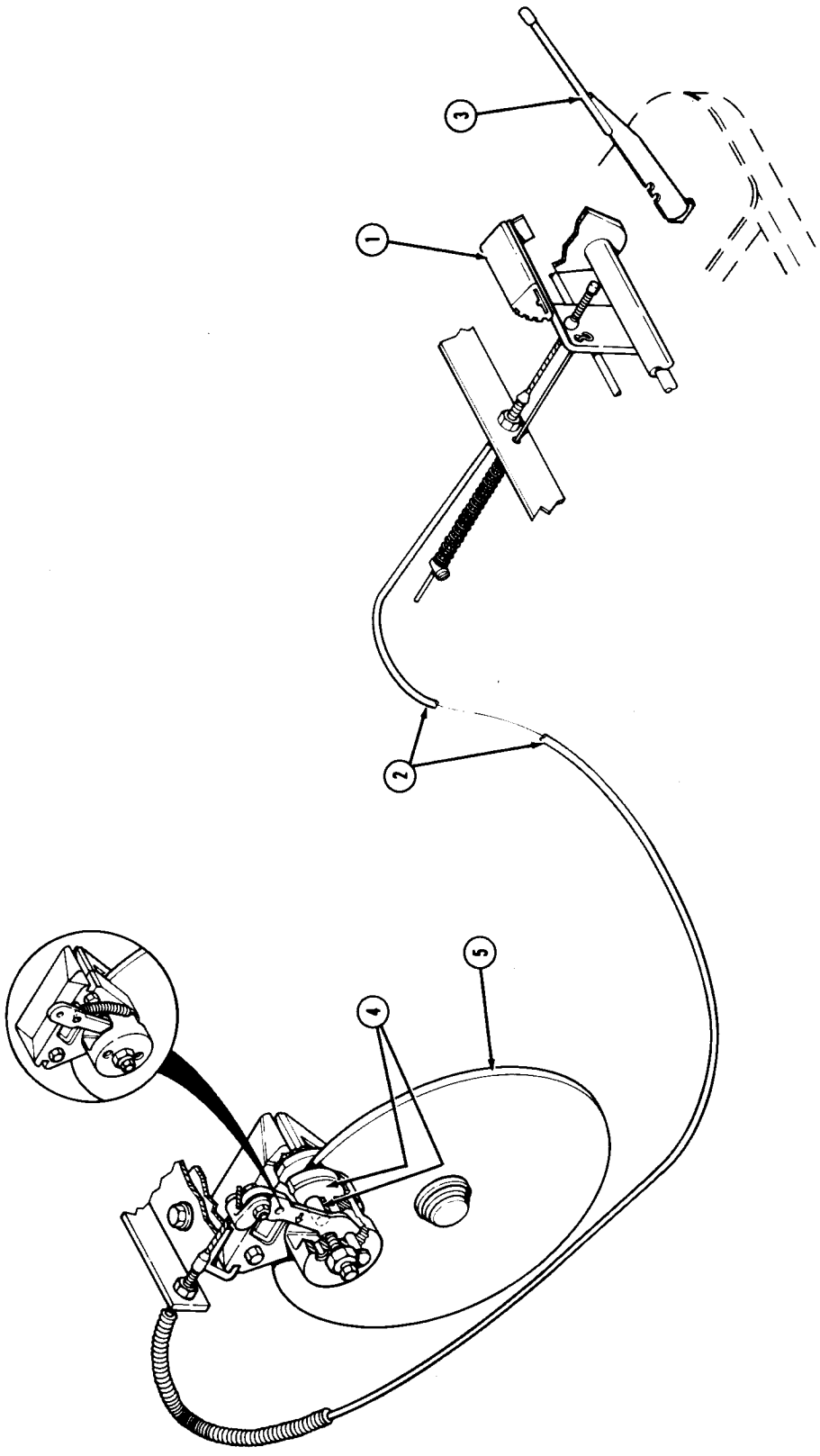
MX,26015HE,3 -19-29AUG91

BRAKE EFFORT, NOISE, WEAR OR ADJUSTMENT

CONDITIONS:
•Rear wheels raised off ground

Test/Location	Normal	If Not Normal
1. Pedal assembly.	Pedal pivots freely, cable adjusted correctly at lever.	Clean and lubricate. Replace worn or damaged components. Adjust cable.
2. Cable.	Cable moves freely in housing.	Replace damaged cable. Remove any sharp bends in routing. Clean and lubricate cable.
3. Park lock.	Cam rotates freely and engages with lever in locked position.	Clean and lubricate. Replace worn or damaged components.
4. Pin & wear plate.	Wear plate moves freely in bracket, pin moves freely up ramps of lever as lever is moved rearward.	Clean brake housing. Replace damaged pins, wear plates.
5. Disk.	Runout of disks no more than 0.8 mm (0.030 in.).	Check for bent disk or axle. Check for incorrectly assembled rear axle. Check for damaged splines of axle or disk.

MX,26015HE,4 -19-27SEP91



BRAKE DIAGNOSIS

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M44877 -19-06SEP91

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MX,26015HE,5 -19-27SEP91

BRAKE CABLE ADJUSTMENT

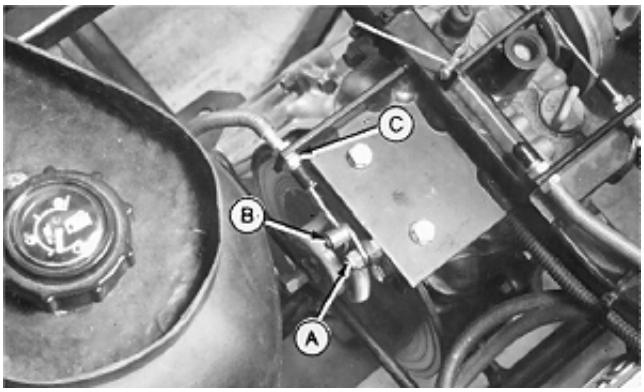
REASON:
Adjust brakes to ensure proper operation.

PROCEDURE:
1. Loosen screw (B).

2. Put brake pedal in rear position and brake lever (A) forward.

3. Loosen adjusting nuts (C) to remove slack from cable but not extending cable to the point of brake engagement.

4. Tighten screw (B).



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A—Lever
B—Screw
C—Nuts

MX,26015HE,6 -19-27SEP91

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Section 270
HYDRAULIC SYSTEM OPERATION, TESTS & ADJUSTMENTS

Contents

Page

COMPONENT LOCATION INFORMATION

This group contains component location drawings for the following hydraulic components:
•Hydraulic Lift System
•Hydraulic Lift Pump

