

# **655, 755, 855, 955, 756 and 856 Compact Utility Tractors**

## **TECHNICAL MANUAL**

**John Deere  
Lawn & Grounds Care Division  
TM1360 (June 1996)**

# 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.

**P**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, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

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.

*NOTE: The 756 and 856 tractors are identical to the 755 and 855 tractors; therefore, all information pertaining to the 755 also pertains to the 756 and the same is true for the 855 and the 856 tractors. The 655, 756 and 856 tractors were all discontinued before the late model 755 and 855 tractors and the new 955 tractors were produced. Therefore, any late model references do not include the 655, 756, and 856 tractors.*

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*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.*

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# Section 10

## General Information

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### HANDLE FLUIDS SAFELY—AVOID FIRES

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

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

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

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



DX,FLAME -19-04JUN90

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TS227

### 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).



DX,SPARKS -19-04JUN90

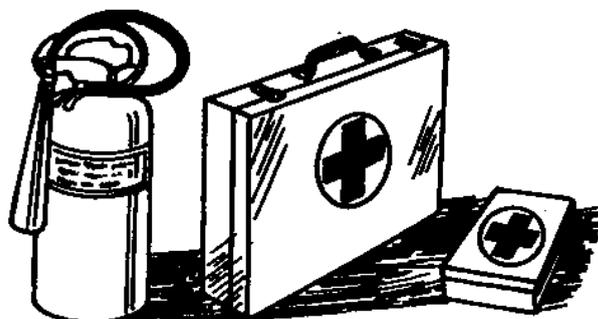
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TS204

### 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.



DX,FIRE2 -19-04JUN90

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TS291

## 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:

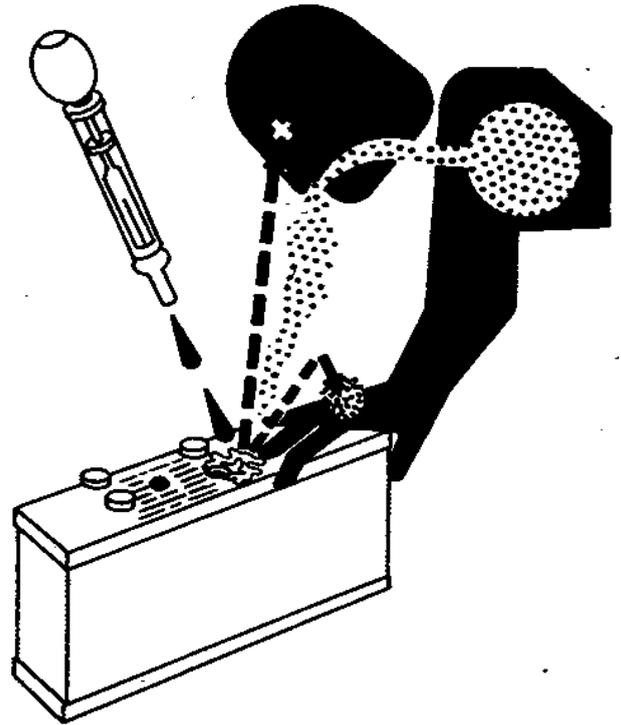
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

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.



DX, POISON -19-04JUN90

TS203 -UN-23AUG88

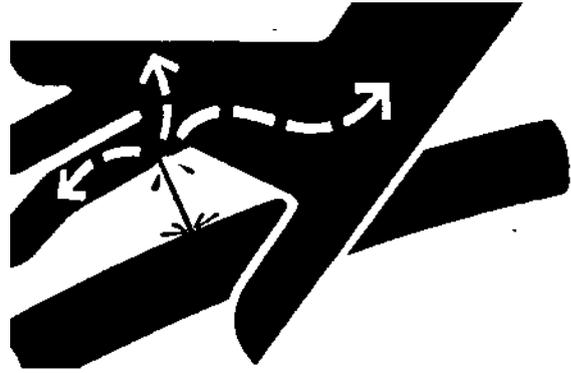
## AVOID HIGH-PRESSURE FLUIDS

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.



DX,FLUID -19-09AUG91

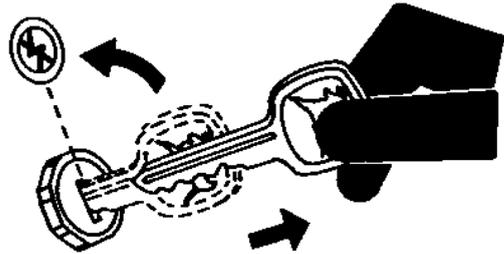
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X9811

## 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.



DX,PARK -19-04JUN90

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TS230

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### 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.



DX,LOWER -19-04JUN90

TS229 -UN-23AUG88

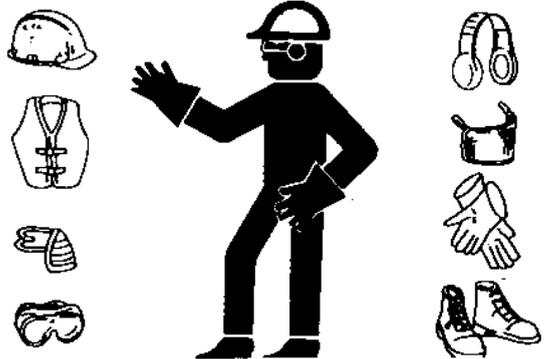
### WEAR PROTECTIVE CLOTHING

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.



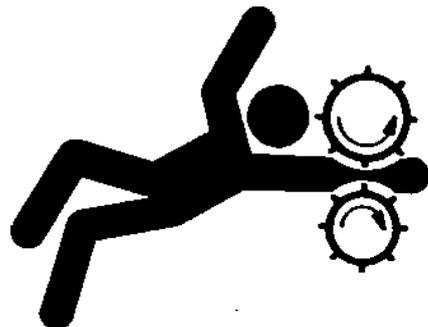
DX,WEAR -19-10SEP90

TS206 -UN-23AUG88

### 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.



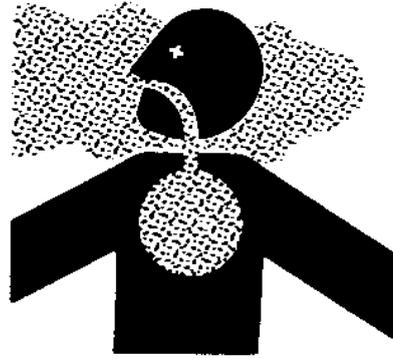
DX,LOOSE -19-04JUN90

TS228 -UN-23AUG88

### 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.



DX,AIR -19-04JUN90

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TS220

### 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.

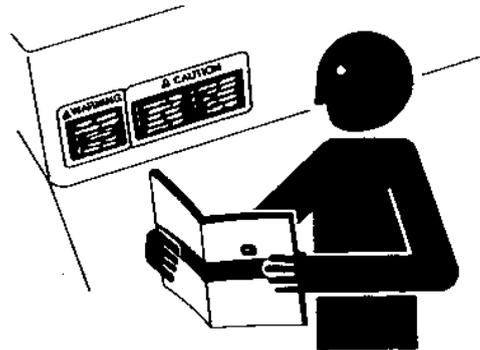


DX,LIGHT -19-04JUN90

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TS223

### REPLACE SAFETY SIGNS

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



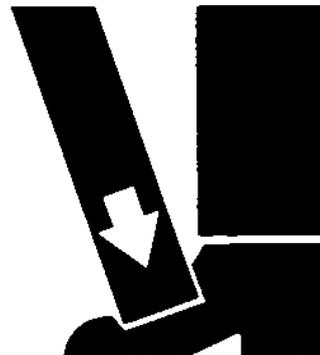
DX,SIGNS1 -19-04JUN90

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### 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.



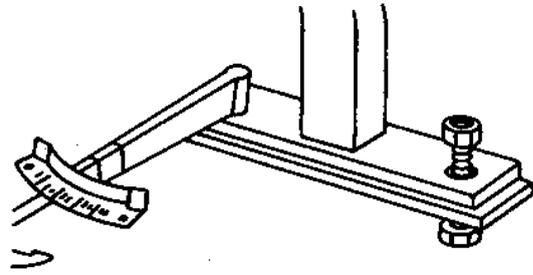
DX,LIFT -19-04JUN90

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TS226

## KEEP ROPS INSTALLED PROPERLY

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

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



DX,ROPS3 -19-04JUN90

TS212 -UN-23AUG88

## SERVICE TIRES SAFELY

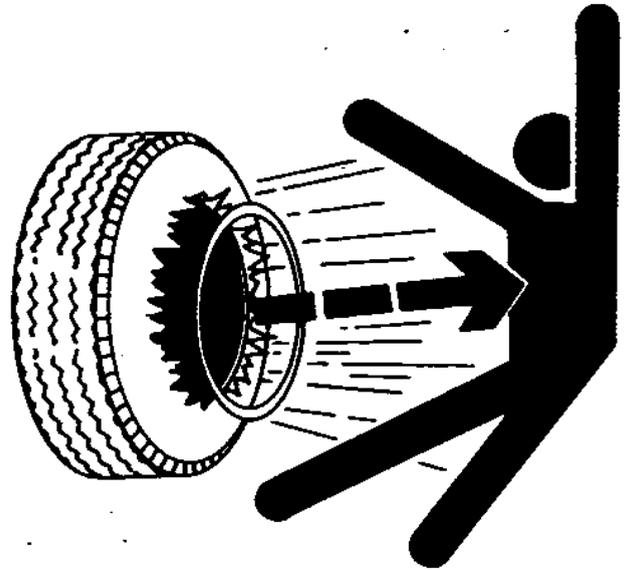
Explosive separation of a tire and rim parts can cause serious injury or death.

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.



DX,RIM -19-24AUG90

TS211 -UN-23AUG88

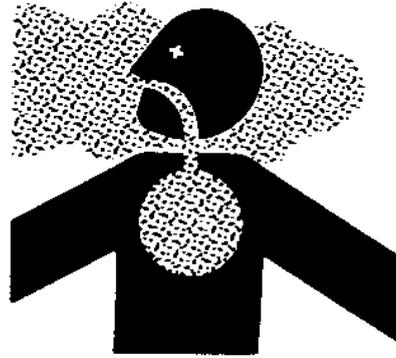
## AVOID HARMFUL ASBESTOS DUST

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.



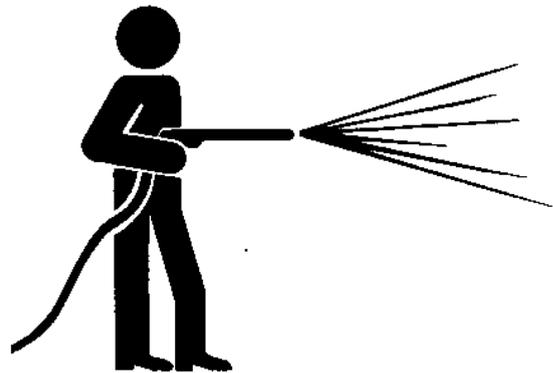
DX,DUST -19-15MAR91

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## WORK IN CLEAN AREA

Before starting a job:

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



DX,CLEAN -19-04JUN90

T6642EJ -UN-18OCT88

## 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

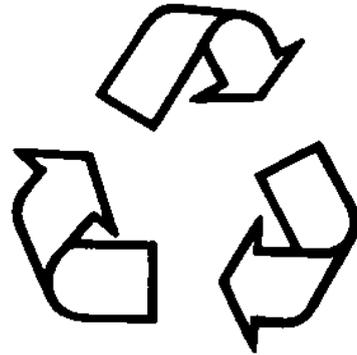
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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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**GENERAL TRACTOR SPECIFICATIONS**

| ITEM  | 655                                 | 755/756                             | 855/856                             | 955                                  |
|---|-------------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|
| <b>ENGINE:</b>                              |                                     |                                     |                                     |                                      |
| Engine Model . . . . .                      | 3TN66UJ                             | 3TNA72UJ                            | 3TN75RJ                             | 3TN84RJ                              |
| Engine Horsepower, Net. . . . .             | 16 (11.9 kW)                        | 20 (14.9 kW)                        | 24 (17.9 kW)                        | 33 (24.6 kW)                         |
| PTO Horsepower . . . . .                    | 10.6 (8.1 kW)                       | 15 (11.2 kW)                        | 19 (14.2 kW)                        | 27 (20.1 kW)                         |
| Rated Engine Speed. . . . .                 | 3200 rpm                            | 3200 rpm                            | 3200 rpm                            | 3200 rpm                             |
| Type . . . . .                              | Diesel                              | Diesel                              | Diesel                              | Diesel                               |
| Operating Range . . . . .                   | 1400-3425 rpm                       | 1400-3425 rpm                       | 1400-3425 rpm                       | 1400-3425 rpm                        |
| Number of Cylinders. . . . .                | 3                                   | 3                                   | 3                                   | 3                                    |
| Displacement . . . . .                      | 40.2 cu. in.<br>658 cm <sup>3</sup> | 53.6 cu. in.<br>879 cm <sup>3</sup> | 60.7 cu. in.<br>995 cm <sup>3</sup> | 87.3 cu. in.<br>1430 cm <sup>3</sup> |
| Bore and Stroke . . . . .                   | 2.59x2.53 in.<br>(66x64.2 mm)       | 2.83x2.83 in.<br>(72x72 mm)         | 2.95x2.95 in.<br>(75x75 mm)         | 3.31x3.39 in.<br>(84x86 mm)          |
| Compression Ratio . . . . .                 | 22.4:1                              | 22.3:1                              | 17.8:1                              | 18.0:1                               |
| Lubrication . . . . .                       | Pressured                           | Pressured                           | Pressured                           | Pressured                            |
| Cooling System. . . . .                     | Water-pump                          | Water-pump                          | Water-pump                          | Water-pump                           |
| Air Cleaner . . . . .                       | Dry-Type with<br>Safety Element     | Dry-Type with<br>Safety Element     | Dry-Type with<br>Safety Element     | Dry-Type with<br>Safety Element      |
| Engine Shutoff . . . . .                    | Key                                 | Key                                 | Key                                 | Key                                  |
| Engine Torque at<br>Rated Speed. . . . .    | 35 N•m<br>(26 lb-ft)                | 45 N•m<br>(33 lb-ft)                | 58 N•m<br>(39 lb-ft)                | 73 N•m<br>(54 lb-ft)                 |
| <b>ELECTRICAL SYSTEM:</b>                   |                                     |                                     |                                     |                                      |
| Type . . . . .                              | 12 volt                             | 12 volt                             | 12 volt                             | 12 volt                              |
| Battery Size . . . . .                      | 491 Cold Cranking<br>Amps @ -18° C  | 491 Cold Cranking<br>Amps @ -18° C  | 475 Cold Cranking<br>Amps @ -18° C  | 475 Cold Cranking<br>Amps @ -18° C   |
| Alternator . . . . .                        | 35 Amp<br>40 Amp                    | 35 Amp<br>40 Amp                    | 35 Amp<br>40 Amp                    | N/A<br>40 Amp                        |
| Starter Size. . . . .                       | 1.3 hp (1.0 kW)                     | 1.3 hp (1.0 kW)                     | 1.3 hp (1.0 kW)                     | 1.9 hp (1.4 kW)                      |
| <b>FUEL SYSTEM:</b>                         |                                     |                                     |                                     |                                      |
| Type . . . . .                              | Indirect Injection                  | Indirect Injection                  | Direct Injection                    | Direct Injection                     |
| Injection Pump Type . . . . .               | In-line with<br>Electric Shutoff    | In-line with<br>Electric Shutoff    | In-line with<br>Electric Shutoff    | In-line with<br>Electric Shutoff     |
| Gallon/hr at 75% load<br>(mowing). . . . .  | Not Available                       | 0.86                                | 0.79                                | 1.4                                  |
| <b>DRIVE TRAIN:</b>                         |                                     |                                     |                                     |                                      |
| Transmission Type . . . . .                 | Hydrostatic-2-range                 | Hydrostatic-2-range                 | Hydrostatic-2-range                 | Hydrostatic-2-range                  |
| Transaxle Speed<br>Ranges . . . . .         | High/Lo                             | High/Lo                             | High/Lo                             | High/Lo                              |
| Number of Speeds . . . . .                  | Infinite                            | Infinite                            | Infinite                            | Infinite                             |
| Final Drive. . . . .                        | Planetary                           | Planetary                           | Planetary                           | Planetary                            |
| Brakes. . . . .                             | Wet Disk                            | Wet Disk                            | Wet Disk                            | Wet Disk                             |
| Steering . . . . .                          | Power                               | Power                               | Power                               | Power                                |
| Drawbar Tonque Weight<br>Capacity . . . . . | 675 lb. (306 kg)                    | 675 lb. (306 kg)                    | 675 lb. (306 kg)                    | 800 lb. (363 kg)                     |

**GENERAL SPECIFICATIONS—CONTINUED**

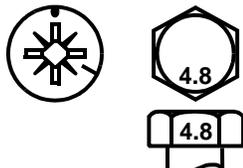
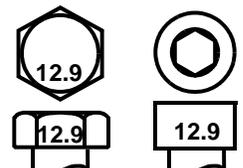
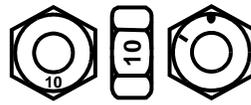
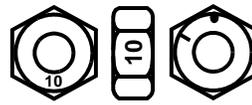
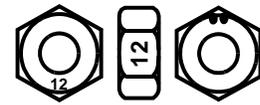
| ITEM   | 655                           | 755/756                             | 855/856                             | 955                                 |
|--|-------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| <b>HYDRAULIC SYSTEM:</b>   |                               |                                     |                                     |                                     |
| Type of System . . . . .   | Open Center                   | Open Center                         | Open Center                         | Open Center                         |
| Working Pressure . . . . .                                       | 2050 psi<br>(14135 kPa)       | 2050 psi<br>(14135 kPa)             | 2050 psi<br>(14135 kPa)             | 2500 psi<br>(17240 kPa)             |
| Pump Type . . . . .  | Gerotor Gear                  | Gerotor Gear                        | Gerotor Gear                        | Gerotor Gear                        |
| Pump Capacity . . . . .  | 4 gpm<br>(0.25 L/s)           | 5.6 gpm<br>(0.35 L/s)               | 5.6 gpm<br>(0.35 L/s)               | 7.2 gpm<br>(0.45 L/s)               |
| 3-PT. Hitch Type . . . . .                                       | Cat. 1 (Standard)             | Cat. 1 (Standard)                   | Cat. 1                              | Cat. 1                              |
| <b>Hitch Lift Capacity<br/>(24 in. behind link arms)</b>         |                               |                                     |                                     |                                     |
| Early Models . . . . .   | 785 lbs.<br>(357 kg)          | 785 lbs.<br>(357 kg)                | 785 lbs.<br>(357 kg)                | 957 lbs.<br>(434 kg)                |
| Late Models or Retrofit . . . . .                                | N/A                           | SN 180250—<br>1005 lbs.<br>(456 kg) | SN 180450—<br>1005 lbs.<br>(456 kg) | SN 180525—<br>1177 lbs.<br>(534 kg) |
| Lift Control Type . . . . .                                      | Position                      | Position                            | Position                            | Position                            |
| <b>PTO:</b>  |                               |                                     |                                     |                                     |
| Type . . . . .   | Live Independent              | Live Independent                    | Live Independent                    | Live Independent                    |
| <b>Speed (PTO rpm at 3200<br/>engine rpm—full load):</b>         |                               |                                     |                                     |                                     |
| Mid (1:1 gear ratio) . . . . .                                   | 2100 rpm                      | 2100 rpm                            | 2100 rpm                            | 2100 rpm                            |
| Rear (1:3 gear ratio) . . . . .                                  | 540 rpm                       | 540 rpm                             | 540 rpm                             | 540 rpm                             |
| Clutch . . . . .   | Hydraulic<br>Multi-Disk       | Hydraulic<br>Multi-Disk             | Hydraulic<br>Multi-Disk             | Hydraulic<br>Multi-Disk             |
| Brake . . . . .  | Hydraulically<br>Controlled   | Hydraulically<br>Controlled         | Hydraulically<br>Controlled         | Hydraulically<br>Controlled         |
| <b>MOWER BLADE TIP SPEED<br/>(at 3200 engine rpm full load):</b> |                               |                                     |                                     |                                     |
| 50 Inch Mower . . . . .  | 15,371 ft/min<br>(4688 m/min) | N/A                                 | N/A                                 | N/A                                 |
| 1:1.04 Gear Ratio . . . . .                                      | Spindle rpm 3389              | N/A                                 | N/A                                 | N/A                                 |
| 60 Inch Mower . . . . .  | N/A                           | 15,471 ft/min<br>(4719 m/min)       | 15,471 ft/min<br>(4719 m/min)       | 15,471 ft/min<br>(4719 m/min)       |
| 1:1 Gear Ratio . . . . .   | N/A                           | Spindle rpm 2883                    | Spindle rpm 2883                    | Spindle rpm 2883                    |
| 72 Inch Mower . . . . .  | N/A                           | 15,167 ft/min<br>(4626 m/min)       | 15,167 ft/min<br>(4626 m/min)       | 15,167 ft/min<br>(4626 m/min)       |
| 1:1 Gear Ratio . . . . .   | N/A                           | Spindle rpm 2321                    | Spindle rpm 2321                    | Spindle rpm 2321                    |
| 261 Inch Mower . . . . .   | N/A                           | 14,465 ft/min<br>(4412 m/min)       | 14,465 ft/min<br>(4412 m/min)       | 14,465 ft/min<br>(4412 m/min)       |
| 1:3 Gear Ratio . . . . .   | N/A                           | Spindle rpm 2695                    | Spindle rpm 2695                    | Spindle rpm 2695                    |
| 272 Inch Mower . . . . .   | N/A                           | 14,601 ft/min<br>(4453 m/min)       | 14,601 ft/min<br>(4453 m/min)       | 14,601 ft/min<br>(4453 m/min)       |
| 1:3 Gear Ratio . . . . .   | N/A                           | Spindle rpm 2234                    | Spindle rpm 2234                    | Spindle rpm 2234                    |

**GENERAL SPECIFICATIONS—CONTINUED**

| ITEM   | 655                         | 755/756   | 855/856                     | 955                         |
|--|-----------------------------|---|-----------------------------|-----------------------------|
| <b>FLUID CAPACITIES:</b>                                   |                             |   |                             |                             |
| Fuel Tank . . . . .  | 3.95 U.S. gal (15 L)        | 4.4 U.S. gal (16.7 L)                           | 6.6 U.S. gal (25 L)         | 6.6 U.S. gal (25 L)         |
| Cooling System . . . . .                                   | 4 U.S. qt. (3.8 L)          | 4 U.S. qt. (3.8 L)                              | 4.8 U.S. qt. (4.5 L)        | 4.8 U.S. qt. (4.5 L)        |
| Crankcase (w/filter) . . . . .                             | 2.5 U.S. qt. (2.4 L)        | 2.86 U.S. qt. (2.7 L)                           | 4.1 U.S. qt. (3.9 L)        | 4.4 U.S. qt. (4.2 L)        |
| Transmission and Hydraulic System . . . . .                | 4.5 U.S. gal. (17 L)        | 4.5 U.S. gal. (17 L)                            | 4.5 U.S. gal. (17 L)        | 4.5 U.S. gal. (17 L)        |
| MFWD Gear Case . . . . .                                   | 2.25 U.S. qt. (2.13 L)      | 2.25 U.S. qt. (2.13 L)                          | 2.25 U.S. qt. (2.13 L)      | 3.5 U.S. qt. (3.3 L)        |
| <b>WEIGHT (includes fuel, oil, coolant and R-1 tires):</b> |                             |   |                             |                             |
| 2WD . . . . .  | 1584 lbs.<br>(718 kg)       | 1700 lbs.<br>(771 kg)                           | 1790 lbs.<br>(812 kg)       | N/A                         |
| MFWD . . . . .   | 1680 lbs.<br>(762 kg)       | 1835 lbs.<br>(832 kg)                           | 1870 lbs.<br>(848 kg)       | 1990 lbs.<br>(903 kg)       |
| <b>SERVICE INTERVALS:</b>                                  |                             |   |                             |                             |
| <b>Engine</b>  |                             |   |                             |                             |
| Valve Adjustment . . . . .                                 | 300 Hours                   | 300 Hours                                       | 300 Hours                   | 300 Hours                   |
| Primary Filter . . . . .                                   | 400 Hours                   | 400 Hours                                       | 400 Hours                   | 400 Hours                   |
|  |                             | or every two years                              |                             |                             |
| Secondary Filter . . . . .                                 | Every two years             | Every two years                                 | Every two years             | Every two years             |
|  |                             | or when every third primary filter is installed |                             |                             |
| <b>GROUND SPEEDS (at full engine rpm):</b>                 |                             |   |                             |                             |
| Forward High Range . . . . .                               | 0—10.0 mph<br>(0—16.1 K/hr) | 0—10.6 mph<br>(0—17.1 K/hr)                     | 0—11.0 mph<br>(0—17.7 K/hr) | 0—11.4 mph<br>(0—18.3 K/hr) |
| Forward Lo Range . . . . .                                 | 0—05.4 mph<br>(0—08.7 K/hr) | 0—05.8 mph<br>(0—09.3 K/hr)                     | 0—06.0 mph<br>(0—09.7 K/hr) | 0—05.1 mph<br>(0—08.2 K/hr) |
| Reverse High And Lo . . . . .                              | 0—05.0 mph<br>(0—08.1 K/hr) | 0—05.3 mph<br>(0—08.5 K/hr)                     | 0—05.5 mph<br>(0—08.9 K/hr) | 0—05.7 mph<br>(0—09.2 K/hr) |
| <b>ENGINE COOLANT HEATER:</b>                              |                             |   |                             |                             |
|  | Current Draw<br>400 Watts   | Current Draw<br>400 Watts                       | Current Draw<br>400 Watts   | Current Draw<br>400 Watts   |
| <b>SPARK ARRESTER:</b>                                     |                             |   |                             |                             |
|  | Not Available               | Available                                       | Available                   | Available                   |



**METRIC FASTENER TORQUE VALUES**

|   |  |   |  |   |
|---|--|---|--|---|
| <b>Property Class and Head Markings</b> | <p>4.8</p>  | <p>8.8      9.8</p>  | <p>10.9</p>  | <p>12.9</p>  |
| <b>Property Class and Nut Markings</b>  | <p>5</p>    | <p>10</p>            | <p>10</p>    | <p>12</p>    |

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| SIZE | Class 4.8               |       |                  |       | Class 8.8 or 9.8        |       |                  |       | Class 10.9              |       |                  |       | Class 12.9              |       |                  |       |
|------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|
|      | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       |
|      | N•m                     | lb-ft | N•m              | lb-ft |
| M6   | 48                      | 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              | 109   |
| 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  | 2200             | 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 hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a ±10% variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the **NUT** instead of the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

<sup>a</sup> "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.

Reference: JDS—G200.

## INCH FASTENER TORQUE VALUES

|                             |   |  |   |
|-----------------------------|---|--|---|
| SAE Grade and Head Markings | 1 or 2 <sup>b</sup><br>No Marks  | 5  5.1  5.2  | 8  8.2  |
|                             | 2<br>No Marks                    | 5    | 8       |

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| SIZE  | Grade 1                 |       |                  |       | Grade 2 <sup>b</sup>    |       |                  |       | Grade 5, 5.1 or 5.2     |       |                  |       | Grade 8 or 8.2          |       |                  |       |
|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|-------------------------|-------|------------------|-------|
|       | Lubricated <sup>a</sup> |       | Dry <sup>a</sup> |       |
|       | 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 hand torque values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only and include a ±10% variance factor. Check tightness of fasteners periodically. DO NOT use air powered wrenches.

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

Fasteners should be replaced with the same grade. Make sure fastener threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

When bolt and nut combination fasteners are used, torque values should be applied to the **NUT** instead of the bolt head.

Tighten toothed or serrated-type lock nuts to the full torque value.

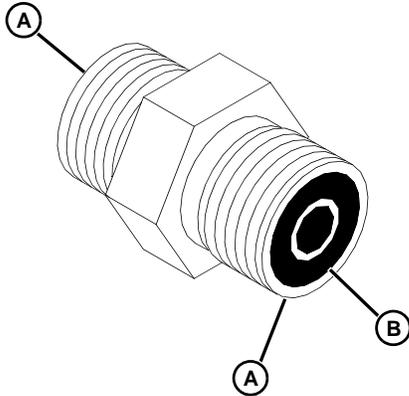
<sup>a</sup> "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate - Specification JDS117) without any lubrication.

<sup>b</sup> "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.

Reference: JDS—G200.

**SERVICE RECOMMENDATIONS**

**O-RING FACE SEAL FITTINGS**



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

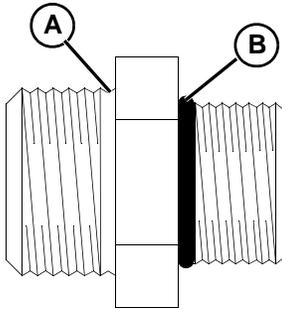
**O-RING FACE SEAL FITTING INCH TORQUE**

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

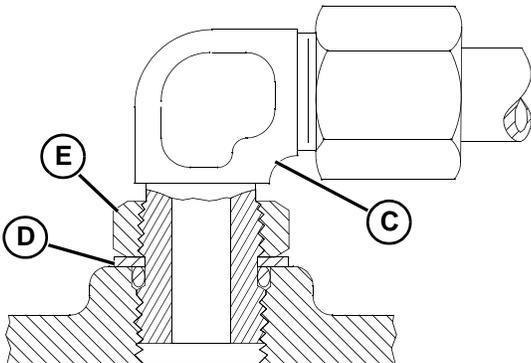
NOTE: Torque tolerance is + 15 -20%.

## O-RING BOSS FITTINGS

1. Inspect boss O-ring boss seat. It must be free of dirt and defects. If repeated leaks occur, inspect for defects with a magnifying glass. Some raised defects can be removed with a slip stone.



2. Put hydraulic oil or petroleum jelly on the O-ring (B). Place electrical tape over the threads to protect O-ring from nicks. Slide O-ring over the tape and into the groove (A) of fitting. Remove tape.



3. For angle fittings (C), loosen special nut (E) and push special washer (D) against threads so O-ring can be installed into the groove of fitting.
4. Turn fitting into the boss by hand until special washer or washer face (straight fitting) contacts boss face and O-ring is squeezed into its seat.
5. To position angle fittings, turn the fitting counter-clockwise a maximum of one turn.
6. Tighten straight fittings to torque value shown on chart. For angle fittings, tighten the special nut to value shown in the chart while holding body of fitting with a wrench.

## STRAIGHT FITTING OR SPECIAL NUT TORQUE

| Thread<br>Size | Torque <sup>a</sup> |       | Number<br>of Flats <sup>b</sup> |
|----------------|---------------------|-------|---------------------------------|
|                | N•m                 | lb-ft |                                 |
| 3/8-24 UNF     | 8                   | (6)   | 2                               |
| 7/16-20 UNF    | 12                  | (9)   | 2                               |
| 1/2-20 UNF     | 16                  | (12)  | 2                               |
| 9/16-18 UNF    | 24                  | (18)  | 2                               |
| 3/4-16 UNF     | 46                  | (34)  | 2                               |
| 7/8-14 UNF     | 62                  | (46)  | 1-1/2                           |
| 1-1/16-12 UN   | 102                 | (75)  | 1                               |
| 1-3/16-12 UN   | 122                 | (90)  | 1                               |
| 1-5/16-12 UN   | 142                 | (105) | 3/4                             |
| 1-5/8-12 UN    | 190                 | (140) | 3/4                             |
| 1-7/8-12 UN    | 217                 | (160) | 1/2                             |

a. Torque tolerance is  $\pm 10$  percent.

b. To be used if a torque wrench cannot be used. After tightening fitting by hand, put a mark on nut or boss; then tighten special nut or straight fitting the number of flats shown.

## DIESEL FUEL - NORTH AMERICA

In general, diesel fuels are blended to satisfy the low air temperature requirements of the geographical area in which they are sold.

In North America, diesel fuel is usually specified to **ASTM D975** and sold as either **Grade 1** for cold air temperatures or **Grade 2** for warm air temperatures.

If diesel fuels being supplied in your area **DO NOT** meet any of the above specifications, use diesel fuels with the following equivalent properties:

- Cetane Number 40 (minimum)

A cetane number **greater than 50 is preferred**, especially for air temperatures below  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) or elevations above 1500 m (5000 ft).

- Cold Filter Plugging Point (CFPP)

The air temperature at which diesel fuel **begins to cloud or jell** — at least  $5^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ) below the expected low air temperature range.

- Sulfur Content of 0.05%

Diesel fuels for highway use in the United States now require sulfur content to be **less than 0.05%**.

If diesel fuel being used has a sulfur content **greater than 0.05%**, **reduce the service interval** for engine oil and filter by **50%**.

Consult your local diesel fuel distributor for properties of the diesel fuel available in your area.



**California Proposition 65 Warning:** Diesel engine exhaust and some of its elements from this product are known to the State of California to cause cancer, birth defects, or other reproductive harm.

## DIESEL FUEL LUBRICITY

Diesel fuel must have adequate lubricity to ensure proper operation and durability of fuel injection system components. Fuel lubricity should pass a **minimum of 3300 gram load level** as measured by the **BOCLE** scuffing test.

## DIESEL FUEL STORAGE

**IMPORTANT: DO NOT USE GALVANIZED CONTAINERS**—diesel fuel stored in galvanized containers reacts with zinc coating in the container to form zinc flakes. If fuel contains water, a zinc gel will also form. The gel and flakes will quickly plug fuel filters and damage fuel injectors and fuel pumps.

It is recommended that diesel fuel be stored **ONLY** in a clean, approved **POLYETHYLENE PLASTIC** container **WITHOUT** any metal screen or filter. This will help prevent any accidental sparks from occurring. Store fuel in an area that is well ventilated to prevent possible igniting of fumes by an open flame or spark, this includes any appliance with a pilot light.

**IMPORTANT: Keep all dirt, scale, water or other foreign material out of fuel.**

Keep fuel in a safe, protected area and in a clean, properly marked (“**DIESEL FUEL**”) container. **DO NOT** use deicers to attempt to remove water from fuel. **DO NOT** depend on fuel filters to remove water from fuel. It is recommended that a water separator be installed in the storage tank outlet. **BE SURE** to properly discard unstable or contaminated diesel fuel and/or their containers when necessary.

## DIESEL FUEL - EUROPE

In general, diesel fuels are blended to satisfy the low air temperature requirements of the geographical area in which they are sold.

In Europe, diesel fuel is usually specified to **EN590** and sold in 5 different classes or 6 different grades.

If diesel fuels being supplied in your area **DO NOT** meet any of the above specifications, use diesel fuels with the following equivalent properties:

- Cetane Number 40 (minimum)

A cetane number **greater than 50 is preferred**, especially for air temperatures below  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) or elevations above 1500 m (5000 ft).

If diesel fuel being used has a sulfur content **greater than 0.05%**, **reduce the service interval** for engine oil and filter by **50%**.

Consult your local diesel fuel distributor for properties of the diesel fuel available in your area.

- Cold Filter Plugging Point (CFPP)

The air temperature at which diesel fuel **begins to cloud or jell** — at least  $5^{\circ}\text{C}$  ( $9^{\circ}\text{F}$ ) below the expected low air temperature range.

- Sulfur Content of 0.05%

Diesel fuel for highway use in the European Union will be required to have a sulfur content of **less than 0.05%** by **1 October 1996**.

If diesel fuel being used has a sulfur content **greater than 0.05%**, **reduce the service interval** for engine oil and filter by **50%**.

Consult your local diesel fuel distributor for properties of the diesel fuel available in your area.

## DIESEL FUEL LUBRICITY

Diesel fuel must have adequate lubricity to ensure proper operation and durability of fuel injection system components. Fuel lubricity should pass a **minimum of 3300 gram load level** as measured by the **BOCLE** scuffing test.

## DIESEL FUEL STORAGE

**IMPORTANT: DO NOT USE GALVANIZED CONTAINERS**—diesel fuel stored in galvanized containers reacts with zinc coating in the container to form zinc flakes. If fuel contains water, a zinc gel will also form. The gel and flakes will quickly plug fuel filters and damage fuel injectors and fuel pumps.

It is recommended that diesel fuel be stored **ONLY** in a clean, approved **POLYETHYLENE PLASTIC** container **WITHOUT** any metal screen or filter. This will help prevent any accidental sparks from occurring. Store fuel

in an area that is well ventilated to prevent possible igniting of fumes by an open flame or spark, this includes any appliance with a pilot light.

**IMPORTANT: Keep all dirt, scale, water or other foreign material out of fuel.**

Keep fuel in a safe, protected area and in a clean, properly marked (“**DIESEL FUEL**”) container. **DO NOT** use deicers to attempt to remove water from fuel. **DO NOT** depend on fuel filters to remove water from fuel. It is recommended that a water separator be installed in the storage tank outlet. **BE SURE** to properly discard unstable or contaminated diesel fuel and/or their containers when necessary.

## 4-CYCLE DIESEL ENGINE OIL - NORTH AMERICA

Use appropriate oil viscosity based on the expected air temperature range during the period between recommended oil changes. Operating outside of these recommended oil air temperature ranges may cause premature engine failure.

The following John Deere oils are **PREFERRED**:

- PLUS-50®—SAE 15W-40;**
- TORQ-GARD SUPREME®—SAE 5W-30.**

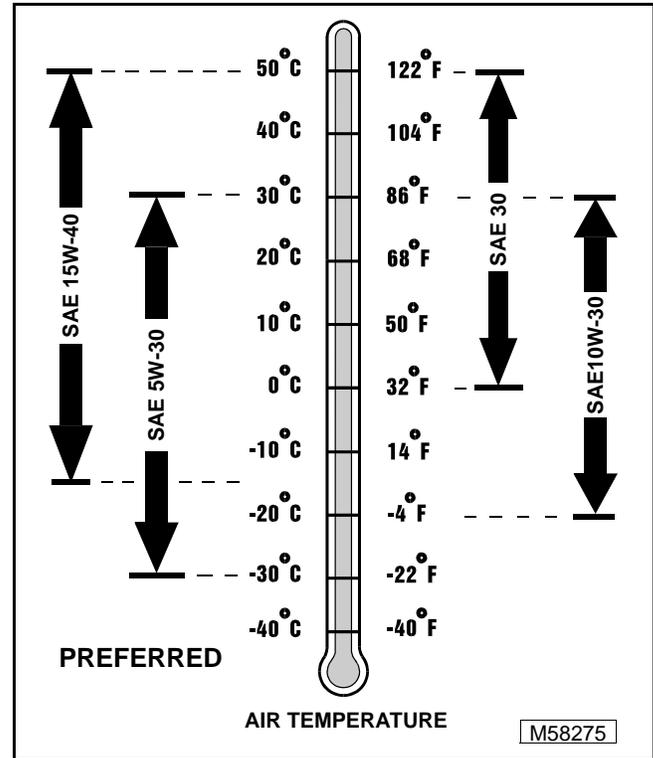
The following John Deere oils are **also recommended**, based on their specified temperature range:

- TURF-GARD®—SAE 10W-30;**
- PLUS-4®—SAE 10W-30;**
- TORQ-GARD SUPREME®—SAE 30.**

Other oils may be used if above John Deere oils are not available, provided they meet one of the following specifications:

- SAE 15W-40 (preferred)—API Service Classifications CG-4 or CF-4 or higher;
- SAE 5W-30 (preferred)—API Service Classification CD or CC or higher;
- SAE 10W-30—API Service Classification CF-4 or CF or higher;
- SAE 30—API Service Classification CF-4 or CF or higher.

**IMPORTANT: If diesel fuel with sulfur content greater than 0.5% is used, reduce the service interval for oil and filter by 50%.**



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, ENOIL in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

## 4-CYCLE DIESEL ENGINE OIL - EUROPE

Use appropriate oil viscosity based on the expected air temperature range during the period between recommended oil changes. Operating outside of these recommended oil air temperature ranges may cause premature engine failure.

The following John Deere oils are **PREFERRED**:

- TORQ-GARD SUPREME®—SAE 15W-40;
- UNI-GARD™—SAE 15W-40;
- TORQ-GARD SUPREME®—SAE 5W-30;
- UNI-GARD™—SAE 5W-30.

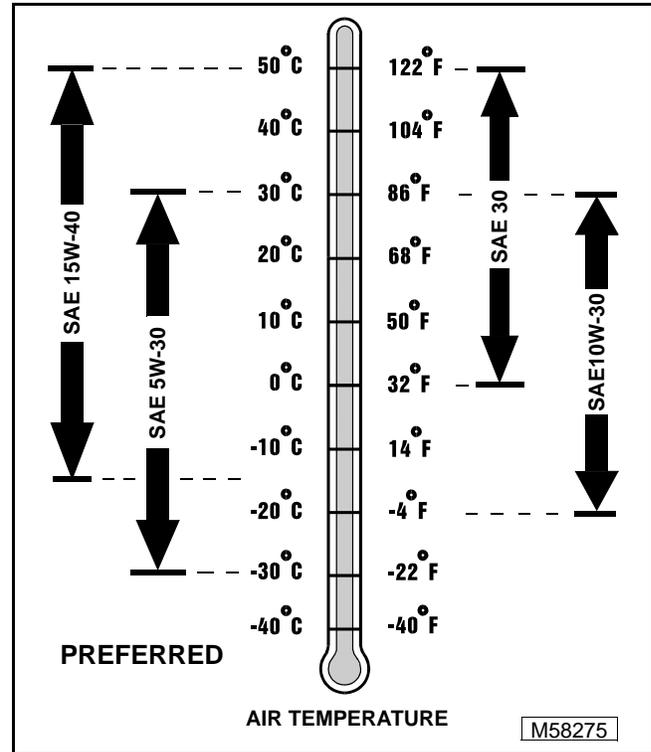
The following John Deere oils are **also recommended**, based on their specified temperature range:

- TORQ-GARD SUPREME®—SAE 10W-30;
- UNI-GARD™—SAE 10W-30;
- TORQ-GARD SUPREME®—SAE 30;
- UNI-GARD™—SAE 30.

Other oils may be used if above John Deere oils are not available, provided they meet one of the following specifications:

- CCMC Specification D5 or Mercedes Benz MB228.3 or higher;
- CCMC Specification D4 or Mercedes Benz MB228.1 or higher.

**IMPORTANT:** If diesel fuel with sulfur content greater than 0.5% is used, reduce the service interval for oil and filter by 50%.



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, ENOIL in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide.

## BREAK-IN DIESEL ENGINE OIL - NORTH AMERICA

**IMPORTANT:** ONLY use this specified break-in oil in rebuilt or remanufactured engines for the first 100 hours maximum. DO NOT use PLUS-50®, SAE 15W40 oil or oils meeting specifications API CG-4 or API CF-4, these oils will not allow rebuilt or remanufactured engines to break-in properly.

The following John Deere oil is **PREFERRED**:

•**BREAK-IN ENGINE OIL.**

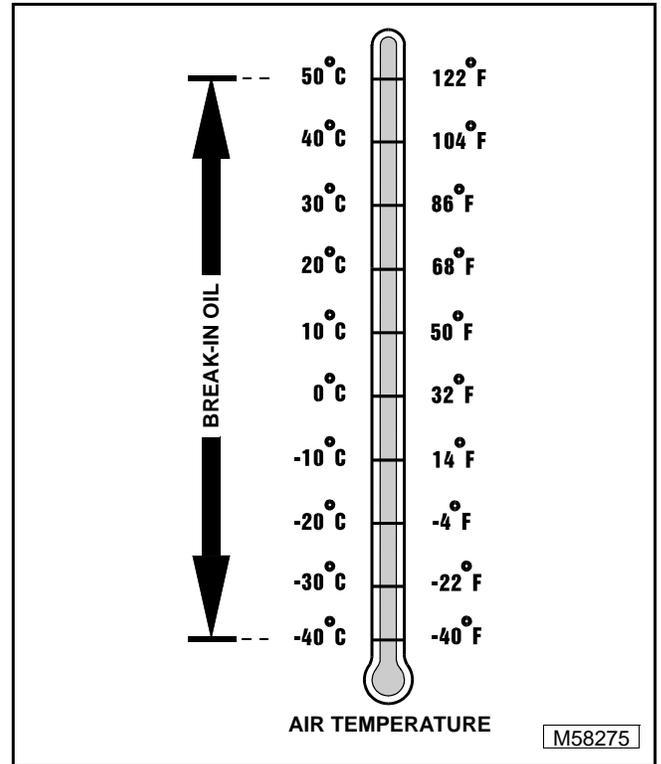
**John Deere BREAK-IN ENGINE OIL** is formulated with special additives for aluminum and cast iron type engines to allow the power cylinder components (pistons, rings, and liners as well) to “wear-in” while protecting other engine components, valve train and gears, from abnormal wear. Engine rebuild instructions should be followed closely to determine if special requirements are necessary.

**John Deere BREAK-IN ENGINE OIL** is also recommended for non-John Deere engines, both aluminum and cast iron types.

If this preferred John Deere oil is not available, use a break-in engine oil meeting the following specification during the first 100 hours of operation:

•API Service Classification CE.

After the break-in period, use the John Deere oil that is recommended for this engine.



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, ENOIL4 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

## BREAK-IN DIESEL ENGINE OIL - EUROPE

**IMPORTANT:** ONLY use this specified break-in oil in rebuilt or remanufactured engines for the first 100 hours maximum. DO NOT use SAE 15W-40 oil or oils meeting CCMC Specification D5—these oils will not allow rebuilt or remanufactured engines to break-in properly.

The following John Deere oil is **PREFERRED:**

•**BREAK-IN ENGINE OIL.**

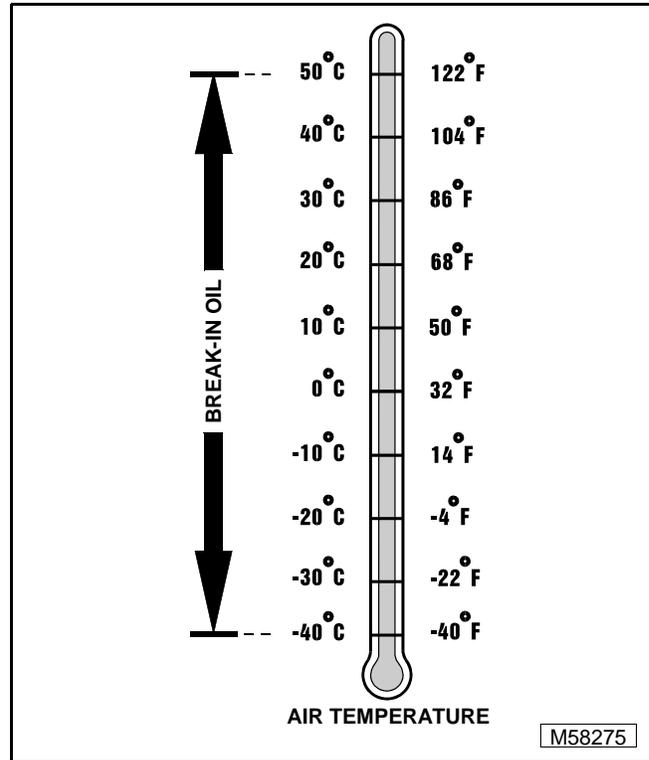
**John Deere BREAK-IN ENGINE OIL** is formulated with special additives for aluminum and cast iron type engines to allow the power cylinder components (pistons, rings, and liners as well) to “wear-in” while protecting other engine components, valve train and gears, from abnormal wear. Engine rebuild instructions should be followed closely to determine if special requirements are necessary.

**John Deere BREAK-IN ENGINE OIL** is also recommended for non-John Deere engines, both aluminum and cast iron types.

If above preferred John Deere oil is not available, use a break-in engine oil meeting the following specification during the first 100 hours of operation:

•CCMC Specification D4.

After the break-in period, use the John Deere oil that is recommended for this engine.



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, ENOIL4 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide.

## HYDROSTATIC TRANSMISSION AND HYDRAULIC OIL - NORTH AMERICA

Use the appropriate oil viscosity based on these air temperature ranges. Operating outside of these recommended oil air temperature ranges may cause premature transmission or hydraulic system failures.

**IMPORTANT:** Mixing of **LOW VISCOSITY HY-GARD®** and **HY-GARD®** oils is permitted. **DO NOT** mix any other oils in this transmission. **DO NOT** use engine oil or "Type F" (Red) Automatic Transmission Fluid in this transmission. **DO NOT** use **BIO-HY-GARD®** in this transmission.

The following John Deere transmission and hydraulic oil is **PREFERRED**:

•**LOW VISCOSITY HY-GARD®—JDM J20D.**

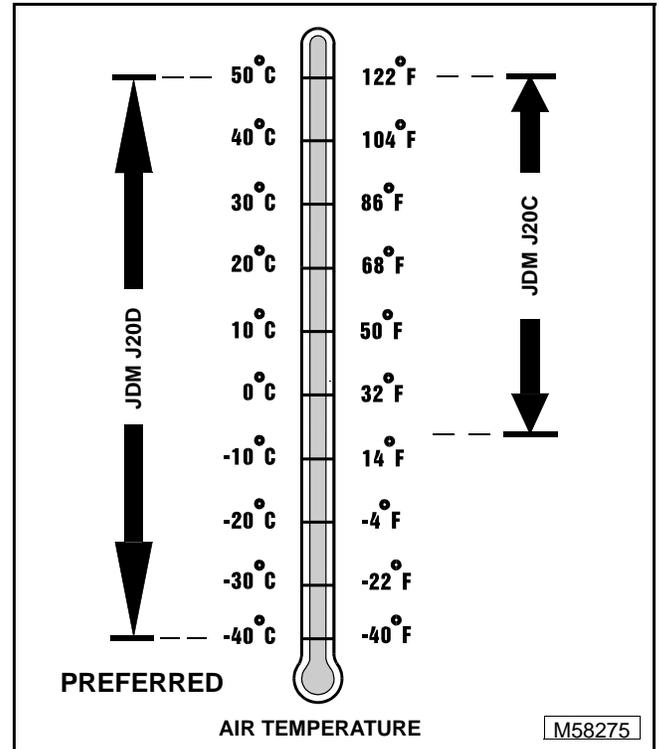
The following John Deere oil is **also recommended** if above preferred oil is not available:

•**HY-GARD®—JDM J20C.**

Other oils may be used if above recommended John Deere oils are not available, provided they meet one of the following specifications:

- John Deere Standard JDM J20D (**preferred**);
- John Deere Standard JDM J20C.

**IMPORTANT:** When using **HY-GARD® (JDM J20C)**, if the minimum air temperature should fall below **-7°C (-20°F)** drain reservoir and switch to **LOW VISCOSITY HY-GARD® (JDM J20D)**. If minimum air temperature should fall below **-40°C (-40°F)**, the transmission oil must be heated to at least five degrees above the lower limit before start-up or transmission may be damaged. For prolonged operation under heavy load in air temperatures above **50°C (122°F)** reduce service interval by 50%.



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, ANTI in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

*NOTE: Disregard the John Deere All Weather Hydrostatic Fluid (JDM J21A) listing—it has been eliminated from the specifications.*

## HYDROSTATIC TRANSMISSION AND HYDRAULIC OIL - EUROPE

Use the appropriate oil viscosity based on these air temperature ranges. Operating outside of these recommended oil air temperature ranges may cause premature transmission or hydraulic system failures.

**IMPORTANT: Mixing of LOW VISCOSITY HY-GARD® and HY-GARD® oils is permitted. DO NOT mix any other oils in this transmission. DO NOT use engine oil or "Type F" (Red) Automatic Transmission Fluid in this transmission. DO NOT use BIO-HY-GARD® in this transmission.**

The following John Deere transmission and hydraulic oil is **PREFERRED**:

•**LOW VISCOSITY HY-GARD®—JDM J20D.**

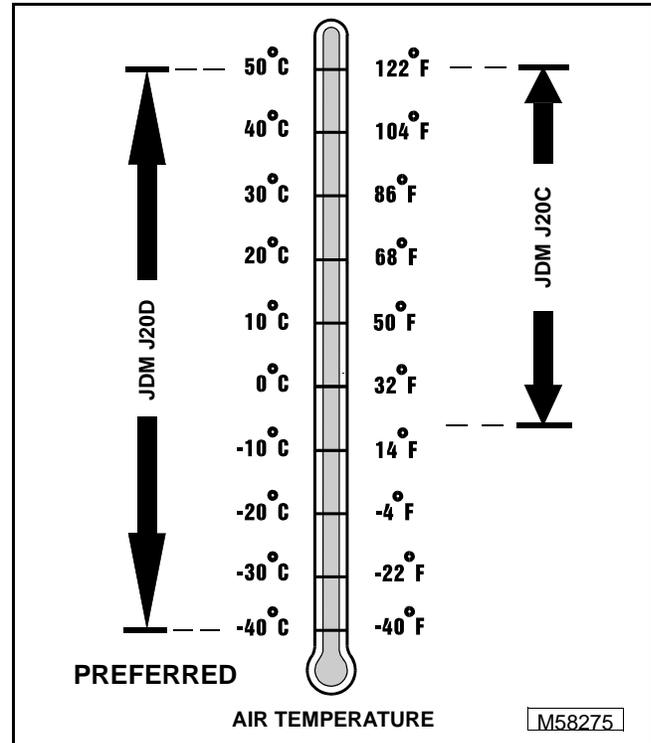
The following John Deere oil is **also recommended** if above preferred oil is not available:

•**HY-GARD®—JDM J20C.**

Other oils may be used if above recommended John Deere oils are not available, provided they meet one of the following specifications:

- John Deere Standard JDM J20D (**preferred**);
- John Deere Standard JDM J20C.

**IMPORTANT: When using HY-GARD® (JDM J20C), if the minimum air temperature should fall below -7°C (-20°F) drain reservoir and switch to LOW VISCOSITY HY-GARD® (JDM J20D). If minimum air temperature should fall below -40°C (-40°F), the transmission oil must be heated to at least five degrees above the lower limit before start-up or transmission may be damaged. For prolonged operation under heavy load in air temperatures above 50°C (122°F) reduce service interval by 50%.**



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, ANTI in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide.

*NOTE: Disregard the John Deere All Weather Hydrostatic Fluid (JDM J21A) listing—it has been eliminated from the specifications.*

## GEAR CASE OIL - NORTH AMERICA

### MECHANICAL FRONT WHEEL DRIVE

Use the following oil viscosity based on the air temperature range. Operating outside of the recommended oil air temperature range may cause premature gear case failure.

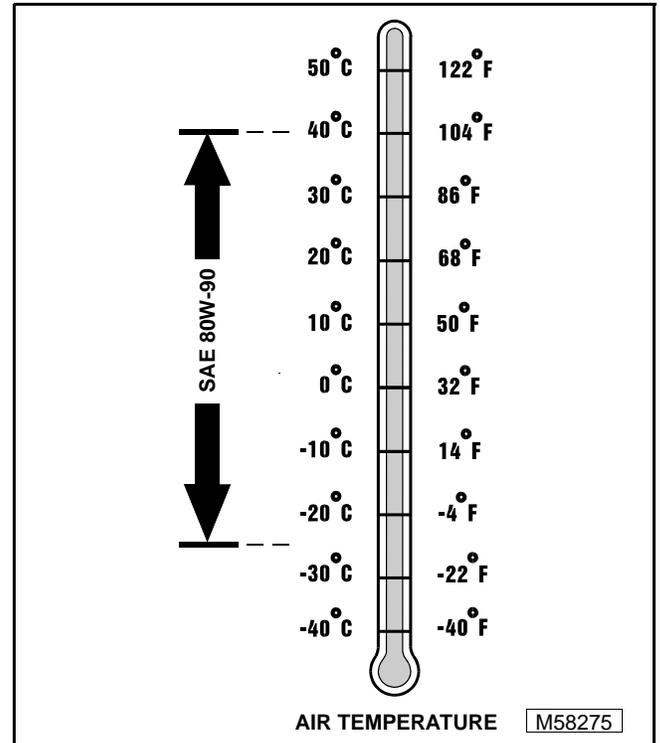
**IMPORTANT: ONLY use a quality oil in this gear case. DO NOT mix any other oils in this gear case. DO NOT use BIO-HY-GARD® in this gear case.**

The following John Deere gear case oil is **PREFERRED:**

•**GL-5 GEAR LUBRICANT®—SAE 80W-90.**

Other gear case oils may be used if above recommended John Deere gear case oil is not available, provided they meet the following specification:

•**API Service Classification GL-5.**



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, GEOIL in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- Lubrication Sales Manual PI7032.

## GEAR CASE OIL - EUROPE

### MECHANICAL FRONT WHEEL DRIVE

Use the following oil viscosity based on the air temperature range. Operating outside of the recommended oil air temperature range may cause premature gear case failure.

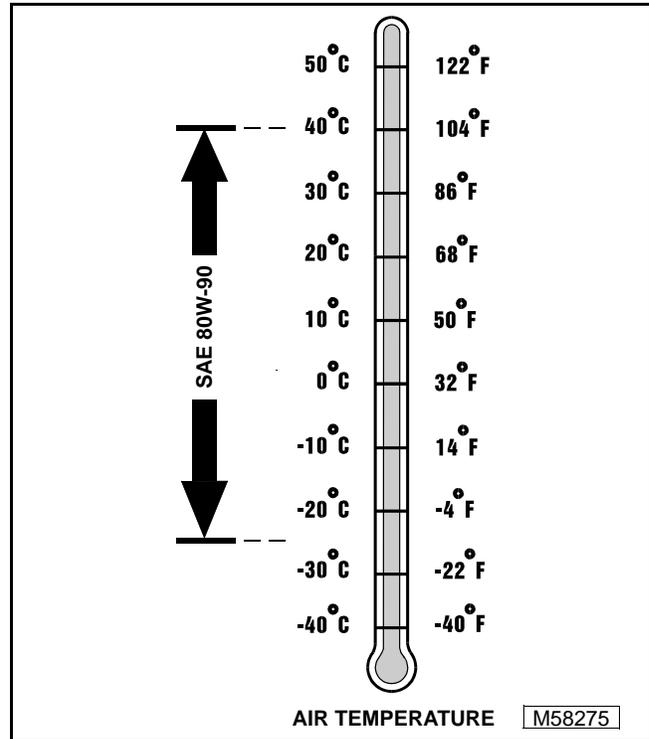
**IMPORTANT: ONLY use a quality oil in this gear case. DO NOT mix any other oils in this gear case. DO NOT use BIO-HY-GARD® in this gear case.**

The following John Deere gear case oil is **PREFERRED:**

•**EXTREME-GARD™—SAE 80W-90.**

Other gear case oils may be used if above recommended John Deere gear case oil is not available, provided they meet the following specification:

•**API Service Classification GL-5.**



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil for your customers:

- Module DX, GEOIL in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide.

## GREASE - NORTH AMERICA

### (FOR ALL OTHER PRODUCTS AND COMPONENTS NOT ALREADY COVERED)

Use the following grease based on the air temperature range. Operating outside of the recommended grease air temperature range may cause premature failures.

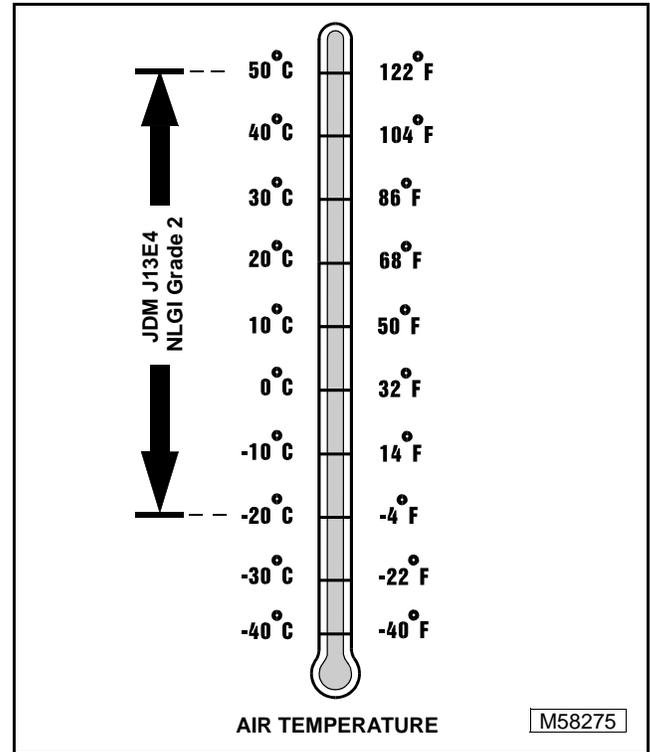
**IMPORTANT: ONLY use a quality grease in this application. DO NOT mix any other greases in this application. DO NOT use any BIO-GREASE in this application.**

The following John Deere grease is **PREFERRED**:

•**NON-CLAY HIGH-TEMPERATURE EP GREASE®—JDM J13E4, NLGI Grade 2.**

Other greases may be used if above preferred John Deere grease is not available, provided they meet the following specification:

•**John Deere Standard JDM J13E4, NLGI Grade 2.**



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper grease for your customers:

- Module DX, GRE A1 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;
- the Lubrication Sales Manual PI7032.

## GREASE - EUROPE

### (FOR ALL OTHER PRODUCTS AND COMPONENTS NOT ALREADY COVERED)

Use the following grease based on the air temperature range. Operating outside of the recommended grease air temperature range may cause premature failures.

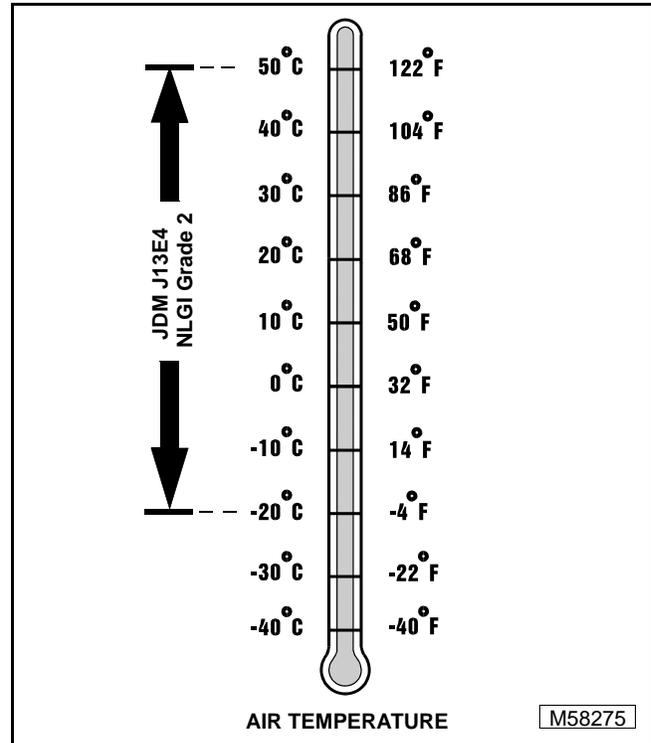
**IMPORTANT: ONLY use a quality grease in this application. DO NOT mix any other greases in this application. DO NOT use any BIO-GREASE in this application.**

The following John Deere grease is **PREFERRED**:

•**GREASE-GARD™—JDM J13E4, NLGI Grade 2.**

Other greases may be used if above preferred John Deere grease is not available, provided they meet the following specification:

•**John Deere Standard JDM J13E4, NLGI Grade 2.**



**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper grease for your customers:

- Module DX, GREA1 in JDS-G135;
- Section 530, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide.

## ALTERNATIVE LUBRICANTS - NORTH AMERICA

Conditions in certain geographical areas outside the United States and Canada may require different lubricant recommendations than the ones printed in this technical manual or the operator's manual. Consult with your John Deere Dealer, or Sales Branch, to obtain the alternative lubricant recommendations.

**IMPORTANT: Use of alternative lubricants could cause reduced life of the component.**

If alternative lubricants are to be used, it is recommended that the factory fill be thoroughly removed before switching to any alternative lubricant.

## SYNTHETIC LUBRICANTS

Synthetic lubricants may be used in John Deere equipment if they meet the applicable performance requirements (industry classification and/or military specification) as shown in this manual.

The recommended air temperature limits and service or lubricant change intervals should be maintained as shown in the operator's manual, unless otherwise stated on lubricant label.

Avoid mixing different brands, grades, or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements. Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

## LUBRICANT STORAGE

All machines operate at top efficiency only when clean lubricants are used. Use clean storage containers to handle all lubricants. Store them in an area protected from dust, moisture, and other contamination.

Store drums on their sides. Make sure all containers are properly marked as to their contents. Dispose of all old, used containers and their contents properly.

## MIXING OF LUBRICANTS

In general, avoid mixing different brands or types of lubricants. Manufacturers blend additives in their lubricants to meet certain specifications and performance requirements.

Mixing different lubricants can interfere with the proper functioning of these additives and lubricant properties which will downgrade their intended specified performance.

## OIL FILTERS

**IMPORTANT: Filtration of oils is critical to proper lubrication performance. Always change filters regularly.**

The following John Deere oil filters are **PREFERRED:**  
•**AUTOMOTIVE AND LIGHT TRUCK ENGINE OIL FILTERS.**

Most John Deere filters contain pressure relief and anti-drainback valves for better engine protection.

Other oil filters may be used if above recommended John Deere oil filters are not available, provided they meet the following specification:

•ASTB Tested In Accordance With SAE J806.

**John Deere Dealers:** You may want to cross-reference the following publications to recommend the proper oil filter for your customers:

•Module DX, FILT in JDS-G135;

•Section 540, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;

•Lawn & Grounds Care Tune-Up Guide PI672.

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•Module DX, FILT in JDS-G135;

•Section 540, Lubricants & Hydraulics, of the John Deere Merchandise Sales Guide;

•Lawn & Grounds Care Tune-Up Guide PI672.

## DIESEL ENGINE COOLANT - NORTH AMERICA

The engine cooling system when filled with a proper dilution mixture of anti-freeze and deionized or distilled water provides year-round protection against corrosion, cylinder or liner pitting, and winter freeze protection down to  $-37^{\circ}\text{C}$  ( $-34^{\circ}\text{F}$ ).

The following John Deere coolant is **PREFERRED**:

- PRE-DILUTED DIESEL ENGINE ANTI-FREEZE/SUMMER COOLANT™ (TY16036).**

This coolant satisfies specifications for “Automobile and Light Duty Engine Service” and is safe for use in John Deere Lawn and Grounds Care/Golf and Turf Division equipment, including aluminum block gasoline engines and cooling systems.

The above preferred pre-diluted anti-freeze provides:

- adequate heat transfer**
- corrosion-resistant chemicals for the cooling system**
- compatibility with cooling system hose and seal material**
- protection during extreme cold and extreme hot weather operations**
- chemically pure water for better service life**
- compliance with ASTM D4656 (JDM H24C2) specifications**

If above preferred pre-diluted coolant is not available, the following John Deere concentrate is **recommended**:

- DIESEL ENGINE ANTI-FREEZE/SUMMER COOLANT CONCENTRATE™ (TY16034).**

If either of above recommended engine coolants are available use any Automobile and Light Duty Engine Service **ethylene glycol base coolant**, meeting the following specification:

- ASTM D3306 (JDM H24C1).**

Read container label completely before using and follow instructions as stated.

**IMPORTANT:** To prevent engine damage, **DO NOT** use pure anti-freeze or less than a **50% anti-freeze mixture in the cooling system. DO NOT mix or add any additives/conditioners to the cooling system in Lawn and Grounds Care/ Golf and Turf Division equipment. Water used to dilute engine coolant concentrate must be of high quality—clean, clear, potable water (low in chloride and hardness—Table 1) is generally acceptable. DO NOT use salt water. Deionized or distilled water is ideal to use. Coolant that is not mixed to these specified levels and water purity can cause excessive scale, sludge deposits, and increased corrosion potential.**

**Table 1: Water Quality**

| Property                          | Requirements           |
|-----------------------------------|------------------------|
| Total Solids, Maximum             | 340 ppm (20 grns/gal)  |
| Total Hardness, Max.              | 170 ppm (10 grns/gal)  |
| Chloride (as Cl), Max.            | 40 ppm (2.5 grns/gal)  |
| Sulfate (as $\text{SO}_4$ ), Max. | 100 ppm (5.8 grns/gal) |

Mix 50 percent anti-freeze concentrate with 50 percent distilled or deionized water. This mixture and the pre-diluted mixture (TY16036) will protect the cooling system down to  $-37^{\circ}\text{C}$  ( $-34^{\circ}\text{F}$ ) and up to  $108^{\circ}\text{C}$  ( $226^{\circ}\text{F}$ ).

Certain geographical areas may require lower air temperature protection. See the label on your anti-freeze container or consult your John Deere dealer to obtain the latest information and recommendations.

## DIESEL ENGINE COOLANT DRAIN INTERVAL - NORTH AMERICA

When using **John Deere Pre-Diluted (TY16036)** Automobile and Light Duty Engine Service coolants, drain and flush the cooling system and refill with fresh coolant mixture every **36 months or 3,000 hours** of operation, whichever comes first.

When using **John Deere Concentrate (TY16034)** Automobile and Light Duty Engine Service coolants, drain and flush the cooling system and refill with fresh coolant mixture every **24 months or 2,000 hours** of operation, whichever comes first.

If above John Deere Automobile and Light Duty Engine Service coolants **are not** being used; drain, flush, and refill the cooling system according to instructions found on product container or in equipment operator’s manual or technical manual.

## DIESEL ENGINE COOLANT - EUROPE

The engine cooling system when filled with a proper dilution mixture of anti-freeze and deionized or distilled water provides year-round protection against corrosion, cylinder liner pitting, and winter freeze protection down to  $-37^{\circ}\text{C}$  ( $-34^{\circ}\text{F}$ ).

The following John Deere coolant is **PREFERRED**:  
**•COOL-GARD COOLANT CONCENTRATE™.**

If above preferred coolant is not available, use any Automobile and Light Duty Engine Service **ethylene glycol base coolant**, meeting the following specification:

**•ASTM D3306 (JDM H24C1).**

Read container label completely before using and follow instructions as stated.

**IMPORTANT:** To prevent engine damage, **DO NOT** use pure anti-freeze or less than a **50% anti-freeze mixture in the cooling system. DO NOT** mix or add any additives/conditioners to the cooling system in Lawn and Grounds Care/Golf and Turf Division equipment. Water used to dilute engine coolant concentrate must be of high quality—clean, clear, potable water (low in chloride and hardness—Table 1) is generally acceptable. **DO NOT** use salt water. Deionized or distilled water is best to use. Coolant that is not mixed to these specified levels and water purity can cause excessive scale, sludge deposits, and increased corrosion potential.

**Table 1: Water Quality**

| Property                          | Requirements           |
|-----------------------------------|------------------------|
| Total Solids, Maximum             | 340 ppm (20 grns/gal)  |
| Total Hardness, Max.              | 170 ppm (10 grns/gal)  |
| Chloride (as Cl), Max.            | 40 ppm (2.5 grns/gal)  |
| Sulfate (as $\text{SO}_4$ ), Max. | 100 ppm (5.8 grns/gal) |

Mix 50 percent anti-freeze concentrate with 50 percent distilled or deionized water. This mixture will protect the cooling system down to  $-37^{\circ}\text{C}$  ( $-34^{\circ}\text{F}$ ) and up to  $108^{\circ}\text{C}$  ( $226^{\circ}\text{F}$ ).

Certain geographical areas may require lower air temperature protection. See the label on your anti-freeze container or consult your John Deere dealer to obtain the latest information and recommendations.

## DIESEL ENGINE COOLANT DRAIN INTERVAL - NORTH AMERICA

When using **John Deere Pre-Diluted (TY16036)** Automobile and Light Duty Engine Service coolants, drain and flush the cooling system and refill with fresh coolant mixture every **36 months or 3,000 hours** of operation, whichever comes first.

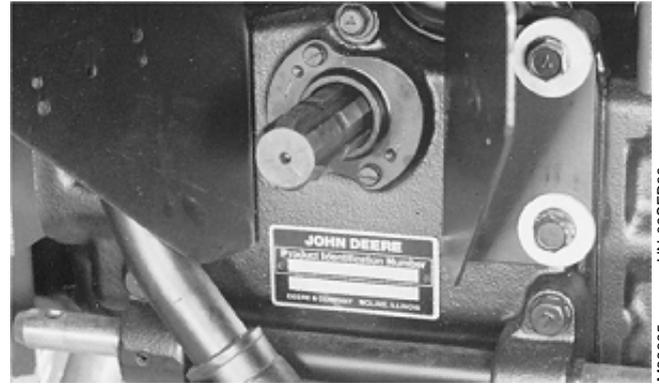
When using **John Deere Concentrate (TY16034)** Automobile and Light Duty Engine Service coolants, drain and flush the cooling system and refill with fresh coolant mixture every **24 months or 2,000 hours** of operation, whichever comes first.

If above John Deere Automobile and Light Duty Engine Service coolants **are not** being used; drain, flush, and refill the cooling system according to instructions found on product container or in equipment operator's manual or technical manual.

### PRODUCT SERIAL NUMBER

The tractor's 13-digit product serial number is located below rear PTO on transmission case.

Product Serial Number \_\_\_\_\_



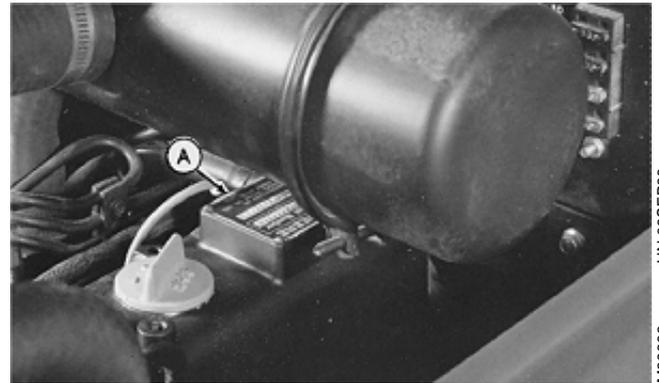
MX,HU,1025,1 -19-16OCT91

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M39695 -UN-09SEP88

### ENGINE SERIAL NUMBER

The tractor's engine serial number (A) is located on valve cover.

Engine Serial Number \_\_\_\_\_



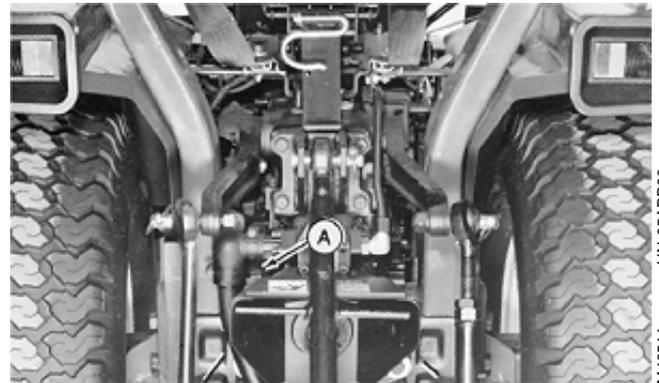
MX,HU,1025,2 -19-16OCT91

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### TRANSAXLE SERIAL NUMBER

The transaxle serial number plate is located on flat surface (A) below left-hand rockshaft lift arm.

Transaxle Serial Number \_\_\_\_\_



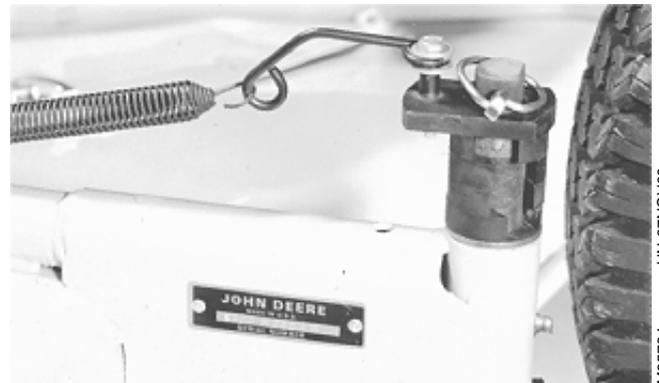
MX,HU,1025,3 -19-16OCT91

M48511 -UN-05APR90

### MOWER DECK SERIAL NUMBER

The mower deck serial number plate is located at various points on the different mower decks available for these tractors.

Mower Deck Serial Number \_\_\_\_\_



MX,HU,1025,4 -19-16OCT91

M35734 -UN-27NOV89



# Section 20 Diesel Engine Repair

## Contents

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**Group 10—Remove and Install Oil Cooler**

Remove and Install Oil Cooler . . . . .20-10-1

**Group 15—Remove and Install Radiator**

Service Equipment and Tools. . . . .20-15-1

Specifications. . . . .20-15-1

Remove and Install Radiator . . . . .20-15-2

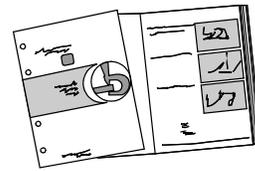
**Group 20—Remove and Install Diesel Engine**

Remove and Install Diesel Engine. . . . .20-20-1



**JOHN DEERE/YANMAR DIESEL ENGINE  
REPAIR—JOHN DEERE SERIES 220  
DIESEL ENGINES**

For complete repair information, the COMPONENT TECHNICAL MANUAL (CTM) is also required, use JOHN DEERE SERIES 220 DIESEL ENGINES—CTM3 (10AUG93 or later) in conjunction with this machine manual.



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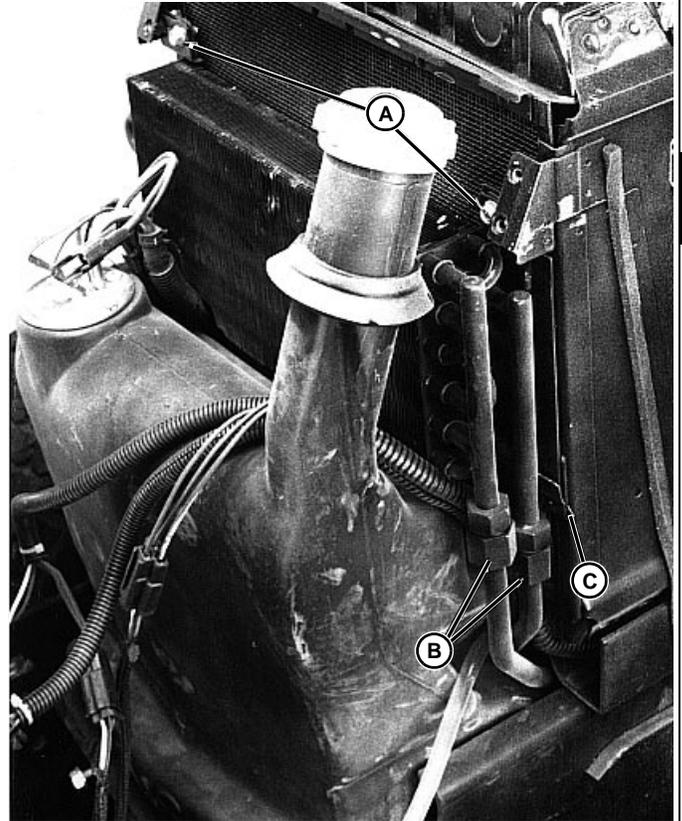
## REMOVE AND INSTALL OIL COOLER

*NOTE: Late model 755/756 Tractor shown. See Remove and Install Radiator in Group 15 of this section for steps required to reach disassembly point shown. Have a clean oil pan, several shop cloths, and two oil caps and plugs ready to catch, trap, and/or clean-up hydraulic oil.*

1. Remove two cap screws (A).
2. Disconnect oil cooler lines (B).
3. Lift cooler from base clips (C), one on each side.
4. Drain oil cooler and remove to bench.
5. Remove and discard O-rings.
6. Install new O-rings.
7. Set oil cooler in base clips (C), one on each side.

**IMPORTANT: Do not flex oil cooler lines. Hydrostatic line fittings must align with oil cooler fittings before lines are installed onto oil cooler.**

8. Loosen clamp that retains hydraulic lines to the frame.
9. Move hydraulic line's until hydraulic line and oil cooler line fitting's align.
10. Connect oil cooler lines (B) and tighten clamp. If at this time hydraulic oil cooler line's do not align, bend slightly until they do align.
11. Install and tighten two cap screws (A).
12. See Remove and Install Radiator in this section for final assembly steps.



M42294



### SERVICE EQUIPMENT AND TOOLS

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name                   | Use         |
|------------------------|-------------|
| Overhead 1/2 Ton Hoist | Pull Engine |

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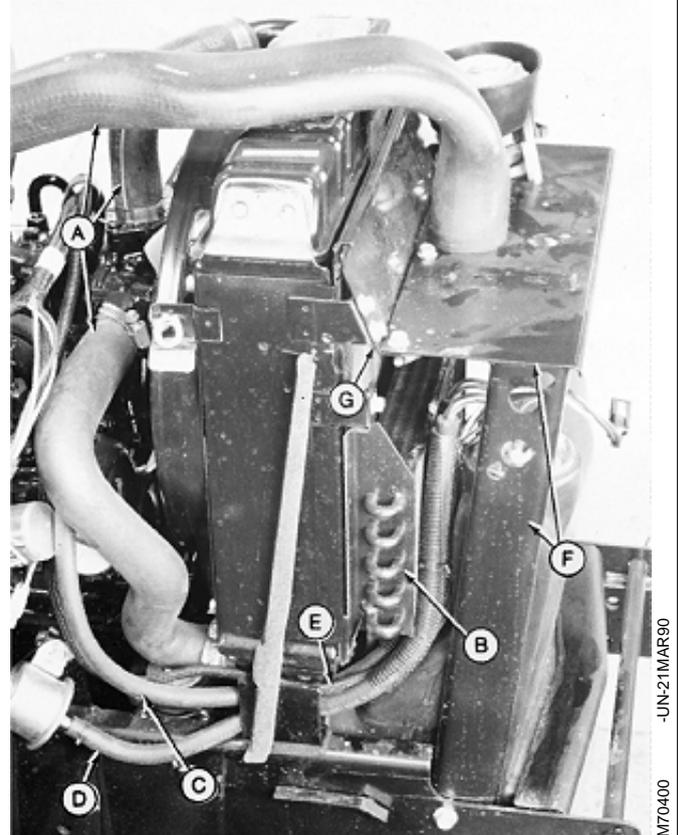
### SPECIFICATIONS

| Item                            | Measurement        | Specification   |
|---------------------------------|--------------------|---|
| Fan Blade                       | Radiator Clearance | 12mm (1/2 in.)  |
| Engine Side Panel Mounting Tabs | Center Distance    | 655—508 mm (20 in.)<br>755/756—562 mm (22.1 in.)<br>855/856/955—567 mm (22.3 in.) |

## REMOVE AND INSTALL RADIATOR

**NOTE:** On 955 Tractors and 855/856 Tractors (S/N 615001—999,999 and 1990 model S/N 10,001— ) the fuel tank and battery locations have been switched. Early model tractor used for illustrations.

1. Remove grille, side shields and hood.
2. Drain radiator.
3. Remove three hoses (A) and oil cooler (B), see REMOVE AND INSTALL OIL COOLER in Group 10 earlier in this section.
4. Disconnect return fuel line (C) and pump fuel line (D) from engine. Pull lines forward from radiator support.
5. Disconnect sender harness (E) leads form fuel tank sender and pull rearward from radiator support.
6. Disconnect radiator/hood support (F) from upper radiator bracket (G).
7. Remove radiator/hood support (F) lower frame bolts from both sides.
8. Have a person pull forward on fuel tank while you pull up and forward on radiator to clear frame locator pins and fan.

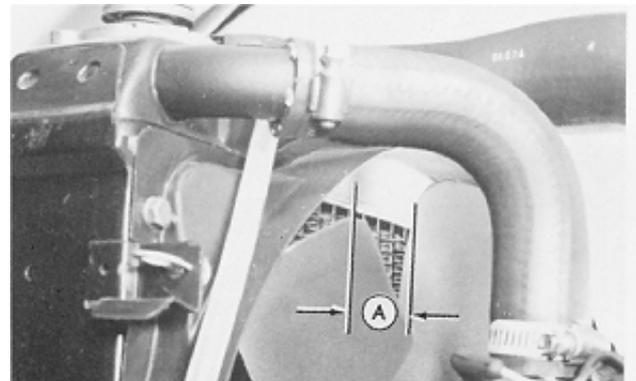


A—Radiator and Air Intake Hoses  
 B—Oil Cooler  
 C—Return Fuel Line  
 D—Pump Fuel Line  
 E—Fuel Sender Harness  
 F—Radiator/Hood Support  
 G—Upper Radiator Bracket

MX,HU,2015,1D -19-16OCT91

9. Distance (A) between fan blade and inner face of shroud must be at least 12 mm (1/2 in.).

10. If less than 12 mm (1/2 in.), make certain two shims have been inserted under each front engine mount (655).



MX,HU,2015,2 -19-16OCT91

*Remove and Install Radiator/Remove and Install Radiator*

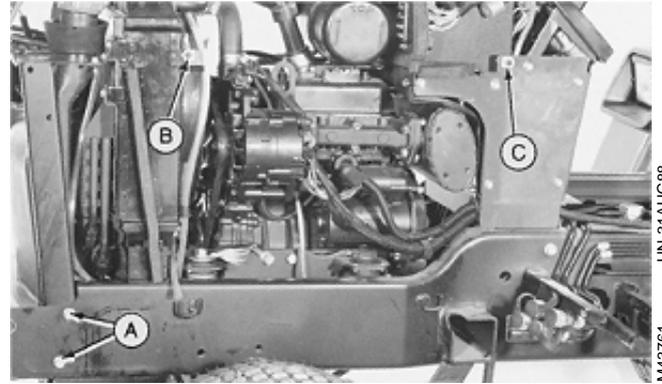
11. If shims are in place, reposition radiator forward to obtain at least 12 mm (1/2 in.) clearance. Tighten mounting bolts (A).

12. Center distance between engine side panel mounting tabs (B and C) must be:

508 mm (20 in.) on 655

562 mm (22.1 in.) on 755/756

567 mm (22.3 in.) on 855/856/955



MX,HU,2015,3 -19-16OCT91

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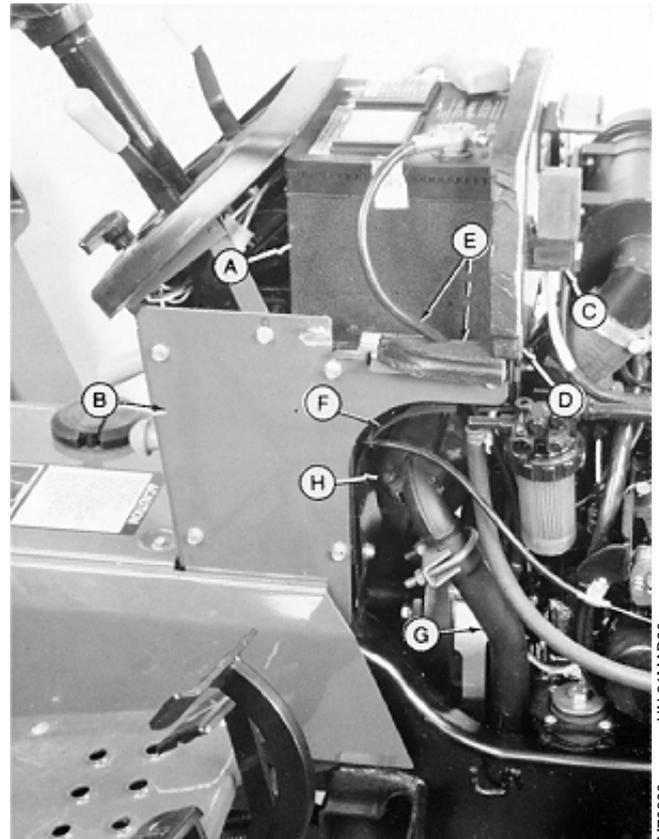


**REMOVE AND INSTALL DIESEL ENGINE**

*NOTE: Early model tractor used for illustrations. On 955 Tractors and 855 Tractors (S/N 615001—999,999 and 1990 model S/N 10,001— ) the fuel tank and battery locations have been switched.*

1. Remove grille, side shields, hood, oil cooler, fuel tank and radiator.
2. Remove items (A — H), lay firewall panel on top of dash so you don't have to disconnect the fuse block.

- A—Battery
- B—Pedestal Side Panels
- C—Starting Aid Module With Base
- D—Firewall Panel
- E—Battery Tray With Cables
- F—Muffler Heat Shield
- G—Exhaust Pipe
- H—Muffler



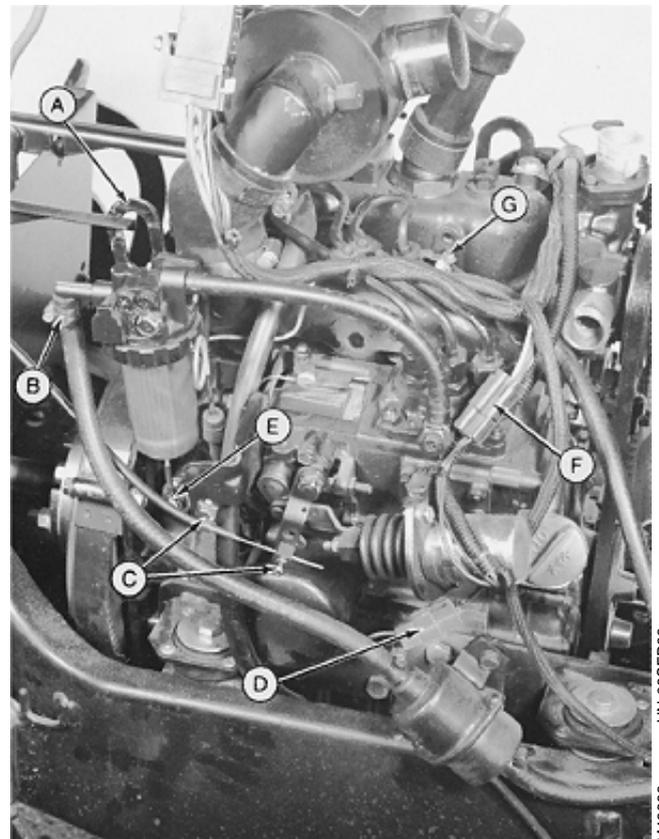
MX,HU,2020,1 -19-16OCT91

3. Install lifting eye (A) in upright position.

**IMPORTANT: Install plug and cap to keep dirt out of fuel system.**

4. Disconnect items (B through G).

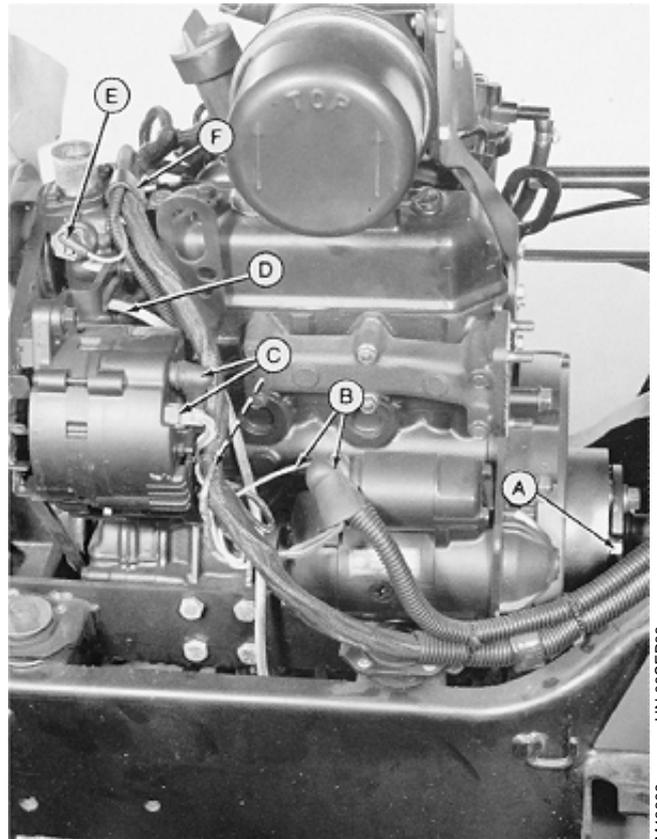
- A—Lifting Eye
- B—Fuel Line
- C—Throttle Cable Clamps
- D—Fuel Pump Connector
- E—Oil Pressure Sending Unit
- F—Fuel Shut-Off Connector
- G—Glow Plug (655/755/756) or Air Heater (855/856/955) Terminal



MX,HU,2020,2 -19-16OCT91

5. Disconnect items (A - F).

- A—Drive Shaft Isolator
- B—Starter Connections
- C—Alternator Connections
- D—Tachometer Cable
- E—Temperature Sender
- F—Harness Clamp



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MX,HU,2020,3 -19-16OCT91

6. Remove four engine mounting bolts (A).

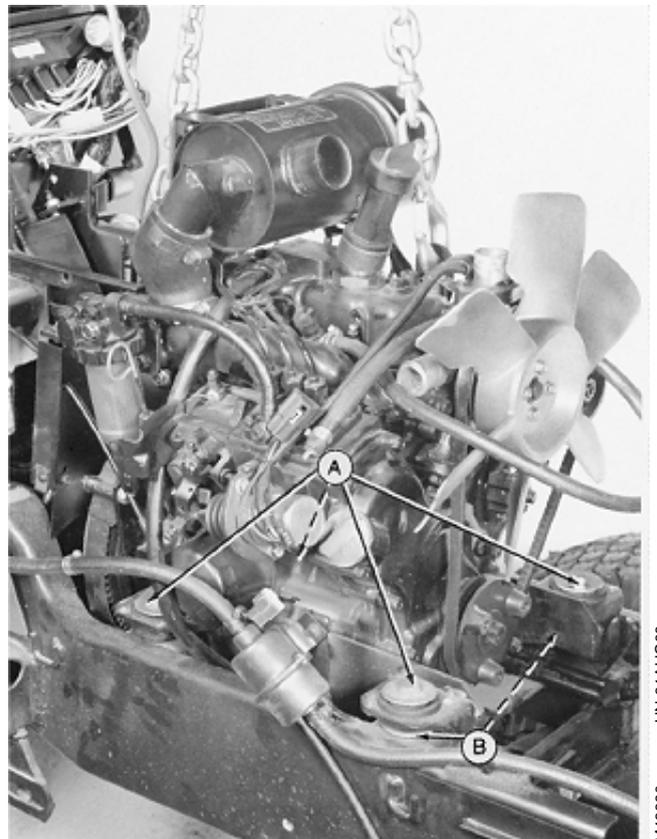
7. Remove engine from tractor frame. Keep shims (B), if equipped, for engine installation (655 Tractors Only).

INSTALLATION:

8. Reverse removal procedures noting the following items:

—Reinstall same number of shims (B) as removed on 655 Tractor.

—See Section 220, Group 10 for proper adjustment of throttle cable and fuel shut-off solenoid.



M43690 -UN-31AUG88

MX,HU,2020,4 -19-16OCT91

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# Section 30 Fuel and Air Repair

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### Group 10—Fuel Tank

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### Group 15—Fuel Tank Tube and Sender

Remove and Install Fuel Tank Tube  
and Sender . . . . .30-15-1

### Group 20—Air Cleaner

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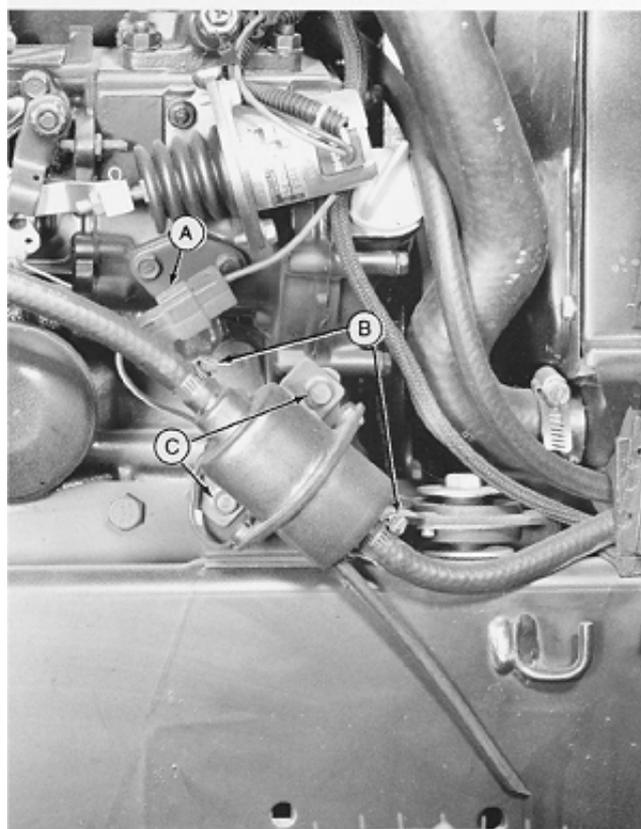
Remove and Install Air Cleaner . . . . .30-20-2

Remove and Install Air Restriction  
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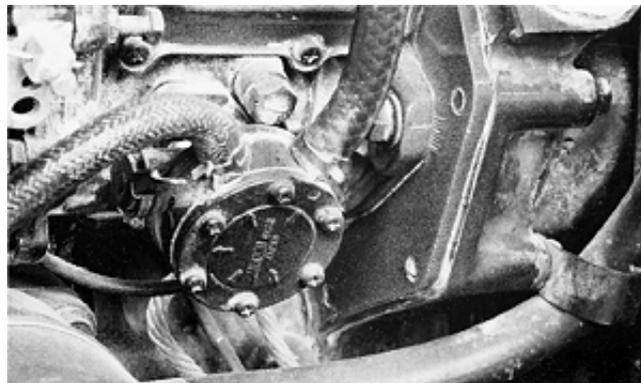
## REMOVE AND INSTALL FUEL TRANSFER PUMP

1. Lift hood. Remove right-hand engine shield.
2. Disconnect power lead (A).
3. Loosen hose clamps (B). Remove hoses from fuel pump. Plug hoses to prevent fuel contamination.
4. Remove cap screws (C). Remove fuel pump.
5. Install and fasten new fuel pump to bracket. Be sure end of pump marked "IN" is to the front of tractor.
6. Connect fuel hoses and power lead.
7. Bleed fuel injection system. (Refer to Section 220.)



MX,HU,3005,1 -19-16OCT91

All 955 Tractors and late model 855 Tractors (S/N 615001—999,999 and 1990 models S/N 10,001— ) use a mechanical fuel pump.



955 Tractor Shown

MX,HU,3005,2 -19-16OCT91

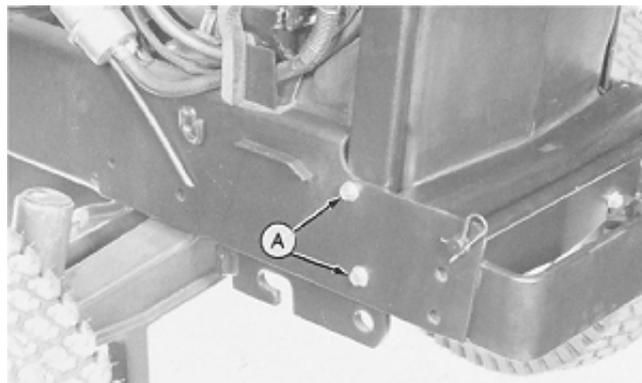
*Fuel Transfer Pump/Remove and Install Fuel Transfer Pump*

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## REMOVE AND INSTALL FUEL TANK

*NOTE: 755/756 Tractors illustrated only.*

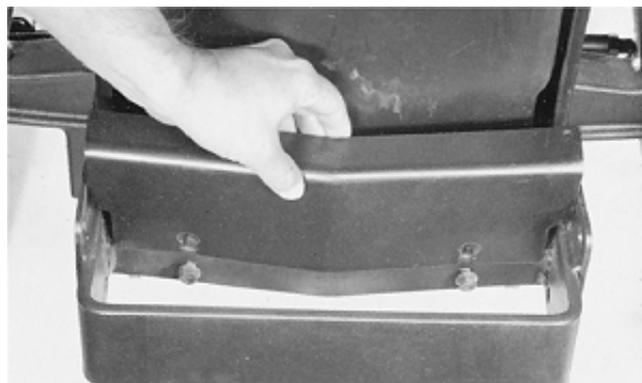
1. Remove front grill screen assembly.
2. Remove cap screws (A) on both sides of tractor.



MX,HU,3010,1 -19-16OCT91

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-UN-31AUG88

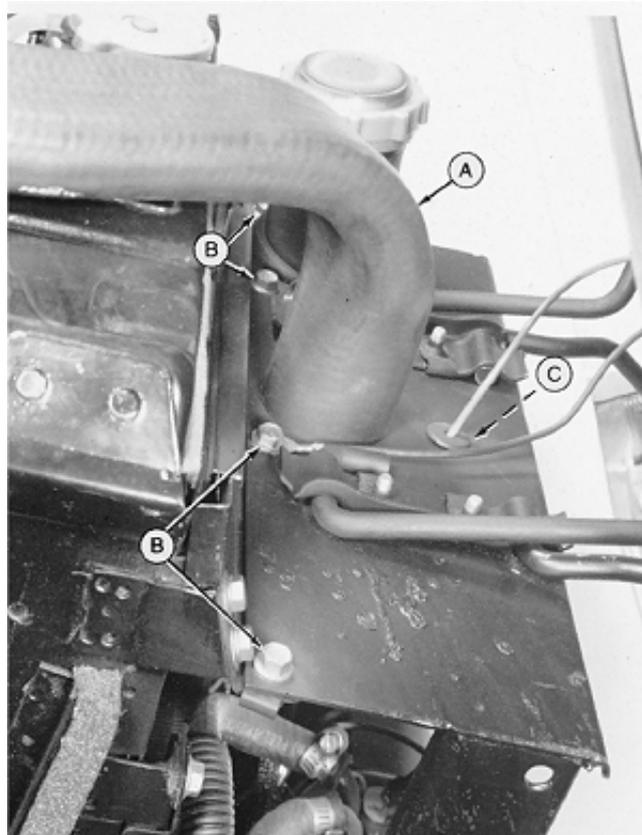
3. Loosen nuts and remove front plate.



MX,HU,3010,2 -19-16OCT91

M43527  
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4. Remove hose (A) and cap screws (B).
5. Disconnect lighting wire connector (C).
6. Remove fuel tank cap, spill cup, and drain hose.
7. Remove hood.



MX,HU,3010,3 -19-16OCT91

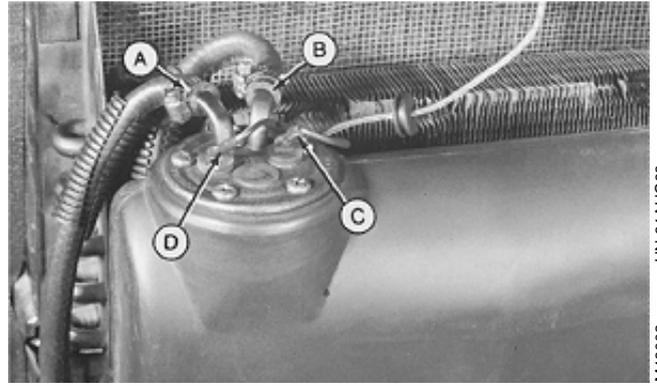
M43528  
-UN-31AUG88

## Fuel Tank/Remove and Install Fuel Tank

8. Remove and plug or cap fuel lines (A and B).
9. Disconnect wires (C and D).
10. Remove fuel tank.
11. Check fuel tank for cracks, holes or worn spots. Replace tank if damaged.

**IMPORTANT: Replace foam seals or pads whenever fuel tank is removed and installed.**

12. Install fuel tank in reverse order of removal. Make certain all rubber seals and front pads are in proper locations and in good condition.



A—Supply line  
B—Return line  
C—Black Wire  
D—Black/White Striped Wire

MX,HU,3010,4 -19-16OCT91

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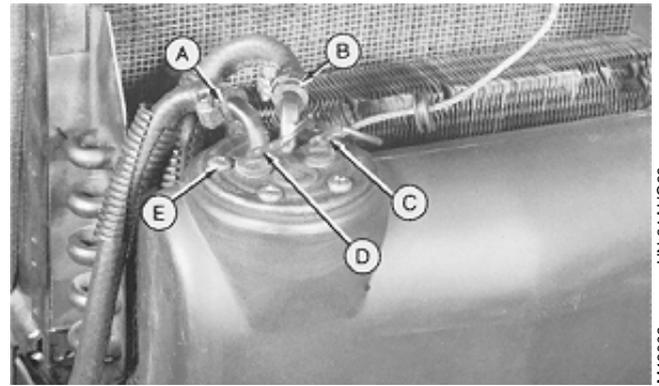
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## REMOVE AND INSTALL FUEL TANK TUBE AND SENDER

*NOTE: 755 Tractor illustrated only.*

1. Remove and plug fuel lines (A and B).
2. Disconnect wires (C and D).
3. Remove screws (E).
4. Remove tube and sender from tank.

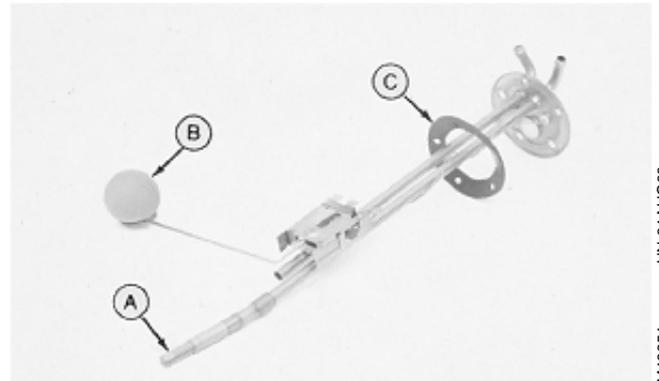
*NOTE: See Remove and Install Fuel Tank for Sender access.*



A—Supply line  
B—Return line  
C—Black Wire  
D—Black/White Striped Wire  
E—Screws

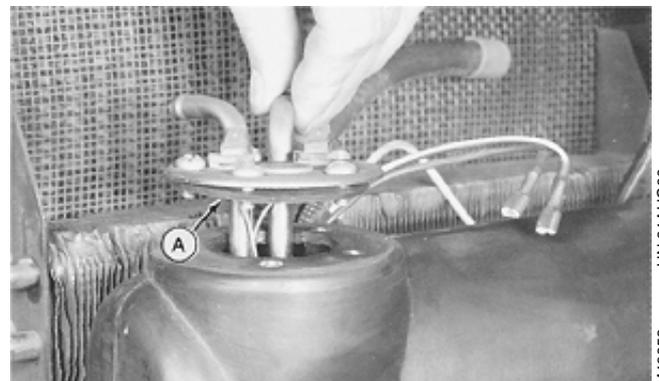
MX,HU,3015,1 -19-16OCT91

5. Remove filter screen (A). Clean and inspect screen and hose for damage. Replace as necessary. Keep length of hose and pickup same as original.
6. Inspect float (B) for cracks or damage. Replace as necessary.
7. Inspect gasket (C) for deterioration. Replace as necessary.



MX,HU,3015,2 -19-16OCT91

8. Install gasket (A) and align holes. Start screws through gasket.
9. Install tube and sender. Tighten screws securely.
10. Reinstall hoses and wires.
11. Bleed fuel system. See BLEED FUEL INJECTION SYSTEM in Section 220.



MX,HU,3015,3 -19-16OCT91

*Fuel Tank Tube and Sender/Remove and Install Fuel Tank Tube and Sender*

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**SPECIFICATIONS**

| <b>Item</b>               | <b>Measurement</b> | <b>Specification</b>   |
|---------------------------|--------------------|------------------------|
| Primary Air Cleaner       | Air Restriction    | 635 mm (25 in.) Vacuum |
| Secondary Air Cleaner     | Air Restriction    | 508 mm (20 in.) Vacuum |
| Air Restriction Indicator | Torque             | FINGER TIGHT ONLY      |

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## REMOVE AND INSTALL AIR CLEANER— 655, 755/756 AND EARLY 855/856 TRACTORS

**IMPORTANT:** DO NOT clean the primary air cleaner element with water or compressed air. Replace it only when the air restriction indicator shows 635 mm (25 in.) of vacuum or locks into the red position.

Tapping the filter on a hard surface Does Not Help to clean it! It may dent the wire mesh bringing the paper element in contact with the mesh. During normal operation the filter will vibrate and if it's touching the wire mesh, a hole will develop in the paper.

1. STOP engine, set park brake, and open hood.
2. Remove outside wing nut with washer (A) to remove cover assembly (B).
3. Remove inside wing nut with washer (C) and primary element (D).

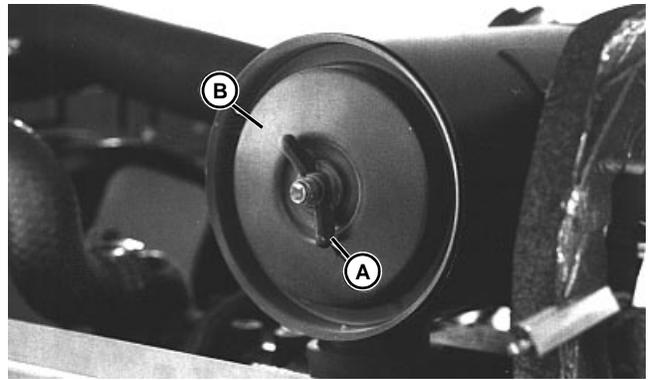
**IMPORTANT:** Ensure the washer is used with the wing nut, this will ensure that only filtered air enters the combustion chamber.  
A properly secured air filter can not be rotated with one hand.

4. Install new element and secure with wing nut and washer.
5. Install cover and secure with wing nut and washer.
6. Push reset button (A) on air restriction indicator. Indicator must reset.
7. START engine and allow to run one minute at maximum speed.
8. STOP engine and check air restriction indicator. If indicator shows 508 mm (20 in.) or more vacuum, replace secondary element.

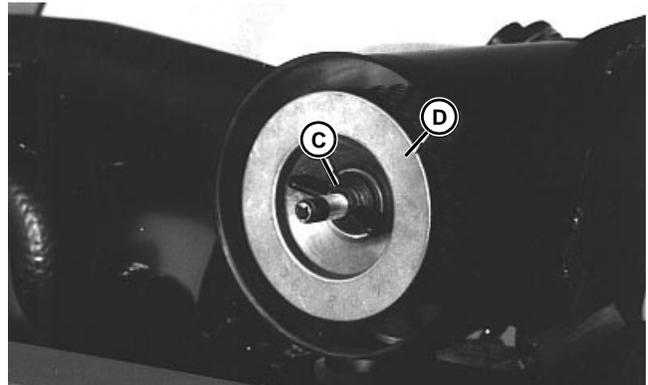
### SECONDARY ELEMENT REPLACEMENT

**IMPORTANT:** DO NOT clean secondary element, replace it only when air restriction indicator shows 508 mm (20 in.) vacuum and new primary element has been installed. DO NOT remove secondary element unless both these conditions are present.

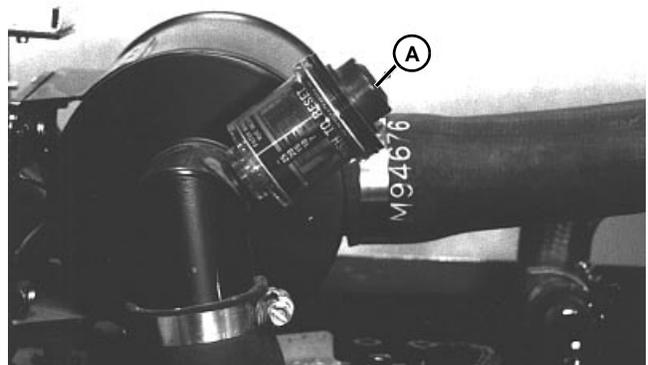
9. Remove primary element as described above, but do not discard primary element.
10. Remove innermost wing nut and washer (A), remove secondary element (B) and discard.



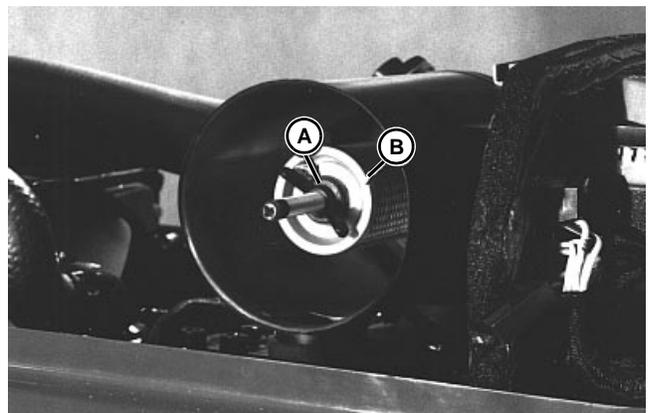
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M62777

11. Install new secondary element and secure with wing nut and washer.
12. Install primary element and secure with wing nut and washer.
13. Install cover and secure with wing nut and washer.
14. Push reset button on air restriction indicator. Indicator must reset.

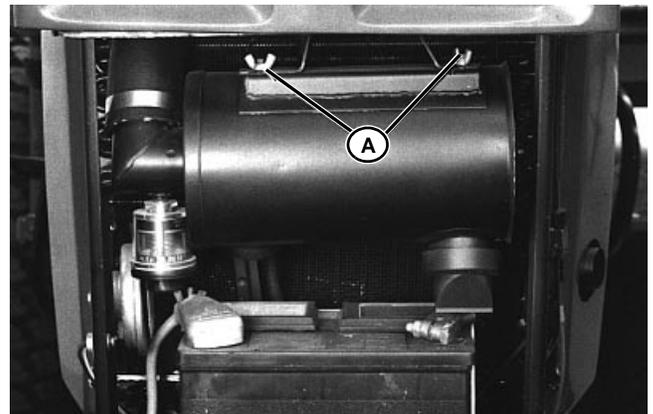
## REMOVE AND INSTALL AIR CLEANER— LATE 855 AND ALL 955 TRACTORS

**IMPORTANT:** DO NOT clean the primary air cleaner element with water or compressed air. Replace it only when the air restriction indicator shows 635 mm (25 in.) of vacuum or locks into the red position. Tapping the filter on a hard surface Does Not Help to clean it! It may dent the wire mesh bringing the paper element in contact with the mesh. During normal operation the filter will vibrate and if it's touching the wire mesh, a hole will develop in the paper.

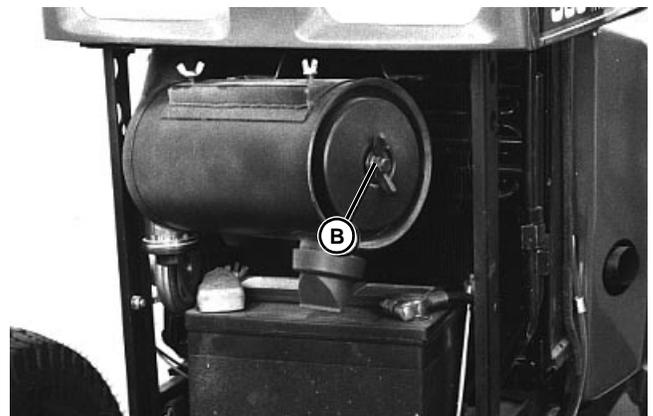
1. STOP engine, set park brake, and remove grille.
2. Loosen two wing nuts (A) and adjacent intake hose clamp to rotate air cleaner assembly forward for access.
3. Remove outside wing nut with washer (B) to remove cover assembly.
4. Remove inside wing nut with washer (C) and primary element (D).

**IMPORTANT:** Ensure the washer is used with the wing nut, this will ensure that only filtered air enters the combustion chamber. A properly secured air filter can not be rotated with one hand.

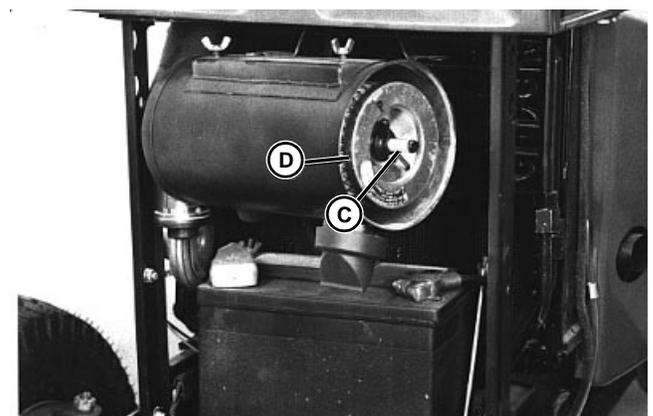
5. Install new element and secure with wing nut and washer.
6. Install cover and secure with wing nut and washer.
7. Push reset button (A) on air restriction indicator. Indicator must reset.
8. START engine and allow to run one minute at maximum speed.
9. STOP engine and check air restriction indicator. If indicator shows 508 mm (20 in.) or more vacuum, replace secondary element.



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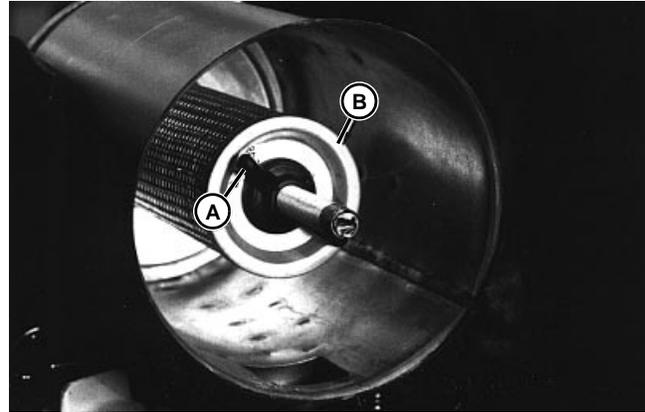


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## SECONDARY ELEMENT REPLACEMENT

**IMPORTANT:** DO NOT clean secondary element, replace it only when air restriction indicator shows 508 mm (20 in.) vacuum and new primary element has been installed. DO NOT remove secondary element unless both these conditions are present.

10. Remove primary element as described above, but do not discard primary element.
11. Remove innermost wing nut and washer (A), remove secondary element (B) and discard.
12. Install new secondary element and secure with wing nut and washer.
13. Install primary element and secure with wing nut and washer.
14. Install cover and secure with wing nut and washer.
15. Rotate assembly into position, tighten two wing nuts and hose clamp.
16. Push reset button on air restriction indicator. Indicator must reset. Install grille.

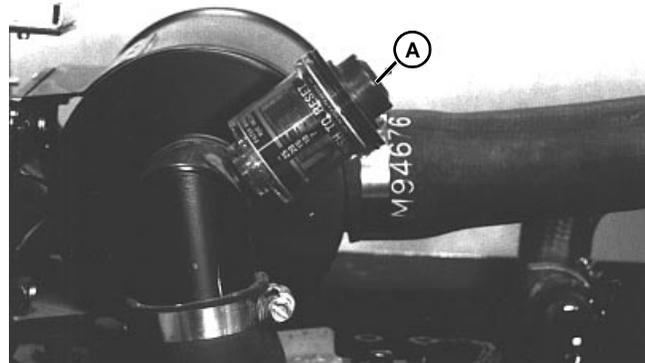


M62798

## REMOVE AND INSTALL AIR RESTRICTION INDICATOR

**IMPORTANT:** A faulty air restriction indicator, that goes undetected, may cause a dusted engine. Make sure all air restriction indicators are in good condition and the proper air restriction indicator is installed (DIESEL INDICATOR ON DIESEL ENGINE) before any tractor so equipped is released to the customer. Always test new indicators.

1. Remove the air restriction indicator (A) with your fingers—DO NOT use a pliers.
2. Carefully clean the inlet area of the indicator without getting dirt inside.
3. Put the inlet in your mouth and suck until the indicator locks in the red position.
4. Remove the inlet from your mouth and push the reset button. The indicator should reset to zero. If the indicator does not lock in the red or will not reset, check for air leaks in the filtered portion of the intake system. If remote mounted, check for leaks in the restriction indicator hose. Replace if necessary.
5. Reinstall the indicator finger tight. Overtightening will crack the housing.



M62776

*Note: Air Restriction Indicator may differ from depiction.*

# Section 40 Alternator Repair

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|                                       |         |
|---------------------------------------|---------|
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### Group 10—Alternator Installation

|                                   |         |
|-----------------------------------|---------|
| Installation Procedures . . . . . | 40-10-1 |
|-----------------------------------|---------|



**SERVICE EQUIPMENT AND TOOLS**

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name  | Use                               |
|---|-----------------------------------|
| Volt-Ohm-Amp Meter  | Check continuity                  |
| 13-Ton Bearing Puller Set   | Remove rotor shaft bearing        |
| Soldering Gun (120 Watt Capacity) & Solder<br>(Only 60-40 Rosin Core) | Disconnect/Connect Wire Terminals |
| Sandpaper (No. 00 or 400-Grit Silicon Carbide Paper)                  | Polish Slip Rings                 |

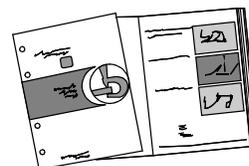
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**SPECIFICATIONS**

| Item:                            | Alternator:         | Specifications:  |
|----------------------------------|---------------------|--|
| Minimum Exposed Brush Length     | Nippon Denso 35 Amp | 5.5 mm (0.22 in.)  |
|                                  | Nippon Denso 40 Amp | 4.5 mm (0.18 in.)  |
| Maximum Exposed New Brush Length | Nippon Denso 35 Amp | 13.0 mm (0.50 in.)   |
|                                  | Nippon Denso 40 Amp | 10.5 mm (0.41 in.)   |
| Sheave Nut Torque                | Nippon Denso 35 Amp | 54 N•m (40 lb-ft.)   |
|                                  | Nippon Denso 40 Amp | 69 N•m (51 lb-ft.)   |
| Belt Deflection                  | All Engines         | 10-15 mm (0.400-0.600 in.) at<br>98N (22lb) Force Between Sheaves. |

**ALTERNATOR REPAIR**

For complete repair information, the COMPONENT TECHNICAL MANUAL (CTM) is also required. Use (10Aug93 or later) to repair all alternators.



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05  
2

## INSTALLATION PROCEDURES

**IMPORTANT:** If replacing original alternator with service alternator be sure to order correct mounting hardware. These installation procedures apply to the following engine serial numbers 655 (sn 025201 and below), 755 (s/n - 030103 and below), 855 (s/n -009848 and below), and 955 (s/n -009848 and below). For all other alternators the procedures differ slightly. Use exploded view for reference.

*NOTE: For 855's only. If alternator belt cannot be removed (because top mounting tab hits muffler when pushed in) grind away back edge to provide clearance. This has already been done on engines s/n CH3033A010453 and above.*

1. Remove and discard original 8 mm diameter lower mounting bolt (A).

2. The rear (engine block) side of the lower engine alternator mounting boss is threaded to access a 10 mm bolt or stud (B).

3. (655 & 755) Install the appropriate length 10 mm pivot bolt and tighten to 27 N•m (20 lb-ft).

4. (855 & 955) Install stud in lower pivot hole on radiator side. Slide alternator pivot hole over stud and secure with nut tightened to 48•m (35 lb-ft).

5. Install belt on alternator pulley.

6. Belt should deflect approximately 10-15 mm (0.400-0.600 in.) at 98N (22lb) force between sheaves. Check belt tension between fan and alternator using belt tension gauge and a straight edge.

7. To adjust belt, loosen adjusting nut, apply pressure to front alternator housing only (near the belt) until tension is correct, then tighten nut.

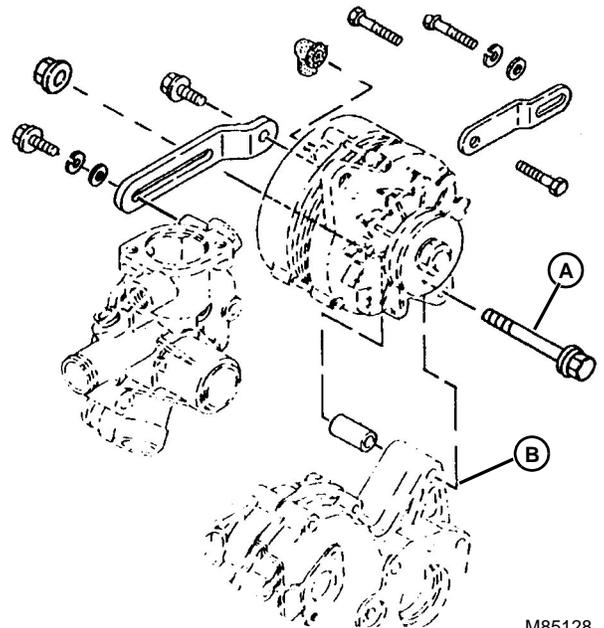
8. Tighten remaining hardware. See Section 10 Group 15 Repair Information for additional torque values.

9. Install red wire to top stud terminal (positive terminal).

10. Plug yellow/brown wire connector into connector at rear of housing (charging system).

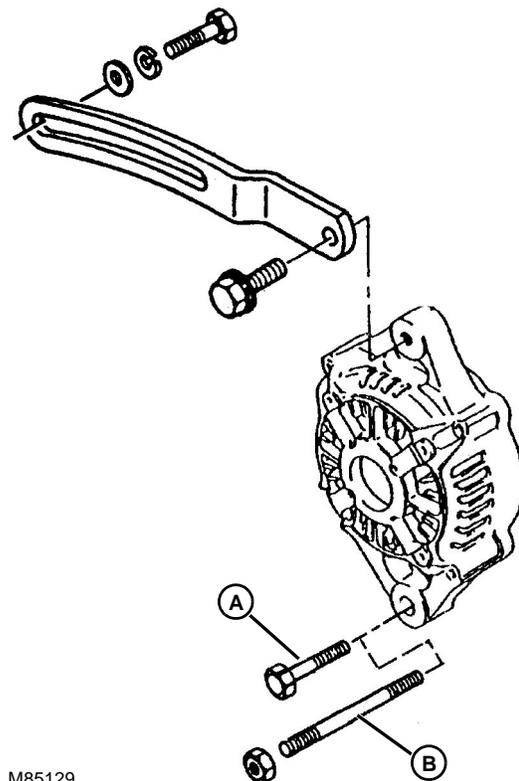
11. Install black wire to bottom bolt at rear of housing (ground terminal).

*NOTE: There is no separate voltage regulator. The regulator was built into original 35-amp alternator and is built into new 40-amp alternator.*



35-Amp Alternator

M85128



40-Amp Alternator

M85129



# Section 50

## Power Train Repair

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### **SERVICE EQUIPMENT AND TOOLS**

*NOTE: Order tools from the U.S. SERVICE-GARD™ or from the European Microfiche Tool Catalog (MTC).  
Some tools may be available from a local supplier.*

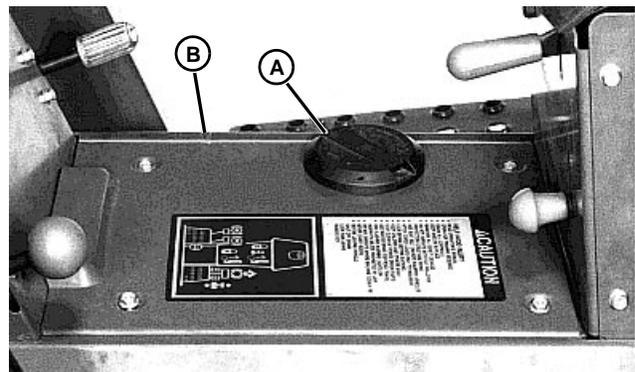
| <b>Name</b>                           | <b>Use</b>   |
|---------------------------------------|--|
| Bushing, Bearing, and Seal Driver Set | To service bearings and seals.                         |
| 2-Jaw Slide Hammer Puller             | To remove bearings.                                    |
| Knife-Edge Puller                     | To remove bearings.                                    |
| Hydraulic Press                       | To service bearings.                                   |
| Snap Ring Pliers Set                  | To remove snap rings.                                  |
| Overhead Hoist                        | To remove hydrostatic transmission.                    |
| Work Bench Fixture                    | To disassemble hydrostatic transmission.               |
| #4—40 x 1 UNC-2B Cap Screw            | To remove motor bearings retaining pin (Early Models). |
| #8—32 x 1 UNC-2B Cap Screw            | To remove motor bearings retaining pin (Late Models).  |

**SPECIFICATIONS**

| Item                                     | Measurement  | Specification                            |
|--|--|--|
| Charge Pump                              | Cap Screw Torque   | 37—50 N•m (27—37 lb-ft)                  |
| Charge Inlet Fitting                     | Torque   | 95—230 N•m (70—170 lb-ft)                |
| Drive Shaft-to-Engine                    | Cap Screw Torque   | 49 N•m (35 lb-ft)                        |
| Drive Shaft-to-Hydro                     | Cap Screw Torque   | 60 N•m (45 lb-ft)                        |
| Neutral Return Lever Bushing             | Inside Diameter  | 19.088 ± 0.025 mm<br>(0.7515 ± 0.001 in) |
| Drive Shaft Coupler to Hydro Input Shaft | Torque   | 60 N•m (45 lb-ft)                        |
| Swash Plate End Caps                     | Cap Screw Torque   | 8—9 N•m (72—84 lb-in)                    |
| Transmission Center Section-to-Housing   | Cap Screw Torque   | 44—55 N•m (33—41 lb-ft)                  |
| Gear-to-Output Shaft                     | Cap Screw Torque (Early Models)<br>Castle Nut Torque (Late Models) | 54 N•m (40 lb-ft)<br>109 N•m (80 lb-ft)  |
| Transmission Attaching                   | Cap Screw Torque   | 142 N•m (105 lb-ft)                      |
| Neutral Return Lever Spring              | Adjusted Coil Length   | 133 mm (5.25 in)                         |
| Plugs:                                   |  |  |
| 3/4-16 SAE O-ring                        | Torque   | 45—95 N•m (33—70 lb-ft)                  |
| 1/4-20 SAE O-ring                        | Torque   | 4—7 N•m (36—60 lb-in)                    |

**REMOVE AND INSTALL SHEET METAL PANELS**

1. Park tractor safely. Lock park brake, remove key.
2. Turn depth control lever (A) clockwise until it stops.
3. Remove four cap screws. To remove panel (B), lift up on right rear corner of panel first, then lift left side to clear head of depth control bolt, and move panel out from the right side of the tractor.



M43634

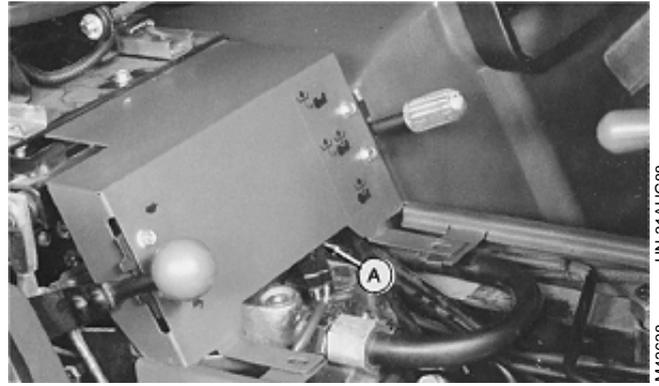
## Hydrostatic Transmission/Remove Drive Shaft

*NOTE: 755/756, 855/856, and 955 tractors have two additional side cap screws under each fender.*

4. Remove panel (A).

*NOTE: Panel need not be removed for driveshaft and charge pump repair.*

5. Install in reverse order. Be sure depth control lever aligns with bolt head.

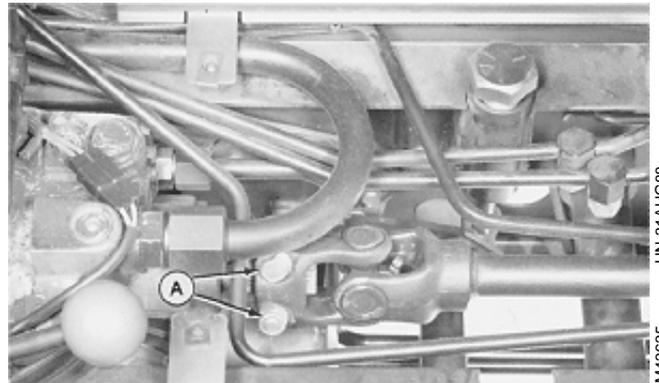


655 Shown

MX,HU,5005,7 -19-16OCT91

### REMOVE DRIVE SHAFT

1. Loosen two bolts (A) of drive shaft coupler.

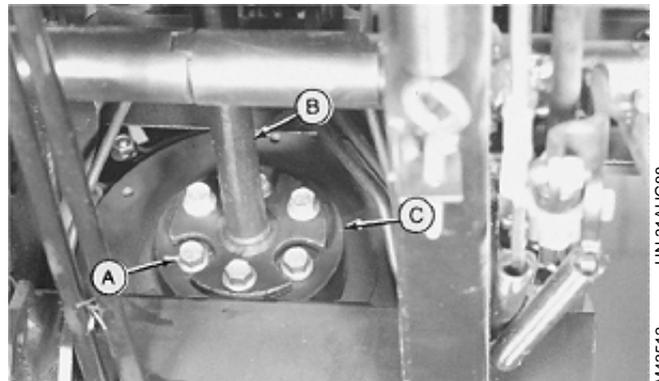


MX,HU,5005,8 -19-16OCT91

2. Remove six cap screws (A).

3. Push driveshaft (B) back to remove isolator (C).

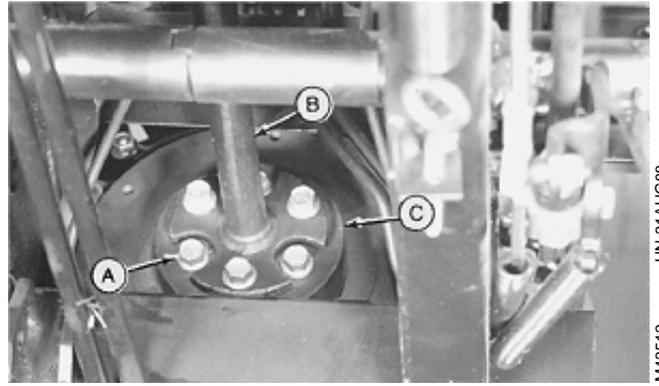
4. Remove driveshaft.



MX,HU,5005,9 -19-16OCT91

## INSTALL DRIVE SHAFT

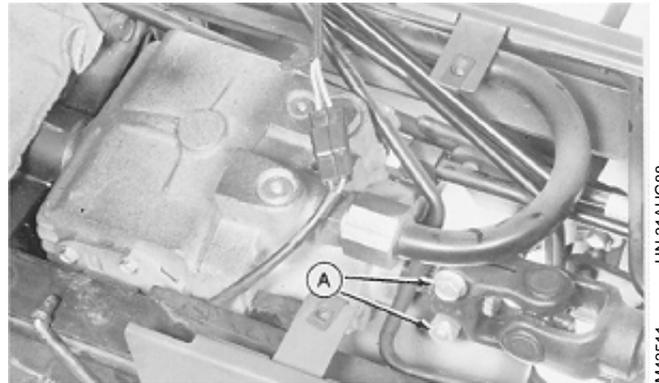
1. Put drive shaft (B) on transmission.
2. Install isolator (C). Be sure raised portion of unthreaded holes are toward engine.
3. Fasten isolator to engine with three longer cap screws and fasten drive shaft to isolator with three shorter cap screws (A). Tighten cap screws to 49 N·m (36 lb-ft).



MX,HU,5005,10 -19-16OCT91

M43512 -UN-31AUG88

4. Tighten two bolts (A) of drive shaft coupler to 60 N·m (45 lb-ft).

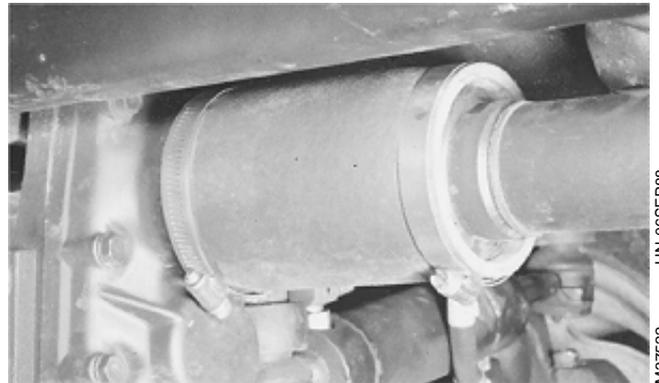


MX,HU,5005,11 -19-16OCT91

M43511 -UN-31AUG88

## REMOVE AND INSTALL MFWD DRIVE SHAFT

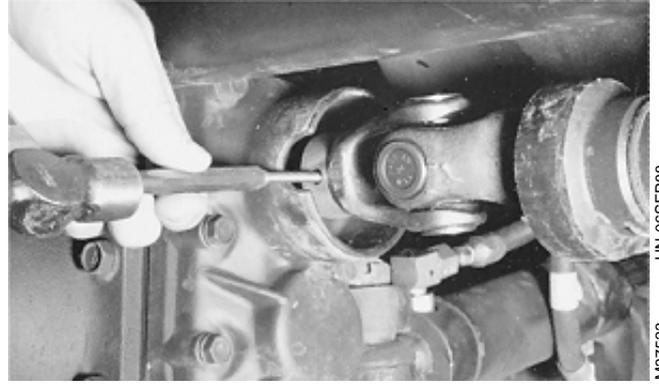
1. Loosen clamps. Slide front and rear covers away from universal joints.



MX,HU,5005,11A -19-16OCT91

M37522 -UN-06SEP88

2. Drive pin out of front universal joint to remove shaft.
3. To install, align pin holes of drive shaft front U-joint and MFWD input shaft as you slide the shaft into position.
4. Fasten with spring pin removed earlier.
5. Fasten front cover in place with band clamps.
6. Fasten rear U-joint of drive shaft to transaxle output shaft.
7. Fasten rear cover in place with band clamps.



M37523 -UN-06SEP88

MX,HU,5005,12 -19-16OCT91

## REMOVE AND INSTALL CHARGE PUMP

*NOTE: Orientation of charge pump: Flat on charge pump housing must be on right-hand side. If turned 180°, pump will not function.*

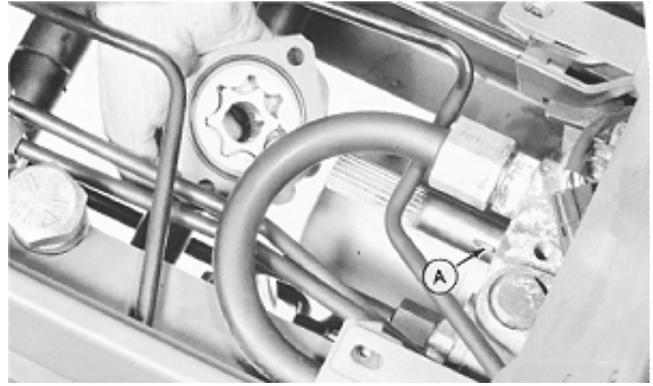
1. Remove two cap screws (A) to remove charge pump.



M43636 -UN-31AUG88

MX,HU,5005,13 -19-16OCT91

2. Remove pin (A). Inspect pin for damage or wear. Replace if necessary.
3. Inspect machined surface of transmission for severe scoring. If scoring is noted, replace transmission.
4. Clean and dry all parts. Machined surface of transmission must be clean.
5. Apply clean transmission oil on all internal parts.
6. Install pin (A). Apply petroleum jelly to pin and shaft to hold pin in place during installation of charge pump.
7. Be sure O-ring is in place on pump.
8. Torque cap screws (Step 1) to specification.



M43637 -UN-19JAN90

**TORQUE SPECIFICATION**

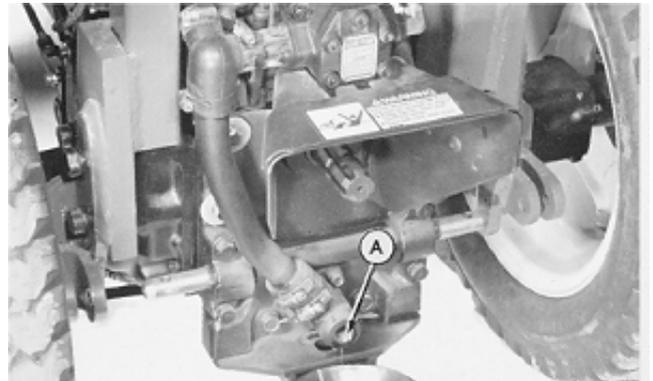
Charge Pump Cap Screws . . . . . 37-50 N·m (27-37 lb-ft)

MX,HU,5005,14 -19-16OCT91

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**REMOVE HYDROSTATIC TRANSMISSION**

1. Drain transaxle. Oil capacity is approximately 17 L (4.5 gal).
2. Remove the following:
  - Drawbar
  - Sheet Metal Panels (see procedures in this group)
  - Transmission Drive Shaft (see procedures in this group)
  - MFWD Drive Shaft (see procedures in this group).

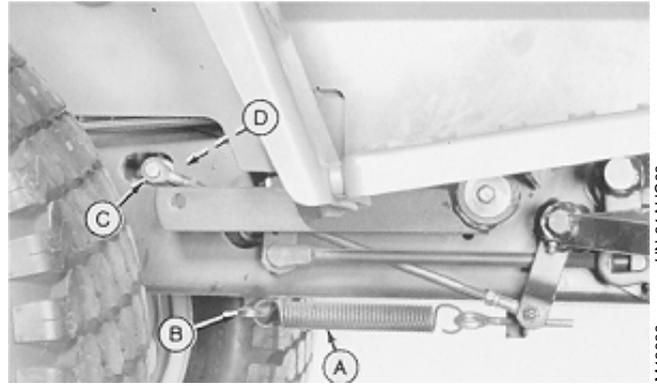


M43506 -UN-31AUG88

MX,HU,5005,16 -19-16OCT91

3. Disconnect spring (A) from lever (B).
4. Remove bolt (C) to disconnect linkage from transmission (D).

A—Spring  
B—Transmission Neutral Return Lever  
C—Bolt  
D—Transmission



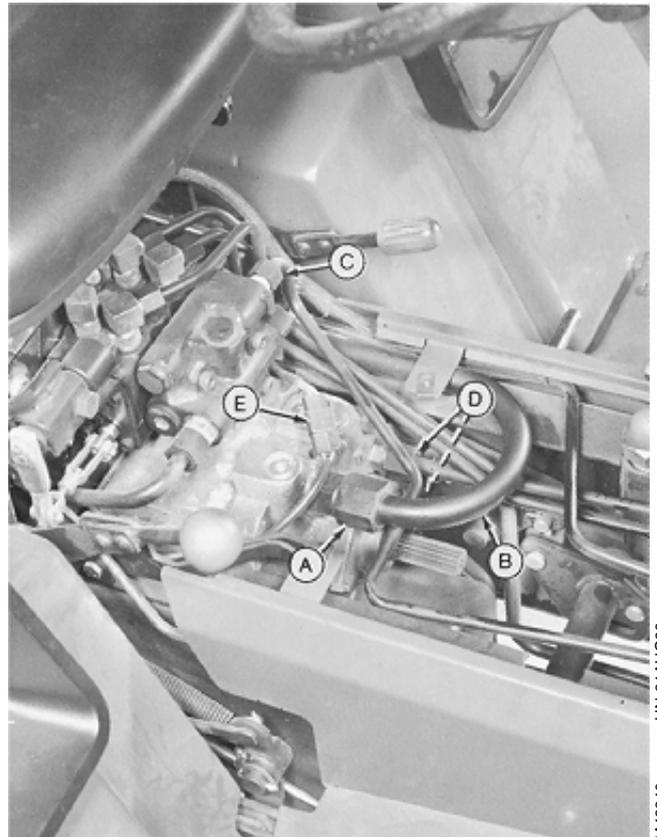
MX,HU,5005,17 -19-16OCT91

M43639 -UN-31AUG88

**IMPORTANT: Close all openings with caps and plugs to keep dirt out of the hydraulic system.**

5. Disconnect fitting (A). Loosen clamp on other end and turn tube (B) to permit transmission removal.
6. Disconnect line (C).
7. Disconnect lines (D).
8. Disconnect wiring (E).

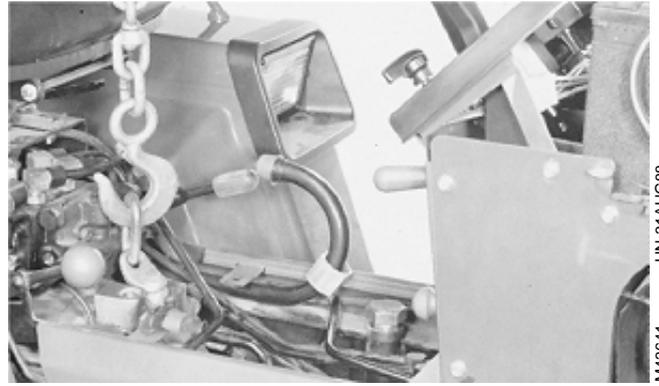
A—Fitting  
B—Suction Line  
C—Steering Line  
D—Oil Cooler Lines (2)  
E—Neutral Start Wire



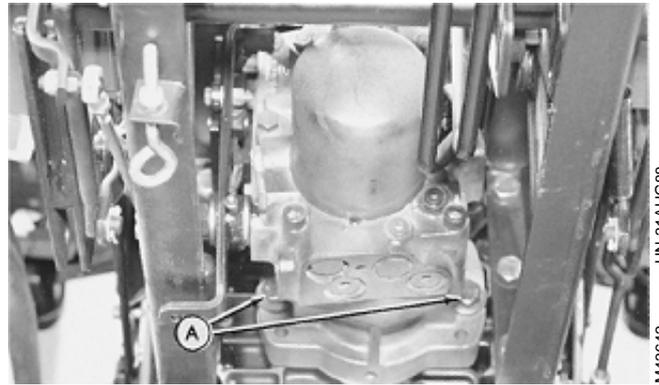
MX,HU,5005,18 -19-16OCT91

M43640 -UN-31AUG88

9. Fasten a lifting eye to the transmission and hold transmission with an overhead hoist.
10. Remove two cap screws (A).
11. Move transmission forward so that output gear clears transaxle, then lower transmission to remove it.



M43641 -UN-31AUG88

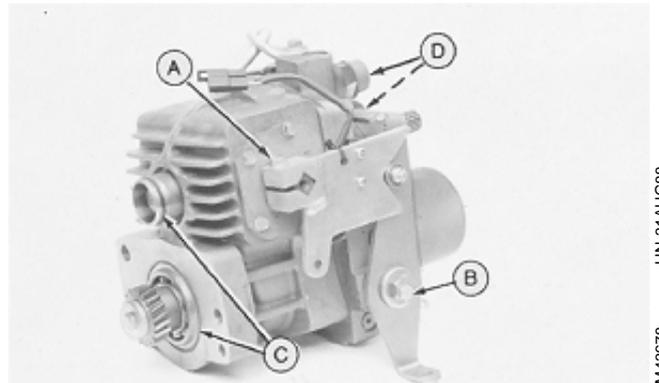


M43642 -UN-31AUG88

MX,HU,5005,19 -19-16OCT91

12. Remove cap screw and speed control lever (A).
13. Remove cap screw and neutral return lever (B).
14. Remove O-rings (C).
15. Remove three fittings (D).

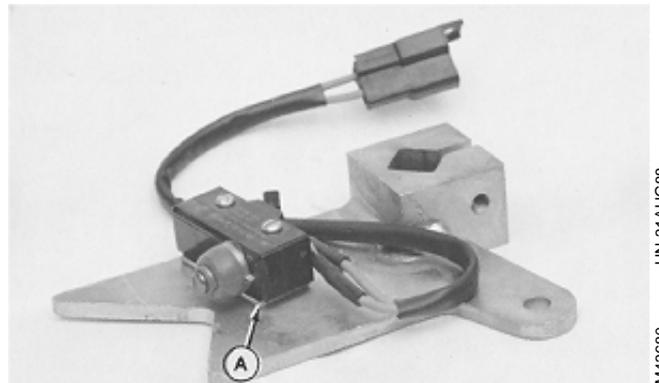
- A—Cap Screw/Speed Control Lever
- B—Cap Screw/Neutral Return Lever
- C—O-ring
- D—Fittings



M43678 -UN-31AUG88

MX,HU,5005,20 -19-16OCT91

16. If neutral start switch is being replaced, be sure to install spacer (A) between switch and speed control lever.



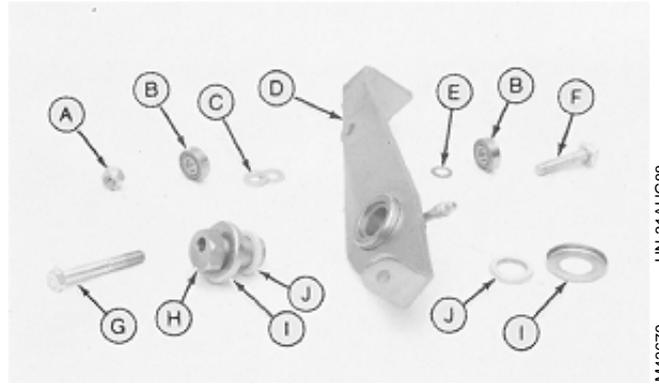
M43680 -UN-31AUG88

MX,HU,5005,21 -19-16OCT91

17. Inspect neutral return lever rollers (B). Replace them if they DO NOT turn freely.

18. Inspect bronze bushing in neutral return lever (D) for excessive wear on the inside diameter. If bushing is being replaced, be sure to align hole in bushing with grease fitting hole in lever. Ream bushing to  $19.088 \pm 0.025$  mm ( $0.7515 \pm 0.001$  in.) diameter.

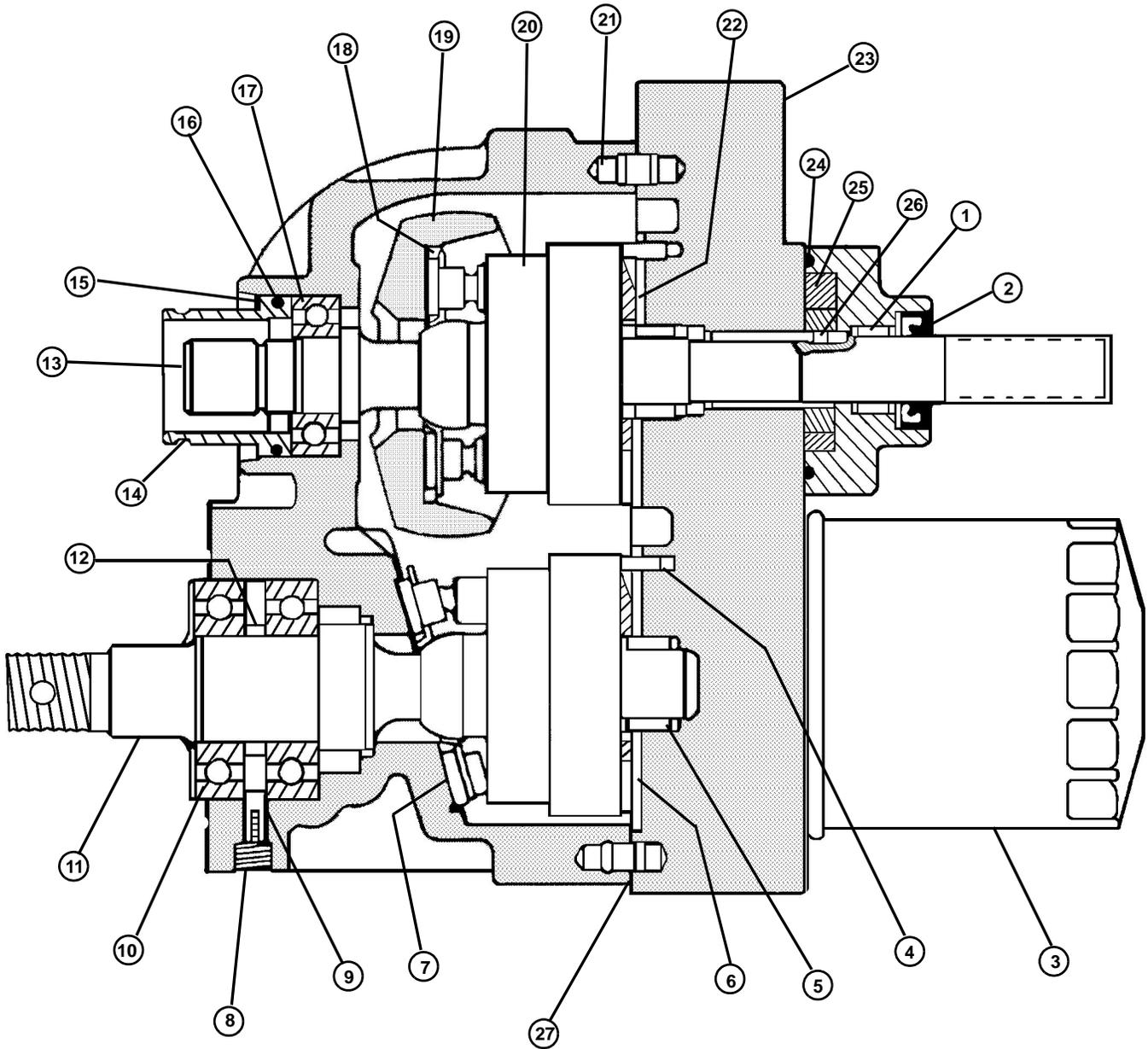
- A—Lock nut
- B—Roller (2 used)
- C—Washer (2 used)
- D—Neutral Return Lever
- E—Thin Washer
- F—Short Cap Screw
- G—Long Cap Screw
- H—Eccentric Pivot
- I—Seal Cover (2 used)
- J—Felt Seal (2 used)



M43679 -UN-31AUG88

MX,HU,5005,22 -19-16OCT91

**CROSS-SECTION VIEW—HYDROSTATIC TRANSMISSION**



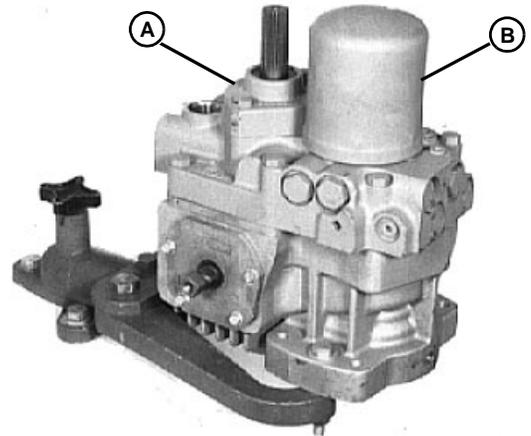
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M85125

- |   |   |   |                           |
|---|---|---|---------------------------|
| 1—Needle Bearing  | 8—Drain Plug  | 14—Seal Guide                               | 21—Pin (2 Used)           |
| 2—Seal  | 9—Bearing Retaining Pin   | 15—Snap Ring                                | 22—Pump Valve Plate       |
| 3—Filter  | 10—Ball Bearing (2 Used)  | 16—O-Ring                                   | 23—Center Section         |
| 4—Pin (2 used)  | 11—Late Model Motor Shaft<br>(Early Models Are Not<br>Threaded) | 17—Ball Bearing                             | 24—O-Ring                 |
| 5—Needle Bearing (2 Used)                                     | 12—Collar   | 18—Thrust Plate                             | 25—Gerotor Charge<br>Pump |
| 6—Motor Valve Plate   | 13—Pump Shaft   | 19—Variable Swash Plate                     | 26—Gerotor Drive Pin      |
| 7—Motor Cylinder Block<br>Assembly With Fixed<br>Thrust Plate |   | 20—Pump Cylinder Block<br>Assembly (2 Used) | 27—Gasket                 |

## DISASSEMBLE TRANSMISSION

1. Thoroughly clean outside surface of transmission using wire brush and solvent.
2. Install transmission on a bench fixture.
3. Remove and inspect charge pump (A). (See procedures previously in this section.)
4. Remove filter (B).

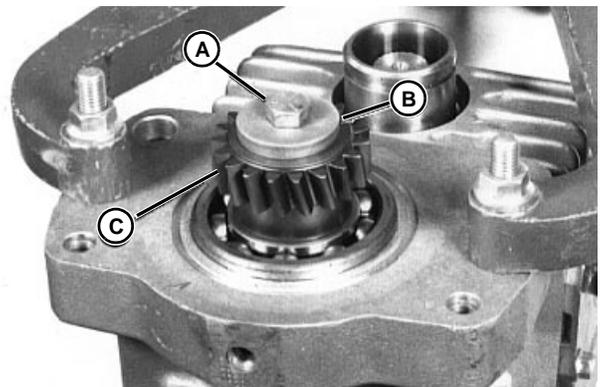


M43813

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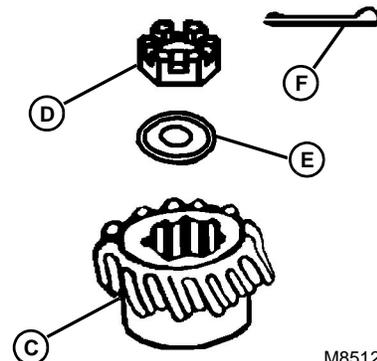
5. (Early Models) Rotate fixture 180°. Remove cap screw (A), and washer (B) to remove output shaft drive gear (C) (19 teeth).

**IMPORTANT:** Late model Hydrostatic Transmissions have cotter pin (F) and castle nut (D) assembly (Hydrostatic Driveshaft Kit AM118962 for positive gear retention) instead of cap screw (A) assembly.



M43814

5. (Late Models) Rotate fixture 180°. Remove cotter pin (F), castle nut (D), and washer (E) to remove output shaft drive gear (C) (19 teeth).

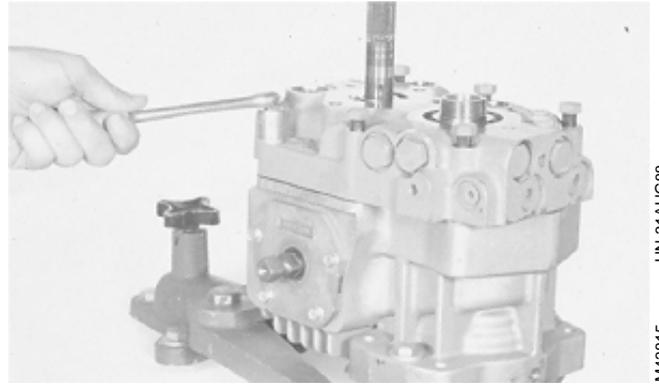


M85124

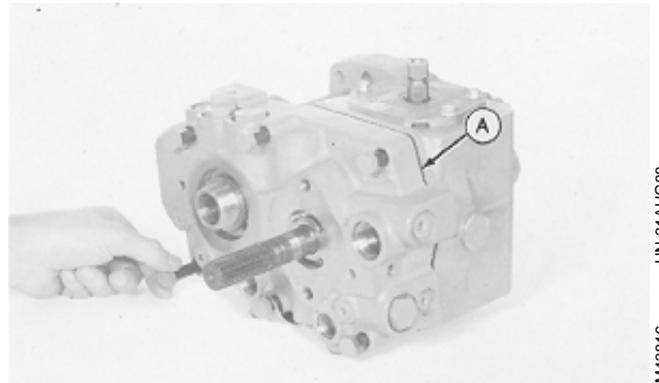
**IMPORTANT: Do not allow internal parts to fall when removing center section.**

6. Rotate fixture 180°. Loosen six cap screws (DO NOT remove). Remove transmission from bench fixture.

7. Put transmission on its side on a work bench and remove six cap screws, center section and gasket (A).



M43815  
-UN-31/AUG88



M43816  
-UN-31/AUG88

MX,HU,5005,26 -19-16OCT91

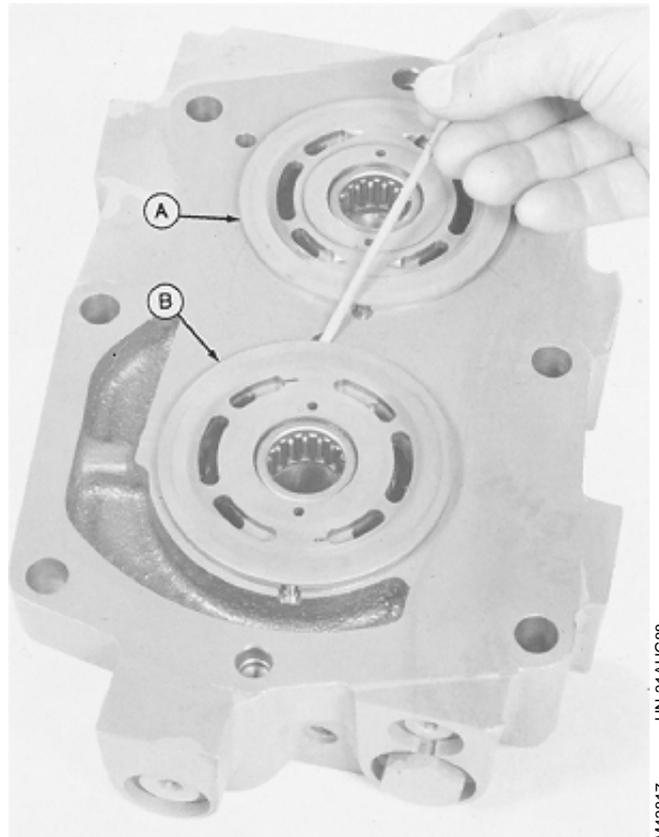
**IMPORTANT: Do not nick or scratch lapped or machined surfaces of the center section, valve plates or cylinder blocks.**

**Keep pump and motor components separate, they are not interchangeable.**

8. Remove valve plates (A and B). If it is necessary to pry valve plates loose from center section, use a wooden dowel and pry only at dowel pin grooves.

If valve plates DO NOT come off with center section, remove valve plates from cylinder block assemblies.

It may be necessary to apply diesel fuel between valve plate and cylinder block to cut oil film.



M43817  
-UN-31/AUG88

MX,HU,5005,27 -19-16OCT91

9. Inspect valve plates. Valve plates should be flat, free of all nicks, burrs, scratches, and erosion around the ports. The bronze metal should show no scoring, smearing, or be discolored.

**NOTE:** Scoring is indicated by fine scratches or grooves cut into the plate.

*When these scratches can be detected by feel, fingernail or lead pencil, the plate should be replaced.*

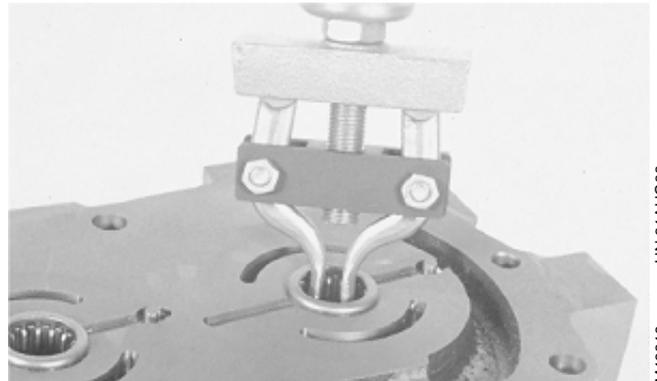


MX,HU,5005,28 -19-16OCT91

M43818  
-UN-31AUG88

10. Inspect both bearings in center section. Replace if necessary. Remove bearing using a 2-jaw slide hammer puller.

11. For disassembly of center section, see Cross-Section View—Center Section later in this section.



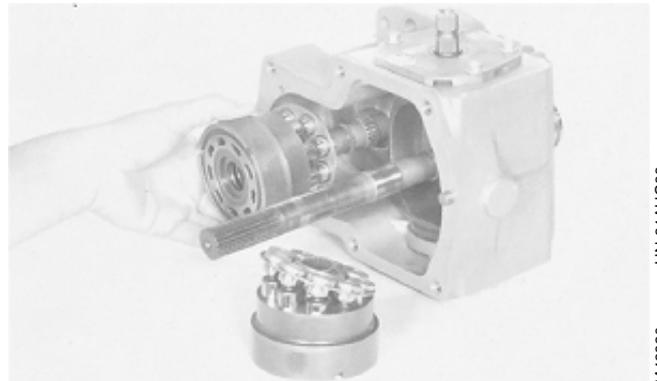
MX,HU,5005,29 -19-16OCT91

M43819  
-UN-31AUG88

**IMPORTANT:** Do not nick or scratch lapped surface of cylinder blocks.

**Piston-to-bore relationship need not be maintained; keep pump and motor components separate, they are not interchangeable.**

12. Remove motor and pump cylinder blocks.



MX,HU,5005,30 -19-16OCT91

M43820  
-UN-31AUG88

13. Inspect cylinder block assemblies.

**IMPORTANT:** Do not interchange pistons between motor and pump cylinder blocks. Pistons and cylinder blocks are matched.

Lift piston retainer and pistons from cylinder block. Check for free movement of pistons in cylinder bores.



MX,HU,5005,31 -19-16OCT91

M36111  
-UN-29AUG88

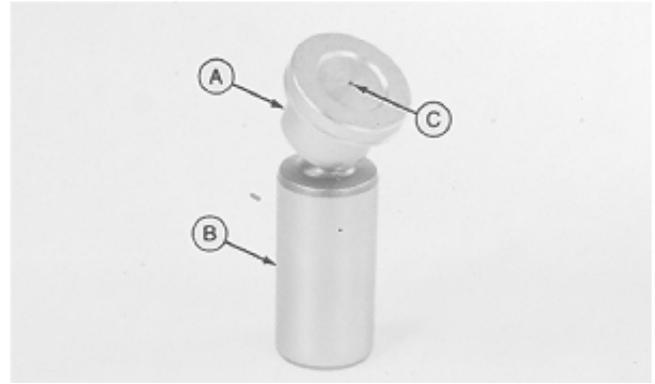
14. Remove and inspect all pistons.

Check barrel (B) for scoring, discoloration, or any signs of separation of slippers.

Check slipper (A) for scoring, smearing, rolled edges and a full 360° free rotation on barrel.

Check lubrication hole (C) for blockage. Clean with compressed air.

If any component of the piston is damaged, the cylinder block assembly must be replaced.



M36112 -UN-29AUG88

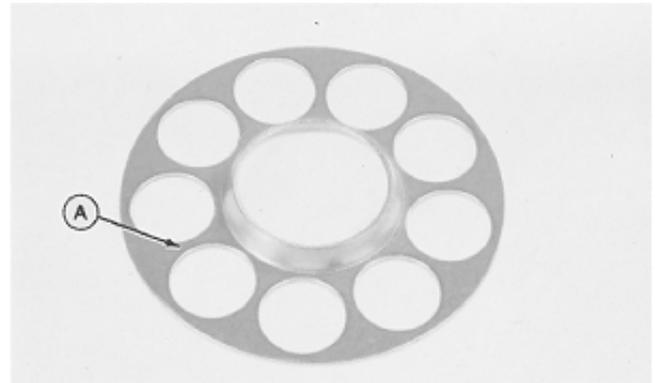
MX,HU,5005,32 -19-16OCT91

15. Remove and inspect both piston retainers.

Check retainer for flatness, nicks, burrs, and discoloration.

Check area around piston slippers (A) for scoring.

If any part of the piston retainer is damaged, the cylinder block assembly must be replaced.



M36113 -UN-29AUG88

MX,HU,5005,33 -19-16OCT91

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16. Inspect both cylinder blocks.

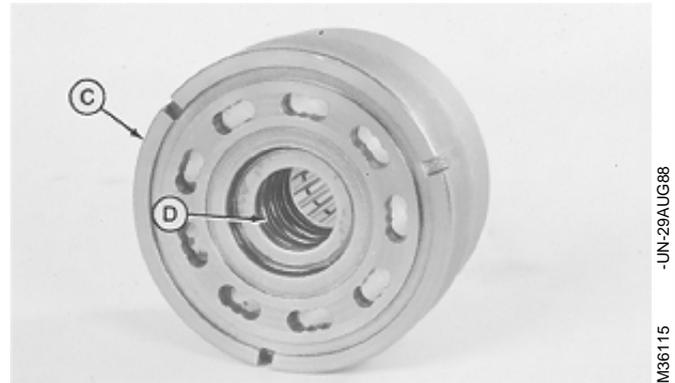
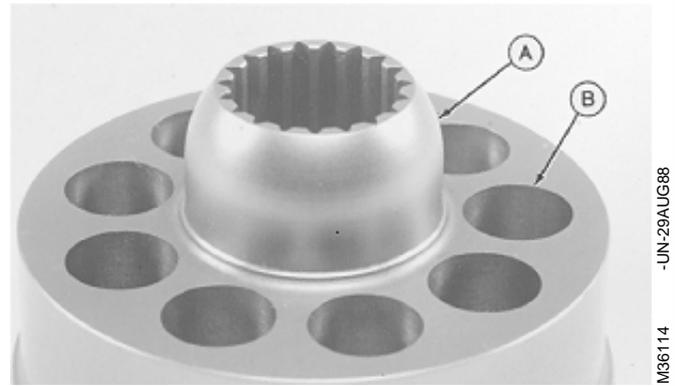
Check ball guide area (A) for scoring, wear and damage.

Check nine cylinder bores (B) for burrs and scoring.

Check lapped surface (C) for wear and damage.

Check spring assembly (D) for damage and free axle movement.

If any part of the cylinder block is damaged, the cylinder block assembly must be replaced.

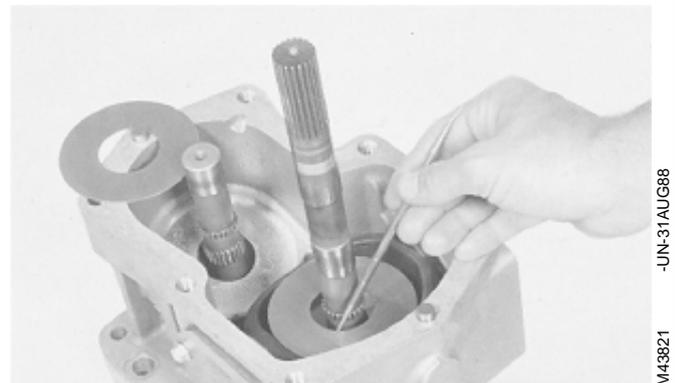


MX,HU,5005,34 -19-16OCT91

**IMPORTANT: Do not scratch machined surfaces of thrust plates or swashplates. Initial production transmission cases were machined for 1.02 mm (.040 in) larger motor thrust plates than pump thrust plates. A running change to equal-diameter thrust plates for both the motor and the pump has been made. Do not try to install the new (smaller diameter) thrust plates in earlier model transmission cases with the wider motor machined bore.**

17. Remove pump and motor thrust plates using a brass O-ring pick.

Inspect thrust plates. Check plates for scoring and smeared bronze material.

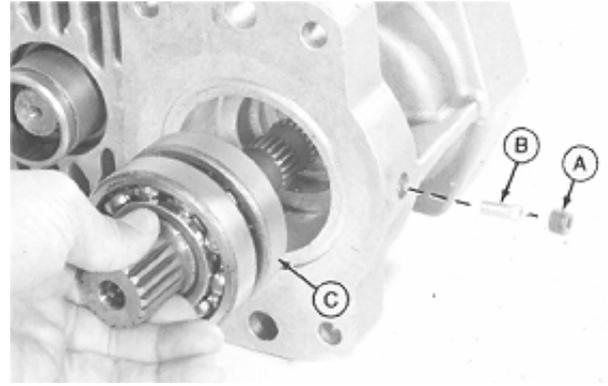


MX,HU,5005,35 -19-16OCT91

**NOTE:** Remove pin (B) using a #4-40 x 1 UNC-2B cap screw (only on tractors through July, 1990) or a #8-32 x 1 UNC-2B cap screw (only on tractors after July, 1990).

18. Remove drain plug (A) and bearing retaining pin (B). (Keys 8 and 9 of Cross Section View shown earlier in this section.) Use a slide hammer puller on the head of the cap screw to remove retaining pin (B).

19. Remove motor shaft assembly (C).



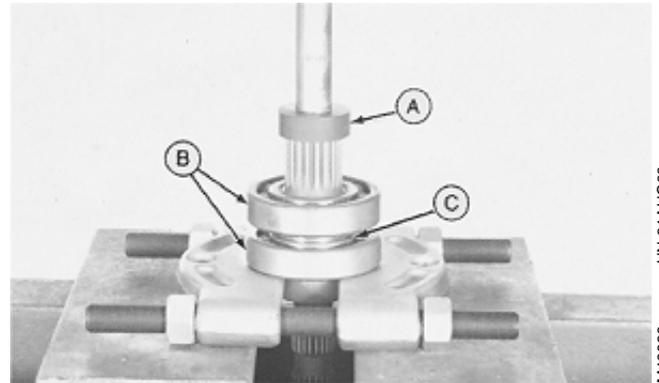
-UN-29MAY91  
M43822

MX,HU,5005,36 -19-16OCT91

20. Inspect bearings, replace if necessary.

**IMPORTANT:** Be sure to hold shaft while removing bearing.

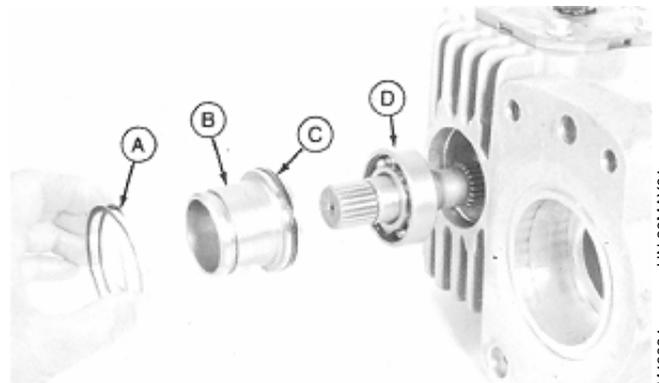
21. Remove bearings (B) and collar (C) using a 1 in. driver disk (A), knife-edge puller, and a hydraulic press.



-UN-31AUG88  
M43823

MX,HU,5005,37 -19-16OCT91

22. Remove snap ring (A), seal guide (B), O-ring (C), and pump shaft assembly (D).



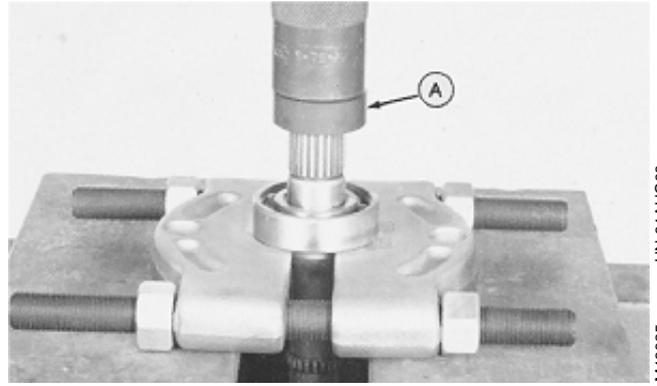
-UN-29MAY91  
M43824

MX,HU,5005,38 -19-16OCT91

23. Inspect bearing, replace if necessary.

**IMPORTANT: Be sure to hold shaft while removing bearing.**

24. Remove bearing using a 1 in. driver disk (A), knife-edge puller, and a hydraulic press.



MX,HU,5005,39 -19-16OCT91

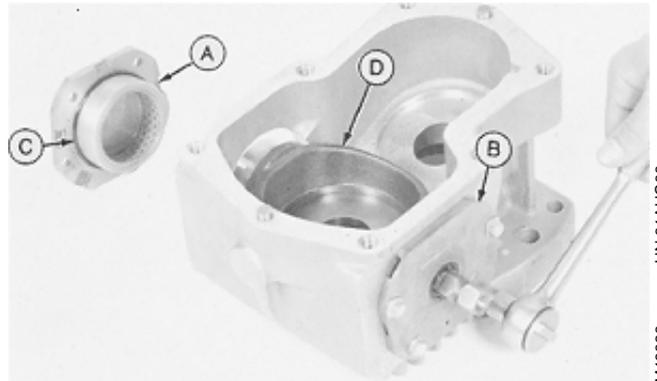
M43825 -UN-31AUG88

25. Remove cap screws to remove end caps (A and B).

Inspect bearings; if bearings are worn or damaged, replace the end cap. Remove O-ring (C).

Inspect control shaft seal, replace as required.

26. Remove swashplate (D).



MX,HU,5005,40 -19-16OCT91

M43826 -UN-31AUG88

50-05-17

## CROSS-SECTION VIEW—CENTER SECTION

A—Oil Cooler Bypass Relief Valve

B—Plugs (4 used)

C—Spring

D—To Oil Cooler

E—From Oil Cooler

F—Main Relief and Inlet Check

G—Plug (2 used)

H—Spring (2 used)

I—Relief Valve Assembly

J—Charge Relief Valve

K—Shims (as required)

L—Spring

M—Valve (4 used)

N—Spring

O—Reverse Flow Check Valve

P—Oil Filter Bypass Valve

Q—Spring

R—Charge Pump Inlet

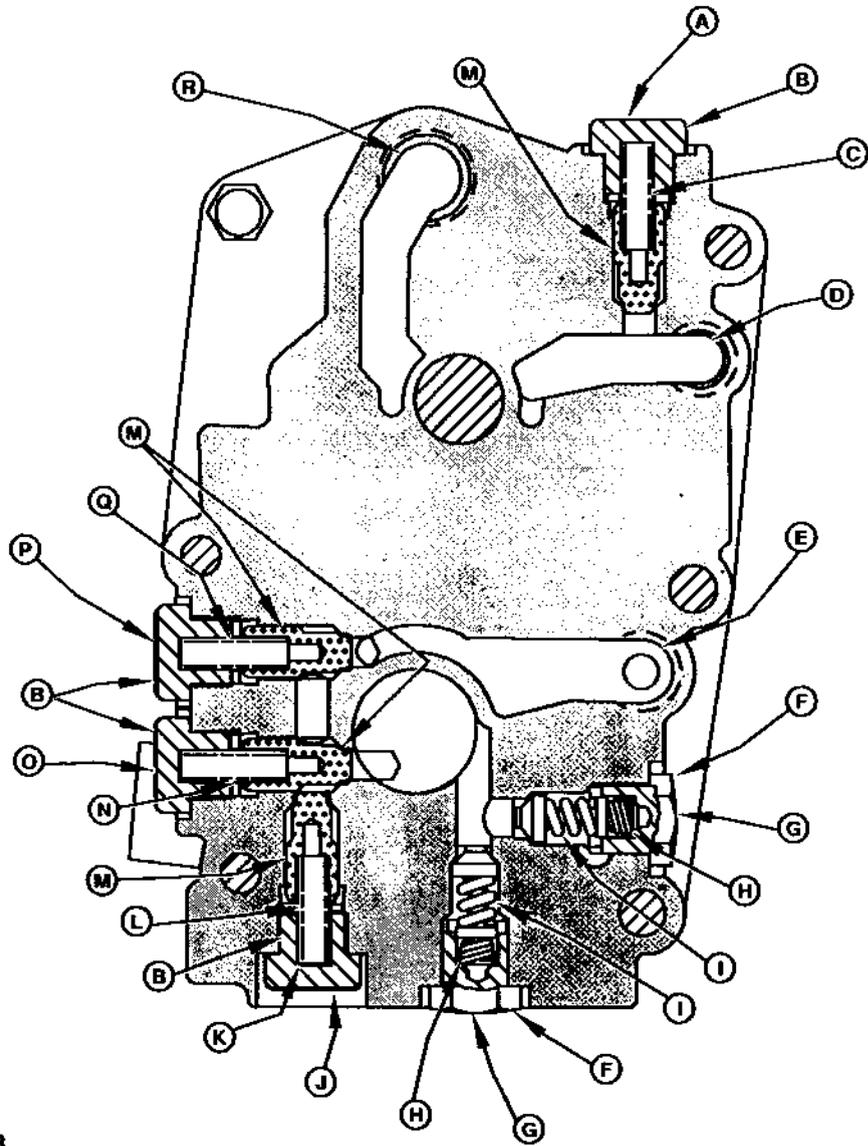
**IMPORTANT: Return all shims, springs and valves to their original port.**

Remove charge relief valve (J); remove plug, shims (I) if equipped, spring, and valve. Remove the remaining valves as required. Inspect valves and seats for damage. Valves must slide freely in bore.

Apply clean transmission oil on all internal parts when assembling relief valves and check valves. After assembly and installation, check for correct operation. (See Section 250.)

MX,HU,5005,41A -19-16OCT91

Hydrostatic Transmission/Cross-Section View—Center Section



M42208

MX,HU,5005,41B -19-16OCT91

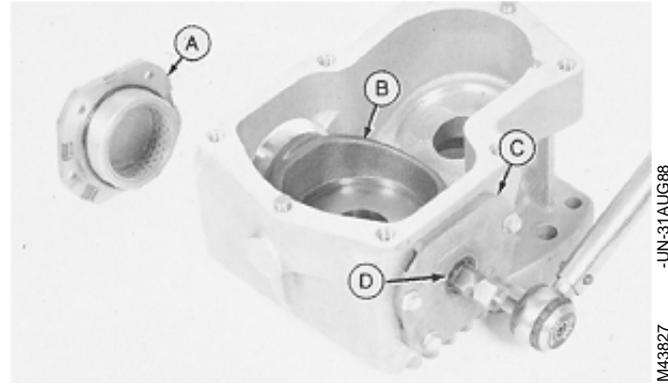
M42208 -JUN-29MAY91

## ASSEMBLE TRANSMISSION

1. Clean and dry all parts.
2. Use new O-rings, seals, and gaskets when assembling the transmission.
3. Before assembly, apply clean transmission oil on all internal parts.
4. Install swashplate (B).
5. Install seal (D) with spring side toward the inside of transmission.

**IMPORTANT: Do not damage seal when installing end cap over the control shaft. Replace end cap (A) when plastic wears through into the bronze backing.**

6. Carefully install end cap (C) over control shaft. Install cap screws.
7. Install end cap (A) and cap screws. Tighten all cap screws to 8-9 N·m (72-84 lb-in).

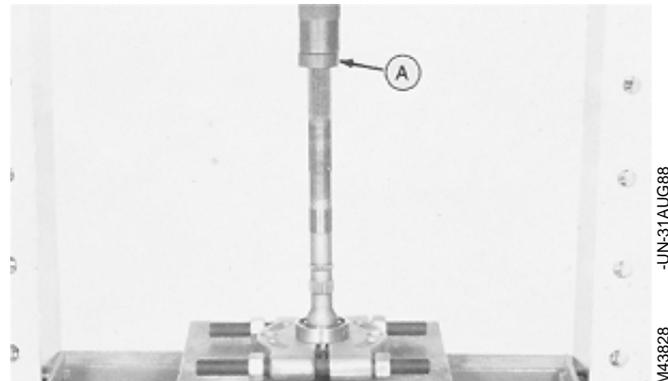


A—End Cap  
B—Swashplate  
C—End Cap  
D—Seal

M43827 -UN-31AUG88

MX,HU,5005,42 -19-16OCT91

8. Use a 1 in. driver disk (A), knife-edge puller, and a press to push pump shaft into bearing until it contacts the shaft shoulder.



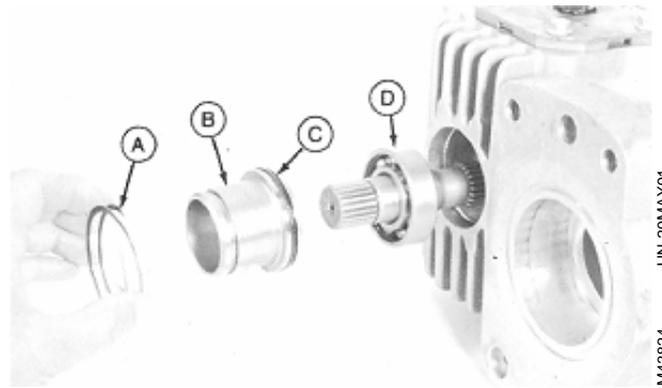
M43828 -UN-31AUG88

MX,HU,5005,43 -19-16OCT91

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05  
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9. Install pump shaft assembly (D), O-ring (C), seal guide (B), and snap ring (A).

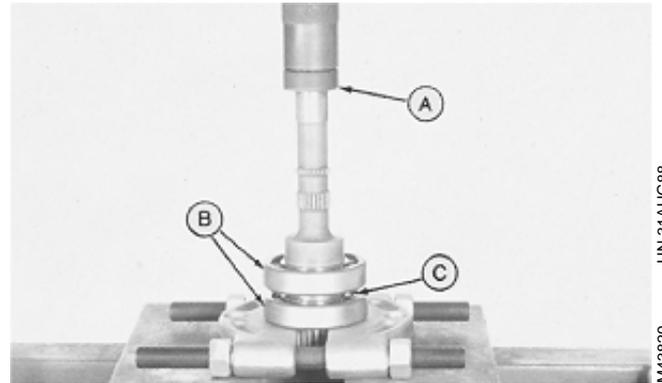
- A—Snap Ring
- B—Seal Guide
- C—O-Ring
- D—Pump Shaft Assembly



MX,HU,5005,44 -19-16OCT91

M43824 -UN-29MAY91

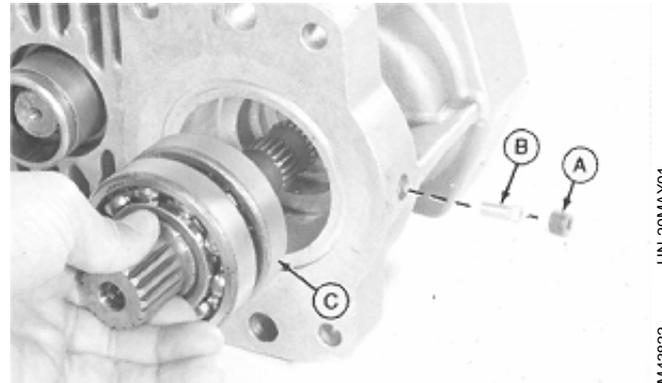
10. Use a 1 in. driver disk (A), knife-edge puller, and a press to push motor shaft into bearings (B) and collar (C) until they are on the shaft shoulder.



MX,HU,5005,45 -19-16OCT91

M43829 -UN-31AUG88

11. Install motor shaft assembly (C), retaining pin (B), and set screw (A) and tighten.

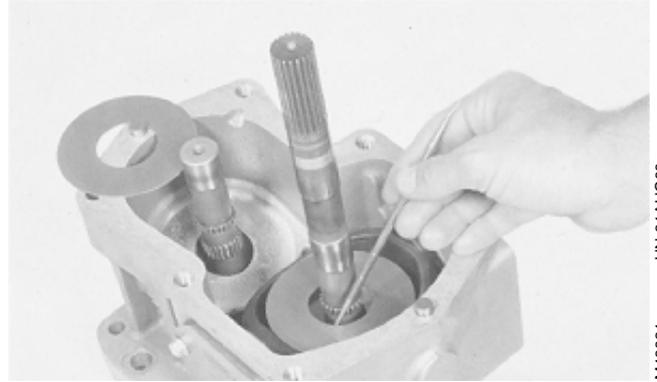


MX,HU,5005,46 -19-16OCT91

M43822 -UN-29MAY91

**IMPORTANT:** Do not nick or scratch lapped surface of cylinder blocks. Piston-to-bore relationship need not be maintained.

Do not scratch machined surfaces of thrust plates or swashplates. Initial production transmission cases were machined for 1.02 mm (.040 in) larger motor thrust plates than pump thrust plates. A running change to equal-diameter thrust plates for both the motor and the pump has been made. Do not try to install the new (smaller diameter) motor thrust plates in earlier model transmission cases with the wider motor machined bore.



M43821 -UN-31AUG88

12. Install pump and motor thrust plates.

MX,HU,5005,47 -19-16OCT91

13. Install pistons and piston retainer.

Lift piston retainer and piston from cylinder block. Check for free movement of pistons in cylinder block before installing in housing.



M36111 -UN-29AUG88

MX,HU,5005,48 -19-16OCT91

14. Install pump and motor cylinder blocks.



M43820 -UN-31AUG88

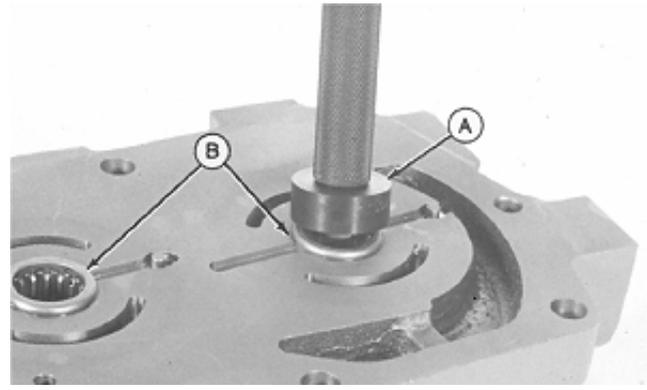
MX,HU,5005,49 -19-16OCT91

**IMPORTANT: Do not nick or scratch lapped or machined surfaces of the center section, valve plates or cylinder block.**

**Keep pump and motor components separate. They are not interchangeable.**

15. Use a 1-5/16 in. driver disk (A) to install two needle bearings (B). Drive bearings into housing until they are approximately 3 mm (7/64 in.) above the surface of the housing.

16. For assembly of center section, see Cross-Section View—Center Section shown earlier in this section.



M43830 -UN-29MAY91

MX,HU,5005,50 -19-16OCT91

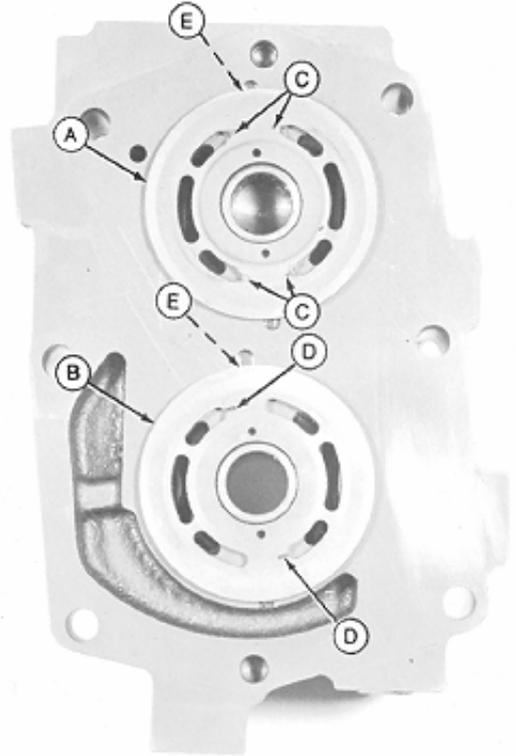
17. Put clean hydrostatic oil on valve plates and housing surface.

**IMPORTANT: PUMP VALVE PLATE has TWO slotted ports (D).**

**MOTOR VALVE PLATE has FOUR slotted ports (C).**

18. Install pump valve plate (B) and motor valve plate (A) over the protruding bearings and align slots on back sides of plates with pins (E) in housing.

- A—Motor Valve Plate
- B—Pump Valve Plate
- C—Slotted Ports (Motor)
- D—Slotted Ports (Pump)
- E—Center Section Pins



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M43831 -UN-29MAY91

MX,HU,5005,51 -19-16OCT91

**IMPORTANT: Use extreme care when assembling the center section, valve plates and cylinder block to avoid dropping, nicking, or scratching lapped surfaces.**

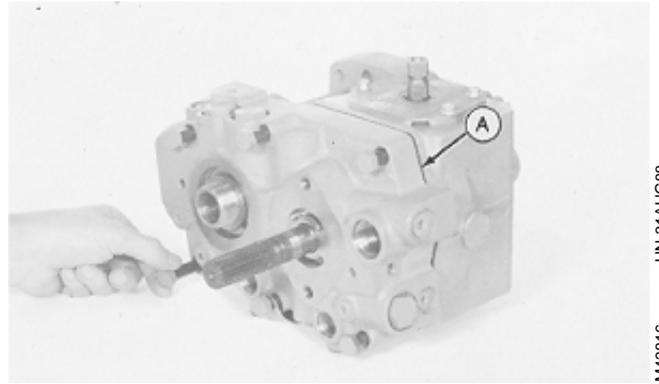
19. Install center section and gasket (A) on housing and install six cap screws. Tighten cap screws evenly in a crossing pattern until they are snug—DO NOT torque them at this time.

*NOTE: Center section will seem springy, this is because the springs inside the cylinder blocks are being compressed.*

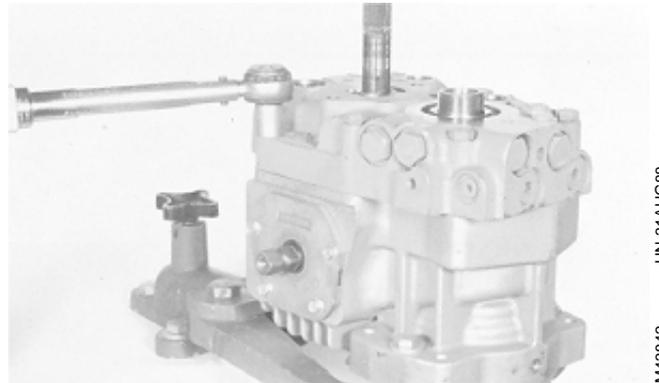
20. Install transmission upright in bench fixture.

**IMPORTANT: Check for proper internal assembly by slowly rotating pump, motor and control shaft while tightening cap screws.**

21. Tighten cap screws to 44-55 N·m (33-41 lb-ft), also in a crossing pattern.



M43816  
-UN-31AUG88



M43842  
-UN-31AUG88

MX,HU,5005,52 -19-16OCT91

22. Install new filter (B).

23. Install charge pump (A). (See Remove and Install Charge Pump earlier in this section.)



M43813  
-UN-31AUG88

MX,HU,5005,53 -19-16OCT91

24. Turn transmission and bench fixture over to install output drive gear (C) (19 teeth) on output shaft.

**NOTE:** If Hydrostatic Driveshaft Kit AM118962 (for positive gear retention) is used go to step 27.

25. (Early Models) Install washer (B) and cap screw (A). Use John Deere LOCTITE® Thread Lock and Sealer on cap screw threads.

26. Tighten cap screw to 54 N•m (40 lb-ft).

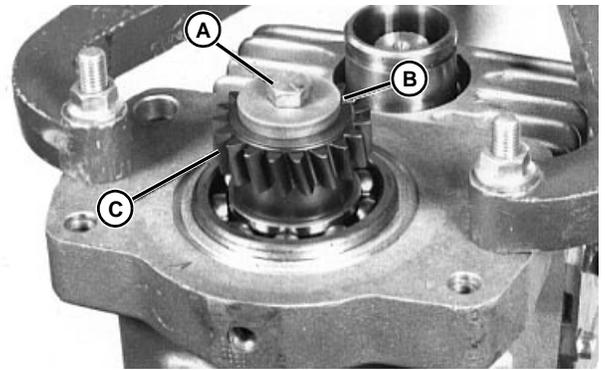
27. (Late Models) Install washer (E) and castle nut (D). Tighten castle nut to 109 N•m (80 lb-ft). If needed, continue tightening castle nut until slot in castle nut lines up with hole in shaft.

**IMPORTANT:** If the cotter pin is installed as described it will not contact the transmission case.

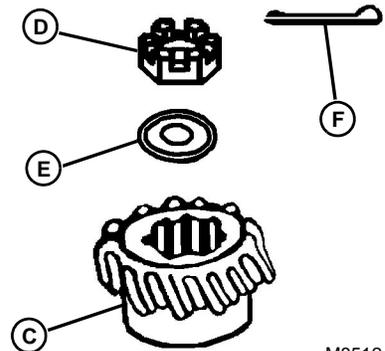
28. Install cotter pin (F). Seat head of cotter pin down in slot of castle nut by tapping with hammer.

29. Bend both ends of cotter pin over end of shaft.

30. Tap ends of cotter pin down tight against the end of the shaft. (Cotter pin should have minimal movement, it should be tight in shaft and castle nut).



M43814



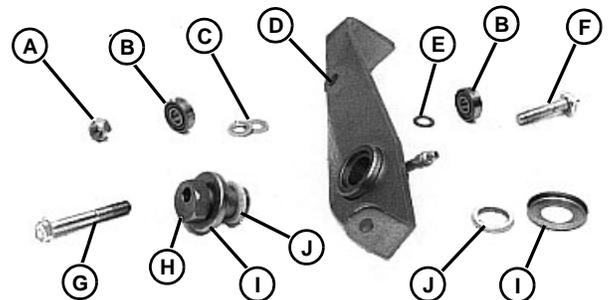
M85124

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## INSTALL TRANSMISSION

1. Assemble neutral return lever parts (A thru J).

- |                        |                       |
|------------------------|-----------------------|
| A—Lock Nut             | F—Short Cap Screw     |
| B—Roller (2 used)      | G—Long Cap Screw      |
| C—Washer (2 used)      | H—Eccentric Pivot     |
| D—Neutral Return Lever | I—Seal Cover (2 used) |
| E—Thin Washer          | J—Felt Seal (2 used)  |



M43679

2. Install neutral return lever. Fasten it with cap screw (B).

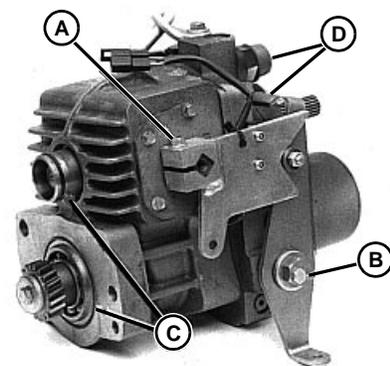
3. Install speed control lever. Fasten it with cap screw (A).

4. Install new O-rings (C). Apply petroleum jelly to hold O-rings in place while installing transmission.

5. Install three fittings (D).

### TORQUE SPECIFICATIONS

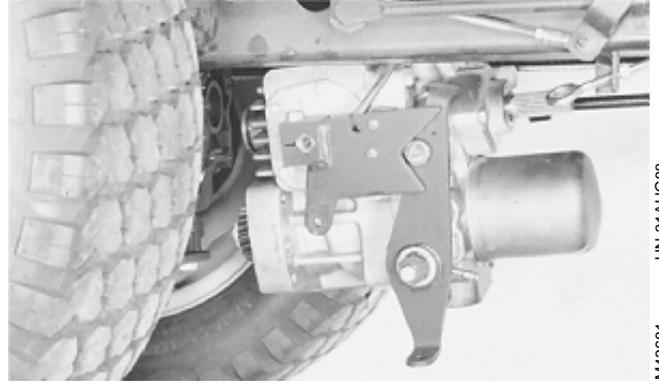
- Flow Divider Fitting—34 N•m (25 lb-ft)
- Swivel Elbow Line & Nut—27 N•m (20 lb-ft)
- Union Connectors Flow Divider—47 N•m (35 lb-ft)
- PTO Valve Fitting—49 N•m (36 lb-ft)
- Charge Inlet Line Fitting—95—230 N•m (70—170 lb-ft)



M43678

- A—Speed Control Lever Cap Screw
- B—Neutral Return Lever Cap Screw
- C—O-Rings
- D—Fitting

6. Fasten a lifting eye to the transmission and hoist it up through the frame. Be sure control levers are positioned as shown.



MX,HU,5005,57 -19-16OCT91

M43681  
-UN-31AUG88

7. Be sure coupler (A) is in place in transaxle.

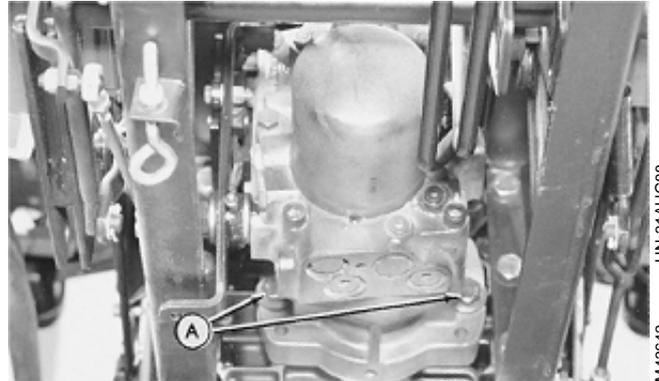
8. Turn axles or transmission input shaft to align splines and gears as the transmission is moved into place. Be careful not to damage the O-ring surfaces.



MX,HU,5005,58 -19-16OCT91

M43682  
-UN-31AUG88

9. Install two cap screws and thick washers (A). Tighten cap screws to 142 N·m (105 lb-ft).



MX,HU,5005,59 -19-16OCT91

M43642  
-UN-31AUG88

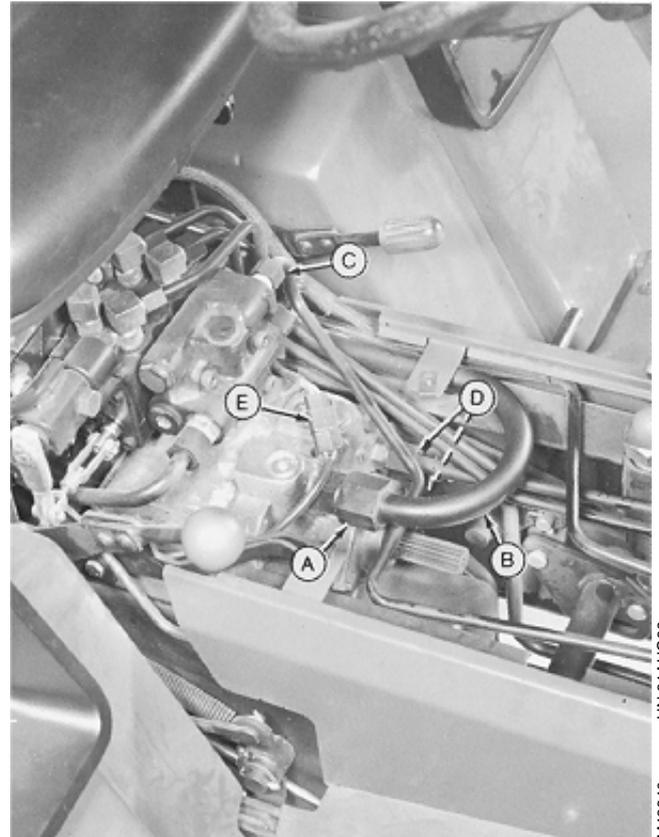
10. Be sure O-rings are in place on all fittings. Connect two hydraulic lines (D).

11. Install suction line (B). Tighten fitting (A), then tighten clamp on other end of tube.

12. Connect line (C).

13. Connect wiring (E). Be sure wire does not interfere with transmission lock linkage.

- A—Fitting
- B—Suction Line
- C—Steering Line
- D—Oil Cooler Lines (2)
- E—Neutral Start Wire



MX,HU,5005,60 -19-16OCT91

M43640 -UN-31AUG88

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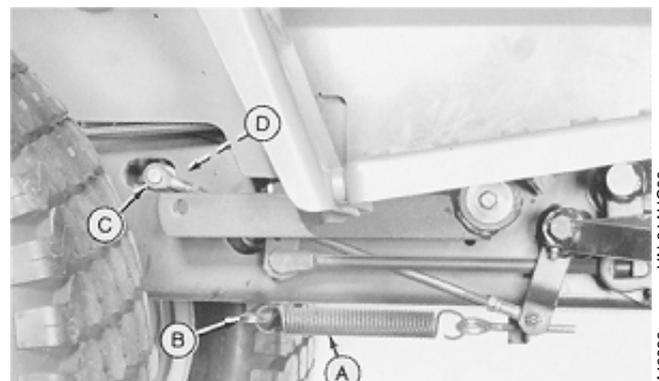
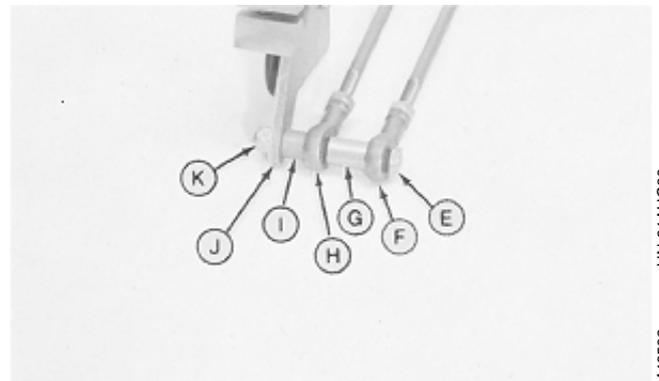
14. Install parts (E thru K) to connect transmission control linkage (C).

15. Connect spring (A) to neutral return lever (B). Adjust coil length to 133 mm (5.25 in.).

16. Install the following:

- Transmission Drive Shaft (see procedures at the front of this group)
- Sheet Metal Panels (see procedures at the front of this group)
- MFWD driveshaft (see procedures at the front of this group).

- A—Spring
- B—Neutral Return Lever
- C—Transmission Control Linkage (E thru K)
- D—Transmission
- E—Cap Screw
- F—Forward Control Link
- G—Long Spacer
- H—Reverse Control Link
- I—Short Spacer
- J—Hydro Swashplate Bracket
- K—Lock Nut



MX,HU,5005,61 -19-16OCT91

M43532 -UN-31AUG88

M43639 -UN-31AUG88

## SERVICE PROCEDURE

1. Fill hydrostatic transmission with 17 L (4.5 gal) of **LOW VISCOSITY HY-GARD®—JDM J20D** transmission and hydraulic oil. See page 10-20-7.

2. Adjust transmission control linkage.  
(See Section 250, Group 10.)



**CAUTION: Transmission control lever may be out of neutral adjustment. Lift drive wheels off ground and support tractor frame on jack stands before you start the engine.**

**Be sure MFWD is in neutral (if equipped.)**

## FLUSH HYDRAULIC SYSTEM

*NOTE: Average capacity of oil in compact tractors is approximately 5 gallons. Changing oil is less costly than the labor to disassemble and clean all components which require oil. Also, if one major component failure can be avoided, it will more than make up for the oil cost.*

After installing a repaired or replacement part, follow this run-in procedure to assure that debris (mainly from failure of internal component) is purged from the hydraulic system without disassembly of all components.

1. Replace failed component (fill with clean oil when installing). Depending on failed component(s) and degree of disassembly, flush system by pouring or spraying gears, bearings, etc. with diesel fuel. Do this through top or rear covers, as situation requires. Check for rough bearings or damaged gear teeth.

2. Drain and flush all oil from cylinders, hoses, pumps, and any place there is oil.



**CAUTION: Do not start engine with diesel fuel in transmission case or hydraulic reservoir system.**

3. Put 4-5 gallons of diesel fuel in sump area, push tractor forward and backward in neutral to flush debris from gears. **DRAIN OUT SEDIMENT AND ALL DIESEL FUEL.**

**IMPORTANT: Do not stroke hydrostatic pedals or operate hydraulics.**

4. Clean sump screens, wipe debris from bottom of case or use magnet to pick up chips, install new filter (FILL WITH OIL). Idle unit 20-30 minutes.

5. Change oil, clean sump screen, install new filter (fill with oil).

6. Run unit at slow idle for 20-30 minutes to circulate oil through filter for cleaning.

7. Run engine at fast idle. Operate all hydraulic functions. Drive unit in all speeds forward and reverse whether gear or hydro unit. Also operate PTO (front and rear if equipped).

8. Change oil, clean sump screen, install new filter (FILL WITH OIL).

9. Run engine at slow idle for 20-30 minutes to trap any debris in filter that may have been loosened during step 7.

10. Run at fast idle, operate unit at all speeds forward and reverse. Also engage front and rear PTO (if equipped).

11. Operate all hydraulic functions as in step 7. Then replace filter only.

12. Test all hydraulic and hydrostatic functions for pressure and flow per technical manual specifications. Operate unit and check performance of all functions.

13. Have customer operate unit 5-10 hours. Change oil and filter, clean sump screen.

## BLEED HYDRAULIC SYSTEM

After installing a repaired or placement part, follow this run-in procedure to assure that air is purged from the hydraulic system.

1. Start engine and idle it for ten minutes.

2. Run engine at high idle for one minute.

3. Turn steering wheel full left and hold for five seconds.

4. Turn steering wheel to straight forward for ten seconds.

5. Turn steering wheel full right, hold for five seconds.

6. Return steering wheel to straight forward. Travel vehicle forward about twenty feet then make two hard left turns.

7. Then make two hard right turns.

8. Travel vehicle in reverse for ten feet.

9. Cycle all hydraulic functions three times.

10. Shut engine off and inspect hydraulic components for leaks.

11. Fill system as required with specified oil.

## SERVICE EQUIPMENT AND TOOLS

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

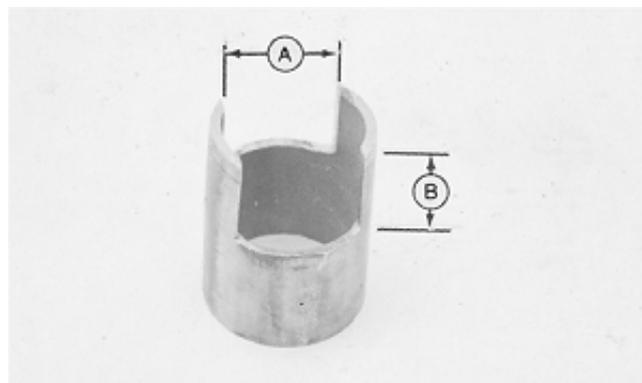
| Name                                 | Use  |
|--------------------------------------|--|
| Bushing, Bearing and Seal Driver Set | To service bearings and seal.  |
| Press                                | To service bearings.   |
| Knife-Edge Puller                    | To remove bearings.  |
| Magnet Extraction Tool               | To remove inside portion of PTO valve.                               |
| Snap Ring Pliers Set                 | To remove snap rings.  |
| 6mm Cap Screw                        | To remove rear portion of PTO valve.                                 |
| 8mm Cap Screws                       | To remove inertia brake piston and differential carrier.             |
| Floor Jack Stands                    | To support tractor frame.  |
| Overhead Hoist                       | To remove rear wheels, hydrostatic transmission, ROPS and transaxle. |

MX,HU,5010,1 -19-16OCT91

## FABRICATED TOOLS

Make clutch piston compression tool from 50 mm (2 in.) inside diameter pipe approximately 65 mm (2-1/2 in.) long. Tool is used in a vise to compress the PTO clutch piston spring so the snap ring can be removed or installed.

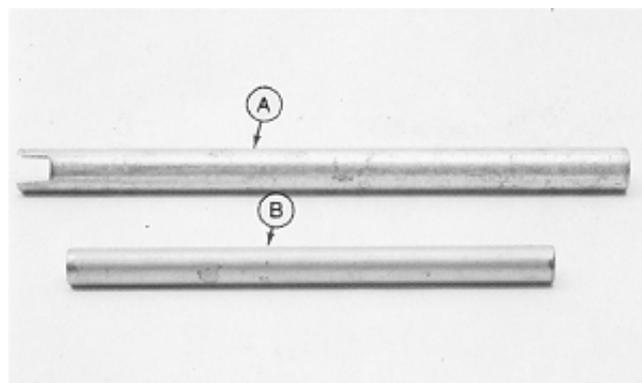
**A—40 mm (1-5/8 in.)**  
**B—32 mm (1-1/4 in.)**



MX,HU,5010,2 -19-16OCT91

Pipe (A) is used to compress the spring to remove the snap ring on the differential lock shaft. The inside pipe diameter is 25 mm (1 in.). Make a 20 mm (3/4 in.) notch in the end of the pipe. Pipe length is not important.

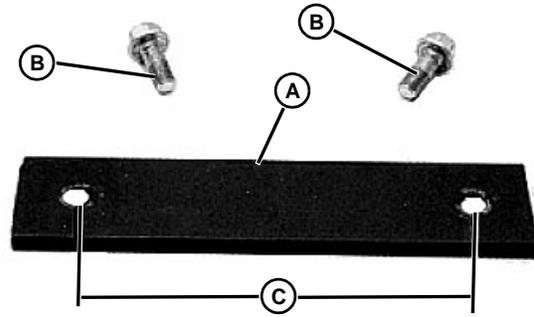
Pipe (B) is used to install the snap ring on the differential lock shaft. The inside pipe diameter is 20 mm (13/16 in.). Pipe length is not important.



MX,HU,5010,3 -19-16OCT91

Steel plate (A) is used to attach to the transaxle case. A magnetic base gauge holder is then attached to the steel plate. Attach steel plate to case with two M12 cap screws (B). Drill two 13 mm (1/2 in.) holes as shown.