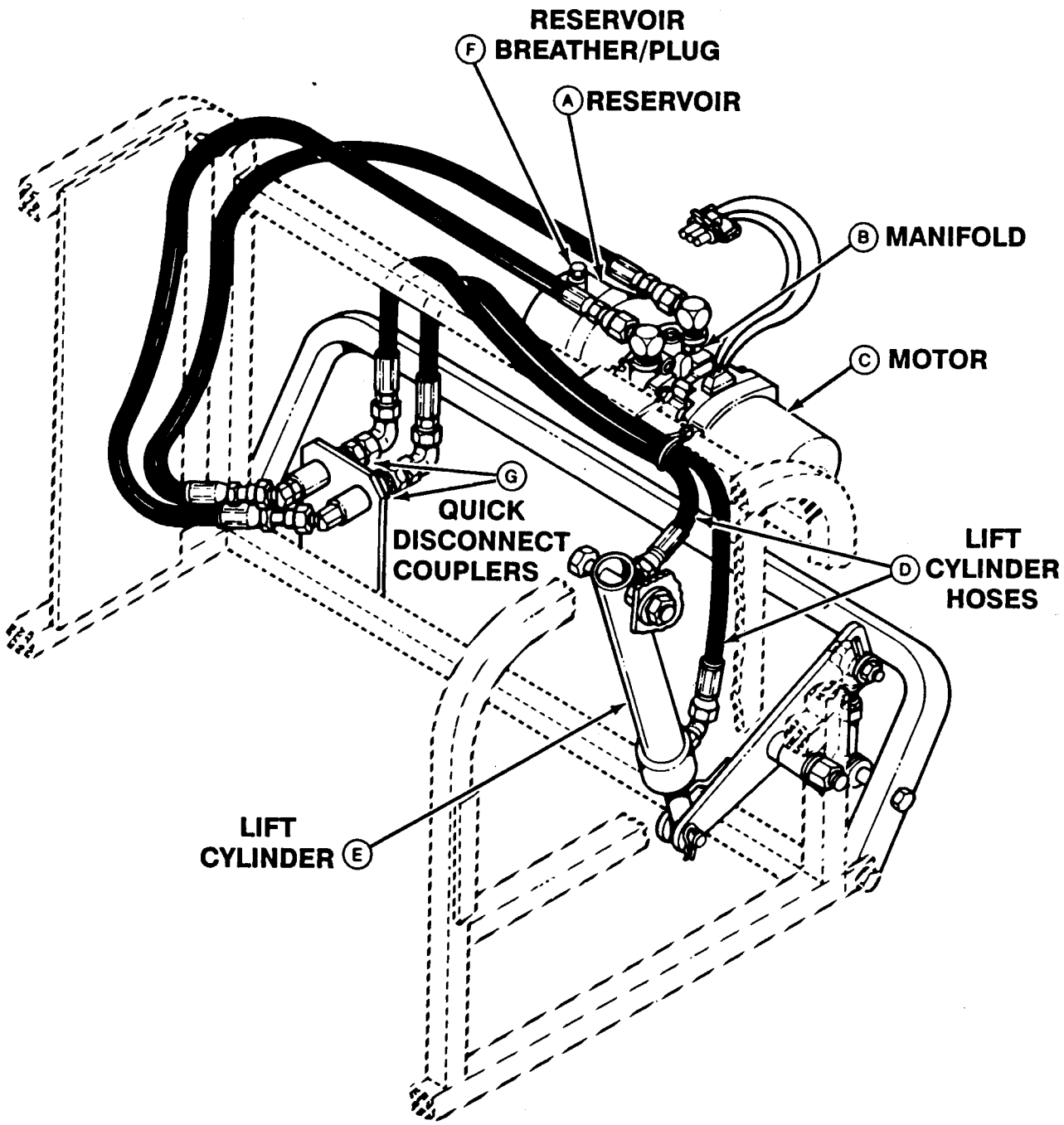
Use the drawings when diagnosing a hydraulic problem and to help locate the components to be tested.

MX,27005HE,A1 -19-11SEP91

HYDRAULIC LIFT SYSTEM COMPONENTS

A—Reservoir
B—Manifold
C—Motor
D—Lift Cylinder Hoses
E—Lift Cylinder
F—Reservoir Breather/Plug
G—Quick Disconnect Couplers

MX,27005HE,A2 -19-11SEP91



HYDRAULIC LIFT SYSTEM COMPONENTS

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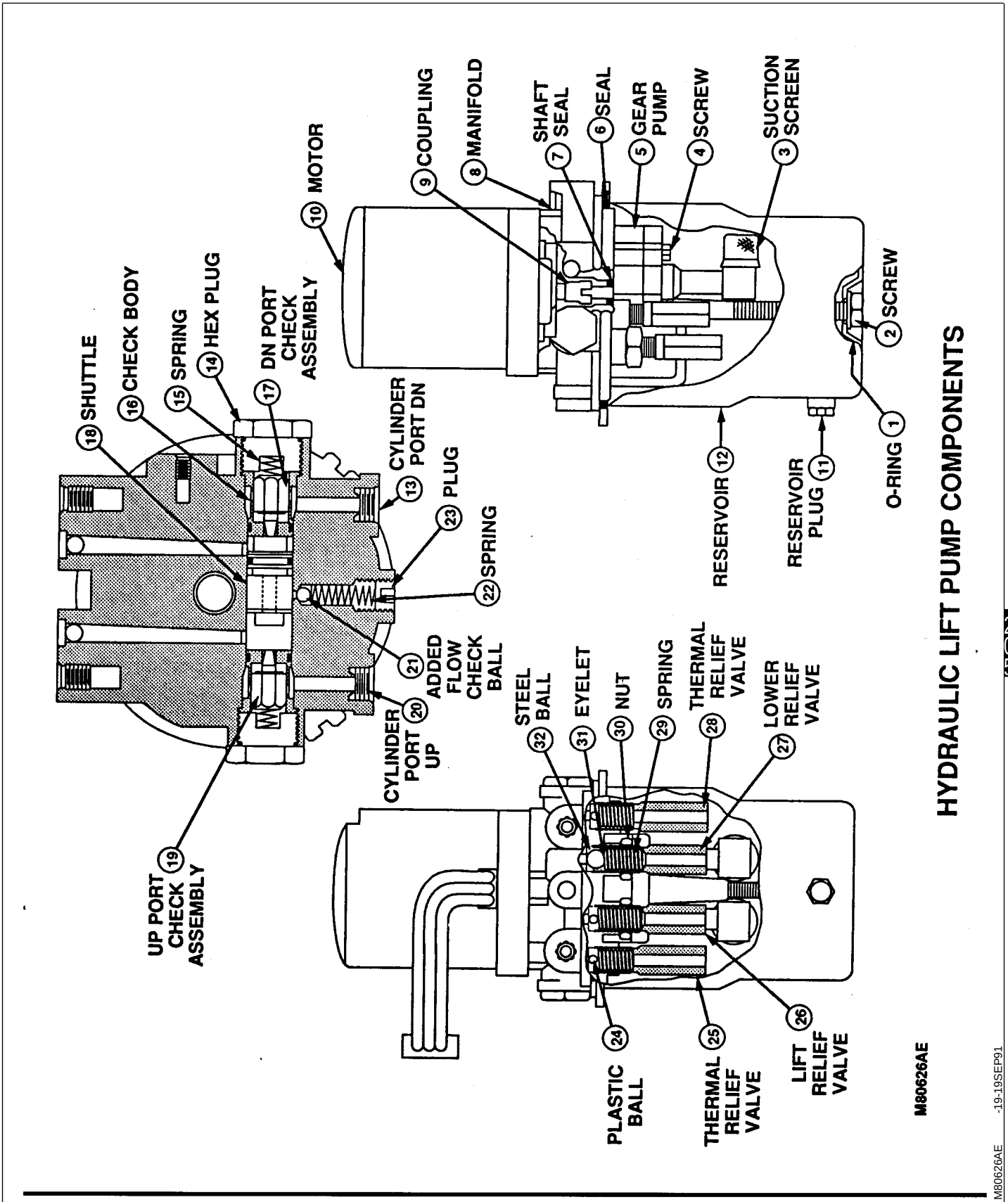
MX,27005HE,A3 -19-27SEP91