- A—Steel Plate
- B—M12 Cap Screws (2 used)
- C—Two 13 mm (1/2 in.) holes,  
213 mm (8-3/8 in.) apart



M43093

## OTHER MATERIALS

| Number | Name  | Use                            |
|--------|---|--------------------------------|
| T43511 | John Deere LOCTITE®<br>Clean and Cure Primer                    | Clean threads                  |
| T43512 | John Deere LOCTITE® Thread<br>Lock and Sealer (Medium Strength) | Retain differential cap screws |

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the LOCTITE Corp.

## SPECIFICATIONS

| Item                                  | Measurement          | Specification                              |
|---------------------------------------|----------------------|--|
| <b>PTO Inertia Brake Spring</b>       |                      |  |
| Inner Spring (All)                    | Minimum Free Length  | 61.6 mm (2.425 in)                         |
|                                       | Minimum Working Load | 47.5 mm at 327 N (1.870 in. at 73 lb)      |
| Outer Spring<br>(655/755/756/855/856) | Minimum Free Length  | 64.3 mm (2.531 in)                         |
|                                       | Minimum Working Load | 47.5 mm at 700.5 N (1.870 in. at 157.5 lb) |
| Outer Spring (955)                    | Minimum Free Length  | 60.5 mm (2.382 in)                         |
|                                       | Minimum Working Load | 44.5 mm at 1117 N (1.75 in. at 251 lb)     |
| Separator Plates                      | Minimum Thickness    | 1.0 mm (0.039 in)                          |
| Brake Disks                           | Minimum Thickness    | 1.9 mm (0.075 in)                          |
| Clutch Pack-to-Face                   | Maximum Distance     | 43 mm (1.69 in)                            |
| Differential Cap Screws               | Torque               | 26 N·m (19 lb-ft)                          |
| <b>PTO Clutch</b>                     |                      |  |
| Separator Plate-to-Cylinder           | Maximum Distance     | 4.7 mm (0.185 in)                          |
| Top Plate                             | Minimum Thickness    | 2.9 mm (0.114 in)                          |
| Clutch Disk                           | Minimum Thickness    | 1.9 mm (0.075 in)                          |
| Separator Plate                       | Minimum Thickness    | 1.0 mm (0.039 in)                          |
| Piston Return Spring                  | Minimum Free Length  | 29 mm (1.14 in)                            |
|                                       | Minimum Working Load | 17.5 mm at 540 N (0.689 in. at 121 lb)     |
| Differential Shaft Bearing Retainer   | Cap Screw Torque     | 26 N·m (19 lb-ft)                          |
| Front Cover Assembly                  | Torque               |  |
|                                       | M12 Cap Screw        | 90 N·m (66 lb-ft)                          |
|                                       | M10 Cap Screw        | 50 N·m (37 lb-ft)                          |
|                                       | M8 Cap Screw         | 26 N·m (19 lb-ft)                          |
| MFWD Gear Assembly Cover              | Cap Screw Torque     | 26 N·m (19 lb-ft)                          |

Continued on next page

*Transaxle/Specifications*

| <b>Item</b>                            | <b>Measurement</b> | <b>Specification</b>          |
|--|--------------------|-------------------------------|
| Differential Ring Gear                 | Backlash           | 0.15—0.21 mm (0.006—0.008 in) |
| Case-to-Differential Carrier Cap Screw | Torque             | 26 N·m (19 lb-ft)             |
| Rear Cover Cap Screws                  | Torque             |                               |
|  | M12 Cap Screw      | 90 N·m (66 lb-ft)             |
|  | M10 Cap Screw      | 50 N·m (37 lb-ft)             |
| PTO Valve Cover                        | Cap Screw Torque   | 26 N·m (19 lb-ft)             |
| PTO Shield                             | Cap Screw Torque   | 90 N·m (66 lb-ft)             |
| Final Drives                           |                    |                               |
| M10 Cap Screws                         | Torque             | 52 N·m (38 lb-ft)             |
| M16 Cap Screws W/Out ROPS              | Torque             | 187 N·m (138 lb-ft)           |
| PTO Valve Line Fitting                 | Torque             | 49 N·m (36 lb-ft)             |
| Transaxle-To-Frame                     | Cap Screw Torque   | 142 N·m (105 lb-ft)           |
| Transmission-To-Transaxle              | Cap Screw Torque   | 142 N·m (105 lb-ft)           |
| Drive Shaft-To-Engine                  | Cap Screw Torque   | 49 N·m (36 lb-ft)             |
| Drive Shaft-To-Transmission            | Cap Screw Torque   | 60 N·m (45 lb-ft)             |
| ROPS Mounting Bolts                    | Torque             | 215 N·m (159 lb-ft)           |
| Rear Wheel Lug Bolts                   | Torque             | 115 N·m (85 lb-ft)            |

MX,HU,5010.7 -19-16OCT91

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## REPLACE SEALS

The transaxle front cover must be removed for the following seal replacement:

- Mid PTO Drive Shaft Seal (M800600).

The transaxle rear cover must be removed for the following seal replacement:

- Rear PTO Drive Shaft Seal (CH14620).

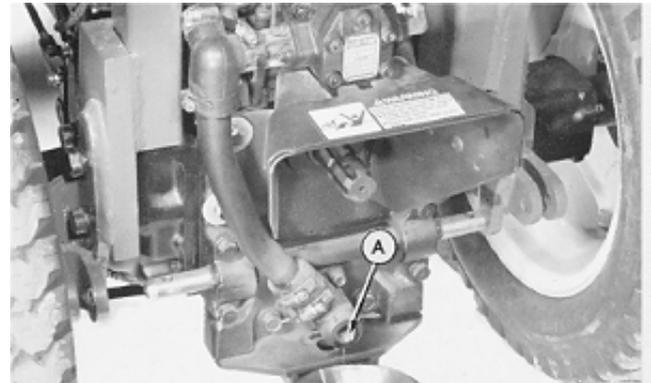
The transaxle MFWD housing must be removed for the following seal replacement:

- MFWD Drive Shaft Seal (CH14765).

MX,HU,5010,7A -19-16OCT91

## REMOVAL PREPARATIONS

1. Remove rockshaft housing. (See Section 70, Group 15.)
2. Remove drawbar.
3. Remove drain plug (A) to drain transaxle. Oil capacity is approximately 17 L (4.5 gal).



MX,HU,5010,8 -19-16OCT91

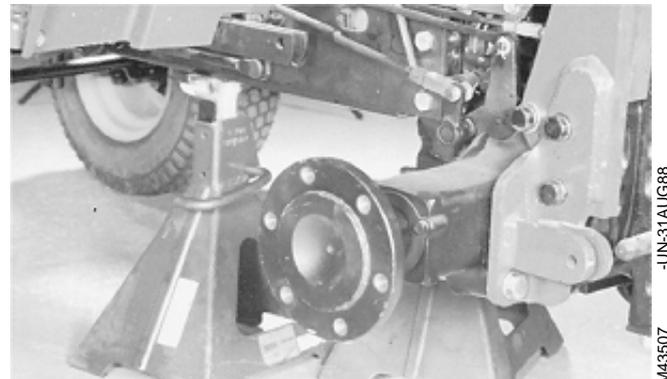
4. Put wedge blocks in front of and behind both front wheels.

5. Loosen rear wheel bolts.

**IMPORTANT: DO NOT put lifting device under transaxle or transaxle case could become damaged.**

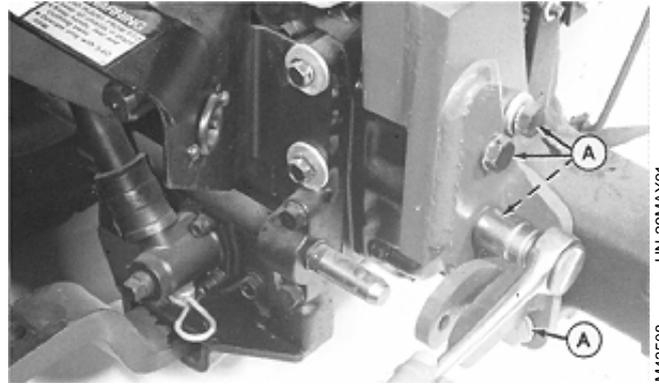
6. Raise tractor and support both sides of frame in front of transaxle with jack stands.

7. Remove rear wheels.



MX,HU,5010,9 -19-16OCT91

8. Support ROPS with overhead hoist then remove four bolts (A) and all washers from each side to remove ROPS.

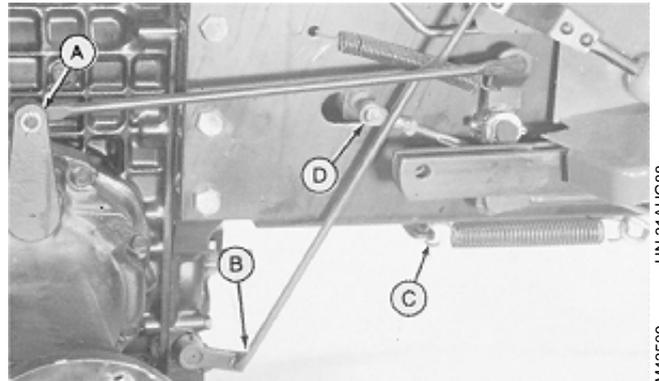


MX,HU.5010,10 -19-16OCT91

M43508 -UN-29MAY91

## DISCONNECT LINKAGE

1. Remove cotter pin and washer to disconnect right brake link (A).
2. Remove cotter pin to disconnect range shifter link (B). Late model tractors also have a stop link connected to this range shifter arm.
3. Disconnect spring (C).
4. Remove nut and cap screw to disconnect transmission control linkage (D).



Right Side View

- A—Brake Link
- B—Range Shifter Link
- C—Spring
- D—Transmission Control Linkage

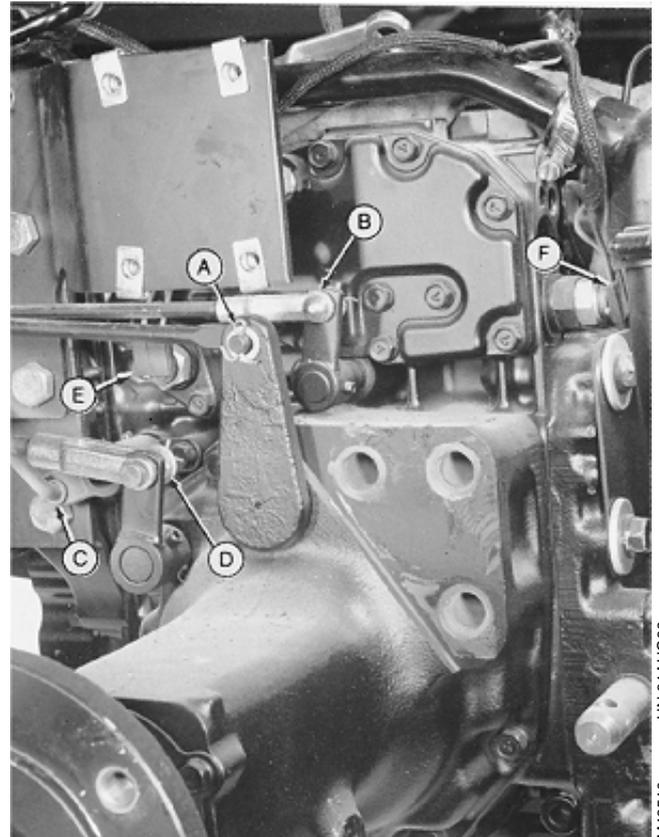
MX,HU.5010,11 -19-16OCT91

M43509 -UN-31AUG88

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6

5. Remove cotter pin and washer to disconnect brake link (A).
6. Remove cotter pin and drilled pin to disconnect PTO control link (B).
7. Remove cotter pin and washer to disconnect PTO selector link (C).
8. Remove cotter pin, washer, and drilled pin to disconnect differential lock link (D).
9. Disconnect electrical leads (E and F).

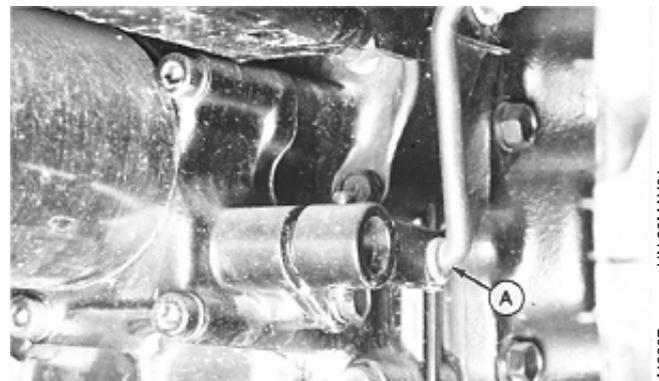
- A—Brake Link
- B—PTO Control Link
- C—PTO Selector Link
- D—Differential Lock Link
- E—PTO Magnet Switch
- F—PTO Lamp Switch



Left Side View

MX,HU,5010,12 -19-16OCT91

10. Remove cotter pin and washer to disconnect MFWD shift link (A).
11. Remove the following: (see procedures in Group 05 of this section)
  - MFWD Drive Shaft
  - Transmission Drive Shaft
  - Hydrostatic Transmission.



Left Front View

MX,HU,5010,13A -19-16OCT91

## REMOVE ROCKSHAFT HOUSING ASSEMBLY

To remove rockshaft housing, see Section 70, Group 15.

BE SURE to protect transaxle internal components by covering the opening with a shop cloth.

MX,HU,5010,13B -19-16OCT91

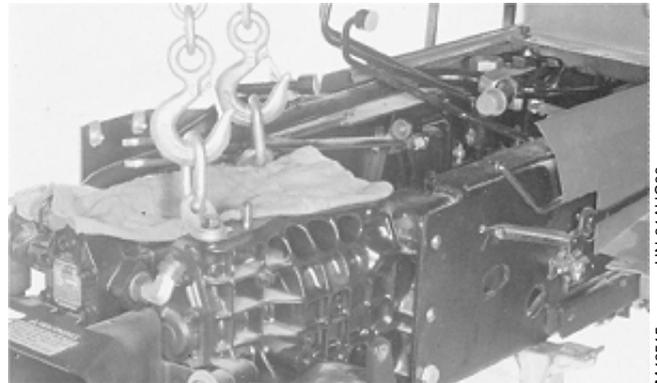
## DISCONNECT FLOW DIVIDER AND SELECTIVE CONTROL VALVES

To disconnect flow divider valve and selective control valves, see Section 70, Group 10.

MX,HU,5010,13C -19-16OCT91

## REMOVE TRANSAXLE

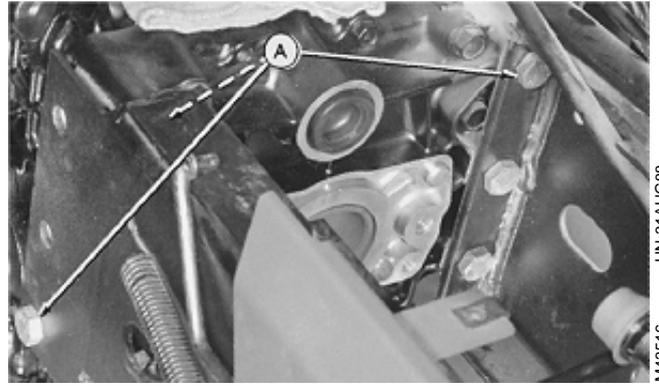
1. Fasten two lifting eyes to transaxle and hold it in place using a load-positioning sling and hoist.



MX,HU,5010,14A -19-16OCT91

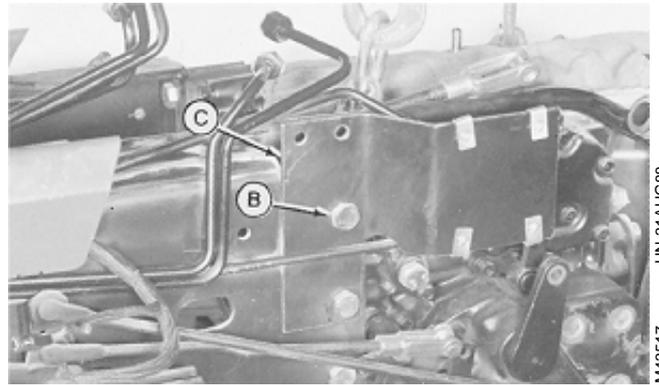
M43515  
-UN-31AUG88

2. Remove seven cap screws (A).



3. Remove three cap screws (B).

4. Remove bracket (C).



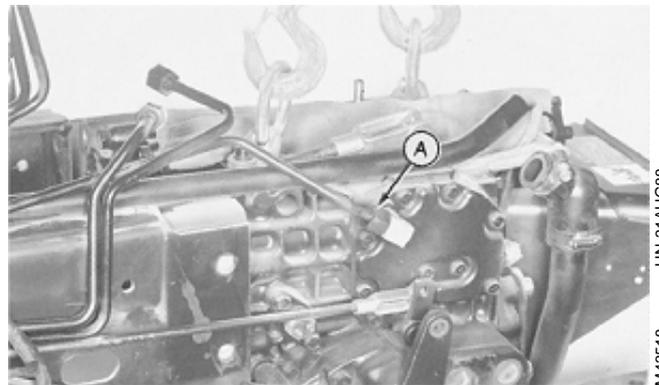
MX,HU,5010,15A -19-16OCT91

5. Disconnect PTO valve line (A).

6. Close all openings with caps and plugs to keep dirt out of the hydraulic system.

7. Move transaxle assembly away from frame.

8. Safely support transaxle before continuing with following procedures.

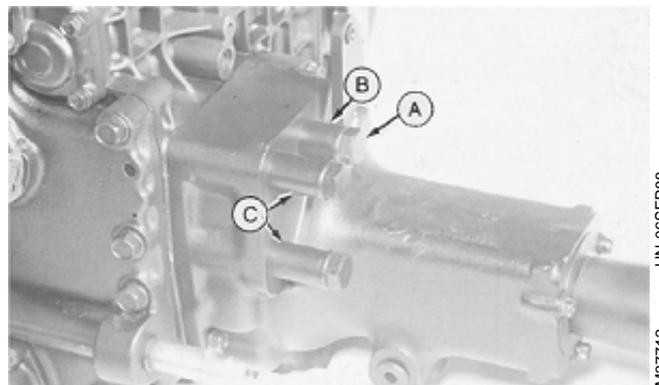


MX,HU,5010,16A -19-16OCT91

## REMOVE FINAL DRIVE AXLES

1. Remove differential cap screws (A).

2. Remove short spacer (B) and long spacers (C). Spacers are only used when the ROPS has been removed on some models.

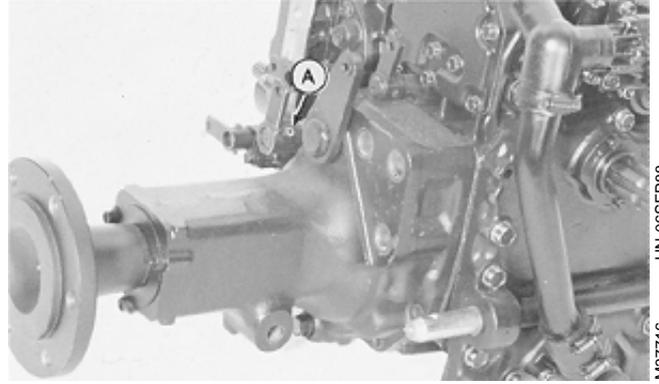


Right Side View

MX,HU,5010,17A -19-16OCT91

## Transaxle/Remove Final Drive Axles

3. Remove spring pin (A) on left side. Remove lever.
4. Remove final drive assemblies.

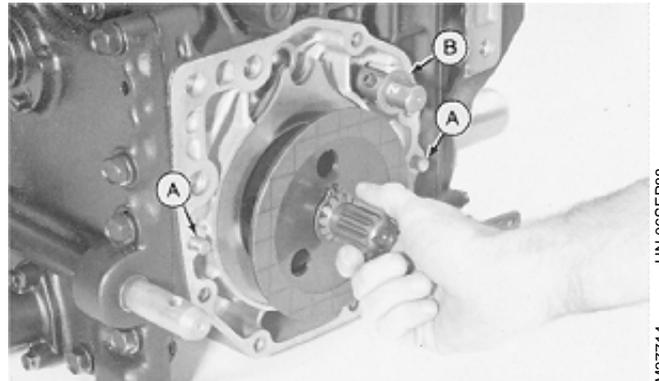


Left Side View

MX,HU,5010,18A -19-16OCT91

M37716 -UN-06SEP88

5. Keep dowels (A) in their respective holes.
6. Remove washer (B) from right-side of differential lock shaft.
7. Pull final drive pinion shaft, two plates, and two brake disks from transaxle.



Right Side View

MX,HU,5010,19 -19-16OCT91

M37714 -UN-06SEP88

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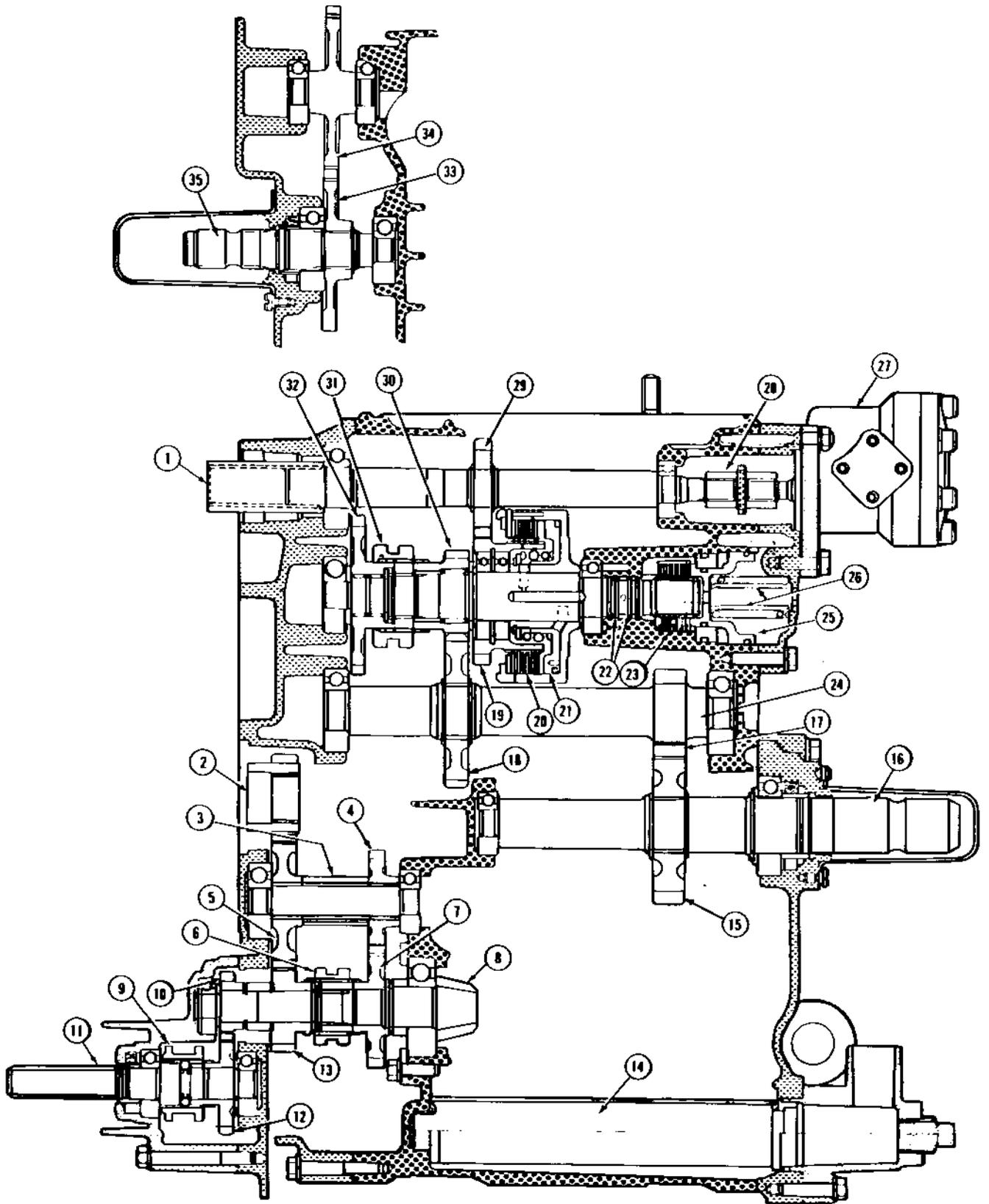


## CROSS-SECTION VIEW—TRANSAXLE

- |   |                               |                                      |   |
|---|-------------------------------|--------------------------------------|---|
| 1—Main PTO/Hydraulic Pump Drive Shaft W/Splined Collar (Engine Speed Input) | 9—MFWD Shift Collar           | 19—PTO Clutch Drive Gear             | 28—Hydraulic Pump Coupler                 |
| 2—Hydro/Transaxle Input Drive Gear  | 10—MFWD Drive Gear            | 20—PTO Clutch Pack (Disk and Plates) | 29—PTO Main Input Shaft Drive Gear        |
| 3—Hi/Lo Reduction/Speed Shaft   | 11—MFWD Output Drive Shaft    | 21—PTO Clutch Piston                 | 30—Clutch Shaft Rear PTO Drive Gear       |
| 4—Lo-Range Reduction Gear   | 12—MFWD Output Drive Gear     | 22—Clutch Shaft Sealing Rings        | 31—Clutch Shaft Mid/Rear PTO Shift Collar |
| 5—Hi-Range Reduction Gear   | 13—Hi-Range Input Gear        | 23—Brake Pack (Disks and Plates)     | 32—Clutch Shaft Mid PTO Input Drive Gear  |
| 6—Hi-Lo Shift Collar  | 14—Hydraulic Reservoir Screen | 24—Rear PTO Reduction Shaft          | 33—Mid PTO Output Drive Gear              |
| 7—Lo-Range Input Gear   | 15—Rear PTO Output Drive Gear | 25—PTO Brake Piston                  | 34—Mid PTO Transfer Gear                  |
| 8—Differential Drive Shaft With Pinion Gear                                 | 16—Rear PTO Drive Shaft       | 26—PTO Brake Springs                 | 35—Mid PTO Drive Shaft                    |
|   | 17—Rear PTO Transfer Gear     | 27—Main Hydraulic Pump               |   |
|   | 18—Rear PTO Reduction Gear    |                                      |   |

MX,HU,5010,20 -19-16OCT91

Transaxle/Cross-Section View

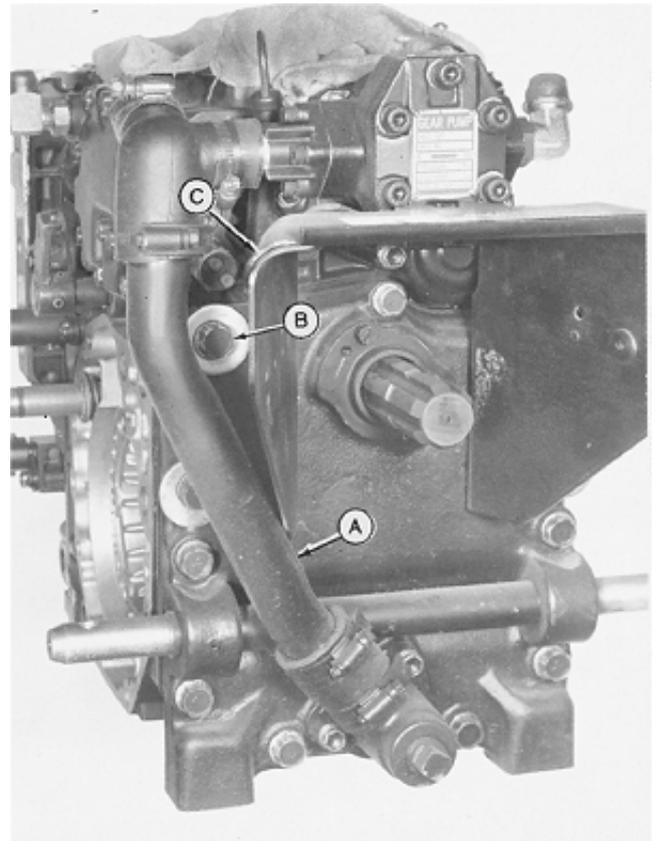


## REPAIR OIL SUPPLY SYSTEM

1. Remove supply tube (A).

*NOTE: Inspect supply tube rubber boots for cracks, cuts, hardening, or damaged clamps—replace if necessary.*

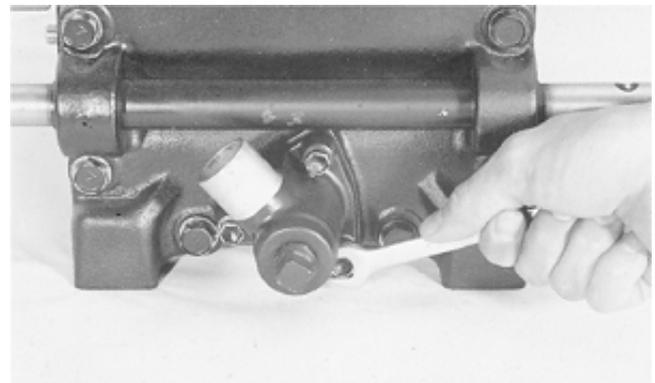
2. Remove four cap screws (B) to remove PTO shield (C).



MX,HU,5010,22 -19-16OCT91

M37717 -UN-06SEP88

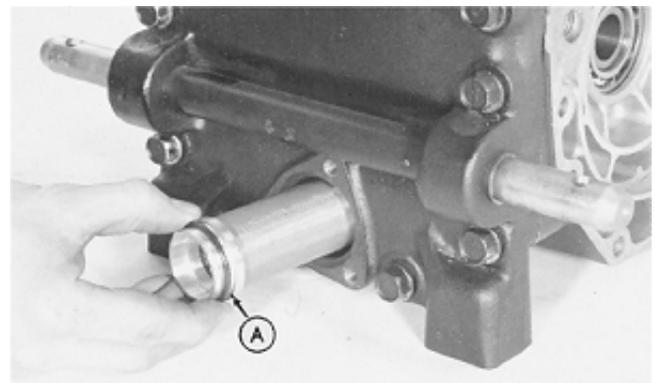
3. Remove filter screen adapter from rear of case.



MX,HU,5010,23 -19-16OCT91

M37718 -UN-06SEP88

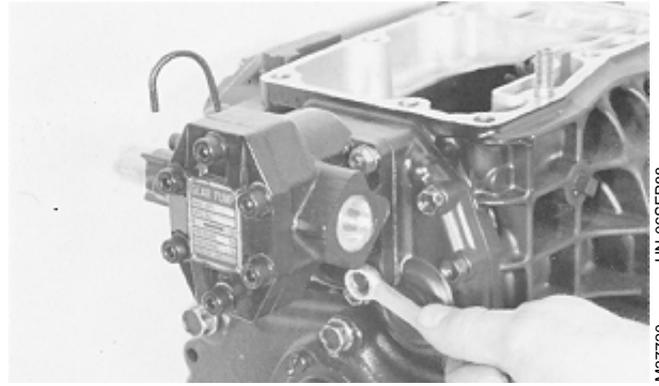
4. Pull out filter screen. Remove and discard O-ring (A). Clean filter screen thoroughly in approved solvent, blow dry with compressed air, and examine closely for damage—replace if required.



MX,HU,5010,24 -19-16OCT91

M37719 -UN-06SEP88

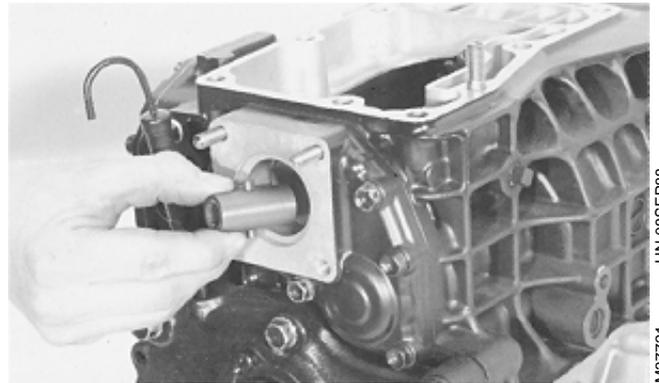
5. Remove main hydraulic pump. See Section 70, Group 05 for pump repair.



MX,HU,5010,25 -19-16OCT91

M37720 -UN-06SEP88

6. Remove pump drive coupling.



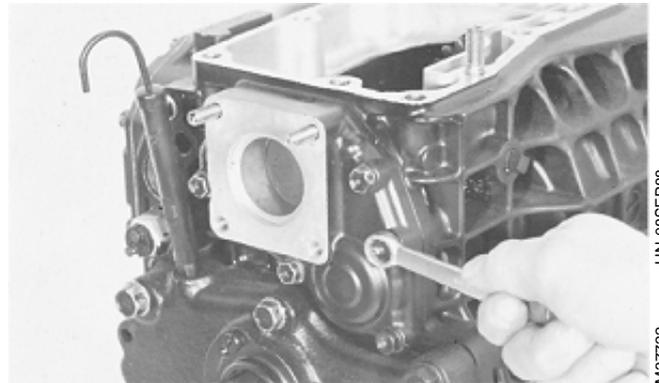
MX,HU,5010,26 -19-16OCT91

M37721 -UN-08SEP88

## REPAIR PTO INERTIA BRAKE

**N** **CAUTION:** Inertia brake cover is spring loaded. Use caution when removing cap screws.

1. Loosen the five cap screws from the cover. Leave one cap screw slightly engaged, and remove remaining cap screws. Carefully remove the last cap screw while holding the cover.



MX,HU,5010,27 -19-16OCT91

M37722 -UN-08SEP88

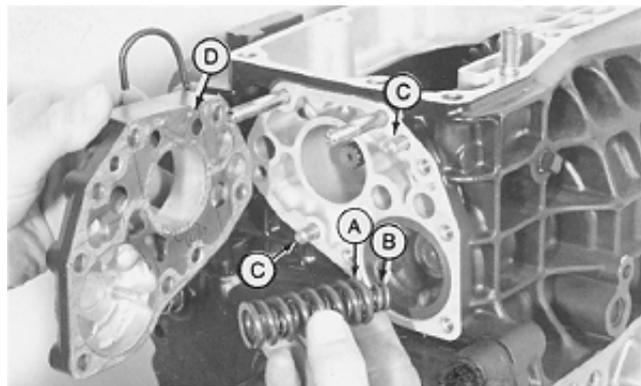
2. Remove outside spring (A) and inside spring (B).  
Check the spring free length and working load.

3. Keep dowel pins (C) in their respective holes.

4. Replace gasket (D).

A—Outside Spring  
B—Inside Spring

C—Pin (2 used)  
D—Gasket



M37723 -UN-08SEP88

**INERTIA BRAKE SPRING SPECIFICATIONS**

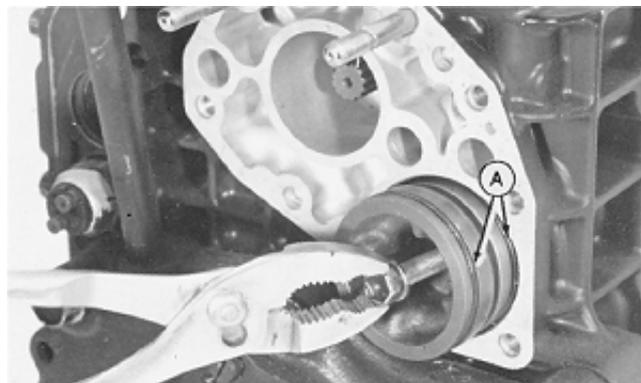
|  |   |   |
|--|---|---|
| Inner Spring—all models                | Minimum free length<br>Minimum working load | 61.6 mm (2.425 in.)<br>47.5 mm at 327 N<br>(1.870 in. at 73 lb.)      |
| Outer Spring—<br>(655/755/756/855/856) | Minimum free length<br>Minimum working load | 64.3 mm (2.531 in.)<br>47.5 mm at 700.5 N<br>(1.870 in. at 157.5 lb.) |
| Outer Spring—(955)                     | Minimum free length<br>Minimum working load | 60.5 mm (2.382 in.)<br>44.5 mm at 1117 N<br>(1.75 in. at 251 lb.)     |

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MX,HU,5010,28 -19-16OCT91

5. Pull the inertia brake piston out using an 8 mm cap screw.

6. Replace piston O-rings (A).



M37724 -JUN-29AUG88

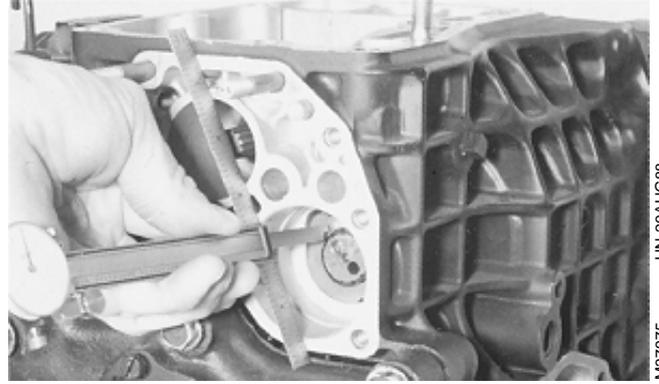
MX,HU,5010,29 -19-16OCT91

7. Measure the distance between the inertia brake clutch pack and the face of the housing. If the measurement is more than 43 mm (1.693 in.), measure each of the disks and plates.

The inertia brake separator plates must measure a minimum thickness of 1.0 mm (0.039 in.) each.

The inertia brake disks must measure a minimum thickness of 1.9 mm (0.075 in.) each.

8. Replace separator plates or disks as required.



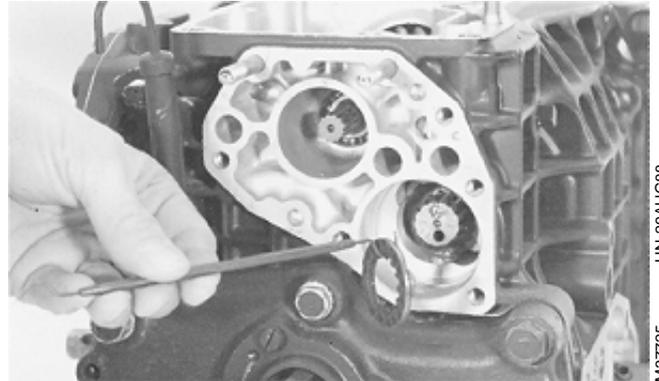
M37975 -UN-29AUG88

**PTO INERTIA BRAKE SPECIFICATIONS**

|                             |                    |
|-----------------------------|--------------------|
| Clutch Pack to Housing Face | 43 mm (1.69 in.)   |
|                             | maximum            |
| Brake Plate                 | 1.0 mm (0.039 in.) |
|                             | minimum thickness  |
| Brake Disk                  | 1.9 mm (0.075 in.) |
|                             | minimum thickness  |

MX,HU,5010,30 -19-16OCT91

9. Remove six disks and seven separator plates on 655, 755/756, and 855/856 tractors. Remove seven disks and eight separator plates on 955 tractors.

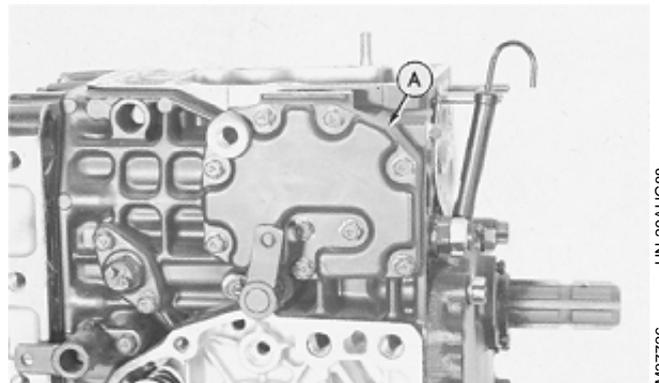


M37725 -UN-29AUG88

MX,HU,5010,31 -19-16OCT91

**REPAIR PTO VALVES**

1. Remove nine cap screws to remove PTO valve cover (A).

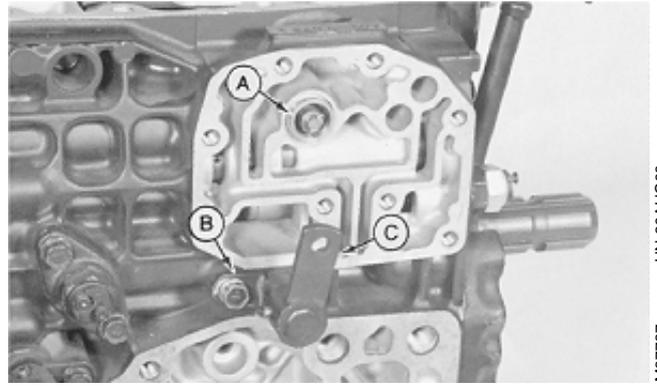


M37726 -UN-29AUG88

MX,HU,5010,32 -19-16OCT91

2. Remove lube relief valve (A).

3. Remove cap screw and retaining plate (B). Push shifter arm (C) straight into the transaxle case to disengage internal shifter arm from lower valve.



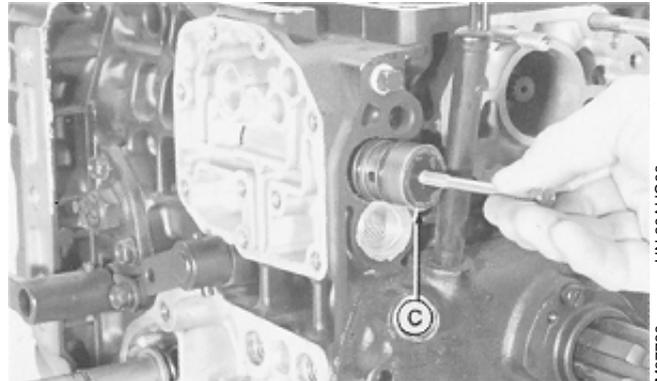
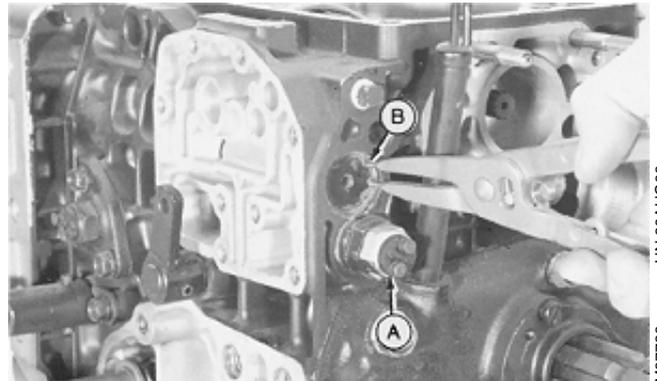
MX,HU,5010,33 -19-16OCT91

M37727 -UN-29AUG88

4. Remove PTO switch and holder (A). Pull out lower valve assembly.

5. Remove snap ring (B).

6. Remove rear portion of PTO valve (C) with a 6 mm cap screw. Pull out inside portion of valve with a magnet.

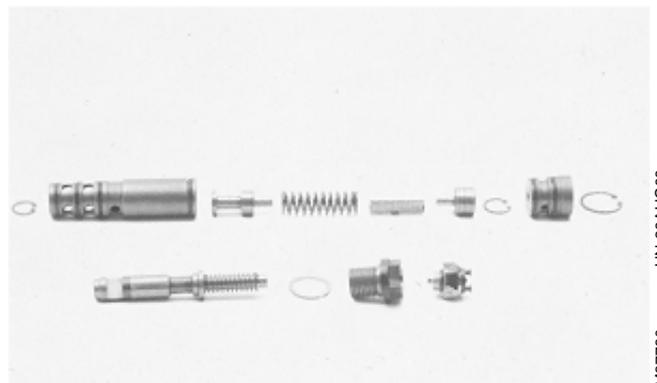


MX,HU,5010,34 -19-16OCT91

M37728 -UN-29AUG88

M37729 -UN-29AUG88

7. Disassemble upper and lower valve assemblies. Inspect and repair as required.

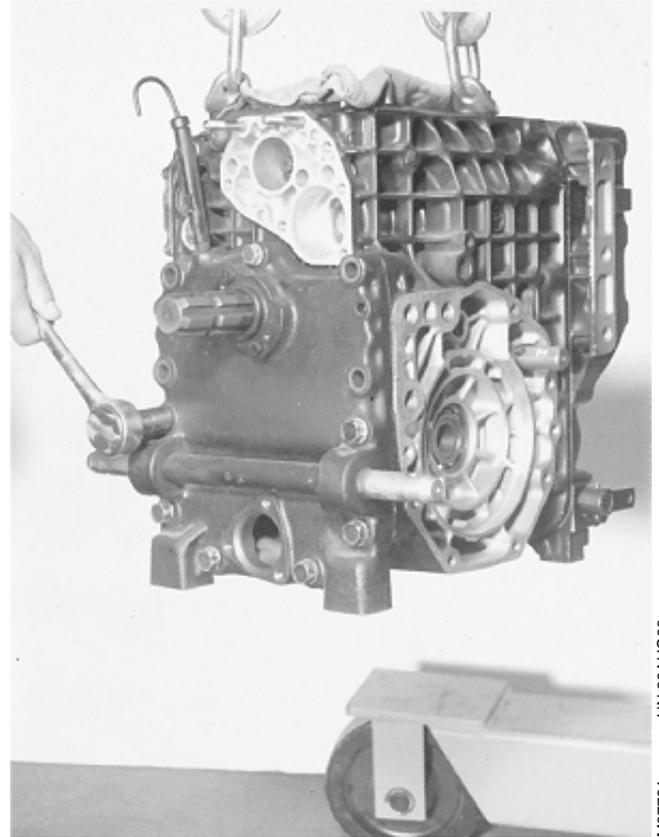


MX,HU,5010,35 -19-16OCT91

M37730 -UN-29AUG88

## REPAIR REAR PTO SHAFT ASSEMBLY

1. Remove seven cap screws from transaxle rear case cover.

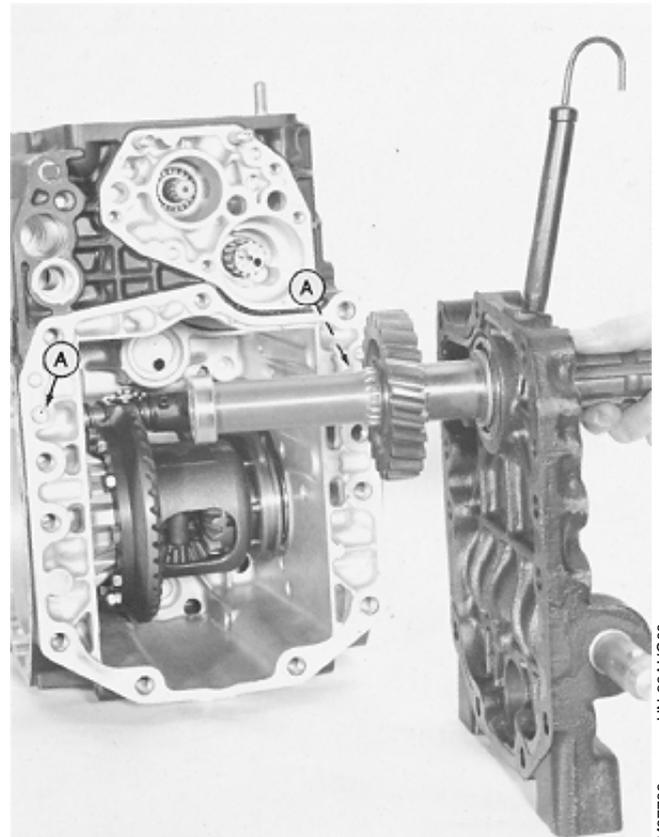


MX,HU,5010,36 -19-16OCT91

2. Remove rear case cover with PTO shaft assembly. Keep two dowel pins (A) in their respective holes.

3. Inspect PTO shaft assembly, if parts show wear replace them.

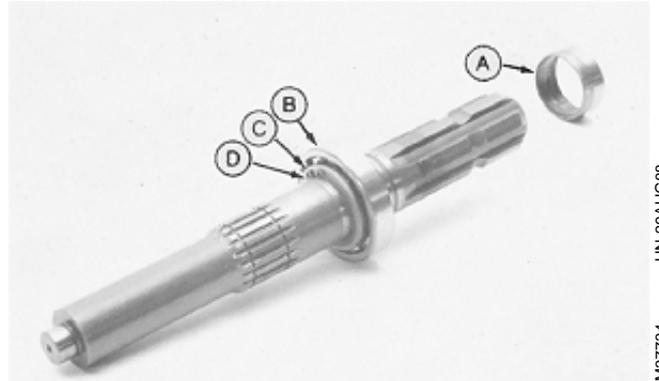
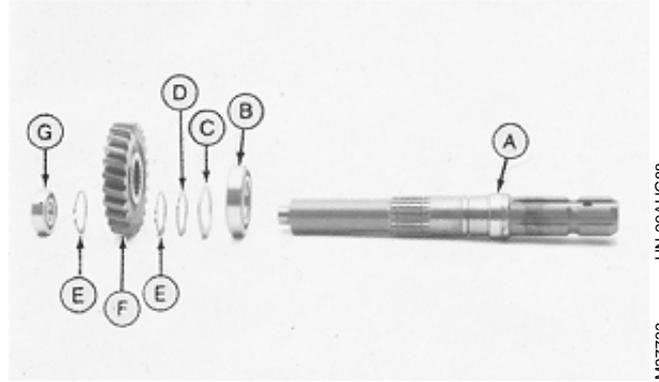
4. Remove PTO shaft assembly through the inside of rear case cover.



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5. Disassemble shaft as required. Inspect oil seal wear sleeve (A). Replace as required.
6. Install rear case bearing (B) on shaft from smooth end of shaft.
7. Install washer (C) and snap ring (D) on shaft.
8. Install oil seal wear sleeve (A) on shaft from splined end with chamfer towards the bearing (B).
9. Install first snap ring (E), 24-tooth rear PTO final drive gear (F), and second snap ring (E).
10. Install bearing (G) on end of shaft.
11. See INSTALL REAR PTO SHAFT AND COVER later in this section.

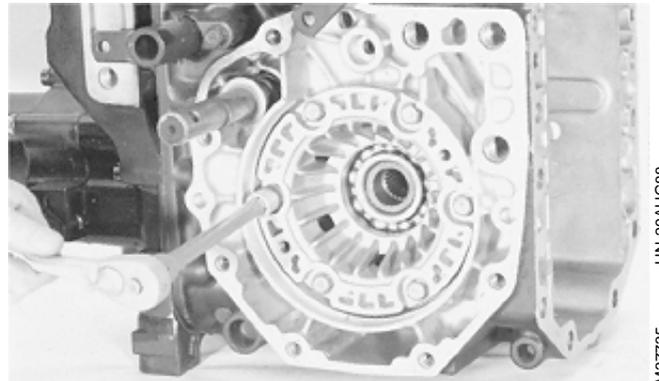
- A—Oil Seal Wear Sleeve
- B—Case Bearing
- C—Washer
- D—Snap Ring
- E—Snap Ring
- F—Drive Gear
- G—Bearing



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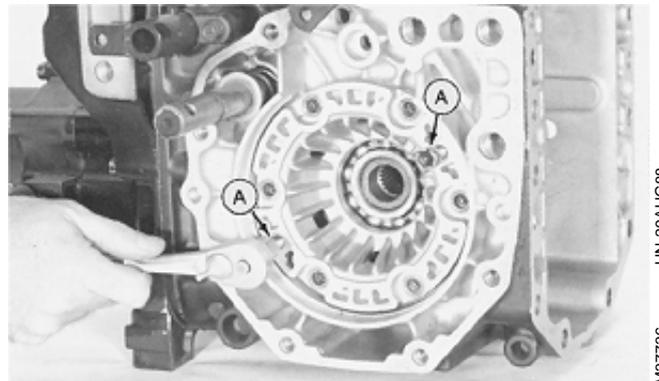
## REPAIR DIFFERENTIAL ASSEMBLY

1. Remove six cap screws from left-side differential carrier.



MX,HU,5010,39 -19-16OCT91

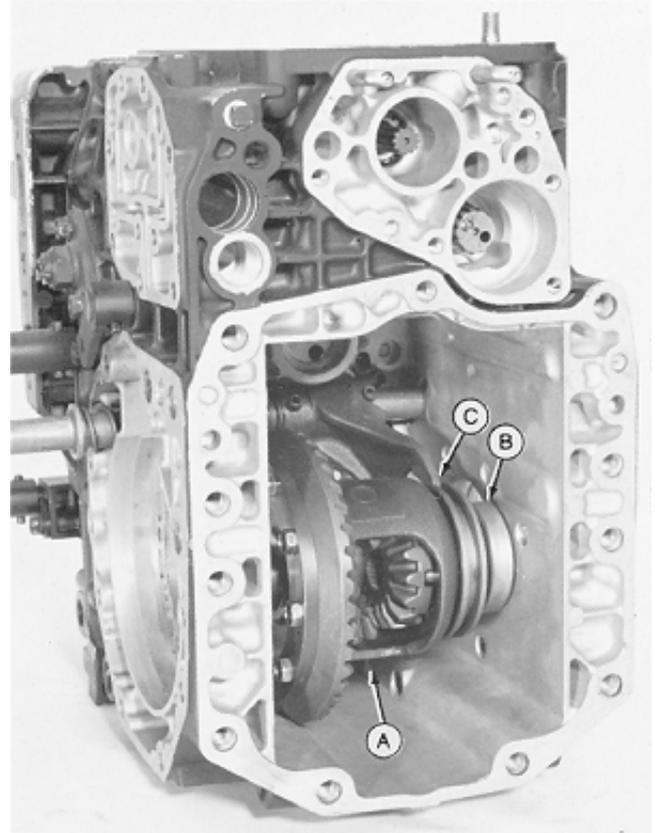
2. Jack differential carrier from transaxle case using two 8 mm cap screws through special threaded holes (A).



MX,HU,5010,40 -19-16OCT91

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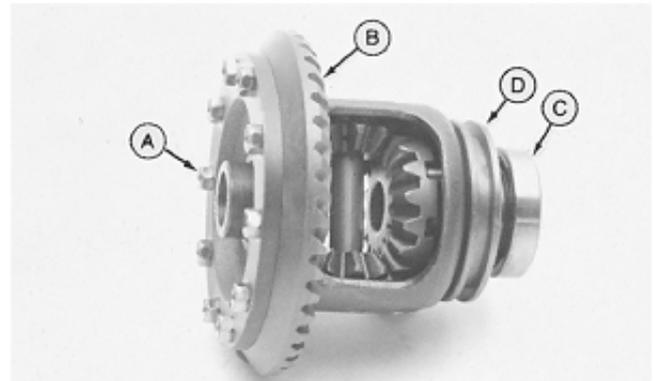
3. Remove differential assembly (A) by sliding assembly to the left side to clear bearing (B) from right wall of case and shift collar (C) from shifter fork.



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4. Remove bearing (C) using a knife-edge puller.
5. Remove shift collar (D).
6. Remove ten cap screws (A) to remove ring gear (B).

**A—Cap Screws**  
**B—Ring Gear**  
**C—Bearing**  
**D—Shift Collar**



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7. Drive spring pin from cross shaft (A) to disassemble differential pinion gears (D), bevel washers (E), locking side gear (C), side gear (G) and flat thrust washers (B).

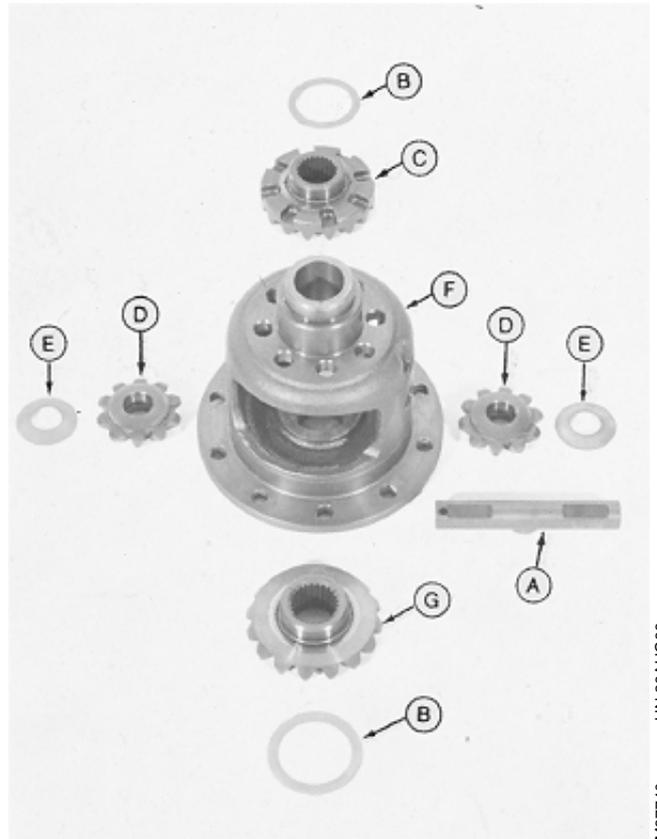
8. Inspect spring pin, cross shaft, pinion gears, side gears, and washers for wear or damage—replace if necessary.

9. Install side gears (C and G) (16 teeth) with flat thrust washers (B) inside housing.

- A—Pinion Shaft
- B—Flat Thrust Washer
- C—Right Side Gear
- D—Pinion Gears
- E—Bevel Thrust Washer
- F—Differential Carrier
- G—Left Side Gear



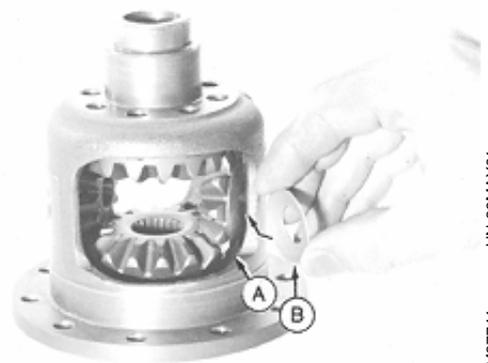
M37739 -UN-29AUG88



M37740 -UN-29AUG88

MX,HU,5010,43 -19-16OCT91

10. Install pinion gears (A) (10 teeth) between side gears and slide bevel thrust washers (B) between pinion gears (A) and differential housing.

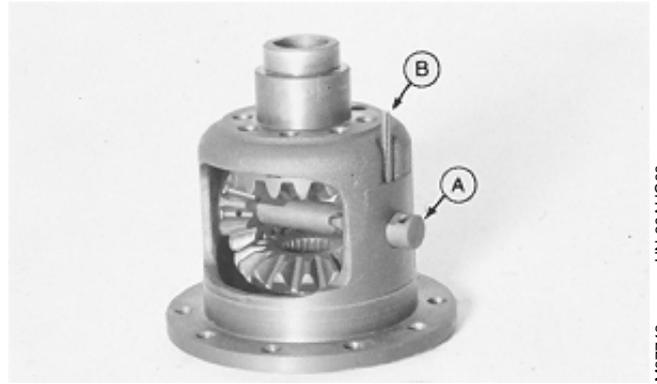


M37741 -UN-29MAY91

MX,HU,5010,44 -19-16OCT91

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11. Install pinion cross shaft (A) and fasten with spring pin (B).



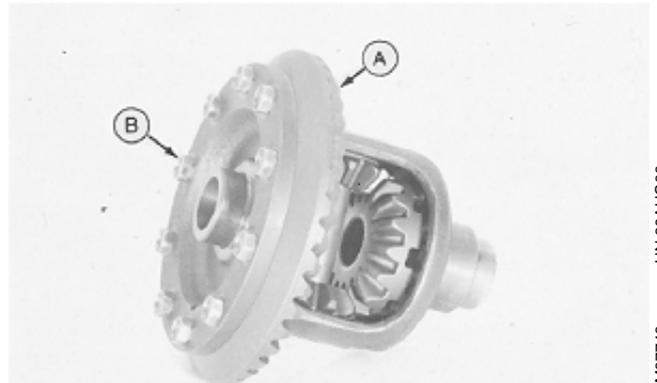
MX,HU,5010,45 -19-16OCT91

M37742 -UN-29AUG88

12. Clean threads of cap screws and threaded ring gear (41 teeth for 655, 755/756, and 855/856 tractors—39 teeth for 955 tractors) with clean and cure primer.

13. Apply medium strength thread lock and sealer to the cap screw threads.

14. Install ten cap screws. Tighten to 26 N·m (19 lb-ft).

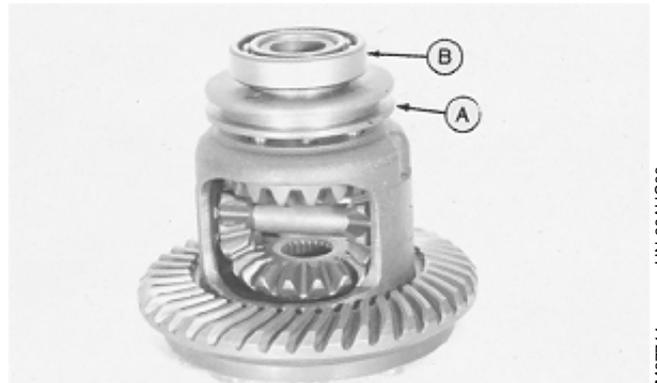


MX,HU,5010,46 -19-16OCT91

M37743 -UN-29AUG88

15. Install shift collar (A).

16. Install bearing (B).



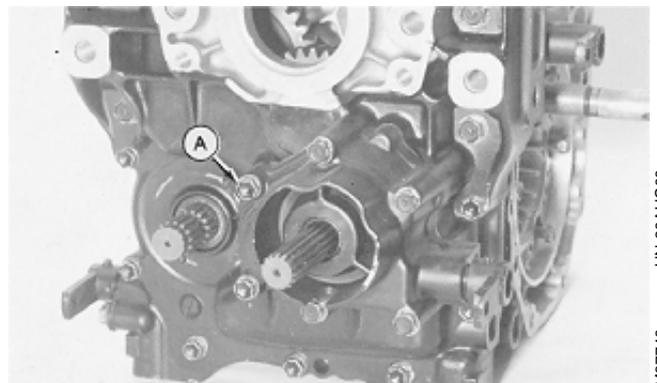
MX,HU,5010,47 -19-16OCT91

M37744 -UN-29AUG88

## REPAIR MFWD GEAR CASE ASSEMBLY

*NOTE: You DO NOT have to remove and disassemble transaxle to repair MFWD output shaft seal and gear assembly. It can be done without fully disassembling the transaxle.*

1. Remove five cap screws (A) to remove MFWD gear drive assembly.

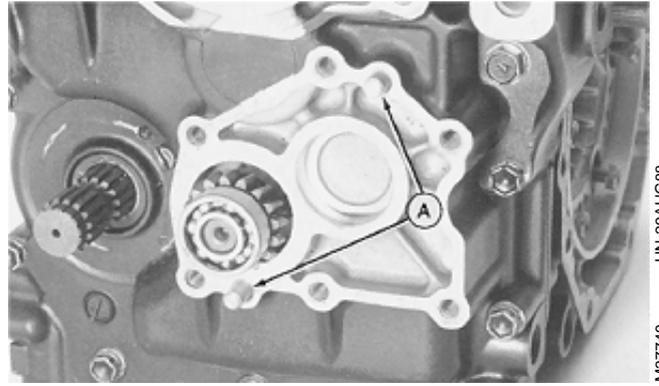


MX,HU,5010,48 -19-16OCT91

M37748 -UN-29AUG88

Transaxle/Repair MFWD Gear Case Assembly

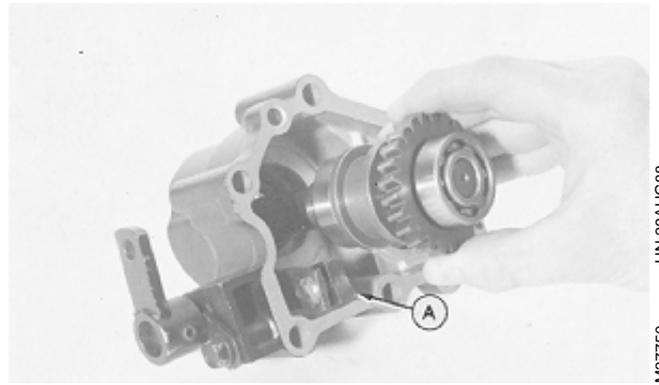
2. Keep alignment pins (A) in place.



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M37749 -UN-29AUG88

3. Remove gear assembly from housing by rotating shift lever and shift collar follower (A) to allow clearance.

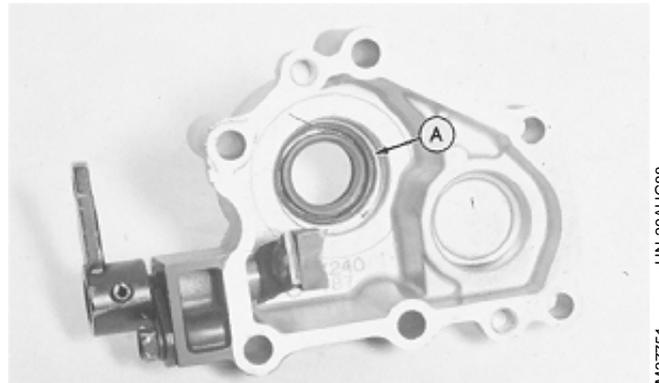


MX,HU,5010,50 -19-16OCT91

M37750 -UN-29AUG88

*NOTE: MFWD housing oil seal (A) must be replaced from inside the housing.*

4. Inspect housing oil seal (A)—replace if necessary.



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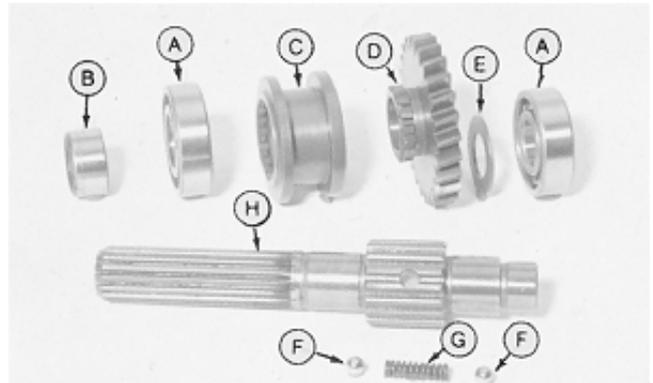
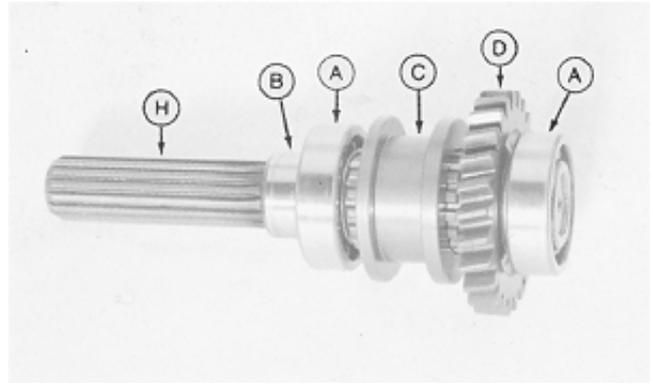
M37751 -UN-29AUG88

5. Use a knife-edge puller to remove bearings (A)—oil seal wear sleeve (B) will come off with bearing.

*NOTE: Detent balls (F) are spring loaded in the shaft.  
Do not lose them when removing shift collar (C).*

6. Slide shift collar (C) off splines slowly so you can capture detent balls (F) and spring (G).

- A—Bearing (2)
- B—Oil Seal Wear Sleeve
- C—Shift Collar
- D—Gear
- E—Washer
- F—Detent Ball (2)
- G—Spring
- H—Shaft



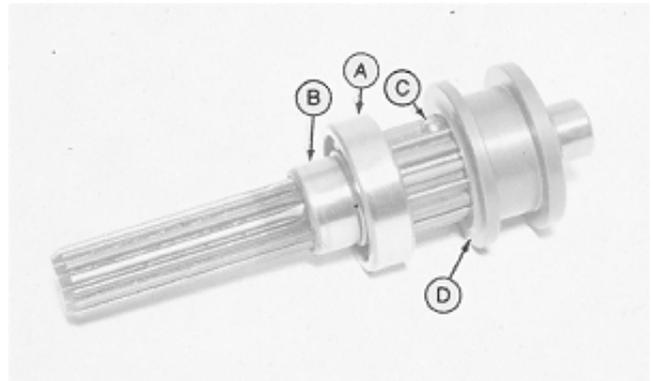
MX,HU,5010,52 -19-16OCT91

7. Install bearing (A) and oil seal wear sleeve (B), with chamfer towards the bearing, over the small-diameter splined end of shaft.

8. Install spring with two detent balls (C) into hole in large-diameter splines.

9. Slide shift collar with raised side (D) on the large-diameter splines as you depress the two detent balls.

10. Install MFWD output drive gear (26 teeth for 655 tractors; 20 teeth for 755/756, 855/856, and 955 tractors), washer, and bearing on the smooth machined surface of the shaft (see orientation of gear in two illustrations of previous module).

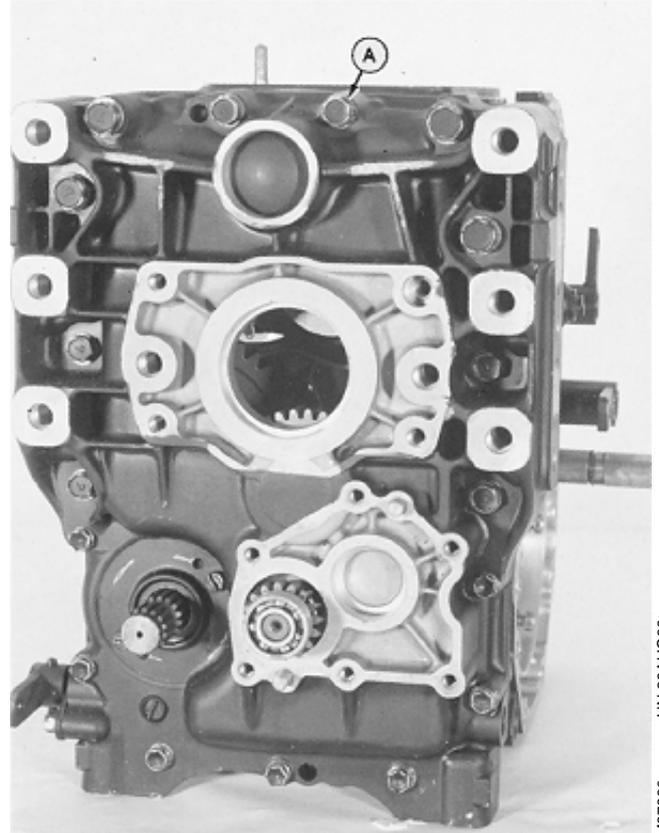


- A—Bearing
- B—Oil Seal
- C—Detent Ball (2 used)
- D—Shift Collar

MX,HU,5010,53 -19-16OCT91

## REMOVE FRONT GEAR CASE COVER

1. Remove 17 cap screws (A) from front transaxle gear case cover.

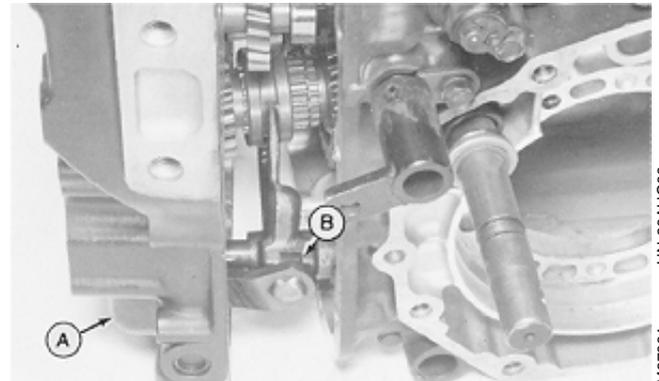


Transaxle With MFWD Shown

MX,HU,5010,54 -19-16OCT91

M37860 -UN-29AUG88

2. Remove front gear case cover (A) by rotating shifter arm (B) to clear the shift fork notch; but allow the shift fork to remain with the transaxle assembly.



MX,HU,5010,55 -19-16OCT91

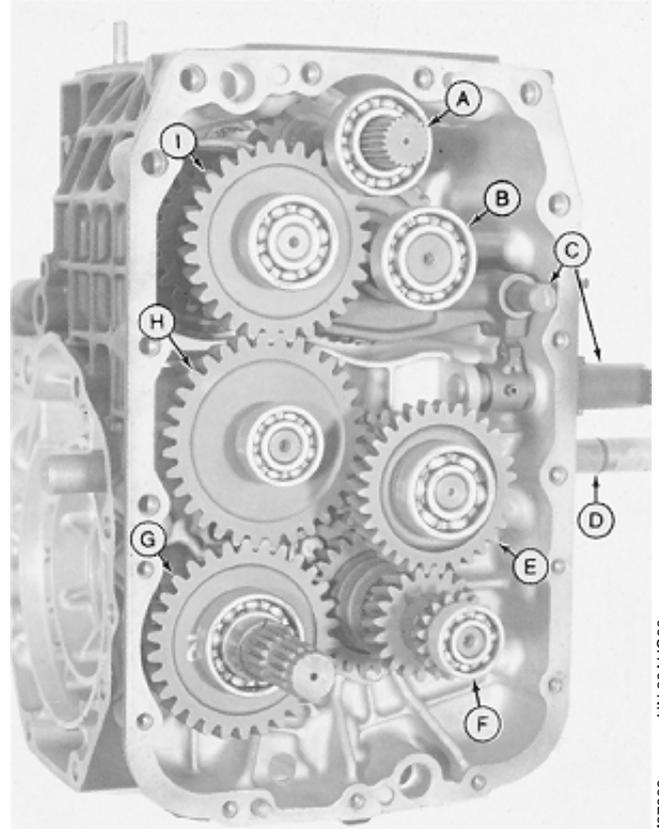
M37861 -UN-29AUG88

## REMOVE GEAR SHAFT ASSEMBLIES

**NOTE:** All shafts are shown with the front case bearings attached—the bearings may remain with the front case cover as it is removed.

1. Identify all gear and shaft assemblies listed below before doing any disassembly.

- A—PTO Main Shaft Assembly
- B—PTO Reduction Shaft Assembly
- C—PTO Shift Fork and Lever Assembly
- D—Differential Lock Lever Assembly
- E—Reduction Gear Assembly
- F—Differential Drive Shaft With MFWD Drive Gear Assembly
- G—Mid PTO Shaft Assembly
- H—Transfer Gear Assembly
- I—PTO Clutch Shaft Assembly

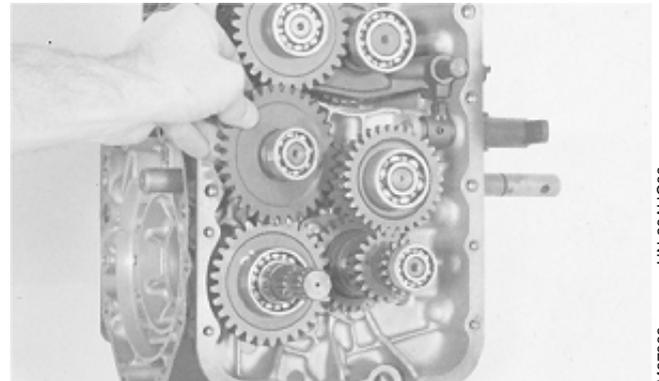


MX,HU,5010,56 -19-16OCT91

M37862 -UN-29AUG88

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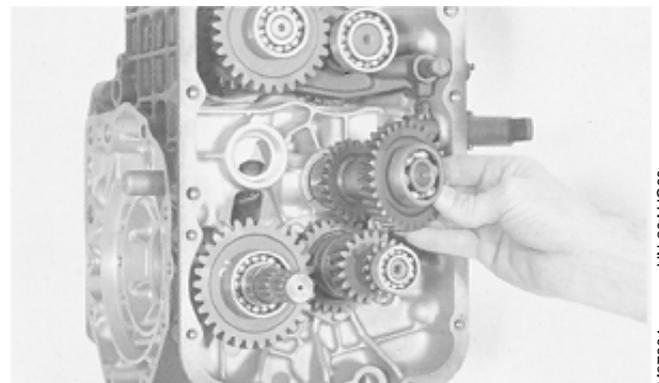
2. Remove the transfer gear and shaft with front and rear bearings.



MX,HU,5010,57 -19-16OCT91

M37863 -UN-29AUG88

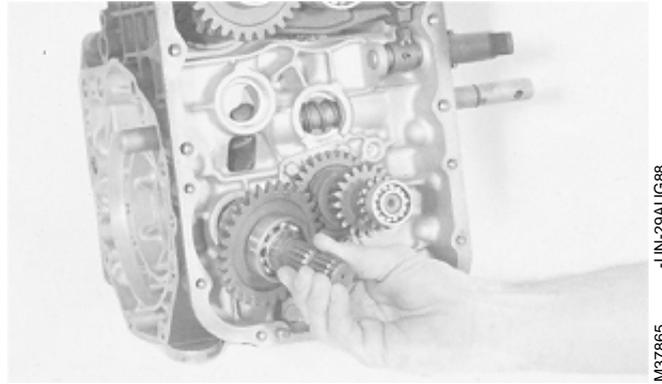
3. Remove the reduction shaft and gears and front and rear bearings.



MX,HU,5010,58 -19-16OCT91

M37864 -UN-29AUG88

4. Remove the mid PTO shaft assembly.

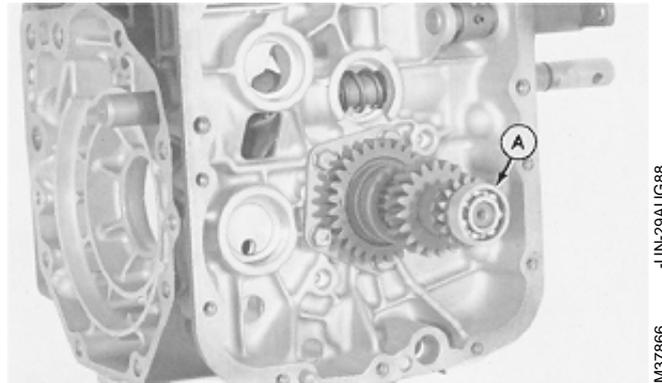


MX,HU,5010,59 -19-16OCT91

M37865 -UN-29AUG88

5. Pull bearing (A) from shaft using a knife-edge puller.

6. Disassemble differential drive shaft assembly by removing all gears, washers, and snap rings—keep the assembly in order as it is removed.

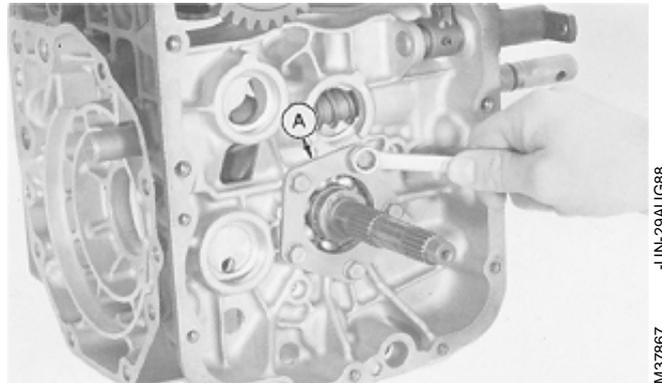


MX,HU,5010,60 -19-16OCT91

M37866 -UN-29AUG88

*Transaxle With MFWD Shown*

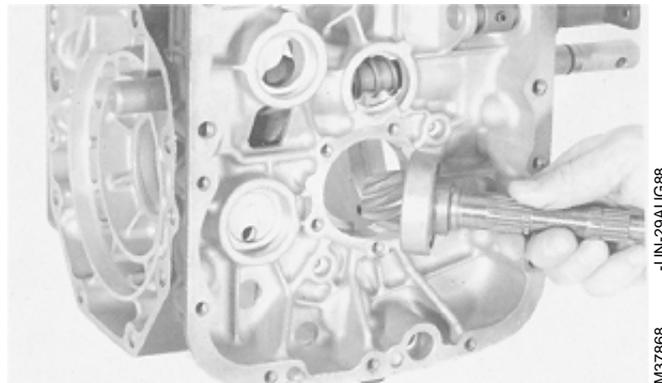
7. Remove five cap screws and retaining bracket (A).



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M37867 -UN-29AUG88

8. Remove differential drive shaft with bearing.



MX,HU,5010,62 -19-16OCT91

M37868 -UN-29AUG88

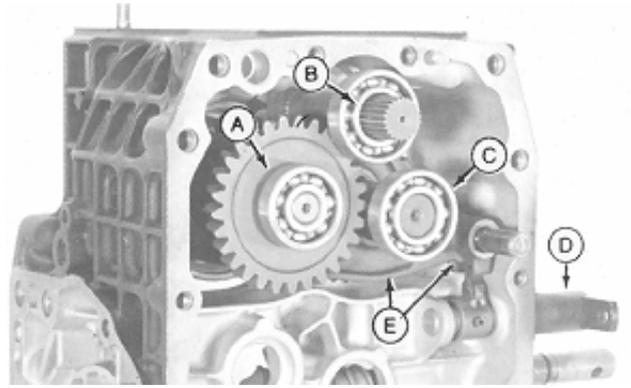
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## Transaxle/Repair PTO Shift Fork Assembly

9. Remove PTO clutch shaft (A), PTO main shaft (B) and PTO reduction shaft (C) all at the same time.

10. Rotate external PTO shift arm (D) downward to remove PTO shift fork assembly (E) from case.

- A—PTO Clutch Shaft
- B—PTO Main Shaft
- C—PTO Reduction Shaft
- D—External PTO Shift Arm
- E—Shift Fork Assembly

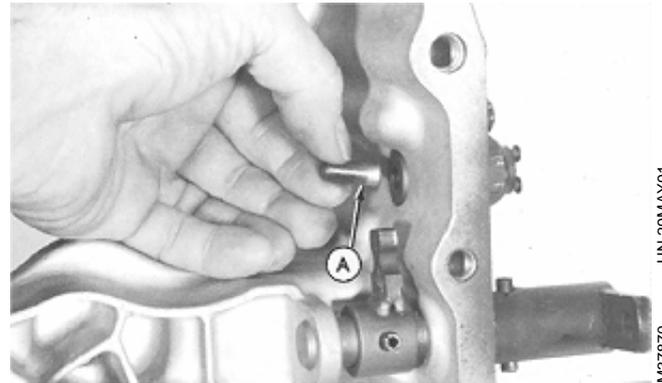


MX,HU,5010,63 -19-16OCT91

M37869 -UN-29MAY91

### REPAIR PTO SHIFT FORK ASSEMBLY

1. Remove the PTO select switch pin (A) now so you won't lose it—keep it in a safe place until assembly.

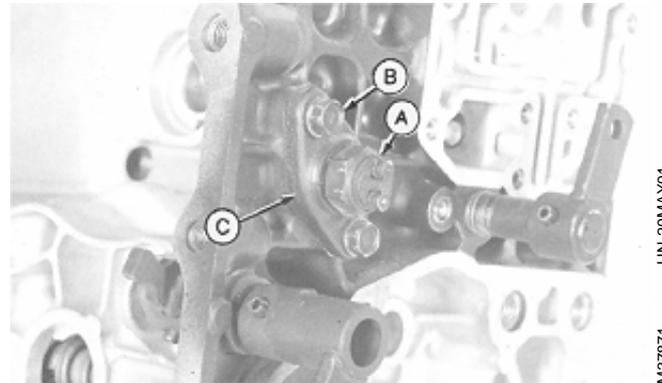


MX,HU,5010,64 -19-16OCT91

M37870 -UN-29MAY91

2. Remove PTO select switch (A).

3. Remove two cap screws (B) to remove switch mounting bracket and gasket (C).



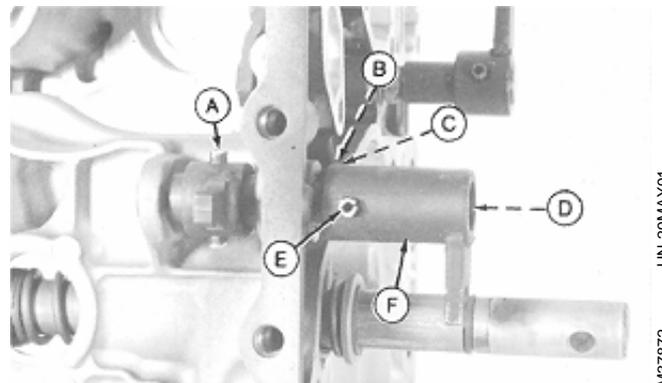
MX,HU,5010,65 -19-16OCT91

M37871 -UN-29MAY91

4. Remove spring pin (A), cap screw (B) and retainer plate (C) to remove PTO shifter shaft (D).

5. Remove spring pin (E) to remove external PTO shifter arm (F).

- A—Spring Pin
- B—Cap Screw
- C—Retainer Plate
- D—PTO Shifter Shaft
- E—Spring Pin
- F—PTO Shifter Arm



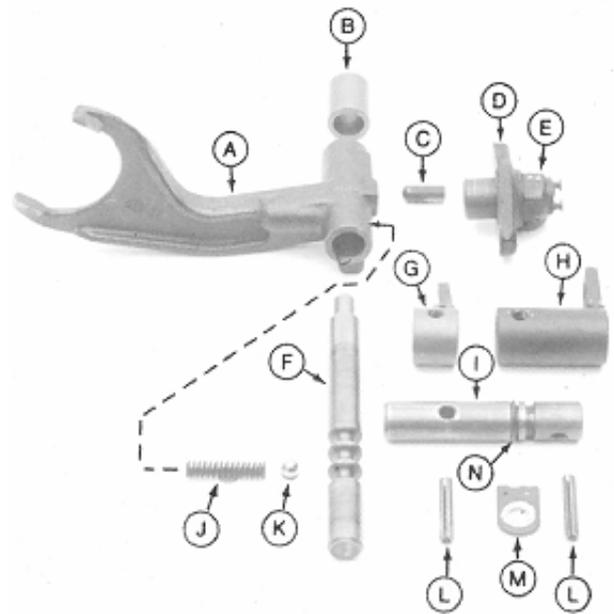
MX,HU,5010,66 -19-16OCT91

M37872 -UN-29MAY91

## Transaxle/Repair PTO Shift Fork Assembly

6. Separate PTO shift fork assembly by first removing rear collar (B), then PTO fork shaft (F), then spring (J) and ball (K).
7. Inspect all PTO shift components—replace if required.
8. Install external PTO shift arm (H) on PTO shifter shaft (I).
9. Install new O-ring (N) and coat with grease.
10. Install spring (J), ball (K), and PTO fork shaft (F) into PTO shift fork (A).
11. Install rear collar (B) on end of PTO fork shaft (F).

|  |                                  |
|--|----------------------------------|
| <b>A</b> —PTO Shift Fork                     | <b>H</b> —External PTO Shift Arm |
| <b>B</b> —Rear Collar                        | <b>I</b> —PTO Shifter Shaft      |
| <b>C</b> —Switch Pin                         | <b>J</b> —Spring                 |
| <b>D</b> —Switch Mounting Bracket and Gasket | <b>K</b> —Ball                   |
| <b>E</b> —Switch                             | <b>L</b> —Spring Pin             |
| <b>F</b> —PTO Fork Shaft                     | <b>M</b> —Retainer Plate         |
| <b>G</b> —Internal PTO Shift Arm             | <b>N</b> —O-Ring                 |



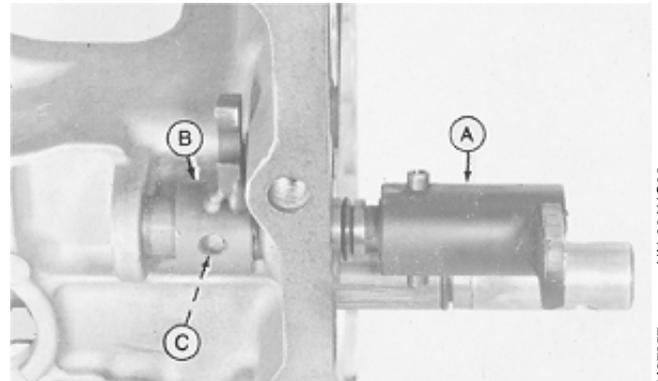
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MX,HU,5010,67 -19-16OCT91

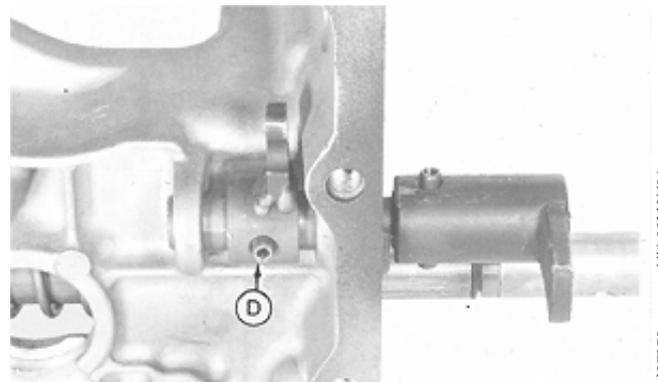
12. Install external PTO shift arm assembly (A) through case, through internal PTO shift arm (B) into case mounting hole while aligning spring pin holes (C).

13. Install spring pin (D).

|                                       |
|---------------------------------------|
| <b>A</b> —External Shift Arm Assembly |
| <b>B</b> —Internal PTO Shift Arm      |
| <b>C</b> —Spring Pin Holes            |
| <b>D</b> —Spring Pin                  |



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M37957



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M37958

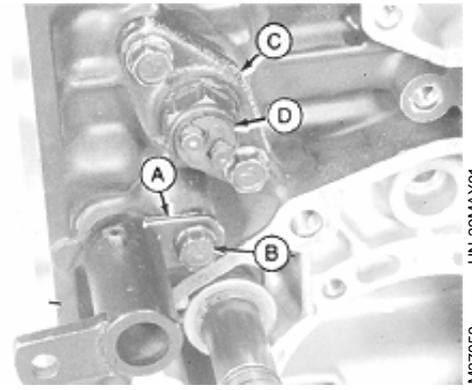
MX,HU,5010,68 -19-16OCT91

Transaxle/Repair PTO Shift Fork Assembly

14. Install shifter shaft retaining plate (A) and cap screw (B).

15. Install switch mounting bracket and gasket (C), then install switch (D) in bracket.

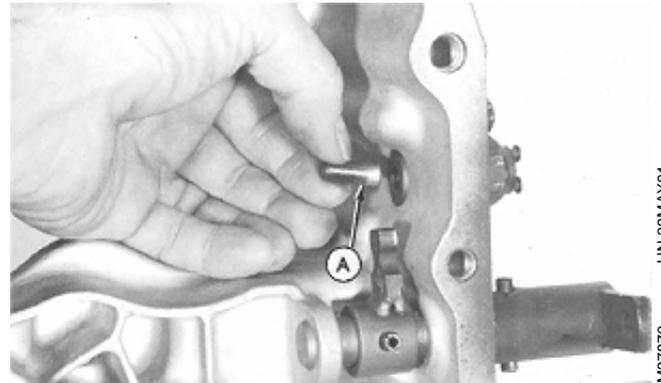
- A—Retaining Plate
- B—Cap Screw
- C—Switch Mounting Bracket and Gasket
- D—Switch



MX,HU,5010,69 -19-16OCT91

M37959 -UN-29MAY91

16. Install PTO select switch pin (A).



MX,HU,5010,70 -19-16OCT91

M37870 -UN-29MAY91

## REPAIR PTO REDUCTION SHAFT ASSEMBLY

1. Inspect PTO reduction shaft (A), bearings (B and E), snap rings (D), and 35-tooth reduction gear (C)—replace components as required.

2. Pull bearings (B and E) off shaft using a knife-edge puller.

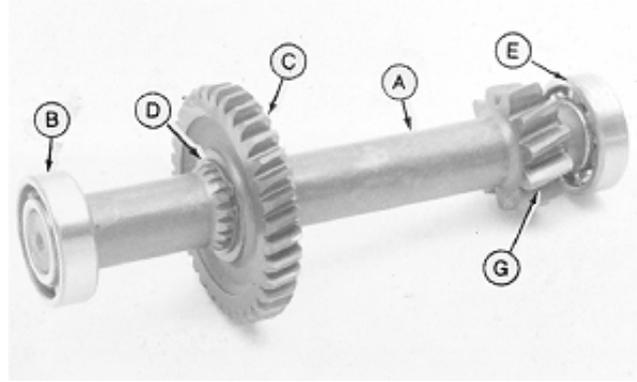
3. Remove two snap rings (D), one on each side, to remove 35-tooth reduction gear (C) from shaft splines.

4. Install 35-tooth reduction gear (C) on shaft splines and fasten with two snap rings (D).

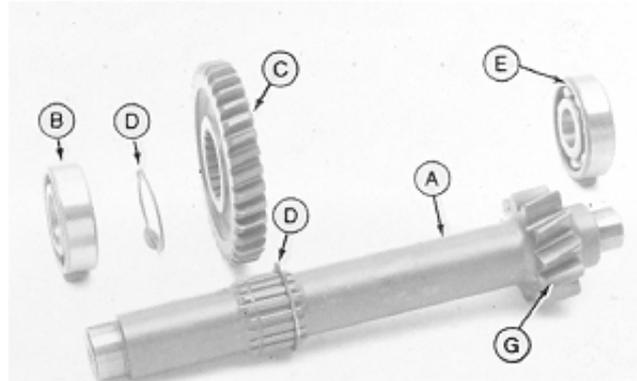
5. On 655, 755/756 and 855/856 Tractors, install bearings (B and E) on ends of shaft.

**IMPORTANT: On 955 Tractors only, end bearing (E) has a thrust sleeve (F). Install this thrust sleeve towards 11-tooth reduction shaft transfer gear (G)—thrust sleeve (F) holds bearing in its case bore.**

- A—PTO Reduction Shaft
- B—Bearing
- C—Gear
- D—Snap Ring (2 used)
- E—Bearing
- F—Thrust Sleeve
- G—Reduction Shaft Transfer Gear



-UN-12MAR90  
M48521



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M48522



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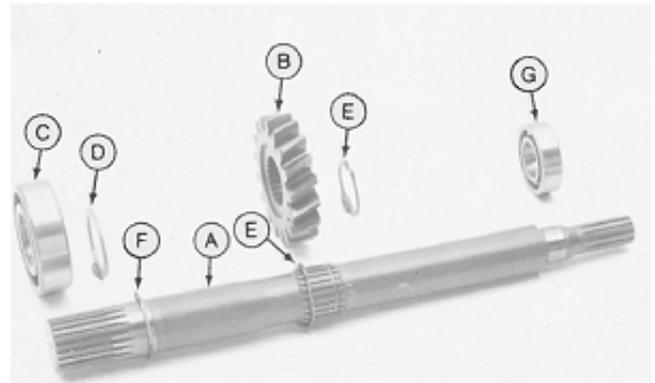
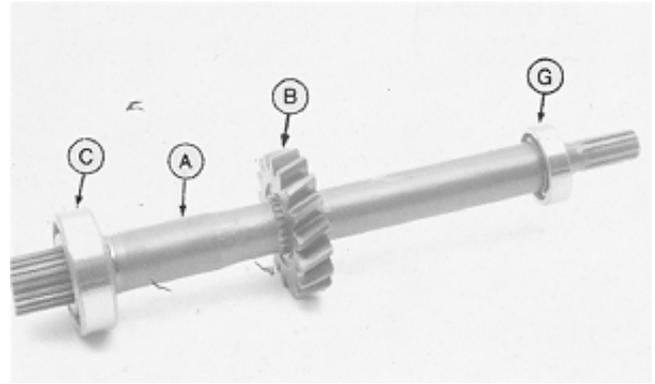
MX,HU,5010,71 -19-16OCT91

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## REPAIR MAIN PTO SHAFT ASSEMBLY

1. Inspect main PTO shaft (A), main PTO input gear (B), and bearings (C and G).
2. Disassemble and repair as required. Remove bearings (C and G) from shaft using a knife-edge puller.
3. Inspect and replace snap rings (E and F) as required.
4. Install main PTO input gear (B) (19 teeth on 655, 755/756, and 855/856 tractors—17 teeth on 955 tractors) on shaft with two snap rings (E).
5. Install snap ring (F) to shaft with washer (D) and large bearing (C).
6. Install small bearing (G).

A—Main PTO Shaft  
B—Gear  
C—Large Bearing  
D—Flat Washer  
E—Snap Ring (2 used)  
F—Snap Ring  
G—Small Bearing

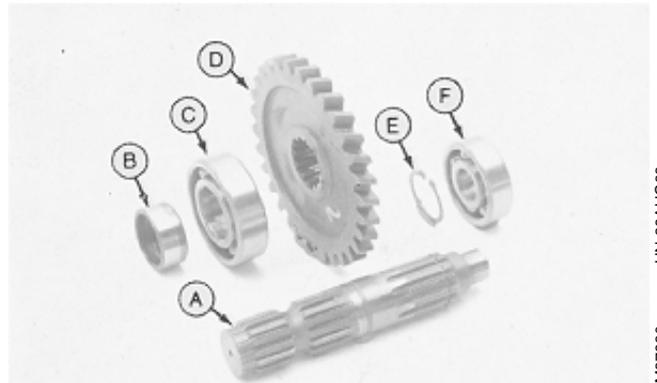
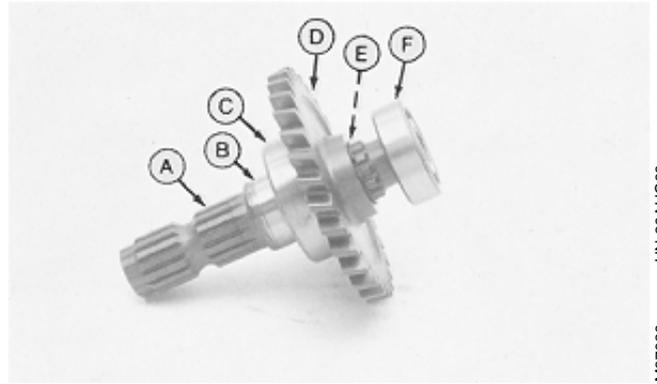


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## REPAIR MID PTO SHAFT ASSEMBLY

1. Inspect mid PTO shaft assembly for wear or damage.
2. Disassemble shaft if required. Pull bearing (F) from shaft using a knife-edge puller.
3. Remove snap ring (E) and drive gear (D).
4. Remove bearing (C) and oil seal wear sleeve (B) together. Discard oil seal wear sleeve.
5. Install 30-tooth mid PTO final drive gear (D) on shaft (A) with hub side of gear to snap ring groove. Install snap ring (E).
6. Install bearing (C). Apply grease to inside of oil seal wear sleeve (B). Install sleeve with chamfer to bearing. Use a knife-edge puller to push oil seal wear sleeve (B), bearing (C), and gear (D) up against snap ring (E).
7. Install bearing (F).

- A—Mid PTO Shaft
- B—Oil Seal Wear Sleeve
- C—Bearing
- D—Gear
- E—Snap Ring
- F—Bearing



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M37930 -UN-29AUG88

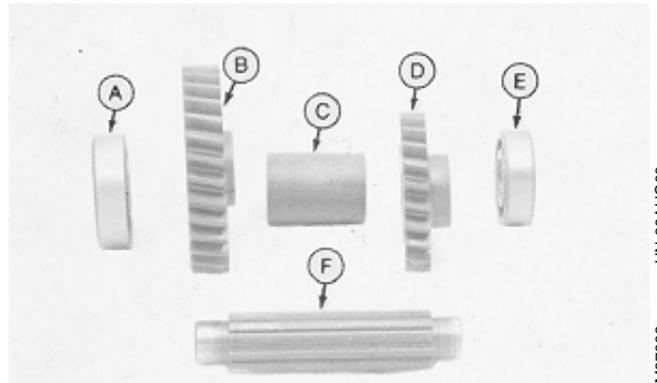
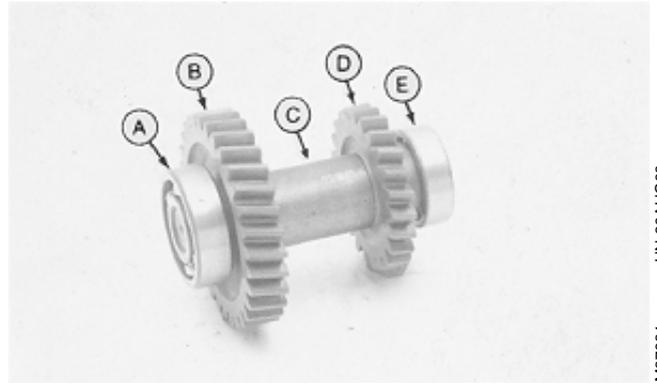
MX,HU,5010,73 -19-16OCT91

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10  
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## REPAIR REDUCTION SHAFT ASSEMBLY

1. Inspect reduction shaft assembly. Disassemble as required.
2. Remove large bearing (A) and small bearing (E) from the shaft using a knife-edge puller. Remove reduction gears (B and D) and collar (C).
3. Assemble collar (C) onto shaft (F).
4. Install 31-tooth hi-range reduction gear (B) and lo-range reduction gear (D) (23 teeth on 655, 755/756, and 855/856 tractors—21 teeth on 955 tractors). The hub side of both gears must face small bearing (E) end of shaft.
5. Install large bearing (A) and small bearing (E).

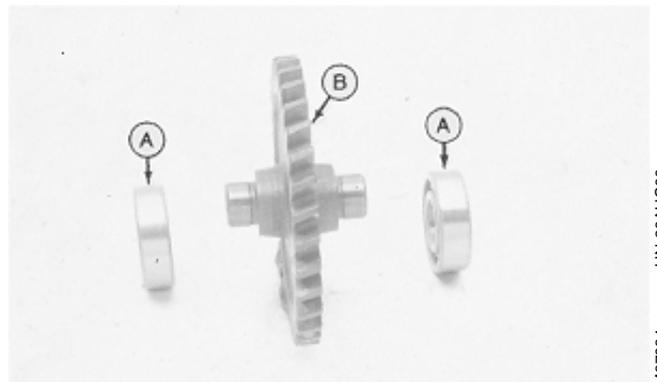
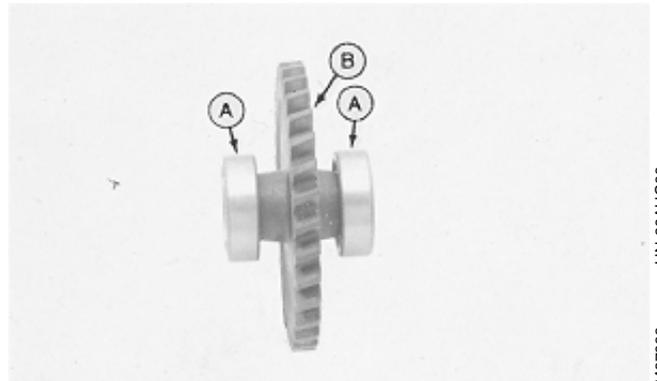
A—Large Bearing  
 B—Hi-Range Reduction Gear  
 C—Collar  
 D—Lo-Range Reduction Gear  
 E—Small Bearing



MX,HU,5010,74 -19-16OCT91

## REPAIR MID PTO TRANSFER GEAR ASSEMBLY

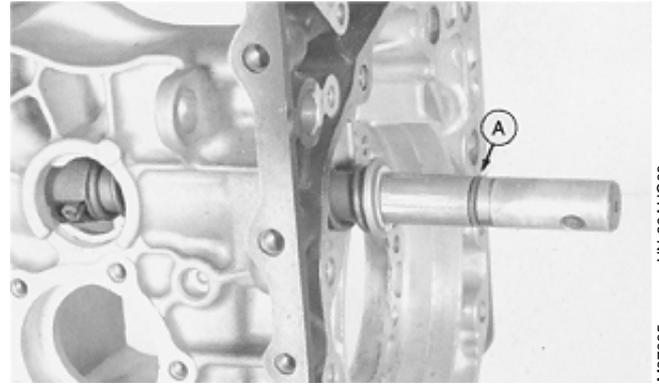
1. Inspect transfer gear (B) bearings (A). Disassemble, if required.
2. Remove two bearings (A) using a knife-edge puller—bearings are identical.
3. Press new bearings (A) on 32-tooth mid PTO transfer gear (B).



MX,HU,5010,75 -19-16OCT91

## REPAIR DIFFERENTIAL LOCK LEVER ASSEMBLY

1. Remove and discard O-ring (A).



Left Side View

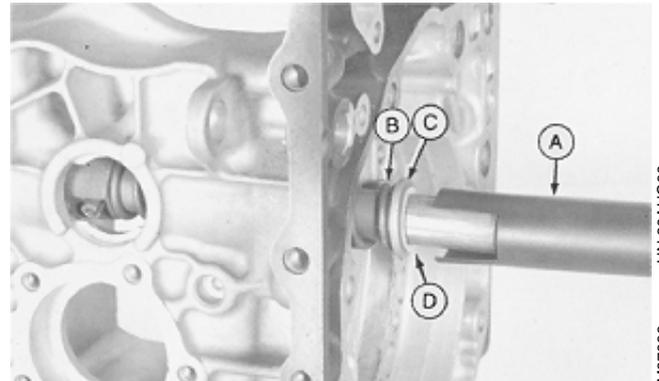
MX,HU,5010,76 -19-16OCT91

M37935 -JUN-29AUG88

2. Depress spring (B) with washer (C) using special tool (A).

3. Remove snap ring (D) from its groove while pressing on spring washer (C) with special tool, then ease off on tool pressure as you remove snap ring from shaft.

A—Special Tool  
B—Spring  
C—Washer  
D—Snap Ring

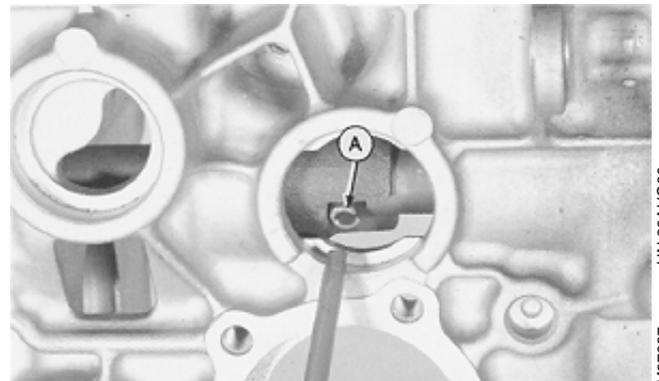


Left Side View

MX,HU,5010,77 -19-16OCT91

M37936 -JUN-29AUG88

4. Remove spring pin (A) from center of shaft inside the case.



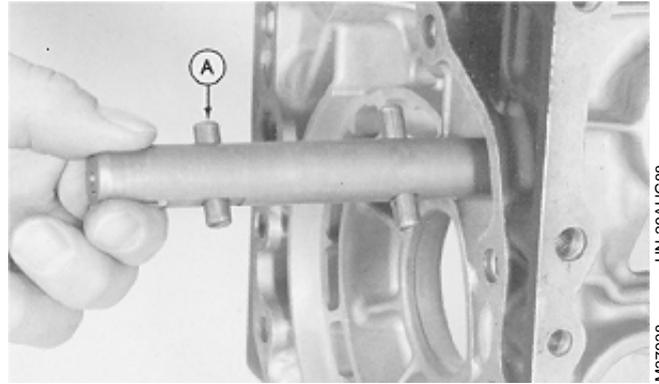
Front View

MX,HU,5010,78 -19-16OCT91

M37937 -JUN-29AUG88

## Transaxle/Repair Differential Lock Lever Assembly

5. Remove shifter shaft from the side of the case. Inspect spring pin (A) for wear or damage—replace if required.



Right Side View

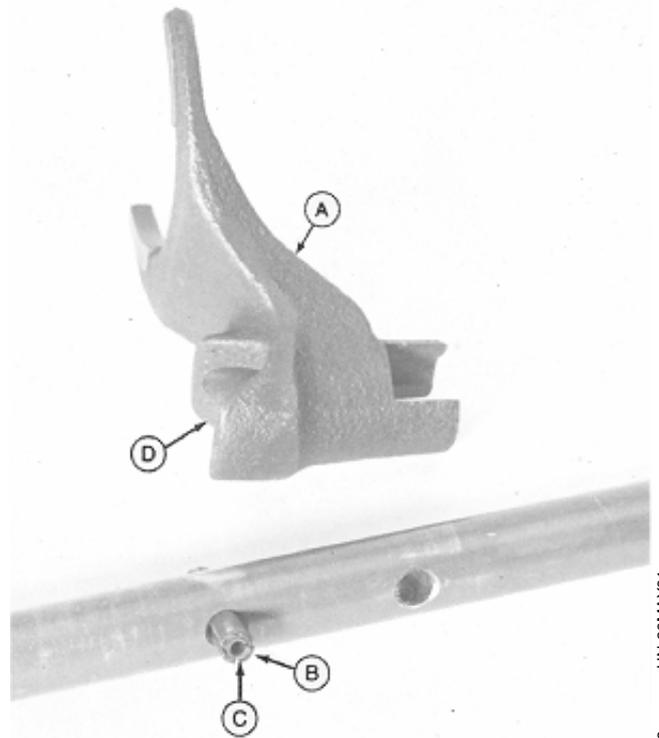
MX,HU,5010,79 -19-16OCT91

M37938  
-UN-29AUG88

### B and C-Spring Pins D-Groove

6. Inspect shifter fork (A)—replace if required.
7. Inspect the double spring pins (B) and (C), one inside the other. Replace if required.
8. Install large outside spring pin (B) with open side away from groove (D) in shift fork (A). Install small spring pin (C) inside large spring pin (B) with open side towards groove (D) in shifter fork (A).

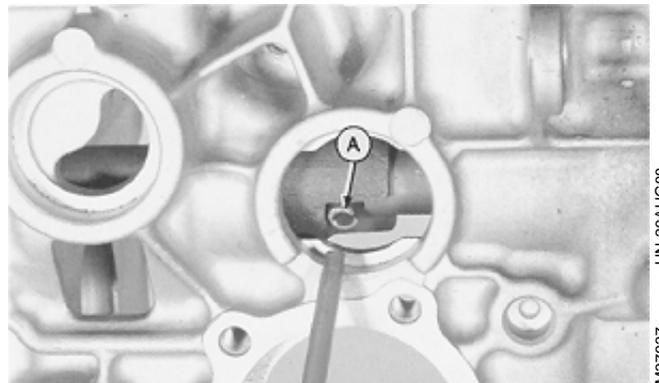
A—Shifter Fork



MX,HU,5010,80 -19-16OCT91

M37939  
-UN-29MAY91

9. Install shifter shaft in case, through shift fork.
10. Install spring pin (A) with shift fork in position.



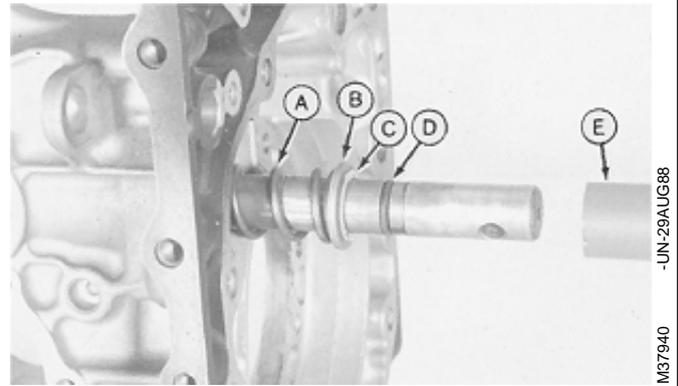
Front View

MX,HU,5010,81 -19-16OCT91

M37937  
-UN-29AUG88

11. Install spring (A) and flat washer (B) on the shaft.
12. Install snap ring (C) on end of shaft; then, use the un-notched end of special tool used earlier or a 1 in. ID pipe (E) to push snap ring, washer, and spring inward until snap ring seats in its groove in the shaft.
13. Install new O-ring (D).
14. Install external shift arm and spring pin.

- A—Spring
- B—Flat Washer
- C—Snap Ring
- D—O-Ring
- E—Pipe



Left Side View

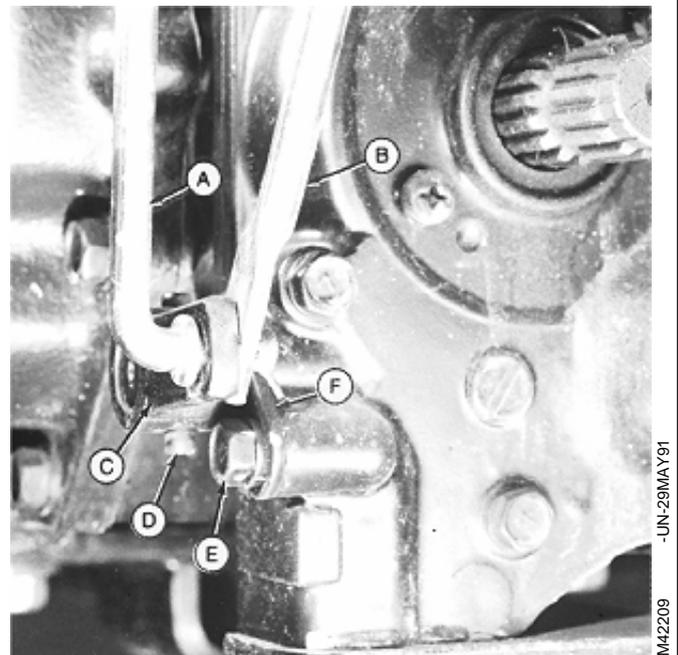
MX,HU,5010,82 -19-16OCT91

## REPAIR RANGE SHIFTER SHAFT O-RING

*NOTE: O-ring can be replaced without transaxle disassembly.*

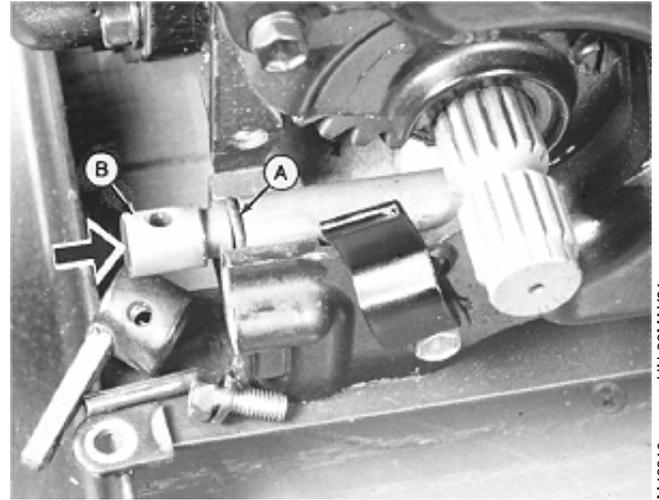
1. Drain transaxle. Oil capacity is approximately 17 L (4.5 gal).
2. Move 2-speed range shifter to Lo-Range.
3. Remove cotter pin to disconnect shifter link (A) and stop link (B) from external shifter arm (C), located at right, front corner of transaxle, near mid PTO output shaft.
4. Remove spring pin (D) to remove external shifter arm (C).
5. Remove cap screw (E) and retainer plate (F).

- A—Shifter Link
- B—Stop Link
- C—Shifter Arm
- D—Spring Pin
- E—Cap Screw
- F—Retainer Plate



MX,HU,5010,83 -19-16OCT91

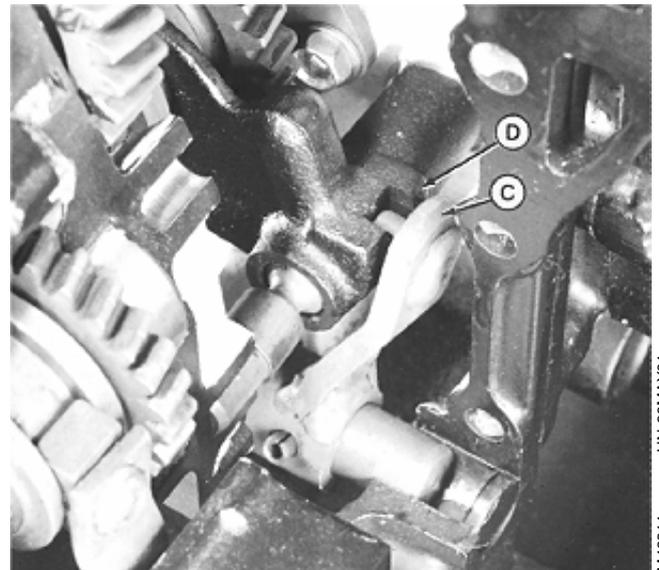
6. To replace O-ring (A), push straight in on shifter shaft (B) until it stops, without turning shaft.



Training Aid Cutaway View—Right Side

This will disengage the internal shifter arm (C) from the shifter fork (D).

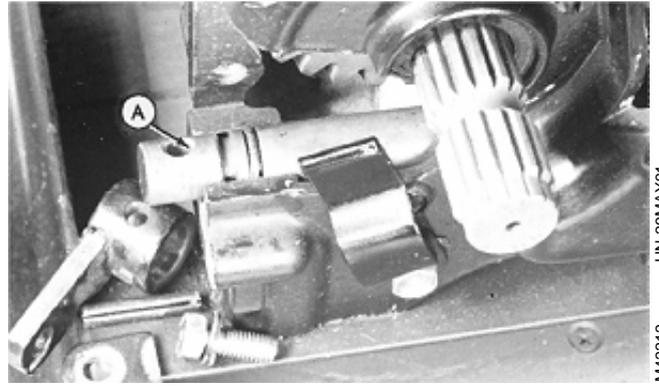
- A—O-Ring
- B—Shifter Shaft
- C—Internal Shifter Arm
- D—Shifter Fork



Training Aid Cutaway View—Left Side

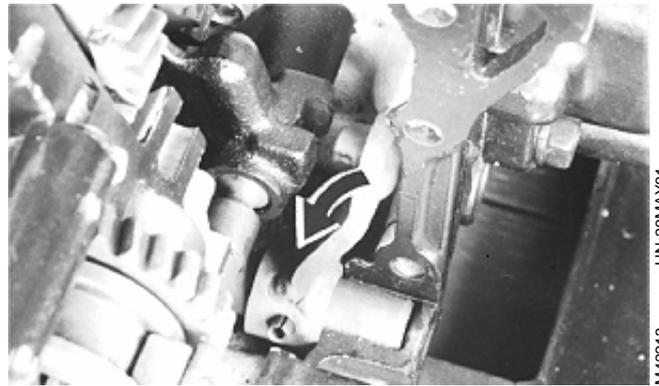
MX,HU,5010,84 -19-16OCT91

7. Scribe a mark on outside case (cutaway) where drilled hole (A) meets case.



Training Aid Cutaway View—Right Side

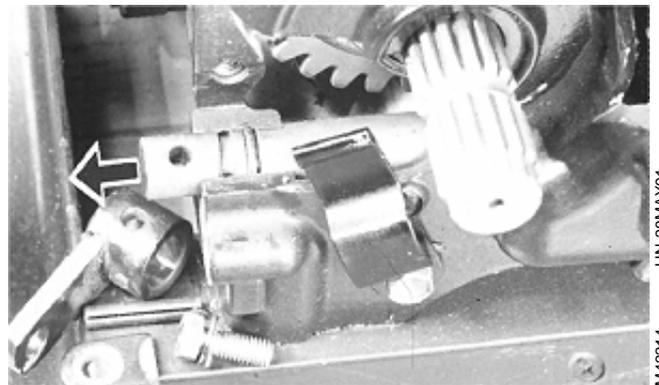
8. Turn end of shifter shaft to the right to rotate internal shifter arm towards front of case.



Training Aid Cutaway View—Left Side

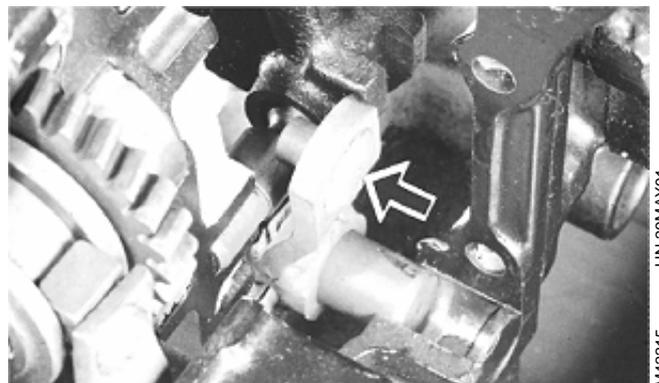
MX,HU,5010,85 -19-16OCT91

9. Pull shaft outward as far as it will go.



Training Aid Cutaway View—Right Side

You may have to turn shaft left and right slightly to ensure internal arm is as far as it can go.



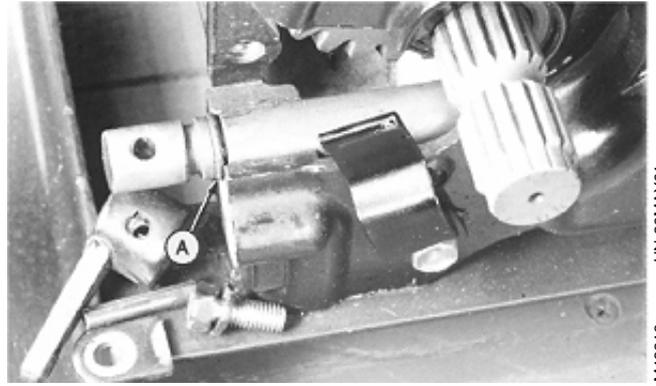
Training Aid Cutaway View—Left Side

MX,HU,5010,86 -19-16OCT91

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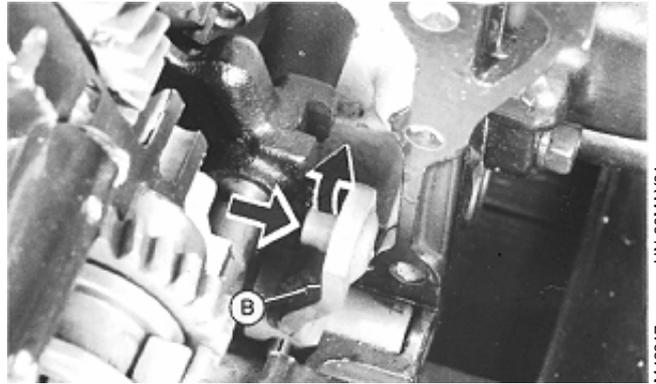
## Transaxle/Repair Range Shifter Shaft O-Ring

10. Remove O-ring (A) with a pick and discard. Grease new O-ring and install on shaft.



Training Aid Cutaway View—Right Side

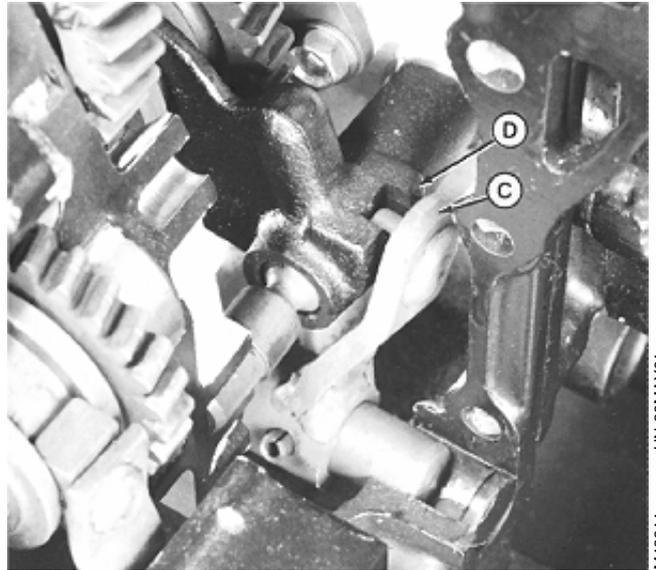
11. Push shaft in so internal shifter arm (B) can be rotated to the rear to align with shifter fork slot (turn left on end of shaft until spring pin hole aligns with mark on case, scribed earlier).



Training Aid Cutaway View—Left Side

MX,HU,5010,87 -19-16OCT91

12. Pull straight out on shifter shaft to engage pin of internal shifter arm (C) in slot of shifter fork (D).



Training Aid Cutaway View—Left Side

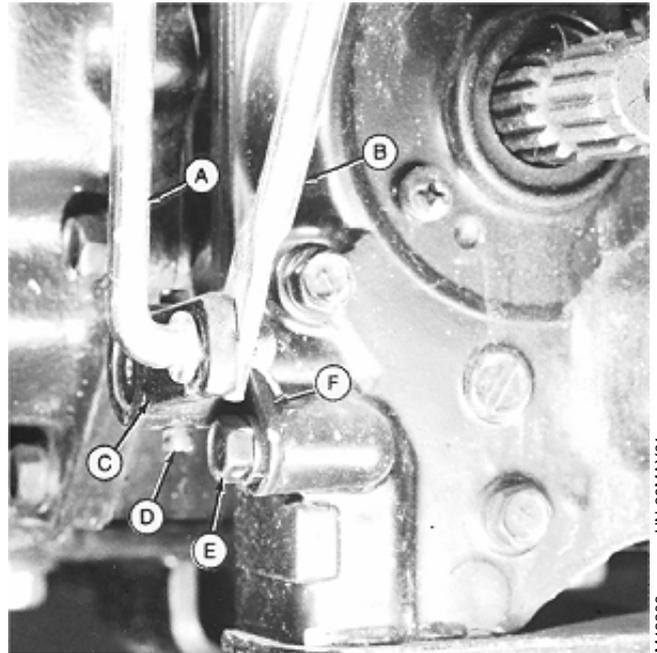
MX,HU,5010,88 -19-16OCT91

13. Install retainer plate (F) and fasten with cap screw (E).

14. Install external shifter arm (C) and fasten with spring pin (D).

15. Connect shifter link (A) and stop link (B). Fasten them with a new cotter pin.

- A—Shifter Link
- B—Stop Link
- C—External Shifter Arm
- D—Spring Pin
- E—Cap Screw
- F—Retainer Plate



M42209 -UN-29MAY91

MX,HU,5010,89 -19-16OCT91

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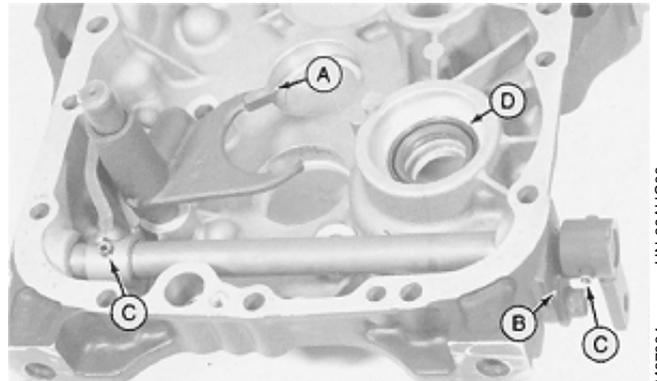
## REPAIR RANGE SHIFT FORK ASSEMBLY

1. Inspect range shifter fork (A) for wear. Replace if required.

2. Remove retaining plate (B) and two spring pins (C) to disassemble shaft.

3. Remove and discard mid PTO shaft oil seal (D). Install new oil seal from inside case cover.

- A—Shifter Fork
- B—Retainer Plate
- C—Spring Pin (2 Used)
- D—Oil Seal



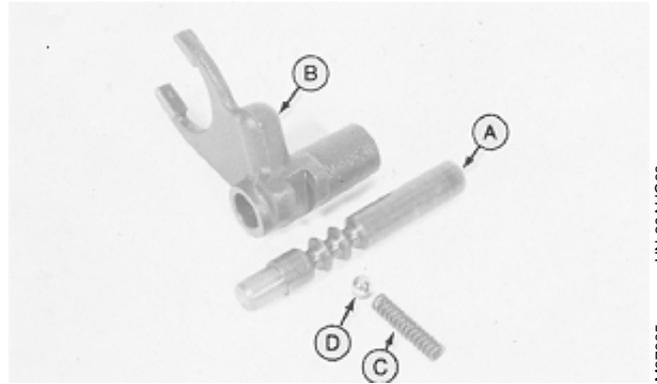
M37964 -UN-29AUG88

MX,HU,5010,90 -19-16OCT91

4. Remove and inspect fork shaft (A), shifter fork (B), spring (C) and ball (D)—replace if required.

5. Assemble shaft and shifter fork with spring and ball.

- A—Fork Shaft
- B—Shifter Fork
- C—Spring
- D—Ball



MX,HU,5010,91 -19-16OCT91

M37965 -UN-29AUG88

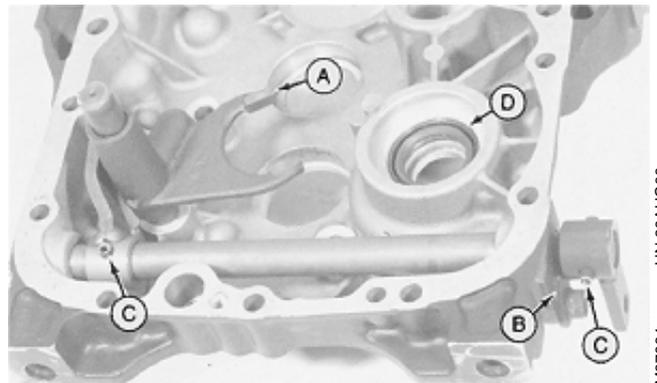
6. Install new O-ring on end shaft.

7. Install internal shifter arm pin into slot of shifter fork (A).

8. Install shifter shaft into front case cover and internal shifter arm.

9. Install external shifter arm and fasten both arms with spring pins (C) and external retainer plate (B).

- A—Shifter Fork
- B—Retainer Plate
- C—Spring Pin (2 Used)
- D—Oil Seal

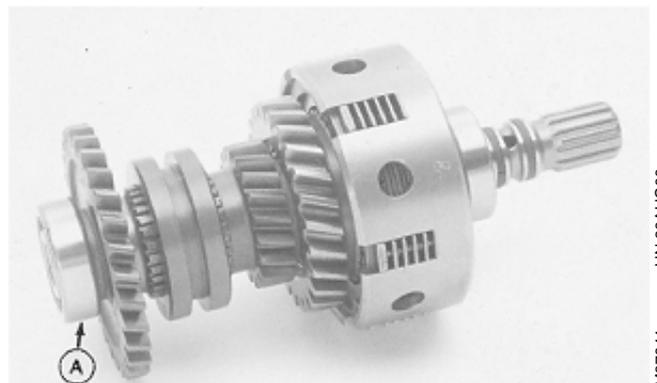


MX,HU,5010,92 -19-16OCT91

M37964 -UN-29AUG88

## REPAIR PTO CLUTCH ASSEMBLY

1. Remove bearing (A) using a knife-edge puller.



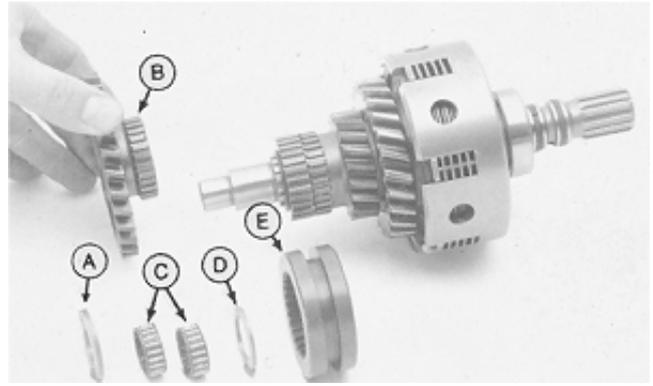
MX,HU,5010,93 -19-16OCT91

M37941 -UN-29AUG88

2. Remove grooved washer (A). Remove clutch shaft mid PTO drive gear (B) with two needle bearings (C).

3. Remove grooved washer (D) and shift collar (E).

- A—Grooved Washer
- B—Gear
- C—Needle Bearing (2 Used)
- D—Grooved Washer
- E—Shift Collar



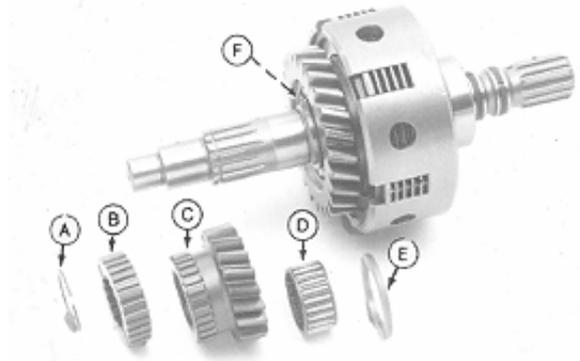
MX,HU,5010,94 -19-16OCT91

M37942 -UN-08SEP88

4. Remove snap ring (A), splined collar (B), clutch shaft rear PTO drive gear (C) with needle bearing (D), and grooved washer (E).

5. Remove snap ring (F).

- A—Snap Ring
- B—Splined Collar
- C—Gear
- D—Needle Bearing
- E—Grooved Washer
- F—Snap Ring



MX,HU,5010,95 -19-16OCT91

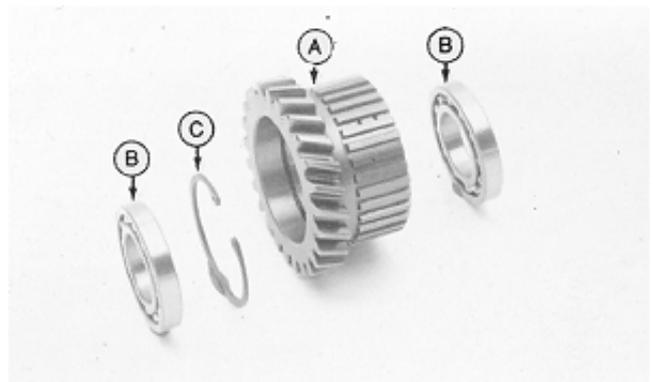
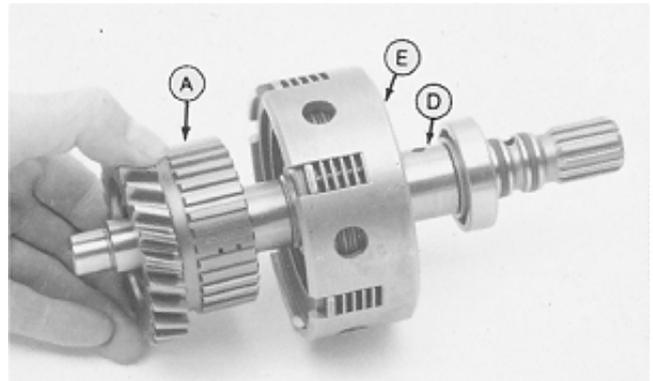
M37943 -UN-19JUL91

6. Remove clutch gear (A).

7. Inspect bearings (B) and snap ring (C). Remove and replace as required.

8. Remove the shaft (D) from the PTO cylinder (E).

- A—Clutch Gear
- B—Bearings
- C—Snap Ring
- D—Shaft
- E—PTO Clutch Cylinder



MX,HU,5010,96 -19-16OCT91

M37944 -UN-08SEP88

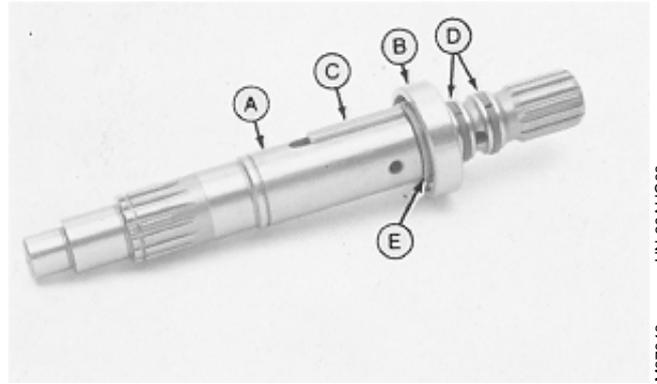
M37945 -UN-05APR90

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9. Inspect PTO clutch shaft (A), bearing (B), and key (C). Replace as required. Use a knife-edge puller to remove the bearing.

10. Replace two fiber seal rings (D).

- A—Clutch Shaft
- B—Bearing
- C—Key
- D—Seal Rings (2 Used)
- E—Washer



MX,HU,5010,97 -19-16OCT91

M37946 -UN-29AUG88

11. Hold all the clutch disks together then measure the space between the bottom separator plate and the PTO cylinder. If space measures 4.7 mm (0.185 in.) or more, replace all the clutch disks.



MX,HU,5010,98 -19-16OCT91

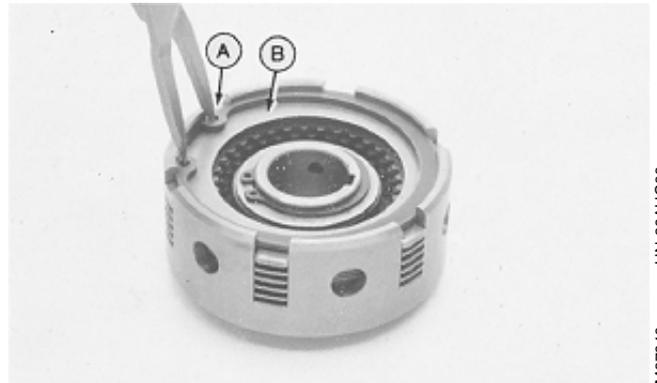
M37947 -UN-29AUG88

12. Disassemble clutch if required. Remove large snap ring (A). Lift top plate (B) off clutch assembly.

Measure thickness of the top plate. A minimum thickness is required and the plate must be flat.

**MINIMUM THICKNESS SPECIFICATION**

Clutch Top Plate . . . . . 2.9 mm (0.114 in.)

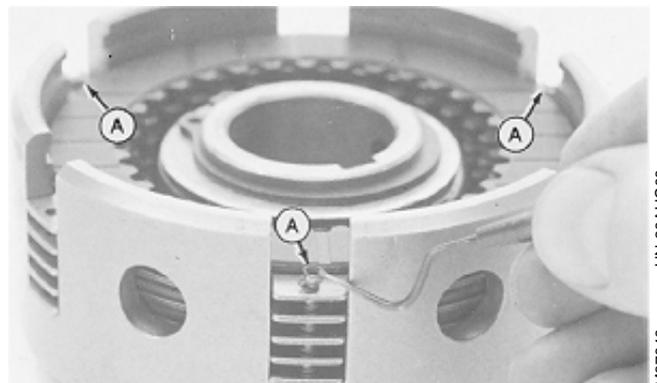


MX,HU,5010,99 -19-16OCT91

M37948 -UN-29AUG88

13. Remove 15 small springs (A) as the disks are removed. The springs are located on three sides of the clutch assembly.

655, 755/756, 855/856 . . . . . 15 Springs  
 955 . . . . . 18 Springs



MX,HU,5010,100 -19-16OCT91

M37949 -UN-29AUG88

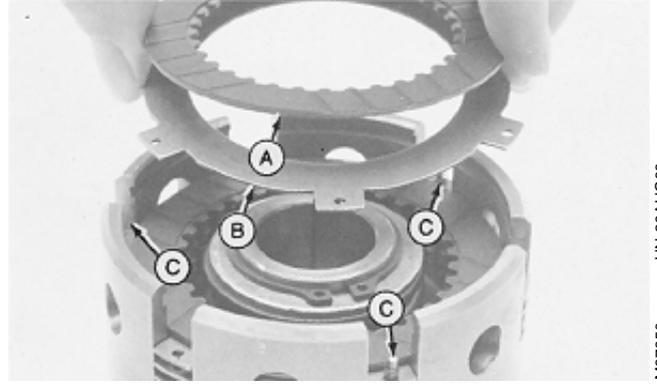
14. Remove clutch disks (A) and separator plates (B).  
Remove three pins (C).

Measure clutch plates and separator disks for minimum thickness requirement. The separator disks must be flat.

**MINIMUM THICKNESS SPECIFICATION**

Clutch Disk . . . . . 1.9 mm (0.075 in.)  
Separator Plate . . . . . 1.0 mm (0.039 in.)

655, 755/756, 855/856 . . . . . 6 clutch plates, 5 disks  
955 . . . . . 7 clutch plates, 6 disks



M37950 -UN-29AUG88

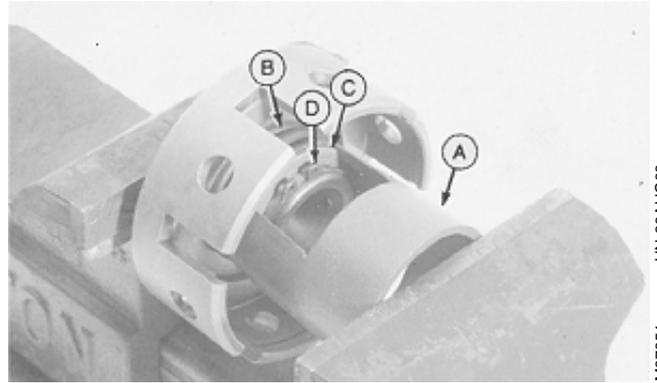
MX,HU,5010,101 -19-16OCT91

15. Disassemble clutch piston by placing piston and fabricated special tool (A) in a vise.

16. Tighten vise to compress spring (B) and flat washer (C) to remove snap ring (D).

17. Slowly back off on vise to remove spring (B).

- A—Special Tool
- B—Spring
- C—Flat Washers
- D—Snap Ring



M37951 -UN-29AUG88

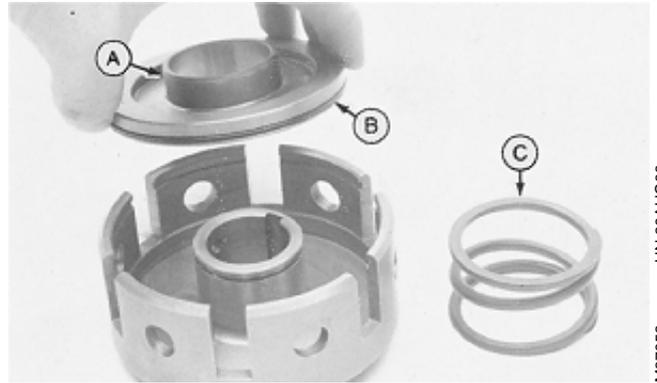
MX,HU,5010,102 -19-16OCT91

18. Remove piston (A). Piston must be free of nicks and scratches; if not, replace it.

19. Check free length of piston return spring (C), replace if required.

**PISTON RETURN SPRING SPECIFICATION**

Minimum Free Length . . . . . 29 mm (1.14 in.)  
Minimum Working Load . . . . . 17.5 mm at 540 N  
(0.689 in. at 121 lb.)



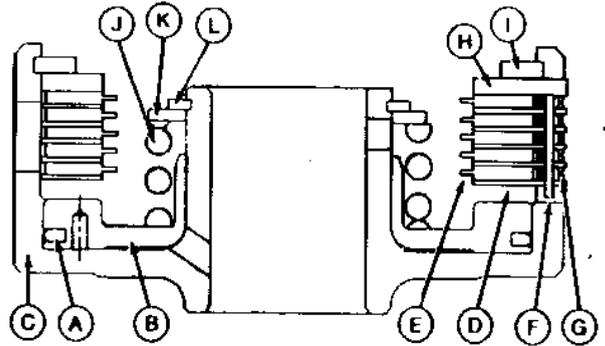
M37952 -UN-29AUG88

MX,HU,5010,103 -19-16OCT91

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### CROSS-SECTION VIEW—PTO CLUTCH

- |   |  |
|---|--|
| A—O-Ring  | F—Pin (3 used)   |
| B—Clutch Piston   | G—Spring (15 used on<br>6/7/855/856—18 used<br>on 955) |
| C—Clutch Cylinder   | H—Plate  |
| D—Plate (6 used on<br>6/7/855/856—7 used<br>on 955)       | I—Snap Ring  |
| E—Clutch Disk (5 used<br>on 6/7/855/856—6<br>used on 955) | J—Spring   |
|   | K—Washer   |
|   | L—Snap Ring  |

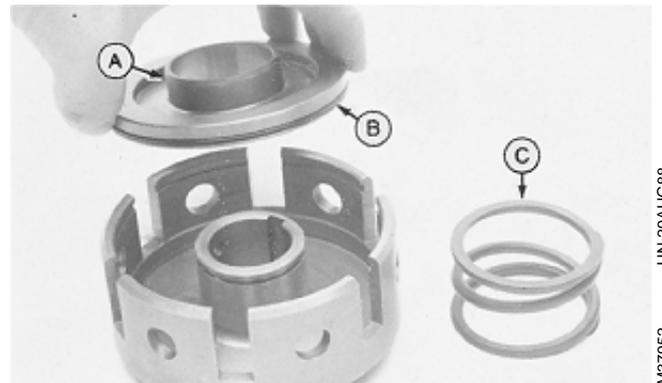


MX,HU,5010,104 -19-16OCT91

M43096 -UN-08JUL91

### ASSEMBLE PTO CLUTCH

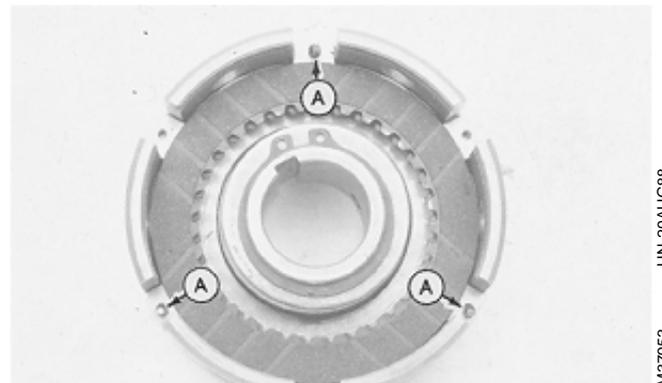
1. Install new O-ring (B). Lubricate piston (A) and O-ring and install.
2. Put piston return spring (C) on top of piston.



MX,HU,5010,105 -19-16OCT91

M37952 -UN-29AUG88

3. Use a vise, the special tool, snap ring and flat washer to compress and fasten return spring into clutch cylinder.
4. Install one of the thin separator plates into the bottom of the slots in the wall of the clutch cylinder.
5. Install the three pins (A).
6. Install one spring on each pin as each of the five clutch disks and five remaining separator plates are installed alternately. Remember, there are seven separator plates and six clutch disks on 955 units.

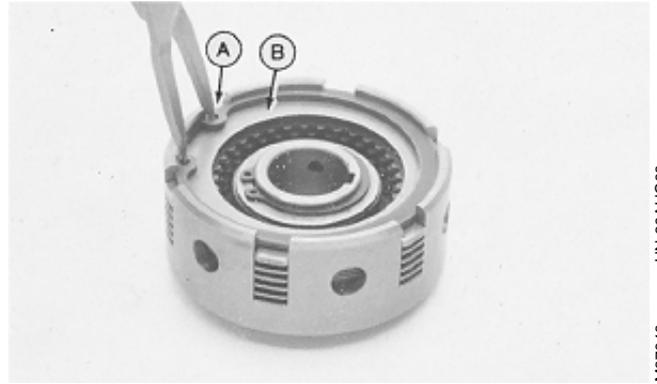


MX,HU,5010,106 -19-16OCT91

M37953 -UN-29AUG88

**IMPORTANT:** Position the snap ring (A) so that the open portion is against one of the sides of the cylinder wall.

7. Install the thick separator plate (B) last and fasten the assembly with snap ring (A).



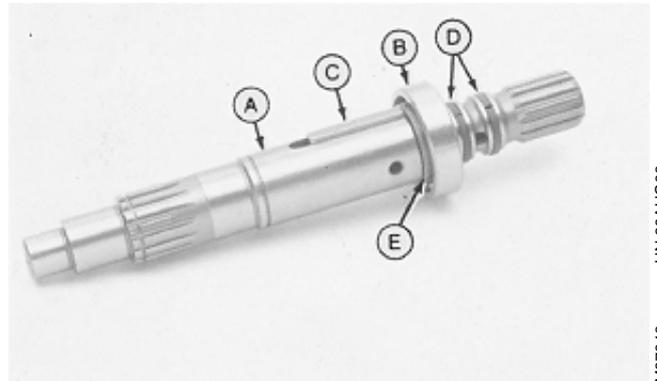
MX,HU,5010,107 -19-16OCT91

M37948 -UN-29AUG88

8. Put washer (E) on clutch shaft (A).

9. Install bearing (B), key (C) and two new fiber seals (D).

- A—Clutch Shaft
- B—Bearing
- C—Key
- D—Fiber Seals (2 used)
- E—Washer



MX,HU,5010,108 -19-16OCT91

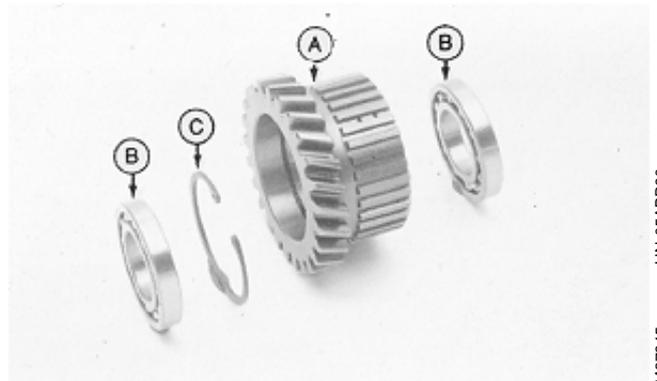
M37946 -UN-29AUG88

10. Assemble clutch gear (A) with snap ring (C) and two bearings (B).

11. Install shaft (D) into PTO clutch cylinder (E).

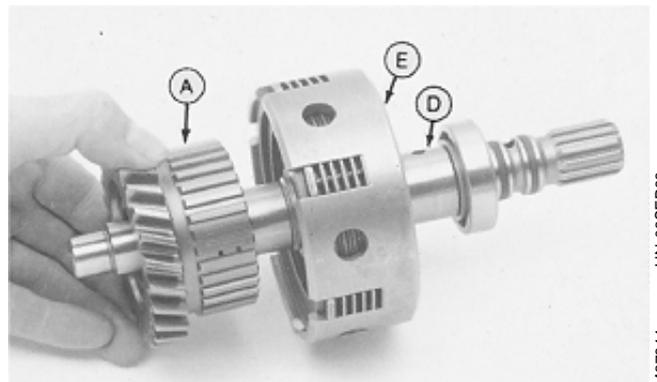
12. Install clutch gear assembly (A) (28 teeth on 655, 755/756, and 855/856 tractors—25 teeth on 955 tractors) on shaft and into splines of clutch disks.

- A—Clutch Gear
- B—Bearings
- C—Snap Ring
- D—Shaft
- E—PTO Clutch Cylinder



MX,HU,5010,109 -19-16OCT91

M37945 -UN-05APR90



MX,HU,5010,109 -19-16OCT91

M37944 -UN-08SEP88

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48

## Transaxle/Assemble PTO Clutch

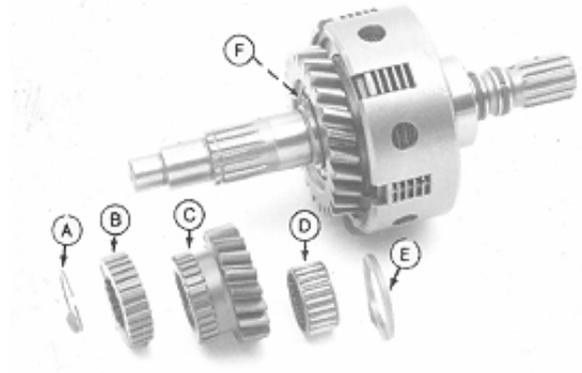
13. Install snap ring (F).

14. Put grooved washer (E) on the shaft with grooves away from snap ring.

15. Install bearing (D) in 19-tooth clutch shaft rear PTO drive gear (C) and put on shaft.

16. Install collar (B) and snap ring (A).

- A—Snap Ring
- B—Splined Collar
- C—Gear
- D—Needle Bearing
- E—Grooved Washer
- F—Snap Ring



MX,HU,5010,110 -19-16OCT91

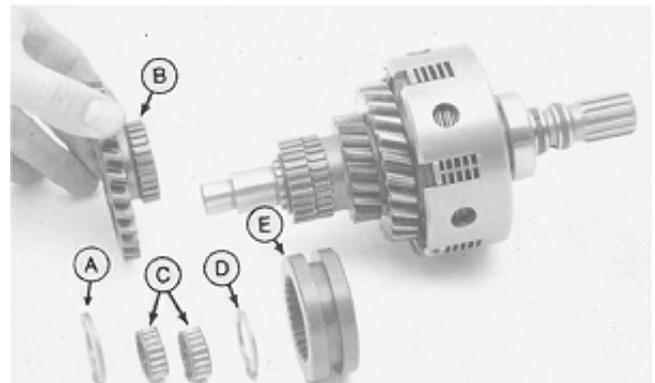
17. Install shift collar (E) over splines.

18. Install washer (D) with grooves away from snap ring.

19. Install two needle bearings (C) inside 29-tooth clutch shaft mid PTO drive gear (B) and install gear on shaft.

20. Install washer (A) on shaft with grooves facing gear.

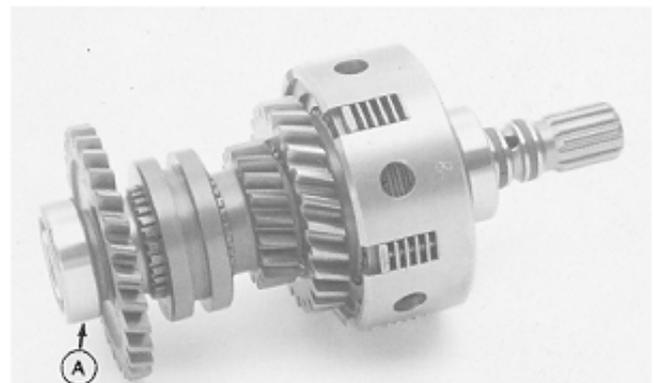
- A—Grooved Washer
- B—Gear
- C—Needle Bearing (2 Used)
- D—Grooved Washer
- E—Shift Collar



MX,HU,5010,111 -19-16OCT91

21. Install bearing (A).

The PTO clutch assembly is complete and ready for installation in the transaxle case.

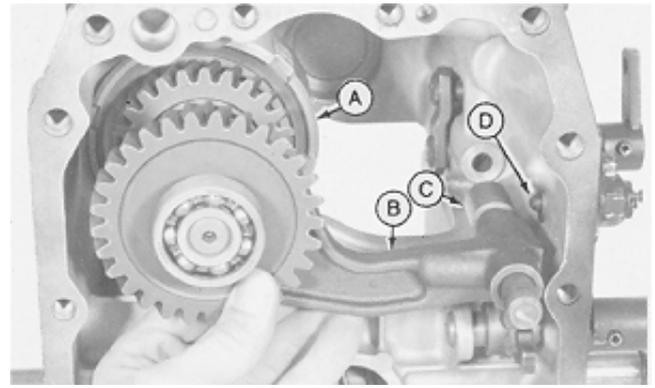


MX,HU,5010,112 -19-16OCT91

## INSTALL PTO CLUTCH ASSEMBLIES

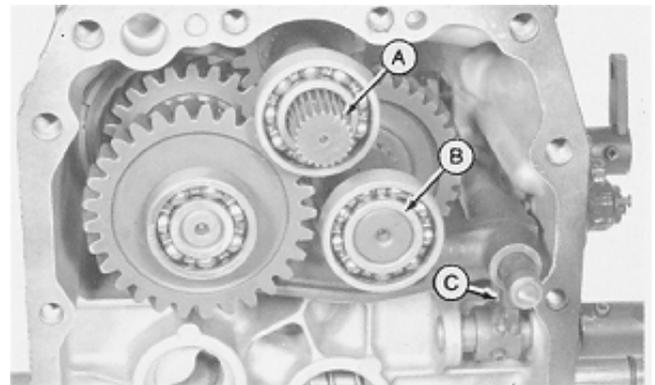
1. Hold PTO clutch assembly (A) in position, but DO NOT install.
2. Hold shift fork assembly (B) with collar (C) in position, but DO NOT install.
3. Install switch pin (D) if not already in place.

A—PTO Clutch  
 B—Shift Fork  
 C—Collar  
 D—Switch Pin



MX,HU,5010,113 -19-16OCT91

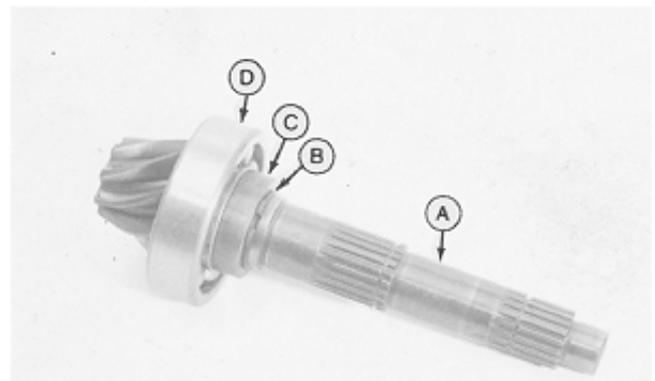
4. Put main PTO shaft (A) and then PTO reduction shaft (B) in position.
5. Engage internal shifter arm (C) in shift fork groove.
6. Install all shafts and PTO clutch assembly. Check for proper positioning of the shift fork assembly.



MX,HU,5010,114 -19-16OCT91

## REPAIR DIFFERENTIAL DRIVE SHAFT ASSEMBLY

1. Inspect drive shaft (A) and bearing (D)—replace if required.
2. Remove snap ring (B) and collar (C) first before pressing bearing off shaft, away from the worm gear (8 teeth on 655, 755/756, and 855/856 tractors—7 teeth on 955 tractors).
3. Assemble differential drive shaft bearing (D), collar (C), and snap ring (B) on shaft (A).

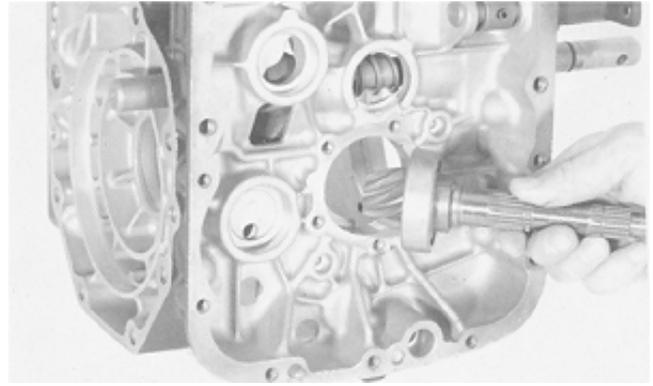


A—Drive Shaft  
 B—Snap Ring  
 C—Collar  
 D—Bearing

MX,HU,5010,115 -19-16OCT91

## INSTALL DIFFERENTIAL DRIVE SHAFT ASSEMBLY

1. Install differential drive shaft into case.

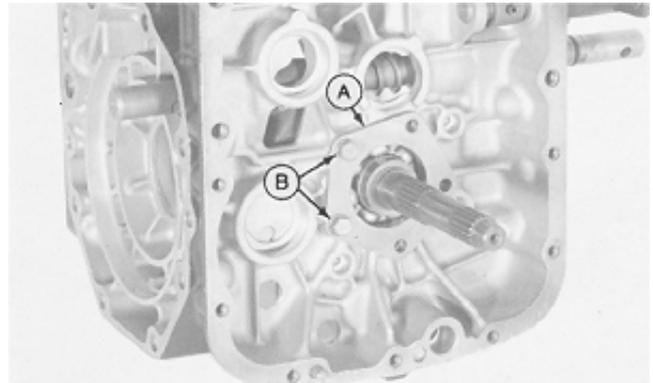


MX,HU,5010,116 -19-16OCT91

M37668 -UN-29AUG88

**IMPORTANT: You must pre-load bearing retainer as shown for proper installation.**

2. Fasten bearing retainer (A) with two cap screws (B) on the left side. Tighten the two screws to 26 N·m (19 lb-ft).
3. Install the remaining three cap screws and tighten to 26 N·m (19 lb-ft).



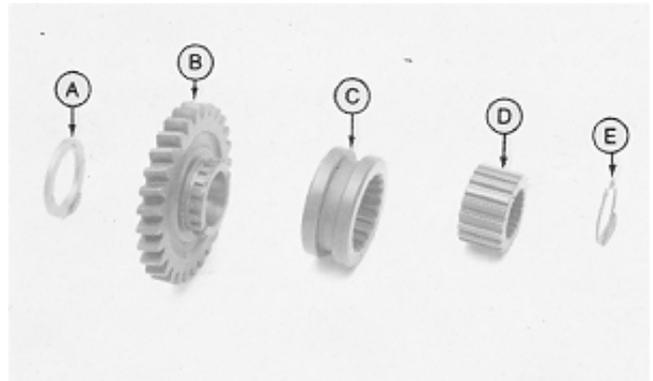
MX,HU,5010,117 -19-16OCT91

M37656 -UN-29AUG88

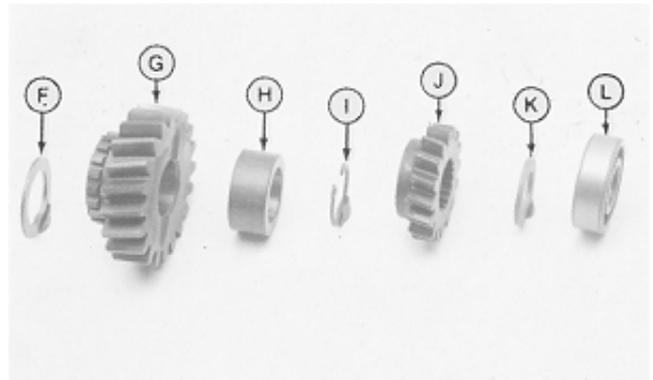
4. Install grooved washer (A) with grooves to the outside, lo-range drive gear (B) (28 teeth on 655, 755/756, and 855/856 tractors—30 teeth on 955 tractors), shift collar (C), splined collar (D), and snap ring (E).

5. Install washer (F), 20-tooth hi-range drive gear (G), collar (H), snap ring (I), 13-tooth MFWD drive gear (J), washer (K), and bearing (L).

- A—Grooved Washer
- B—Gear
- C—Shift Collar
- D—Splined Collar
- E—Snap Ring
- F—Washer
- G—Gear
- H—Collar
- I—Snap Ring
- J—Gear
- K—Washer
- L—Bearing



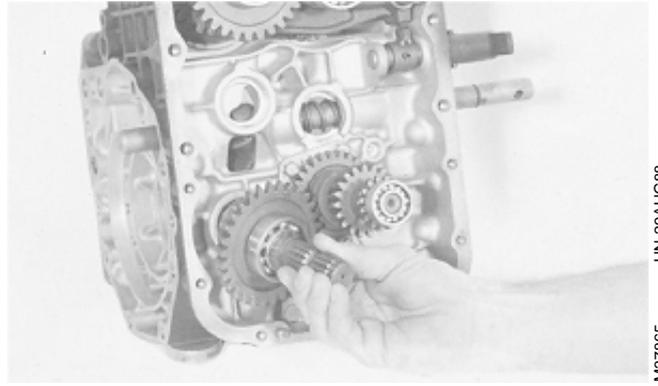
M37962 -UN-29AUG88



M37963 -UN-29AUG88

MX,HU,5010,118 -19-16OCT91

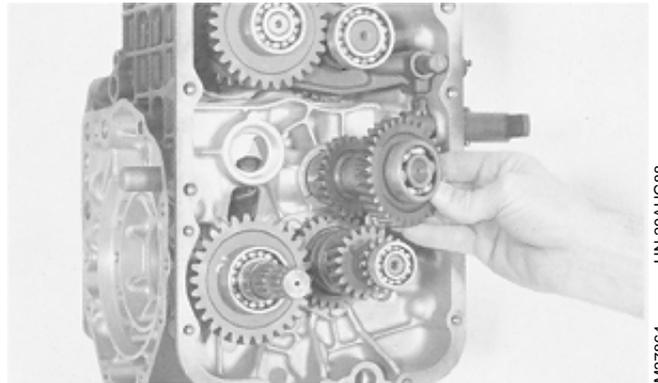
**INSTALL MID PTO SHAFT ASSEMBLY**



MX,HU,5010,119 -19-16OCT91

M37865 -UN-29AUG88

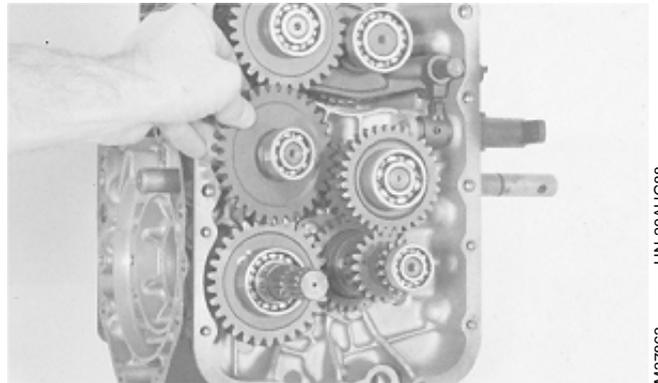
**INSTALL HI/LO REDUCTION SHAFT ASSEMBLY**



MX,HU,5010,120 -19-16OCT91

M37864 -UN-29AUG88

**INSTALL MID PTO TRANSFER GEAR ASSEMBLY**



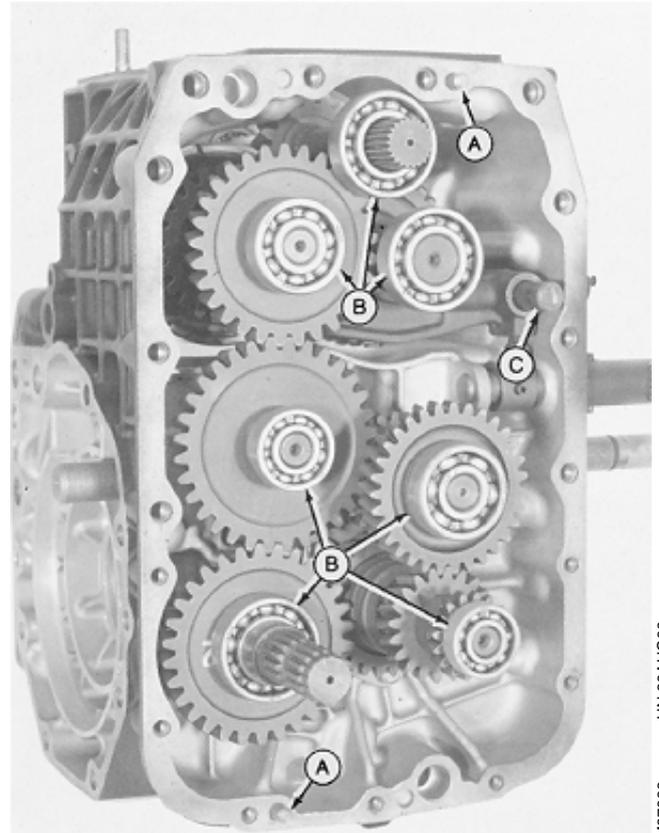
MX,HU,5010,121 -19-16OCT91

M37863 -UN-29AUG88

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52

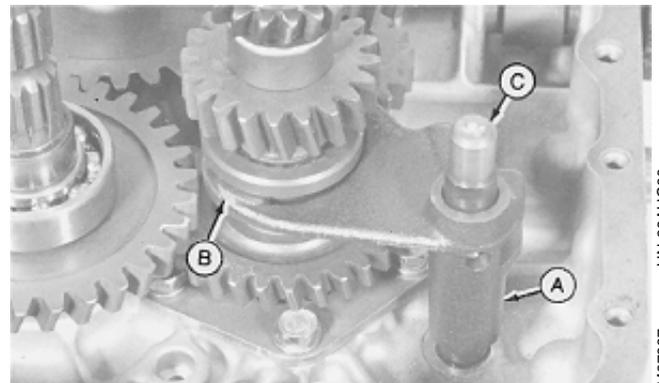
## INSTALL FRONT CASE COVER ASSEMBLY

1. Check that upper and lower pins (A) are in transaxle case.
2. Install all outside bearings (B) on shaft assemblies, if not previously installed. Lubricate the outside surfaces of all bearings and the internal PTO shifter shaft (C) with oil.



M37966 -UN-29AUG88  
50-10-53  
MX,HU,5010,122 -19-16OCT91

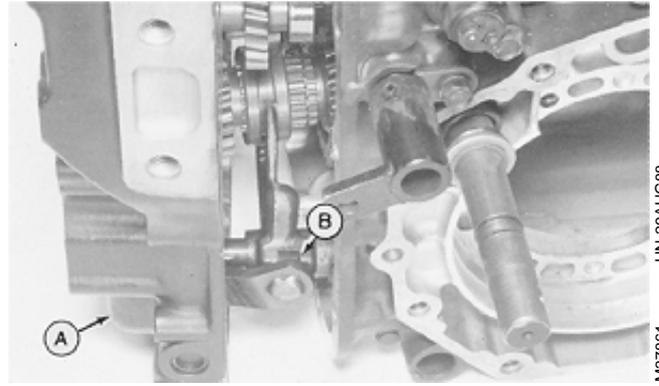
3. Lubricate outside and end surfaces of shaft (C) with oil.
4. Install fork in shift collar (B) of differential drive shaft assembly as you install range shifter fork assembly (A) in transaxle case.



M37967 -UN-29AUG88  
50-10-53  
MX,HU,5010,123 -19-16OCT91

## Transaxle/Install Front Case Cover Assembly

5. Install new gasket on front case cover.
6. Engage internal range shifter arm into range shifter fork slot (B) as cover is installed. Check alignment of all six bearings and two shifter shaft ends.
7. Fasten front case cover assembly (A) to transaxle case.

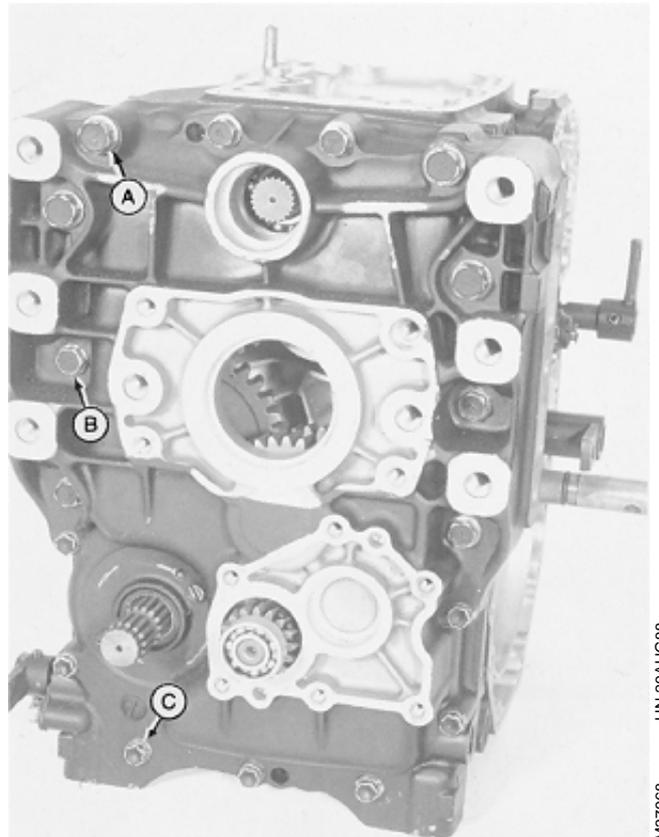


Left Side View

MX,HU,5010,124 -19-16OCT91

8. Tighten four M12 (A), six M10 (B), and seven M8 (C) cap screws to specifications listed below.

| CAP SCREW | TORQUE SPECIFICATIONS |
|-----------|-----------------------|
| M12       | 90 N·m (66 lb-ft)     |
| M10       | 50 N·m (37 lb-ft)     |
| M8        | 26 N·m (19 lb-ft)     |

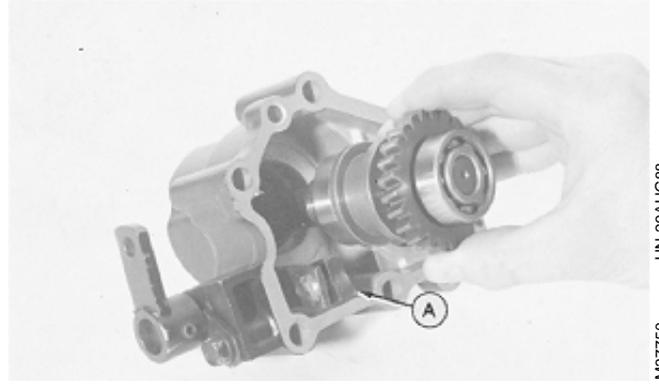


Front View

MX,HU,5010,125 -19-16OCT91

## INSTALL MFWD GEAR CASE ASSEMBLY

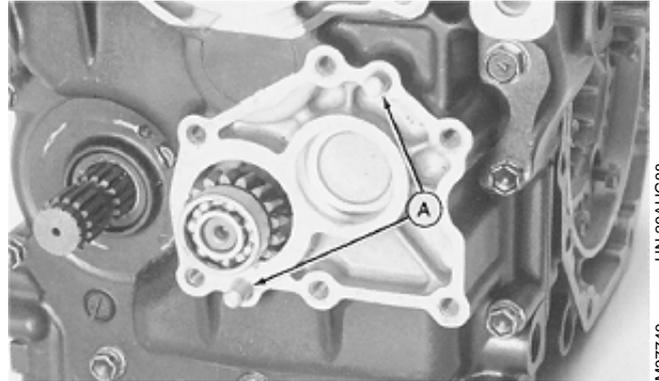
1. Rotate shifter lever to engage internal shifter arm (A) with shifter collar as you install MFWD output drive shaft assembly into case housing.



MX,HU,5010,126 -19-16OCT91

M37750 -UN-29AUG88

1. Make sure alignment pins (A) are in place.

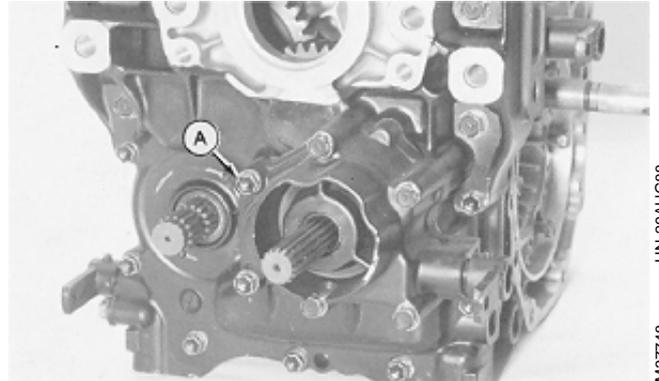


MX,HU,5010,127 -19-16OCT91

M37749 -UN-29AUG88

2. Install new gasket.

3. Align gear teeth as you install MFWD gear assembly. Fasten with five M8 cap screws (A). Tighten screws to 26 N·m (19 lb-ft).

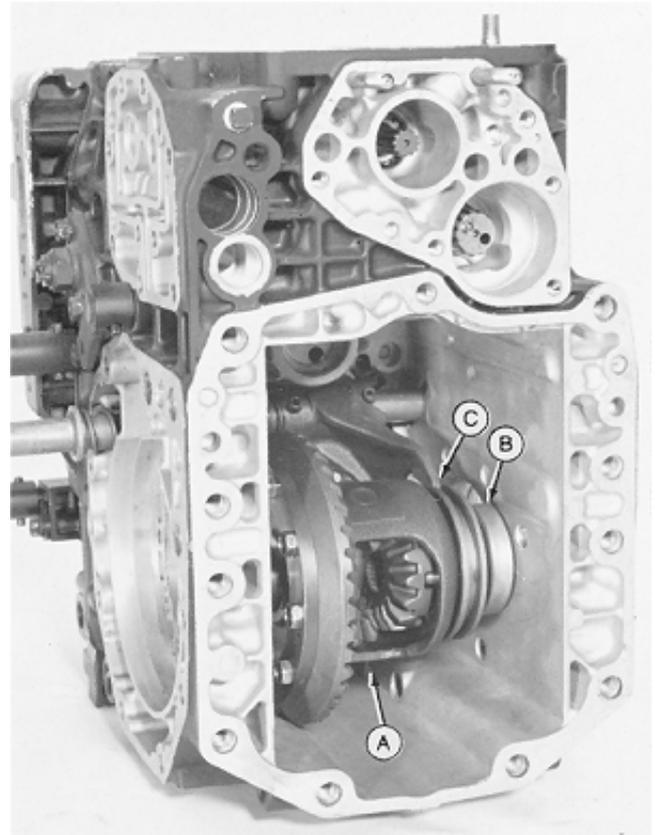


MX,HU,5010,128 -19-16OCT91

M37748 -UN-29AUG88

## ADJUST BACKLASH—DIFFERENTIAL ASSEMBLY

1. Put a film of grease or oil on surfaces of bearing (B). Align shifter fork (C) with collar and differential drive shaft pinion (worm) gear with differential ring gear as you install differential assembly (A) in transaxle housing.



Rear View

MX,HU,5010,129 -19-16OCT91

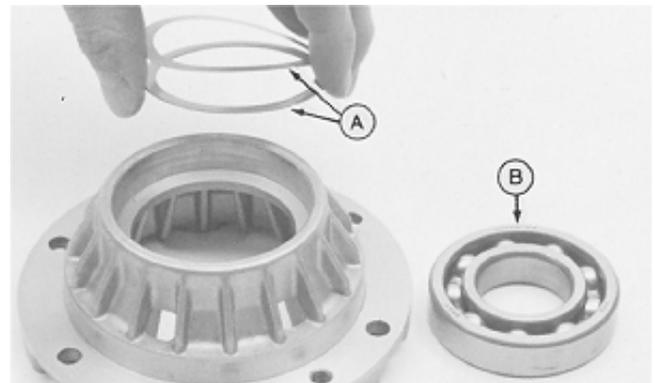
M37737 -UN-29AUG88

2. Install the same number of shims (A) into carrier assembly as were removed.

### Shim Pack Sizes

- 0.1 mm
- 0.3 mm
- 0.5 mm

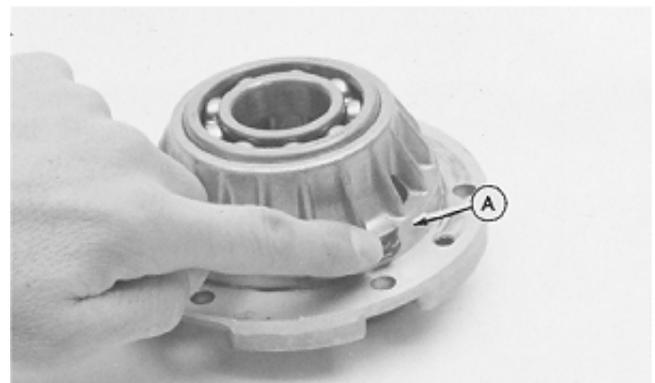
3. Install bearing (B) into carrier.



MX,HU,5010,130 -19-16OCT91

M37969 -UN-29AUG88

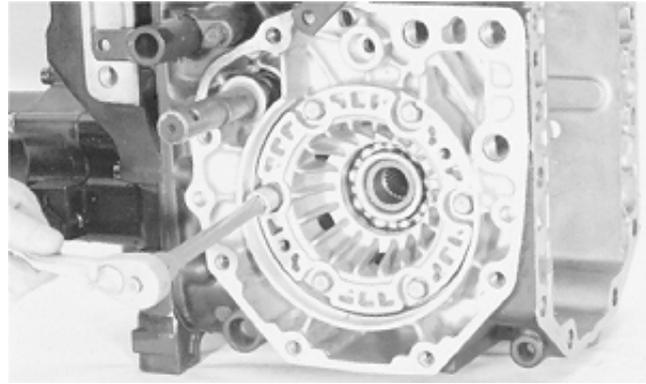
4. Add a coat of grease to the outside surface (A) of the carrier.



MX,HU,5010,131 -19-16OCT91

M37970 -UN-29AUG88

5. Install carrier bearing on left-side bearing surface of differential assembly, align six mounting holes and fasten with M8 x 25 cap screws. Tighten cap screws to 26 N-m (19 lb-ft).



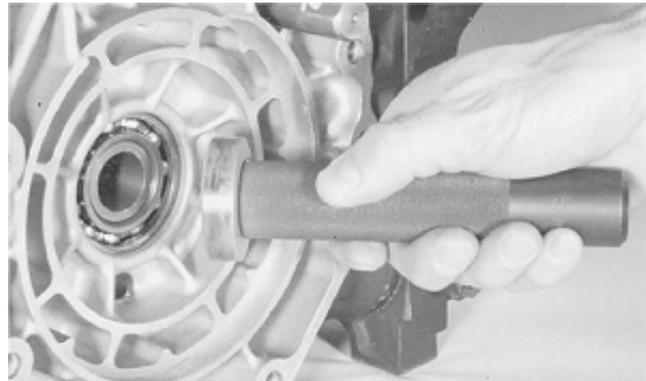
Left Side View

MX,HU,5010,132 -19-16OCT91

M37735 -UN-29AUG88

6. Push bearing and differential assembly to the left side using a disk driver. Differential assembly must be tight against left shims and side carrier before backlash is checked.

Tap disk driver lightly to ensure you don't damage any parts.



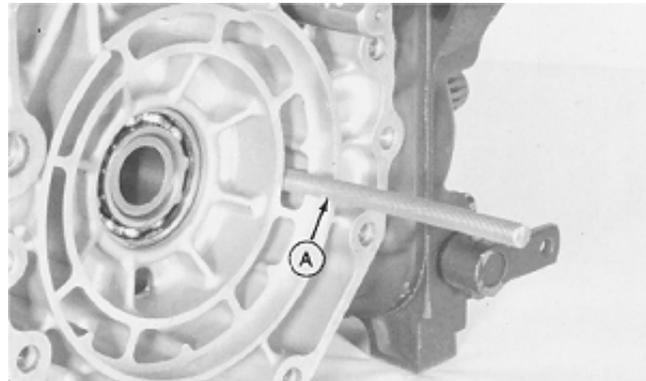
Right Side View

MX,HU,5010,133 -19-16OCT91

M37971 -UN-29AUG88

7. Put a rod (A) through the right side carrier and into the differential drive shaft pinion (worm) gear.

Use the rod to prevent movement of the pinion gear while the backlash measurement is performed.



MX,HU,5010,134 -19-16OCT91

M37972 -UN-29AUG88

8. Install fabricated steel plate (A) across the transaxle case. Mount the magnetic indicator base (B) on the plate. Position a deflection gauge (C) against one of the ring gear teeth (D).

9. Hold rod (E) firmly against the pinion gear while moving the ring gear back and forth. Total ring gear backlash movement must measure 0.15—0.21 mm (0.006—0.008 in).

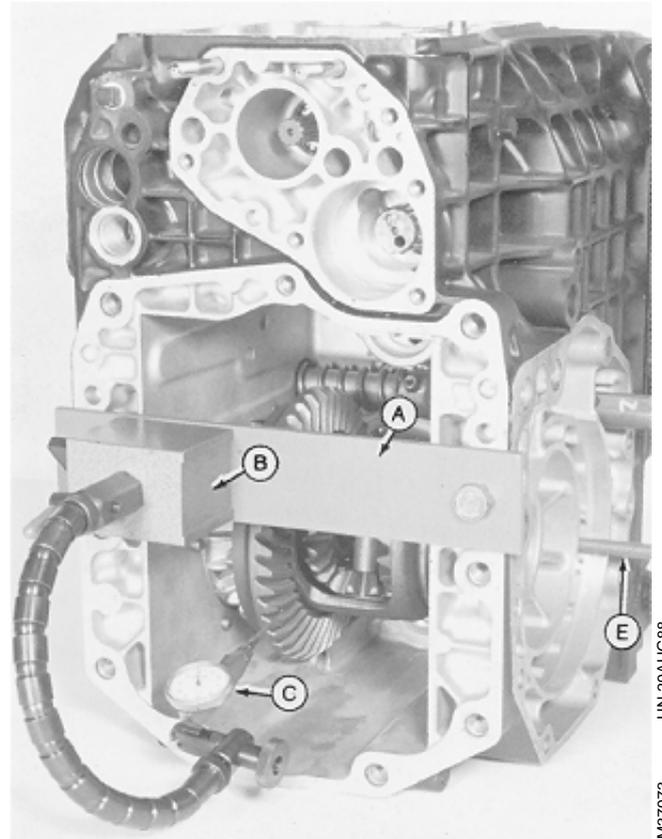
10. If proper backlash is not obtained, disassemble carrier and add a shim(s) to decrease backlash or subtract a shim(s) to increase backlash. Repeat procedure to measure backlash.

11. Tighten six left-side carrier cap screws to 26 N-m (19 lb-ft).

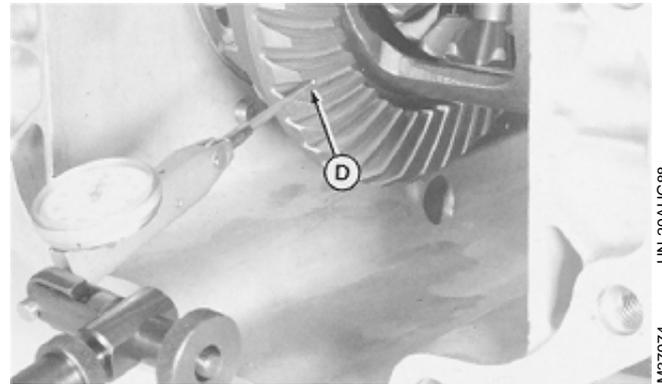
**BACKLASH SPECIFICATION**

Ring Gear . . . . . 0.15—0.21 mm  
(0.006—0.008 in.)

- A—Steel Plate
- B—Magnetic Base
- C—Deflection Gauge
- D—Ring Gear
- E—Rod



Rear View



MX,HU,5010,135 -19-16OCT91

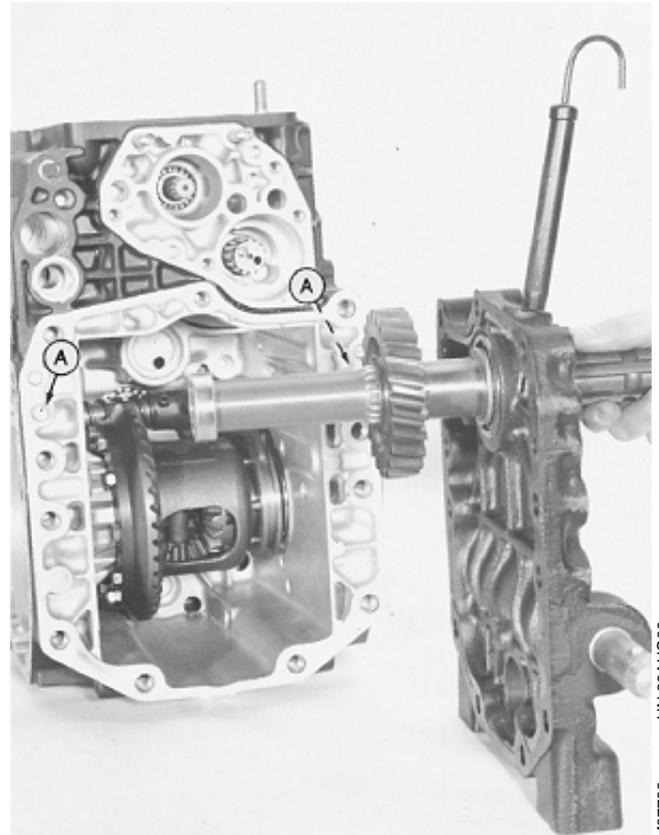
50  
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58

M37973 -UN-29AUG88

M37974 -UN-29AUG88

## INSTALL REAR PTO SHAFT ASSEMBLY

1. Install new rear seal from inside rear case cover.
2. Install rear PTO shaft assembly from inside rear case cover.
3. Make sure two alignment pins (A) are installed in case.



Rear View

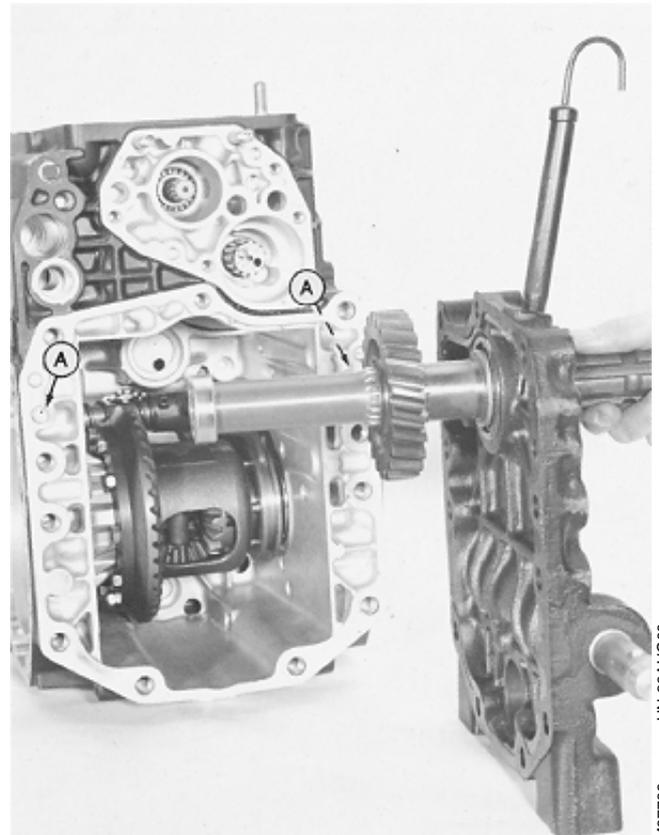
MX,HU,5010,136 -19-16OCT91

M37732 -UN-29AUG88

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59

## INSTALL REAR CASE COVER ASSEMBLY

1. Install a new gasket over pins (A).
2. Align rear PTO shaft drive gear with PTO reduction shaft gear up inside transaxle case as you align front bearing of rear PTO shaft with transaxle case bearing seat and the two guide pins (A).

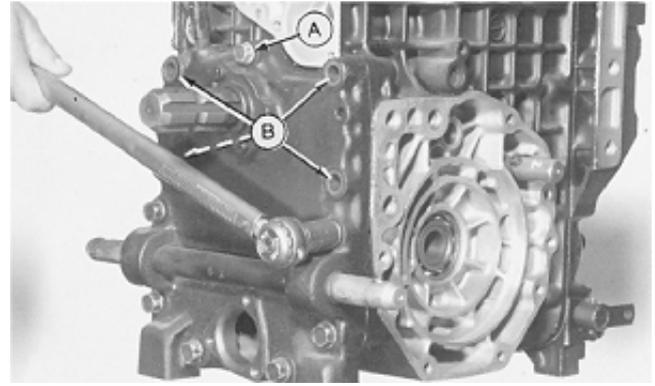


Rear View

MX,HU,5010,137 -19-16OCT91

M37732 -UN-29AUG88

3. Fasten bottom half of cover with four M12 x 70 cap screws (shown with torque wrench on head of one), two M12 x 55 cap screws in bottom case cover holes and one top half M10 x 50 cap screw (A). DO NOT install cap screws in four PTO shield mounting holes (B) at this time. Tighten other cap screws to below specifications.



M43519 -UN-31AUG88

**REAR COVER**

**TORQUE SPECIFICATIONS**

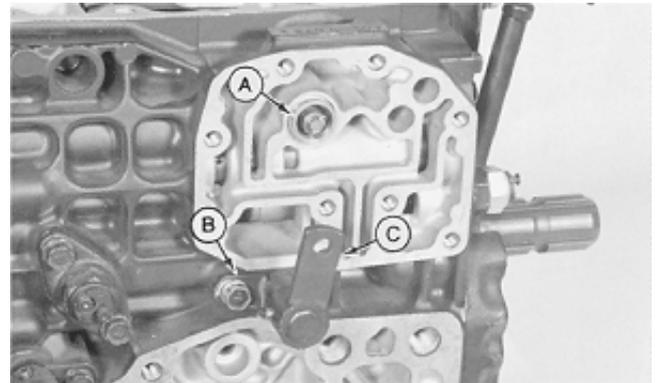
|                |                      |
|----------------|----------------------|
| M12 Cap Screws | 90 N·m<br>(66 lb-ft) |
| M10 Cap Screws | 50 N·m<br>(37 lb-ft) |

MX,HU,5010,138 -19-16OCT91

**INSTALL PTO VALVE ASSEMBLIES**

*NOTE: Install PTO valves in reverse order of disassembly (see Repair PTO Valve Assemblies earlier in this section).*

1. Install new O-rings on upper and lower valve assemblies before you install them in valve bodies.
2. Engage internal PTO shifter lever (C) in lower valve. Install retaining plate and cap screw (B).
3. Install lube relief valve (A).

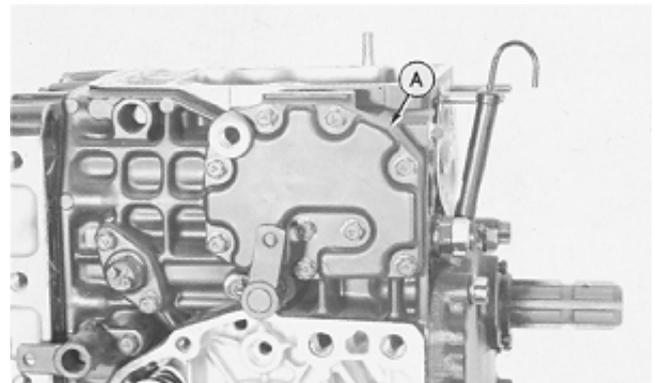


Left Side View

M37727 -UN-29AUG88

MX,HU,5010,139 -19-16OCT91

4. Install cover (A). Tighten nine cover cap screws and retaining plate cap screw to 26 N·m (19 lb-ft).



M37726 -UN-29AUG88

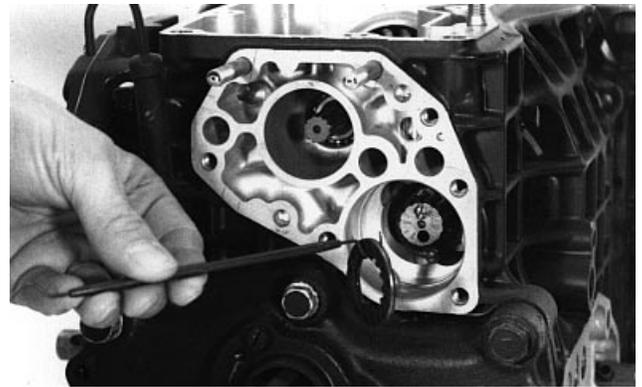
MX,HU,5010,140 -19-16OCT91

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## INSTALL PTO INERTIA BRAKE ASSEMBLY

1. Install seven separator plates and six clutch disks for 655, 755/756 and 855/856 tractors (eight separator plates and seven clutch disks for 955 tractors). Install a separator plate first, then alternate clutch disks and separator plates.

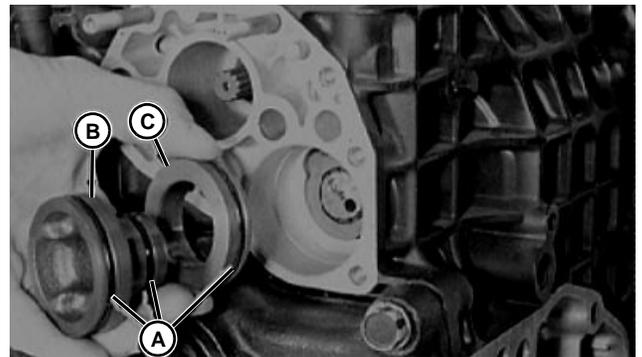
**NOTE:** When replacing an old housing (AM875949) with a new housing (AM876998) on 655, 755, and 855 tractors, a spacer M801959 must be used to compensate for the additional depth in the newer housing. The following units are affected, 655 with housing s/n below 610730; 755/ 756 and 855/856 units with housing s/n below 827729. Housing serial numbers above these already have spacer factory installed.



Rear View

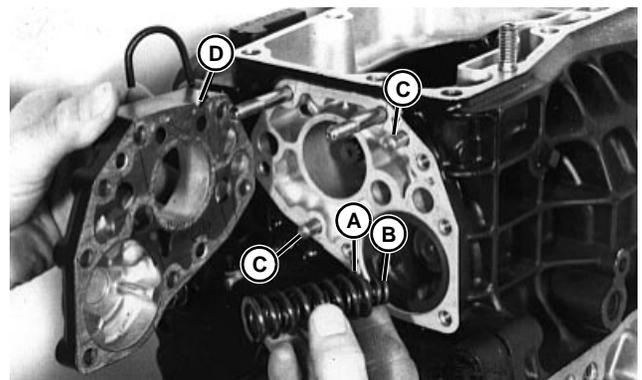
M37725

2. Install spacer M801959 if needed, (See NOTE: above).
3. Install new O-rings on collar (C) and piston (B). Apply a light film of grease or oil to the O-rings.
4. Install collar (C) over piston (B) as you install them in housing.

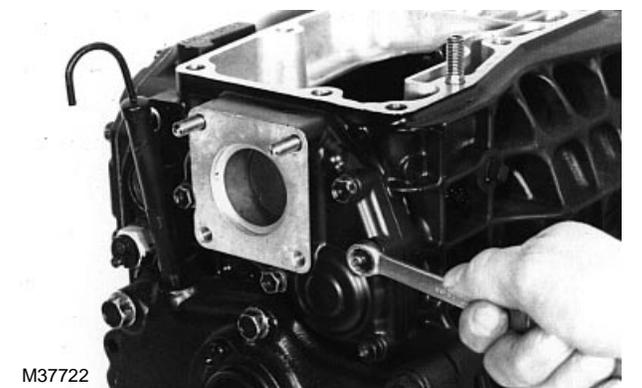


M37976

5. Make sure alignment pins (C) are in place.
6. Install new gasket (D).
7. Install small spring (B) inside larger spring (A). Put springs against piston and install cover over two stud bolts. Fasten cover with five cap screws and tighten them to 26 N•m (19 lb-ft.).



M37723

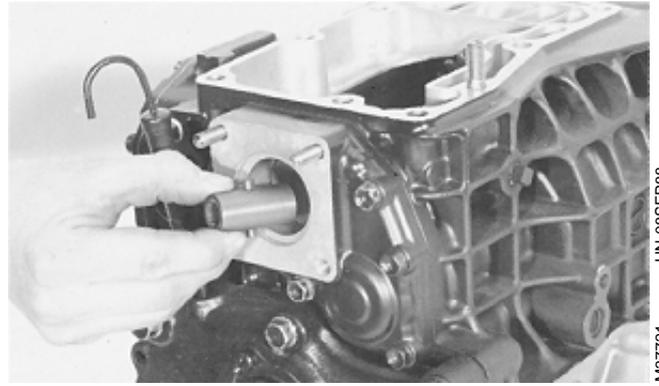


M37722

## INSTALL OIL SUPPLY SYSTEM

1. Install pump drive coupling. The coupling fits in either direction.

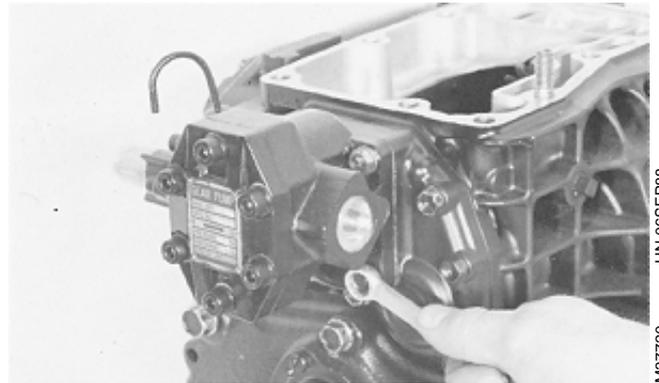
Rear View



MX,HU,5010,144 -19-16OCT91

M37721 -UN-08SEP88

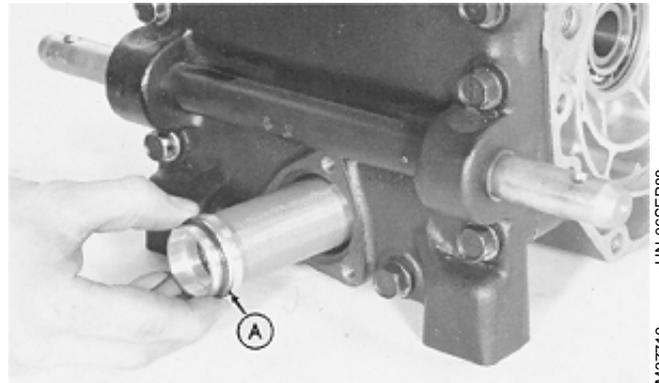
2. Install main hydraulic pump. Use two nuts and two cap screws to attach pump, tighten them to 26 N·m (19 lb-ft).



MX,HU,5010,145 -19-16OCT91

M37720 -UN-06SEP88

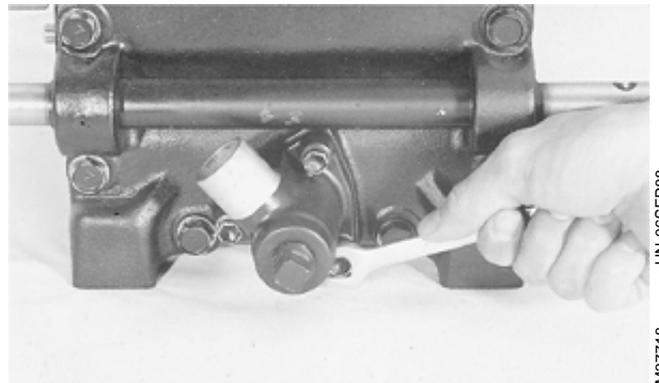
3. Install new O-ring (A) on end of new or cleaned oil supply filter screen and coat with oil before installing filter into case.



MX,HU,5010,146 -19-16OCT91

M37719 -UN-06SEP88

4. Install filter housing with three cap screws. Tighten cap screws to 26 N·m (19 lb-ft).



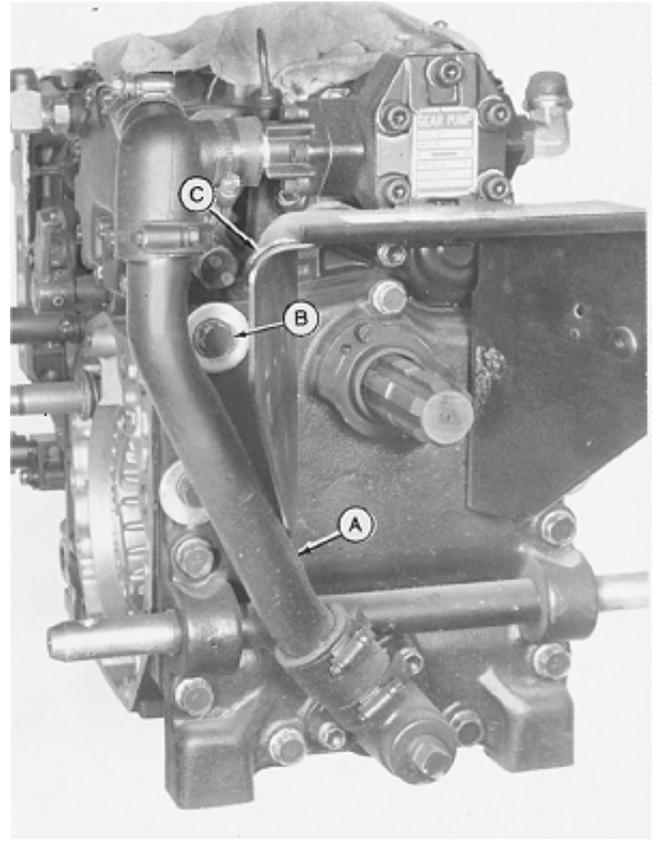
MX,HU,5010,147 -19-16OCT91

M37718 -UN-06SEP88

5. Install PTO shield (C). Fasten it with flat washers and four M12 x 55 cap screws (B). Tighten cap screws to 90 N·m (66 lb-ft).

*NOTE: Inspect rubber boots for cuts, cracks, hardness, and etc. Replace if required.*

6. Install oil supply tube (A) with rubber boots, protective bushings, and band clamps.



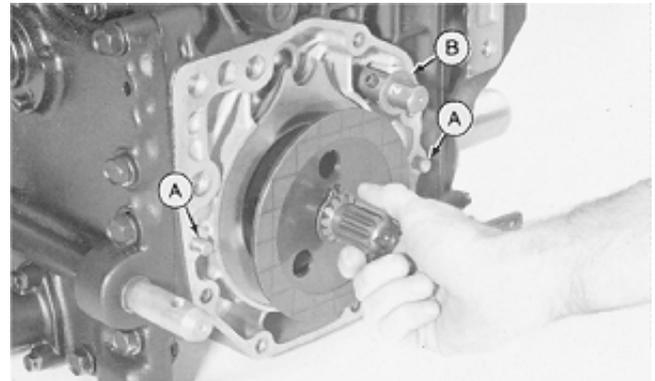
MX,HU,5010,148 -19-16OCT91

M37717 -UN-06SEP88

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33

## INSTALL FINAL DRIVE AXLE ASSEMBLIES

1. Put two separator plates and two brake disks alternately in place against snap ring on final drive pinion shaft and install them into differential assembly.
2. Install washer (B) on differential lock shaft.
3. Make sure alignment pins (A) are in place.
4. Install gasket over alignment pins (A).



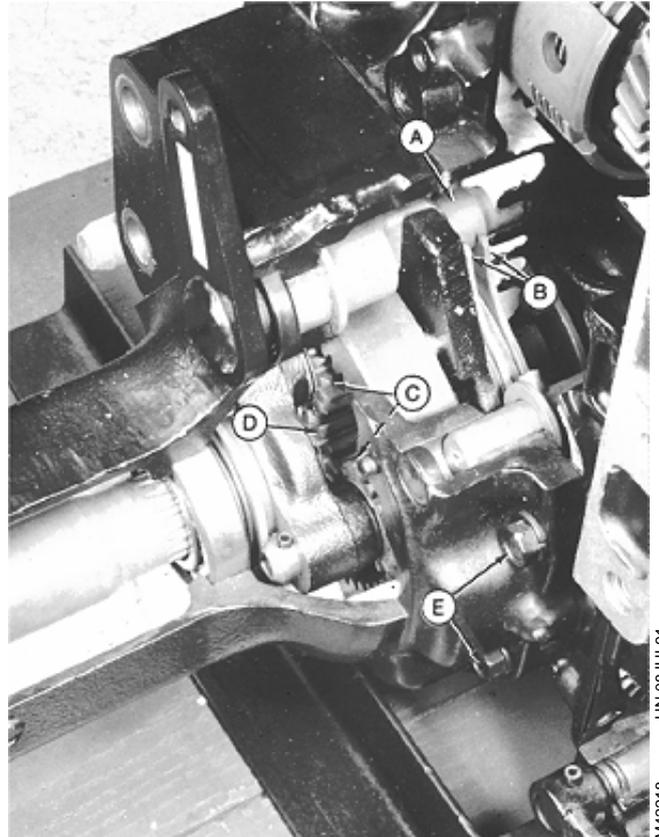
Right Side View

MX,HU,5010,149 -19-16OCT91

M37714 -UN-06SEP88

5. Align brake camshaft (A) with notches (B) of brake separator plates as you align three gears (C) of final drive planetary with splines (D) of final drive pinion shaft.

6. Fasten final drive axle assembly with five M10 x 35 cap screws (E) and one M10 x 50 cap screw in top hole of final drive case (cutaway). Tighten all six cap screws to 52 N-m (38 lb-ft).



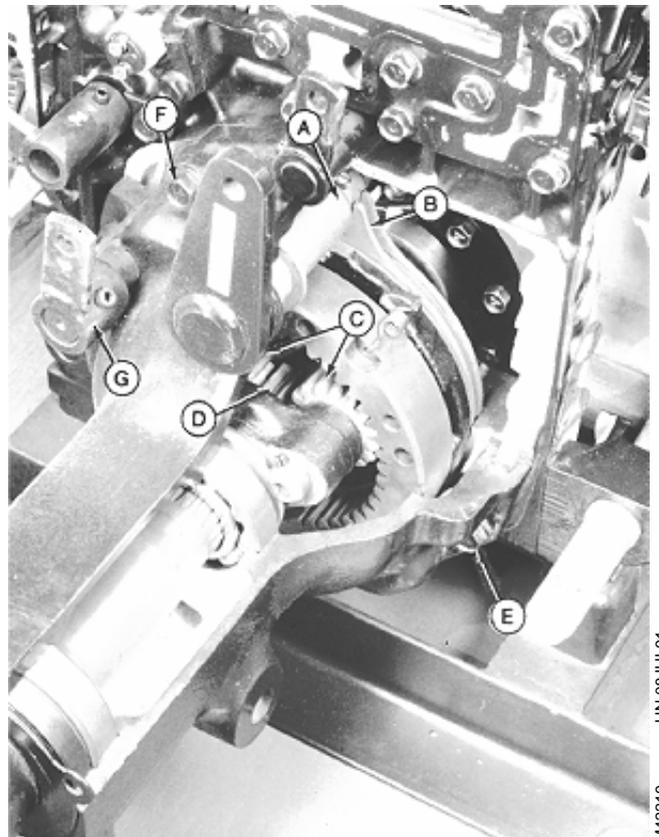
Training Aid Cutaway View—Right Side

7. Install gasket over alignment pins (A).

8. Align brake camshaft (A) with notches of brake separator plates (B) as you align three gears (C) of final drive planetary with splines (D) of final drive pinion shaft.

9. Fasten final drive axle assembly with five M10 x 35 cap screws (E) and one M10 x 50 cap screw (F) in top hole of final drive case (cutaway in right side view). Tighten all six cap screws to 52 N-m (38 lb-ft).

10. Install external shifter arm (G) on end of differential lock shifter shaft and fasten it with the spring pin removed earlier.



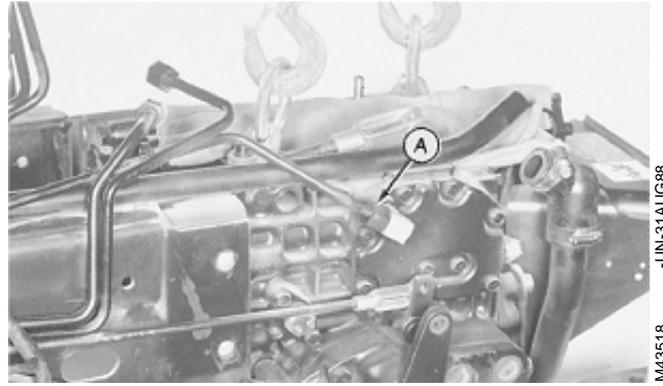
Training Aid Cutaway View—Left Side

MX, HU, 5010, 150 -19-16OCT91

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64

## INSTALL TRANSAXLE

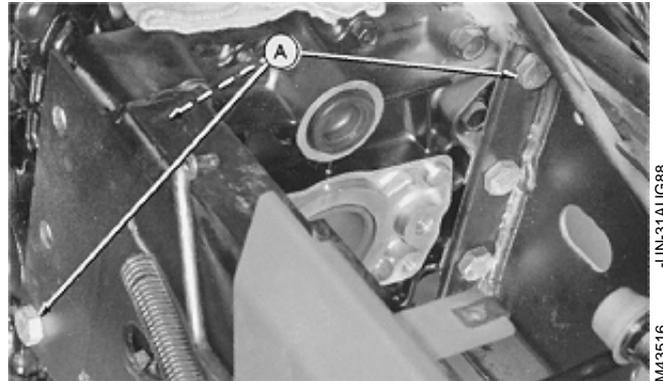
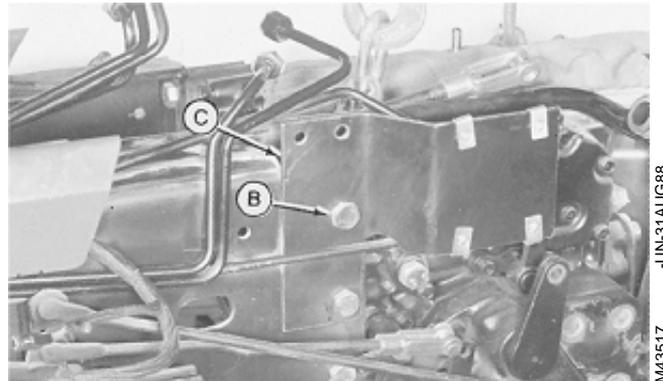
1. Fasten two lifting eyes to transaxle assembly and lift it into place using a load-positioning sling and hoist. Support bottom of axles with floor jacks or blocks.
2. Install new O-ring on elbow fitting and connect hydraulic line (A). Tighten connector to 49 N·m (36 lb-ft).