HYDRAULIC LIFT PUMP COMPONENTS

1—O-Ring
2—Screw
3—Suction Screen
4—Screw
5—Gear Pump
6—Seal
7—Shaft Seal
8—Manifold
9—Coupling
10—Motor
11—Reservoir Plug
12—Reservoir
13—Cylinder Port DN
14—Hex Plug
15—Spring
16—Check Body
17—Lower Check Assembly
18—Shuttle
19—Lift Check Assembly
20—Cylinder Port UP
21—Added Flow Check Ball
22—Spring
23—Plug
24—Plastic Ball
25—Thermal Relief Valve
26—Lift Relief Valve
27—Lower Relief Valve
28—Thermal Relief Valve
29—Spring
30—Nut
31—Eyelet
32—Steel Ball

MX,27005HE,A4 -19-11SEP91



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MX,27005HE,A5 -19-11SEP91

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 Lift System Operation
•Hydraulic Lift Pump Neutral Operation
•Hydraulic Lift Pump Raise Operation
•Hydraulic Lift Pump Lower Operation
•Hydraulic Lift Pump Relief Valve Operation

The slide number reference under the art is used for service training purposes to match a specific piece of technical manual art to the same slide.

MX,27010HE,A1 -19-11SEP91

HYDRAULIC LIFT SYSTEM OPERATION

A—Suction Screens
B—Inlet Check
C—Gear Pump
D—Motor
E—Shuttle
F—Check Valve
G—UP Port Raise Relief Valve
H—Cylinder
I—Inlet Check
J—Reservoir
K—DN Port Check
L—High Pressure Oil
M—Return Oil

FUNCTION:
The hydraulic lift system uses an electric-hydraulic pump and a hydraulic cylinder to raise and lower the rake. The hydraulic lift kit is a dealer installed option.

MAJOR COMPONENTS:
•Suction Screens
•Inlet Checks
•Lower Relief Valve
•Shuttle Valve
•Lift and Lower Checks
•Thermal Relief Valve
•Cylinder
•Raise Relief Valve
•Motor
•Gear Pump
•Reservoir
•System Ball Check

THEORY OF OPERATION:
Raise Operation

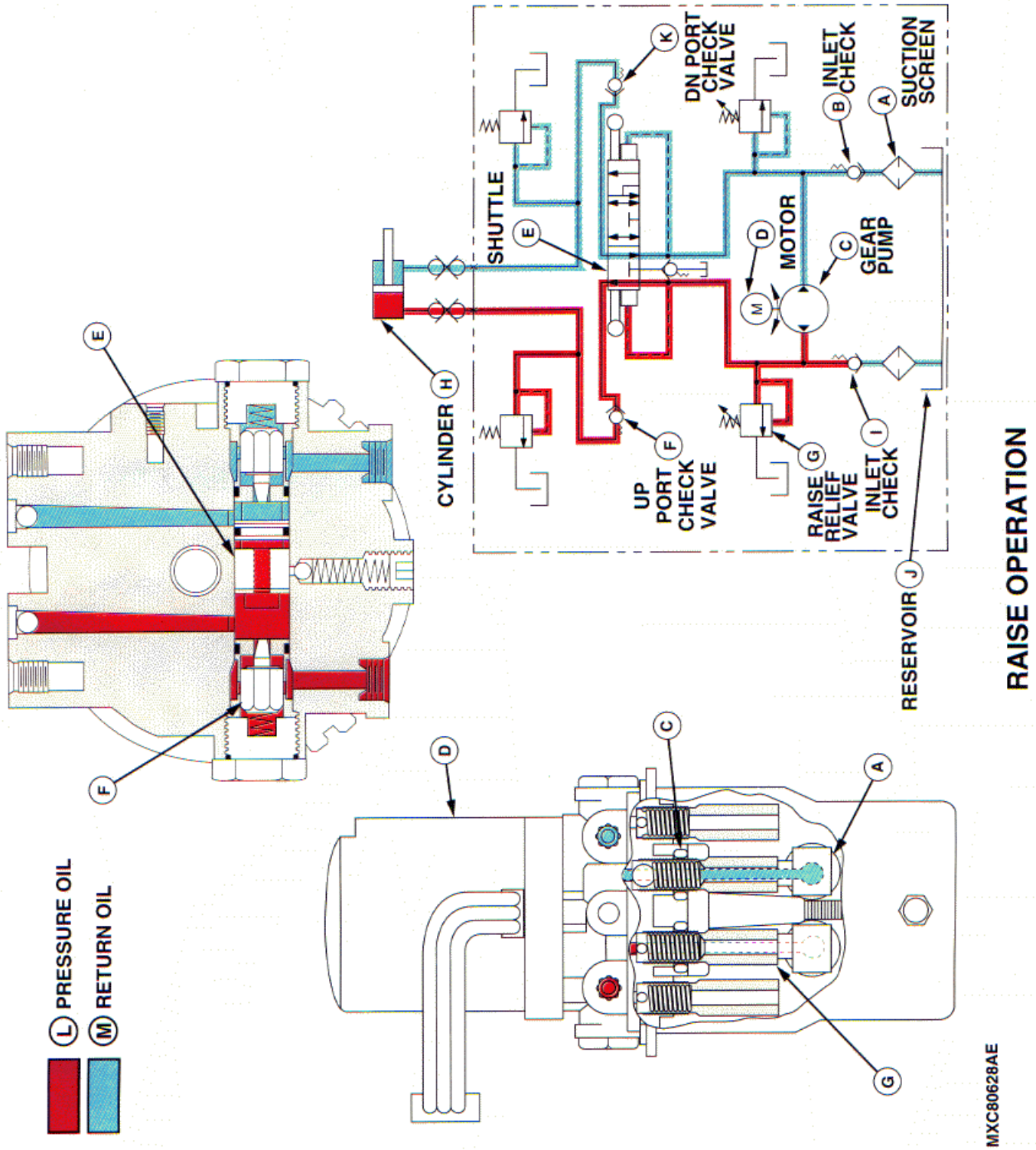
When the hydraulic lift switch is in the raise position and the motor (D) is operating, the gear pump (C) draws oil from the reservoir (J) through the suction screen (A). The inlet check (B) opens, allowing oil to flow to the inlet side of gear pump.

The gear pump produces high pressure oil on the outlet side of the gear pump. This high pressure oil closes inlet check (I) so oil can not flow back to the reservoir. High pressure acts against the shuttle, moving the shuttle towards the DN port check valve (K). The shuttle opens the DN check valve.

The pressure increases, opening UP check valve (F) by overcoming the spring force. This allows high pressure oil to flow to the lift cylinder (H) to extend the cylinder. The raise relief valve (G) prevents the raise pressure from exceeding 5171 ± 345 kPa (750 ± 50 psi).

Oil from the head end of the cylinder flows back to the pump, through the open DN port check valve and to the suction side of the gear pump.