MX,HU,5010,151 -19-16OCT91

M43518  
-UN-31AUG88

3. Install bracket (C) with three M14 x 35 cap screws (B).
4. Install seven M14 x 35 cap screws (A). Tighten all ten cap screws evenly to pull transaxle up to frame. Tighten them to 142 N·m (105 lb-ft).

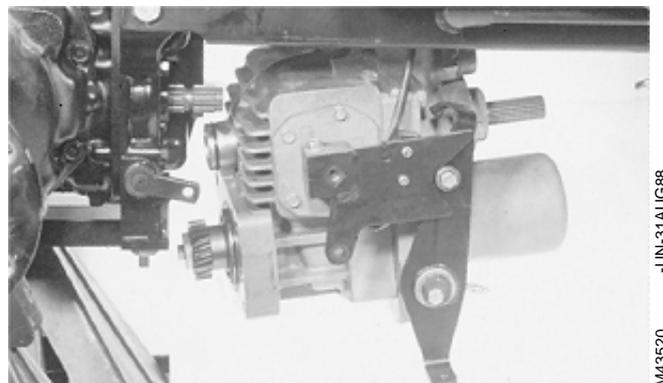


MX,HU,5010,152A-19-16OCT91

M43517  
-UN-31AUG88  
M43516  
-UN-31AUG88

## INSTALL HYDROSTATIC TRANSMISSION

1. Fasten a lifting eye to the transmission and use a hoist to lift it into place. Be sure control linkage is positioned as shown.



Right Side View

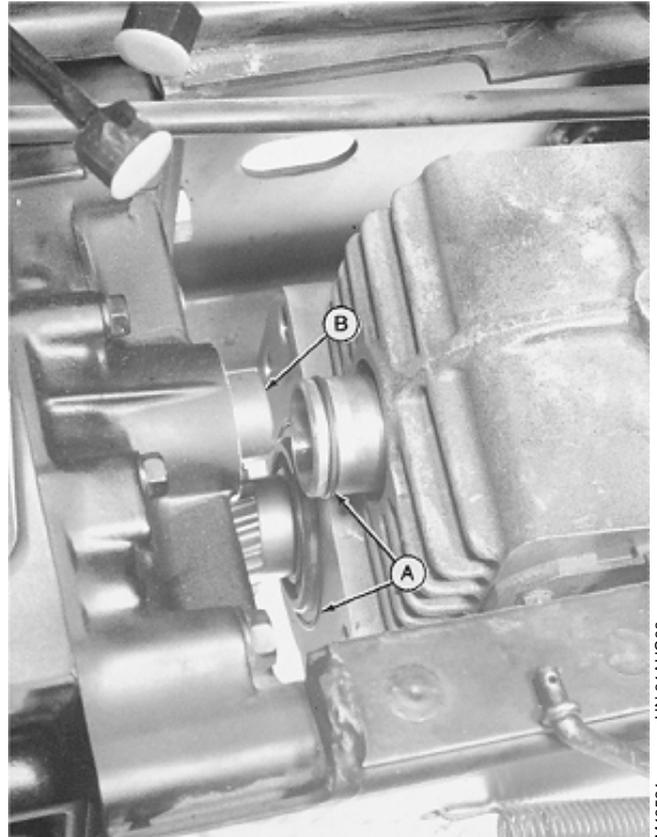
MX,HU,5010,153A-19-16OCT91

M43520  
-UN-31AUG88

2. Install new O-rings (A). Apply grease to O-rings to hold them in place.

3. Install coupler (B) into transaxle.

4. Turn axles to align splines and gears as the transmission is moved into place. Be careful not to damage the O-ring sealing surfaces.

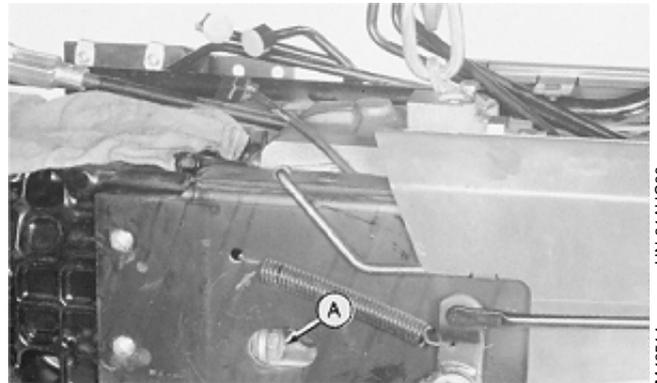


Top View—Right Side

MX,HU,5010,154A-19-16OCT91

M43521 -JUN-31/AUG88

5. Install two M14 x 60 cap screws and thick washers (A). Tighten cap screws to 142 N-m (105 lb-ft).



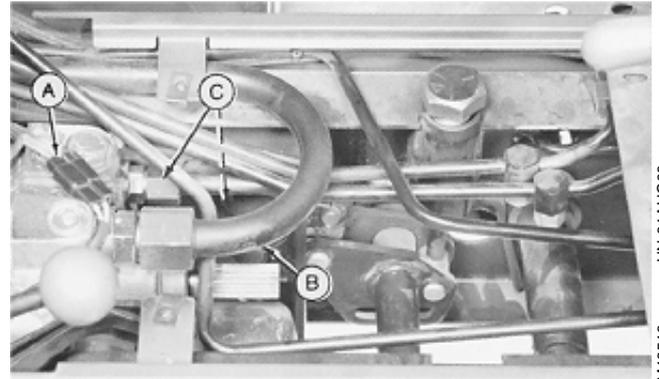
Right Side View

MX,HU,5010,155A-19-16OCT91

M43514 -JUN-31/AUG88

**IMPORTANT: Install new O-rings in all applications before connecting hydraulic fittings.**

6. Connect and tighten lines (C).
7. Install line (B) at both ends. Tighten fittings to 95-230 N·m (70-170 lb-ft).
8. Connect electrical leads (A).
9. Install transmission drive shaft and MFWD drive shaft (if equipped) in reverse order to disassemble procedures found earlier in this section.
10. Fill transaxle with 17 L (4.5 gal) of JOHN DEERE HY-GARD® LOW VISCOSITY transmission and hydraulic oil.



Top View—Right Side

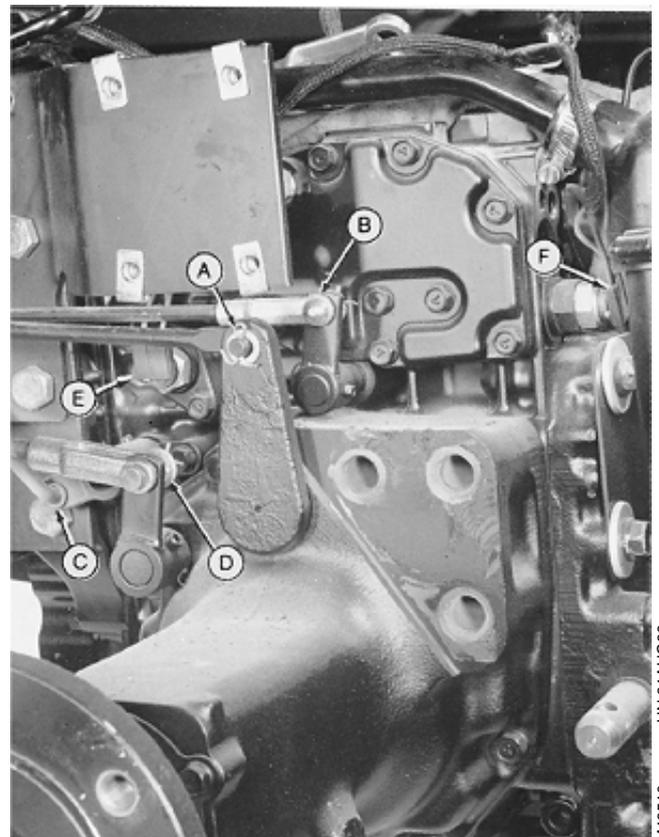
M43513 -UN-31AUG88

MX,HU,5010,156 -19-16OCT91

**INSTALL LINKAGE**

1. Install electrical lead (F). (Blue wire and black wire.)
2. Install electrical lead (E). (Two blue wires.)
3. Install differential lock link (D). Fasten it with a drilled pin, washer, and cotter pin.
4. Install PTO selector link (C). Fasten it with a washer and cotter pin.
5. Install PTO control link (B). Fasten it with a drilled pin and cotter pin.
6. Install brake link (A). Fasten it with a washer and cotter pin.

- A—Left Brake Link
- B—PTO Control Link
- C—PTO Selector Link
- D—Differential Lock Link
- E—PTO Magnet Switch
- F—PTO Lamp Switch



Left Side View

50  
10  
67

M43510 -UN-31AUG88

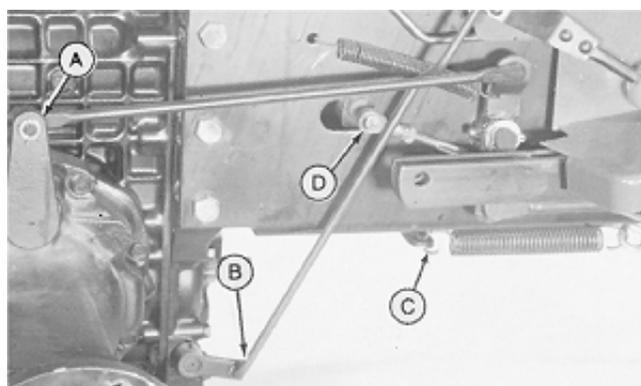
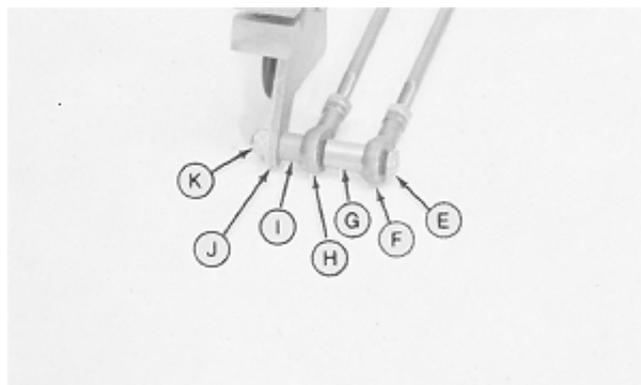
MX,HU,5010,157 -19-16OCT91

7. Install parts (E thru K) to connect transmission control linkage (D).

8. Connect spring (C).

9. Install shifter link (B). Fasten it with a washer and cotter pin. Late model tractors also have a stop link connected to this shifter arm.

10. Install brake link (A). Fasten it with a washer and cotter pin.



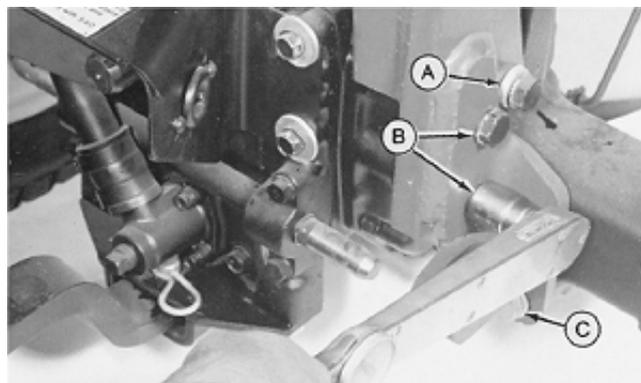
- A—Brake Link
- B—2-Speed Shift Link
- C—Spring
- D—Transmission Control Linkage (E thru K)
- E—Cap Screw
- F—Forward Control Tie Rod
- G—Long Spacer
- H—Reverse Control Tie Rod
- I—Short Spacer
- J—Transmission Control Lever
- K—Lock Nut

MX,HU,5010,158 -19-16OCT91

## INSTALL ROPS

1. Put ROPS in position with hoist. Install shorter bolt, lock washer, and thick washer (A). Install two longest bolts with lock washers (B). Install shortest bolt and lock washer (C). Repeat this procedure for the left side. Tighten all eight bolts evenly to 215 N-m (159 lb-ft).

2. Install drawbar. Fasten it with drilled pin and spring pin.



Right Side View

MX,HU,5010,159 -19-16OCT91

## INSTALL REAR WHEELS

1. Install wheels.
2. Tighten lug bolts to 115 N·m (85 lb-ft).



M43591 -UN-31AUG88

MX,HU,5010,160 -19-16OCT91

## INSTALL ROCKSHAFT HOUSING ASSEMBLY

To install rockshaft housing assembly see Section 70, Group 15.

MX,HU,5010,161 -19-16OCT91

## CONNECT FLOW DIVIDER AND SELECTIVE CONTROL VALVES

To connect flow divider valve and selective control valves, see Section 70, Group 10.

MX,HU,5010,161A-19-16OCT91

## FILL HYDRAULIC SYSTEM RESERVOIR

Fill transaxle reservoir with John Deere Hy-Gard® Low Viscosity Transmission and Hydraulic Oil. Transaxle capacity is approximately 17 L (4.5 gal).

MX,HU,5010,161B-19-16OCT91

## **BLEED HYDRAULIC SYSTEM**

To bleed the hydraulic system see Section 70, Group 05.

MX,HU,5010,162 -19-16OCT91

## **ADJUST CONTROL LINKAGES**

**N** **CAUTION:** Transmission and transaxle control linkages may be out of adjustment. Safely lift drive wheels off ground and support tractor frame on jack stands before making any adjustments.

To check all transaxle functions and adjust transmission control linkages see Section 250, Group 10.

MX,HU,5010,163 -19-16OCT91

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70

## SERVICE EQUIPMENT AND TOOLS

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name                                 | Use                                     |
|--------------------------------------|---|
| Bushing, Bearing and Seal Driver Set | To service bearings and seal.           |
| Press                                | To service bearings.                    |
| Knife-Edge Puller                    | To remove bearings and wear sleeves.    |
| 2-Jaw, Slide-Hammer                  | To remove bearings and wear sleeves.    |
| M8 Jackscrews                        | To remove ring gear.                    |
| Snap Ring Pliers Set                 | To disassemble planetary gear assembly. |
| 50mm (2 in.) ID Pipe                 | To install wear sleeves.                |
| 40mm (1-9/16 in.) ID Pipe            | To install bearings.                    |

MX,HU,5015,1 -19-16OCT91

## OTHER MATERIAL

| Number | Name  | Use                            |
|--------|---|--------------------------------|
| T43511 | John Deere LOCTITE® Clean and Cure Primer                   | Clean Threads                  |
| T43512 | John Deere LOCTITE Thread Lock and Sealer (Medium Strength) | Retain differential cap screws |

*LOCTITE is a trademark of the Loctite Corp.*

MX,HU,5015,2 -19-16OCT91

## SPECIFICATIONS

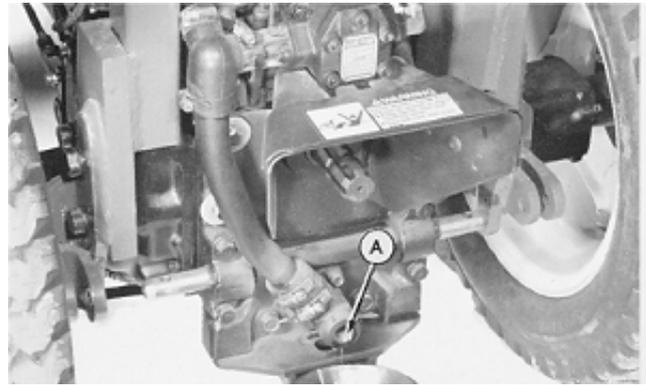
| Item                      | Measurement | Specification       |
|---------------------------|-------------|---------------------|
| Ring Gear Cap Screws      | Torque      | 26 N·m (19 lb-ft)   |
| Final Drives              |             |                     |
| M10 Cap Screw             | Torque      | 52 N·m (38 lb-ft)   |
| M16 Cap Screws W/Out ROPS | Torque      | 187 N·m (138 lb-ft) |
| ROPS Mounting Bolts       | Torque      | 215 N·m (159 lb-ft) |
| Rear Wheel Lug Bolts      | Torque      | 115 N·m (85 lb-ft)  |

MX,HU,5015,3 -19-16OCT91

## REMOVE FINAL DRIVES

*NOTE: Most procedures are identical for both sides of the final drives. Any unique procedures that require special mention will be shown; otherwise, treat the following procedures as identical for both sides.*

1. Park tractor safely.
2. Remove drawbar.
3. Remove drain plug to drain transaxle (A). Oil capacity is approximately 17 L (4.5 gal).



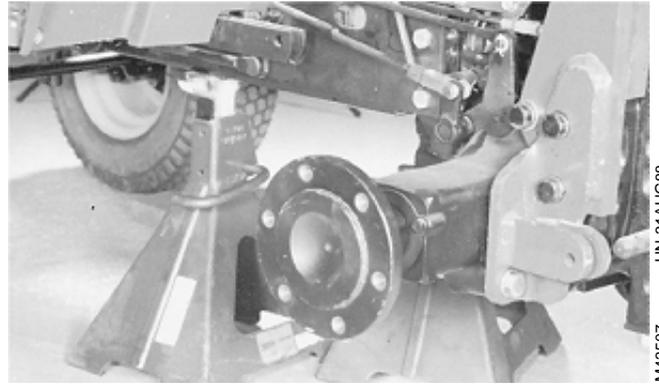
M43506 -UN-31/AUG88

MX,HU,5015,4 -19-16OCT91

4. Put blocks in front and back of front wheels.
5. Loosen rear wheel bolts.

**IMPORTANT: DO NOT put lifting device under transaxle. Transaxle case could become damaged.**

6. Raise tractor. Support frame with jack stands.
7. Remove rear wheels.

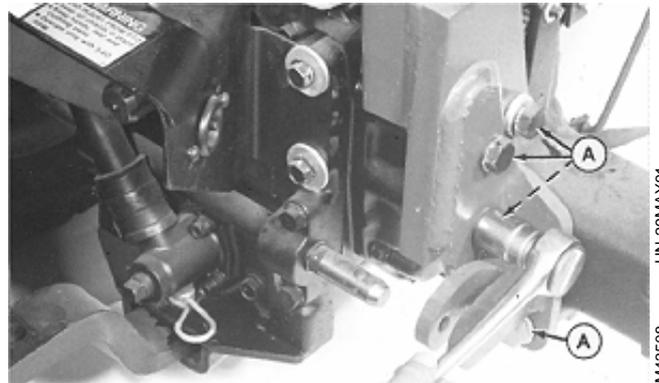


Left Side View

MX,HU,5015,5 -19-16OCT91

M43507 -UN-31AUG88

8. Attach an overhead hoist to ROPS or get a helper to hold ROPS stationary while you remove bolts and washers from both sides. Store ROPS in a safe manner.

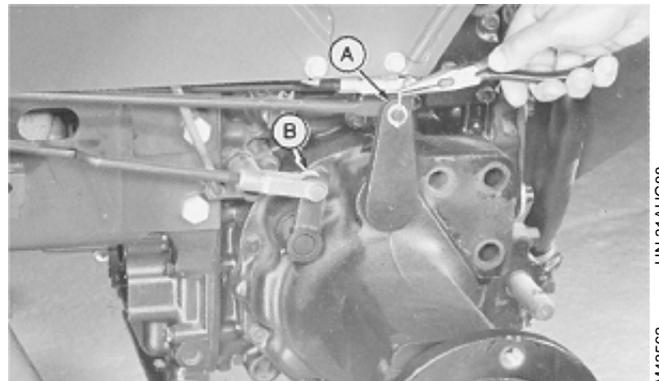


Right Side View

MX,HU,5015,6 -19-16OCT91

M43508 -UN-29MAY91

9. Disconnect brake link (A).
10. Disconnect differential lock link (B). (Left side only.)



Left Side View

MX,HU,5015,7 -19-16OCT91

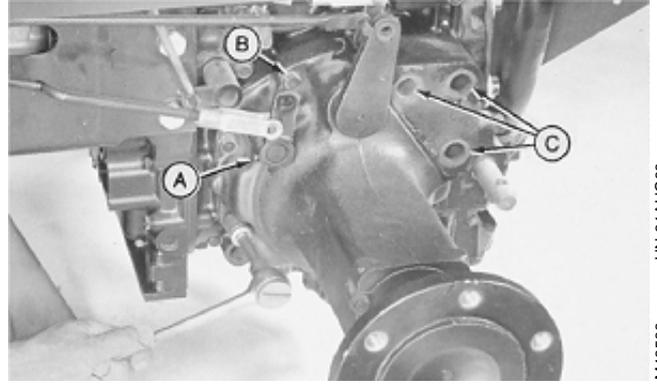
M43562 -UN-31AUG88

11. Use a punch to drive out spring pin (A). Remove differential lock lever. (Left side only.)

12. Hold final drive assembly with an overhead hoist or floor jack and remove six cap screws (B).

*NOTE: If tractor is not equipped with ROPS, remove three cap screws from holes (C).*

13. Remove final drive from transaxle. Clean machined surfaces of any gasket material.



Left Side View

M43588 -UN-31AUG88

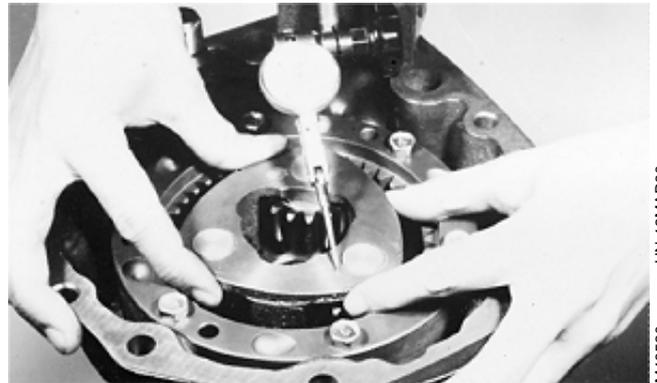
MX,HU,5015.8 -19-16OCT91

## PLANETARY CARRIER END PLAY SPECIFICATION

### SPECIFICATION

End Play (Max) . . . . . 0.6 mm (0.024 in.)

1. Stand final drive on wheel hub.
2. Install dial indicator.
3. Pull planetary carrier up. If out of specification, check thrust washer, snap-ring, carrier, and axle snap-ring groove for wear. Replace parts as necessary.



955 Shown

M48520 -UN-12MAR90

MX,HU,5015.9 -19-16OCT91

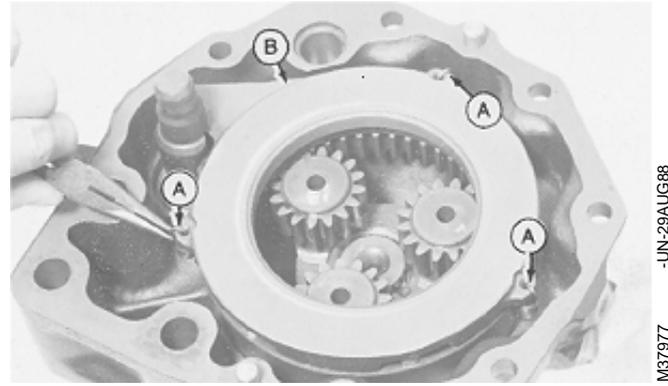
50  
15  
4

## DISASSEMBLE FINAL DRIVES

**NOTE:** Disassembly procedure is shown for a left final drive. The right side is similar, but some parts are not interchangeable, left to right. Do not mix left and right side parts.

1. Remove three springs (A) from actuator plate (B).

655, 755/756, 855/856 Shown—Left



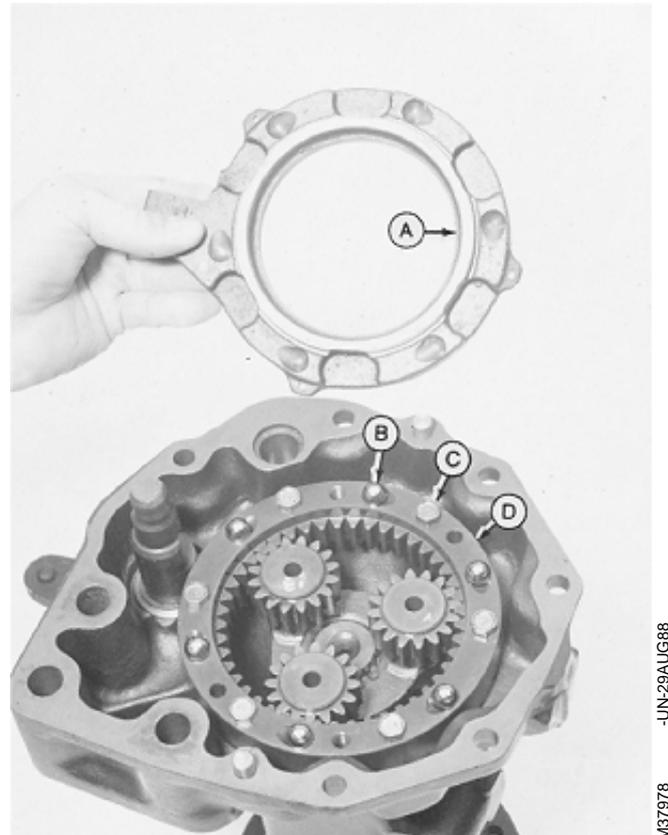
M37977 -UN-29AUG88

MX,HU,5015,10 -19-16OCT91

2. Remove actuator plate (A).
3. Remove six steel balls (B).
4. Remove six cap screws (C) to remove ring gear (D).

**NOTE:** It may be necessary to use two M8 jackscrews directly across from each other to remove ring gear from two alignment pins in final drive case.

- A—Actuator Plate
- B—Steel Ball (6 used)
- C—Cap Screw (6 used)
- D—Ring Gear

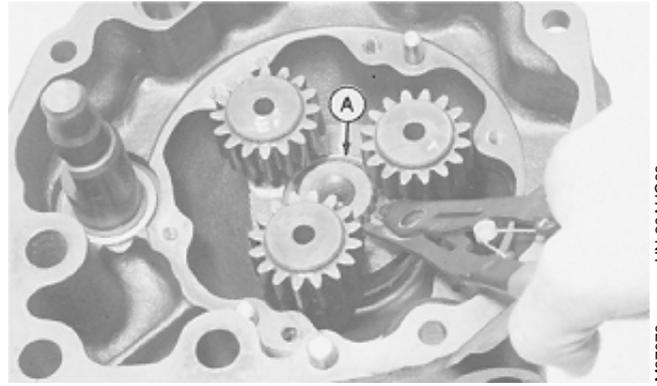


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15  
5

M37978 -UN-29AUG88

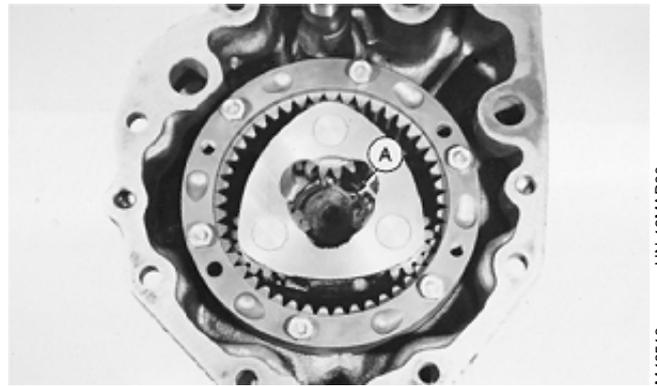
MX,HU,5015,11 -19-16OCT91

5. Remove snap ring (A).
6. Remove planetary gear assembly.



655, 755/756, 855/856 Shown

M37979 -UN-29AUG88



955 Shown

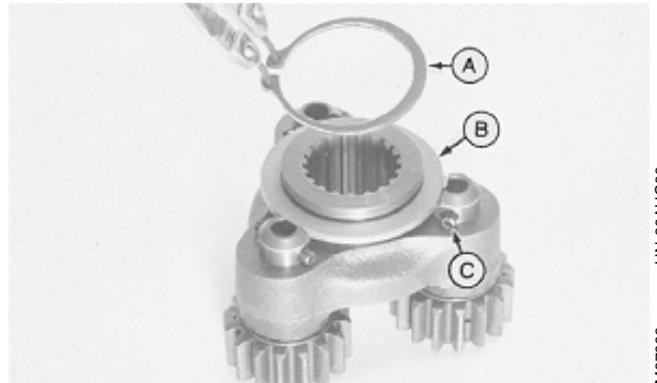
M48516 -UN-12MAR90

MX,HU,5015,12 -19-16OCT91

### REPAIR PLANETARY GEAR ASSEMBLY—655, 755/756, AND 855/856 TRACTORS

1. Remove snap ring (A) and washer (B).
2. Drive out three spring pins (C).

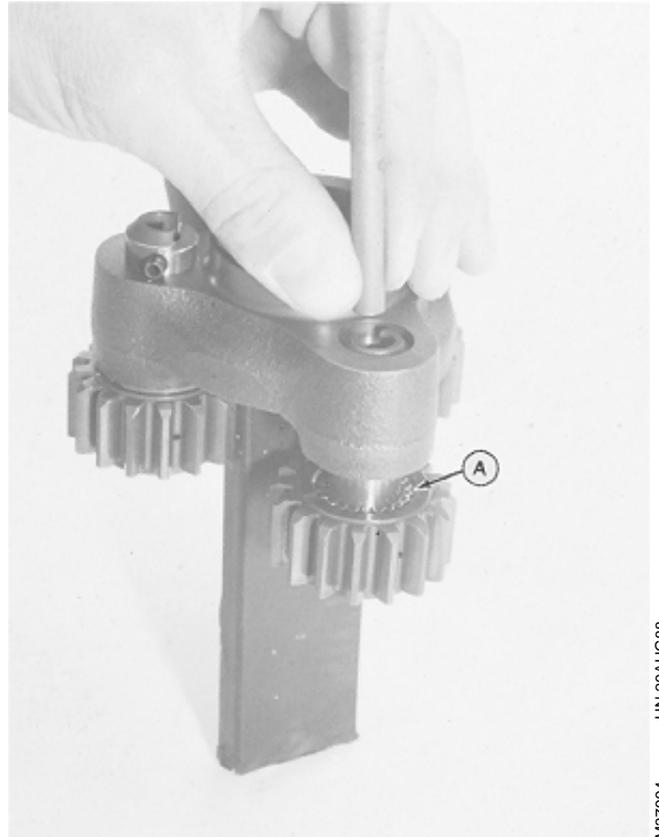
655, 755/756, 855/856 Shown



M37993 -UN-29AUG88

MX,HU,5015,13 -19-16OCT91

3. Drive or press the three pinion shafts out of the carrier. Take care not to lose any of the 22 needle bearings (A) inside each pinion gear. Disassemble and inspect all components for wear or damage—replace if required.



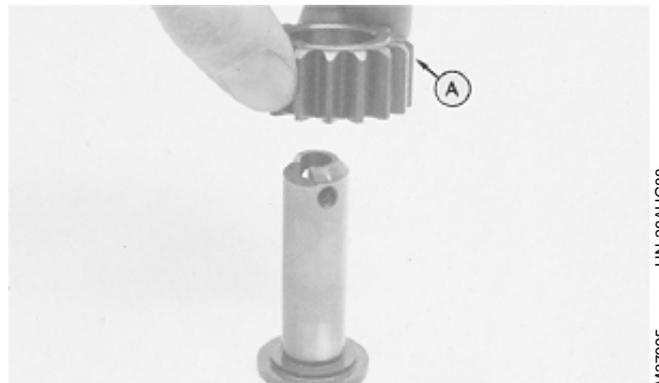
655, 755/756, 855/856 Shown

MX,HU,5015,14 -19-16OCT91

M37994 -UN-29AUG88

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15  
7

4. Assemble gear on shaft with bevel edge (A) up.

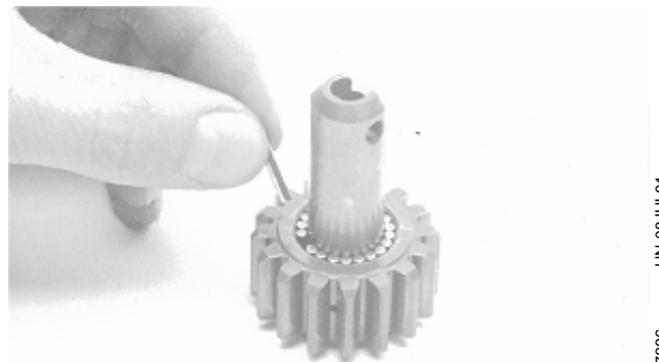


655, 755/756, 855/856 Shown

MX,HU,5015,15 -19-16OCT91

M37995 -UN-29AUG88

5. Install 22 needle bearings (grease-coated lightly) in each pinion gear.



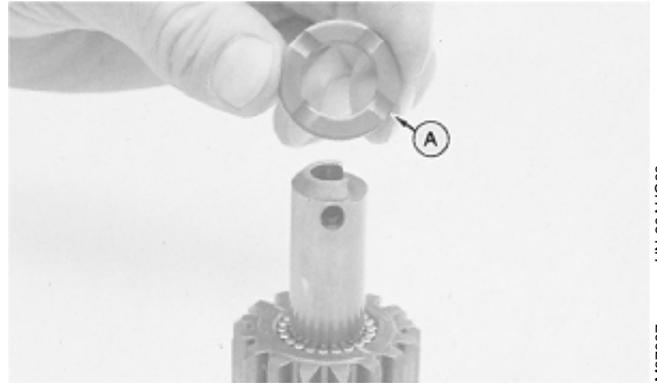
655, 755/756, 855/856 Shown

MX,HU,5015,16 -19-16OCT91

M37996 -UN-08JUL91

## Final Drives/Repair Planetary Gear Assembly

6. Install thrust washer (A) with oil groove side against gear.

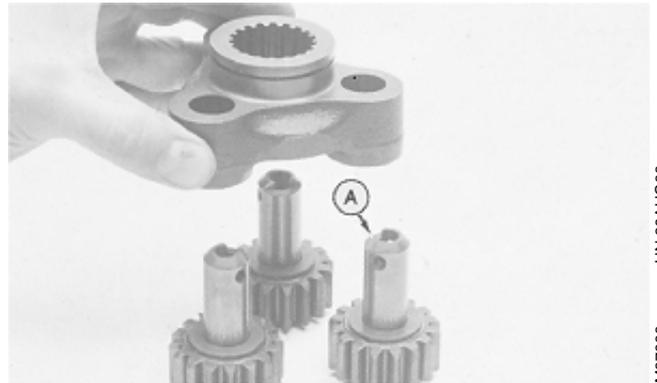


655, 755/756, 855/856 Shown

MX,HU,5015,17 -19-16OCT91

M37997  
-UN-29AUG88

7. Press pinion shafts into the carrier—one at a time. The notch (A) on the end of each pinion shaft must point to the inside of the carrier.



655, 755/756, 855/856 Shown

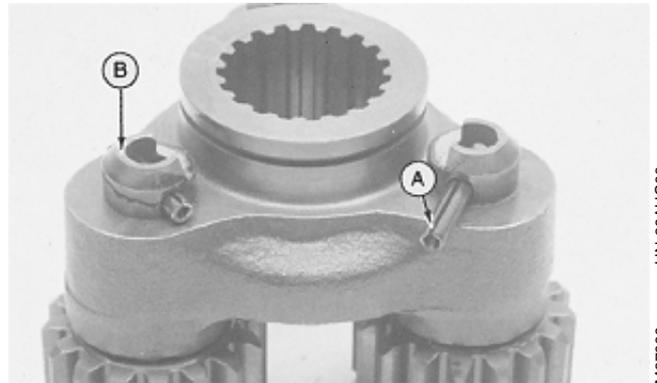
MX,HU,5015,18 -19-16OCT91

M37998  
-UN-29AUG88

8. Drive spring pins into the shafts. The split face of spring pin (A) must point up, away from the gear.

9. Tap down on the top of each pinion shaft (B) so the roll pin rests against carrier surface.

10. Check pinion gears to see that they turn freely.

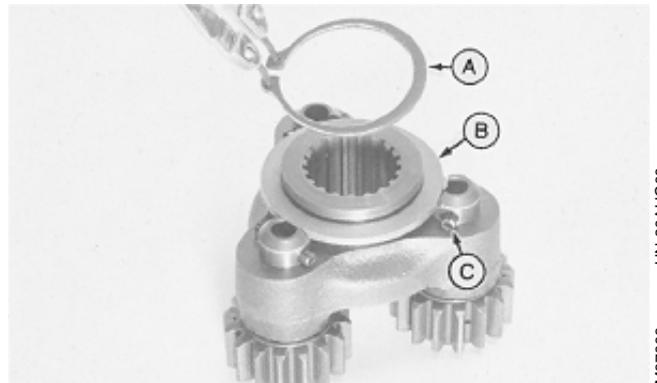


655, 755/756, 855/856 Shown

MX,HU,5015,19 -19-16OCT91

M37999  
-UN-29AUG88

11. Install washer (B) and snap ring (A).

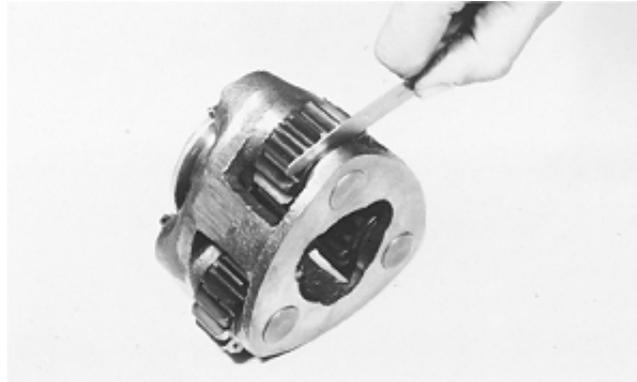


655, 755/756, 855/856 Shown

MX,HU,5015,20 -19-16OCT91

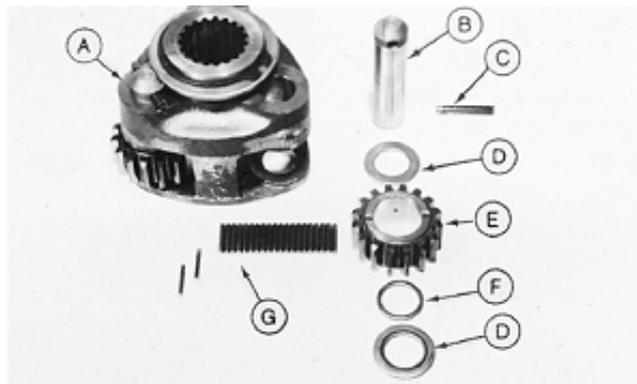
M37993  
-UN-29AUG88

## REPAIR PLANETARY GEAR ASSEMBLY—955 TRACTORS



955 Shown

M48519  
-UN-12MAR90



955 Shown

M48518  
-UN-12MAR90

A—Carrier  
B—Pinion Shaft

C—Spring Pin  
D—Thrust Washers

E—Planetary Pinion Gear  
F—Needle Bearing Spacer

G—Needle Bearings

### SPECIFICATION

Pinion-to-case clearance . . . . . 0.1-0.9 mm (0.004-0.035 in.)

1. Check planetary pinion gear assembly side clearance. If out of specification, check pinion shaft, spring pins, thrust washers, needle bearing spacer, gears and carrier for wear.

*NOTE: Each planetary pinion gear contains 22 needle bearings.*

2. Drive out spring pins from pinion shafts.

3. Press out pinion shafts (B), one at a time, and inspect all parts for wear or damage—replace if required.

4. During assembly, use a light coat of grease to hold needle bearings (G) in place.

5. Put needle spacer (F) over needle bearings on the bottom sides of planetary gears (side opposite the chamfer).

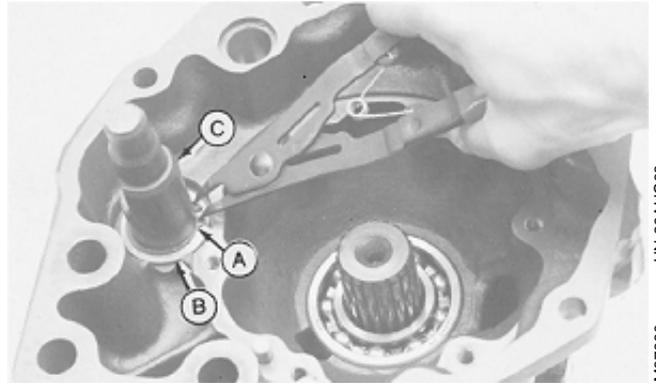
6. Put a thrust washer (D) on each side of planetary gears with oil grooves towards the needle bearings and align them, one at a time, inside the carrier with the chamfer of gears pointing up.

7. Install pinion shafts (B), one at a time, with notches toward inside splines of carrier. Drive in spring pin with split facing up, away from pinion gears.

## REMOVE BRAKE CAMSHAFT ASSEMBLY

*NOTE: Do not mix left and right side brake camshafts, they are not identical.*

1. Remove snap ring (A) from its groove in brake camshaft (C).
2. Push shaft out of housing and remove flat washer (B).



MX,HU,5015,22 -19-16OCT91

M37980 -UN-29AUG88

3. Turn final drive over so it rests on the wide base.
4. Remove and replace the brake camshaft oil seal.

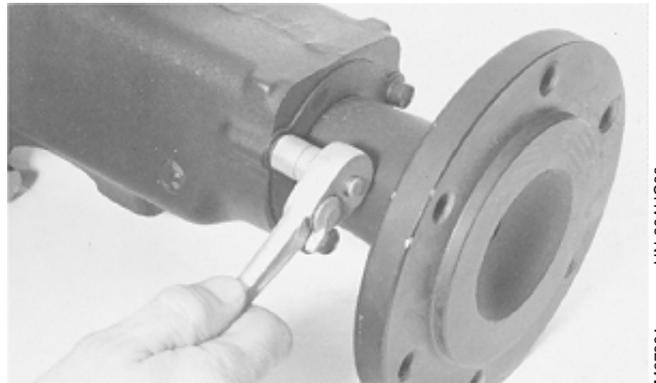


MX,HU,5015,22A -19-16OCT91

M37992 -UN-29AUG88

## REMOVE AXLE SHAFTS

1. Turn axle on its side to remove three cap screws from end of final drive housing.

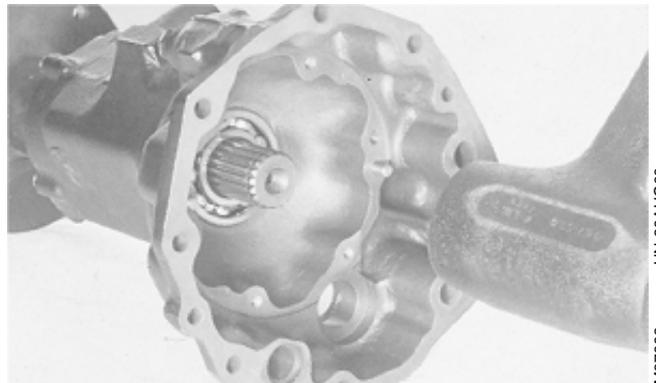


MX,HU,5015,23 -19-16OCT91

M37981 -UN-29AUG88

4. Drive axle shaft out of housing using a soft faced hammer. The two inside bearings will remain in the housing.

5. Inspect and replace parts as required.

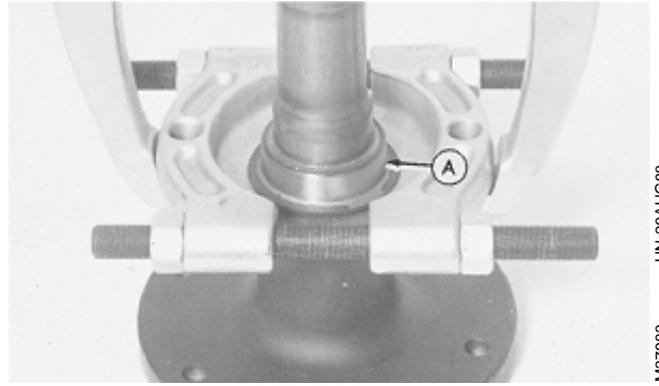


MX,HU,5015,24 -19-16OCT91

M37982 -UN-29AUG88

## REMOVE OIL SEAL WEAR SLEEVE AND COVER

1. Remove oil seal wear sleeve (A) from axle shaft using a knife-edge puller.
2. Inspect axle cover (hidden by knife-edge puller) for damage. Replace, if required.

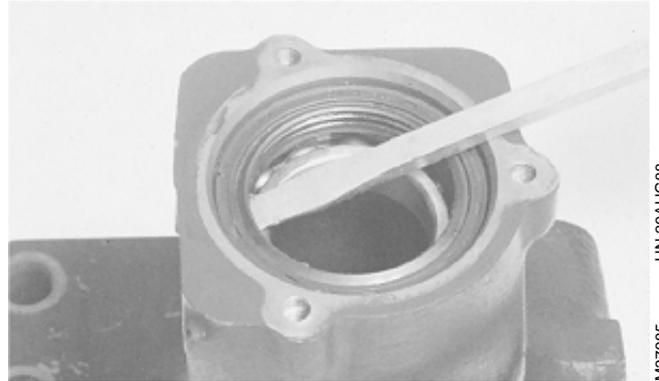


MX,HU,5015,25 -19-16OCT91

M37983 -UN-29AUG88

## REPAIR AXLE HOUSING ASSEMBLY

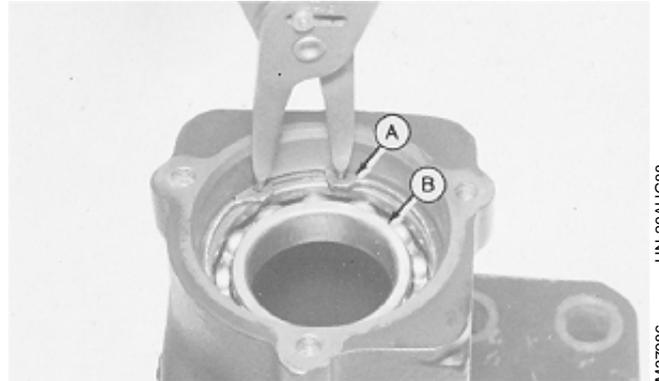
1. Remove oil seal from outer housing.



MX,HU,5015,26 -19-16OCT91

M37985 -UN-29AUG88

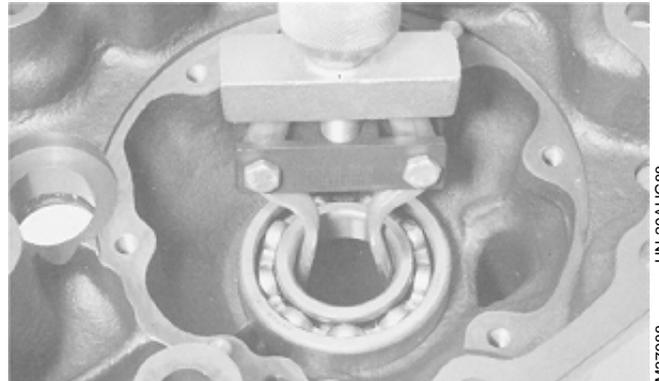
2. Remove snap ring (A) to service outer bearing (B).



MX,HU,5015,27 -19-16OCT91

M37986 -UN-29AUG88

3. Turn housing over onto the square end to remove inner bearing from inside housing. Use a puller if necessary.

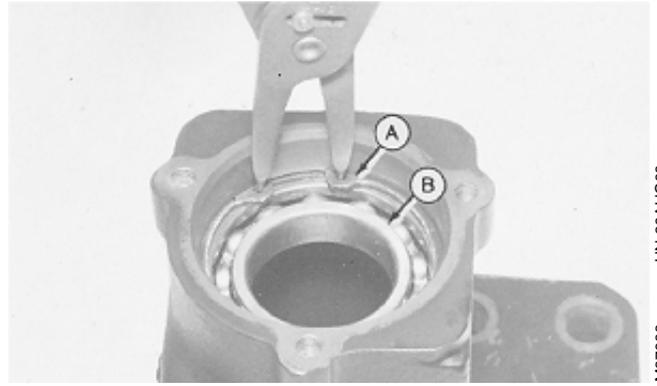


MX,HU,5015,28 -19-16OCT91

M37988 -UN-29AUG88

## Final Drives/Repair Axle Housing Assembly

4. Turn housing over on wide base to install new outer bearing (B) in housing and install snap ring (A).



MX,HU,5015,28A -19-16OCT91

M37986 -UN-29AUG88

5. Install a new seal (A). Push seal into housing using a 75 mm (2-15/16 in.) driver disk. Seal must bottom against the snap ring.

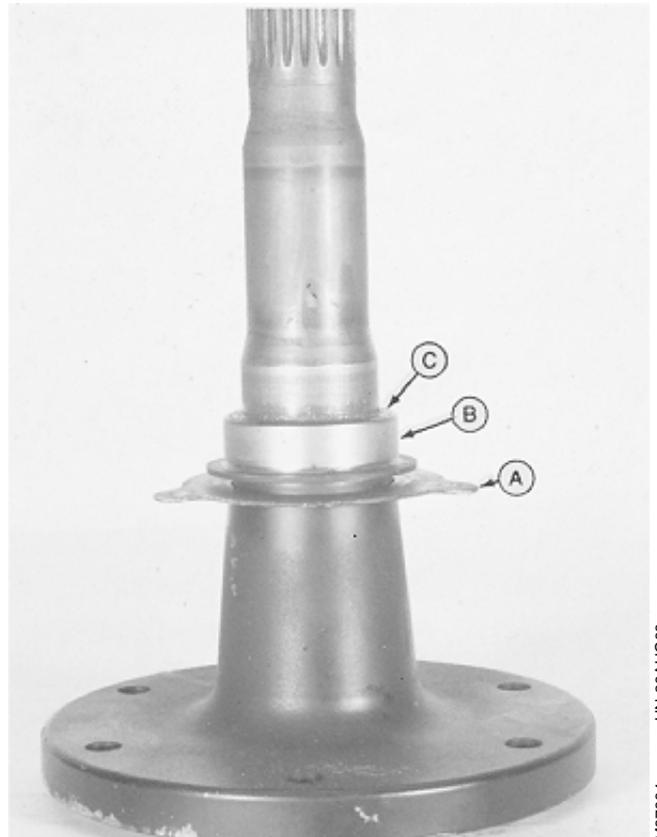


MX,HU,5015,29 -19-16OCT91

M37987 -UN-29AUG88

6. Install seal housing cover (A) over axle shaft.

7. Apply grease to inside surface of oil seal wear sleeve (B). Install oil seal wear sleeve on axle shaft using a pipe with an inside diameter of 51 mm (2 in). Top of sleeve must be flush with lip (C) on axle shaft.



MX,HU,5015,30 -19-16OCT91

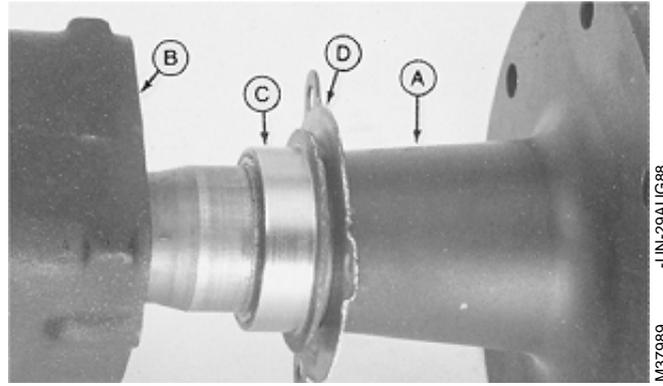
M37984 -UN-29AUG88

## ASSEMBLE AXLE HOUSING ASSEMBLY

**IMPORTANT:** Wrap splines of axle shaft with tape to prevent cutting surface of oil seal as you install shaft into housing.

1. Lay housing on its side to install axle shaft (A) into housing (B) until oil seal wear sleeve (C) contacts end of housing and cover (D) is aligned with housing mounting holes.

A—Axle Shaft  
B—Housing  
C—Oil Seal Wear Sleeve  
D—Seal Housing Cover



MX,HU,5015,31 -19-16OCT91

2. Turn housing upright. Drive axle into the housing until oil seal wear sleeve bottoms against the bearing snap ring.

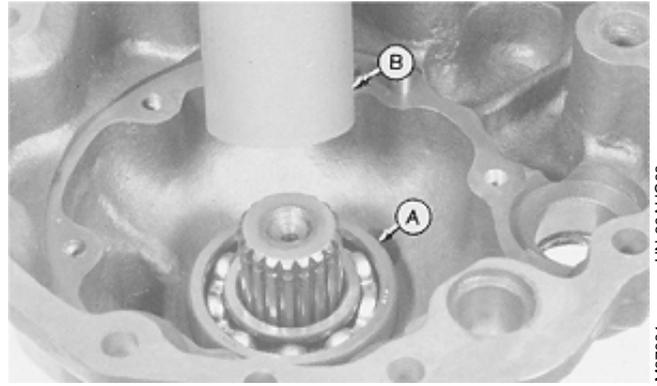
3. Fasten seal housing cover (A) with three cap screws. Tighten cap screws to 26 N·m (19 lb-ft).



MX,HU,5015,32 -19-16OCT91

4. Turn housing over onto the wheel hub.

5. Install new inner bearing (A) into housing. Push bearing into place using a piece of pipe (B) with an inside diameter of 40 mm (1-9/16 in.). Press on inner race only.



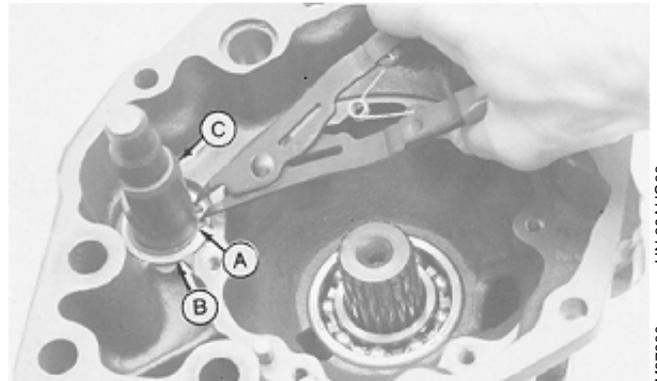
MX,HU,5015,33 -19-16OCT91

M37991  
-UN-29AUG88

## INSTALL BRAKE CAMSHAFT ASSEMBLY

1. Install brake camshaft (C) from outside.

2. Fasten it with washer (B) and snap ring (A).



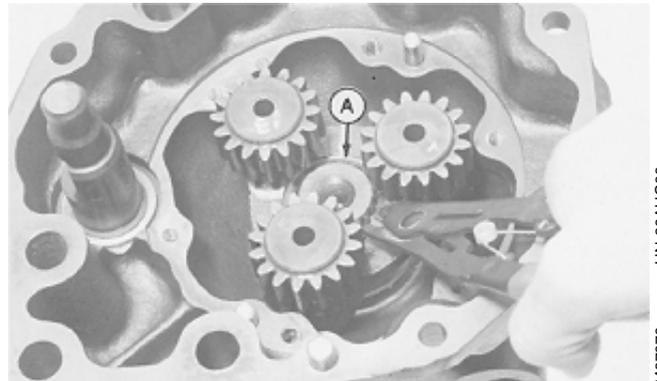
MX,HU,5015,34 -19-16OCT91

M37980  
-UN-29AUG88

## INSTALL PLANETARY GEAR ASSEMBLY—655, 755/756, 855/856 TRACTORS

1. Install planetary gear assembly. Fasten it with snap ring (A).

655, 755/756, 855/856 Shown



MX,HU,5015,35 -19-16OCT91

M37979  
-UN-29AUG88

2. Clean the threads of all six ring gear mounting cap screws and threaded axle housing using clean and cure primer.

*NOTE: Spring mounting holes on bottom of ring gear are not symmetrical with alignment pins. Be sure ring gear is turned so that spring mounting hole is not directly next to brake camshaft.*

3. Install ring gear (D) on alignment pins (seen in previous illustration).

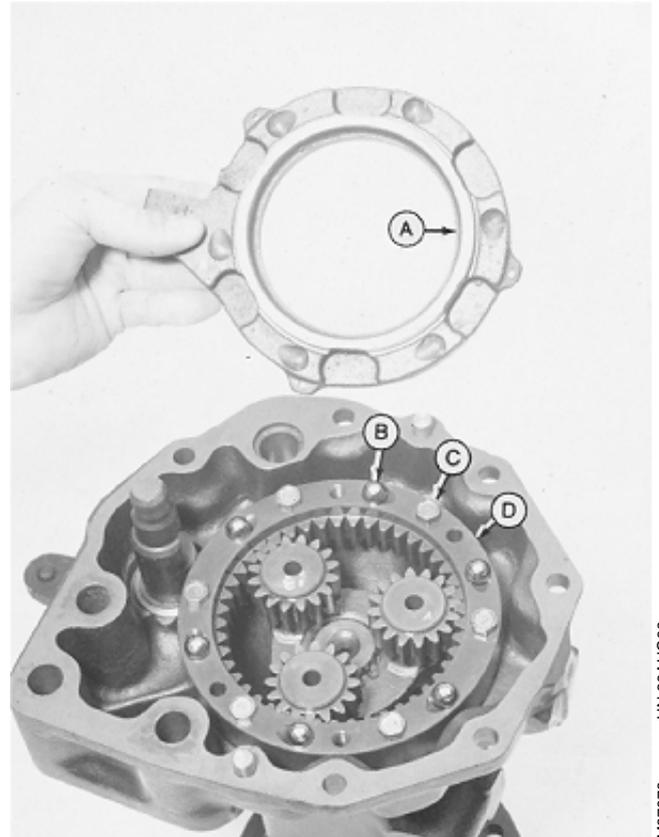
4. Apply thread lock and sealer (medium strength) on threads of cap screws.

5. Install six cap screws (C). Tighten them to 26 N-m (19 lb-ft).

6. Install and apply grease to six balls (B).

7. Put actuator plate (A) in place.

- A—Actuator Plate
- B—Steel Ball (6)
- C—Cap Screw (6)
- D—Ring Gear



MX,HU,5015,36 -19-16OCT91

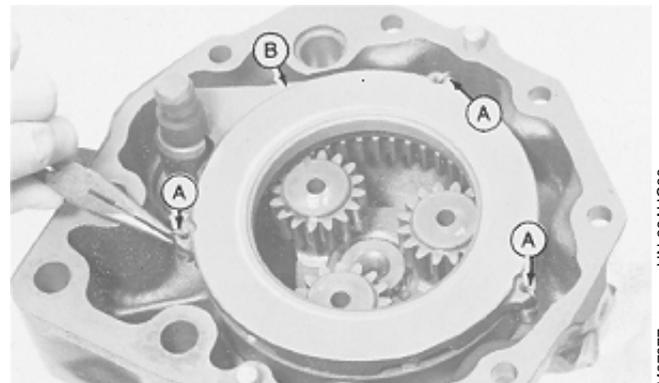
M37978 -UN-29AUG88

50-15-15

8. Install three springs (A), with the shorter hook of springs in ring gear, to anchor actuator plate (B) in place.

9. Be sure two alignment pins are in place.

10. Install new gasket.



MX,HU,5015,37 -19-16OCT91

M37977 -UN-29AUG88

## INSTALL PLANETARY GEAR ASSEMBLY—955 TRACTORS

1. Install planetary gear assembly. Fasten it with snap ring (A).

*NOTE: Spring mounting holes on bottom of ring gear are not symmetrical with alignment pins. Be sure ring gear is turned so that spring mounting hole is not directly next to brake camshaft.*

2. Install ring gear.

3. Apply thread lock and sealer (medium strength) on threads of cap screws.

4. Install six cap screws. Tighten them to 26 N-m (19 lb-ft).

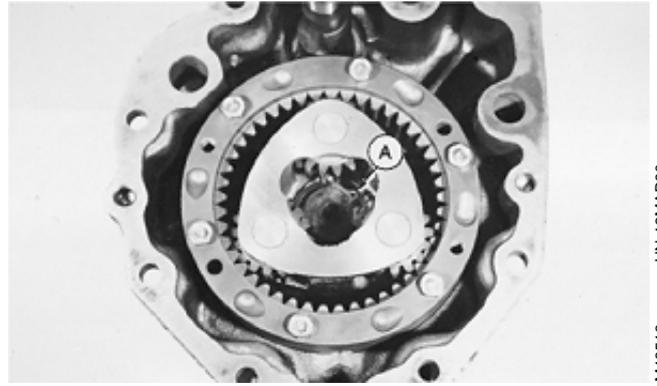
6. Install and apply grease to six balls.

7. Put actuator plate in place.

8. Install three springs (A), with the shorter hook of springs in ring gear, to anchor actuator plate (B) in place.

9. Be sure two alignment pins are in place.

10. Install new gasket.



955 Shown

M48516 -UN-12MAR90

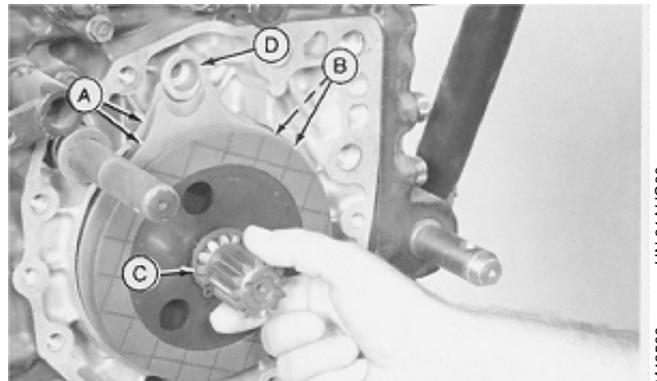
MX,HU.5015,38 -19-16OCT91

## INSTALL FINAL DRIVES

1. Put two separator plates (A) and two brake disks (B) alternately in place against snap ring (C) on final drive pinion shaft.

2. Align notches of separator plates with brake camshaft mounting hole (D) as you install splines of final drive pinion shaft into differential assembly inside the transaxle case.

- A—Brake Plate (2)
- B—Brake Disk (2)
- C—Final Drive Pinion Shaft
- D—Brake Camshaft Hole



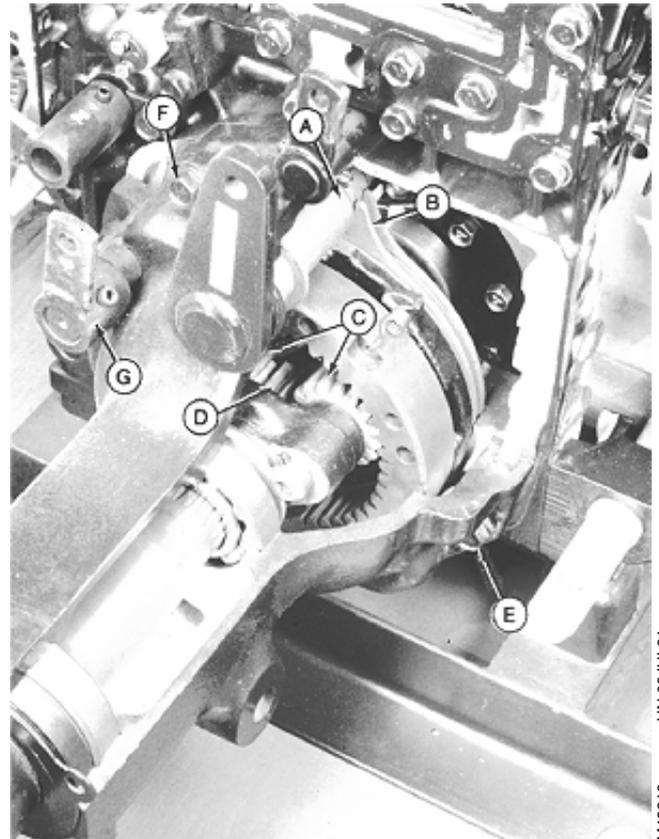
Left Side View

M43589 -UN-31AUG88

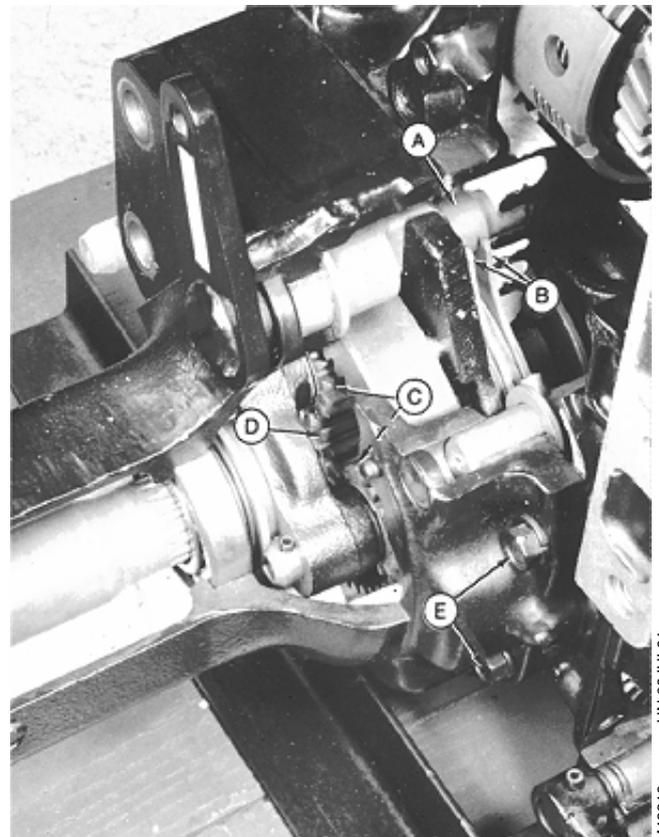
MX,HU.5015,39 -19-16OCT91

3. Make sure alignment pins are in place.
4. Make sure new gasket is installed over alignment pins and that a new O-ring is installed on differential lock shifter shaft.
5. Align brake camshaft (A) with notches (B) of brake separator plates. Align three gears (C) of final drive planetary assembly with splines (D) of final drive pinion shaft as you install final drive assembly.
6. Fasten final drive with five M10 x 35 cap screws (E) and one M10 x 50 cap screw (F) in top hole of final drive case (cutaway in right side view). Tighten all six cap screws to 52 N·m (38 lb-ft).
7. Install external shifter arm (G) on end of differential lock shifter shaft and fasten it with the spring pin removed earlier.

- A—Brake Camshaft
- B—Notches
- C—Gear (3 used)
- D—Final Drive Pinion Shaft Splines
- E—M10 x 35 Cap Screws
- F—M10 x 50 Cap Screws
- G—External Shifter Arm



Training Aid Cutaway View—Left Side



Training Aid Cutaway View—Right Side

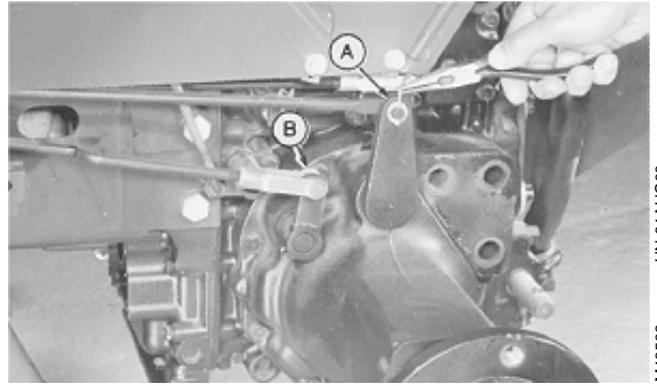
MX,HU,5015,40 -19-16OCT91

8. Connect brake link (A). Fasten it with a washer and cotter pin.

9. Connect differential lock link (B) (left side only). Fasten it with a drilled pin, washer, and cotter pin.

10. On the right side: connect brake link, range shifter link, and stop link (if equipped).

Left Side View



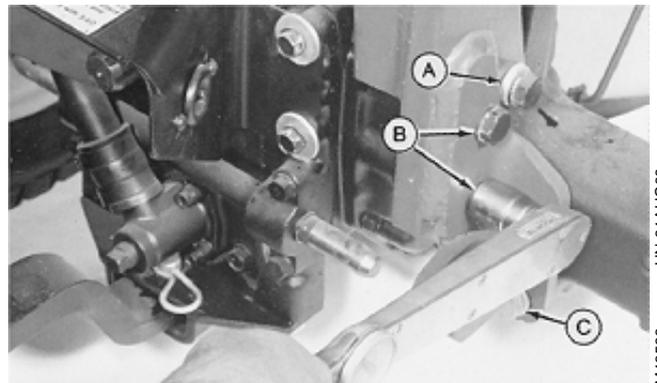
M43562 -UN-31AUG88

MX,HU,5015,41 -19-16OCT91

## INSTALL ROPS AND FINAL ASSEMBLY

1. Put ROPS in position with hoist. Install shorter bolt, lock washer, and thick washer (A). Install two longest bolts with lock washers (B). Install shortest bolt and lock washer (C). Repeat this procedure for the left side. Tighten all eight bolts evenly to 215 N·m (159 lb-ft).

2. Install drawbar. Fasten it with drilled pin and spring pin.



Right Side View

M43533 -UN-31AUG88

MX,HU,5015,42 -19-16OCT91

3. Install wheels. Tighten lug bolts to 115 N·m (85 lb-ft).

**IMPORTANT: Do not put lifting devise under transaxle. Transaxle case could become damaged.**

4. Remove jack stands.

5. Fill transaxle with JOHN DEERE HY-GARD® LOW VISCOSITY transmission and hydraulic oil. Transaxle capacity is approximately 17 L (4.5 gal).



M43591 -UN-31AUG88

MX,HU,5015,43 -19-16OCT91

## **BLEED HYDRAULIC SYSTEM**

To bleed the hydraulic system see Group 05, Section 70.

MX,HU,5015,44 -19-16OCT91

## **ADJUST CONTROL LINKAGES**

**N** **CAUTION:** Transmission control linkages may be out of adjustment. Safely lift drive wheels off ground and support tractor frame on jack stands before any adjustments.

To check all transaxle functions and adjust transmission control linkage see Section 250, Group 10.

MX,HU,5015,45 -19-16OCT91

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**Group 20**  
**Mechanical Front Wheel Drive (MFWD)**

**SPECIFICATIONS**

| Item                                 | Measurement      | Specification                    |
|--------------------------------------|------------------|----------------------------------|
| Ring Gear-to-Differential Housing    | Cap Screw Torque | 22 N•m (16 lb-ft)                |
| Differential Gear                    | Total Backlash   | 0.17—0.23mm (0.007—0.009 in.)    |
| Input Drive Housing Bearing Retainer | Cap Screw Torque | 26 N•m (19 lb-ft)                |
| Input Drive Housing-to-Axle Housing  | Cap Screw Torque | 82 N•m (60 lb-ft)                |
| Tie Rods Ends                        | Torque           | 53 N•m (39 lb-ft)                |
| Bearing Case Cover                   | Cap Screw Torque | 52 N•m (38 lb-ft)                |
| MFWD End-Play                        | Feeler Gauge     | 0.127—1.016 mm (0.005—0.040 in.) |

**OTHER MATERIAL**

| Number | Name  | Use  |
|--------|---|--|
| T43511 | John Deere LOCTITE® Clean and Cure Primer                   | Clean threads  |
| T43512 | John Deere LOCTITE® Threadlock and Sealer (Medium Strength) | Retain brake plate cap screws  |
| PT569  | John Deere NEVER-SEEZ® Lubricant                            | Lubricate axle shaft   |
| GL-5®  | John Deere GL-5® Gear Lubricant                             | Lubricate MFWD Internal Components—Capacity: 2.13 L (2.25 qt.) for 655, 755/756, and 855/856 tractors—3.3 L (3.5 qt) for 955 tractors. |

*LOCTITE is a trademark of the Loctite corporation*

*NEVER-SEEZ is a trademark of the Never-Seez Compound Corporation*

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## SERVICE EQUIPMENT AND TOOLS

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

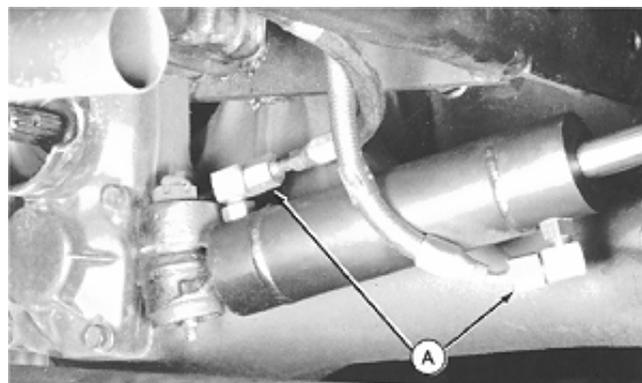
| Name                              | Use                                       |
|-----------------------------------|---|
| 2-Ton Jack Stands                 | To support frame.                         |
| Floor Jack                        | To support MFWD assembly.                 |
| Hydraulic Press                   | To and install remove bearings.           |
| Snap Ring Pliers Set              | To remove snap rings.                     |
| Bushing, Bearing & Seal Drive Set | To service bushings, bearings, and seals. |
| 2-Jaw Slide Hammer Puller         | To remove bearings.                       |
| 40 mm (1-9/16 in.) I.D. Pipe      | To install bearings and wear sleeves.     |
| 3-Jaw Puller                      | To remove bearings.                       |
| Vise-Grip Pliers                  | To set backlash.                          |
| Shim Pack Kit                     | To adjust backlash.                       |

MX,HU,5020,3 -19-16OCT91

## REMOVE MFWD AXLE

1. Remove MFWD drive shaft.
2. On 655, 755/756, and early 855/856 tractors, remove fuel tank. (See procedure in Section 30.) On late 855/856 and all 955 tractors, remove the battery.
3. Remove power steering cylinder from MFWD mountings and tie it to the frame during MFWD repair.

**DO NOT DISCONNECT POWER STEERING HYDRAULIC HOSES OR FITTINGS (A).**



Right Side View

MX,HU,5020,3A -19-16OCT91

4. Loosen lug nuts on front wheels before you raise front of tractor.
5. Raise the front of the tractor and safely support the frame behind the axle, about mid-engine area, to allow removal of front axle.
6. Remove the front wheels.
7. Support the axle with a floor jack.

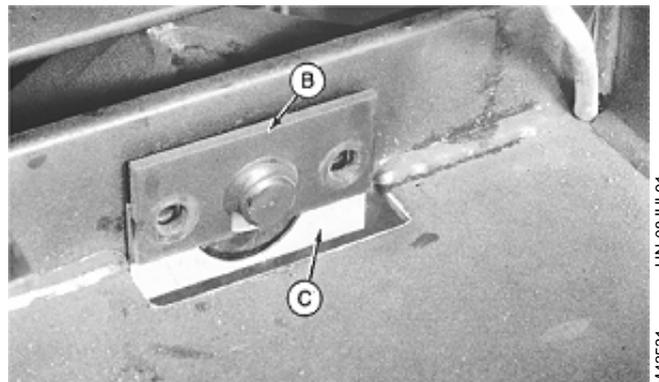
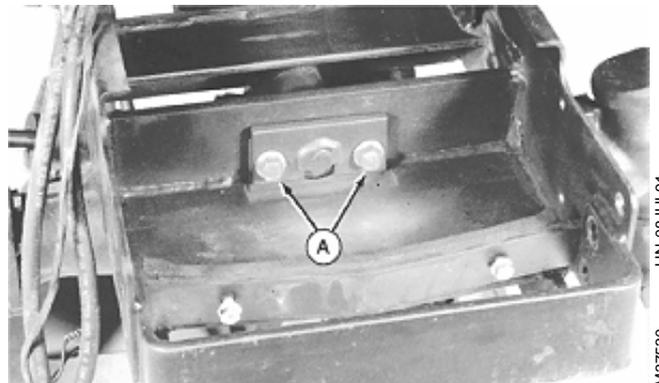


MX,HU,5020,4A -19-16OCT91

M37529 -UN-06SEP88

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5. Remove axle pin mounting bolts (A).
6. Slide axle pin (B) part-of-the-way out to remove shims (C).

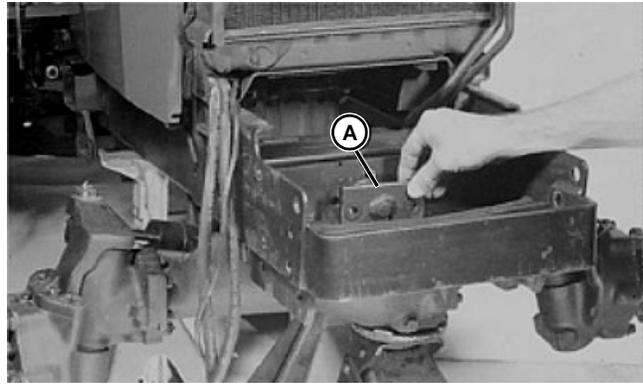


MX,HU,5020,5 -19-16OCT91

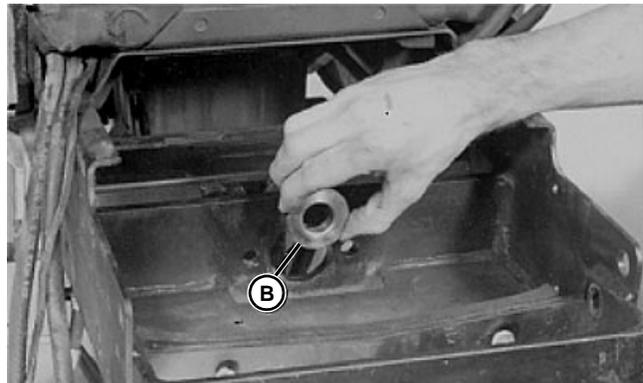
M37530 -UN-08JUL91

M43531 -UN-08JUL91

7. Remove axle pin (A) and bushing (B). Inspect and replace, if required.
8. Lower axle from frame with floor jack and set axle on blocks for disassembly.



M37532

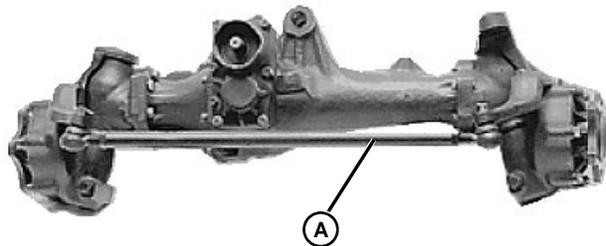


M37533

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### DISASSEMBLE FINAL DRIVE CASE.

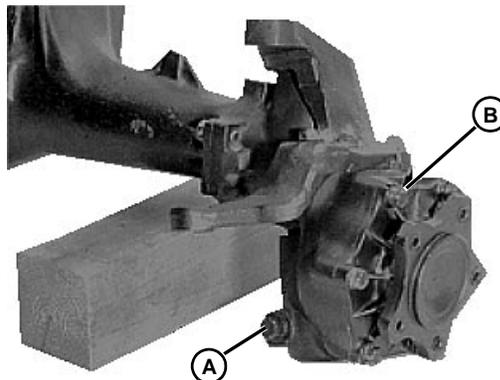
1. Remove tie rod (A).



M37587

2. Drain differential housing first and then each of the spindle/final drive cases at plug (A). Capacity is approximately 2.13 L (2.25 qt) for 655, 755/756, and 855/856 tractors—3.3 L (3.5 qt) for 955 tractors.

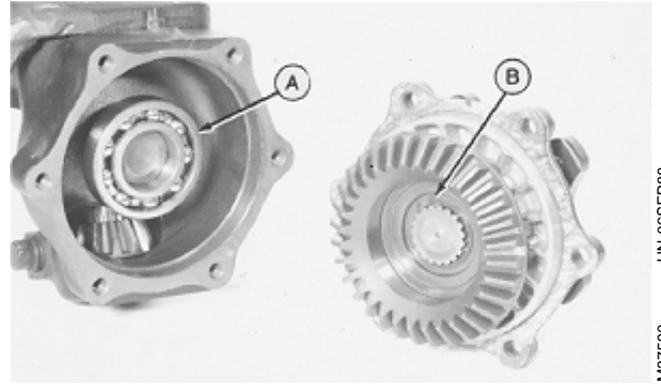
3. Remove six cover cap screws (B). Use a rubber hammer to remove cover assembly from spindle housing.



M37588

Mechanical Front Wheel Drive (MFWD)/Disassemble Final Drive Case

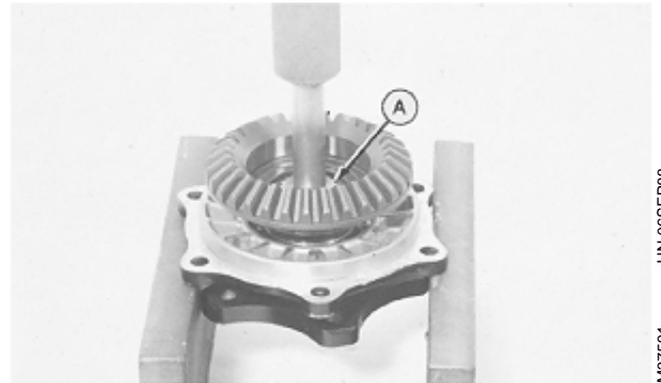
4. Remove bearing (A) from bearing case mount.
5. Remove snap ring (B) from hub shaft.



MX,HU,5020,9A -19-16OCT91

M37590 -UN-06SEP88

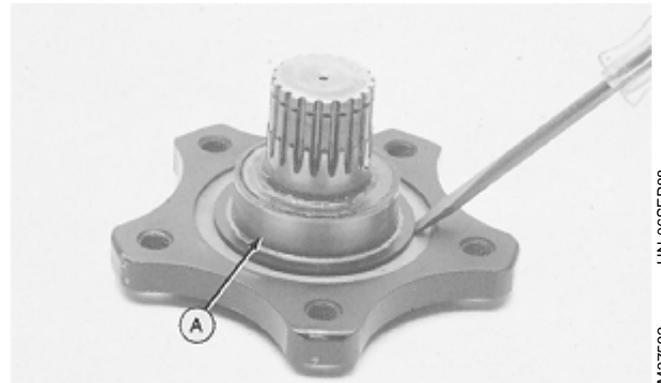
6. Press hub shaft (A) out of cover assembly.



MX,HU,5020,10 -19-16OCT91

M37591 -UN-06SEP88

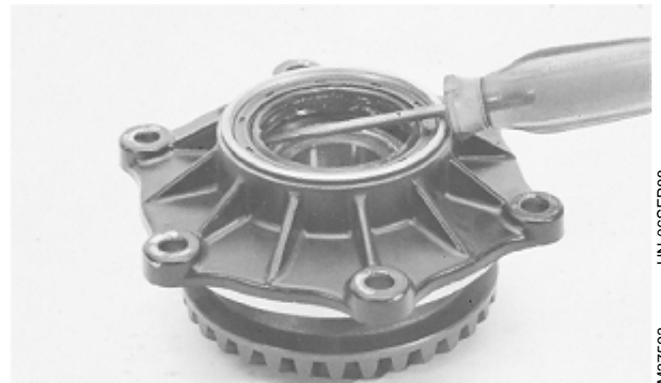
7. Inspect oil seal wear sleeve (A) for wear. Remove and replace if worn or damaged.



MX,HU,5020,11 -19-16OCT91

M37592 -UN-06SEP88

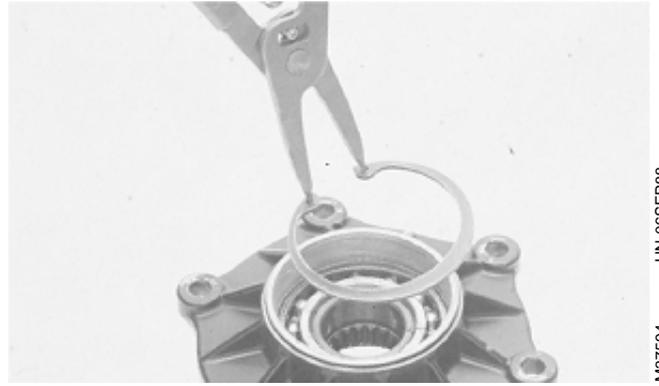
8. Inspect oil seal for damage. Remove and replace if required.



MX,HU,5020,12 -19-16OCT91

M37593 -UN-06SEP88

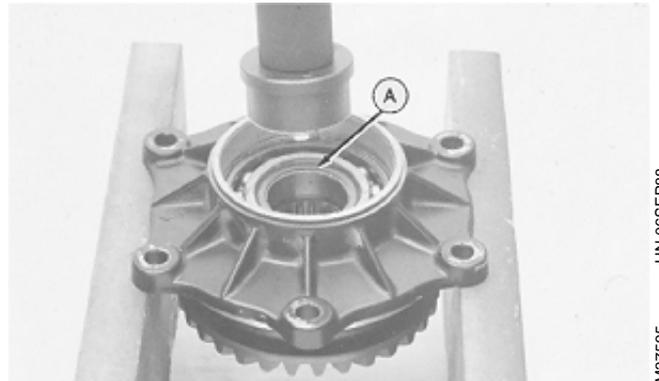
9. Remove outer snap ring.



MX,HU,5020,13 -19-16OCT91

M37594 -UN-06SEP88

10. Push on ring gear race surface (A) to press it out of bearing.

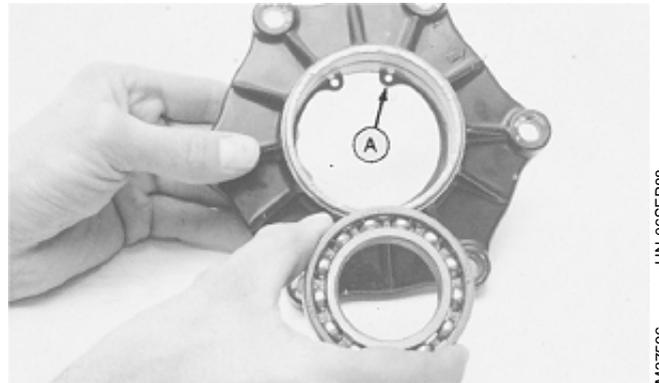


MX,HU,5020,14 -19-16OCT91

M37595 -UN-06SEP88

11. Inspect bearing for wear. Replace if required.

12. Inspect inner snap ring (A) and replace, if required.



MX,HU,5020,15 -19-16OCT91

M37596 -UN-06SEP88

## ASSEMBLE FINAL DRIVE CASE

1. Install inner snap ring (A) in lower groove of case cover.

2. Install bearing in case cover.

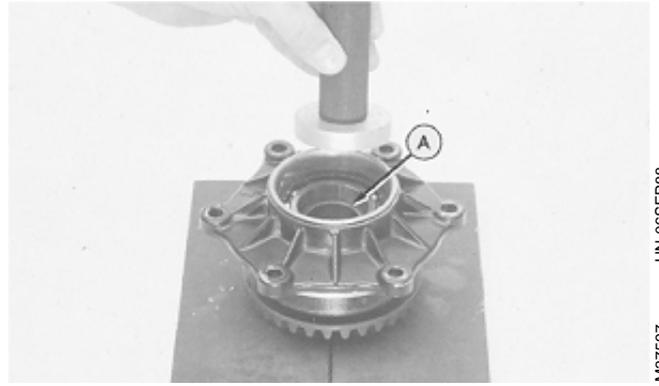


MX,HU,5020,16 -19-16OCT91

M37596 -UN-06SEP88

Mechanical Front Wheel Drive (MFWD)/Assemble Final Drive Case

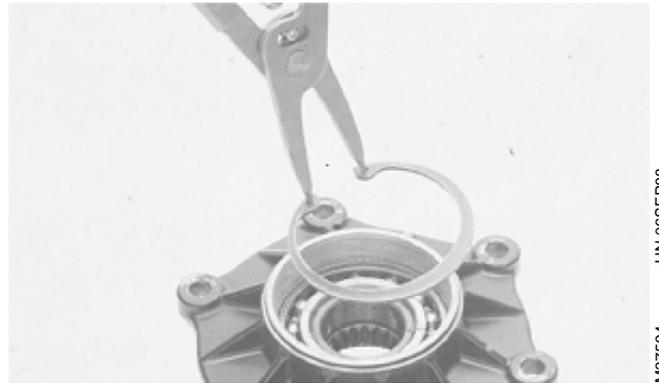
3. Press on inner race surface of cover bearing to install it on shaft (A) of ring gear (32 teeth for 655, 755/756, and 855/856 tractors—40 teeth for 955 tractors).



MX,HU,5020,17 -19-16OCT91

M37597 -UN-06SEP88

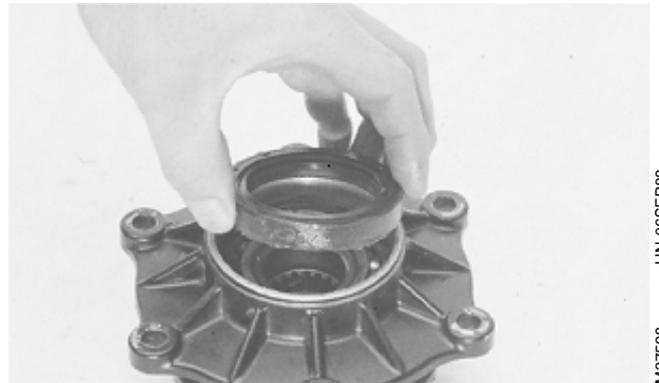
4. Install outer snap ring in cover.



MX,HU,5020,18 -19-16OCT91

M37594 -UN-06SEP88

5. Coat surface of new seal with grease before you install it in cover.



MX,HU,5020,19 -19-16OCT91

M37598 -UN-06SEP88

6. Install new oil seal wear sleeve on hub shaft, if required.



MX,HU,5020,20 -19-16OCT91

M37599 -UN-06SEP88

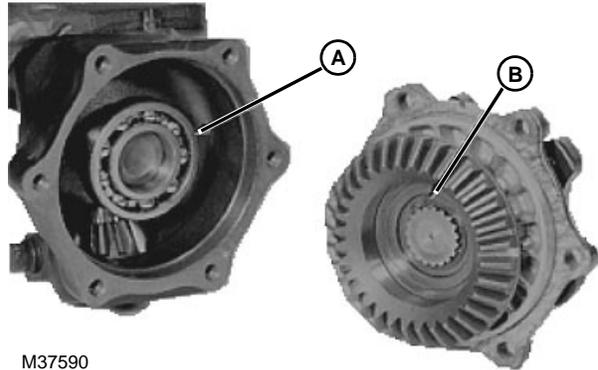
7. Press hub into cover assembly.



M37600

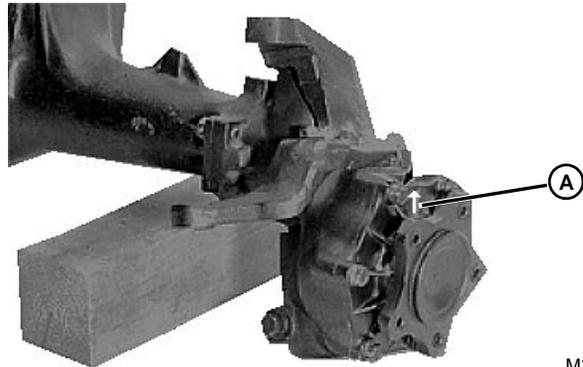
8. Install snap ring (B) in groove of hub shaft.

9. Install bearing (A) on bearing case mount.



M37590

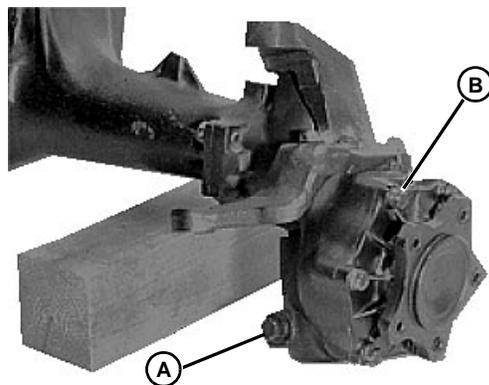
10. Install cover assembly, with arrow (A) pointing up, onto bearing.



M37589

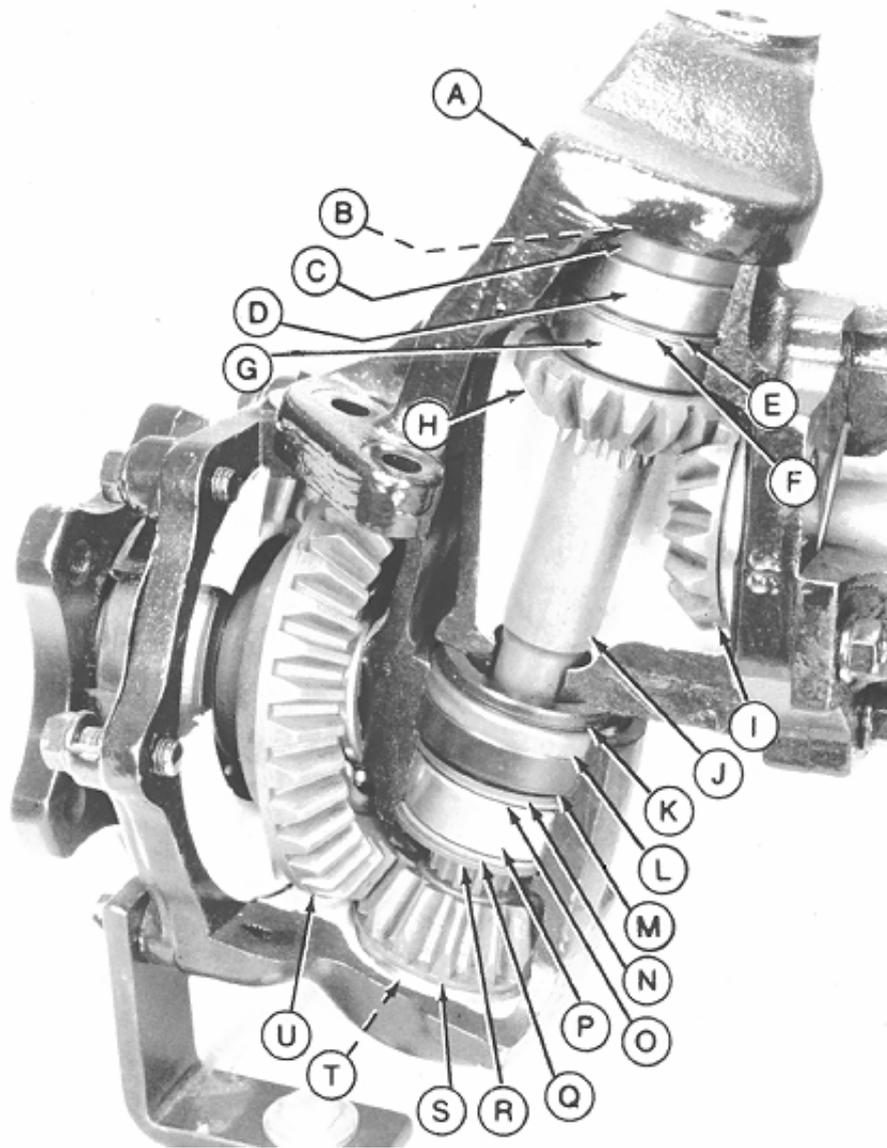
11. Fasten cover with six M10 x 30 cap crews (B). Tighten cap screws in a crossing pattern to 52 N•m (38 lb-ft).

12. Install axle differential center plug and each of the spindle/final drive case plugs (A). Fill case with John Deere GL-5® Gear Lubricant—SAE 80W-90. Capacity is approximately 2.13 L (2.25 qt) for 655, 755/756, and 855/856 tractors—3.3 L (3.5 qt) for 955 tractors.



M37588

**CUTAWAY VIEW—SPINDLE GEAR CASE**



-JUN-08-JUL91  
M42232

A—Steering Arm  
B—Oil Seal Wear Sleeve  
C—Oil Seal  
D—Ball Bearing  
E—Snap Ring  
F—Washer  
G—Ball Bearing

H—Top Spindle Bevel Drive Gear  
I—Spindle Bevel Input Gear W/ Ball Bearing  
J—Spindle Drive Shaft  
K—Oil Seal Wear Sleeve  
L—Bushing

M—Oil Seal  
N—Snap Ring  
O—Washer  
P—Needle Bearing With Inner Race  
Q—Washer

R—Snap Ring  
S—Bottom Spindle Bevel Drive Gear  
T—Ball Bearing  
U—Final Drive Bevel Ring Gear Assembly

*Training Aid Cutaway View—Right-Front*

This training aid cutaway view shows the proper assembly order of the parts that make up the spindle

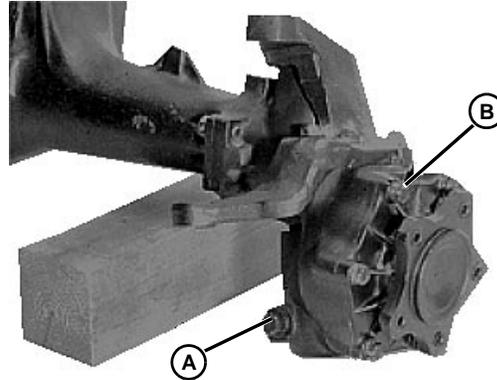
housing. Use this as a reference for disassembly and assembly of the spindle housing.

## DISASSEMBLE SPINDLE GEAR CASE

1. Drain axle differential at center plug first and then each of the spindle/final drive case plugs (A). Capacity is approximately 2.13 L (2.25 qt) for 655, 755/756, and 855/856 tractors—3.3 L (3.5 qt) for 955 tractors.

2. Remove six cover cap screws (B). Use a rubber hammer to remove cover assembly.

*NOTE: To disassemble and assemble final drive case, see Disassemble Final Drive Case (page 50-20-4) in this group.*

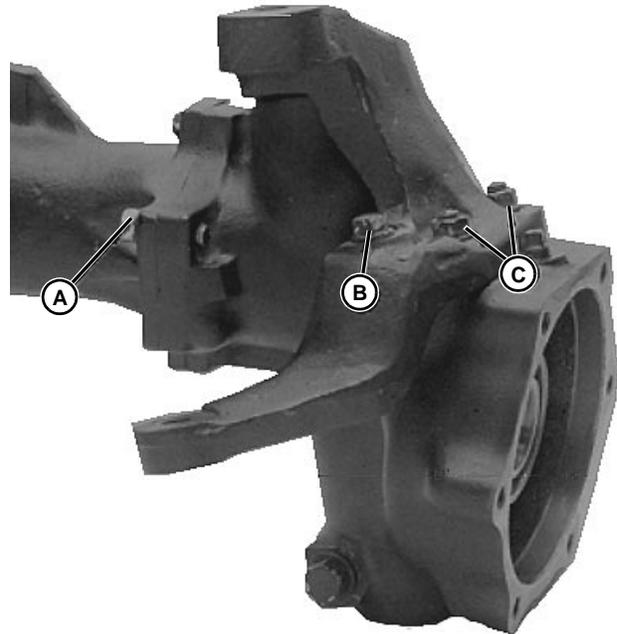


M37588

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

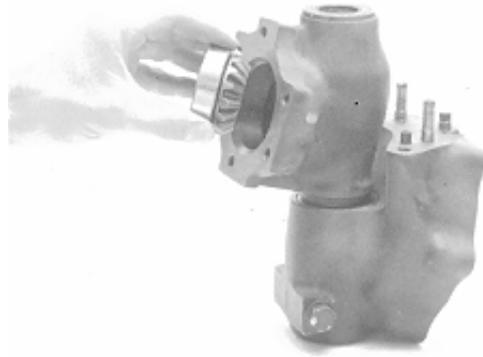
4. Remove six cap screws (A). Use a rubber hammer to separate spindle and final drive housing assemblies from axle housing.



M37601

Mechanical Front Wheel Drive (MFWD)/Disassemble Spindle Gear Case

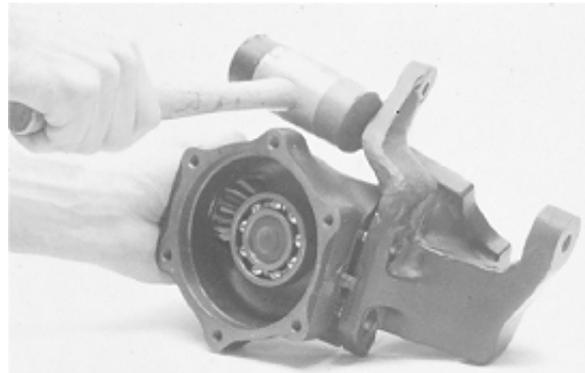
5. Remove bevel gear and bearing from upper spindle gear case. Inspect and replace, if required.



MX,HU,5020,28 -19-16OCT91

M37603  
-UN-26JAN90

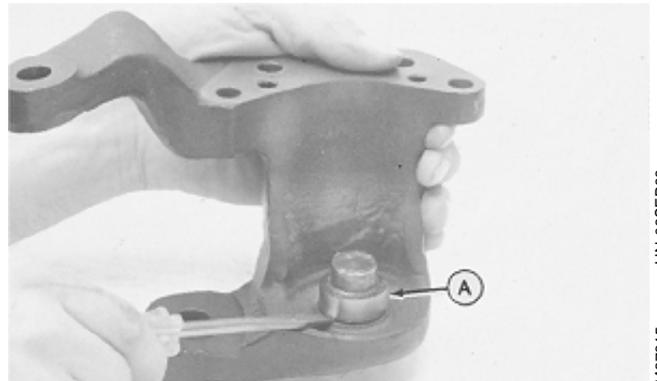
6. Use a rubber hammer to remove steering arm.



MX,HU,5020,29 -19-16OCT91

M37602  
-UN-06SEP88

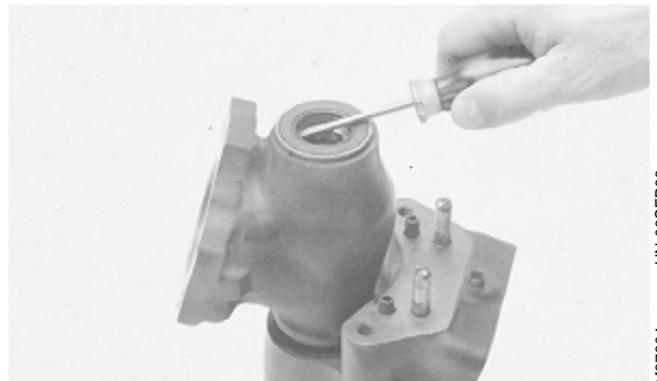
7. Inspect oil seal wear sleeve (A) for damage. Remove and replace, if required.



MX,HU,5020,30 -19-16OCT91

M37615  
-UN-06SEP88

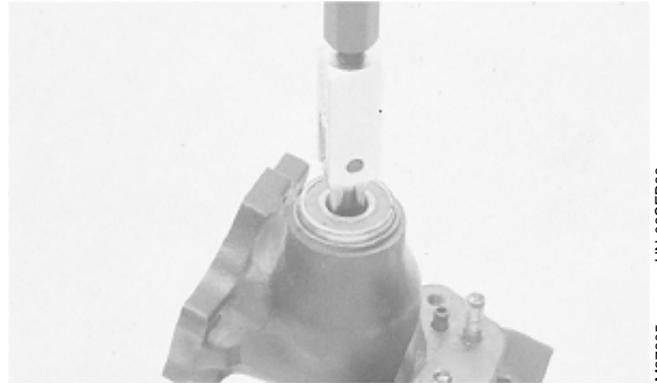
8. Inspect upper case oil seal for damage. Remove and replace, if required.



MX,HU,5020,31 -19-16OCT91

M37604  
-UN-06SEP88

9. Use an internal puller to remove top bearing from upper case. Inspect and replace, if required.



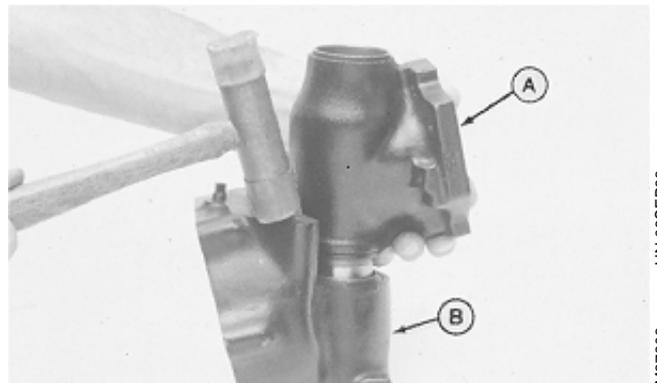
MX,HU,5020,32 -19-16OCT91

M37605 -UN-06SEP88

*NOTE: Bearings in upper gear case (A) are identical.*

10. Use a rubber hammer to remove upper gear case (A) from lower gear case (B).

*NOTE: The spindle shaft may or may not stay in the lower bearing of the upper case and/or the bearing may fall out with the shaft. If bearing and shaft remain in upper gear case, drive spindle shaft from lower bearing and remove lower bearing and washer from upper gear case. If bearing and shaft separate from upper gear case, you must hold the upper case up against the spindle gear while you drive the shaft from the bearing, gear and upper case.*



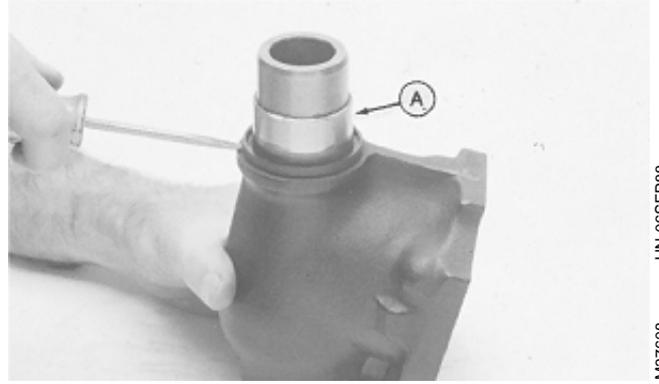
M37606 -UN-06SEP88

*The spindle shaft could also remain in the bottom drive gear and ball bearing of the lower gear case (B), separating itself from upper case components. If this happens, wiggle the shaft out of the ball bearing and gear. Or you may want to walk the bearing and gear out using the shaft as a handle and use a bearing puller to remove the bearing from the spindle shaft.*

MX,HU,5020,33 -19-16OCT91

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12

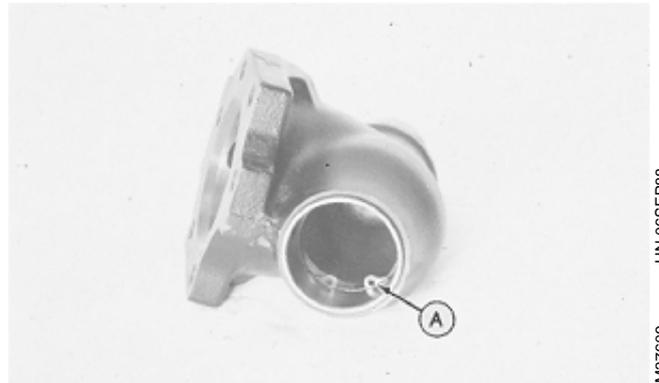
11. Inspect oil seal wear sleeve (A) for damage. Remove and replace, if required.