MX,27010HE,A2 -19-11SEP91



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MX,27010HE,A3 -19-27SEP91

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HYDRAULIC LIFT SYSTEM OPERATION—CONTINUED

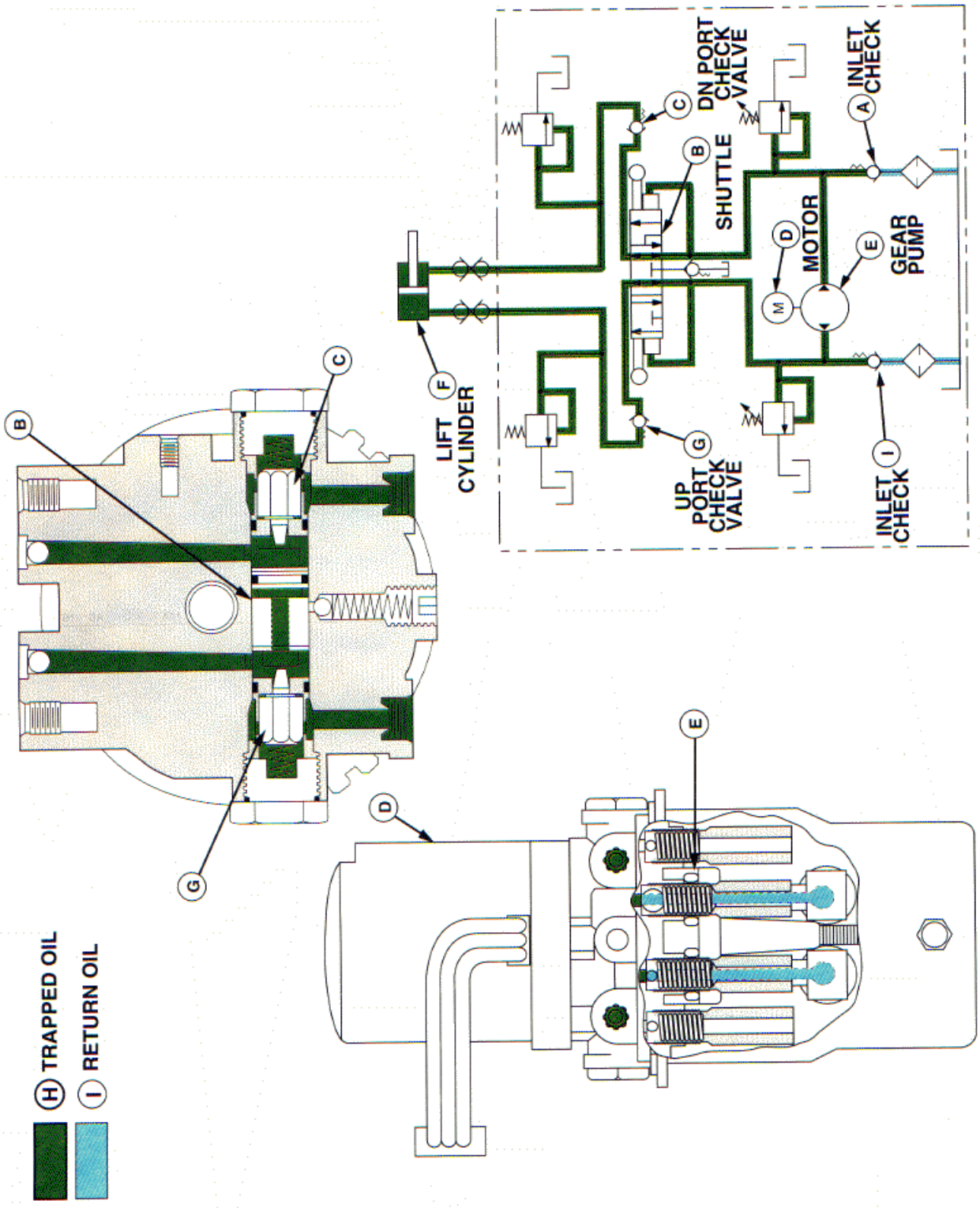
A—Inlet Check
B—Shuttle
C—DN Port Check Valve
D—Motor
E—Gear Pump
F—Lift Cylinder
G—UP Port Check Valve
H—Trapped Oil
I—Return Oil

Neutral Operation

When the hydraulic lift spring in the switch is released, the motor (D) and gear pump (E) stop operating. The oil pressure at the outlet side of the gear pump decreases. Pressure oil from the lift cylinder (F) and the spring in the DN port check valve (C) force the check valve (G) pushes the shuttle towards the center and closes the check valve.

Oil in the lift cylinder is now trapped, keeping the rake in its desired position. Both inlet checks (A) close also.

MX,27010HE,A4 -19-11SEP91



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MX,27010HE,A5 -19-27SEP91

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HYDRAULIC LIFT SYSTEM OPERATION—CONTINUED

A—Inlet Check
B—Lower Relief Valve
C—Shuttle
D—UP Port Check Valve
E—Motor
F—Gear Pump
G—Inlet Check
H—Suction Screen
I—Resesrvoir
J—Lift Cylinder
K—DN Port Check Valve
L—Added Flow Ball Check
M—Pressure Oil
N—Return Oil

Lower Operation

When the hydraulic lift switch is moved to the lower position, the motor (E) and pump (F) turn the opposite direction as the raise operation. The gear pump draws oil from the reservoir (I) through suction screen (H) and inlet check (G).

The gear pump produces high pressure oil on the outlet side of the gear pump. The high pressure oil closes inlet check (A), preventing oil flow back to the reservoir. High pressure oil acts on the shuttle (C), moving the shuttle towards the UP port check valve (D). The shuttle contacts the UP port check valve, opening the check valve.

As the pressure oil increases and overcomes the DN port check valve (K) spring force, the check opens. This allows high pressure oil to flow to rod end of the lift cylinder (J). The lower relief valve (B) prevents the lower pressure from exceeding 2758 ± 345 kPa (400 ± 50 psi).

Oil from the lift cylinder flows through the UP port check valve, past the shuttle, and to the inlet side of the gear pump. More oil is present in the head end of the cylinder than the rod end, so to allow the greater volume of oil to return to the pump, the return oil unseats ball check (L) and some oil is returned directly to the reservoir.