MX,HU,5020,34 -19-16OCT91

M37608 -UN-06SEP88

12. Inspect upper gear case snap ring (A) for damage. Remove and replace, if required.

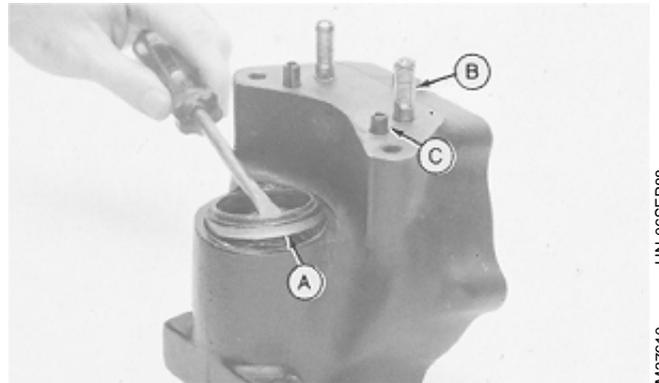


MX,HU,5020,35 -19-16OCT91

M37609 -UN-06SEP88

13. Remove sleeve (A) from lower gear case. Inspect and replace, if required.

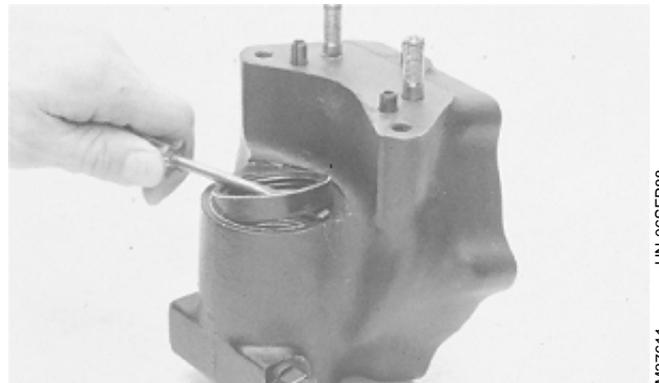
14. Inspect stud bolts (B) and spring pins (C) for damage. Remove and replace, if required.



MX,HU,5020,36 -19-16OCT91

M37610 -UN-06SEP88

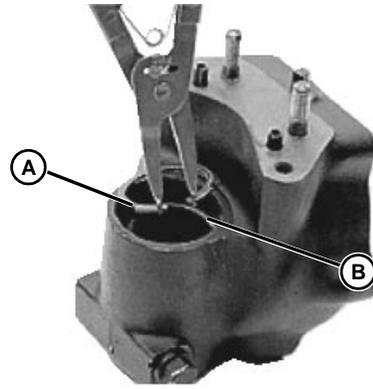
15. Remove and discard oil seal.



MX,HU,5020,37 -19-16OCT91

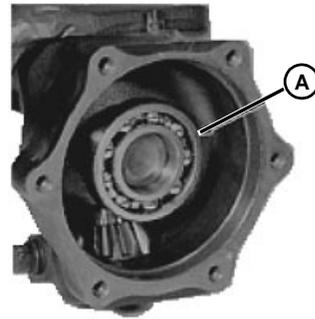
M37611 -UN-06SEP88

16. Remove upper snap ring (A) and washer (B).
17. Remove and inspect inner bearing race. Replace, if required.



M37612

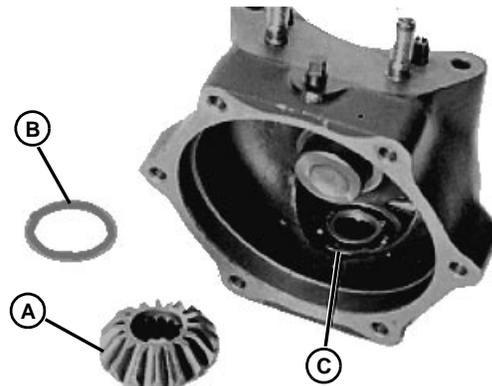
18. Remove bearing (A) (if not already removed).



M85025

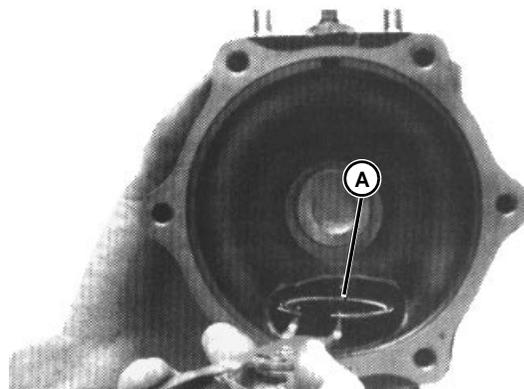
19. Remove gear (A) (13 teeth for 655, 755/756, and 855/856 tractors—12 teeth for 955 tractors), washer (B) (955 tractors) and bearing (C).

*NOTE: 955 tractors use a washer (B) between bearing and gear.*



M37627

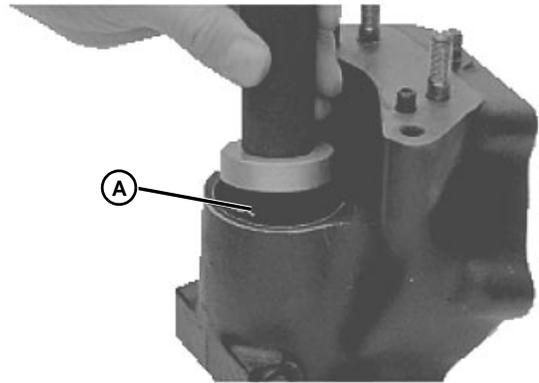
20. Remove lower snap ring (A) and washer (not depicted). Use an angled snap ring pliers.



M37613

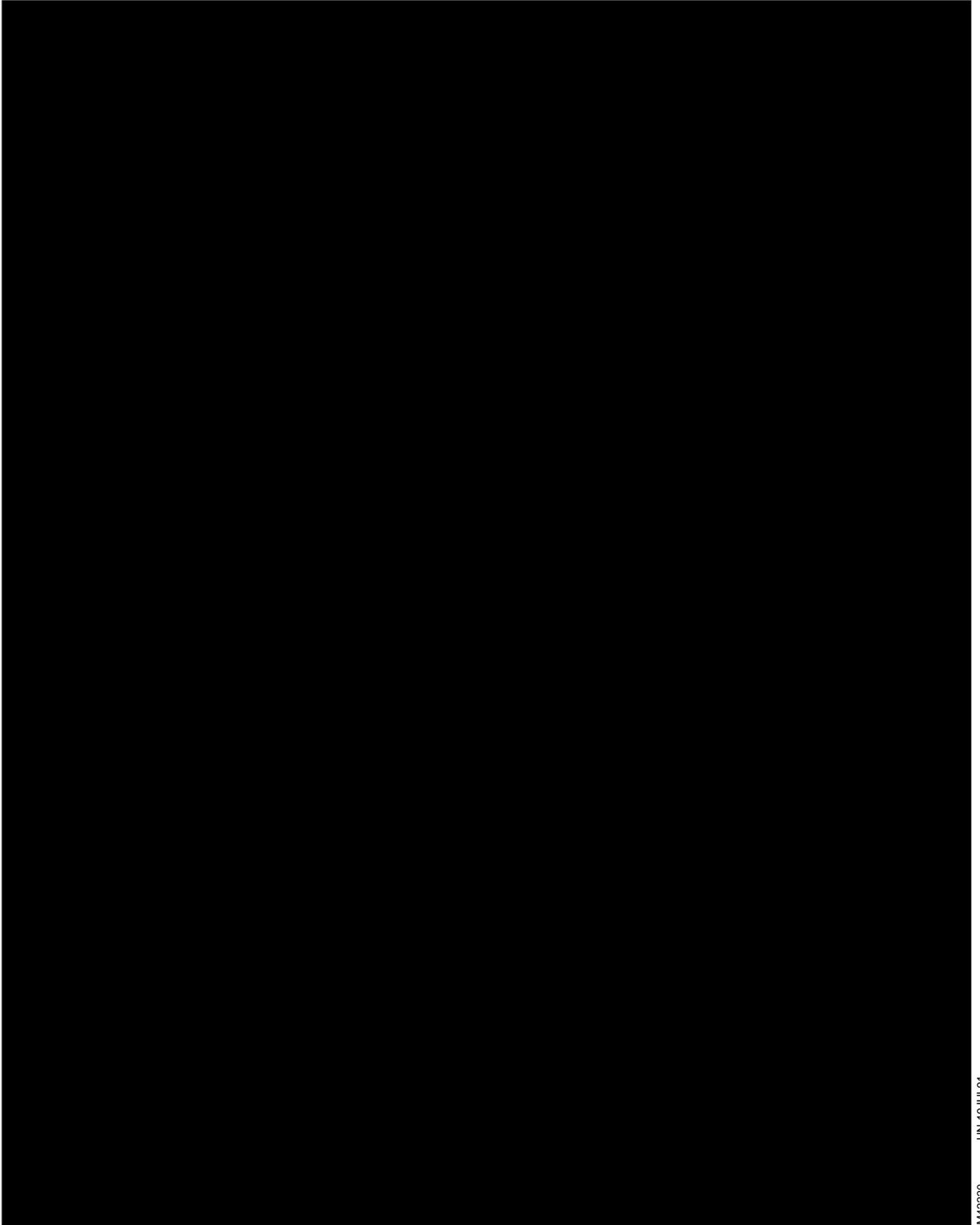


21. Push needle bearing out of gear box with a 2 in. driver disk.



M37614

Mechanical Front Wheel Drive (MFWD)/Cross-Section View



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17

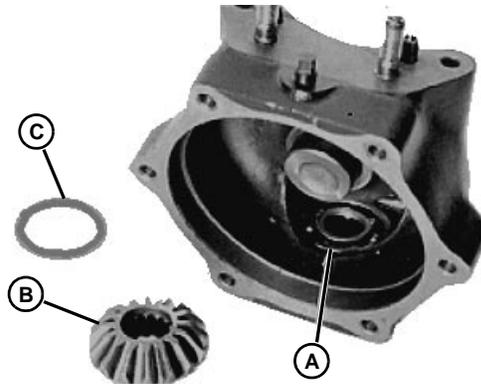
M42220 -UN-19JUL91

MX,HU,5020,46A -19-16OCT91

## ASSEMBLE SPINDLE GEAR CASE

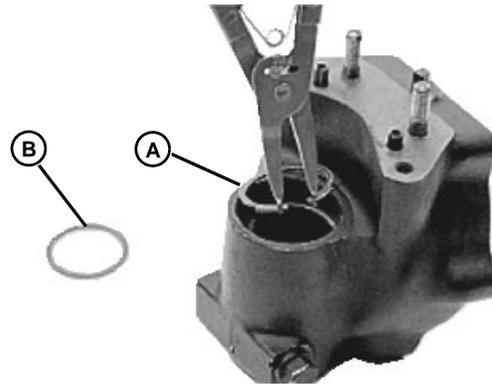
**NOTE:** 955 tractors use a washer (C) between bearing and gear.

1. Install bearing (A) in bottom of lower gear case. Use a 2 in. driver disk to seat the bearing. Place gear (B) (13 teeth for 655, 755/756, and 855/856 tractors—12 teeth for 955 tractors) on top of bearing. See Note above.



M37627

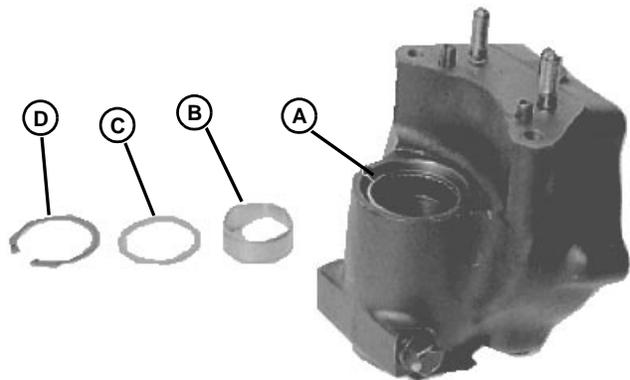
2. Install lower snap ring (A) with angled snap ring pliers. Put washer (B) on top of snap-ring.



M37621

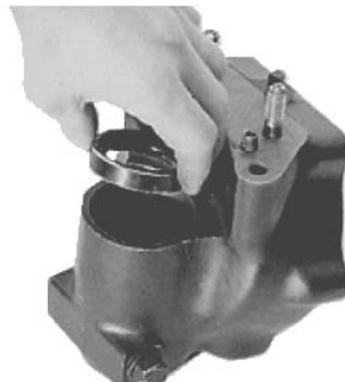
3. Install needle bearing (A) in gear case. Push needle bearing with a 2 in. disk until it contacts lower washer.

4. Install inner race (B), upper washer (C), and upper snap ring (D).



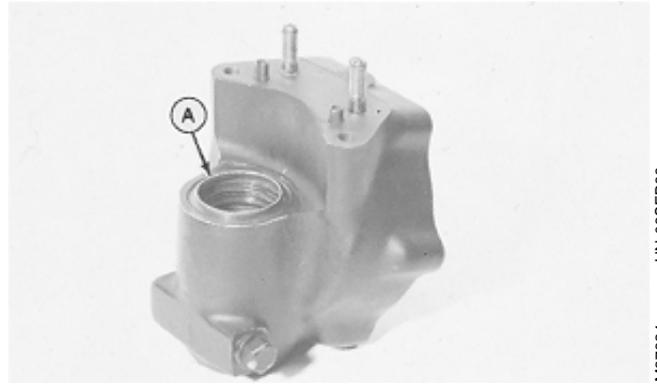
M37622

5. Install oil seal—coat surface of seal with grease, then push seal into gear case until it seats against upper snap ring.



M37623

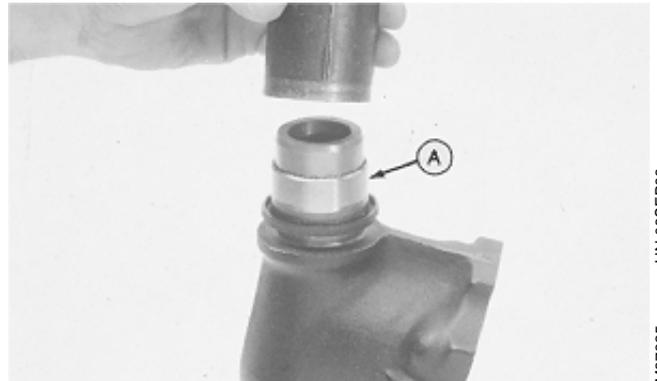
6. Install collar—collar must seat against oil seal.



MX,HU,5020,51 -19-16OCT91

M37624 -UN-06SEP88

7. Install oil seal wear sleeve (A) on upper gear case using a 1-9/16 in. ID pipe.



MX,HU,5020,52 -19-16OCT91

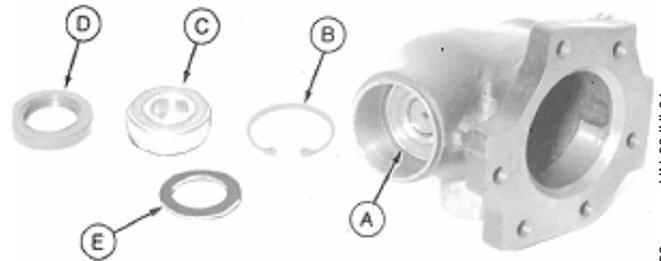
M37625 -UN-06SEP88

**NOTE:** All gear cases on MFWD axles with serial number (017049— ) will have washer (E) between bearing (A) and snap-ring (B). All replacement gear cases will also have this washer.

8. Install bearing (A) in upper gear case 1/16 in. below snap ring groove, then install washer (E).

9. Install snap ring (B), bearing (C), and oil seal (D).

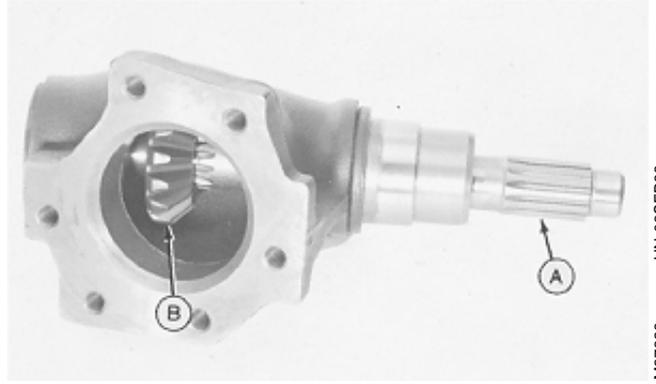
- A—Bearing
- B—Snap Ring
- C—Bearing
- D—Oil Seal
- E—Washer



MX,HU,5020,53 -19-16OCT91

M37626 -UN-08JUL91

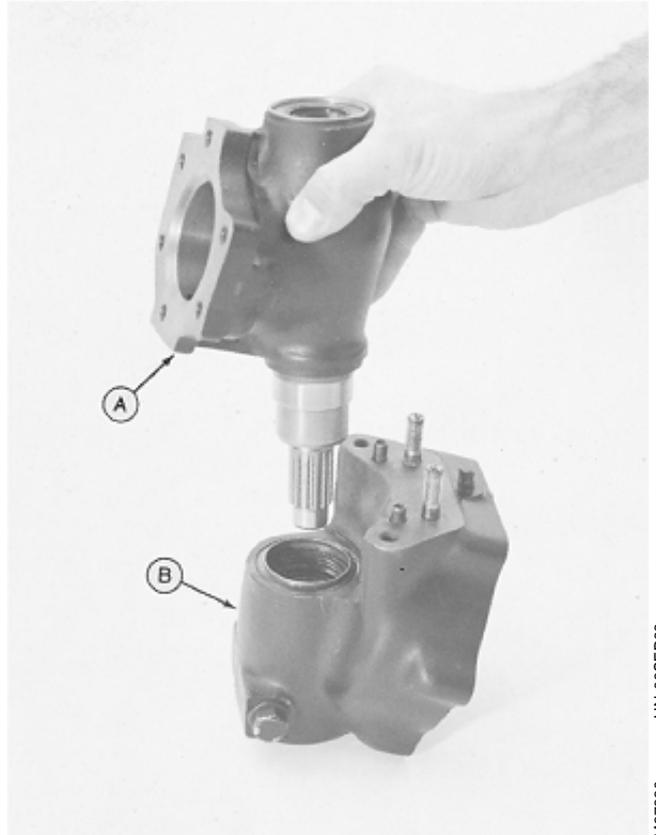
10. Install spindle shaft (A) in gear case. Put short splines of shaft through 16-tooth gear (B) and smooth surface of end of shaft into bearing. Tap shaft into bearing with a rubber hammer until it is fully seated.



MX,HU,5020,54 -19-16OCT91

M37628 -UN-06SEP88

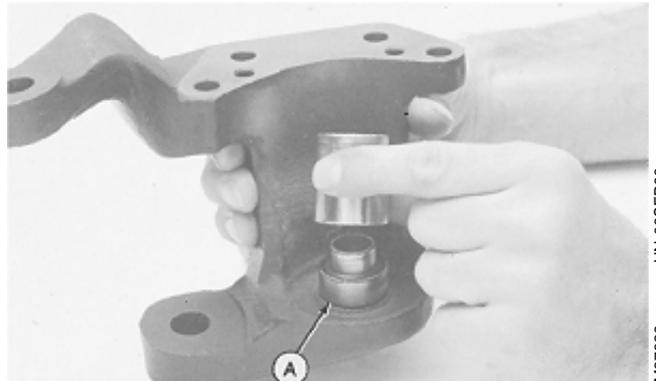
11. Install upper gear case assembly (A) into lower gear case assembly (B). Spindle shaft splines must align with gear in bottom of lower gear case.



MX,HU,5020,55 -19-16OCT91

M37630 -UN-06SEP88

12. Install a new oil seal wear sleeve (A) if required, coat the seal with grease and install with a socket or short pipe.

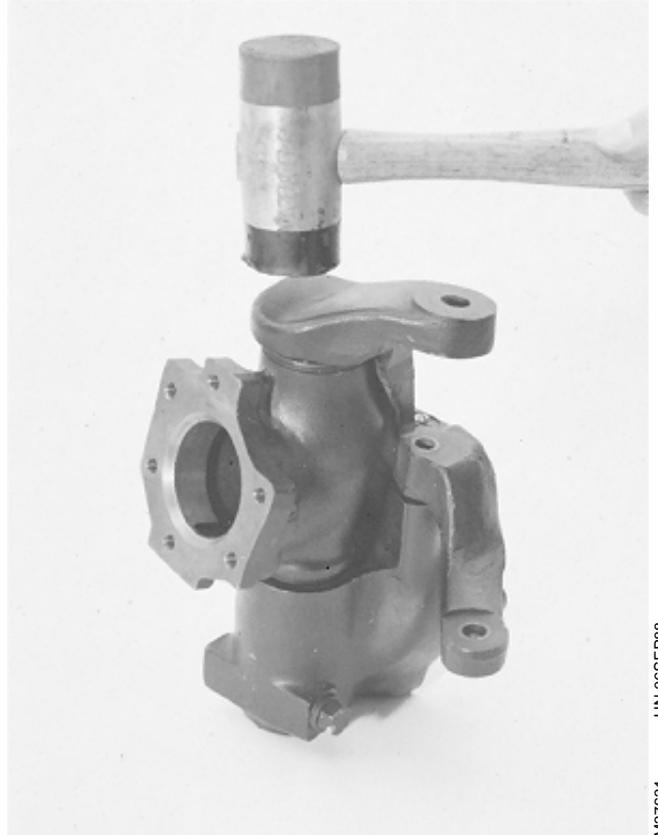


MX,HU,5020,56 -19-16OCT91

M37629 -UN-06SEP88

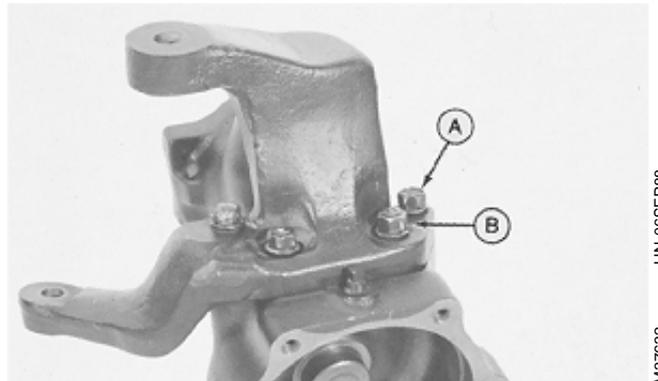
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13. Install steering arm assembly with a rubber hammer.



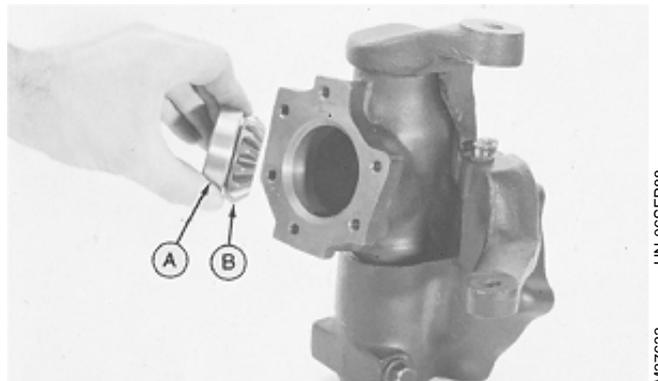
M37631 -UN-06SEP88  
MX,HU,5020,57 -19-16OCT91

14. Install M10 x 30 cap screws (A) and M10 nuts (B). Do not tighten them until after spindle case is attached to axle housing (Step 21).



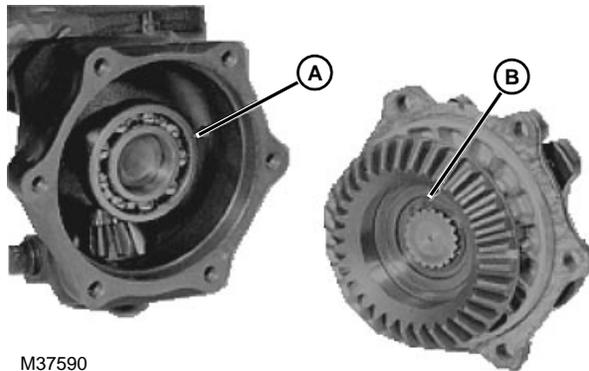
M37632 -UN-06SEP88  
MX,HU,5020,58 -19-16OCT91

15. Assemble bearing (A) and 15-tooth gear (B). Install bearing and gear into upper gear case.



M37633 -UN-06SEP88  
MX,HU,5020,59 -19-16OCT91

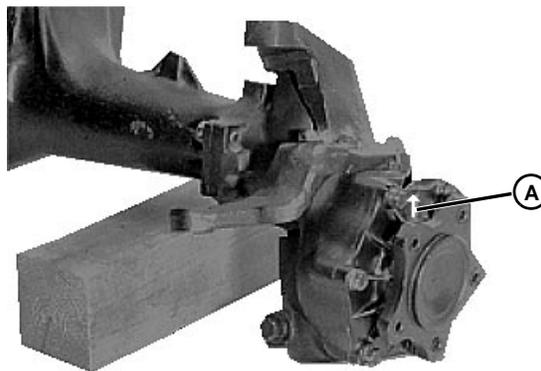
16. Install ball bearing (A) onto mounting surface of lower gear case. Match final drive ring gear mounting surface (B) with ball bearing (A) when hub assembly is installed in Step 18, below.



M37590

17. Align axle shaft splines with spindle input gear splines as you install spindle assembly on differential drive axle.

18. Install hub assembly on spindle assembly with cover arrow (A) pointing up.

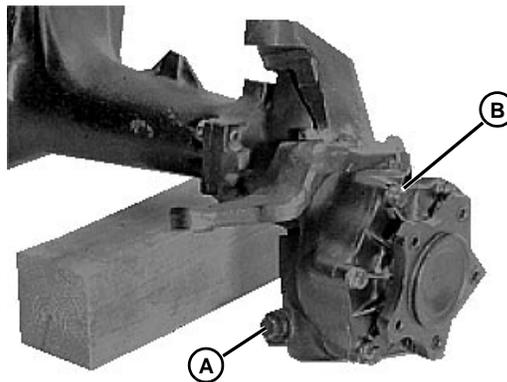


M37589

19. Install six M10 x 30 cap screws (B) and tighten in a crossing pattern to 52 N•m (38 lb-ft).

20. Tighten steering arm cap screws and nuts to 52 N•m (38 lb-ft) at this time.

21. Install axle differential center plug and each of the spindle/final drive case plugs (A). Fill case with John Deere GL-5® Gear Lubricant—SAE 80W-90. Capacity is approximately 2.13 L (2.25 qt) for 655, 755/756, and 855/856 tractors—3.3 L (3.5 qt) for 955 tractors.

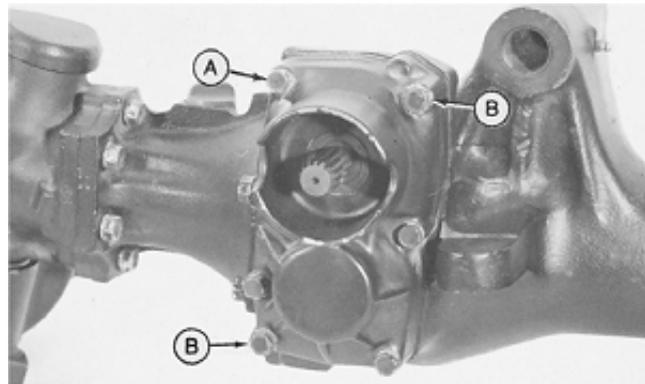


M37588

## DISASSEMBLE DIFFERENTIAL INPUT HOUSING

1. Remove five regular cap screws (A) and two special cap screws (B) to remove drive housing cover and gasket.

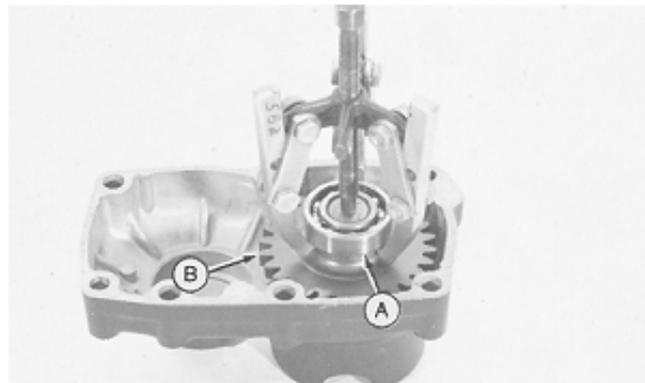
*NOTE: Input shaft, gear and bearing may not come off with cover. If they remain in the differential housing, grab the end of the input shaft and walk the bearing out of its seat.*



MX,HU,5020,60 -19-16OCT91

M37634 -UN-06SEP88

2. Pull bearing (A) from input gear (B). Remove gear from input shaft. Replace any damaged components.

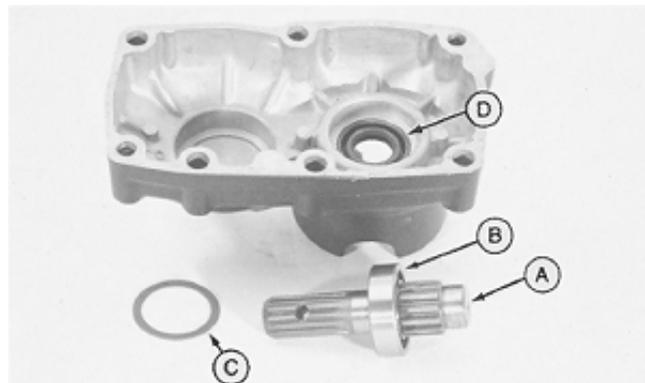


MX,HU,5020,61 -19-16OCT91

M37665 -UN-06SEP88

3. Push input shaft (A) out of the housing. Washer (C) will be between bearing (B) and the housing.

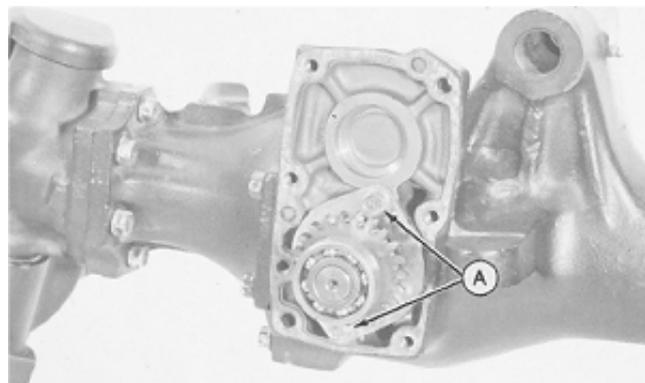
4. Inspect the shaft and bearing for wear or damage. Use a puller over the small splined end of shaft to remove the bearing. Remove and discard oil seal (D).



MX,HU,5020,62 -19-16OCT91

M37637 -UN-06SEP88

5. Use a puller to remove the small bearing from differential pinion drive shaft so you can remove the snap ring to remove the transfer gear. Remove cap screws (A) from retaining plate to remove large bearing and pinion drive shaft.



MX,HU,5020,63 -19-16OCT91

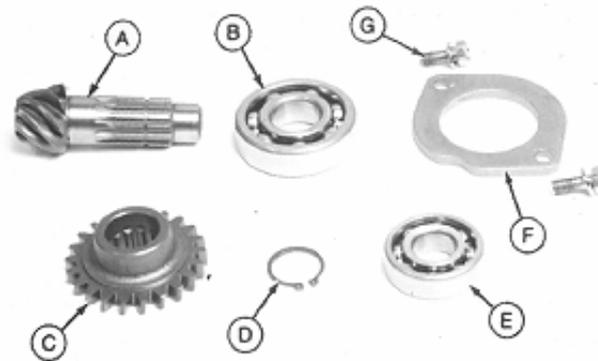
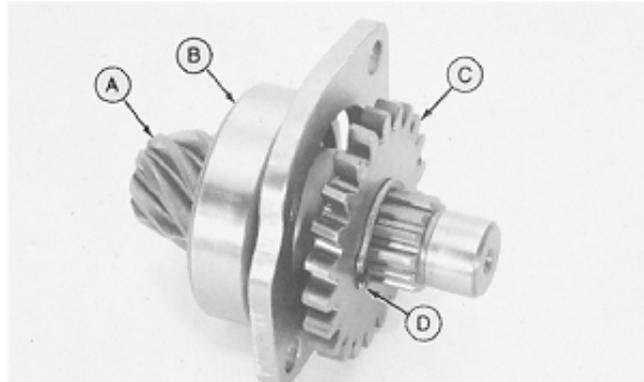
M37635 -UN-06SEP88

6. Inspect pinion gear drive shaft (A), large bearing (B), and transfer gear (C) for wear or damage.

7. Remove snap ring (D) to remove transfer gear (C).

8. Use a puller to remove large bearing (B). The small cover bearing (E) mounts on the right end of the shaft.

- A—Pinion Gear Drive Shaft
- B—Large Bearing
- C—Transfer Gear
- D—Snap Ring
- E—Small Cover Bearing
- F—Retaining Plate
- G—Cap Screw (2)



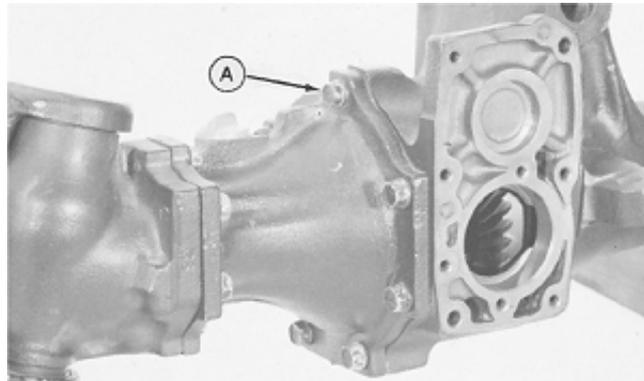
MX,HU,5020,64 -19-16OCT91

M37636 -UN-06SEP88

M42233 -UN-19JUL91

## DISASSEMBLE DIFFERENTIAL

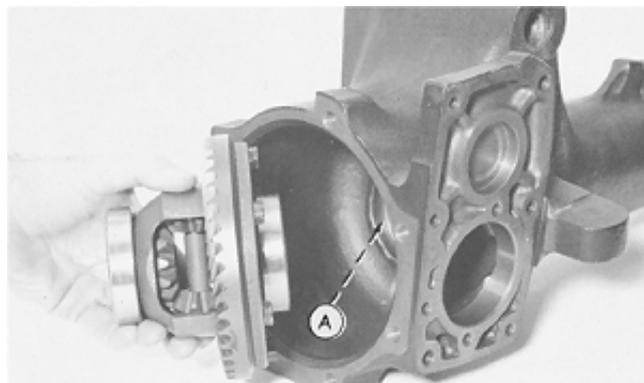
1. Remove seven cap screws to separate the left axle/spindle housing from the center differential housing.



MX,HU,5020,65 -19-16OCT91

M37638 -UN-06SEP88

2. Remove differential assembly from the axle housing. Remove all shims (A) from housing. Keep the shims together for installation.



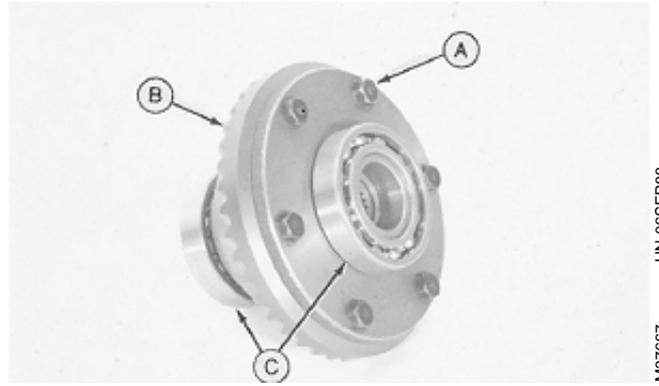
MX,HU,5020,66 -19-16OCT91

M37666 -UN-06SEP88

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24

## Mechanical Front Wheel Drive (MFWD)/Disassemble Differential

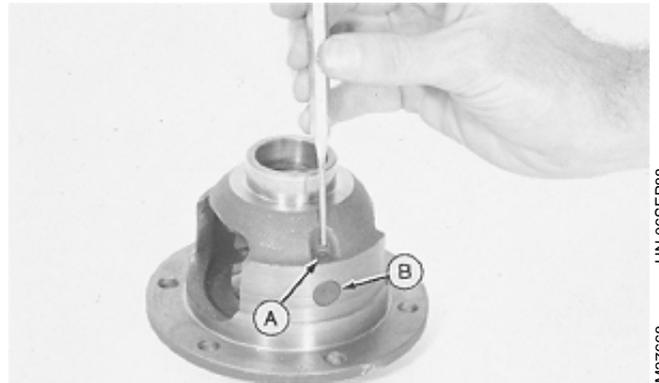
3. Remove six cap screws (A) to remove ring gear (B).
4. Inspect the bearings (they are identical) for wear or damage and replace, if necessary.
5. Use the appropriate type pullers to remove bearings (C).



MX,HU,5020,67 -19-16OCT91

M37667 -UN-06SEP88

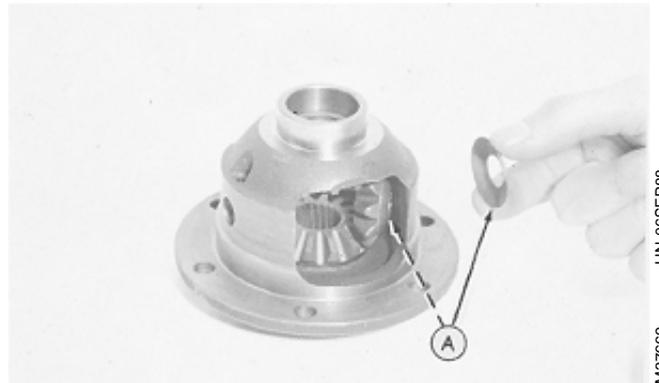
6. Drive spring pin (A) out of differential housing and pinion shaft (B).
7. Push shaft (B) out of housing.



MX,HU,5020,68 -19-16OCT91

M37668 -UN-06SEP88

8. Remove pinion thrust washers (A) and their respective pinion gears.



MX,HU,5020,69 -19-16OCT91

M37669 -UN-06SEP88

9. Remove thrust washer (B) from each of the side pinion gears (A).

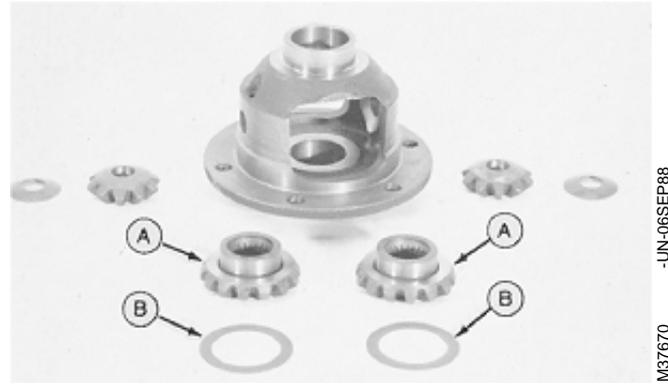


MX,HU,5020,70 -19-16OCT91

M37670 -UN-06SEP88

## ASSEMBLE DIFFERENTIAL

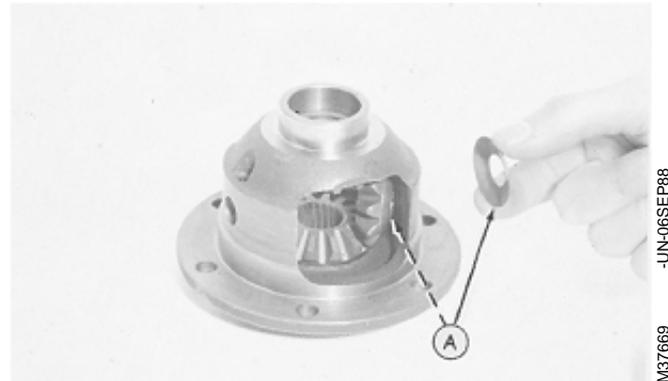
1. Install thrust washers (B) onto (14 teeth) side pinion gears (A) and install into drive housing.



MX,HU,5020,71 -19-16OCT91

M37670 -UN-06SEP88

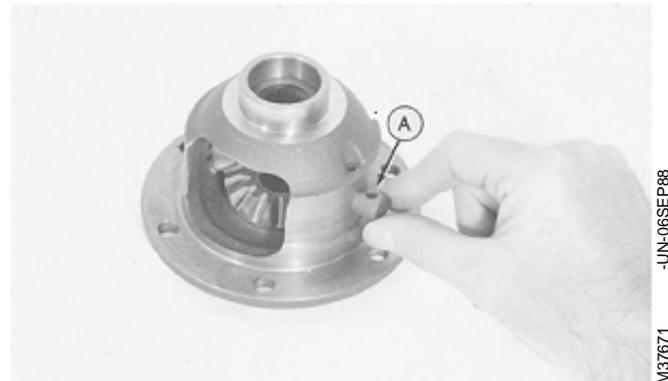
2. Align pinion gears (10 teeth) and thrust washers (A) with drive housing pinion shaft bore.



MX,HU,5020,72 -19-16OCT91

M37669 -UN-06SEP88

3. Install pinion shaft with hole (A) as shown and install spring pin.



MX,HU,5020,73 -19-16OCT91

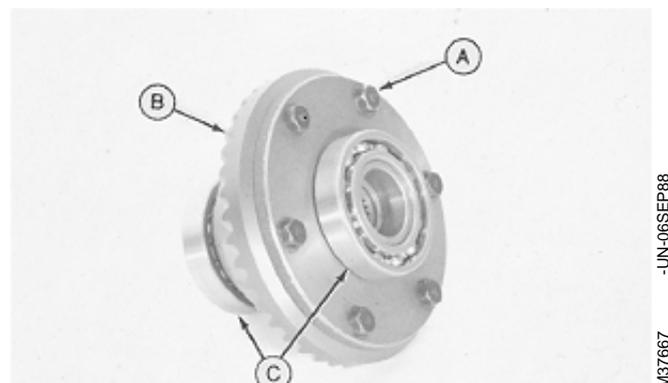
M37671 -UN-06SEP88

4. Install identical bearings (C).

5. Clean threads of all cap screws (A) and the differential housing with clean and cure primer.

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

7. Install ring gear (B) (41 teeth for 655, 755/756, and 855/856 tractors—38 teeth for 955 tractors) and tighten cap screws (A) to 22 N·m (16 lb-ft).



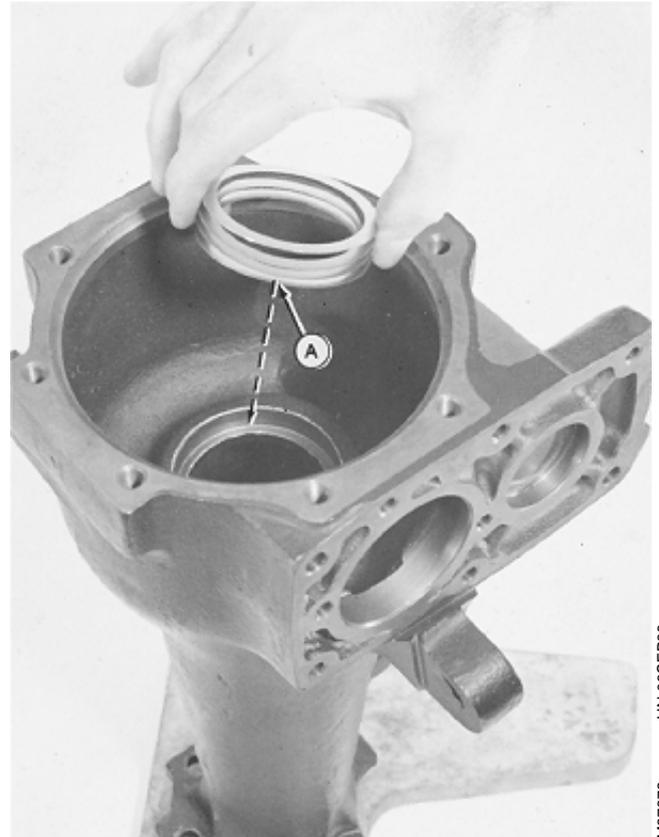
MX,HU,5020,74 -19-16OCT91

M37667 -UN-06SEP88

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26

*NOTE: Assemble and adjust the differential assembly with the axle housing vertical.*

8. Install the same number of shims (A) that were removed into housing.



MX,HU,5020,75 -19-16OCT91

M37672 -UN-06SEP88

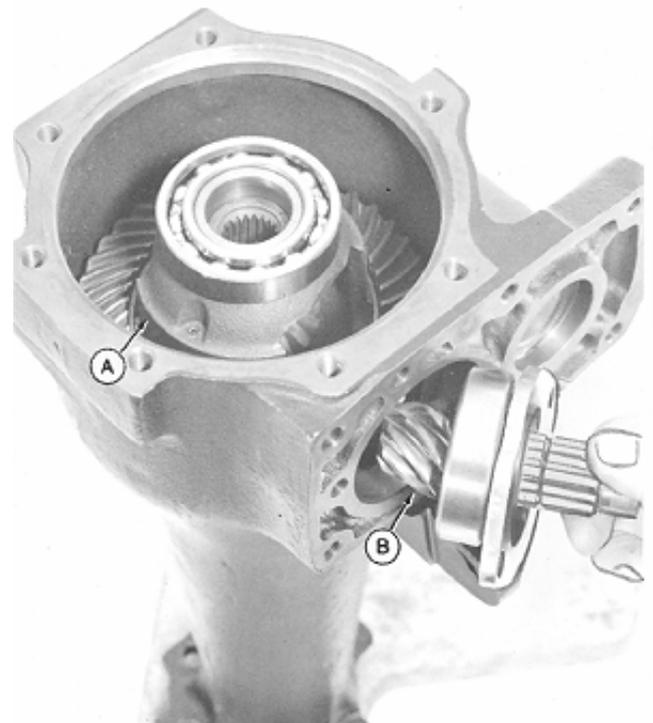
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27

*NOTE: Do not install transfer gear, snap ring, nor small cover bearing on pinion gear drive shaft until backlash adjustment has been made.*

9. Press large bearing on pinion gear drive shaft (B) (8 teeth for 655, 755/756, and 855/856 tractors—9 teeth for 955 tractors).

10. Put retaining plate (F) over shaft as shown.

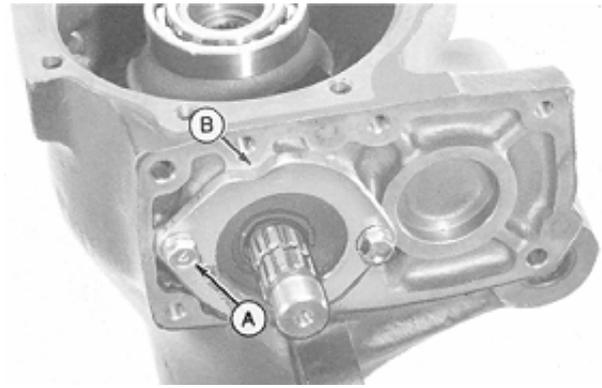
11. Install differential assembly (A) on top of shims inside the housing.



MX,HU,5020,76 -19-16OCT91

M37673 -UN-19JUL91

12. Notch (B) must be positioned as shown. Install and tighten two M8 x 20 bearing retainer cap screws (A) to 26 N-m (19 lb-ft).



MX,HU.5020,77 -19-16OCT91

M37674 -UN-19JUL91

12. Fasten a vise-grip pliers to the splines to the right of the snap ring groove of the pinion gear drive shaft. Let the pliers rest against the power steering cylinder mounting of the axle housing.

13. Install a side deflection gauge. Adjust pointer (A) to the side of a gear tooth, 2/3 of the way to the outside of the ring gear.

14. Adjust the gauge to zero. Lightly move differential back and forth. Total backlash should measure 0.17—0.23 mm (0.007—0.009 in.).

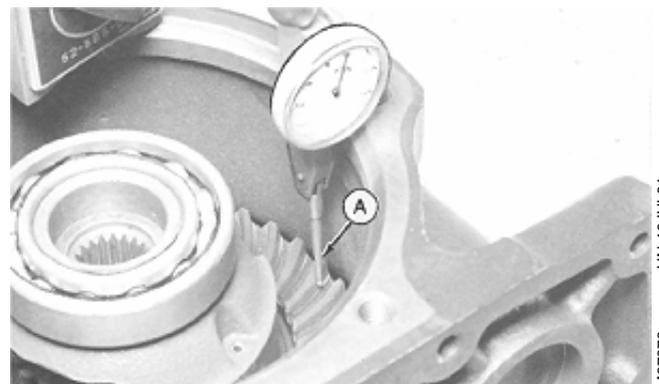
**IMPORTANT: The pinion gear drive shaft must be removed each time a shim adjustment is made. Tighten the bearing retainer plate each time it is installed to properly recheck the backlash.**

15. Adjust backlash by adding or removing shims between the differential assembly bearing and its axle housing seat. Shims are available in a kit. Shims come in 0.1 mm (0.004 in.), 0.3 mm (0.012 in.), and 0.5 mm (0.02 in.) thicknesses.

16. Tighten bearing retainer plate cap screws to 26 N-m (19 lb-ft) after final backlash has been set. Install transfer gear and snap ring on pinion gear drive shaft at this time.



M37675 -UN-19JUL91

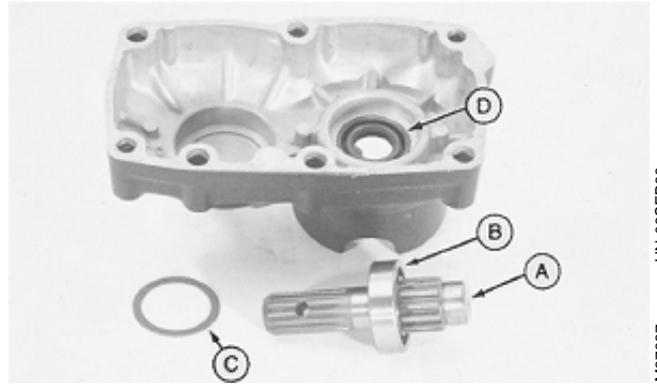


M37676 -UN-19JUL91

MX,HU.5020,78 -19-16OCT91

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28

17. Assemble input housing: install new oil seal (D), place thrust washer (C) on top of oil seal, press bearing (B) onto input shaft (A), and install the shaft in the housing—long splines through the inside of the oil seal first. The shaft bearing must seat fully inside the housing cover.



MX,HU,5020,79 -19-16OCT91

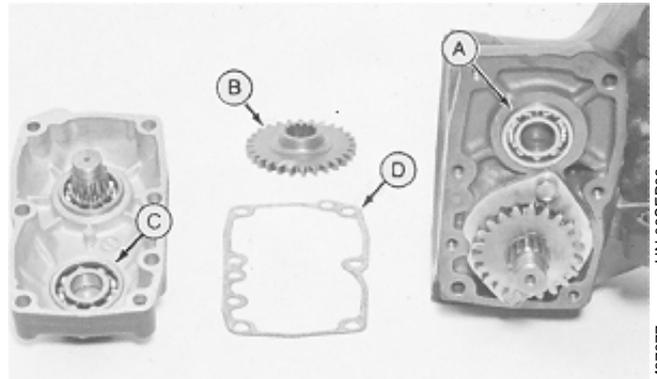
M37637 -UN-06SEP88

18. Install bearing (A).

19. Install input gear (B) (25 teeth for 655, 755/756,855/856 tractors and 28 teeth for 955 tractors) on input shaft with raised side of gear up and away from the seal.

20. Install bearing (C).

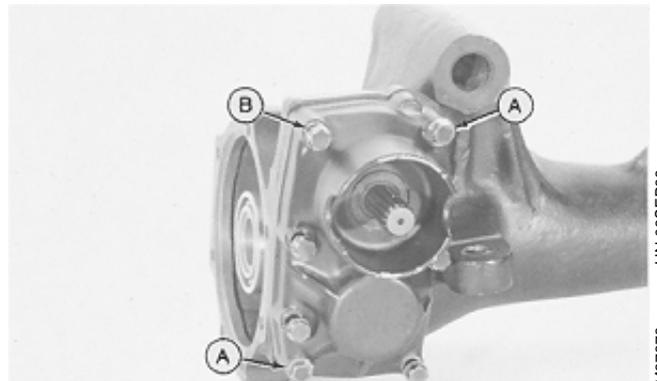
21. Align gears, ends of shafts, and new gasket (D) as you install input housing cover on differential axle housing.



MX,HU,5020,80 -19-16OCT91

M37677 -UN-06SEP88

22. Install larger centering cap screws (A) loose. Start remaining cap screws (B), then tighten cap screws (A). Tighten all cap screws to 26 N·m (19 lb-ft).

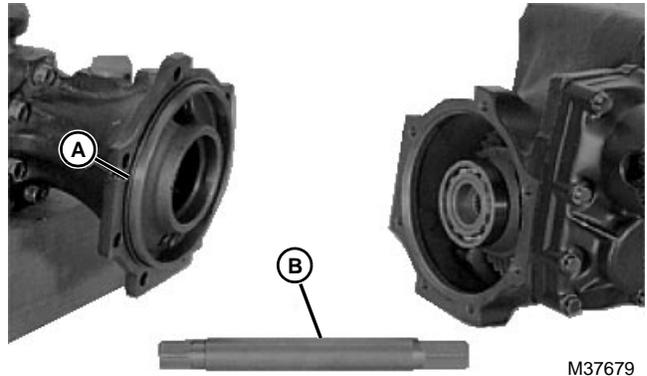


MX,HU,5020,81 -19-16OCT91

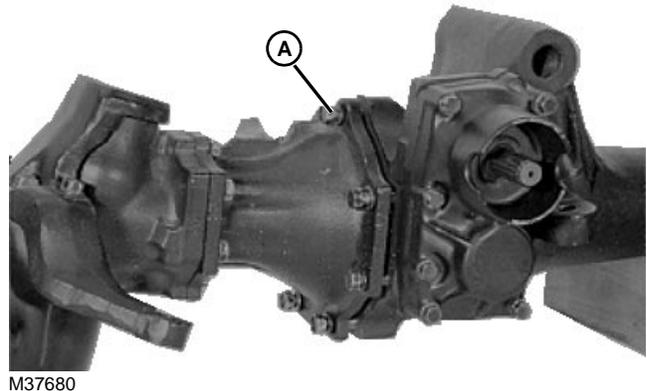
M37678 -UN-06SEP88

## ASSEMBLE AXLE HOUSINGS

1. Install new seal (A).
2. Install shaft (B) with short splines into spindle input gear inside left axle housing.

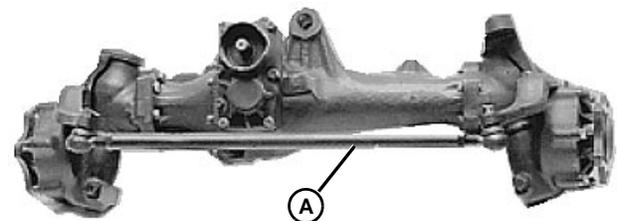


3. Align long splines of left axle shaft with splines of differential assembly.
4. Make sure seal remains in its groove as you slide housing together.
5. Clean all cap screw and housings threads using clean and cure primer.
6. Apply thread lock and sealer (medium strength) to the threads of seven M10 x 30 cap screws (A).
7. Tighten cap screws to 52 N•m (38 lb-ft).



**NOTE:** Install drain plug(s) and fill MFWD with John Deere GL-5® Gear Lubricant—SAE 80W-90. Capacity is approximately 2.13 L (2.25 qt) for 655, 755/756, and 855/856 tractors—3.3 L (3.5 qt) for 955 tractors.

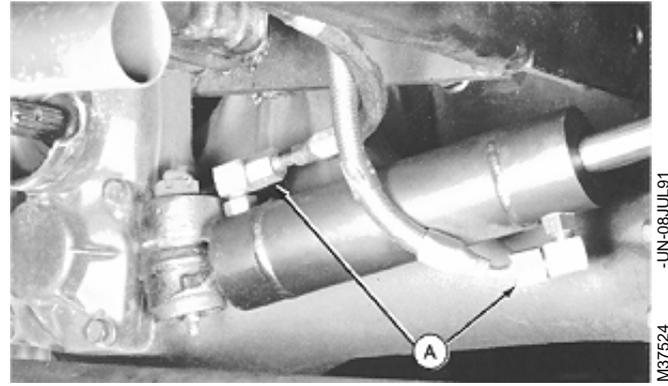
8. Install tie rod (A). Tighten tie rod castle nuts to 53 N•m (39 lb-ft), turn nut forward to drilled hole and install cotter pin. See page 50-20-32 for tie rod adjustment.
9. Install axle to tractor in reverse order of disassembly procedures at the beginning of this section.



10. When you install the power steering cylinder, tighten both castle nuts to 75 N·m (55 lb-ft) before you install cotter pins. Make sure both power steering hoses and their fittings (A) are in good condition and installed properly—otherwise replace and/or repair, if required.

11. Install front wheels. Tighten lug nuts to 79 N·m (58 lb-ft) on 655, 755/756, and 855/856 tractors—120 N·m (89 lb-ft) on 955 tractors.

12. Before you remove tractor support equipment, adjust axle end-play.



M37524 -UN-08JUL91

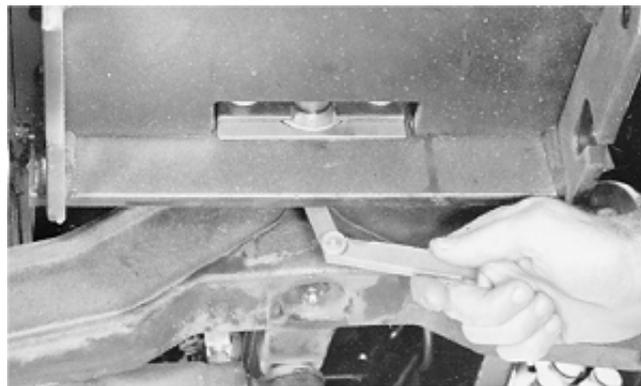
MX,HU,5020,84A -19-16OCT91

## ADJUST FRONT AXLE END-PLAY

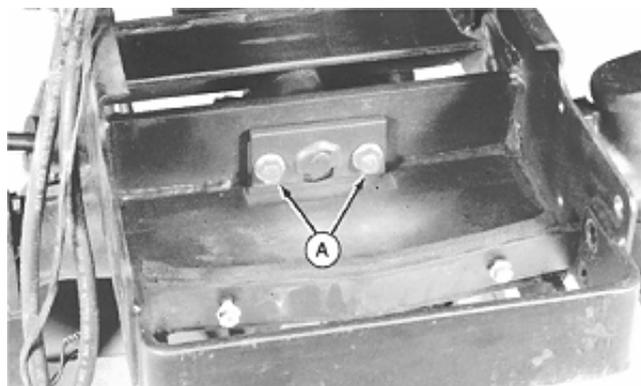
### SPECIFICATION

End-Play . . . . . 0.127-1.016 mm (0.005-0.040 in.)

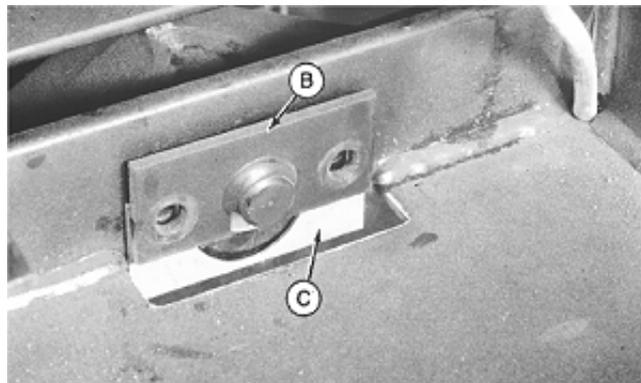
1. Safely jack up tractor so axle is free to pivot.
2. With feeler gauge, measure gap between axle housing and bushing.
3. Add or deduct shims (C) between pin flange (B) and tractor frame to gain specification.
4. Tighten cap screws to 88 N-m (65 lb-ft).



M43484 -UN-31AUG88



M37530 -UN-08JUL91

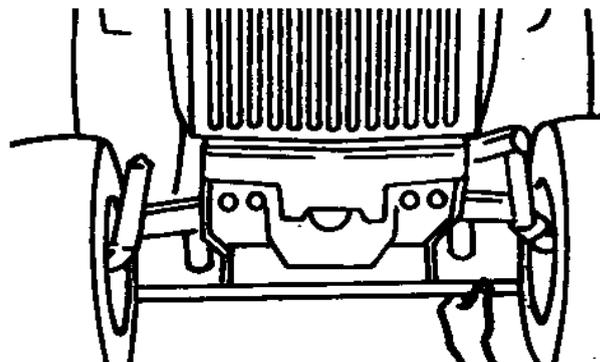


M43531 -UN-08JUL91

MX,HU,5020,85 -19-16OCT91

## ADJUST FRONT AXLE TOE-IN

1. Position wheels so they are pointing straight ahead.
2. Measure distance between the inner edges of the tires at the rear.
3. Measure front distance between tires. When properly adjusted, front distance should be 3-9 mm (1/8-3/8 in.) less than rear distance.



M32064 -UN-28APR89

MX,HU,5020,86 -19-16OCT91

*Mechanical Front Wheel Drive (MFWD)/Adjust Front Axle Toe-In*

4. Loosen tie rod nuts and adjust tie rod to lengthen or shorten distance.

**IMPORTANT: Make sure there is free movement of ball joints after tightening.**

5. Tighten tie rod nuts to 118 N·m (87 lb-ft.).



M43592 -UN-31AUG88

MX,HU.5020,87 -19-16OCT91

50  
20  
33

*Mechanical Front Wheel Drive (MFWD)/Adjust Front Axle Toe-In*

50  
20  
34

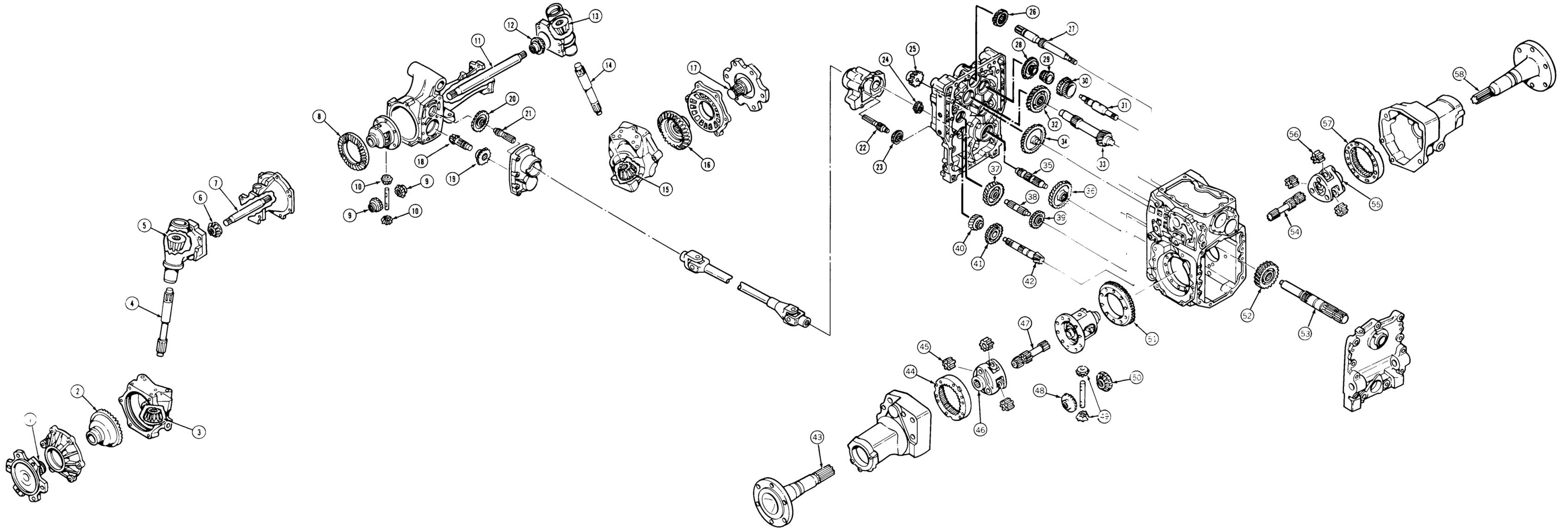


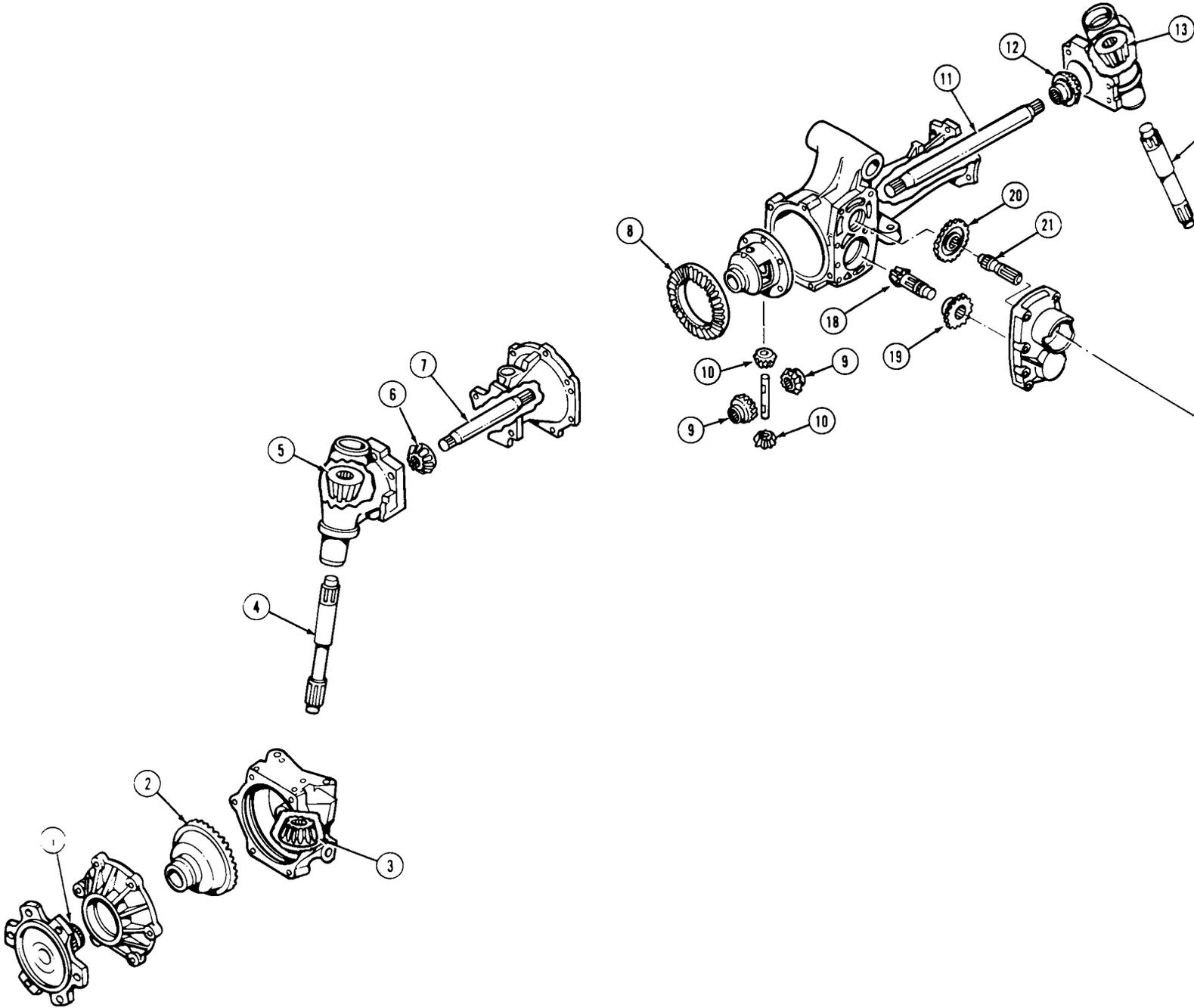
## EXPLODED VIEW—POWER TRAIN GEARS AND SHAFTS

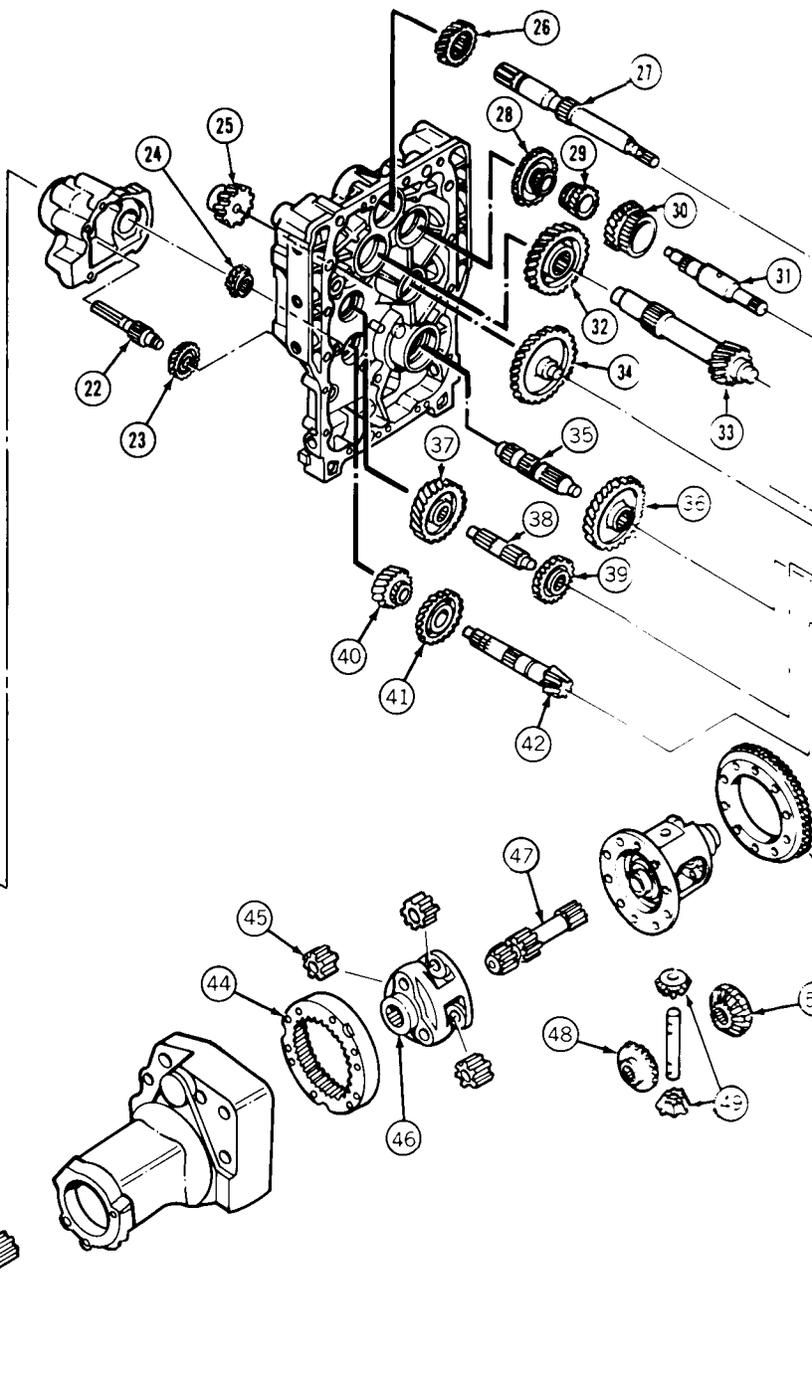
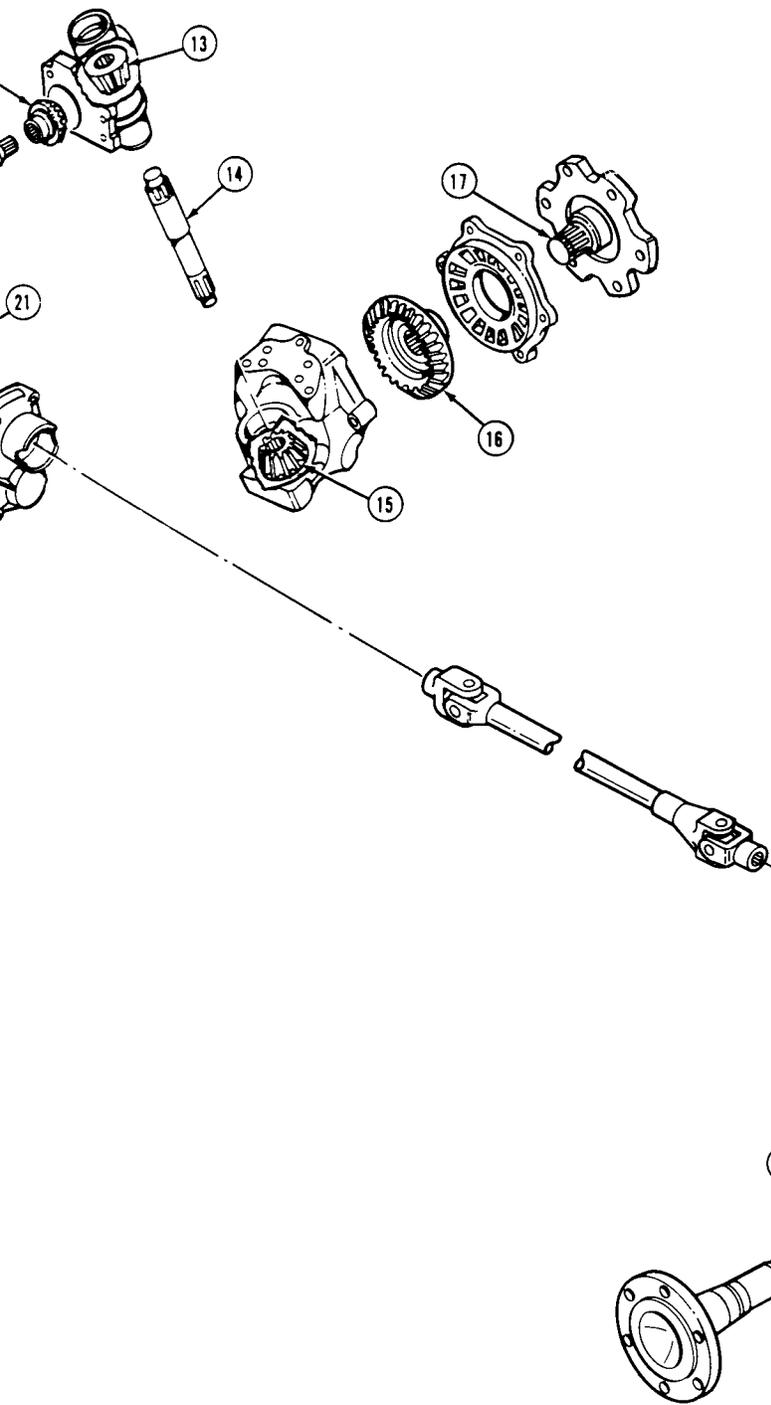
- |   |  |   |   |
|---|--|---|---|
| 1—MFWD Left Hub Shaft   | 17—MFWD Right Hub Shaft  | 32—Transaxle Rear PTO Reduction Gear - (35T-All)                      | 46—Left Final Drive Pinion Carrier                              |
| 2—MFWD Left Final Drive Ring Gear -(32T-655/755/855,40T-955)    | 18—MFWD Differential Input Shaft Pinion Gear -(8T-655/755/855, 9T-955) | 33—Transaxle Rear PTO Reduction Shaft Pinion Gear - (11T-All)         | 47—Left Final Drive Pinion /Brake Drive Shaft - (12T-All)       |
| 3—MFWD Left Bottom Spindle Gear -(13T-655/755/855, 12T-955)     | 19—MFWD Differential Transfer Gear -(20T-655/755/855/, 22T-955)        | 34—Transaxle Mid PTO Transfer Gear - (32T-All)                        | 48—Transaxle Differential (Left) Side Pinion Gear (16T-All)     |
| 4—MFWD Left Spindle Shaft                                       | 20—MFWD Differential Input Gear -(25T-655/755/855, 28T-955)            | 35—Transaxle Mid PTO Output Drive Shaft                               | 49—Transaxle Differential Pinion Gears - (10T-All)              |
| 5—MFWD Left Top Spindle Gear - (16T-All)                        | 21—MFWD Differential Input Shaft                                       | 36—Transaxle Mid PTO Output Gear - (30T-All)                          | 50—Transaxle Differential (Right) Side Pinion Gear (16T-All)    |
| 6—MFWD Left Spindle Input Gear - (15T-All)                      | 22—Transaxle MFWD Output Shaft   | 37—Transaxle Hi-Range Reduction Gear - (31T-All)                      | 51—Transaxle Differential Ring Gear-(41T-655/755 /855, 39T-955) |
| 7—MFWD Left Axle Drive Shaft                                    | 23—Transaxle MFWD Output Gear - (26T-655,20T-755 /855/955)             | 38—Transaxle Hi/Lo Transfer Shaft                                     | 52—Transaxle Rear PTO Output Gear - (24T-All)                   |
| 8—MFWD Differential Ring Gear - (41T-655/755/ 855, 38T-955)     | 24—Transaxle MFWD Drive Gear - (13T-All)                               | 39—Transaxle Lo-Range Speed Gear - (23T-655/ 755/855/, 21T-955)       | 53—Transaxle Rear PTO Output Drive Shaft                        |
| 9—MFWD Differential Side Pinion Gears - (14T-All)               | 25—Hydro/Transaxle Input Drive Gear - (19T-All)                        | 40—Transaxle Hi-Range Speed Gear - (20T-All)                          | 54—Right Final Drive Pinion/Brake Drive Shaft (12T-All)         |
| 10—MFWD Differential Pinion Gears - (10T-All)                   | 26—Transaxle Main PTO Drive Gear - (19T-655/ 755/855, 17T-955)         | 41—Transaxle Lo-Range Reduction Gear - (28T- 655/755/855, 30T-955)    | 55—Right Final Drive Pinion Carrier                             |
| 11—MFWD Right Axle Drive Shaft                                  | 27—Transaxle Main PTO/ Hydraulic Pump Drive Shaft                      | 42—Transaxle Hi/Lo Input Shaft Pinion Gear -(8T- 655/755/855, 7T-955) | 56—Right Final Drive Pinion Gears - (16T-All)                   |
| 12—MFWD Right Spindle Input Gear - (15T-All)                    | 28—Transaxle Mid PTO Input Gear - (29T-All)                            | 43—Left Final Drive Hub Shaft   | 57—Right Final Drive Ring Gear - (45T-All)                      |
| 13—MFWD Right Top Spindle Gear - (16T-All)                      | 29—Transaxle Rear PTO Input Gear - (19T-All)                           | 44—Left Final Drive Ring Gear - (45T-All)                             | 58—Right Final Drive Hub Shaft                                  |
| 14—MFWD Right Spindle Shaft                                     | 30—Transaxle PTO Clutch Drive Gear - (28T-655/ 755/855, 25T-955)       | 45—Left Final Drive Pinion Gears - (16T-All)                          |   |
| 15—MFWD Right Bottom Spindle Gear -(13T-655/ 755/855, 12T-955)  | 31—Transaxle PTO Clutch/ Brake Drive Shaft                             |   |   |
| 16—MFWD Right Final Drive Ring Gear-(32T-655/755 /855, 40T-955) |  |   |   |

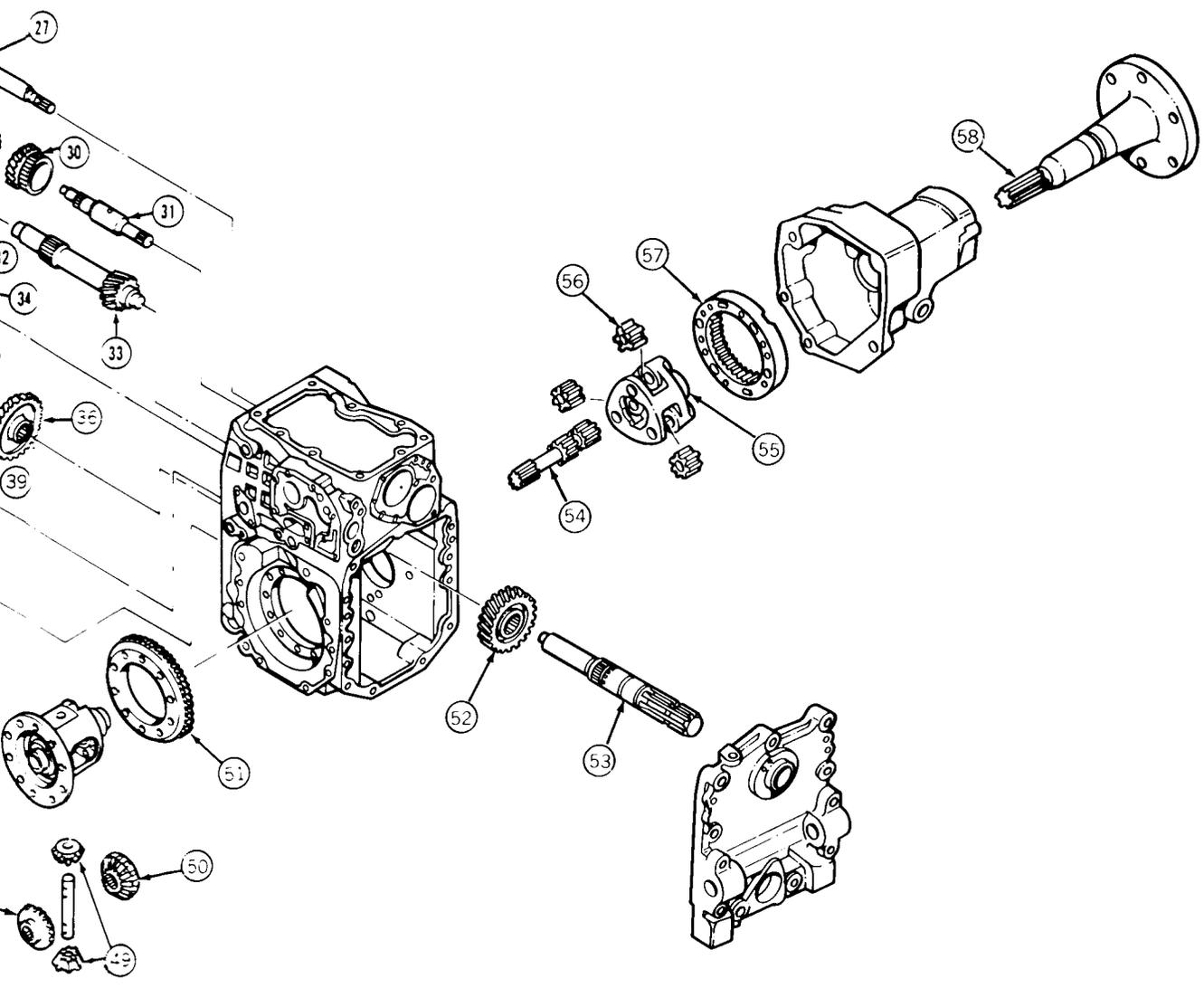
## EXPLODED VIEW—GEAR-MESH PATTERN

- |                    |  |   |
|--------------------|--|---|
| 1 With 2           | 29 With 32                                       | 47 (Right Set) With 48                            |
| 2 With 1 and 3     | 33 (Pinion) With 52                              | 48 With 47 (Right Set) and 49                     |
| 5 With 6           | 34 With 28 & 36                                  | 49 With 50  |
| 8 With 18 (Pinion) | 37 With 25 & 40                                  | 50 With 49 & 54 (Left Set)                        |
| 9 With 10          | 39 With 41                                       | 54 (Left Set) With 50                             |
| 12 With 13         | 42 (Pinion) With 51                              | 54 (Inside Right Set) With Brake/Separator Plates |
| 15 With 16         | 43 With 46                                       | 54 (Far Right Set) With 56                        |
| 19 With 20         | 44 With 45                                       | 55 With 58  |
| 23 With 24         | 45 With 44 & 47 (Far Left Set)                   | 56 With 54 & 57                                   |
| 25 With 37         | 47 (Inside Left Set) With Brake/Separator Plates |   |
| 26 With 30         |  |   |
| 28 With 34         |  |   |









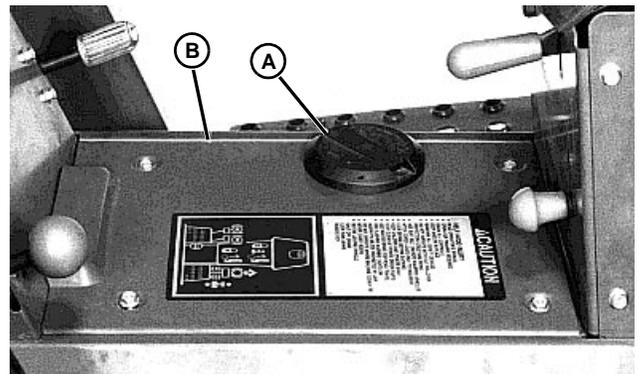
50  
25  
4

### SPECIFICATIONS

| Item   | Measurement                             | Specification                         |
|--|---|---------------------------------------|
| Bronze Bushing                               | Inside Diameter                         | 19.088±0.025 mm<br>(0.7515±0.001 in.) |
| Forward/Reverse Tie Rods                     | Center of Eyelets<br>Preliminary Length | 346 mm (13.62 in.)                    |
| Transmission Swashplate Bracket<br>Cap Screw | Torque                                  | 41 N•m (30 lb-ft)                     |
| Neutral Return Spring                        | Initial Length                          | 133 mm (5.25 in.)                     |

### REMOVE SPEED CONTROL LINKAGE

1. Park tractor safely. Engage park brake.
2. Turn depth control lever (A) clockwise until stops.
3. Remove four cap screws. Remove panel (B) by lifting right-rear corner of panel first and moving panel out the right side after you clear head of depth control cap screw.

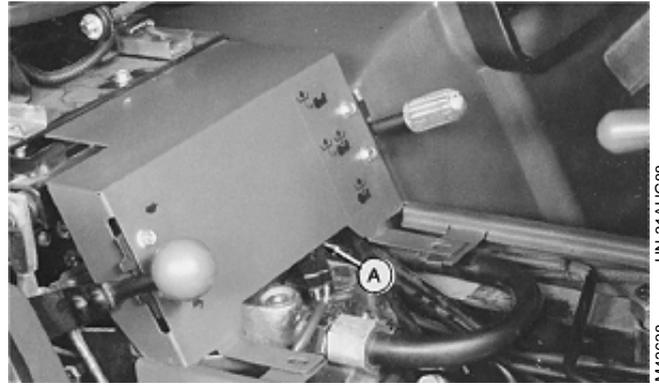


M43634

## Speed Control Linkage/Remove Speed Control Linkage

4. Remove panel (A).

655 Shown

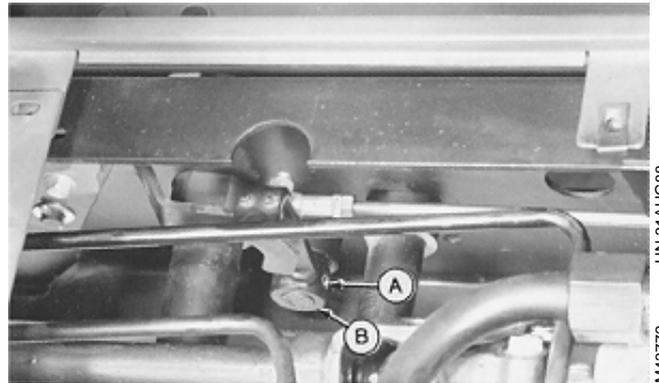


MX,HU,5030,2 -19-16OCT91

M43638 -UN-31AUG88

5. Remove spring pin (A) to remove pawl (B).

Inside Right Frame

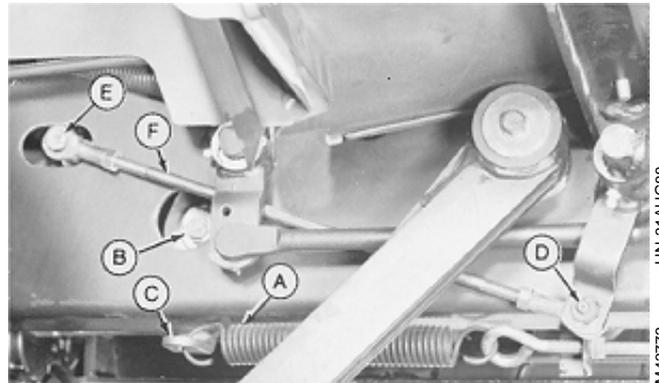


MX,HU,5030,3 -19-16OCT91

M43772 -UN-31AUG88

6. Disconnect spring (A).
7. Remove cap screw (B) to remove neutral return level (C).
8. Remove nut (D) and bolt (E) to disconnect rod (F).

A—Spring  
B—Cap Screw  
C—Neutral Return Level  
D—Lock Nut  
E—Bolt  
F—Speed Control Tie Rod



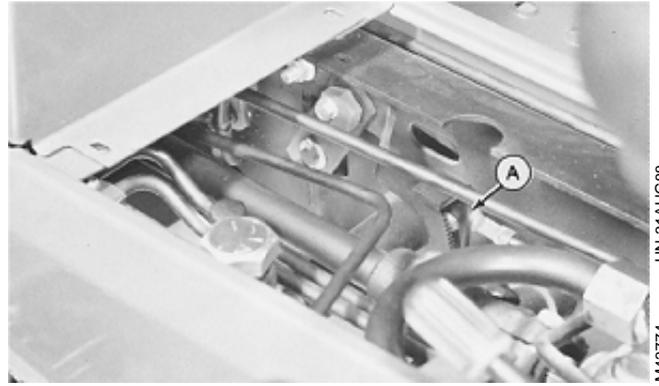
Under Right Foot Rest

MX,HU,5030,4 -19-16OCT91

M43773 -UN-31AUG88

## Speed Control Linkage/Remove Speed Control Linkage

9. Remove cruise control pawl and tie rod assembly (A).



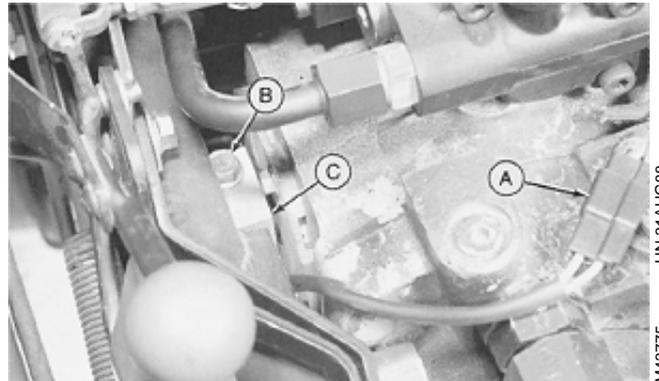
Inside Right Frame

MX,HU,5030,5 -19-16OCT91

M43774 -UN-31AUG88

10. Disconnect switch lead (A).

11. Remove cap screw (B) to remove transmission speed control lever (C).

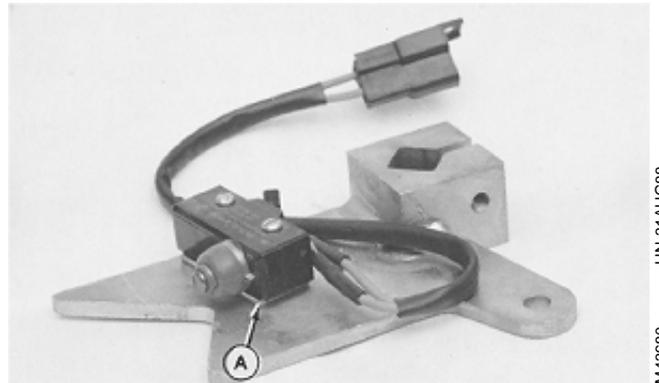


Inside Right Frame

MX,HU,5030,6 -19-16OCT91

M43775 -UN-31AUG88

12. If neutral start switch is being replaced, be sure to install spacer (A) between switch and speed control lever.



MX,HU,5030,7 -19-16OCT91

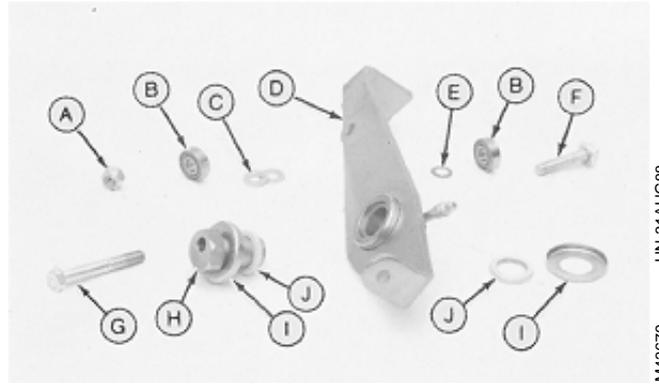
M43680 -UN-31AUG88

## Speed Control Linkage/Remove Speed Control Linkage

13. Inspect neutral return lever rollers (B). Replace them if they DO NOT turn freely.

14. Inspect bronze bushing in lever (D) for excessive wear on the inside diameter. If bushing is being replaced, be sure to align hole in bushing with grease fitting hole in lever. Ream bushing to  $19.088 \pm 0.025$  mm ( $0.7515 \pm 0.001$  in.) diameter.

- A—Lock Nut
- B—Roller (2 used)
- C—Washer (2 used)
- D—Neutral Return Lever
- E—Thin Washer
- F—Short Cap Screw
- G—Long Cap Screw
- H—Eccentric Pivot
- I—Seal Cover (2 used)
- J—Felt Seal (2 used)



MX,HU,5030,8 -19-16OCT91

M43679 -UN-31AUG88

15. Remove speed control pedals.

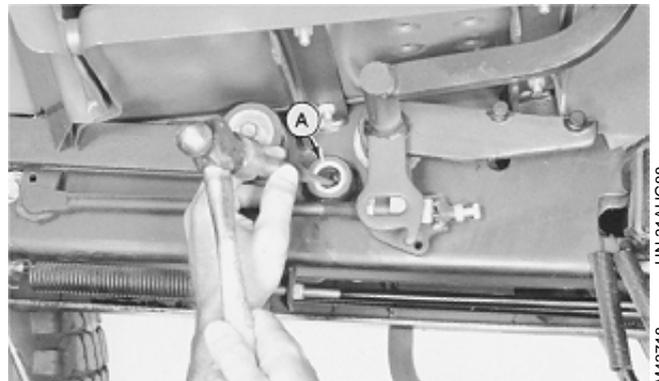


*Under Right Foot Rest*

MX,HU,5030,9 -19-16OCT91

M43717 -UN-31AUG88

16. Inspect bushings (A) for wear. Remove and discard them if they are worn excessively.



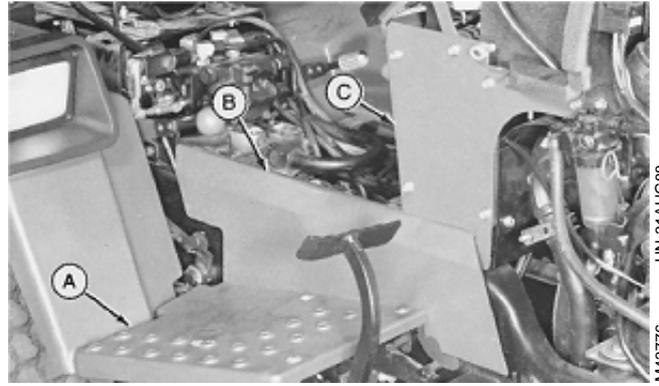
*Under Right Foot Rest*

MX,HU,5030,10 -19-16OCT91

M43718 -UN-31AUG88

## Speed Control Linkage/Remove Speed Control Linkage

17. To replace cruise control linkage, remove foot rest (A), panel (B), and panel (C).



Right Side View

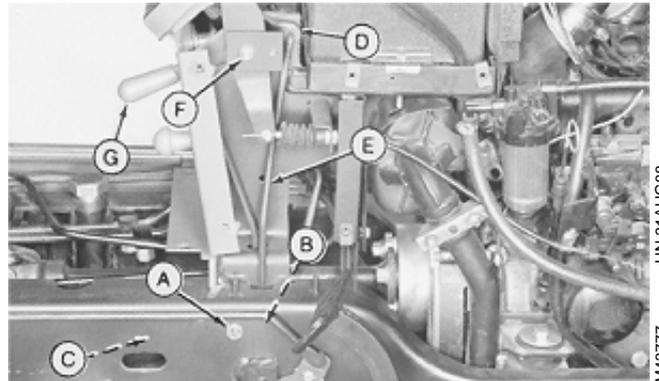
MX,HU,5030,11 -19-16OCT91

18. Remove bolt (A) and cotter pins (B) to disconnect cruise control ratchet assembly (C).

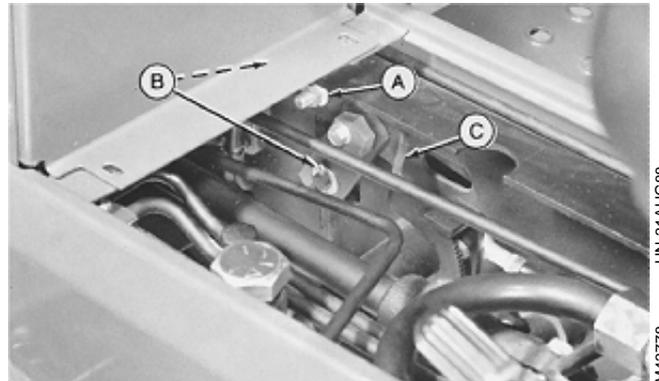
19. Remove cotter pin (D) to disconnect link (E).

20. Remove lock nut (F) to remove cruise control lever (G).

- A—Bolt
- B—Cotter Pin (2)
- C—Cruise Control Ratchet Assembly
- D—Cotter Pin
- E—Cruise Control Link
- F—Lock Nut
- G—Cruise Control Lever



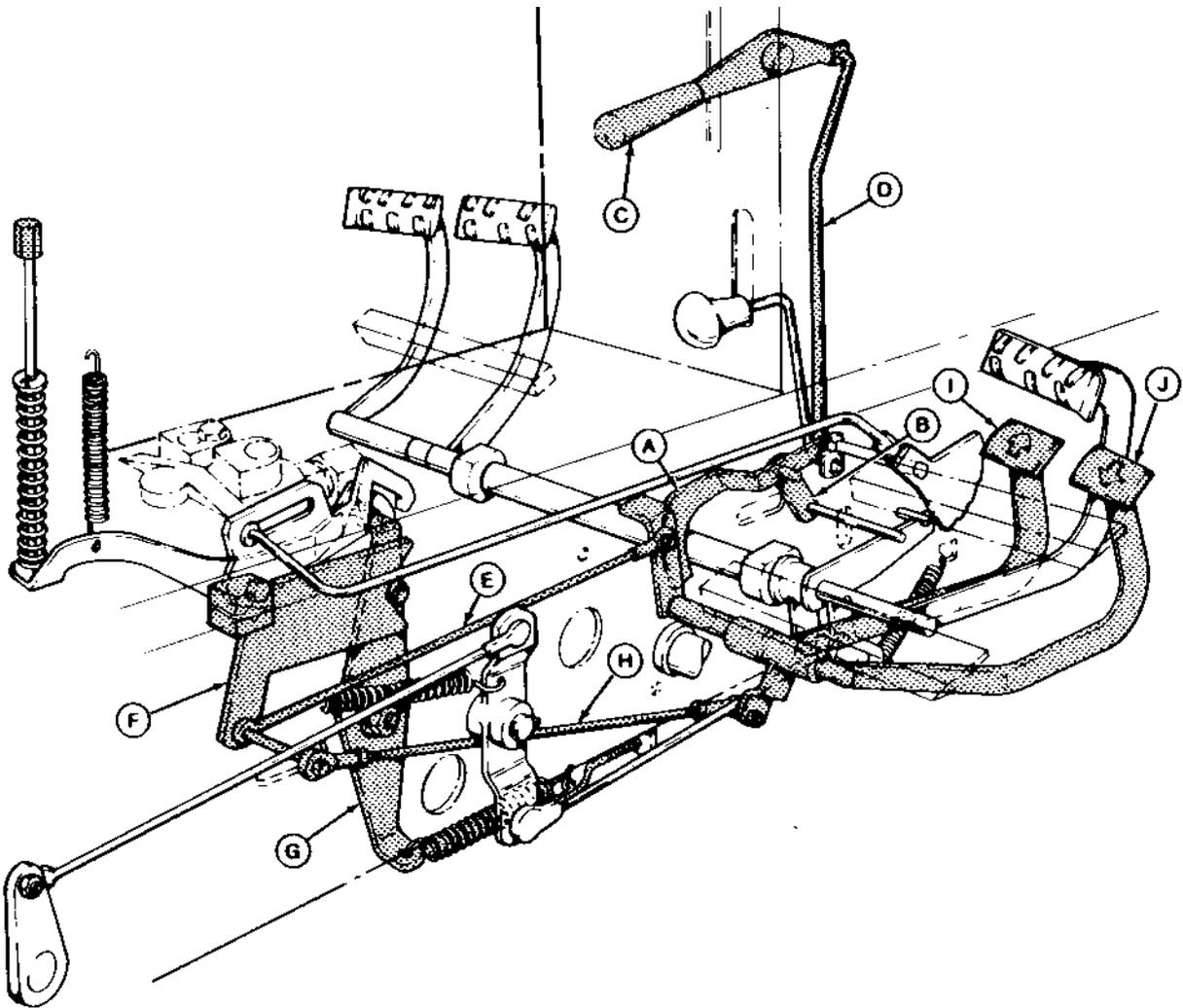
Right Side View



Inside Right Frame

MX,HU,5030,12 -19-16OCT91

**SPEED CONTROL LINKAGE**



A—Cruise Control Ratchet  
Bracket  
B—Master Brake Release  
Link

C—Cruise Control Lever  
D—Cruise Control Link Rod  
E—Reverse Control Tie Rod

F—Transmission Swashplate  
Control Bracket  
G—Neutral Return Bracket

H—Forward Control Tie Rod  
I—Forward Control Pedal  
J—Reverse Control Pedal

50  
30  
6

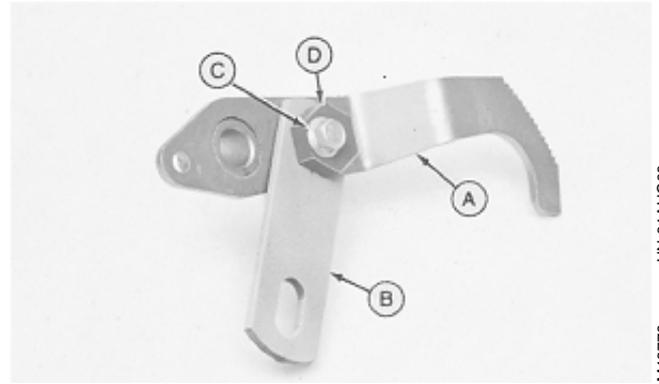
IM43780 -JUN-08/JUL91

MX,HU,5030,13 -19-16OCT91

## INSTALL SPEED CONTROL LINKAGE

1. Assemble parts (A thru D).

- A—Cruise Control Ratchet Bracket
- B—Master Brake Release Link
- C—Bolt and Lock Nut
- D—Eccentric Pivot



MX,HU,5030,14 -19-16OCT91

M43779 -UN-31AUG88

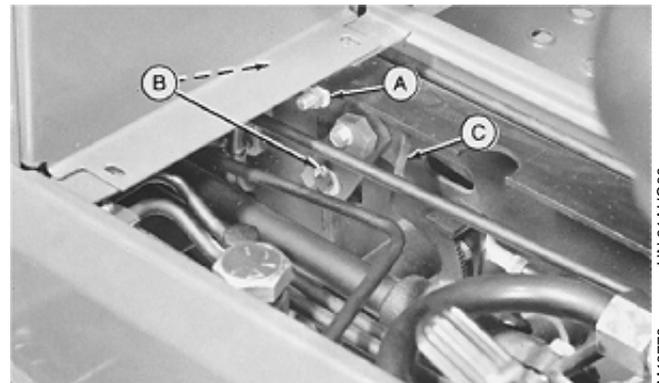
2. Install ratchet assembly (C). Fasten it with bolt (A).

3. Install lever (G). Fasten it with bolt (F).

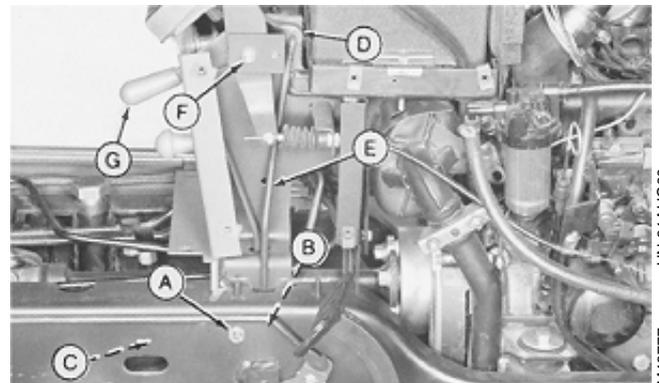
4. Install link rod (E). Fasten it with washers and cotter pins (B and D).

5. Connect ratchet assembly (C) to service/park brake with washer and cotter pin (B).

- A—Bolt
- B—Cotter Pin (2)
- C—Cruise Control Ratchet Assembly
- D—Cotter Pin
- E—Cruise Control Link Rod
- F—Bolt
- G—Cruise Control Lever



Inside Right Frame



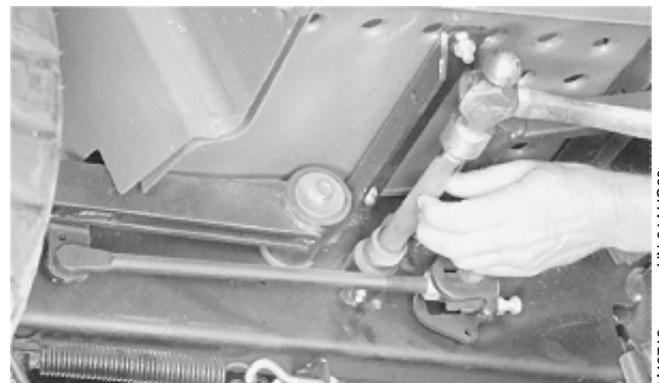
Right Side View

MX,HU,5030,15 -19-16OCT91

M43778 -UN-31AUG88

M43777 -UN-31AUG88

6. Install new bronze bushings flush with ends of boss. Ream bushings to  $19.088 \pm 0.025$  mm ( $0.7515 \pm 0.001$  in.) diameter.



Under Right Foot Rest

MX,HU,5030,16 -19-16OCT91

M43719 -UN-31AUG88

## Speed Control Linkage/Install Speed Control Linkage

7. Install speed control pedals. Check to see that pedals move freely.



*Under Right Foot Rest*

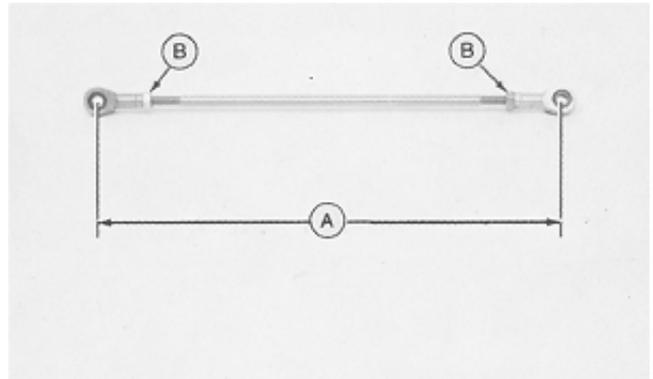
MX,HU,5030,17 -19-16OCT91

M43717 -UN-31AUG88

**IMPORTANT:** One end of tie rod has left-hand threads—make sure you don't strip these threads by turning eyelet in the wrong direction.

If installing new speed control tie rods, preliminary length adjustment (A) from center of eyes should be 346 mm (13.62 in.) for both reverse and forward rods.

8. To adjust length, loosen jam nuts (B). Turn both ends evenly to specified length then tighten jam nuts.



MX,HU,5030,18 -19-16OCT91

M43781 -UN-31AUG88

9. Put same amount of washer shims on pedal shaft as were removed. Put cruise control pawl on the shaft and use a punch to align holes. Add or remove shims as required to reduce shaft end-play.

10. Install cruise control pawl and tie rod assembly (B). Fasten it with spring pin (A).



*Inside Right Frame*

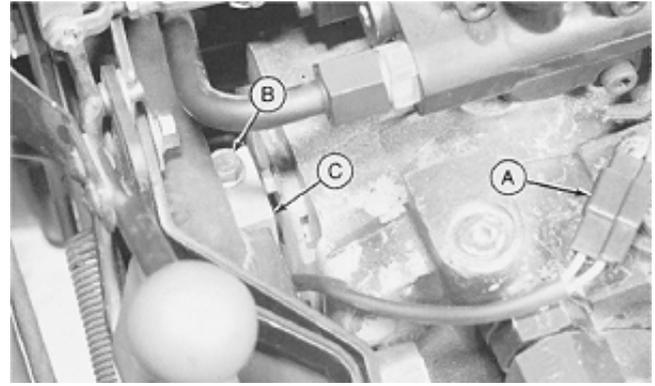
MX,HU,5030,19 -19-16OCT91

M43772 -UN-31AUG88

## Speed Control Linkage/Install Speed Control Linkage

11. Install transmission speed control bracket (C). Fasten it with cap screw (B). Tighten cap screw to 41 N·m (30 lb-ft).

12. Connect switch lead (A).



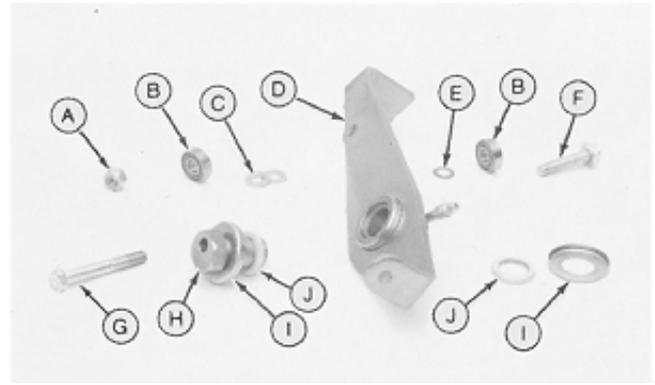
*Inside Right Frame*

MX,HU,5030,20 -19-16OCT91

M43775 -UN-31AUG88

13. Assemble neutral return lever parts (A thru J).

- A—Lock Nut
- B—Roller (2 used)
- C—Washer (2 used)
- D—Neutral Return Lever
- E—Thin Washer
- F—Short Cap Screw
- G—Long Cap Screw
- H—Eccentric Pivot
- I—Seal Cover (2 used)
- J—Felt Seal (2 used)



MX,HU,5030,21 -19-16OCT91

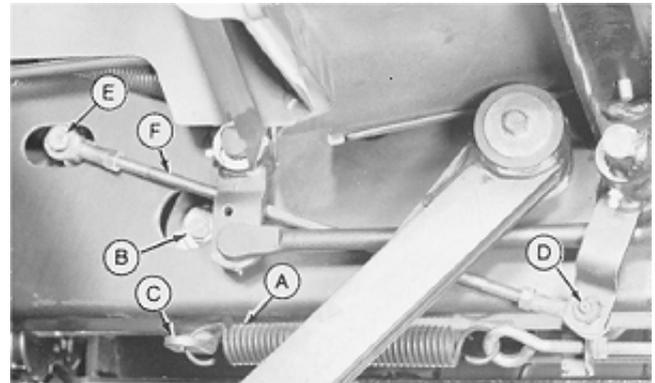
M43679 -UN-31AUG88

14. Install neutral return lever assembly (C). Fasten it to transmission with cap screw (B).

15. Install transmission control linkage parts (E thru K).

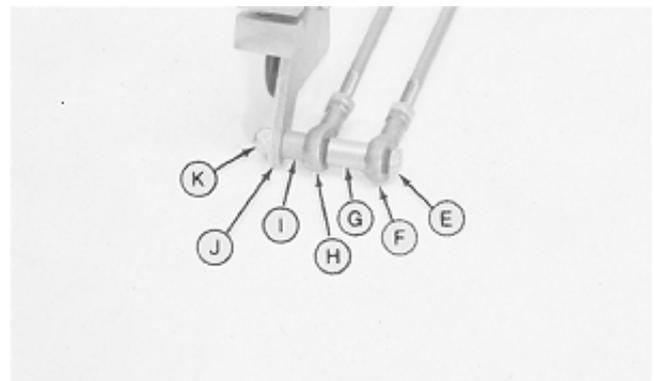
16. Fasten other end of rod (F) to control pedal with lock nut (D).

17. Connect spring (A). Adjust coil length to 133 mm (5.25 in.).



*Under Right Foot Rest*

- A—Spring
- B—Cap Screw
- C—Neutral Return Lever
- D—Lock Nut
- E—Bolt
- F—Forward Control Tie Rod
- G—Long Spacer
- H—Reverse Control Tie Rod
- I—Short Spacer
- J—Transmission Speed Control Lever
- K—Lock Nut



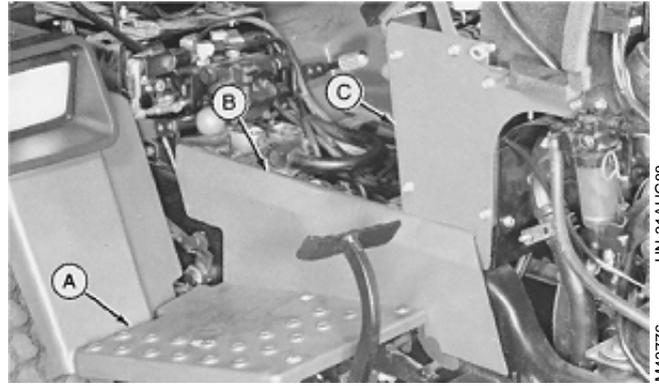
MX,HU,5030,22 -19-16OCT91

M43773 -UN-31AUG88

M43532 -UN-31AUG88

## Speed Control Linkage/Install Speed Control Linkage

18. Install panels (C and B) and foot rest (A).

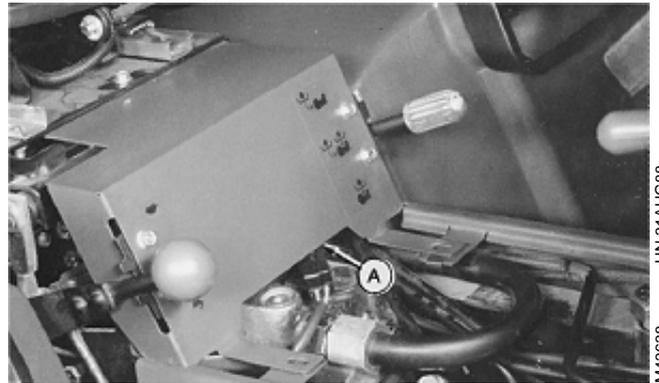


Right Side View

MX,HU,5030,23 -19-16OCT91

M43776 -UN-31AUG88

19. Install panel (A).



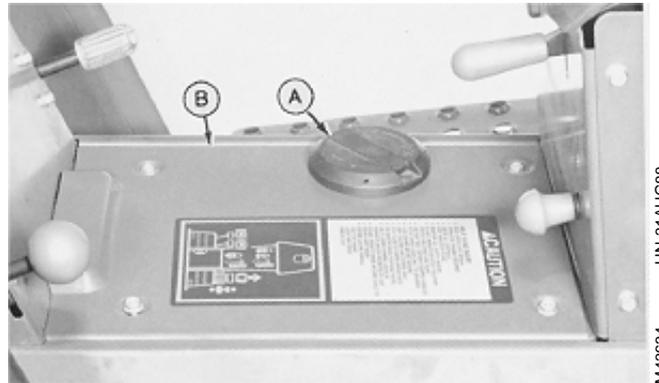
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MX,HU,5030,24 -19-16OCT91

M43638 -UN-31AUG88

20. Adjust transmission control linkage. Adjust cruise control linkage. (See Section 250.)

21. Install panel (B). Be sure depth control lever (A) aligns properly with bolt head. Fasten panel with four cap screws.



MX,HU,5030,25 -19-16OCT91

M43634 -UN-31AUG88

# Section 60

## Steering and Brakes Repair

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**ESSENTIAL TOOLS**

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Number   | Name              | Use                           |
|----------|-------------------|-------------------------------|
| JTO 1732 | Blind Hole Puller | Remove Spindle shaft bushing. |

MX,HU,6005,1 -19-16OCT91

**SERVICE EQUIPMENT AND TOOLS**

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name                                | Use                              |
|-------------------------------------|----------------------------------|
| Feeler Gauge                        | Measure axle end-play            |
| Bushing, Bearing and Seal Drive Set | Service spindle bushing and race |
| 2-Jaw Puller                        | Remove spindle race              |
| Press                               | Service wheel bearing and races  |

MX,HU,6005,2 -19-16OCT91

**OTHER MATERIAL**

| Number                             | Name                                   | Use |
|------------------------------------|--|-----|
| John Deere Multi-Purpose Lubricant | Lubricate wheel bearings, and spindles |     |

MX,HU,6005,2A -19-16OCT91

60  
05  
1

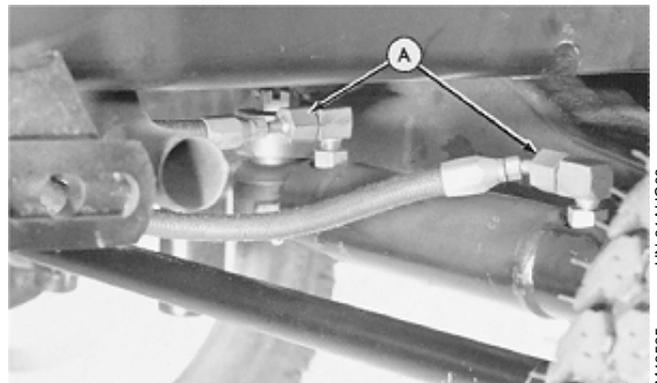
## SPECIFICATIONS

| Item                             | Measurement | Specification  |
|----------------------------------|-------------|--|
| Steering cylinder-to-spindle nut | Torque      | 75 N·m (55 lb-ft)                                    |
| Tie rod-to-spindle nut           | Torque      | 53 N·m (39 lb-ft)                                    |
| Toe-in adjustment                | Length      | 6 mm (1/4 in.) less in front than rear of front tire |
| Tie rod nut                      | Torque      | 118 N·m (87 lb-ft)                                   |
| Pivot pin nut                    | Torque      | 130 N·m (96 lb-ft)                                   |

MX,HU,6005,3 -19-16OCT91

## REMOVE STANDARD FRONT AXLE

1. Remove power steering cylinder—DO NOT disconnect lines (A).
2. Remove fuel tank or battery, depending on which tractor you are working on.



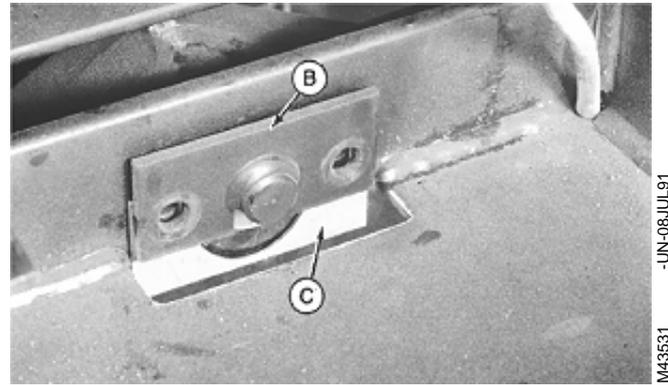
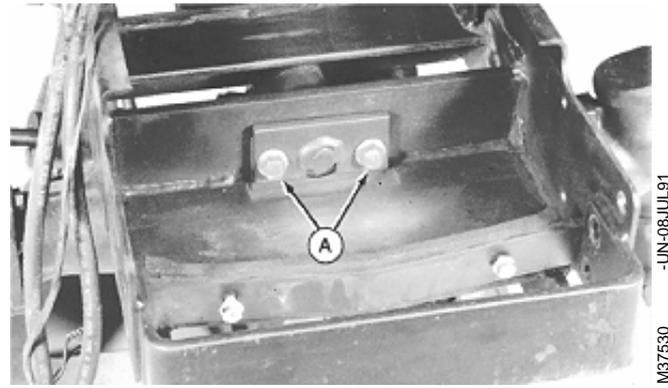
MX,HU,6005,4 -19-16OCT91

3. Raise front of tractor and support on frame behind the axle.
4. Remove front wheels.
5. Support the axle with a jack.



MX,HU,6005,5 -19-16OCT91

6. Remove lock nuts and cap screws (A).
7. Slide pivot pin (B) part of the way out. Remove shims (C).
8. Remove pivot pin and bushing.
9. Lower axle out of frame.
10. Inspect axle, pivot pin, and bushing for excessive wear or damage. Replace as necessary.



MX,HU,6005,6 -19-16OCT91

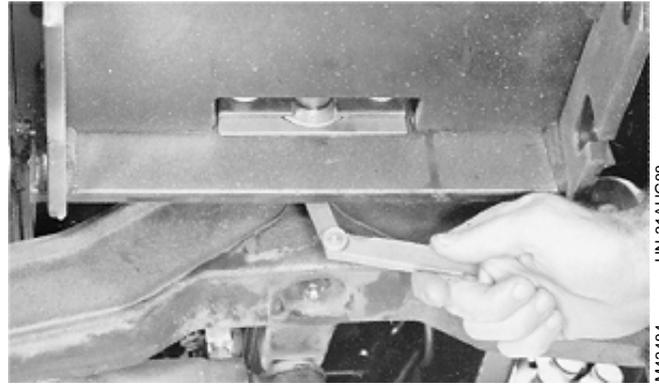
## INSTALL STANDARD FRONT AXLE

1. Raise axle into frame. Install bushing, pivot pin and shims.
2. Install and tighten cap screws and lock nuts to 130 N·m (96 lb-ft).
3. Install and tighten front wheels.
4. Raise tractor and remove support stands.
5. Lubricate axle pivot with multi-purpose grease.
6. Install fuel tank or battery, depending on which tractor you are working.
7. Install power steering cylinder, tighten castle nuts to 75 N·m (55 lb-ft).

MX,HU,6005,7 -19-16OCT91

## ADJUST AXLE END-PLAY

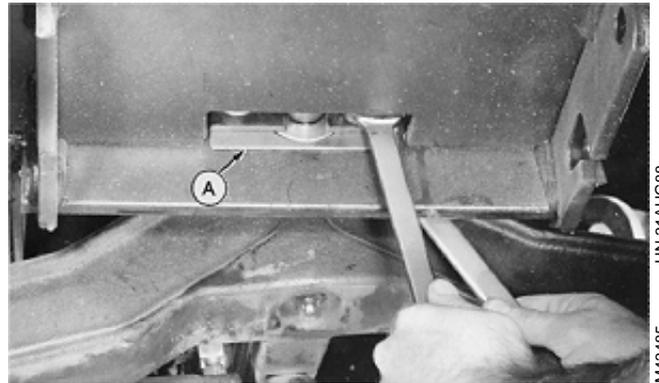
1. Raise front of tractor and push axle assembly fully backward.
2. Measure distance between frame and axle pivot support with a 1 mm (0.040 in.) feeler gauge. If gauge slides in, remove one shim. If gauge does not slide in, check for axle end play. If no end play, add one shim.



MX,HU,6005,8 -19-16OCT91

M43484  
-UN-31AUG88

3. To adjust end play, loosen cap screws and remove or add shims (A) as necessary.

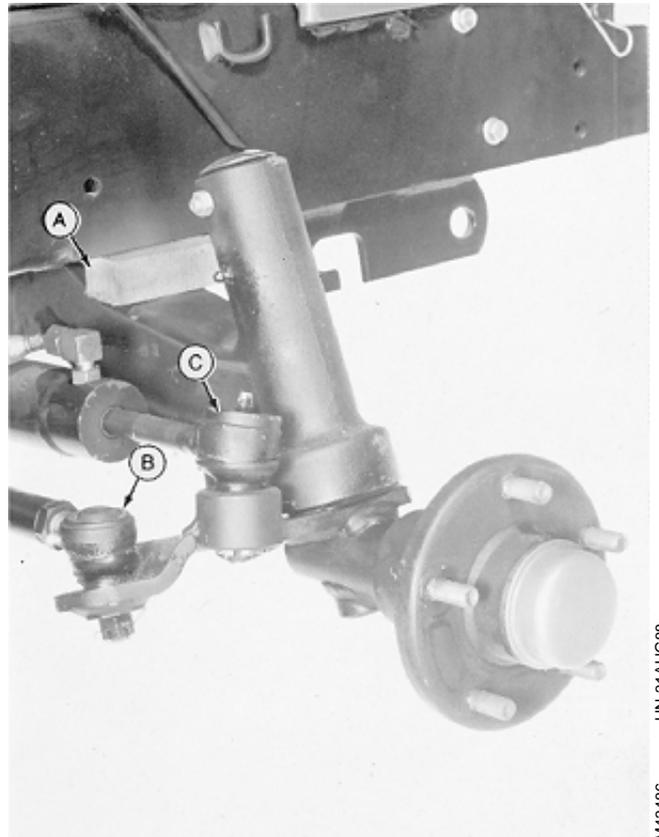


MX,HU,6005,9 -19-16OCT91

M43485  
-UN-31AUG88

## REMOVE SPINDLE SHAFT AND HUB

1. Raise tractor and remove wheel.
2. Push end of axle all the way down and install wood block (A).
3. Disconnect tie rod end (B) and steering cylinder end (C).



MX,HU,6005,10 -19-16OCT91

M43486  
-UN-31AUG88

4. Remove cap (A).
5. Remove set screw and lower shaft and hub from axle.
6. Inspect spindle shaft and bushing for excessive wear or damage. Replace as necessary.

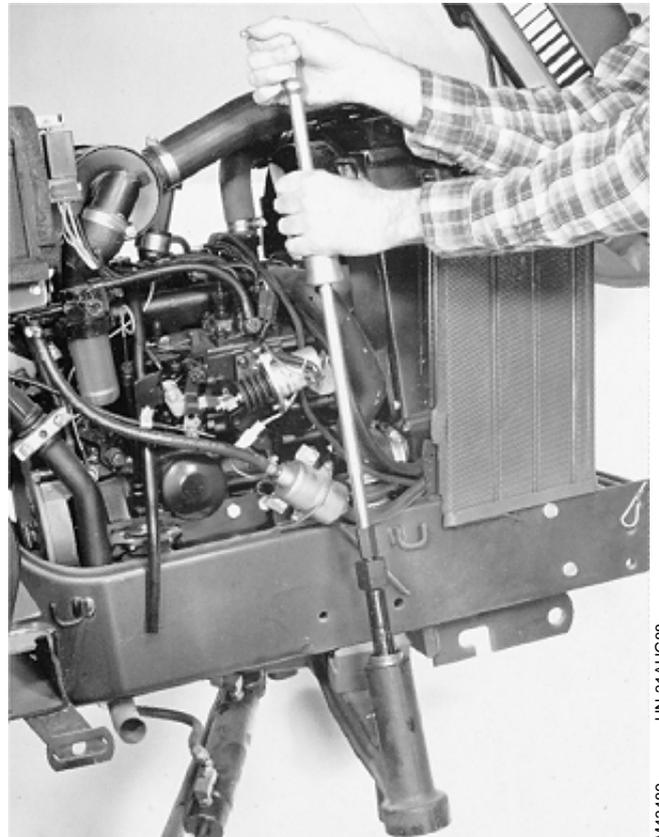


MX,HU,6005,11 -19-16OCT91

M43488 -UN-31AUG88

## REPAIR SPINDLE SHAFT BUSHING

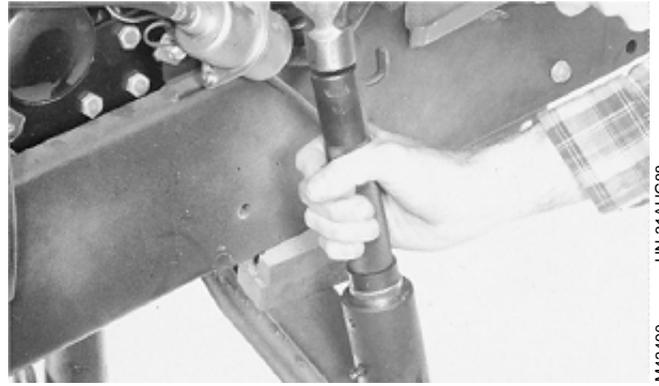
1. Remove bushing. Use 31.75 -38.1 mm (1-1/4—1-1/2 in.) blind hole puller and slide hammer as shown.



MX,HU,6005,12 -19-16OCT91

M43489 -UN-31AUG88

2. Install new bushing until it bottoms on shoulder in housing. Use 31.75 (1-1/4 in.) and 36.51 mm (1-7/16 in.) driver disks.



M43490 -UN-31AUG88  
MX,HU,6005,13 -19-16OCT91

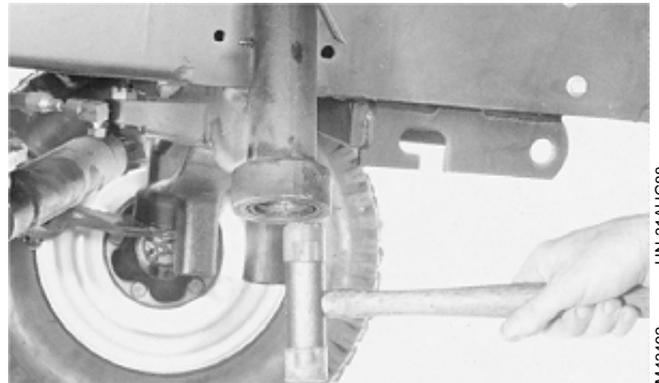
## REPAIR SPINDLE SHAFT BEARING AND RACE

1. Remove grease seal and bearing.
2. Inspect bearing and race for excessive wear or damage. Replace as necessary.
3. Use a 2-jaw puller with slide hammer to remove race.



M43491 -UN-31AUG88  
MX,HU,6005,14 -19-16OCT91

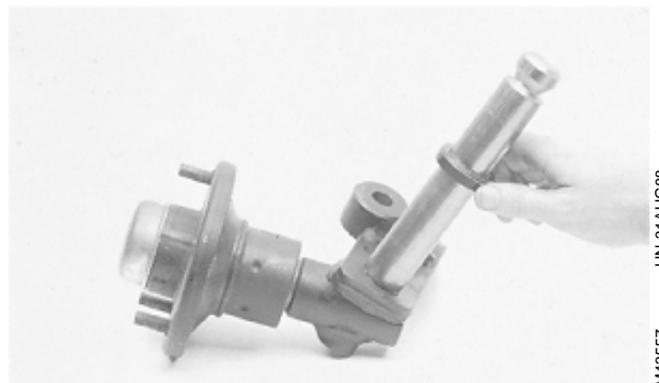
4. Install new race until it bottoms on shoulder in housing. Use a 57.15 mm (2-1/4 in.) driver disk.
5. Pack bearing with multi-purpose grease.
6. Install bearing and new seal. Be sure sealing flange faces down.



M43492 -UN-31AUG88  
MX,HU,6005,15 -19-16OCT91

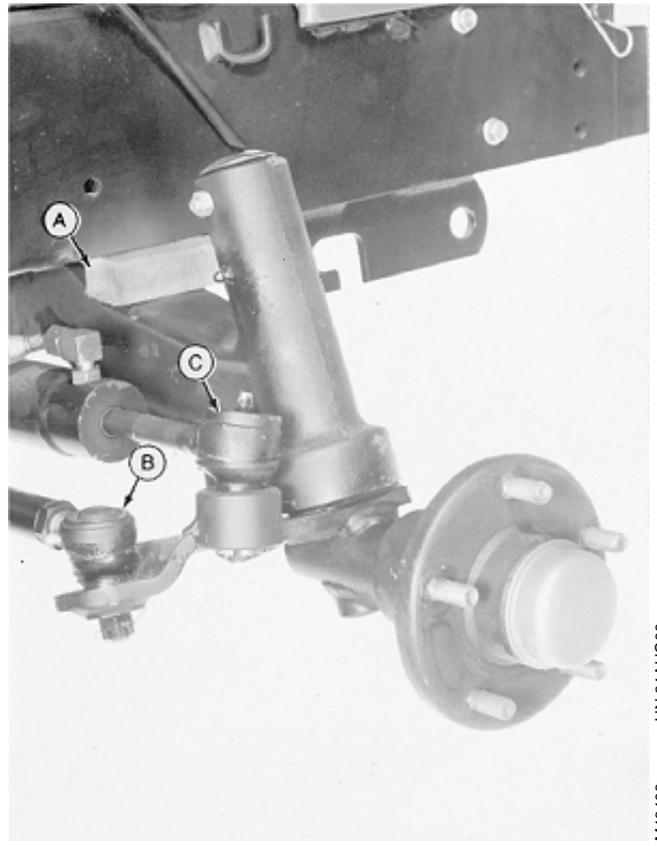
## INSTALL SPINDLE SHAFT AND HUB

1. Install thrust washer with outside chamber up.



M43557 -UN-31AUG88  
MX,HU,6005,16 -19-16OCT91

2. Lubricate spindle shaft with a light film of multi-purpose grease. Slide shaft into spindle housing.
3. Install set screw and tighten nut.
4. Install housing cap.
5. Connect power steering cylinder end (C). Tighten castle nut to 75 N-m (55 lb-ft). Install cotter pin.
6. Connect tie rod end (B). Tighten castle nut to 53 N-m (39 lb-ft). Install cotter pin.
7. Lubricate spindle grease fitting with multi-purpose grease.
8. Install wheels and tighten lug nuts to 79 N-m (58 lb-ft) on 655, 755/756, and 855/856 tractors—120 N-m (89 lb-ft) on 955 tractors.



MX,HU,6005,17 -19-16OCT91

M43486 -UN-31AUG88

## REMOVE WHEEL BEARINGS

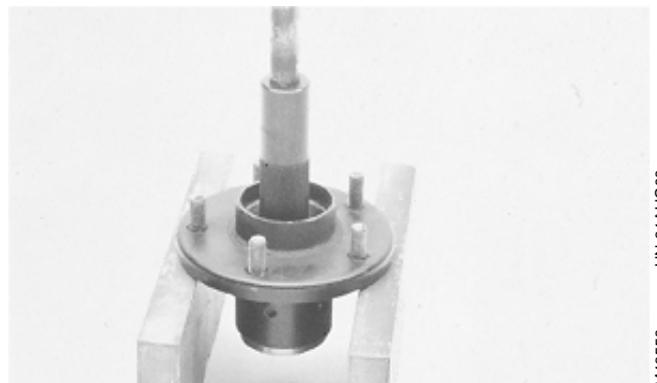
1. Raise tractor, remove wheel and hub cap.
2. Remove cotter pin and castle nut.
3. Slide washer, bearing, and wheel hub off shaft.
4. Inspect bearing and shaft for excessive wear or damage. Replace as necessary.



MX,HU,6005,18 -19-16OCT91

M39643 -UN-09SEP88

5. Remove inner bearing and seal. Use a 46 mm (1-13/16 in.) driver disk.
6. Inspect bearing for excessive wear or damage. Replace as necessary.

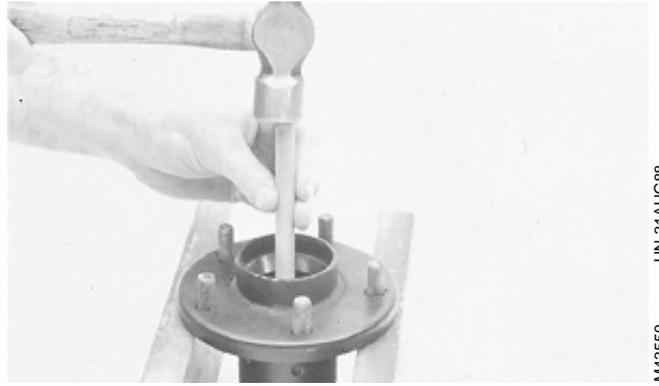


MX,HU,6005,19 -19-16OCT91

M43558 -UN-31AUG88

7. Inspect races for excessive wear or damage. Replace as necessary.

8. To remove inner or outer race use a soft drift.



MX,HU,6005,20 -19-16OCT91

M43559 -UN-31AUG88

## INSTALL WHEEL BEARINGS

1. Use a 58.7 mm (2-5/16 in.) driver disk to install inner or outer race. Drive race in until it bottoms in hub bore.



MX,HU,6005,21 -19-16OCT91

M43560 -UN-31AUG88

2. Pack inner bearing with multi-purpose grease and install a hub.

3. Install new seal flush with hub surface. Use a 65 mm (2-9/16 in.) driver disk.



MX,HU,6005,22 -19-16OCT91

M43561 -UN-31AUG88

4. Pack outer bearing with multi-purpose grease.

5. Install hub, bearing, and washer on spindle.

6. Install and tighten nut until a slight drag is felt when hub is turned. Back nut off 1/4 turn or just enough to install cotter pin.

7. Install cotter pin and hub cap.

8. Install and tighten wheel.

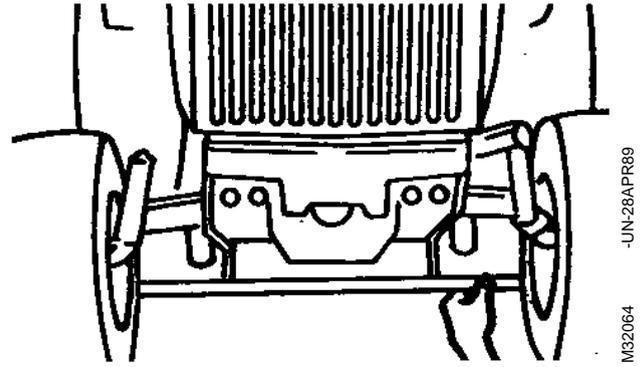


MX,HU,6005,23 -19-16OCT91

M39647 -UN-09SEP88

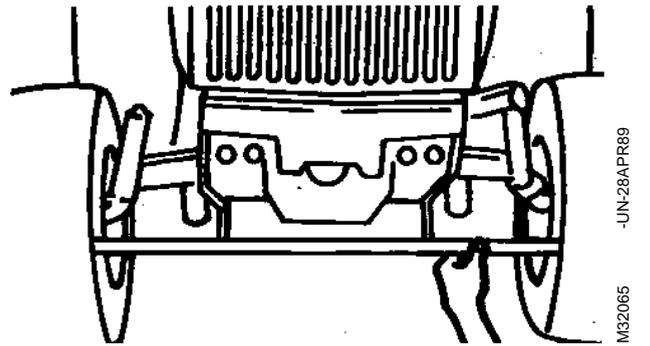
## ADJUST TOE-IN

1. Position wheels so they are pointing straight ahead.
2. Measure distance between the inner edges of the tires at the rear.



MX,HU,6005,23A -19-16OCT91

3. Measure front distance between tires. When properly adjusted, front distance should be 6 mm (1/4 in.) less than rear distance.



MX,HU,6005,24 -19-16OCT91

4. Loosen tie rod nuts and adjust tie rod to lengthen or shorten distance.

**IMPORTANT: Make sure there is free movement of ball joints after tightening.**

5. Tighten tie rod nuts to 118 N-m (87 lb-ft).



MX,HU,6005,25 -19-16OCT91

*Standard Front Axle/Adjust Toe-In*

60  
05  
10

## SERVICE EQUIPMENT AND TOOLS

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name                                 | Use                                    |
|--------------------------------------|--|
| Feeler Gauge                         | Measure rotor-to-stator clearance      |
| 13-Ton Puller Set                    | Remove steering tube bushing           |
| Bushing, Bearing and Seal Driver Set | Install steering tube bushing          |
| 0.18 mm (0.007 in.) Shim Stock       | Align Commutator ring with drive plate |

MX,HU,6010,1 -19-16OCT91

## FABRICATED TOOLS

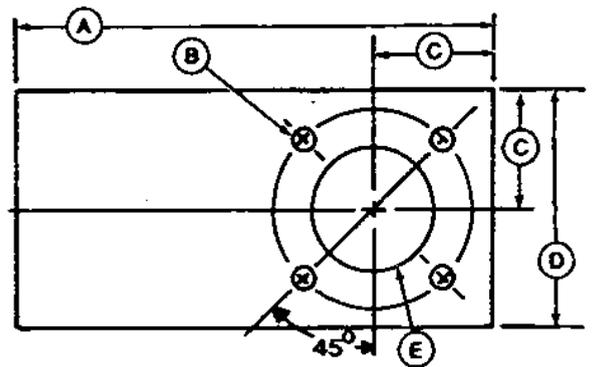
### STEERING VALVE FIXTURE:

Steering valve fixture is used to hold steering valve.

Material required: One piece of 5 x 102 x 203 mm (3/16 x 4 x 8 in.) 1020 mild steel flat stock.

Fastening Hardware: Four 5/16-24 UNF nuts.

- A—203 mm (8.0 in.)
- B—9.5 mm (3/8 in.)<sup>1</sup>
- C—51 mm (2.0 in.)
- D—102 mm (4.0 in.)
- E—51 mm (2.0 in.) Diameter Hole



M36677 -UN-28APR89

<sup>1</sup> Four Diameter Holes Equally Spaced on a 83 mm (3-1/4 in.) Diameter Circle

MX,HU,6010,2 -19-16OCT91

## OTHER MATERIAL

| Number | Name  | Use                             |
|--------|---|---------------------------------|
| T43511 | John Deere LOCTITE® Clean and Cure Primer                 | Clean Threads                   |
| TY9369 | John Deere LOCTITE® Thread Lock and Sealer (Low Strength) | Retain metering assembly screws |

*LOCTITE is a trademark of the Loctite Corp.*

MX,HU,6010,3 -19-16OCT91

## SPECIFICATIONS

| Item                            | Measurement       | Specification                 |
|---------------------------------|-------------------|-------------------------------|
| Rotor-to-Stator Clearance       | Maximum Clearance | 0.08 mm (0.003 in.)           |
| Top of Steering Tube to Bushing | Dimension         | 2.5 mm (0.1 in.)              |
| Metering Assembly Screws        | Torque            | 1.4 ± 0.1 N•m (12 ± 1 lb-in.) |
| Port Cover Nuts                 | Torque            | 27 ± 3 N•m (240 ± 24 lb-in.)  |
| Check Ball Plug                 | Torque            | 14 ± 3 N•m (124 ± 27 lb-in.)  |
| Steering Wheel Nut              | Torque            | 13—16 N•m (10—12 lb-ft.)      |

## REMOVE STEERING VALVE

1. Remove muffler. (See Section 20, Group 15)
2. Remove pedestal side panels, battery and battery base for 655, 755/756, and early 855/856 tractors or fuel tank for late 855/856 and all 955 tractors.
3. Remove driveshaft (A) as described in Section 50, Group 05.

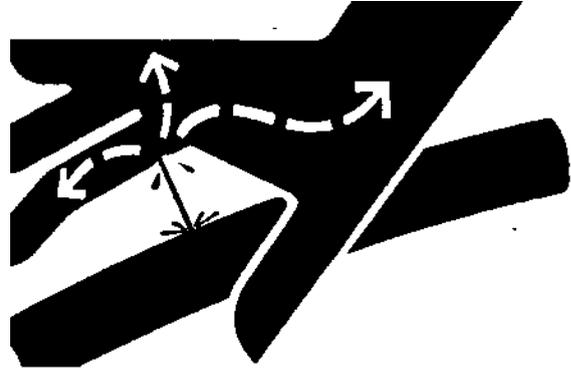
**CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves.

4. Disconnect four hydraulic lines (B). Close all openings with caps and plugs to keep dirt out of the hydraulic system.

*NOTE: If necessary put identification tags on hydraulic lines to aid in installation.*



M43836 -UN-31AUG88



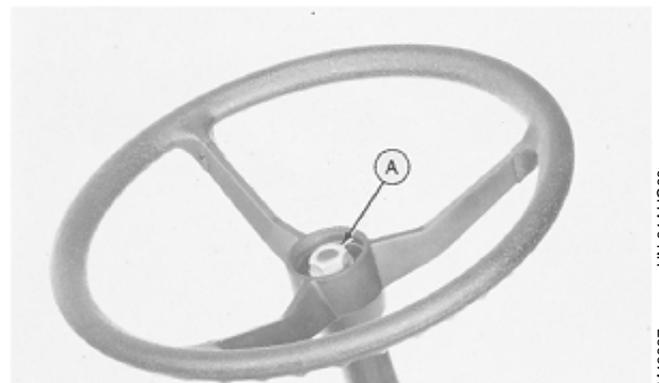
X9811 -UN-23AUG88

MX,HU,6010,6 -19-16OCT91

5. Remove steering wheel cap and nut (A).

**IMPORTANT:** Do not hit on end of steering shaft or damage to steering shaft will occur.

6. Remove steering wheel from steering column.

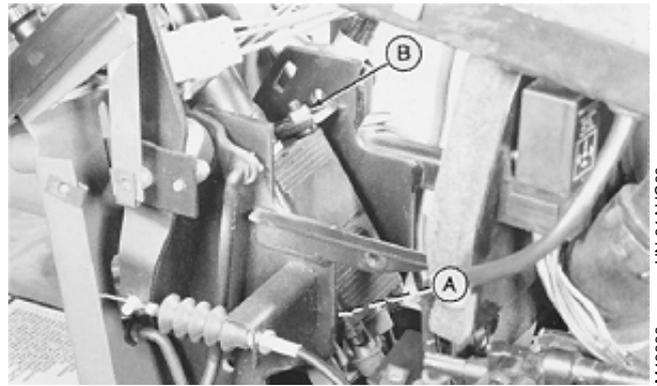


M43837 -UN-31AUG88

MX,HU,6010,7 -19-16OCT91

*NOTE: To aid in installation of the steering valve, note the position of relief valve (A).*

7. Remove four nuts (B) to remove steering valve.



MX,HU,6010,8 -19-16OCT91

M43638 -UN-31AUG88

## DISASSEMBLE STEERING VALVE

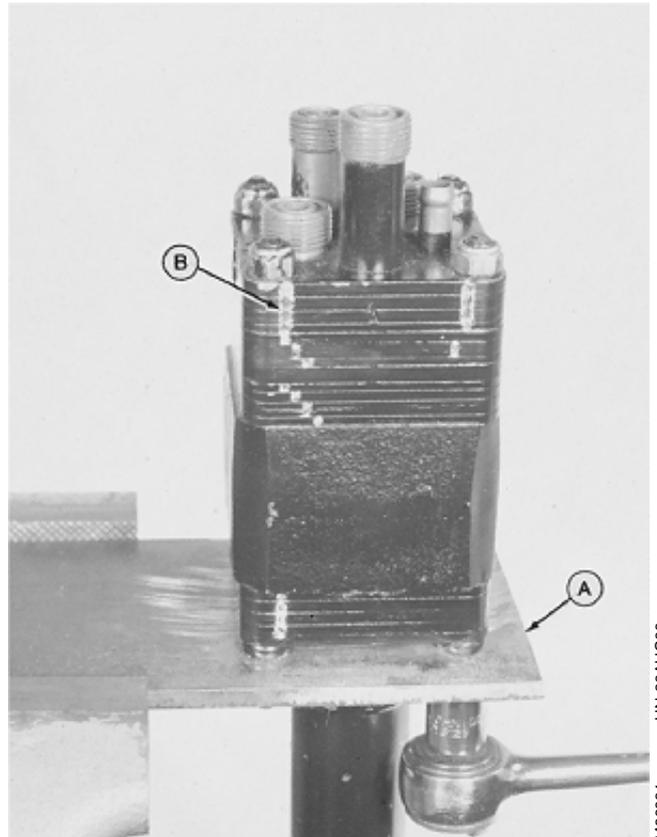
*NOTE: This disassembly procedure is for the 5-port and 4-port steering valves. The differences are noted.*

**IMPORTANT: Do not hold steering valve in a vise during disassembly. Steering valve can be damaged. Disassemble steering valve in a clean work area.**

1. Install power steering valve, with steering column down, in steering valve fixture (A). (See Fabricated Tools in this group.) Fasten valve to fixture using four 5/16-24 UNF nuts.

*NOTE: Check position of alignment grooves (B) in valve body to aid in assembly.*

2. Loosen check ball plug or relief valve plug one turn.



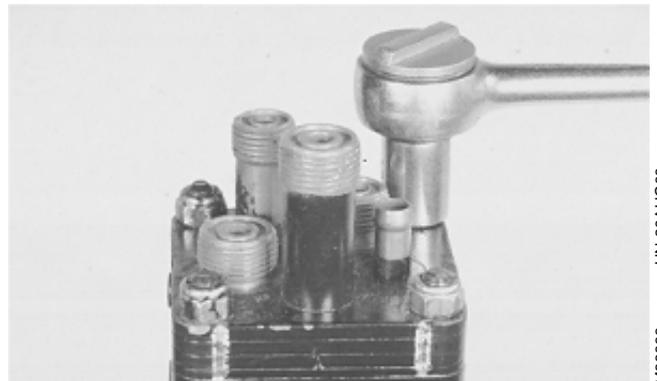
M216010R,11B -19-16OCT91

M36631 -UN-29AUG88

*NOTE: Fitting types may vary depending on application.*

**IMPORTANT: Do not damage fittings during nut removal. Do not nick or scratch the machined surfaces of the steering valve.**

3. Remove nuts to remove port cover assembly (four plates bonded together.)



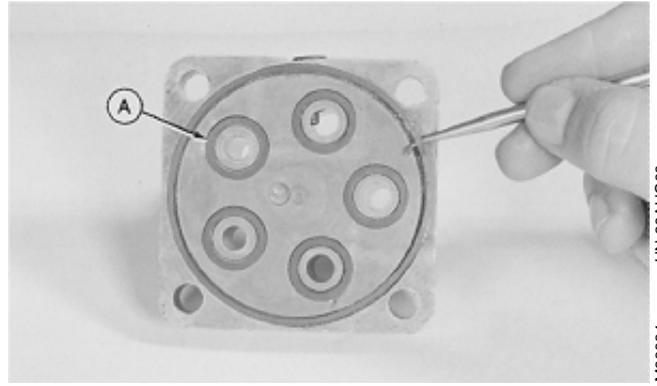
M216010R,13A -19-16OCT91

M36633 -UN-29AUG88

## Steering Valve/Disassemble Steering Valve

*NOTE: 5-port steering valve shown.*

4. Remove seal ring and O-rings (A).



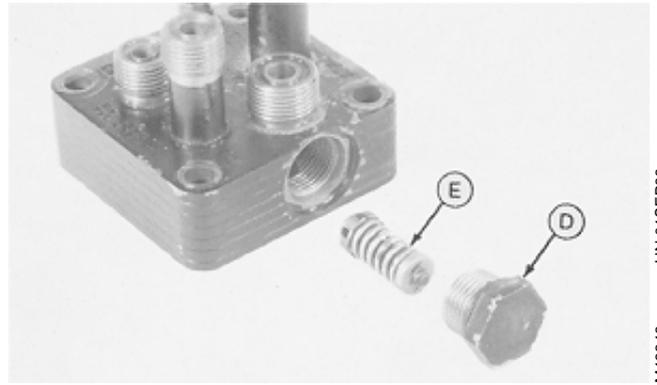
M216010R,14A -19-16OCT91

M36634 -UN-29AUG88

5. Units with check valve—remove plug (A), O-ring (B), and check ball (C).

Units with relief valve—remove plug (D), and relief valve assembly (E).

6. Inspect port cover for scratches on machined surfaces or damage to fittings. Replace cover if damaged.



MX,HU,6010R,15X-19-16OCT91

M43348 -UN-01SEP88

*NOTE: Port manifold has three springs which may come loose during disassembly.*

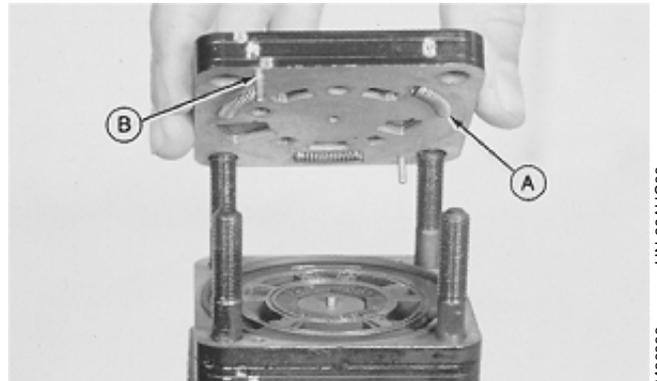
7. Carefully remove port manifold (three plates bonded together).

**IMPORTANT: Do not interchange springs. The steering valve has two sets of springs. Keep springs with respective manifold.**

8. Remove three springs (A).

9. Inspect springs and pins (B) for distortion, wear, or damage.

*NOTE: If one spring is damaged, all six springs in valve must be replaced.*



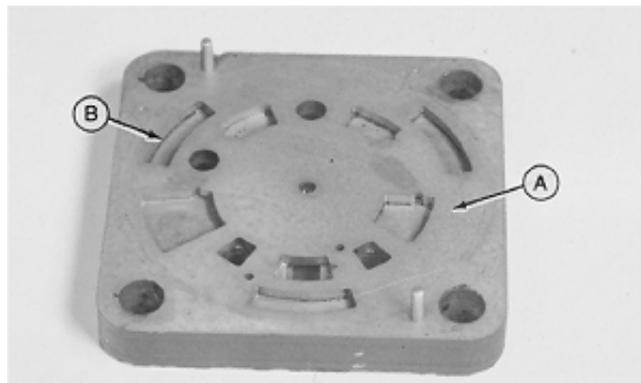
M216010R,16 -19-16OCT91

M36836 -UN-29AUG88

## Steering Valve/Disassemble Steering Valve

10. Inspect port manifold machined surfaces (A) for scratches or scoring. A polished pattern from the rotation of the valve plate and hex drive assembly is normal. All edges (B) must be sharp, free of nicks and burrs.

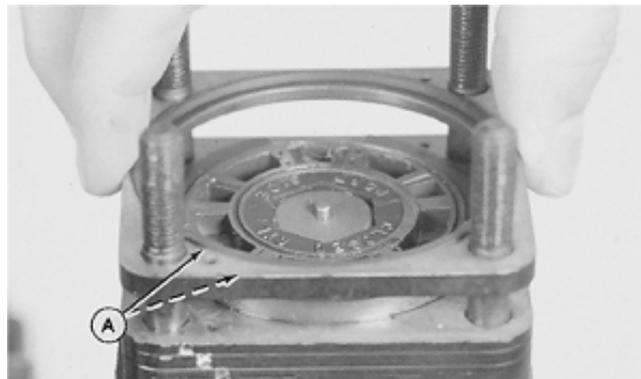
*NOTE: Scoring is indicated by fine scratches or grooves cut into the manifold. When these scratches can be detected by feel with finger nail or lead pencil, the manifold should be replaced.*



MX,HU,6010R,17 -19-16OCT91

M36637  
-UN-29AUG88

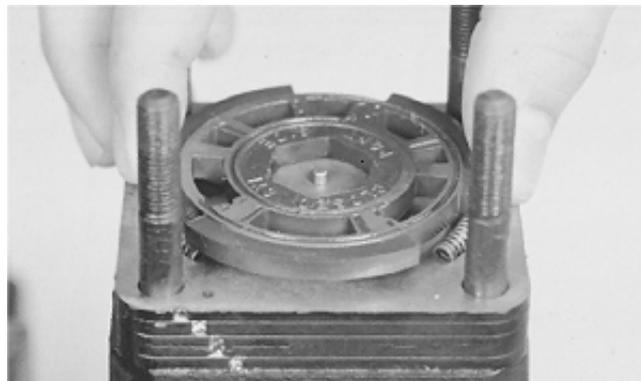
11. Remove the valve ring and two seal rings (A). Check valve ring for nicks and scoring. If the valve ring is damaged, it must be replaced.



MX,HU,6010R,18 -19-16OCT91

M36638  
-UN-29AUG88

12. Remove valve plate. Inspect the slots and ground surfaces for nicks or wear. If the valve plate is scored or the edges are not sharp, the valve plate and valve ring both must be replaced.



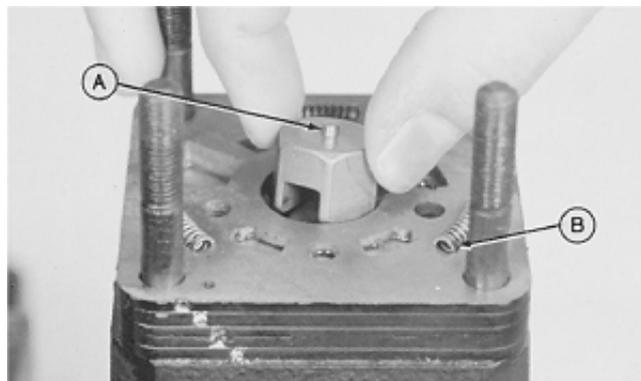
MX,HU,6010R,19 -19-16OCT91

M36639  
-UN-29AUG88

13. Remove and inspect hex drive assembly. Check sides and slot for wear, grooves, or scoring. Pin (A) should be tight and show no wear or damage.

14. Remove three springs (B).

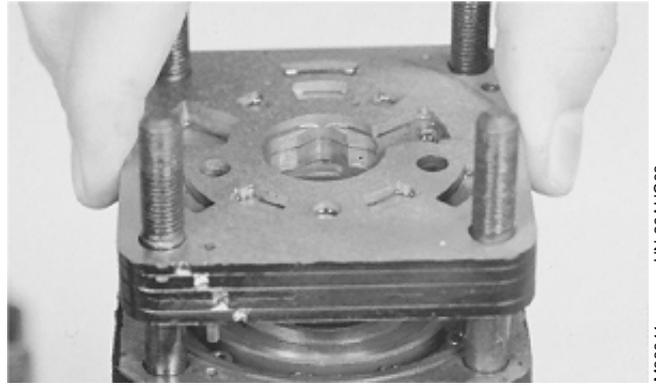
15. Inspect springs for broken coils, wear, or damage.



MX,HU,6010R,20 -19-16OCT91

M36640  
-UN-29AUG88

16. Remove the isolation manifold (four plates bonded together). Check manifold surface, holes and edges for nicks, or unusual wear. A polished pattern from the rotation of the valve plate and commutator cover is normal.

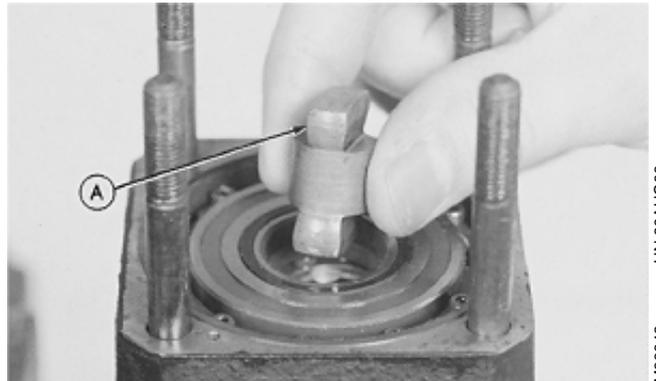


MX,HU,6010R,21 -19-16OCT91

M36641  
-UN-29AUG88

### DISASSEMBLE METERING SECTION

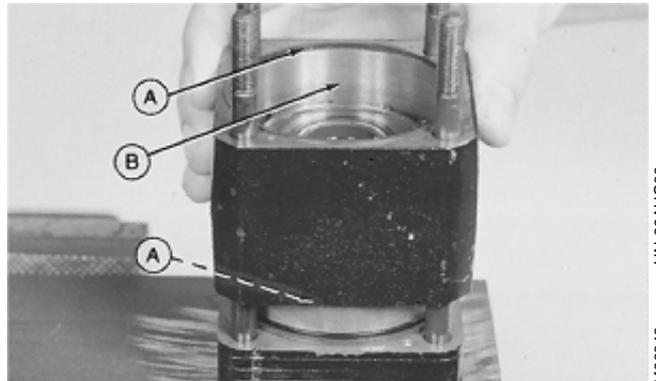
1. Remove drive link. Check the four crowned surfaces (A) for wear or scoring.



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M36842  
-UN-29AUG88

2. Remove metering ring and upper and lower seals (A). If the bore (B) is scored, the metering ring must be replaced.

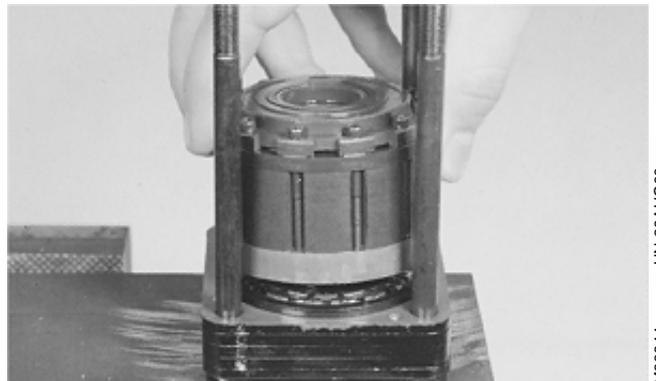


MX,HU,6010R,23 -19-16OCT91

M36843  
-UN-29AUG88

**IMPORTANT: Do not clamp metering assembly in a vise.**

3. Remove metering assembly. Put assembly on a clean surface.



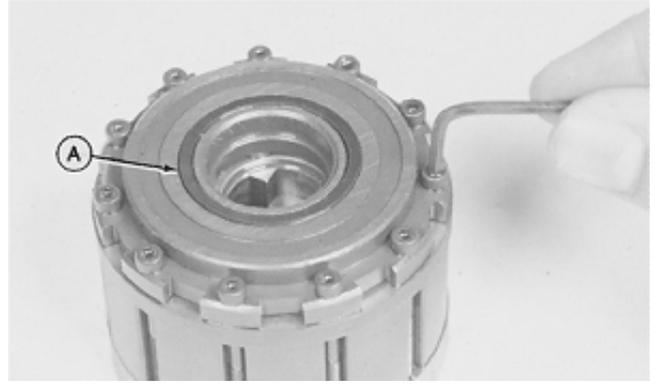
MX,HU,6010R,24 -19-16OCT91

M36644  
-UN-29AUG88

## Steering Valve/Disassemble Metering Section

4. Remove commutator seal (A).

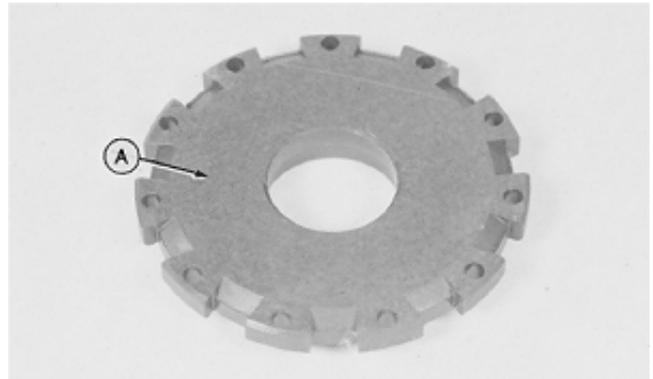
5. Remove 11 screws to remove commutator cover. Inspect screws for damage and replace if necessary.



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M36645  
-UN-29AUG88

6. Check commutator cover machined surface (A) for nicks, burrs, scoring, or unusual wear. A polished pattern due to rotation of the commutator is normal.



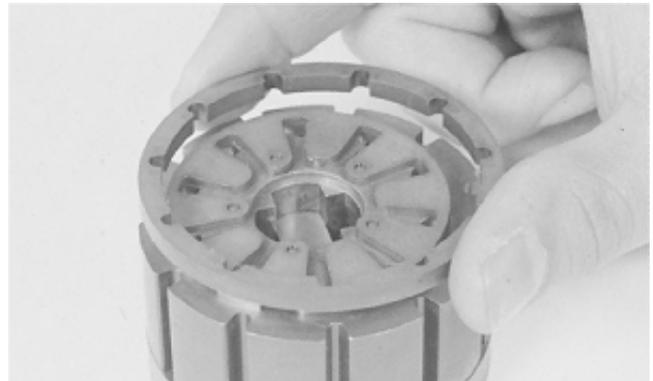
MX,HU,6010R,26 -19-16OCT91

M36846  
-UN-29AUG88

**IMPORTANT: Handle commutator ring with care; it is easily broken.**

7. Remove commutator ring and inspect for wear, burrs, cracks, or scoring.

*NOTE: The commutator ring and commutator are a matched set. If either is worn or damaged, both must be replaced.*



MX,HU,6010R,27 -19-16OCT91

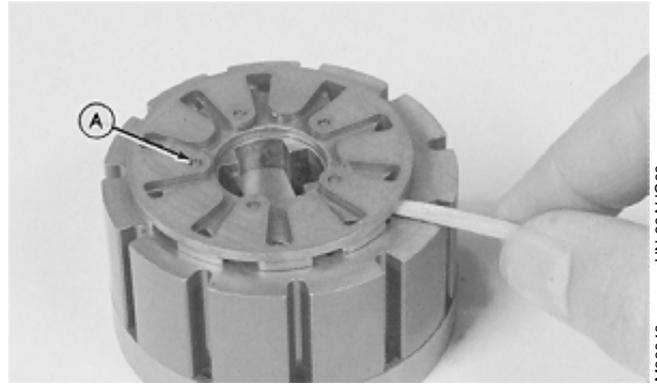
M36847  
-UN-29AUG88

**IMPORTANT: DO NOT use a screwdriver to remove commutator. Commutator can be damaged.**

8. Remove commutator and five pins (A) using a wood dowel or equivalent.

*NOTE: The commutator is made up of two plates bonded together. It is a permanent assembly and cannot be disassembled.*

9. Check commutator machined surface, holes and edges for nicks. Edges must be sharp.



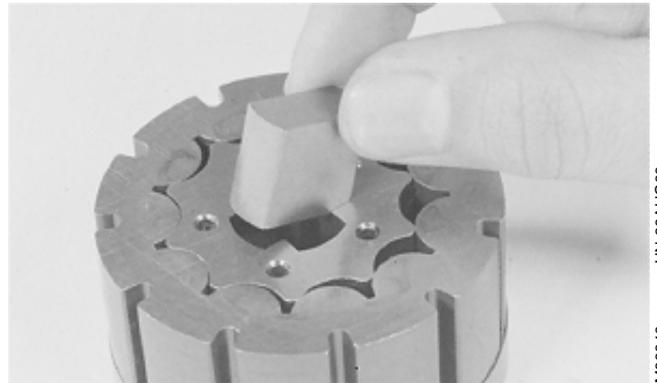
M36648 -UN-29AUG88

MX,HU,6010R,28 -19-16OCT91

10. Remove drive link spacer. Check spacer for grooves, wear, or damage.

11. The rotor should rotate and orbit freely within the stator. Check commutator side of stator face for grooves or scoring.

*NOTE: Stator and rotor are a matched set. If either are worn or damaged, both must be replaced.*



M36649 -UN-29AUG88

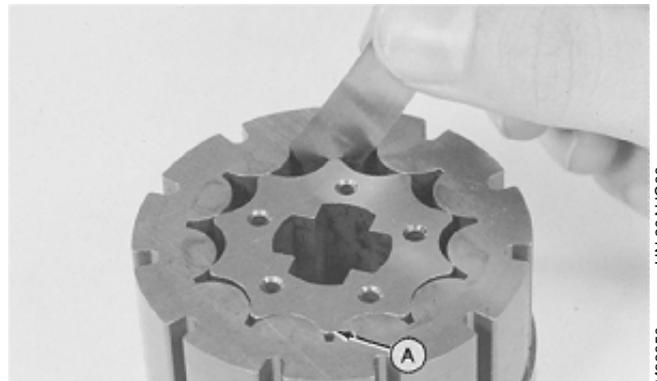
MX,HU,6010R,29 -19-16OCT91

12. Measure rotor-to-stator clearance. Center rotor lobe (A) between stator lobes and check clearance directly opposite lobe (A).

**ROTOR-TO-STATOR SPECIFICATIONS**

Maximum allowable clearance . . . . . 0.08 mm (0.003 in.)

If rotor clearance exceeds 0.08 mm (0.003 in.), replace rotor and stator.



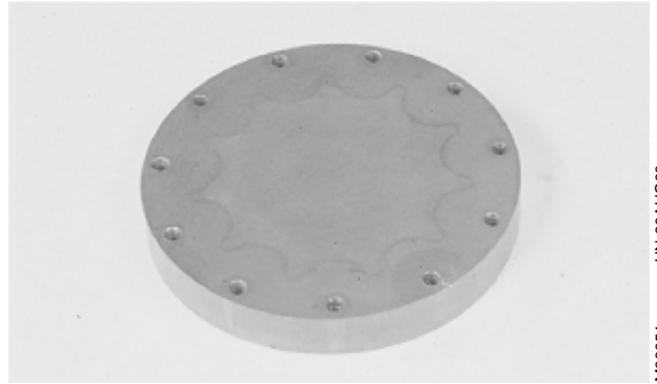
M36650 -UN-29AUG88

MX,HU,6010R,30 -19-16OCT91

## Steering Valve/Disassemble Steering Tube Section

13. Lift the rotor and stator from the drive plate. Check the drive plate side of the rotor assembly for nicks, grooves, or scoring.

A spiral pattern due to rotor movement is normal.

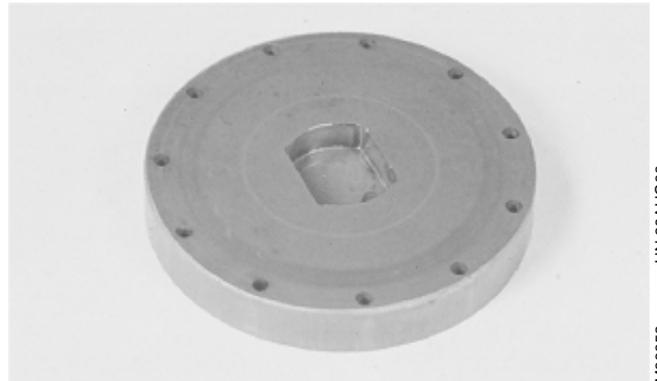


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M36651  
-UN-29AUG88

14. The thrust bearing side of the plate should also show a normal wear pattern without grooves, flaking, or dents.

15. The flat sides of the input shaft hole should not be grooved or worn.



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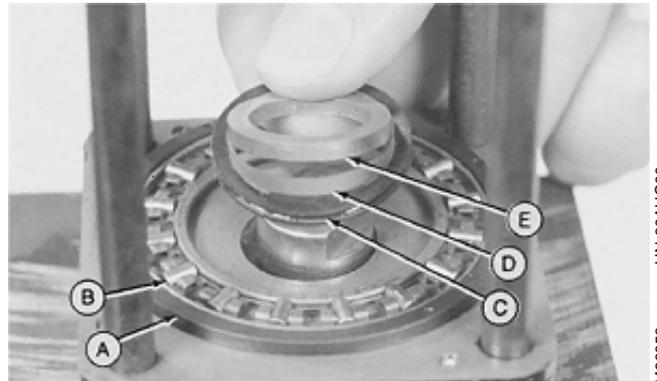
M36652  
-UN-29AUG88

16. Remove parts (A-E).

Inspect bearing for broken or missing rollers, metal flakes, or dents.

Check seal spacer and bearing spacer for wear or damage.

- A—Thrust Bearing Spacer
- B—Thrust Bearing
- C—Face Seal
- D—Back-Up-Ring
- E—Seal Spacer



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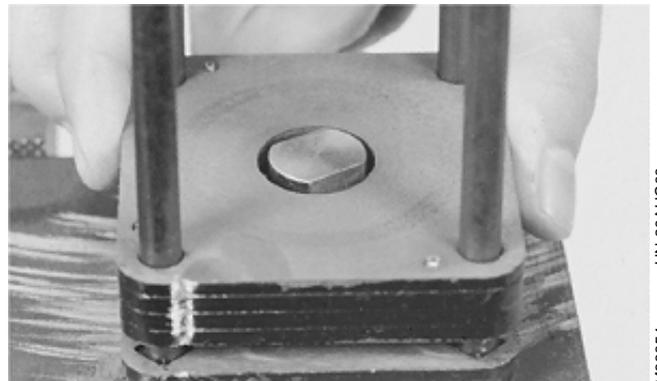
M36653  
-UN-29AUG88

### DISASSEMBLE STEERING TUBE SECTION

1. Remove upper cover plate (four plates bonded together).

Check plate surface for grooves, dents, or metal flakes.

A polished pattern due to the action of the seal is normal.



MX,HU,6010R,34 -19-16OCT91

M36654  
-UN-29AUG88

## Steering Valve/Disassemble Steering Tube Section

2. Remove steering shaft and snap ring (A).
3. Inspect steering shaft serrations, threads, and flats for grooves, wear, or damage.

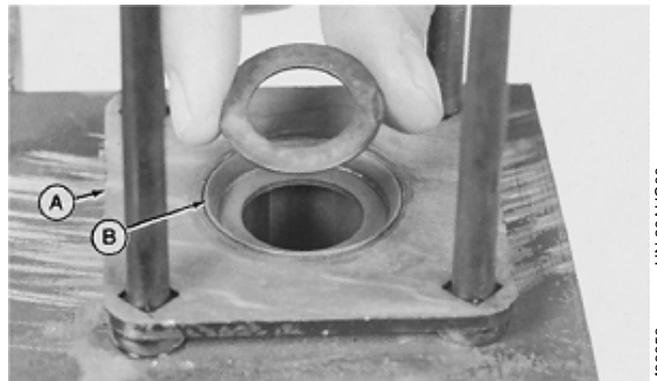


MX,HU,6010R,35 -19-16OCT91

M36655 -UN-29AUG88

4. Remove washer and steering tube (A).

**NOTE:** Steering tube and retaining plate (B) are a matched set. If either part is worn or damaged, both must be replaced.

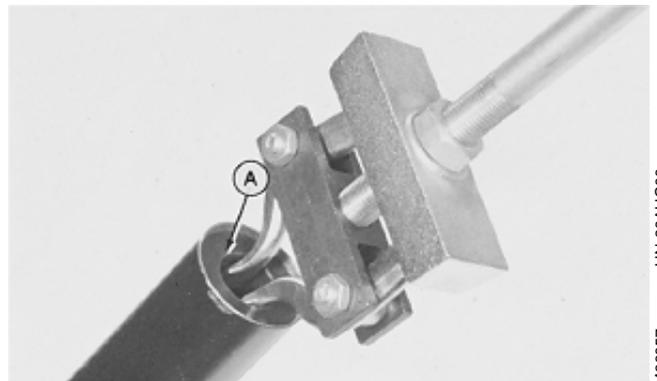


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M36656 -UN-29AUG88

**IMPORTANT:** Hold steering tube in a soft-jaw vise. Be careful not to crush steering tube.

5. Inspect bushing (A) for wear or damage. If bushing replacement is necessary, straighten crimped area of steering tube using a punch.
6. Remove bushing using a 2-jaw, slide hammer puller.

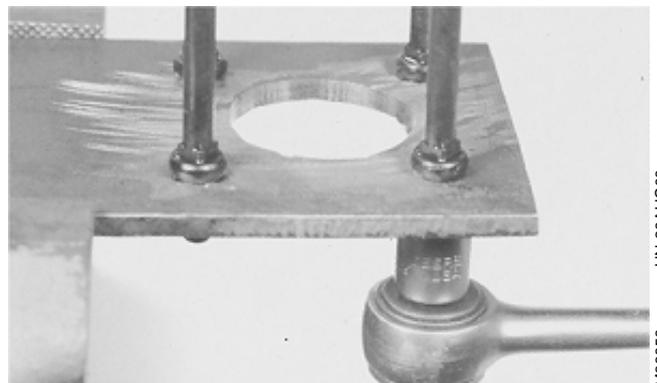


MX,HU,6010R,37 -19-16OCT91

M36657 -UN-29AUG88

7. Remove nuts holding the four bolts to the fixture, and remove the bolts.

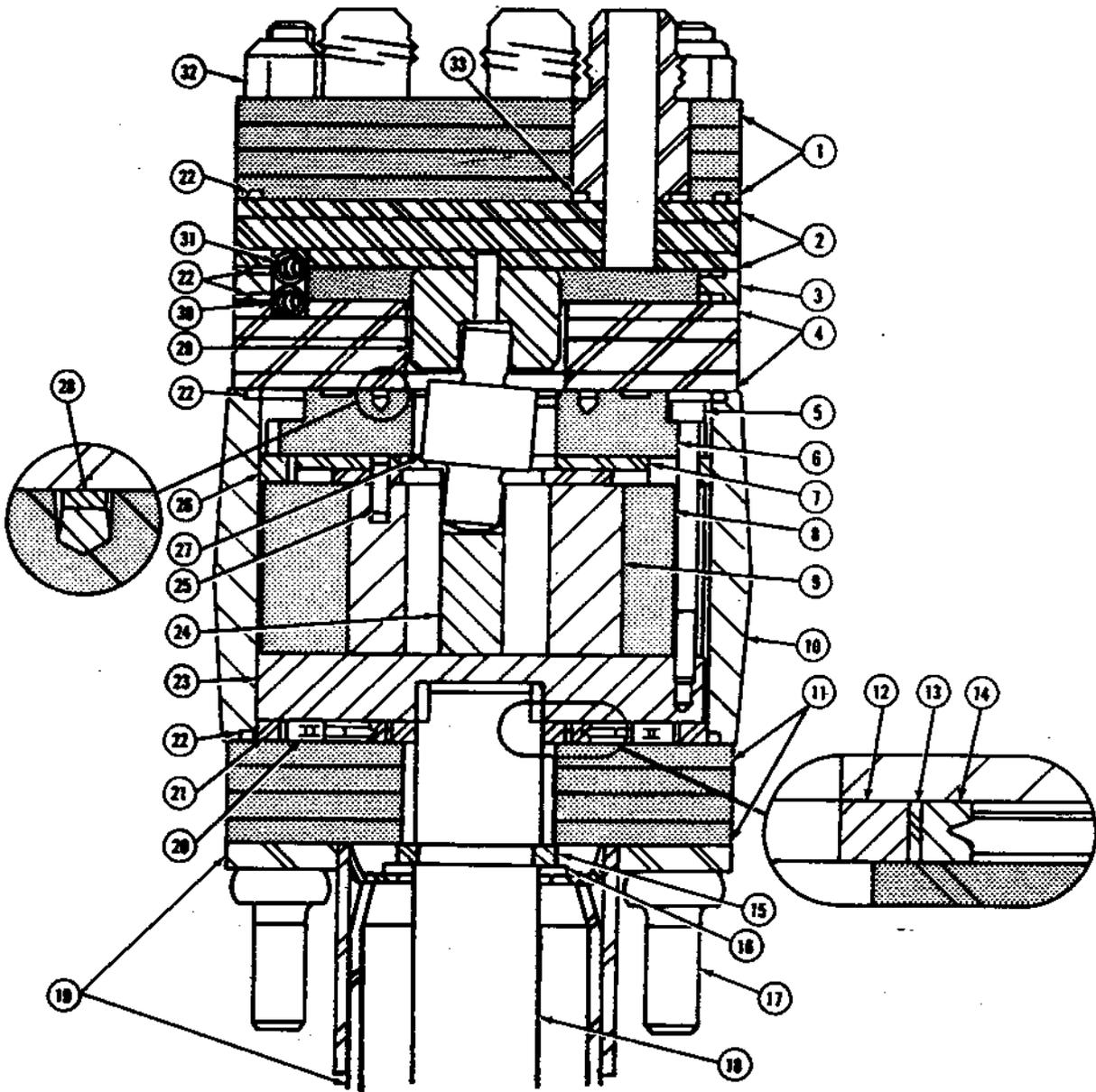
Check bolt threads for wear or damage.



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M36658 -UN-29AUG88

CROSS-SECTION VIEW—STEERING VALVE



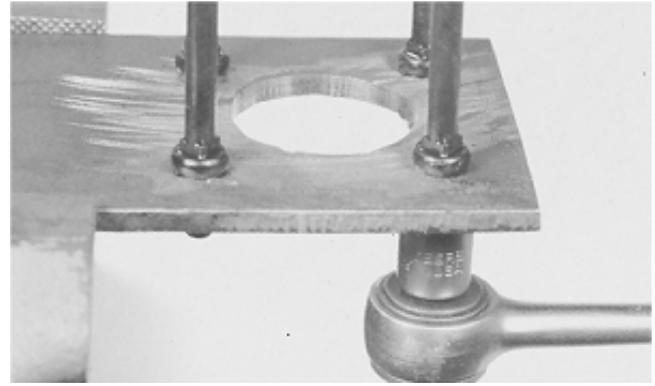
- |                       |                      |                           |                       |
|-----------------------|----------------------|---------------------------|-----------------------|
| 1—Port Cover          | 10—Metering Ring     | 18—Steering Shaft         | 26—Commutator Ring    |
| 2—Port Manifold       | 11—Upper Cover Plate | 19—Steering Tube          | 27—Drive Link         |
| 3—Valve Assembly      | 12—Seal Spacer       | 20—Thrust Bearing         | 28—Commutator Seal    |
| 4—Isolation Manifold  | 13—Back-Up Ring      | 21—Thrust Bearing Spacer  | 29—Hex Drive Assembly |
| 5—Cap Screw (11 used) | 14—Face Seal         | 22—Seal Ring (5 used)     | 30—Spring (3 used)    |
| 6—Commutator Cover    | 15—Snap Ring         | 23—Drive Plate            | 31—Spring (3 used)    |
| 7—Commutator          | 16—Washer            | 24—Drive Link Spacer      | 32—Nut (4 used)       |
| 8—Stator              | 17—Bolt (4 used)     | 25—Alignment Pin (9 used) | 33—O-Ring (5 used)    |
| 9—Rotor               |                      |                           |                       |

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## ASSEMBLE STEERING VALVE

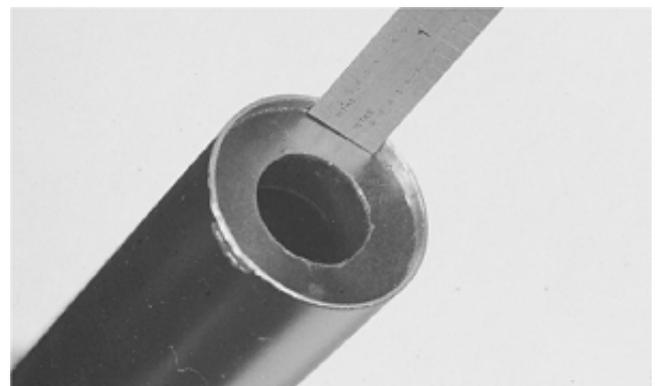
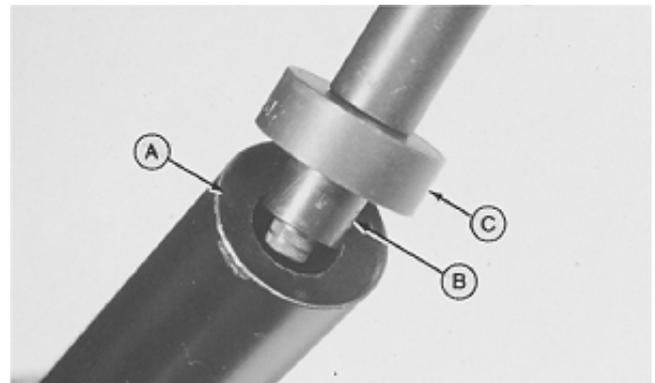
*NOTE: This assembly procedure is for the 4-port and 5-port steering valves. The differences are noted.*

1. Thoroughly clean and dry all parts.
2. Use a seal kit when assembling the steering valve.
3. Put clean hydrostatic oil on internal parts as they are assembled.
4. Install four bolts, with short threaded end down, in fixture. Install nuts and tighten finger tight.



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5. Install bushing (A) with recesses away from driver using a 3/4-in. driver disk (B) and a 1-3/8 in. driver disk (C). Push bushing down until it is 2.5 mm (0.1 in.) below top of steering tube.
6. Slightly bend the end of the steering tube over the bushing using a punch.
7. Apply clean multi-purpose grease on the inside of bushing.



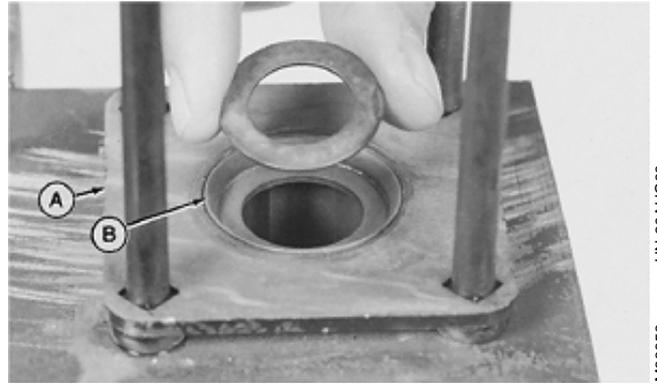
MX,HU,6010R,41 -19-16OCT91

## Steering Valve/Assemble Metering Section

8. Install steering tube (A) on bolts. Be sure the square holes in the steering tube are seated on the square shoulders of the bolts.

9. Apply clean multi-purpose grease on retainer plate (B) and washer.

10. Install washer.

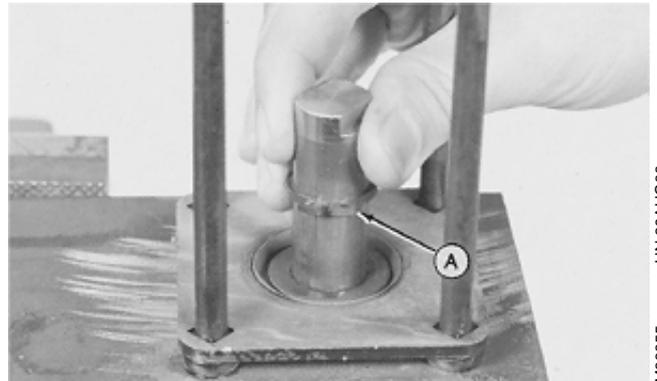


MX,HU,6010R,42 -19-16OCT91

M36656  
-UN-29AUG88

11. Install snap ring (A) on steering shaft.

12. Install steering shaft with threaded end down into steering tube.

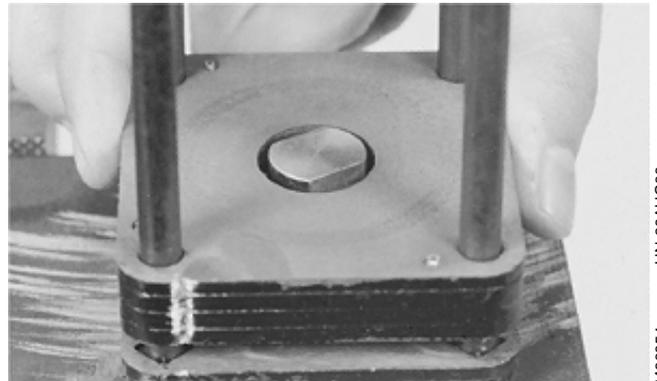


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M36655  
-UN-29AUG88

**IMPORTANT: Alignment grooves must be on only one side of steering valve for proper valve operation.**

13. Install upper cover plate over four bolts with the highly polished surface up.



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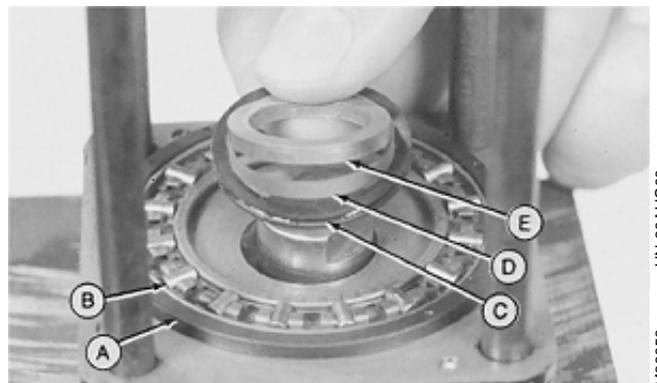
M36654  
-UN-29AUG88

## ASSEMBLE METERING SECTION

1. Apply clean multi-purpose grease on the face of the upper cover plate, steering shaft end, and thrust bearing.

2. Install parts (A-E).

- A—Thrust Bearing Spacer
- B—Thrust Bearing
- C—Face Seal
- D—Back-Up Ring
- E—Seal Spacer



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-UN-29AUG88

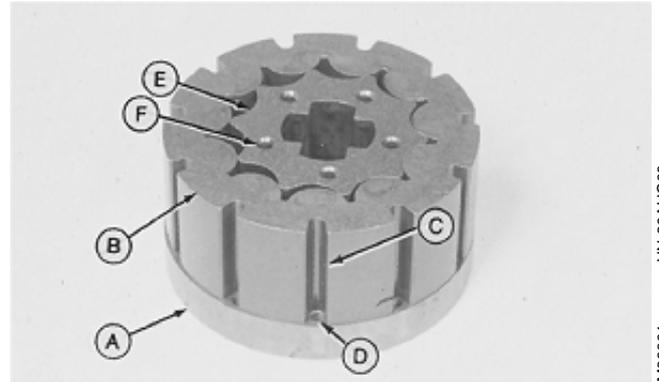
## Steering Valve/Assemble Metering Section

3. Put drive plate (A) on a clean surface with slot downward.

4. Install and turn stator (B) until the stator slots (C) are aligned with drive plate holes (D).

5. Install rotor (E) with five pin holes (F) up.

|                |                     |
|----------------|---------------------|
| A—Drive Plate  | D—Drive Plate Holes |
| B—Stator       | E—Rotor             |
| C—Stator Slots | F—Pin Holes         |

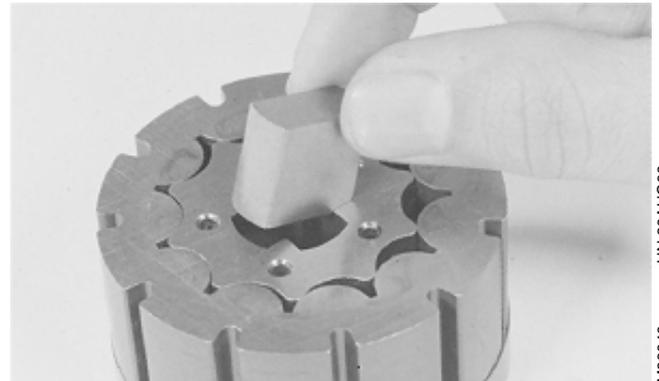


MX,HU,6010R,46 -19-16OCT91

M36661 -UN-29AUG88

6. Apply multi-purpose grease on spacer.

7. Install spacer in rotor drive slot.



MX,HU,6010R,47 -19-16OCT91

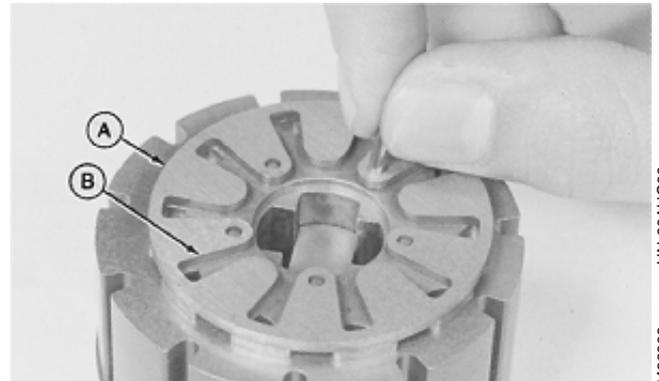
M36849 -UN-29AUG88

8. Install commutator (A), with long grooves (B) upward, on rotor.

**IMPORTANT: Pins must be installed below the surface of the commutator to prevent commutator cover damage.**

9. Align commutator holes with rotor holes and install five pins.

10. Put a few drops of clean hydrostatic oil into each groove of the commutator.



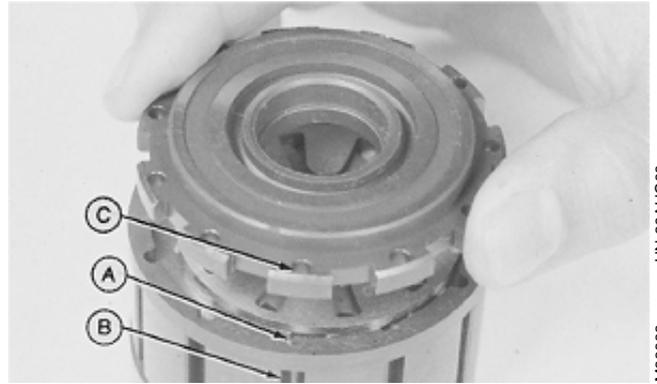
MX,HU,6010R,48 -19-16OCT91

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M36862 -UN-29AUG88

## Steering Valve/Assemble Metering Section

11. Align commutator ring slots (A) with stator slots (B) and install commutator ring.

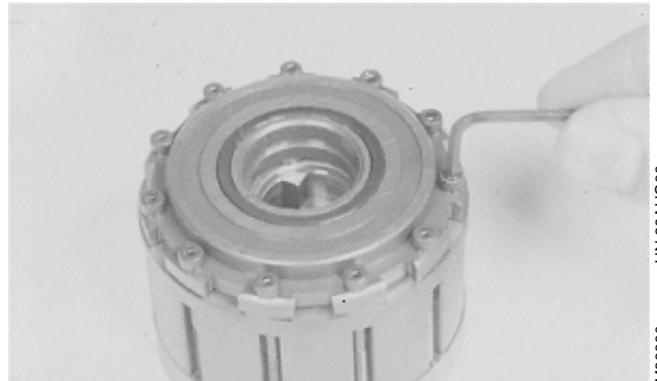
12. Align commutator cover holes (C) with commutator ring slots. Install commutator cover with flat surface toward commutator.



MX,HU,6010R,49 -19-16OCT91

M36663 -UN-29AUG88

13. Clean screw threads using clean and cure primer. Apply thread lock and sealer (low strength) on screw threads. Install 11 screws into metering assembly. DO NOT tighten screws at this time.



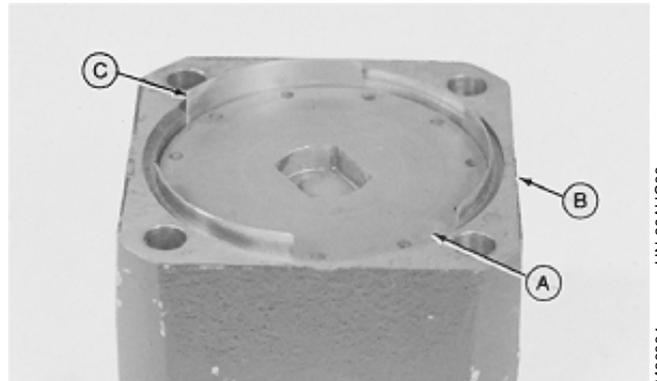
MX,HU,6010R,50 -19-16OCT91

M36880 -UN-29AUG88

**IMPORTANT:** The following procedure must be used to minimize an out-of-round condition between commutator ring and drive plate. The commutator ring is self-centering when the drive plate is shimmed.

14. Install metering assembly, with drive plate (A) up into metering ring (B).

15. Make six pieces of 0.18 mm (0.007 in.) shim stock (C), approximately 13 mm (0.5 in.) wide x 38 mm (1.5 in.) long. Install two shims each between drive plate and metering ring 120° apart.

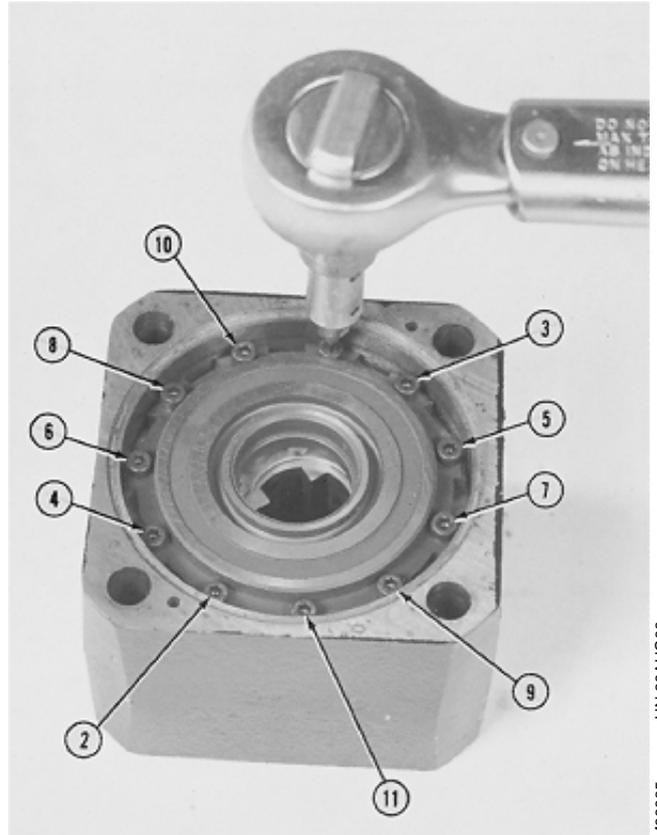


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M36864 -UN-29AUG88

## Steering Valve/Assemble Metering Section

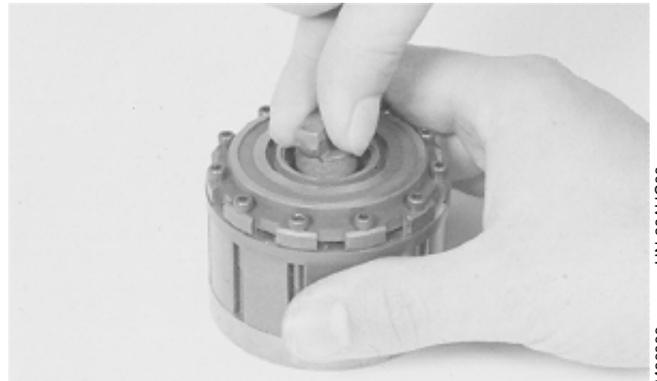
16. Turn metering ring over on a flat surface and push metering assembly down. Tighten 11 screws in several steps and in the sequence shown to  $1.4 \pm 0.1$  N·m ( $12 \pm 1$  lb-in.).



M36865 -UN-29AUG88  
MX,HU,6010R,52 -19-16OCT91

17. Install LARGE end of drive link into the slot in the rotor. Hold the drive link and rotate the metering assembly by hand. The rotor should turn freely inside the stator.

If they bind or DO NOT move, disassemble and inspect to find the cause. Repeat steps 3—17.

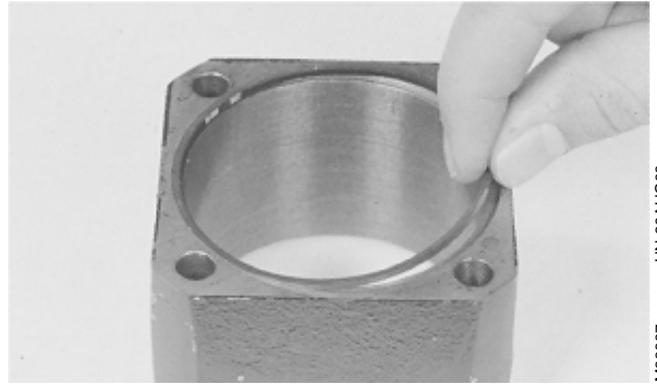


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MX,HU,6010R,53 -19-16OCT91

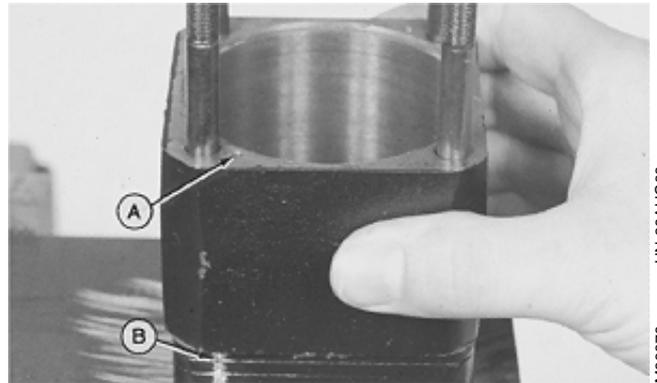
18. Apply clean multi-purpose grease on seal ring. Install seal ring on metering ring end with no pin holes.

**IMPORTANT:** Align pin hole (A) in metering ring with groove (B) on upper cover plate so that remaining parts can be aligned correctly.

19. Install metering ring with pin holes up on bolts.



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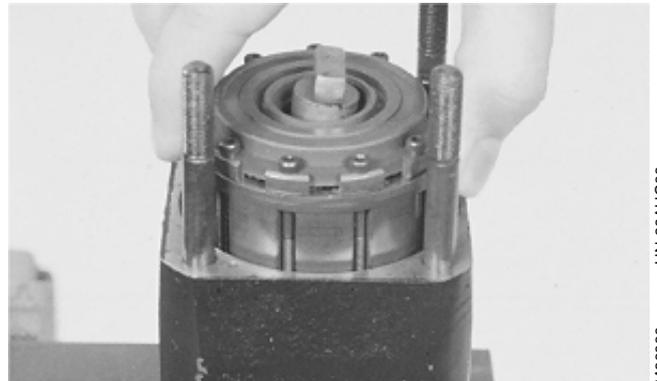


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MX,HU,6010R,54 -19-16OCT91

20. Apply clean multi-purpose grease on drive plate surface.

21. Install metering assembly, with drive plate down into metering ring. Turn metering assembly until the steering shaft engages the drive plate hole. When properly seated, the metering assembly is below the surface of the metering ring.



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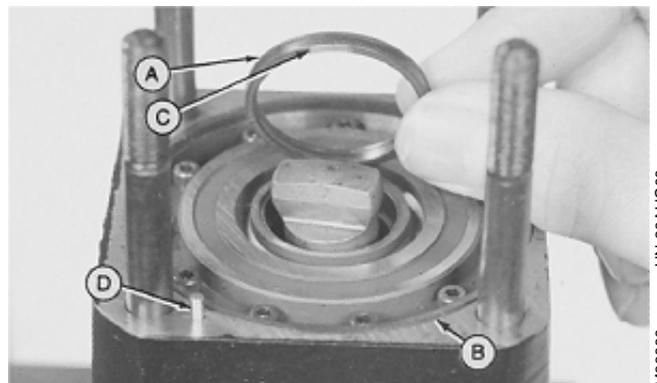
MX,HU,6010R,55 -19-16OCT91

22. Apply clean multi-purpose grease on commutator seal (A) and seal ring (B).

23. Install commutator seal with yellow mark (C) down into commutator cover.

24. Install seal ring and pins (D).

- A—Commutator Seal
- B—Seal Ring
- C—Yellow Mark
- D—Pin (2 used)



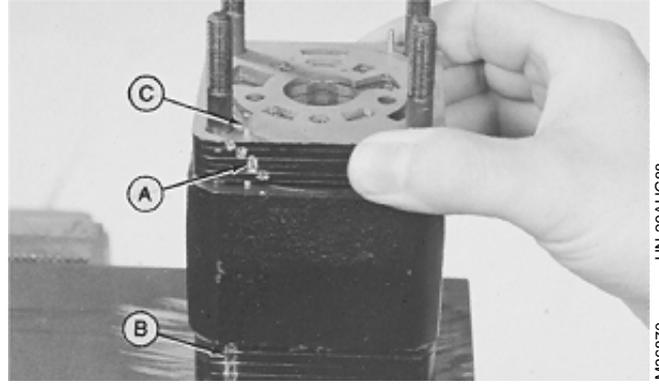
M36669 -UN-29AUG88

MX,HU,6010R,56 -19-16OCT91

## ASSEMBLE CONTROL VALVE SECTION

**IMPORTANT:** Align grooves (A) in isolation manifold with groove (B) in upper cover plate.

1. Install isolation manifold, with recessed slots up, on metering ring.
2. Install pins (C).

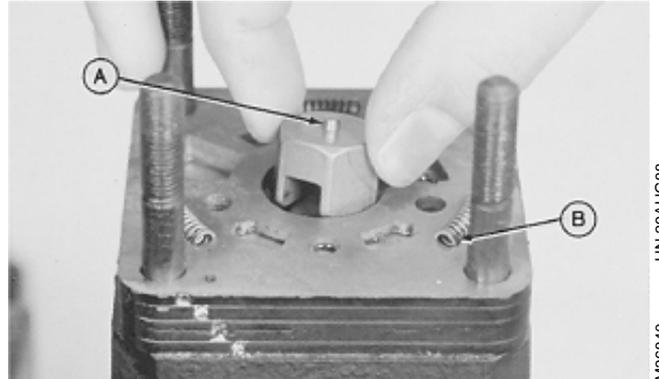


MX,HU,6010R,57 -19-16OCT91

M36670 -UN-29AUG88

3. Install three 13 mm (1/2 in.) springs (B) in recessed slots of the isolation manifold.

4. Install hex. Drive assembly, with pin (A) up, on drive link.

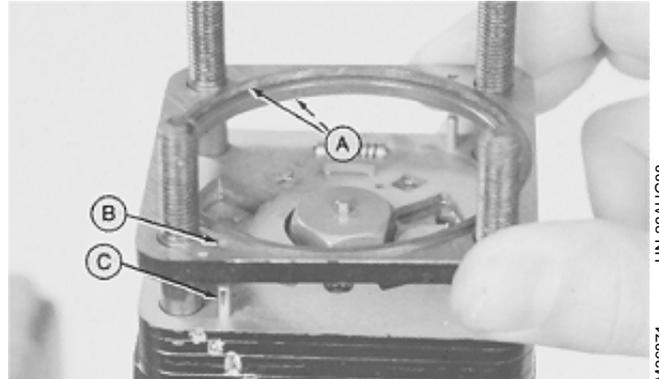


MX,HU,6010R,58 -19-16OCT91

M36840 -UN-29AUG88

5. Apply clean multi-purpose grease on seal rings (A). Install seal rings on valve ring.

6. Align valve ring holes (B) with pins (C) to install valve ring.



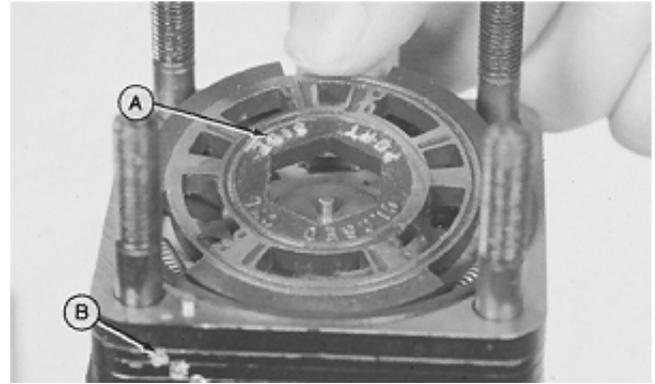
MX,HU,6010R,59 -19-16OCT91

M36871 -UN-29AUG88

**IMPORTANT:** Valve plate must be installed with “PORT SIDE” (A) directly opposite (12 o’clock position) from alignment grooves (B) for proper operation. Valve plate spring slots and springs must be aligned to prevent spring damage when installing port manifold.

7. Install valve plate, with “PORT SIDE” up, on isolation manifold. Turn valve plate to make sure springs are centered in valve plate spring slots.

8. Apply clean hydrostatic oil on valve plate.



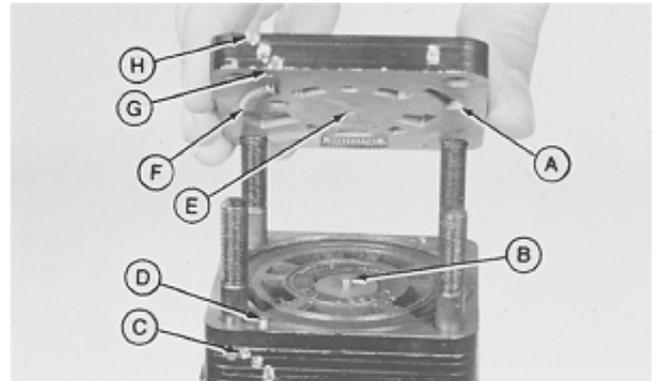
M36672 -UN-29AUG88

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9. Install three 19 mm (3/4 in.) springs (F) in recessed slots (A) of the port manifold.

**IMPORTANT:** Align grooves (H) in port manifold with grooves (C) in isolation manifold. Be careful not to damage springs while installing port manifold.

10. Install port manifold with springs toward valve plate. Be sure pins (D) engage alignment holes (G) in port manifold. Be sure hex drive assembly pin (B) engages center hole (E) in port manifold.



M36673 -UN-29AUG88

- A—Recessed Slots
- B—Hex Drive Assembly Pin
- C—Isolation Manifold Grooves
- D—Pin (2 used)
- E—Port Manifold Center Hole
- F—19 mm (3/4 in.) Spring (3 used)
- G—Port Manifold Alignment Hole (2 used)
- H—Port Manifold Grooves

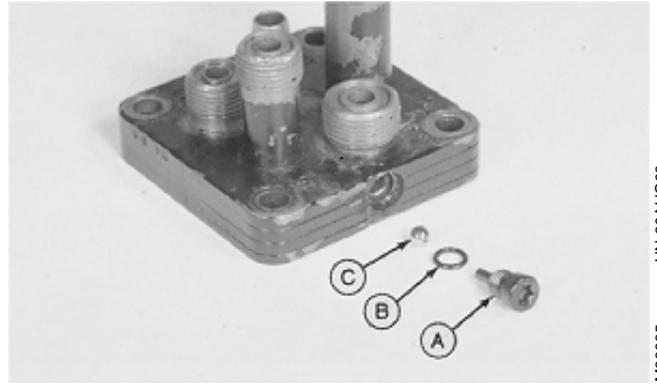
MX,HU,6010R,61 -19-16OCT91

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## Steering Valve/Assemble Control Valve Section

11. Units with check valve—install O-ring (B) on plug (A). Install check ball (C). Be sure check ball is seated in bottom of hole. Install and tighten plug.

Units with relief valve—install relief valve assembly and plug. Tighten plug.