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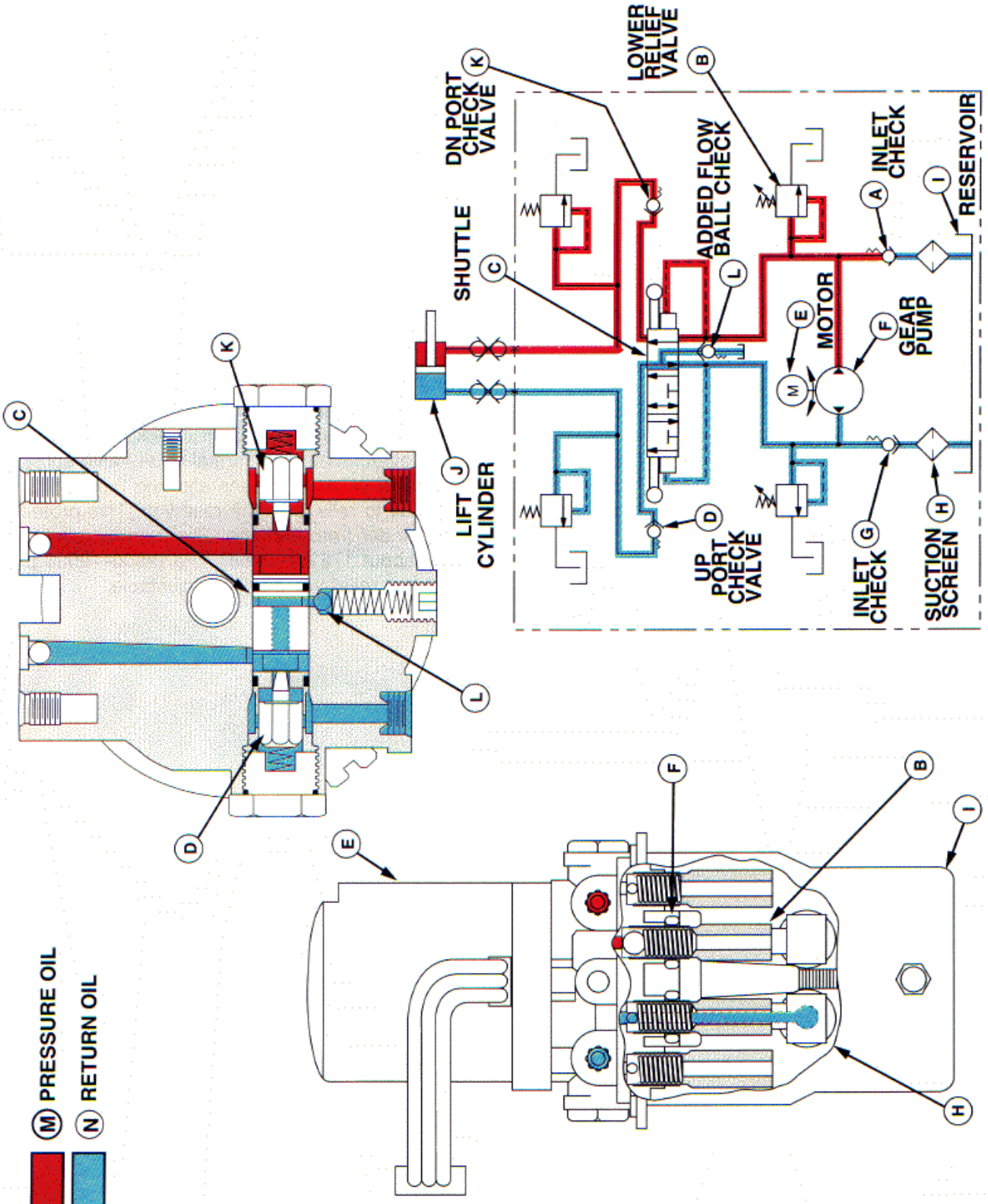
MX,27010HE,A6 -19-11SEP91



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HYDRAULIC LIFT SYSTEM OPERATION—CONTINUED

A—Gear Pump
B—UP Port Check Valve
C—Thermal Relief Valve
D—Raise Relief Valve
E—Lift Cylinder
F—Thermal Relief Valve Spring
G—Raise Relief Valve Spring
H—Lower Relief Valve Spring
I—Lower Relief Valve
J—DN Port Check Valve
K—Pressure Oil
L—Return Oil

Relief Valves Operation

NOTE: Lift circuit of pump is shown in diagram. Relief valves in the lower circuit operate the same as the relief valves in lift circuit.

If the lift cylinder (E) is raising and the load is too heavy or an oil passage becomes blocked, oil pressure will increase at the outlet side of the gear pump (A). When oil pressure overcomes the raise relief valve spring (G), the relief valve (D) opens allowing the high pressure oil to relieve to the reservoir. This protects the gear pump from damage. The raise relief valve is set at about 5171 kPa (750 psi). The raise relief valve is adjustable by turning the relief valve body.

When the lift cylinder is lowering and rake contacts the ground, cylinder bottoms or an oil passage becomes blocked, oil pressure will increase on the DN side of the gear pump. When oil pressure overcomes the lower relief valve spring (H) the relief valve (I) opens, allowing high pressure oil to relieve to the reservoir. The lower relief valve is set at about 2758 kPa (400 psi). The lower relief valve is also adjustable.

With the lift system in the neutral position, the checks (B and J) are closed. If the lift cylinder encounters a shock load, oil pressure in the cylinder will increase because it is blocked by the lift check. When oil pressure overcomes the thermal relief valve spring (F), the relief valve (C) opens allowing the high pressure oil to relieve to the reservoir. This protects the lift cylinder from damage. The thermal relief valve is set at about 17237—20684 kPa (2500—3000 psi). The thermal relief valve is not adjustable.

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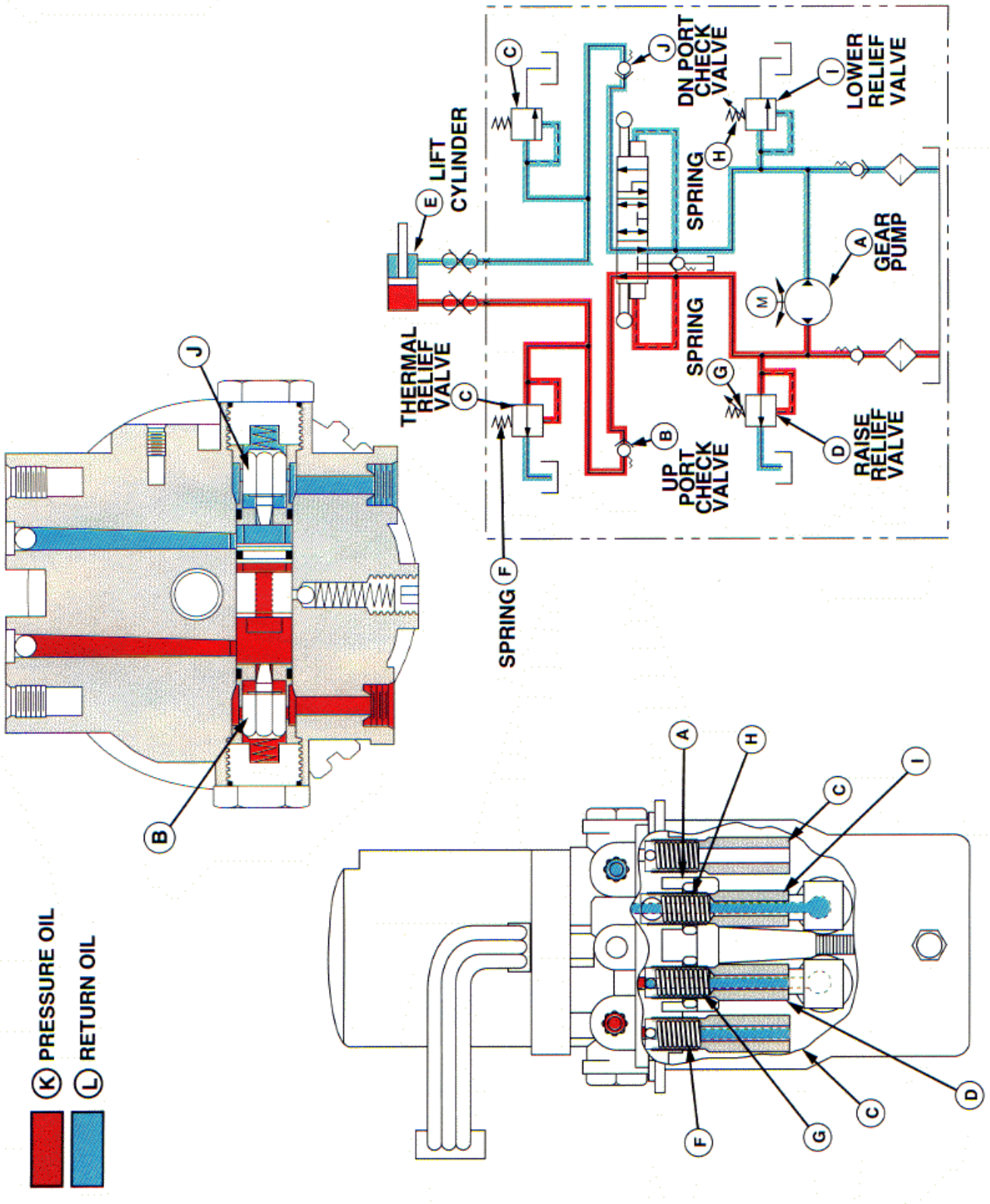
MX,27010HE,A8 -19-11SEP91



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MX,27010HE,A9 -19-27SEP91

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DIAGNOSTIC INFORMATION

The diagnostic information in this group is used to test components related to a specific problem or system. Select a symptom from the list and follow the test procedures under the heading. The symptom headings are:
•Lift Cylinder Will Not Raise
•Lift Cylinder Will Not Lower

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 point the test is to be made.

The slide number reference under the art is used for service training purposes only to match a specific piece of technical manual art to the same slide.

MX,27015HE,A1 -19-11SEP91

LIFT CYLINDER WILL NOT RAISE

CONDITIONS:
•Park brake locked
•Transaxle in neutral
•Key switch in ON position

Test/Location	Normal	If Not Normal
1. Rake pivot.	Load not exceeding 225 kg (500 lb).	Remove some of load.
	Rake must pivot freely.	Repair or replace pivot hardware.
2. Reservoir oil level.	Minimum oil level above suction screens.	Add oil.
	Oil not foamy or milky.	Replace oil.
3. Suction screen.	Clean and not damaged.	Clean or replace.
4. Lift cylinder pivot and rod.	Lift cylinder moves freely, rod not bent or damaged.	Repair or replace lift cylinder.
5. Hydraulic pump UP port.	Raise relief valve pressure about 5171 kPa (750 psi).	Check raise relief valve (A) spring, ball, and seat for debris, damage or leakage. Adjust or replace raise relief valve and check relief pressure again. If pressure is still low, continue testing.
6. Inlet checks.	Ball and seat free from debris and not damaged.	Replace pump.
7. Gear pump.	Gear pump not worn or damaged.	Replace pump.
8. Shuttle.	Shuttle must move freely in bore and not damaged.	Replace valve and manifold.
	Shuttle valve O-ring free from nicks or cuts.	Replace O-ring.
9. Thermal relief valve.	Spring not broken or cracked. Ball and seat free from debris and not damaged.	Replace thermal relief valve.

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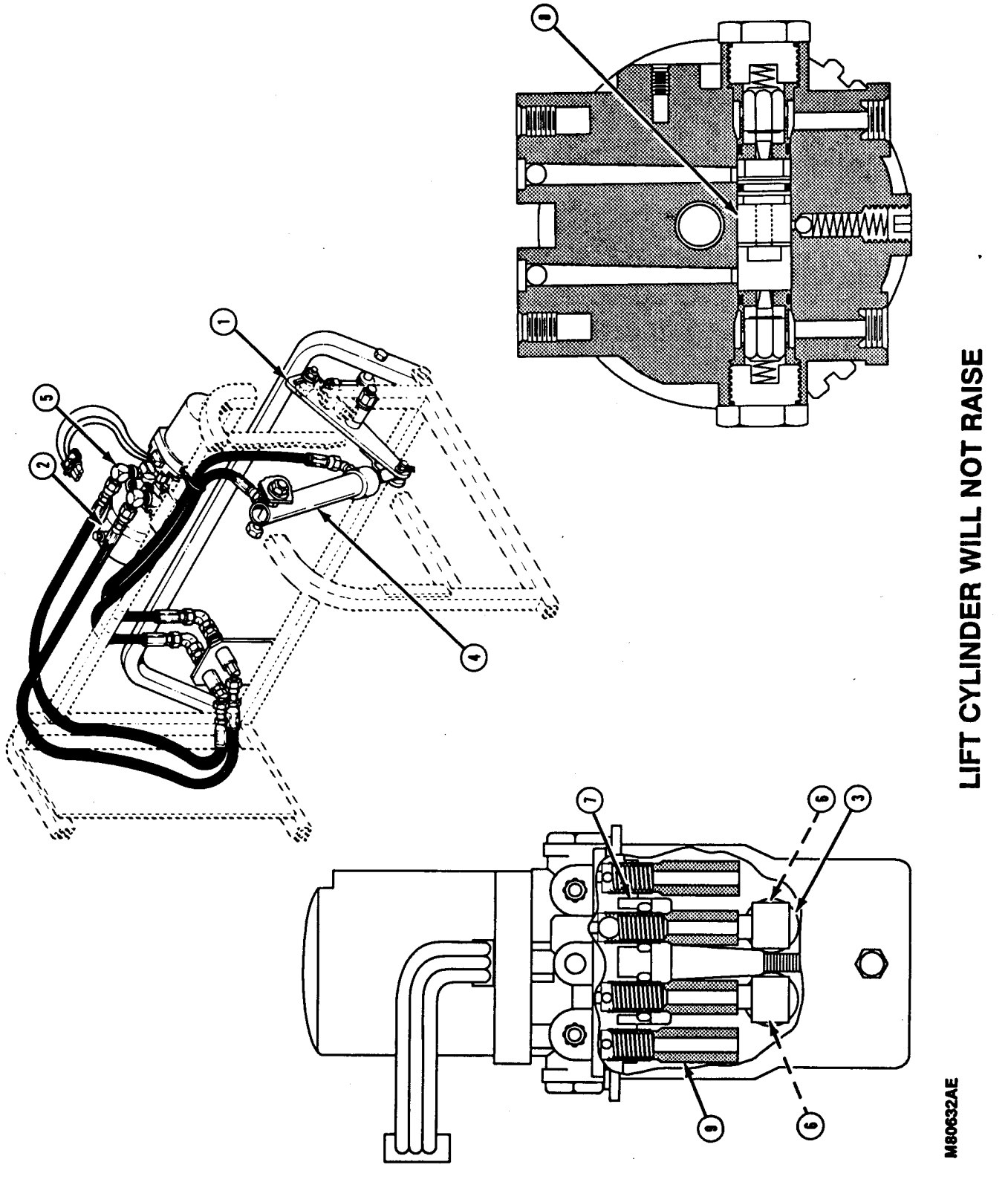
MX,27015HE,A2 -19-11SEP91



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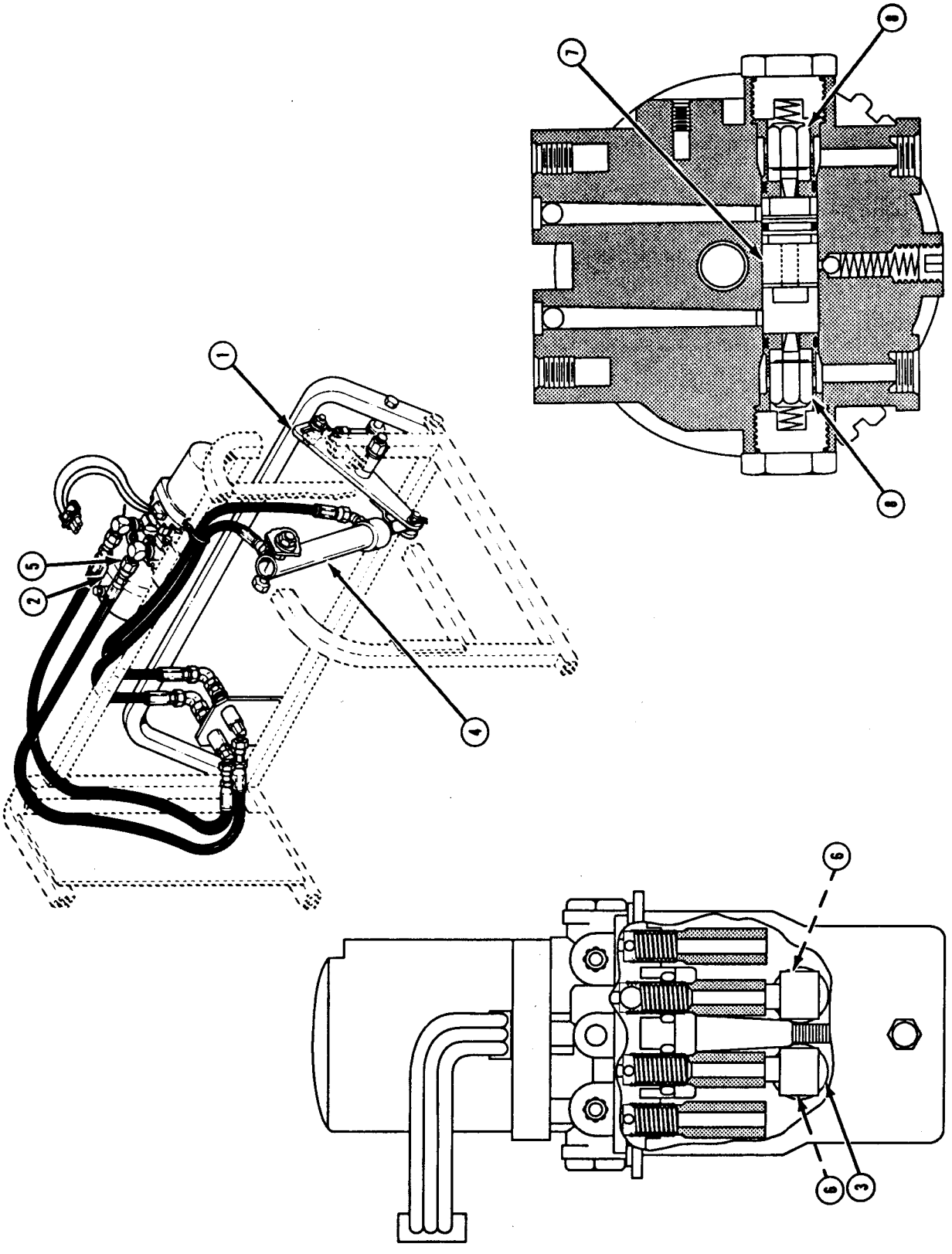
MX,27015HE,A3 -19-27SEP91

LIFT CYLINDER WILL NOT LOWER

CONDITIONS:
•Park brake engaged
•Transaxle in neutral
•Key switch in ON position

Test/Location	Normal	If Not Normal
1. Rake pivot	Rake must move freely and pivot hardware not bent or damaged.	Repair or replace pivot hardware.
2. Reservoir oil level.	Minimum oil level above suction screens.	Add oil.
	Oil not foamy or milky.	Replace oil.
3. Suction screen.	Clean and not damaged.	Clean or replace.
4. Lift cylinder pivot and rod.	Lift cylinder moves freely, rod not bent or damaged.	Repair or replace lift cylinder.
5. Hydraulic pump DN port.	Lower relief valve pressure about 2758 kPa (400 psi).	Check lower relief valve (A) spring, ball and seat for debris, damage or leakage. Adjust or replace lower relief valve and check relief pressure again. If pressure is still low, continue testing.
6. Inlet checks.	Ball and seat free from debris and not damaged.	Replace pump.
7. Shuttle.	Shuttle must move freely in bore and not damaged.	Replace valve and manifold.
	Shuttle valve O-ring free from nicks or cuts.	Replace O-ring.
8. Check valves.	Spring not broken or cracked.	Replace spring.
	Check valve tip not worn or damaged.	Replace check valve.

MX,27015HE,A4 -19-11SEP91



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MX,27015HE,A5 -19-11SEP91

RAISE RELIEF VALVE PRESSURE TEST

REASON:
To check raise relief valve pressure setting.

EQUIPMENT:
•JTO5471 0—6900 kPa (0—1000 psi) gauge

PROCEDURE:
1. Move transaxle shift lever to neutral and engage park brake.

2. Lower rake.

3. Disconnect lift cylinder hose from quick coupler (A) which is connected to UP port.

4. Connect pressure gauge (B) to coupler.

5. Turn key switch to ON position. Move hydraulic pump switch to raise position. Record raise relief valve pressure. Release switch.

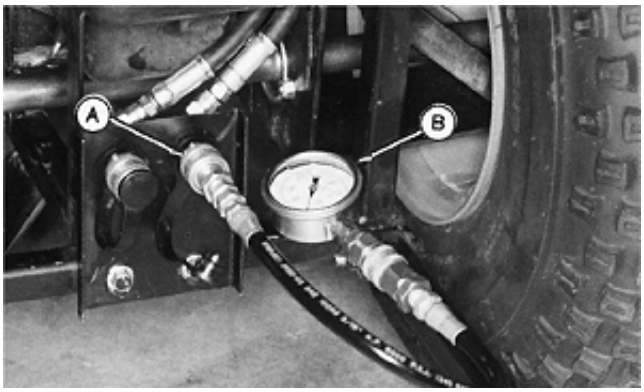
SPECIFICATIONS:
•Oil temperature .. 22˚C (72˚F)
•Raise relief valve pressure .. 4826—5516 kPa (700—800 psi)

RESULTS:
•If pressure is not within specification, adjust raise relief valve:

—Remove reservoir.

—Loosen nut (C). Turn relief valve body clockwise to increase pressure and counterclockwise to decrease pressure. Hold relief valve body and tighten nut (C).

—Install reservoir.



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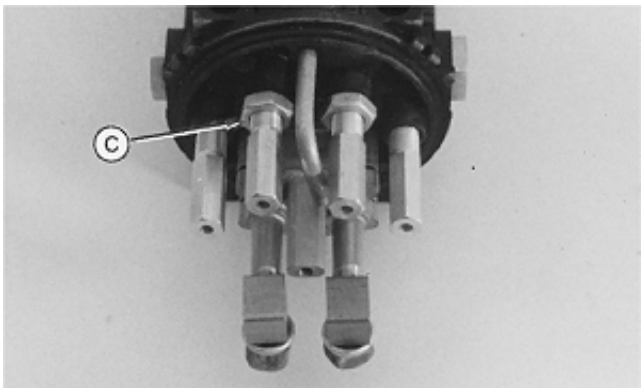

M80635 -UN-19SEP91

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MX,27015HE,A6 -19-11SEP91

LOWER RELIEF VALVE PRESSURE TEST

REASON:
To check lower relief valve pressure setting.

EQUIPMENT:
•JTO5471 0—6900 kPa (0—1000 psi) gauge

PROCEDURE:
1. Move transaxle shift lever to neutral and engage park brake.

2. Lower rake.

3. Disconnect lift cylinder hose from quick coupler (A) which is connected to DN port.

4. Connect pressure gauge (B) to coupler.

5. Turn key switch to ON position. Move hydraulic pump switch to lower position. Record lower relief valve pressure. Release switch.

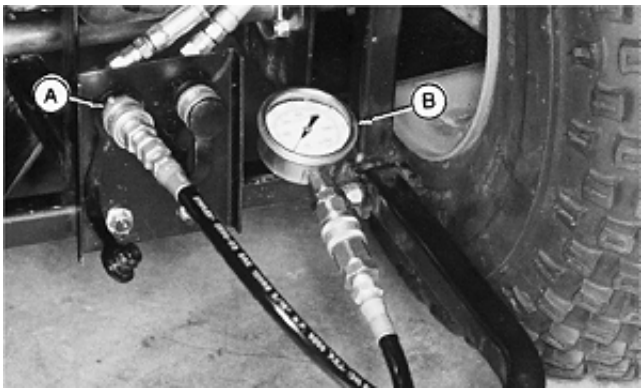
SPECIFICATIONS:
•Oil temperature .. 22˚C (72˚F)
•Lower relief valve pressure .. 2413—3103 kPa (350—450 psi)

RESULTS:
•If pressure is not within specification, adjust lower relief valve:

—Remove reservoir.

—Loosen nut (C). Turn relief valve body clockwise to increase pressure and counterclockwise to decrease pressure and counterclockwise to decrease pressure. Adjust relief valve pressure to 2758 ± 345 kPa (400 ± 50 psi). Hold relief valve body and tighten nut.

—Install reservoir.



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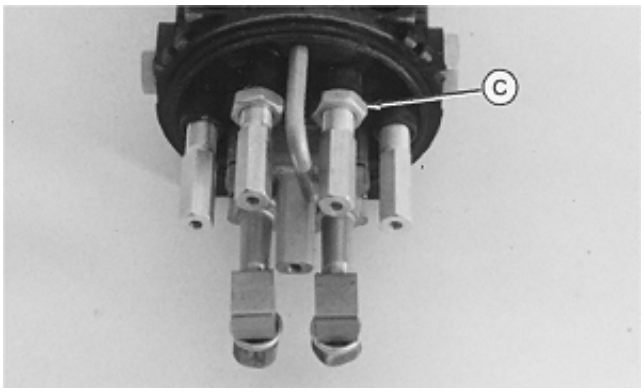

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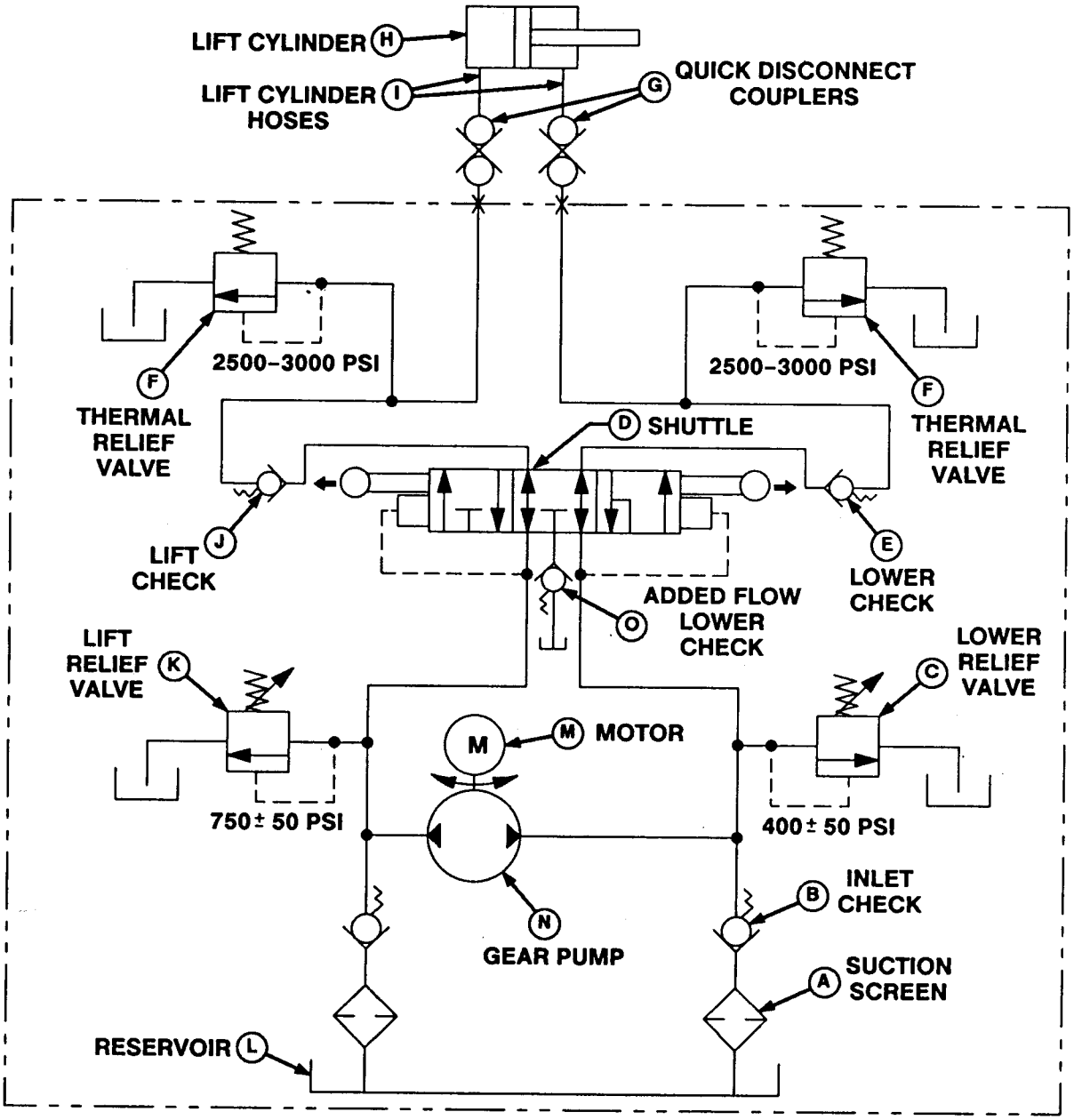

HYDRAULIC LIFT SYSTEM SCHEMATIC

A—Suction Screen (2 used)
B—Inlet Check (2 used)
C—Lower Relief Valve
D—Shuttle Valve
E—Lower Check
F—Thermal Relief Valve
G—Quick Disconnect Coupler (2 used)
H—Lift Cylinder
I—Lift Cylinder Hoses
J—Lift Check
K—Lift Relief Valve
L—Reservoir
M—Motor
N—Gear Pump
O—Added Flow Lower Check

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