M216010R,62X -19-16OCT91

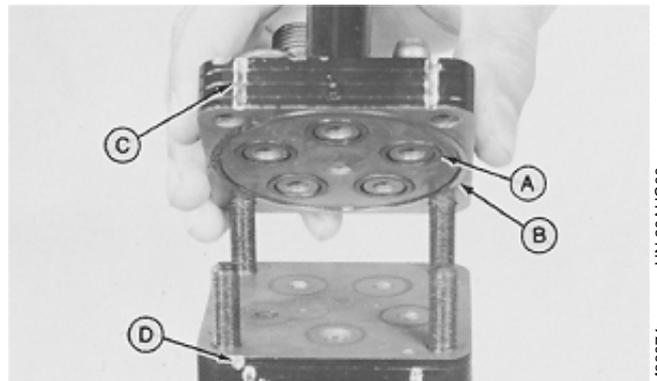
M36635 -UN-29AUG88

12. Apply clean multi-purpose grease on five O-rings (A) and seal ring (B). Install O-rings and seal ring in port cover.

**IMPORTANT: Align grooves (C) in port cover with grooves (D) in port manifold.**

13. Install port cover with seals toward port manifold.

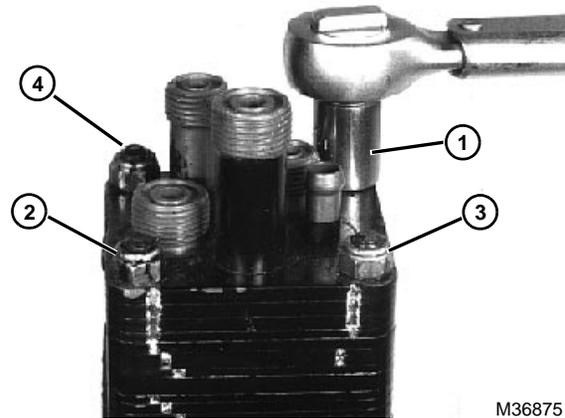
- A—O-Rings (5 used)
- B—Seal Ring
- C—Port Cover Alignment Grooves
- D—Port Manifold Alignment Grooves



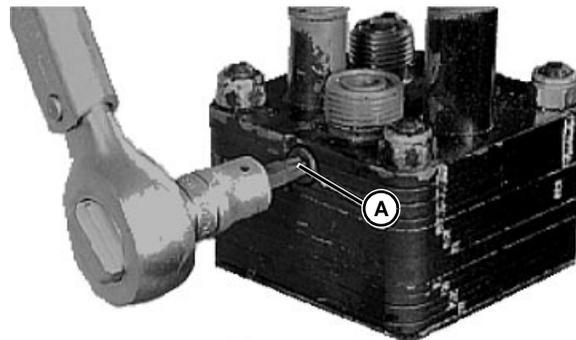
MX,HU,6010R,63 -19-16OCT91

M36874 -UN-29AUG88

14. Install and tighten four nuts in the sequence shown. Tighten in several steps to  $27 \pm 3 \text{ N}\cdot\text{m}$  ( $240 \pm 24 \text{ lb-in.}$ ).
15. Tighten plug (A) to  $14 \pm 3 \text{ N}\cdot\text{m}$  ( $124 \pm 27 \text{ lb-in.}$ ).
16. Remove nuts to remove steering valve from fixture.



M36875

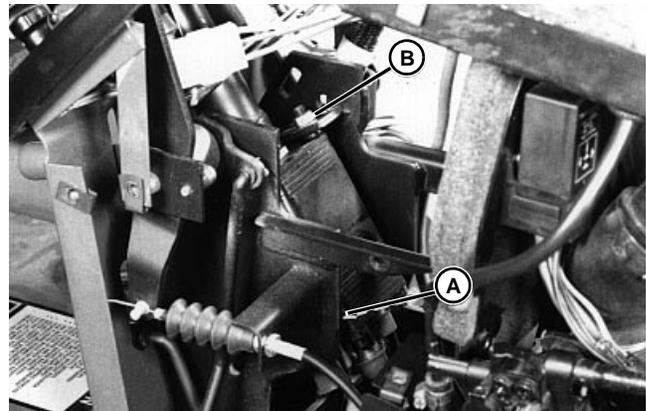


M36876

## INSTALL STEERING VALVE

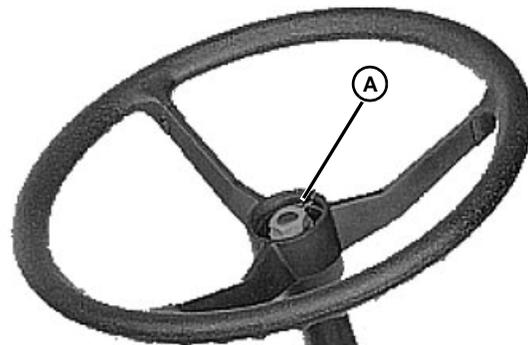
**IMPORTANT:** For proper operation, the steering valve must be installed with the relief valve (A) toward the right side of the machine. Hydraulic lines must be connected to the correct fittings.

1. Position steering valve with relief valve toward the right side of the machine. Fasten with four nuts (B).



M43838

2. Install steering wheel. Install and tighten nut (A) to  $13\text{--}16 \text{ N}\cdot\text{m}$  ( $10\text{--}12 \text{ lb-ft.}$ )
3. Install steering wheel emblem cap.



M43837

## Steering Valve/Install Steering Valve

4. Install new O-rings and connect hydraulic lines (B).
5. Install driveshaft (A) as described in Section 50, Group 05.
6. Install battery base, battery, and pedestal side panels for 655, 755/756, and early 855/856 tractors.
7. Install muffler. (See Section 20, Group 15)
8. Install fuel tank for late 855/856 and all 955 tractors.



M43836 -JUN-31AUG88

MX,HU,6010,67 -19-16OCT91

*Steering Valve/Install Steering Valve*

60  
10  
24

## SPECIFICATIONS

| Item            | Measurement       | Specification                          |
|-----------------|-------------------|--|
| Brake Disk      | Minimum Thickness | 4.4 mm (0.173 in.)                     |
| Spline Backlash | Maximum           | 1.2 mm (0.047 in.)                     |
| Brake Plate     | Minimum Thickness | 2.3 mm (0.090 in.)                     |
| Brake Plate     | Maximum Warpage   | 0.3 mm (0.012 in.)                     |
| Brake Bushings  | I. D.             | 19.099 ± 0.025 mm (0.7515 ± 0.001 in.) |

MX,HU,6015,1 -19-16OCT91

## SERVICE EQUIPMENT AND TOOLS

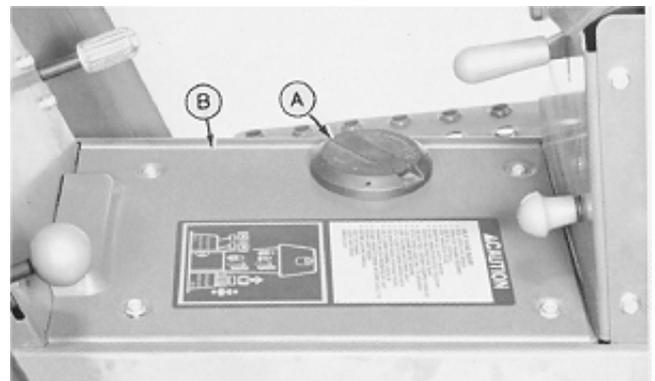
*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name   | Use               |
|--------|-------------------|
| Reamer | To ream bushings. |

MX,HU,6015,1A -19-16OCT91

## REMOVE BRAKE LINKAGE

1. Park tractor safely. Block wheels, remove key, and disengage park brake.
2. Turn depth control lever (A) clockwise until it stops.
3. Remove four cap screws. Remove panel (B) by lifting right rear corner first then lift up depth control lever (A) to clear depth control bolt head and move panel out the right side of the tractor.

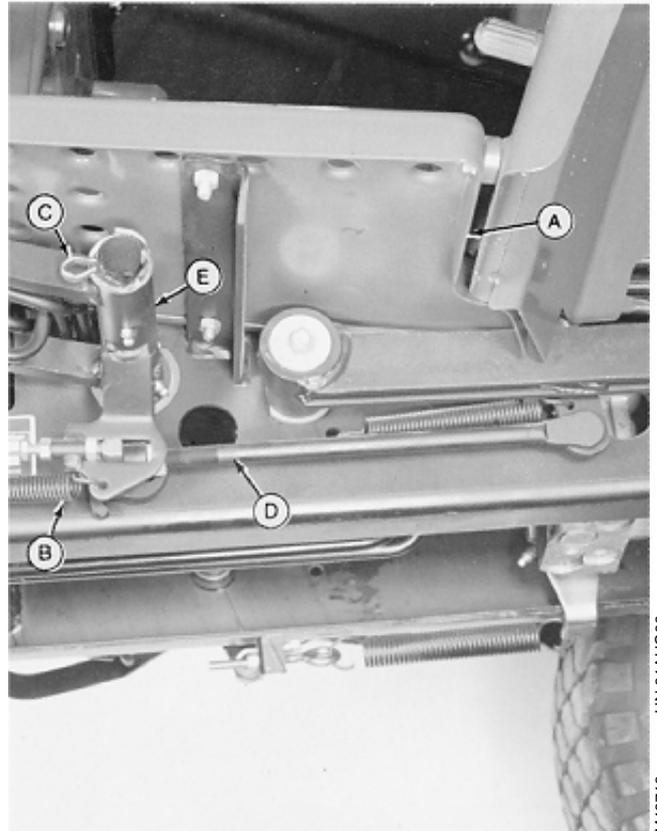


MX,HU,6015,2 -19-16OCT91

## Brake Linkage/Remove Brake Linkage

4. Remove five bolts. Remove left foot rest (A).
5. Disconnect spring (B).
6. Remove cotter pin (C) and washer.
7. Hold brake rod (D) in place and remove left brake pedal (E).

A—Left Foot Rest  
B—Spring  
C—Cotter Pin  
D—Left Brake Rod  
E—Left Brake Pedal

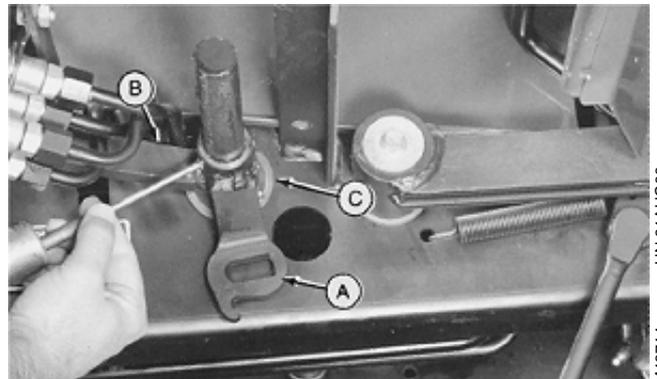


Under Left Footrest

IM43713 -JUN-31AUG88

MX,HU,6015,3 -19-16OCT91

8. Remove roll pin. Remove park brake lever (A).
  9. Remove right brake pedal (B) and bushing (C).
- Inspect bushing (C). Replace bushing if it is worn excessively.



Under Left Footrest

IM43714 -JUN-31AUG88

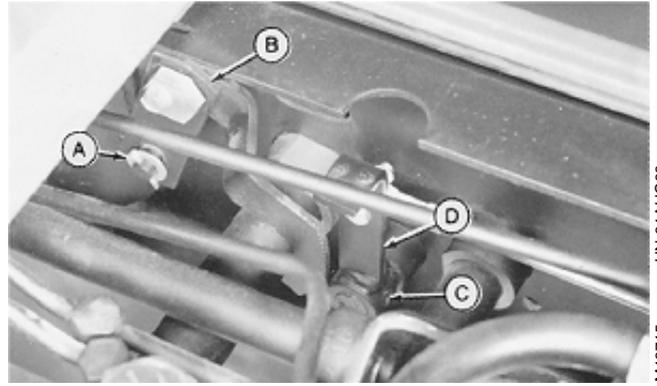
MX,HU,6015,4 -19-16OCT91

## Brake Linkage/Remove Brake Linkage

10. Remove cotter pin (A) and washer to disconnect cruise control-brake disengage link (B).

11. Remove roll pin (C) to remove cruise control pawl (D).

- A—Cotter Pin
- B—Cruise Control-Brake Disengage Link
- C—Roll Pin
- D—Cruise Control Pawl



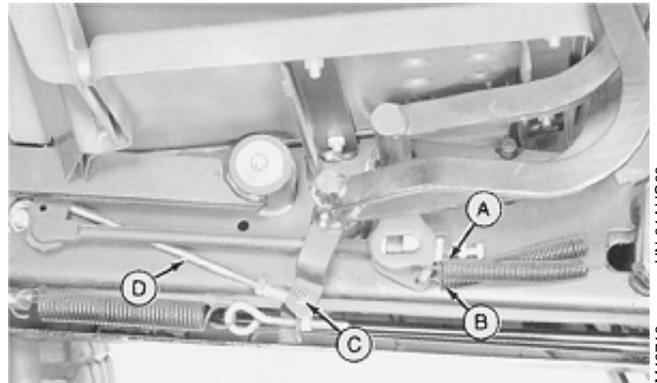
Inside Right Frame

MX,HU,6015.5 -19-16OCT91

12. Disconnect springs (A and B).

13. Remove lock nut (C). Disconnect transmission control rod (D).

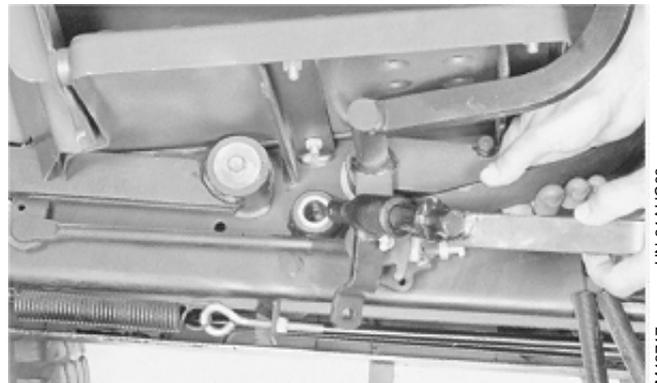
- A—Right Brake Spring
- B—Service/Park Brake Spring
- C—Lock Nut
- D—Transmission Control Rod



Under Right Footrest

MX,HU,6015.6 -19-16OCT91

14. Remove speed control pedals.

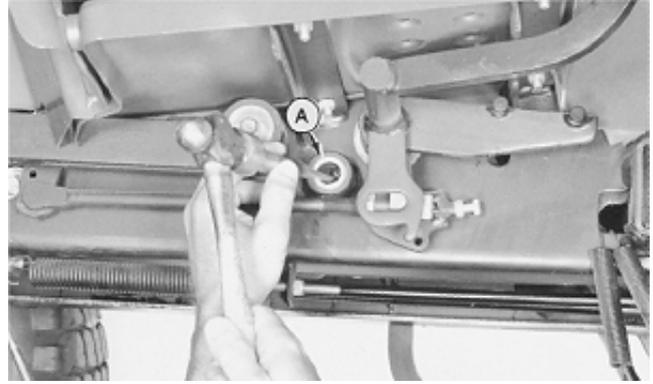


Under Right Footrest

MX,HU,6015.7 -19-16OCT91

## Brake Linkage/Remove Brake Linkage

15. Inspect bushings (A) for wear. Remove them if they are worn excessively.



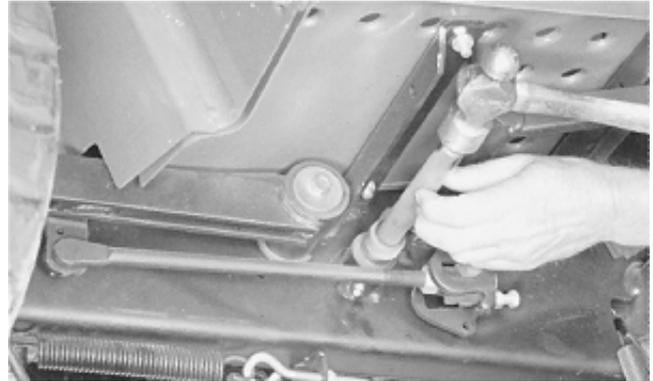
*Under Right Footrest*

MX,HU,6015,8 -19-16OCT91

M43718  
-UN-31AUG88

16. Install new bushings flush with ends of boss.

Ream bushings to  $19.099 \pm 0.025$  mm ( $0.7515 \pm 0.001$  in.).



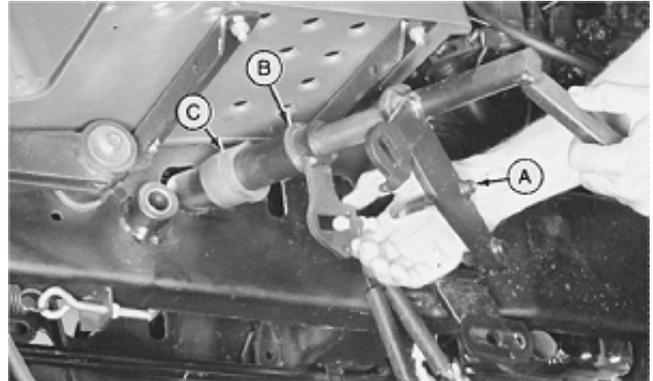
*Under Right Footrest*

MX,HU,6015,9 -19-16OCT91

M43719  
-UN-31AUG88

17. Remove service/park brake pedal (A) right brake lever (B), and bushing (C).

Inspect parts for excessive wear or damage. Replace parts as required.



*Under Right Footrest*

MX,HU,6015,10 -19-16OCT91

M43720  
-UN-31AUG88

## Brake Linkage/Remove Brake Linkage

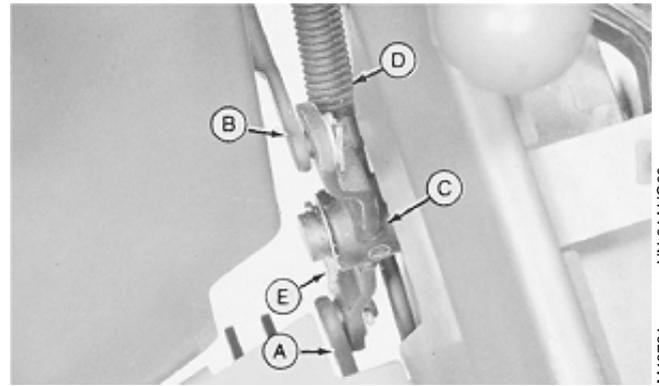
18. Remove cotter pin and washer to remove forward brake rods (A).

19. Remove cotter pin and washer to remove rearward brake links (B).

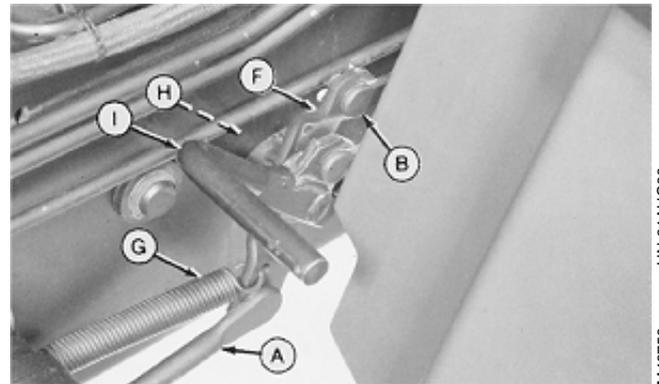
20. To replace right side pivot (C):  
Remove right fender.  
Disconnect spring (D).  
Remove cotter pin (E) and washer.

21. To replace left side pivot (F):  
Remove left fender.  
Disconnect spring (G).  
Remove cotter pin (H) and washer.  
Remove differential lock pedal (I).

- A—Forward Brake Rod
- B—Rearward Brake Link
- C—Right Side Pivot
- D—Spring
- E—Cotter Pin
- F—Left Side Pivot
- G—Spring
- H—Cotter Pin
- I—Differential Lock Pedal



Right Side

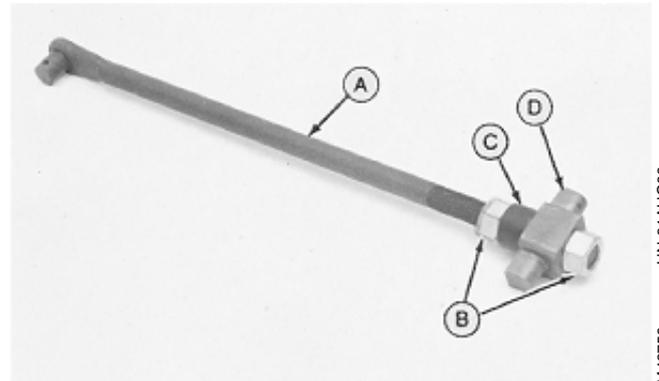


Left Side

MX,HU,6015,11 -19-16OCT91

22. Check forward brake rod (A) for damage. Check brake arm pin (D) for excessive wear or damage. Replace parts as necessary.

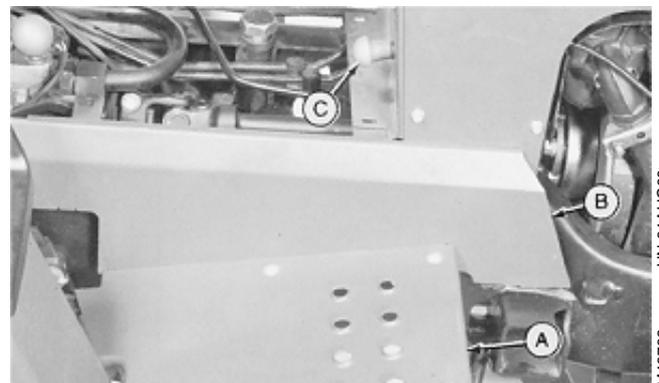
- A—Forward Brake Rod
- B—Nut (2 used)
- C—Spacer
- D—Brake Arm Pin



MX,HU,6015,12 -19-16OCT91

23. To replace park brake lock linkage, remove five bolts to remove right footrest (A) and panel (B).

24. Turn knob (C) counterclockwise to remove it.



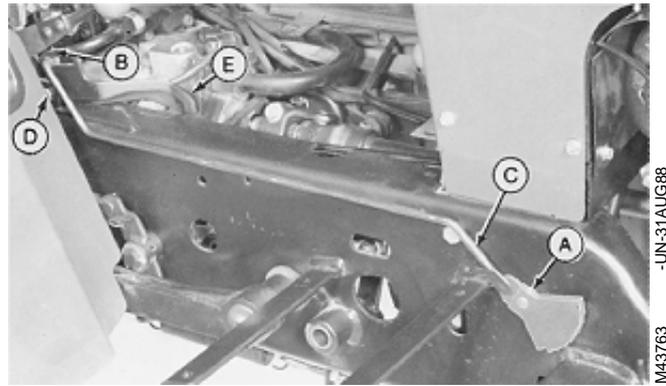
Right Side

MX,HU,6015,13 -19-16OCT91

25. Remove roll pin (A) and cotter pin (B) to remove link (C).

26. Remove bolt (D) to remove transmission lock lever (E).

- A—Roll Pin
- B—Cotter Pin
- C—Transmission Lock Link
- D—Bolt
- E—Transmission Lock Lever

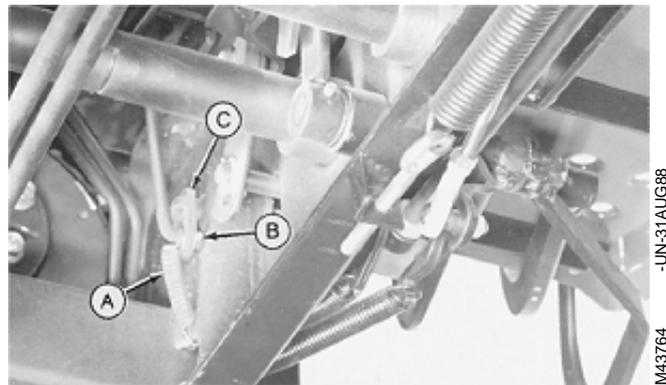


Right Side

MX,HU,6015,14 -19-16OCT91

27. Disconnect spring (A). Remove cotter pin (B) to remove brake lock rod.

28. Remove pivot (C).

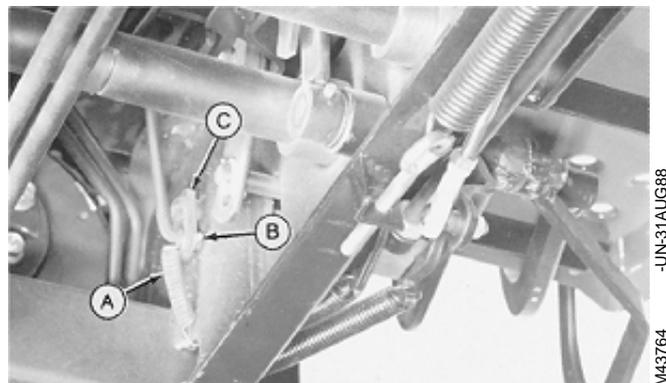


Bottom View-Inside Right Frame

MX,HU,6015,15 -19-16OCT91

## INSTALL BRAKE LINKAGE

1. Install brake lock pivot (C).
2. Install brake lock rod. Fasten it with a washer and cotter pin (B).
3. Install spring (A).



Bottom View-Inside Right Frame

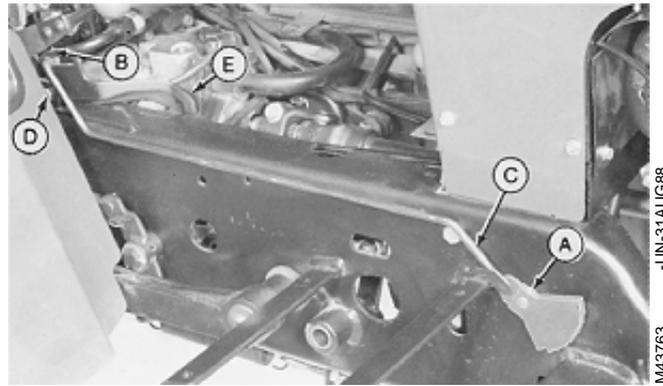
MX,HU,6015,16 -19-16OCT91

## Brake Linkage/Install Brake Linkage

4. Install bolt (D) through seat bracket, lock lever (E) and bushing, two washers, seat lock lever and bushing, washer and nut.

5. Install link and ratchet assembly (C). Fasten it with a washer and cotter pin (B) and roll pin (A).

- A—Roll Pin
- B—Cotter Pin
- C—Transmission Lock Link Assembly
- D—Bolt
- E—Transmission Lock Lever

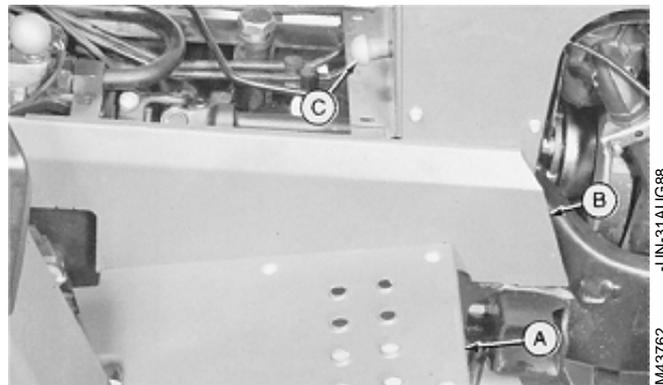


Right Side

MX,HU,6015,17 -19-16OCT91

6. Install washer, spring, and knob (C).

Panel (B) and footrest (A) can be installed after the control pedals have been installed to provide better access.



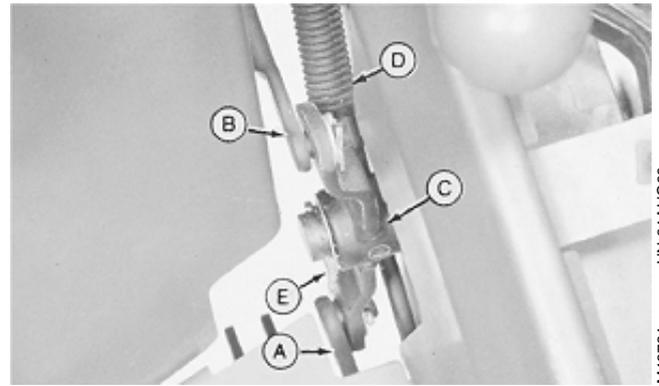
Right Side

MX,HU,6015,18 -19-16OCT91

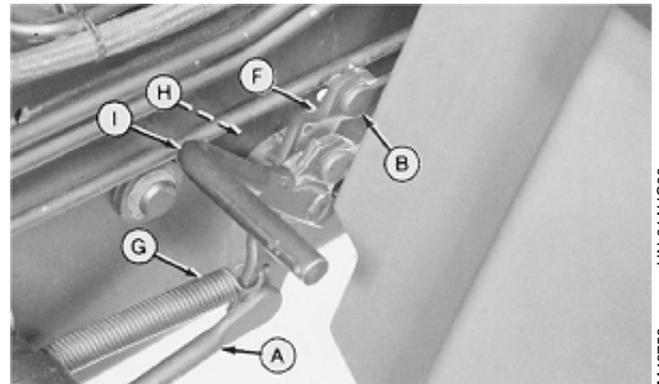
## Brake Linkage/Install Brake Linkage

7. Install right side pivot (C). Fasten it with a washer and cotter pin (E).
8. Install differential lock pedal (I) and left side pivot (F). Fasten both with a washer and cotter pin (H).
9. Install forward brake rods (A) and rearward links (B). Fasten them with washers and cotter pins.
10. Connect springs (D and G).

- A—Forward Brake Rod
- B—Rearward Brake Link
- C—Right Side Pivot
- D—Spring
- E—Cotter Pin
- F—Left Side Pivot
- G—Spring
- H—Cotter Pin
- I—Differential Lock Pedal



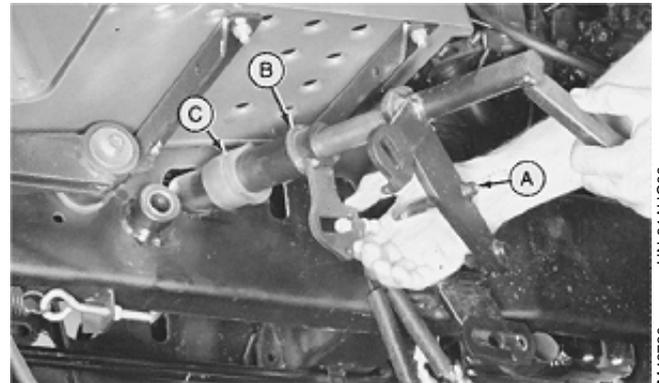
Right Side



Left Side

MX,HU,6015,19 -19-16OCT91

11. Install service/park brake pedal (A), right brake lever (B), and bushing (C).



Under Right Footrest

MX,HU,6015,20 -19-16OCT91

12. Install speed control pedals.
- Check to see that pedals move freely.



Under Right Footrest

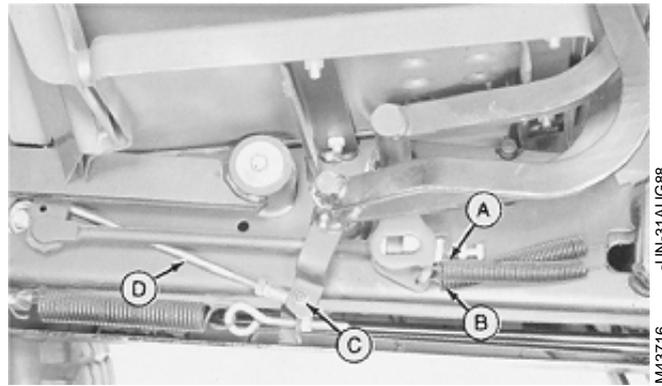
MX,HU,6015,21 -19-16OCT91

## Brake Linkage/Install Brake Linkage

13. Put pins in slots of brake levers and connect springs (A and B).

14. Connect transmission control rod (D) to pedal with lock nut (C).

- A—Right Brake Spring
- B—Service/Park Brake Spring
- C—Lock Nut
- D—Transmission Control Rod



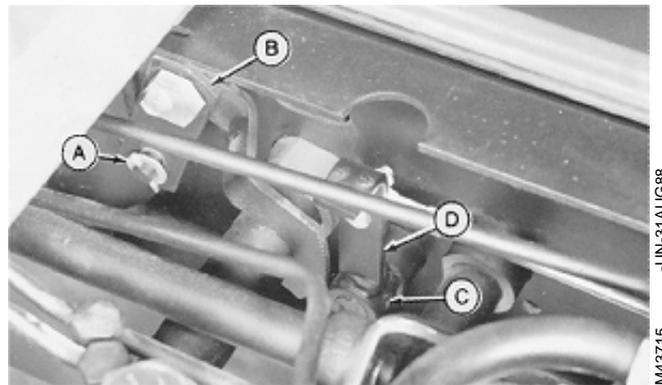
Under Right Footrest

MX,HU,6015,22 -19-16OCT91

15. Install cruise control pawl (D). Fasten it with roll pin (C).

16. Install washer on each side of link (B) and fasten link with cotter pin (A).

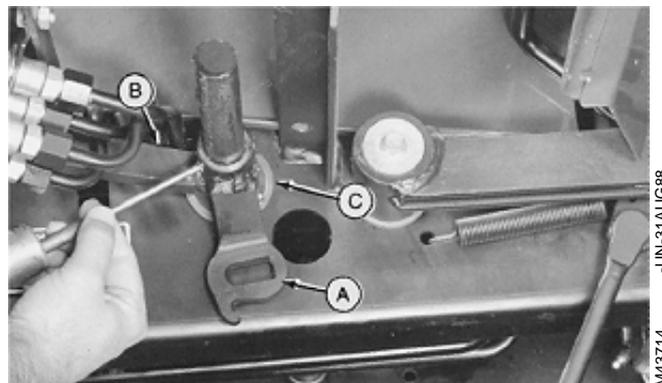
- A—Cotter Pin
- B—Cruise Control-Brake Disengage Link
- C—Roll Pin
- D—Cruise Control Pawl



Top View-Inside Right Frame

MX,HU,6015,23 -19-16OCT91

17. Install bushing (C), right brake pedal (B), and park brake lever (A) on park brake shaft. Fasten lever (A) to shaft with a roll pin.



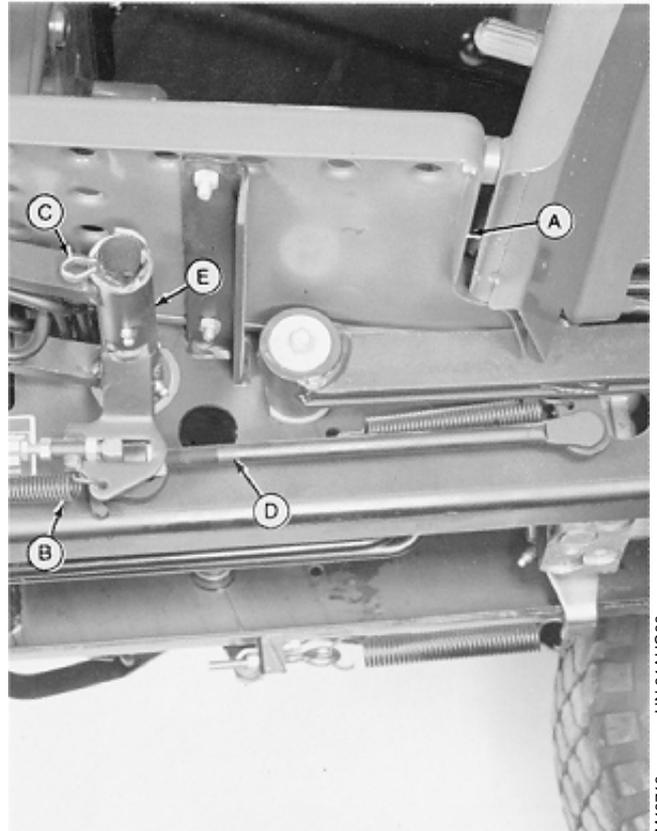
Under Left Footrest

MX,HU,6015,24 -19-16OCT91

## Brake Linkage/Install Brake Linkage

18. Hold brake rod (D) in place and install left brake pedal (E).
19. Install washer and cotter pin (C).
20. Connect spring (B).
21. Install footrest (A). Fasten it with five bolts.

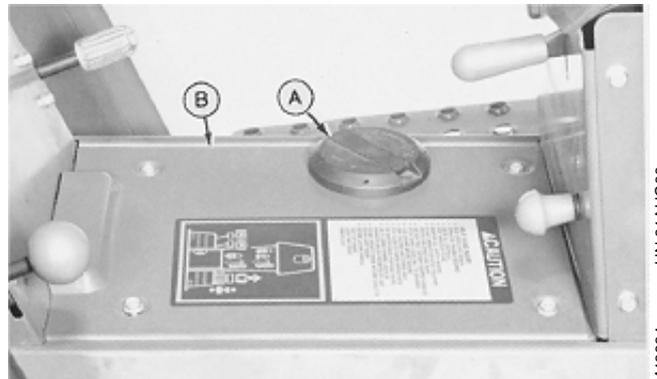
A—Left Footrest  
B—Spring  
C—Cotter Pin  
D—Left Brake Rod  
E—Left Brake Pedal



Under Left Footrest

MX,HU,6015,25 -19-16OCT91

22. Install panel (B). Be sure depth control lever (A) aligns with bolt head. Fasten panel with four cap screws.
23. Adjust brake linkage. (See Section 260.)
24. Adjust transmission control linkage. (See Section 250.)

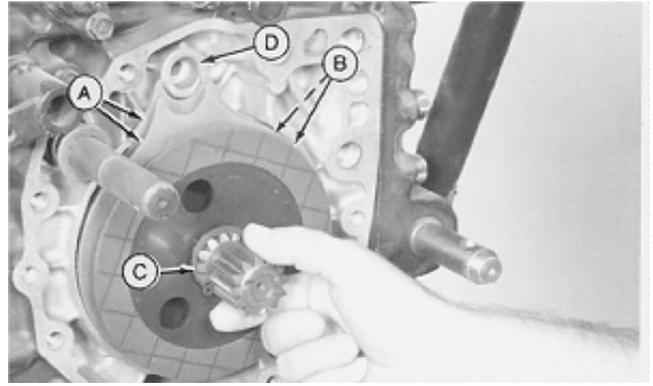


MX,HU,6015,26 -19-16OCT91

## REPAIR BRAKE DISKS

1. Remove final drive axles. (See Remove Final Drives—Section 50, Group 15.)
2. Remove shaft (C), brake disks (B), and plates (A).

A—Brake Plate (2)  
 B—Brake Disk (2)  
 C—Final Drive Pinion Shaft  
 D—Brake Camshaft Hole



MX,HU,6015,27 -19-16OCT91

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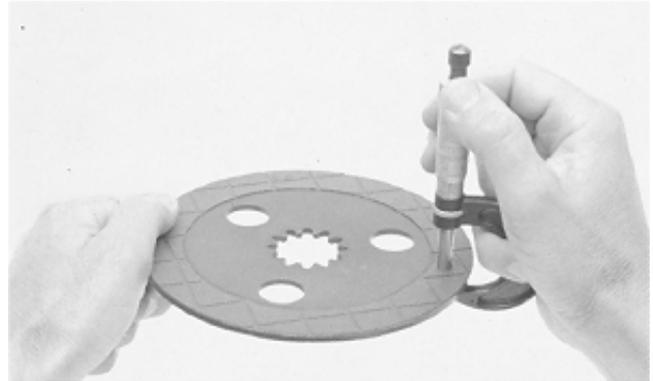
3. Measure brake disks.

### BRAKE DISK SPECIFICATION

Thickness New . . . . . 4.6—4.8 mm (0.181—0.189 in.)  
 Minimum . . . . . 4.4 mm (0.173 in.)

Spline Backlash New . . . . . 0.13—0.31 mm (.005—.012 in.)  
 Maximum . . . . . 1.2 mm (0.047 in.)

Replace brake disks if out of specification.



MX,HU,6015,28 -19-16OCT91

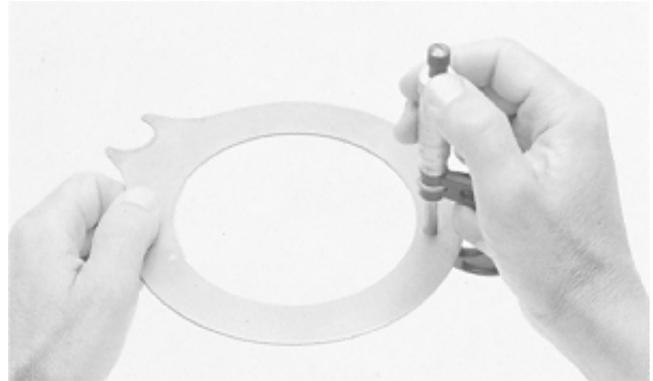
M43766 -UN-31AUG88

### BRAKE PLATE SPECIFICATION

Thickness New . . . . . 2.5—2.7 mm (0.098—0.106 in.)  
 Minimum . . . . . 2.3 mm (0.090 in.)

Warpage New . . . . . 0.15 mm (0.006 in.)  
 Maximum . . . . . 0.3 mm (0.012 in.)

Replace brake disks if out of specification or if surface is scored or grooved.

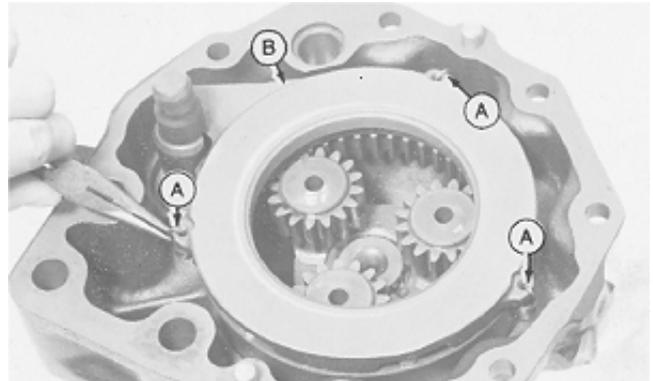


MX,HU,6015,29 -19-16OCT91

M43767 -UN-31AUG88

5. Remove three springs (A). Replace all three if any are broken or stretched.

6. Inspect actuator plate (B) for scoring or roughness. Use 400 grit emery paper to smooth the brake face if necessary.



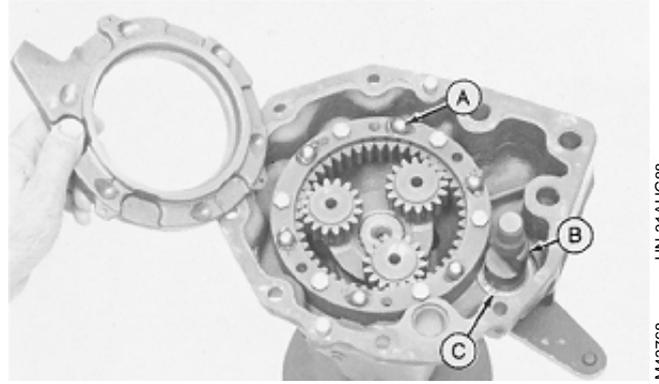
MX,HU,6015,30 -19-16OCT91

M37977 -UN-29AUG88

## Brake Linkage/Repair Brake Disks

7. Inspect six steel balls (A) for damage. Replace any that are damaged.

8. Inspect brake camshaft (B) for wear or damage. To remove camshaft, remove snap ring (C) and washer.



MX,HU,6015,31 -19-16OCT91

M43768 -UN-31AUG88

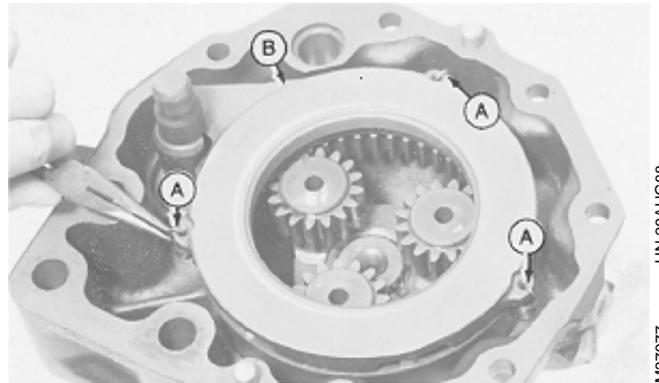
9. Clean all parts. Install camshaft, washer, and snap ring.

10. Install and apply grease to six steel balls.

11. Put actuator plate (B) in place. Fasten it with three springs (A). Put shorter hook of springs on ring gear.

12. Install new gasket. Be sure two guide pins are in place.

13. Install final drive axles. (See Install Final Drives—Section 50, Group 15.)



MX,HU,6015,32 -19-16OCT91

M37977 -UN-29AUG88

# Section 70 HYDRAULICS REPAIR

## Contents

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|                                  |         |
|----------------------------------|---------|
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|----------------------------------|---------|



## SERVICE EQUIPMENT AND TOOLS

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| Name                 | Use                          |
|----------------------|------------------------------|
| Driver Set           | To install seals.            |
| Snap Ring Pliers Set | To remove/install snap ring. |

MX,HU,7005,1A -19-16OCT91

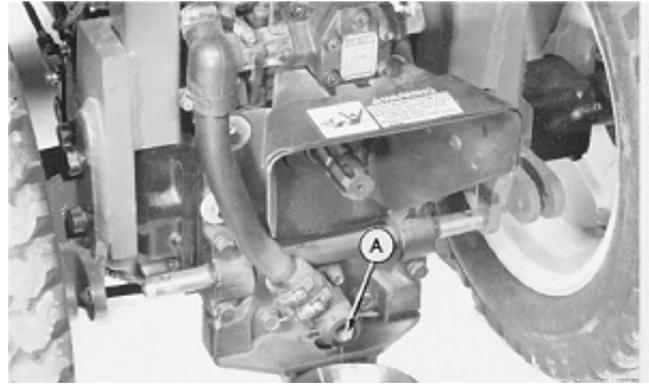
## SPECIFICATIONS

| Item                             | Measurement       | Specification                 |
|----------------------------------|-------------------|-------------------------------|
| Transaxle Case                   | Capacity          | 17 L (4.5 gal)                |
| Relief valve spring              | Free length       | 50.7 mm (2 in.)               |
| Priority flow divider spring     | Free length       | 66 mm (2.6 in.)               |
|                                  | Compressed length | 31.4 mm/54 N (1.24/12 lb)     |
| Proportional flow divider spring | Free length       | 58.5 mm (2.3 in.)             |
|                                  | Compressed length | 46 mm/4.9 N (1.81 in./1.1 lb) |
| Flow divider bolts               | Torque            | 17 N-m (12 lb-ft)             |
| Rockshaft valve spool retainer   | Torque            | 10 N-m (88 lb-in.)            |
| Rockshaft valve bolts            | Torque            | 24 N-m (18 lb-ft)             |
| Fender bracket bolts             | Torque            | 149 N-m (110 lb-ft)           |
| Hydraulic Pump Pressure Lines    | Torque            | 34 N-m (25 lb-ft.)            |
| Hydraulic Pump Adapter           | Torque            | 47 N-m (35 lb-ft.)            |
| Hydraulic SCV lines              | Torque            | 27 N-m (20 lb-ft.)            |

MX,HU,7005,1 -19-16OCT91

## REMOVE HYDRAULIC PUMP

1. Park tractor safely.
2. Disconnect battery ground cable.
3. Remove drawbar.
4. Remove drain plug to drain transaxle case (A). Capacity of transaxle is approximately 17 L (4.5 gal).

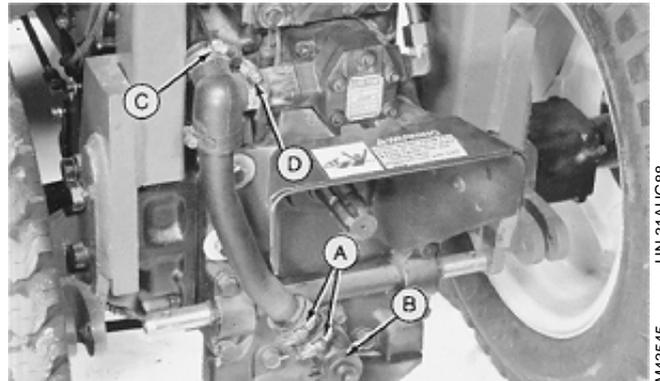


MX,HU,7005,2 -19-16OCT91

M43506  
-UN-31AUG88

*NOTE: Check rubber boot for cuts, cracks, leaks, hardness, and etc. Remove and replace, if required.*

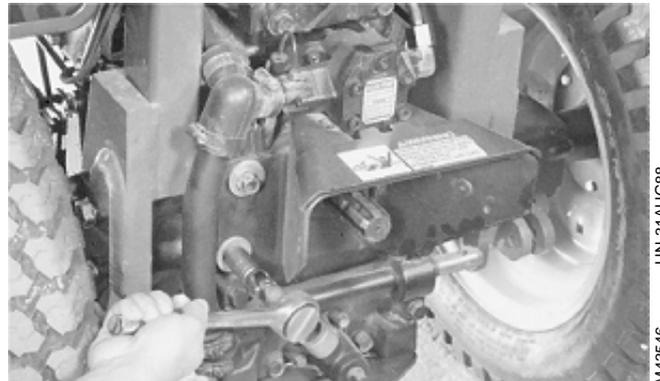
5. Loosen 2 clamps (A). Loosen clamp (C) on hydro return tube and clamp (D) on pump inlet fitting.
6. Disconnect suction tube and hose from suction tube adapter (B) and rubber boot from pump inlet fitting by rotating assembly to the left. Let assembly hang from hydro return tube.



MX,HU,7005,3 -19-16OCT91

M43545  
-UN-31AUG88

7. Remove four bolts with washers to remove PTO shield.



M217005W,4 -19-16OCT91

M43546  
-UN-31AUG88

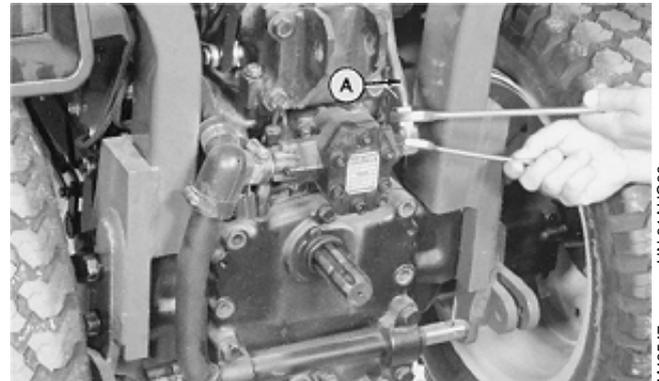
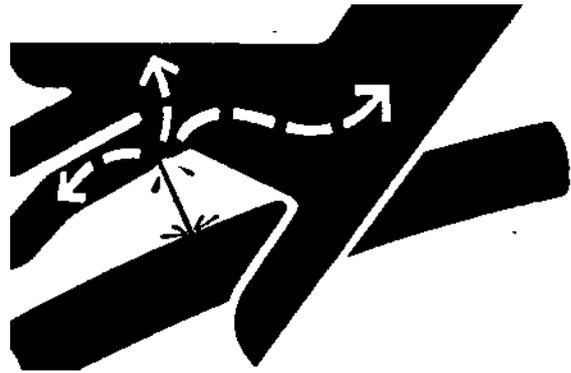
## AVOID HIGH-PRESSURE FLUIDS

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.

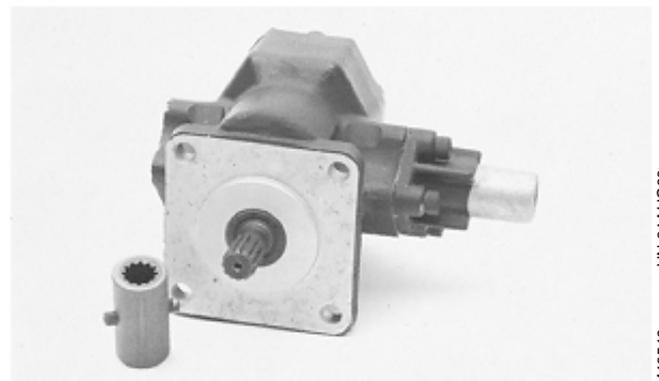


**N CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the hydraulic system by turning off the engine and cycling through all hydraulic control lever positions several times.

8. Disconnect hydraulic pump outlet line (A). Close all openings with caps and plugs to keep dirt out of the hydraulic system.

9. Remove two nuts and two cap screws fastening pump to transaxle housing.

10. Inspect splines on pump shaft and coupler for excessive wear.

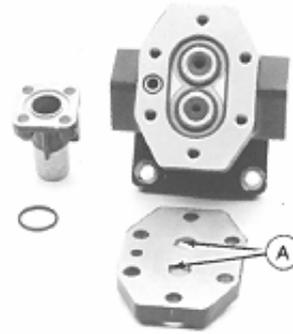


MX,HU,7005,5 -19-16OCT91

MX,HU,7005,7 -19-16OCT91

## DISASSEMBLE HYDRAULIC PUMP

**IMPORTANT:** Watch closely how internal components are removed so you can assemble them exactly as they were removed. This will ensure wear surfaces are matched during assembly. Only the gasket, O-rings, and packings are serviced individually. The housing, gear set, and bushings are not serviced individually. If excessive wear, scoring, or blue discoloring from overheating are discovered in the housing, gear set, or bushings the entire pump assembly must be replaced.

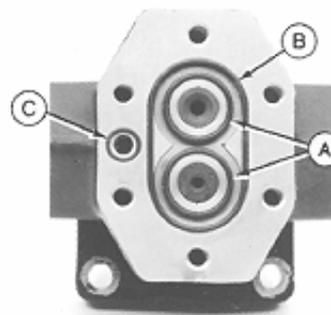


1. Remove inlet fitting and its O-ring from left side of pump housing.
2. Remove pump cover. Check to see that passages (A) in the cover are open.
3. Remove O-rings (and packing on 955 tractors) from rear bushings, recess in housing, and left port between cover and housing.

MX,HU,7005,8 -19-16OCT91

3. Remove O-rings (A), (B), and (C).

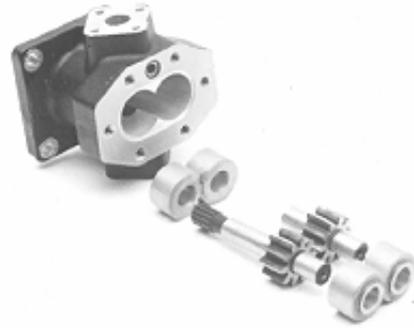
*NOTE: Some pumps have an additional packing that fits in recess around O-rings (A).*



MX,HU,7005,8A -19-16OCT91

4. Remove gear set and four bushings from housing.
5. Inspect the housing for severe wear and scoring. A small amount of wear in the gear tract is normal.
6. Also inspect the shafts and inside diameters of the bushings for wear, scoring, and blue discoloration—indicating overheating.

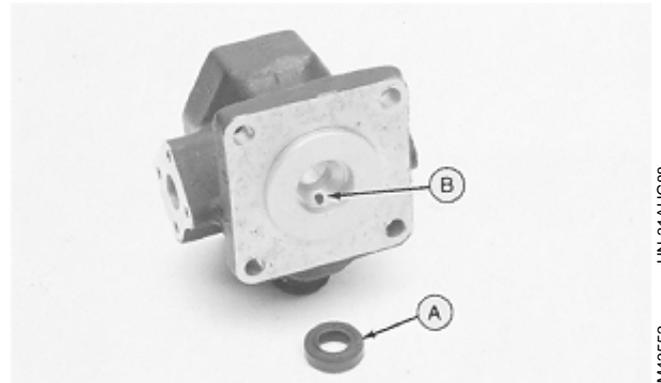
Pump components shown here are not serviced individually; if damaged or worn, replace with new hydraulic pump assembly.



MX,HU,7005,9 -19-16OCT91

M43551 -UN-23SEP91

7. Turn pump housing around. Remove snap ring (if equipped) (7.2 gpm pump only on 955 tractors) and shaft seal (A) from housing. Make sure passageway (B) is open.

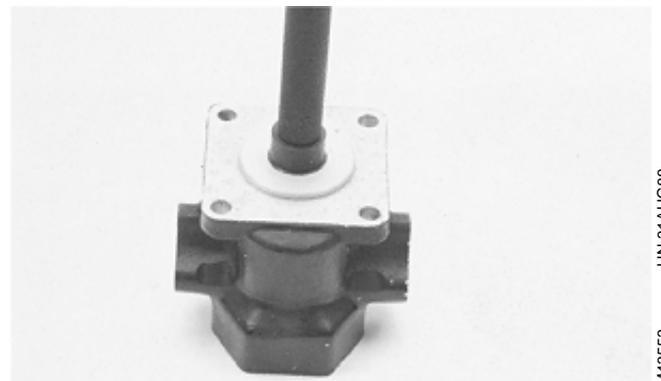


MX,HU,7005,10 -19-16OCT91

M43552 -UN-31AUG88

## ASSEMBLE HYDRAULIC PUMP

1. Clean and dry all parts.
2. Use new O-rings and seals.
3. Apply a thin layer of clean hydraulic oil to all internal parts.
4. Use a 25 mm (1 in.) diameter disk driver to install new shaft seal—top of seal should be flush with housing surface. On pumps equipped with a snap ring, push seal in to a depth just below snap ring groove, then install snap ring.



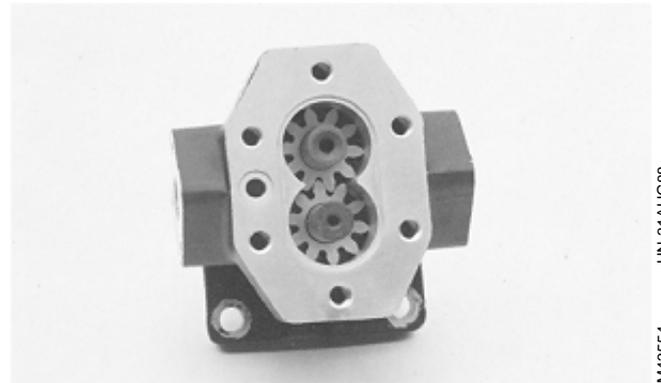
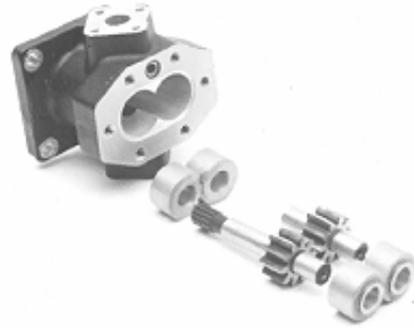
MX,HU,7005,11 -19-16OCT91

M43553 -UN-31AUG88

## Hydraulic Pump/Assemble Hydraulic Pump

5. Install new O-rings on all bushings. Install front set of bushings, O-ring side first, into pump housing. On some pumps, install a new packing also.

6. Install gear set, making sure O-ring seals are not damaged.



MX,HU,7005,12 -19-16OCT91

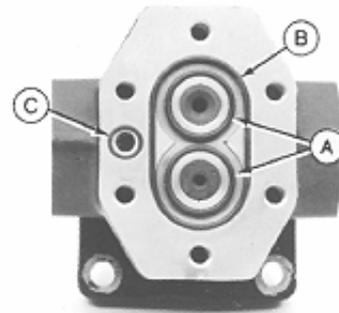
M43551 -UN-23SEP91

M43554 -UN-31AUG88

7. Match and mate rear bushings with gear set and place them in the housing, O-ring side (A) away from the gear set. On some pumps, install a new packing also.

8. Place new oblong O-ring (B) in the housing recess. Install new O-ring (C) in left housing port.

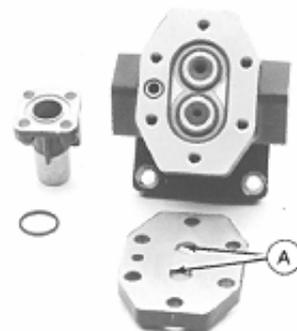
9. Install cover and tighten socket-head cap screws to 25 N-m (18 lb-in).



MX,HU,7005,13 -19-16OCT91

M43555 -UN-23SEP91

10. Make sure ports (A) are clean. Place new O-ring in inlet fitting and install on left port of pump housing. Tighten cap screws to 25 N-m (18 lb-ft).

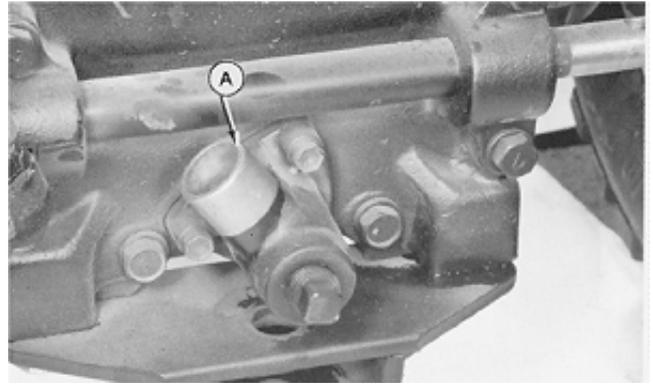


MX,HU,7005,13A -19-16OCT91

M43550 -UN-23SEP91

## REPAIR SUCTION SCREEN

1. Remove three bolts and suction tube adapter (A).
2. Remove suction screen, clean or replace.
3. Install new O-ring on end of suction screen and new packing in groove of tube adapter.
4. Install suction screen inside transaxle housing.
5. Install suction tube adapter (A). Be sure packing remains in its groove (coat it with thin layer of oil or grease). Tighten three M8 x 35 cap screws to 25 N·m (18 lb-ft). Install and tighten drain plug.



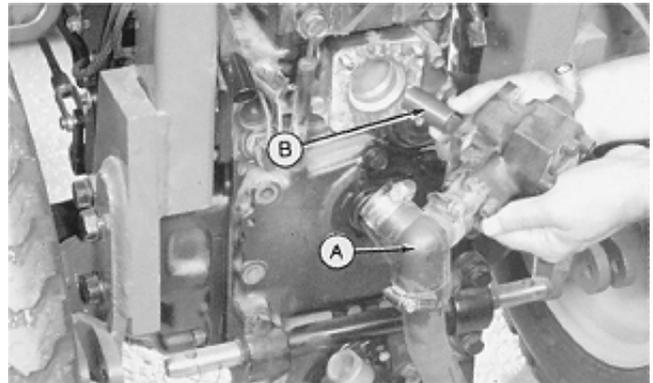
M43556  
-UN-31AUG88

MX,HU,7005,14 -19-16OCT91

## INSTALL HYDRAULIC PUMP

*NOTE: Make sure there is a compression ring (bushing) between rubber boot (A) and suction tube hose and each hose clamp. Compression rings protect hose from being cut by clamps.*

1. Check inlet rubber boot (A) and suction tube hose for cuts, cracks, or hardness. Replace, if required. Fasten it to pump inlet.
2. Connect suction tube to rubber boot and tighten hose clamp.
3. Place coupling (B) on splined pump shaft.
4. Use a new gasket on pump mounting surface and install pump assembly on transaxle housing. Tighten nuts and cap screws to 25 N·m (18 lb-ft).
5. Connect rubber boot (A) to hydro line and tighten hose clamp.
6. Install PTO shield and tighten four M12 x 55 cap screws to 90 N·m (66 lb-ft).



M43548  
-UN-31AUG88

MX,HU,7005,15 -19-16OCT91

## **HYDRAULIC SYSTEM BLEED PROCEDURE**

After installing a repaired or replacement part, air must be purged from the system.

1. Fill transaxle with 17 L (4.5 gal) of John Deere Lo-Viscosity HY-GARD® oil.
2. Start engine and run at half throttle.
3. Cycle all hydraulic lever functions several times.
4. Shut engine off and inspect hydraulic components and fittings for leaks.
5. Check transaxle oil level again and add required amount to bring it up to the full mark.

MX,HU,7005,16 -19-16OCT91

# Group 10 Flow Divider and Selective Control Valves (SCV's)

## OTHER MATERIAL

| Number | Name  | Use                     |
|--------|---|-------------------------|
| T43511 | John Deere LOCTITE® Clean and Cure Primer                   | Clean threads           |
| T43512 | John Deere LOCTITE® Threadlock and Sealer (Medium Strength) | Retain screws and plugs |

LOCTITE™ is a trademark of the Loctite Corp.

MX,HU,7010,1 -19-16OCT91

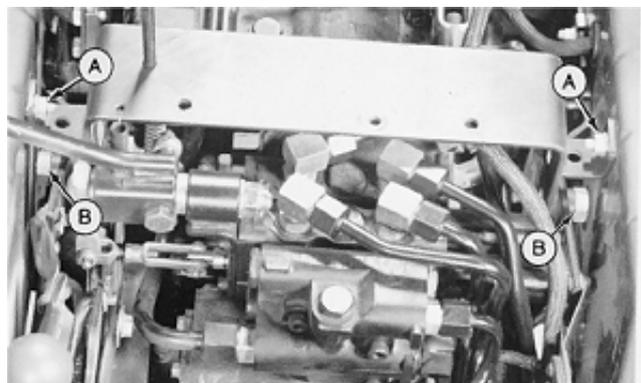
## REMOVE FLOW DIVIDER AND SELECTIVE CONTROL VALVES (SCV'S)

1. Remove operator's seat and sheet metal. (See Section 80, Group 15.)
2. Remove cotter pin and washer. Remove park brake rod (A) from lock lever.



MX,HU,7010,2 -19-16OCT91

3. Remove two cap screws and nuts (A).
4. Loosen PTO and Hi-Lo range lever shoulder bolts (B).



MX,HU,7010,3 -19-16OCT91

## 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.

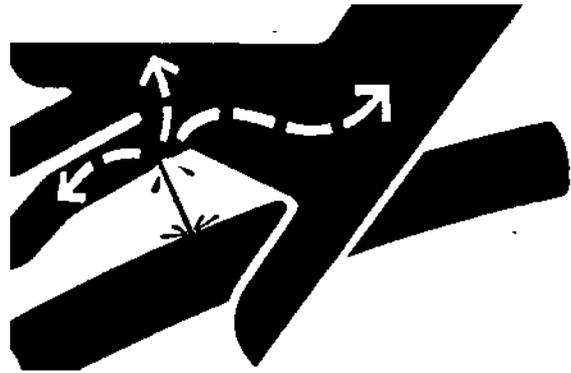
Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

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.

5. Tilt seat bracket (A) rearward.

**N** **CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves.

6. Disconnect two lines from front flow divider and four lines from selective control valves.



-UN-23AUG88

X9811

-UN-31AUG88

M43503

MX,HU,7010,4 -19-16OCT91

7. Remove four socket head bolts to remove flow divider and selective control valves.



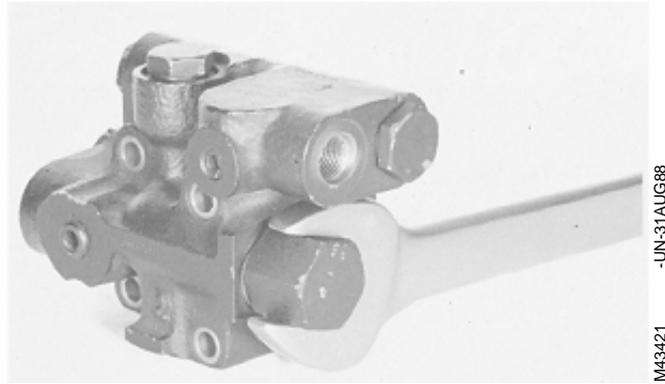
MX,HU,7010,5 -19-16OCT91

-UN-31AUG88

M43504

## REPAIR SYSTEM RELIEF VALVE

1. Remove plug to remove valve assembly (you may want to put relief valve in a soft vise to break valve plug loose).



Left Side

MX,HU,7010,6 -19-16OCT91

M43421  
-UN-31AUG88

**NOTE:** Components D—I should fall out of valve chamber on their own.

2. Use large screwdriver to remove retainer (C). Remove seat (B) and O-ring (A) with an O-ring pick.

3. Inspect seat (B), poppet (D), washer (F), and collar (H) for excessive wear or damage. Replace as necessary.

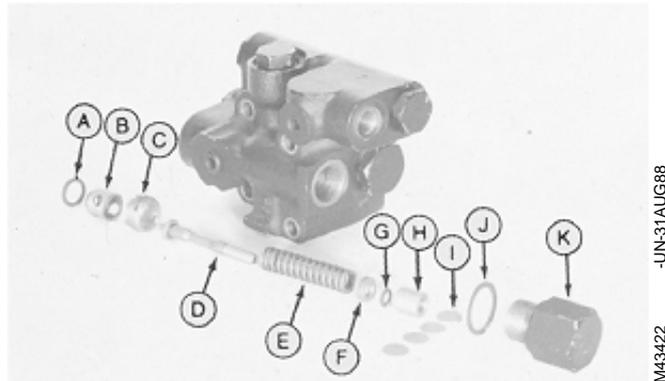
4. Inspect spring (E) for free length of 50.7 mm (2 in.) and a compressed length of 42 mm at 325 N (1.65 in. at 73 lb). Replace as necessary.

5. Replace O-rings (A and G) and sealing ring (J).

6. Dip all parts in clean hydraulic oil before assembly.

7. Install (A — C). Be sure four slotted side of retainer faces seat. Tighten retainer to 29 N·m (22 lb-ft).

8. Install (D — K). Tighten plug to 98 N·m (72 lb-ft).



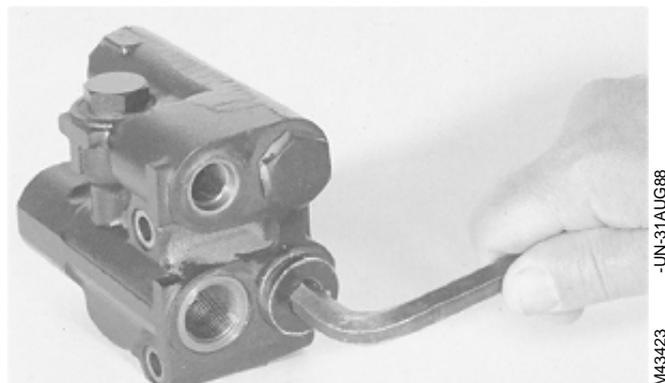
- A—O-ring
- B—Seat
- C—Retainer
- D—Poppet
- E—Spring
- F—Washer
- G—O-ring
- H—Collar
- I—Shims
- J—Sealing Ring
- K—Plug

MX,HU,7010,7 -19-16OCT91

M43422  
-UN-31AUG88

## REPAIR PRIORITY FLOW DIVIDER

1. Remove plug from each end to remove priority flow divider (you may want to put valve body in a soft vise to break plugs loose).



Left Side

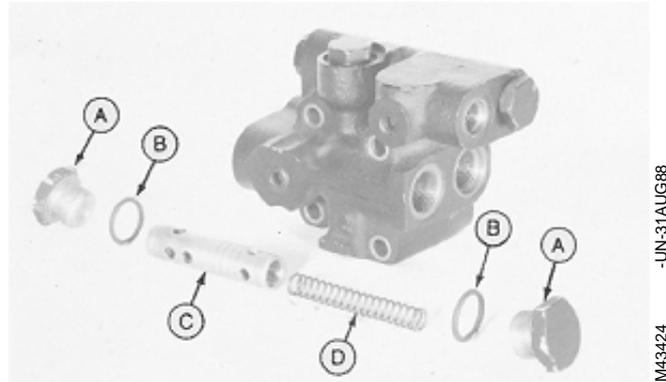
MX,HU,7010,8 -19-16OCT91

M43423  
-UN-31AUG88

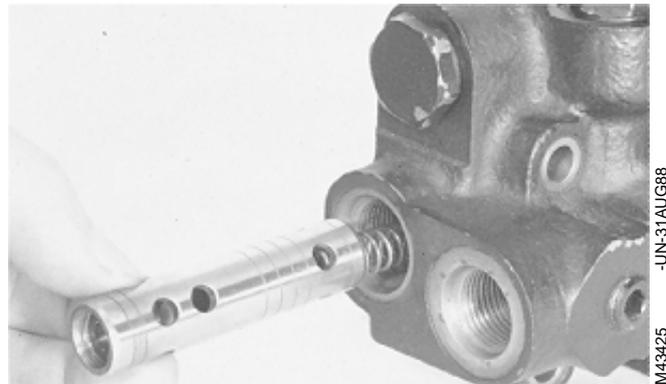
**NOTE:** 655 and 955 will have spacer with axle holes instead of spool assembly and spring

2. Inspect spool assembly (C) for excessive scoring or damage. Replace as necessary
3. Inspect spring (D) for free length of 66 mm (2.6 in.) and a compressed length of 31.4 mm at 54 N (1.24 in. at 12 lb). Replace as necessary.
4. Replace O-ring (B).
5. Dip all parts in clean hydraulic oil before assembly.
6. Install (A thru D). Be sure end of spool assembly with two side holes is installed to gear pump port side of flow divider.
7. Tighten plugs to 98 N-m (72 lb-ft).

- A—Plug (2 used)
- B—O-Ring (2 used)
- C—Spool Assembly
- D—Spring



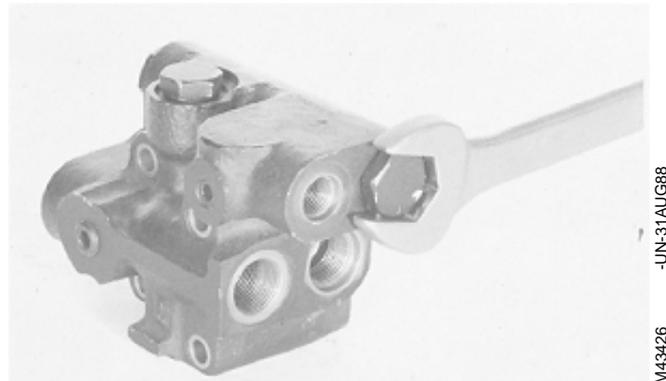
Right Side



MX,HU,7010,9 -19-16OCT91

## REPAIR PROPORTIONAL FLOW DIVIDER

1. Remove plug from each end to remove proportional flow divider (you may want to put valve body in a soft vise to break plugs loose).



Left Side

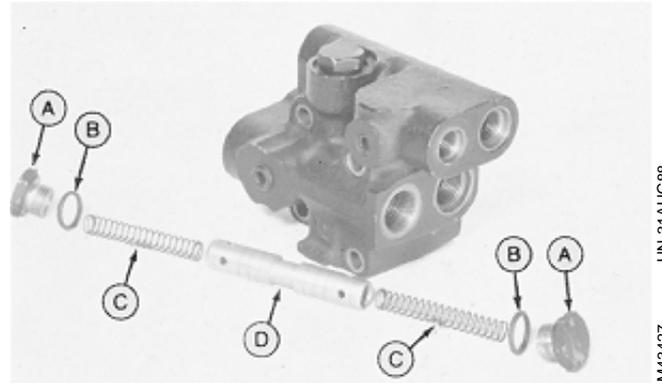
MX,HU,7010,9A -19-16OCT91

2. Inspect dividing valve (D) for excessive scoring or damage. Replace as necessary.
3. Inspect spring (C) for a free length of 58.5 mm (2.3 in.) and a compressed length of 46 mm at 4.9 N (1.81 in. at 1.1 lb). Replace as necessary.
4. Replace O-ring (B).
5. Dip all parts in clean hydraulic oil before assembly.
6. Install (A — D.)

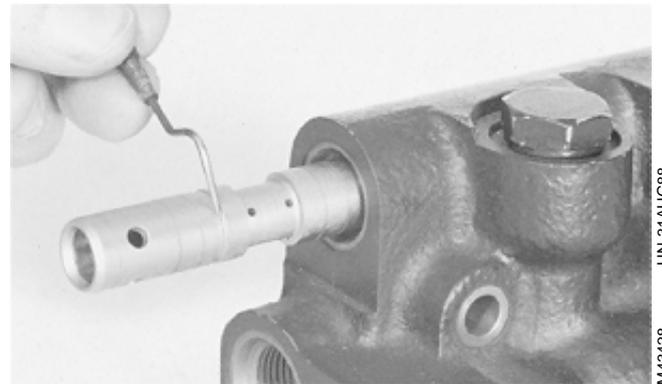
**IMPORTANT:** Be sure slot end of dividing valve is towards the gear pump port side of flow divider.

7. Tighten plugs to 44 N-m (33 lb-ft).

- A—Plug (2 used)
- B—O-ring (2 used)
- C—Spring (2 used)
- D—Dividing Valve



Right Side

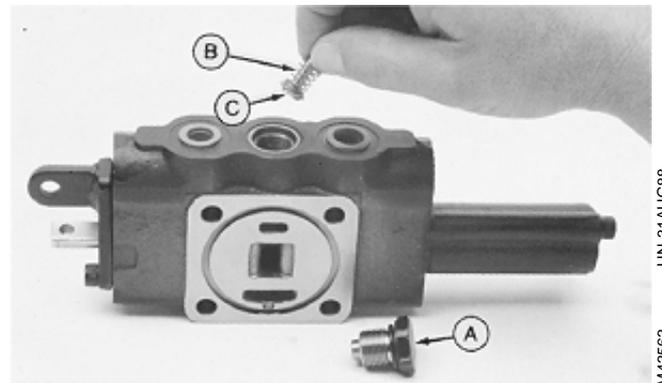


MX,HU,7010,10 -19-16OCT91

### REPAIR REGENERATIVE (FRONT) AND FLOAT (REAR) SECTIONS—SCV'S

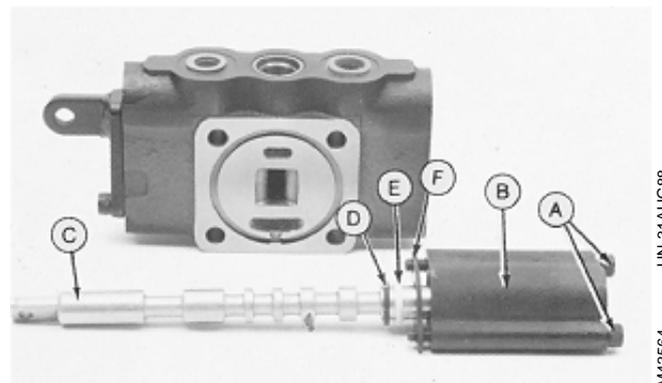
*NOTE: Rear valve float section shown unless otherwise stated.*

1. Remove lift check plug (A), spring (B), and poppet (C) from center port.
2. Inspect spring, poppet, and seat for wear or damage. Replace parts as necessary.



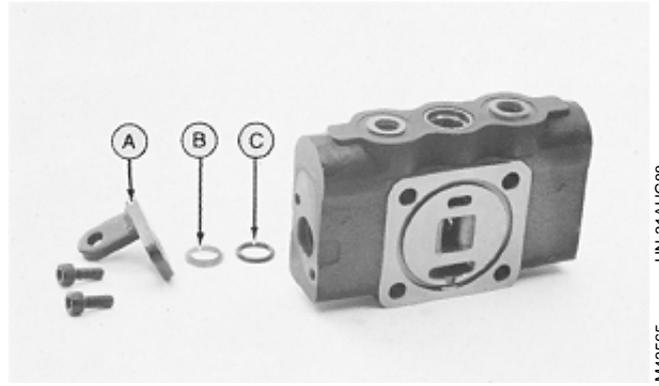
MX,HU,7010,12 -19-16OCT91

3. Remove two socket head bolts (A) to remove detent cover (B), and spool (C).
4. Remove O-ring (D), seal (E), and plate (F) and inspect spool and valve body for scoring and wear. Spool and body are not serviced. If either is damaged, replace complete control valve assembly.



MX,HU,7010,13 -19-16OCT91

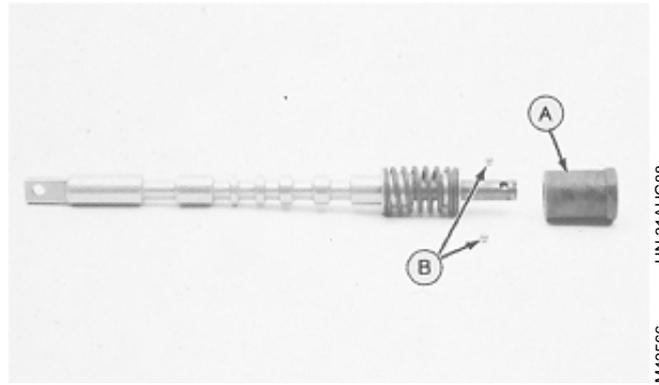
5. Remove two socket head bolts to remove lever support (A), seal (B), and O-ring (C).



MX,HU,7010,14 -19-16OCT91

M43565  
-UN-31AUG88

6. Remove detent holder (A) by driving the spool away from the holder. Use caution to protect the spool from damage. Be careful not to lose the two detent balls (B) that will be free after removing the detent holder.



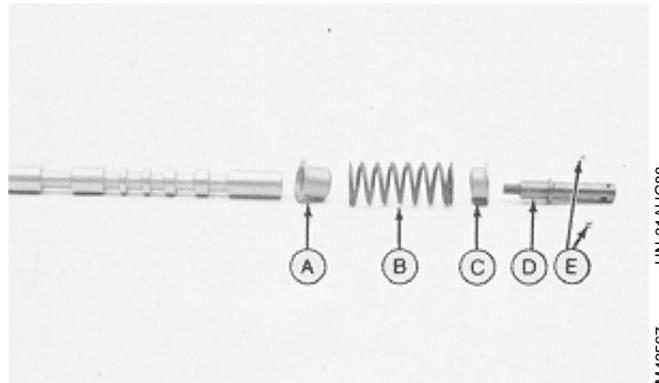
MX,HU,7010,15 -19-16OCT91

M43566  
-UN-31AUG88

7. Remove detent screw (D) to disassemble spool. Use medium strength thread lock and sealer on the threads of the screw.

8. Inspect spring and detent screw for damage. Replace as necessary.

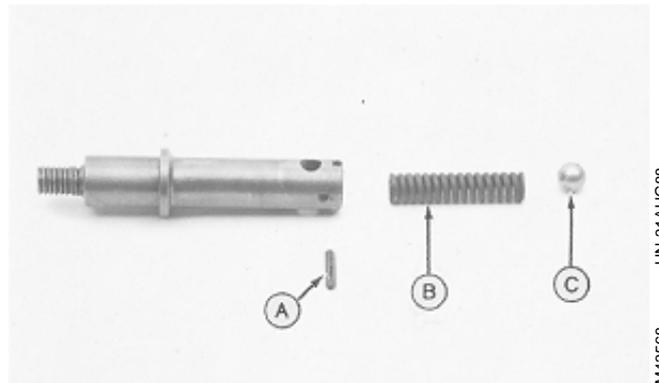
- A—Deep Spring Guide
- B—Spring
- C—Shallow Spring Guide
- D—Detent Screw
- E—Detent Balls



MX,HU,7010,16 -19-16OCT91

M43567  
-UN-31AUG88

9. Drive out roll pin (A), to release large ball (C) and spring (B).

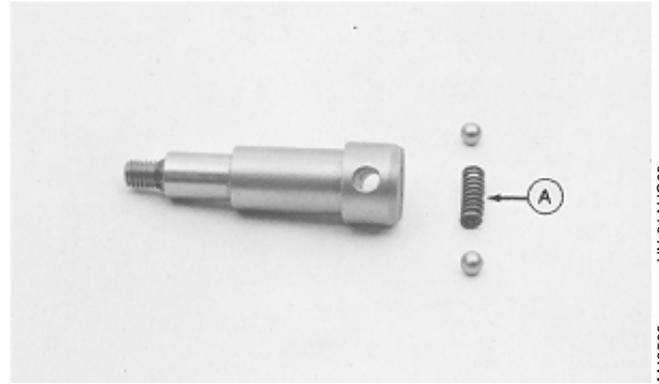


MX,HU,7010,17 -19-16OCT91

M43568  
-UN-31AUG88

70  
10  
6

10. The detent screw in the front regenerative valve section has a cross spring (A) to seat the balls. The rest of the valve section is serviced the same as the rear section.



Front valve regenerative section shown.

MX,HU,7010,18 -19-16OCT91

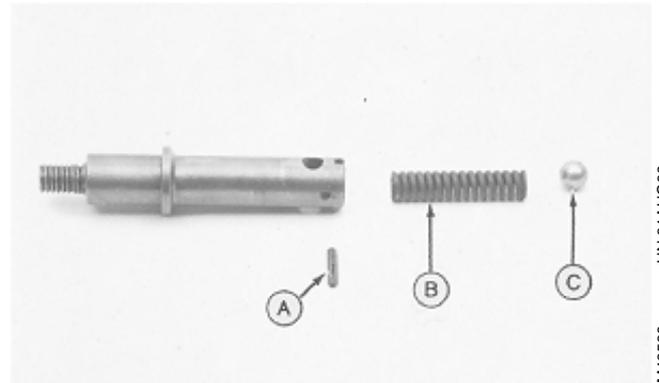
M43569 -UN-31AUG88

11. Clean and dry all parts.

12. Use all new O-rings and seals to assemble valves.

13. Before assembly, apply clean hydraulic oil on all internal parts.

14. Install spring (B), large ball (C), and hold in place with roll pin (A).



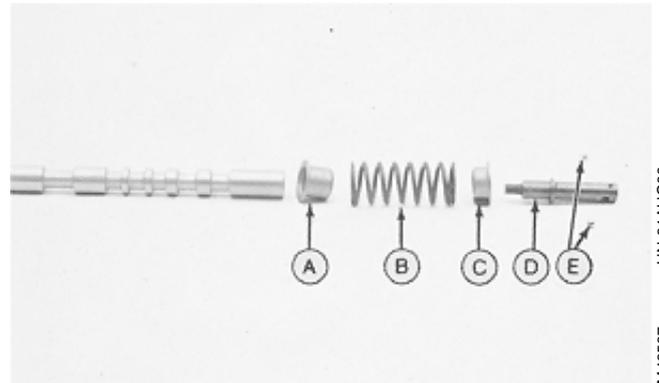
MX,HU,7010,19 -19-16OCT91

M43568 -UN-31AUG88

15. Clean the threads of detent screw (D) and internal threads of the spool using clean and cure primer.

16. Apply thread lock and sealer (medium strength) to the threads of the detent screw.

17. Assemble centering spring assembly and fasten with detent screw.



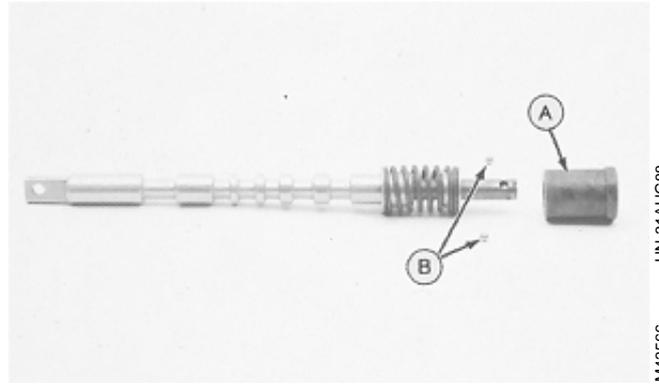
- A—Deep Spring Guide
- B—Spring
- C—Shallow Spring Guide
- D—Detent Screw
- E—Detent Balls

MX,HU,7010,20 -19-16OCT91

M43567 -UN-31AUG88

18. Apply LUBRIPLATE® lubricant on centering spring assembly, detent screw, and inside of detent holder (A).

19. Insert small detent balls (B) into holes of detent screw and drive on detent holder. Make sure balls remain in position.

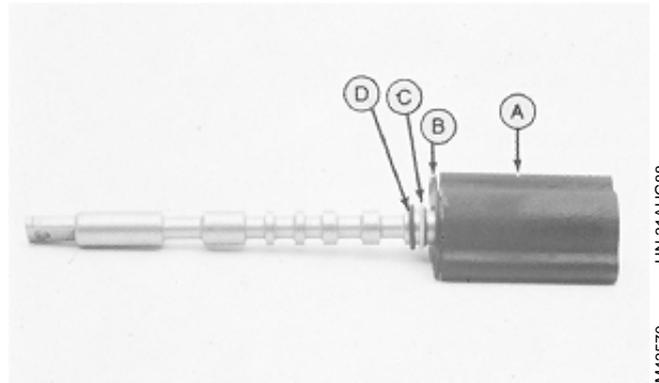


MX,HU,7010,21 -19-16OCT91

M43566  
-UN-31AUG88

20. Slide cover (A), plate (B), seal (C), and O-ring (D) over spool. Recess side of seal should face toward plate. Use care to prevent damage to spool.

- A—Cover
- B—Plate
- C—Seal
- D—O-ring

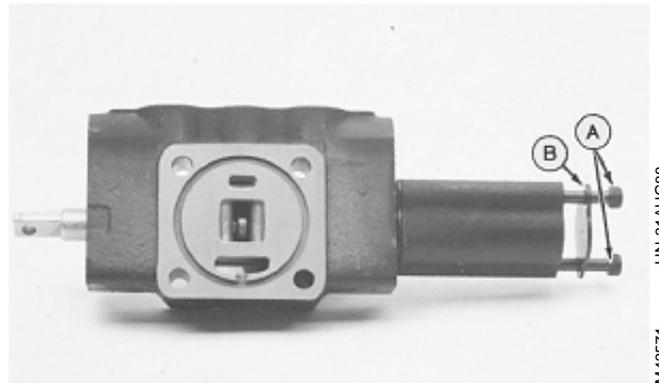


MX,HU,7010,22 -19-16OCT91

M43570  
-UN-31AUG88

21. Install spool assembly into housing.

22. Install two socket head bolts (A) and plate (B). Make certain seal recess fits into hole in plate. Tighten bolts to 11 N·m (96 lb-in.).



MX,HU,7010,23 -19-16OCT91

M43571  
-UN-31AUG88

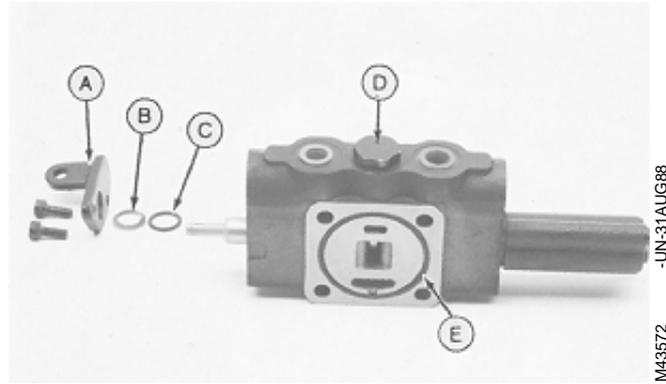
*NOTE: Seal recess faces lever support.*

23. Install new O-ring (C) and seal (B), lever support (A), and two socket head bolts. Tighten bolts to 11 N·m (96 lb-in.).

24. Install lift check assembly (D) with new O-ring on plug. Tighten plug to 44 N·m (33 lb-in.).

25. Install new O-ring (E) on face of valve body.

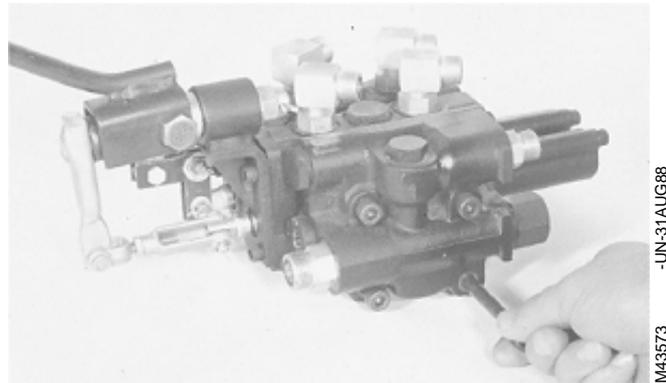
- A—Lever Support
- B—Seal
- C—O-ring
- D—Lift Check Assembly
- E—O-ring



MX,HU,7010,24 -19-16OCT91

## INSTALL FLOW DIVIDER AND SELECTIVE CONTROL VALVES (SCV'S)

1. On bench, install four socket head bolts through flow divider and selective control valves.



MX,HU,7010,25 -19-16OCT91

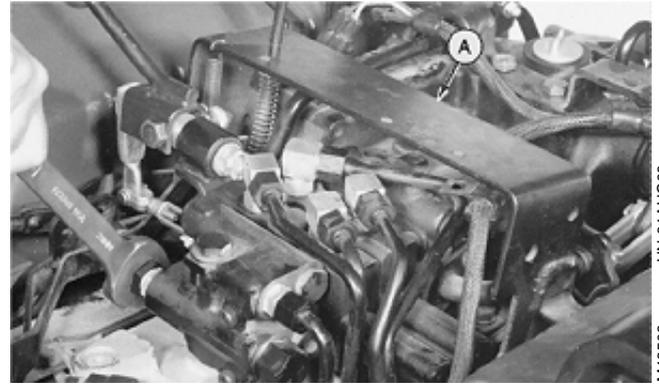
2. Install flow divider and selective control valves with bolts to rockshaft piston cover. Tighten bolts diagonally to 17 N·m (12 lb-ft). Actuate valves to verify they are not “sticky” due to uneven bolt torque.

**IMPORTANT: When tightening hydraulic line connections, use two wrenches to prevent line twisting and overtightening. Align swivel fittings and hydraulic lines carefully to prevent line stress. Line damage or stress will cause premature line failure.**

3. Connect two lines to flow divider housing. Tighten union connectors to 47 N·m (35 lb-ft.). Tighten line nut to 34 N·m (25 lb-ft.)

Connect four lines to selective control valve. With swivel loose, connect and tighten line-to swivel to 27 N·m (20 lb-ft.). Hold swivel in position while tightening swivel nut to 27 N·m (20 lb-ft.).

4. Move seat bracket (A) forward till it is level.

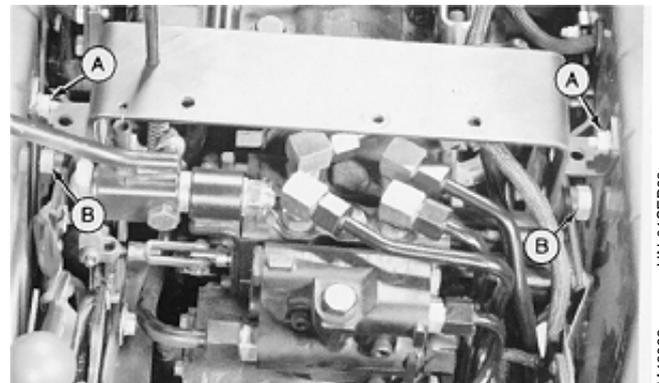


M43503 -UN-31AUG88

MX,HU,7010,26 -19-16OCT91

5. Tighten PTO and Hi-Lo lever shoulder bolts (A).

6. Install and tighten two cap screws and nuts (A).



M43063 -UN-01SEP88

MX,HU,7010,27 -19-16OCT91

7. Install park brake rod (A) through lock lever slot. Fasten it with washer and cotter pin.

8. Install operator's seat. (See Section 80, Group 15.)

9. Install sheet metal panels. (See Section 80, Group 15.)



M43062 -UN-01SEP88

MX,HU,7010,28 -19-16OCT91

**SERVICE EQUIPMENT AND TOOLS**

*NOTE: Order tools from the U.S. SERVICE-GARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.*

| <b>Name</b>                           | <b>Use</b>                |
|---------------------------------------|---------------------------|
| Bushing, Bearing, and Seal Driver Set | Service rockshaft bushing |

MX,HU,TOOLS,1 -19-16OCT91

**SPECIFICATIONS**

| <b>Item</b>                      | <b>Measurement</b> | <b>Specification</b>                 |
|----------------------------------|--------------------|--------------------------------------|
| Check Relief Valve Spring        | Free Length        | 27.7 mm (1.09 in.)                   |
|                                  | Compressed Length  | 18 mm at 10 N<br>(0.71 in. at 2 lb)  |
| Stop Valve Spring                | Free Length        | 36 mm (1.4 in.)                      |
|                                  | Compressed Length  | 14 mm at 59 N<br>(0.55 in. at 13 lb) |
| Overload Relief Valve Spring     | Free Length        | 44 mm (1.73 in.)                     |
|                                  | Compressed Length  | 38 mm at 170 N<br>(1.5 in. at 38 lb) |
| Rockshaft Cylinder               | ID                 | 60.00—60.046 mm<br>(2.362—2.364 in.) |
| Rockshaft Piston                 | OD                 | 59.94—59.97 mm<br>(2.360—2.361 in.)  |
| Piston-to-Cylinder               | Maximum Clearance  | 0.3 mm (0.012 in.)                   |
| Rockshaft Sleeve                 | OD                 | 44.95—44.975 mm<br>(1.769—1.77 in.)  |
| Rockshaft Bushing                | ID                 | 45.0—45.039 mm<br>(1.771—1.773 in.)  |
| Sleeve-to-Bushing                | Maximum Clearance  | 0.4 mm (0.016 in.)                   |
| Lift Arm-to-Rockshaft            | Torque             | 52 N·m (38 lb-ft)                    |
| Control Valve-to-Rockshaft       | Torque             | 26 N·m (19 lb-ft)                    |
| Control Valve Cover-to-Rockshaft | Torque             | 27 N·m (20 lb-ft)                    |
| Piston Cover-to-Rockshaft        | Torque             | 88 N·m (65 lb-ft)                    |
| Flow Divider-to-Rockshaft        | Torque             | 17 N·m (12 lb-ft)                    |

Continued on next page

## Rockshaft/Repair Lowering Check Valve

| Item                           | Measurement | Specification     |
|--------------------------------|-------------|-------------------|
| Rockshaft-to-Transmission      | Torque      | 52 N·m (38 lb-ft) |
| Overload Relief Valve Retainer | Torque      | 27 N·m (20 lb-ft) |
| Overload Relief Valve Plug     | Torque      | 78 N·m (58 lb-ft) |
| Check Relief Valve Plug        | Torque      | 34 N·m (25 lb-ft) |

MX,HU,7015,2 -19-16OCT91

### REMOVE PISTON COVER

1. Remove operator's seat. (See Section 80, Group 15.)
2. Remove flow divider and selective control valve (if equipped). (See Group 10 in this section.)
3. Remove four socket head bolts. Remove cover.

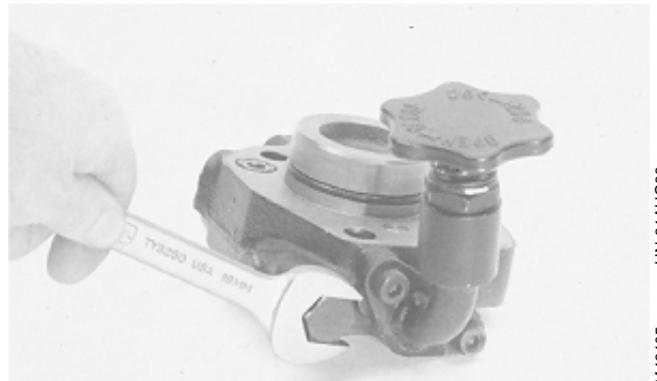


M43497  
-JUN-31AUG88

MX,HU,7015,3 -19-16OCT91

### REPAIR LOWERING CHECK VALVE

1. Remove check relief valve plug. Remove valve assembly.



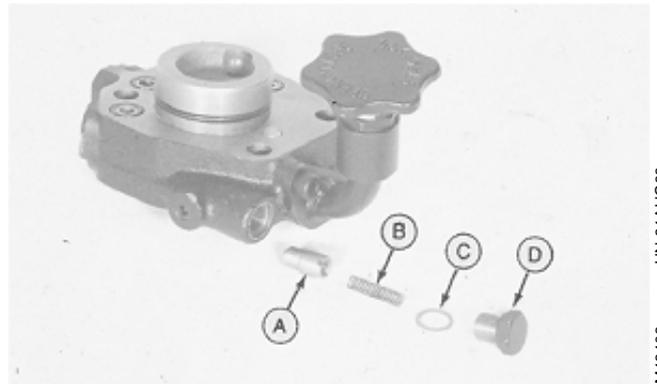
M43405  
-JUN-31AUG88

Left Side

MX,HU,7015,4 -19-16OCT91

2. Inspect poppet (A) for excessive wear or damage. Replace as necessary.
3. Inspect spring (B) for a free length of 27.7 mm (1.09 in.) and a compressed length of 18 mm at 10.1 N (0.71 in. at 2.27 lb).
4. Dip all parts in clean hydraulic oil. Assemble in order as shown. Tighten plug to 34 N·m (25 lb-ft).

- A—Poppet
- B—Spring
- C—Sealing Ring
- D—Plug



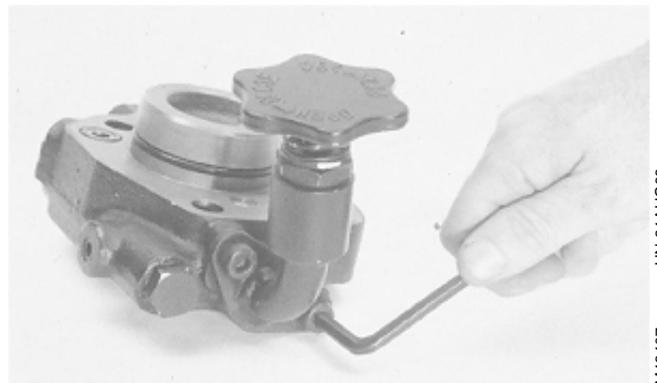
M43406 -UN-31AUG88

MX,HU,7015,5 -19-16OCT91

## REPAIR STOP VALVE

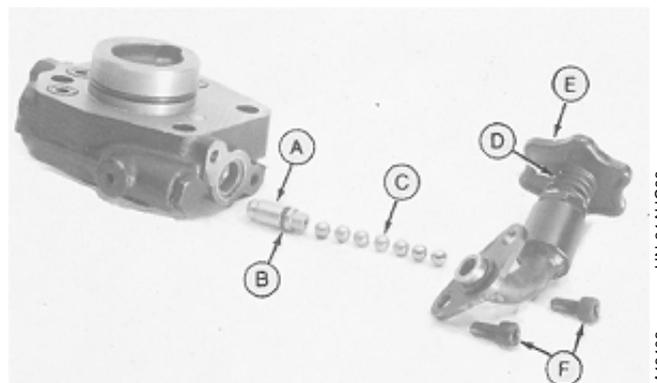
1. Remove two socket head bolts. Remove handle assembly.
2. Remove stop valve (A) with a M5 cap screw.
3. Inspect stop valve and seven steel balls (C) for excessive wear or damage. Replace as necessary.
4. Inspect spring (D) for free length of 36 mm (1.4 in.) and a compressed length of 14 mm at 59.2 N (0.55 in. at 13.3 lb).
5. Replace O-ring (B).
6. Dip stop valve and O-ring in clean hydraulic oil before assembly.
7. Apply light coat of grease to seven steel balls before assembly.
8. Install handle assembly (E). Fasten it with socket head bolts (F). Tighten bolts to 25 N·m (18 lb-ft).

- A—Stop Valve
- B—O-ring
- C—8.7 mm (11/32 in.) Ball (7 used)
- D—Spring
- E—Handle Assembly
- F—Socket Head Bolt



Left Side

M43407 -UN-31AUG88



M43408 -UN-31AUG88

MX,HU,7015,6 -19-16OCT91

## REPAIR IMPLEMENT RELIEF VALVE

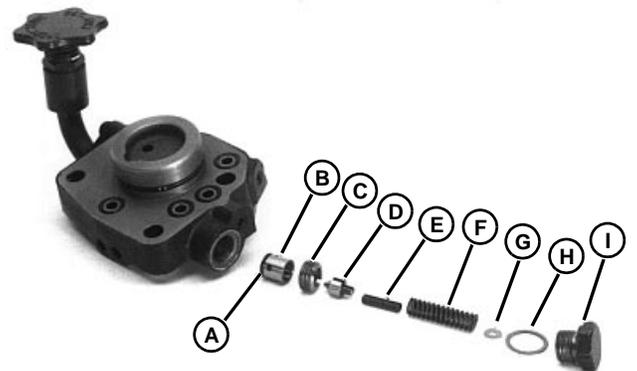
1. Remove overload relief valve plug. Remove valve assembly.
2. Use large screwdriver to remove retainer (C).
3. Inspect seat (B), poppet (D), and roll pin (E) for excessive wear or damage. Replace as necessary.
4. Inspect spring (F) for free length of 44 mm (1.73 in.) and a compressed length of 38 mm at 170 N (1.5 in. at 38.2 lb).
5. Replace O-ring (A).
6. Dip all parts in clean hydraulic oil. Assemble in order as shown. Tighten retainer to 27 N•m (20 lb-ft) and plug to 78 N•m (58 lb-ft).

A—O-ring  
B—Seat  
C—Retainer  
D—Poppet  
E—Roll Pin

F—Spring  
G—Shim  
H—Sealing Ring  
I—Plug



M43409



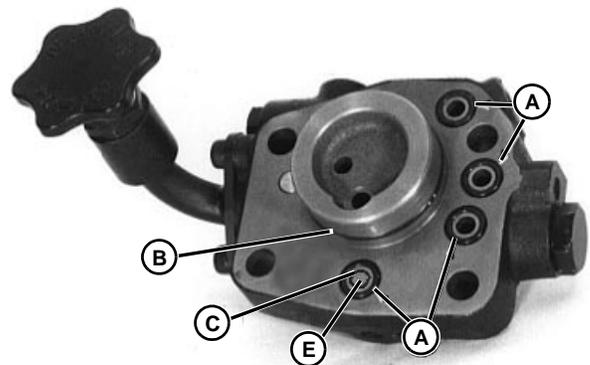
M43410

## INSTALL PISTON COVER

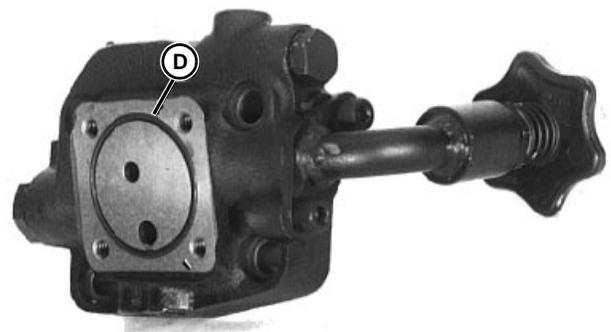
1. Replace O-rings (A, B, C, and D).

**IMPORTANT: O-ring (C) fits into plug (E). Plug (E) is press fit into housing.**

2. Apply oil to O-ring (D) before installing piston cover.

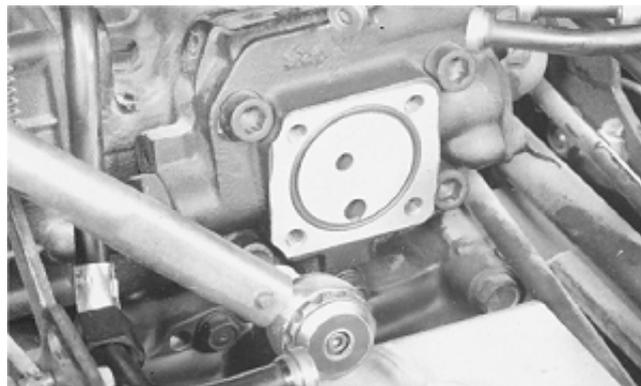


M43411



M43412

3. Install rockshaft piston cover. Fasten it with four socket head bolts. Longer two bolts to the top.
4. Tighten bolts diagonally to 88 N·m (65 lb-ft).
5. Install flow divider and selective control valve. (See Group 10 in this section.)
6. Install operator's seat and sheet metal panels. (See Section 80, Group 15.)

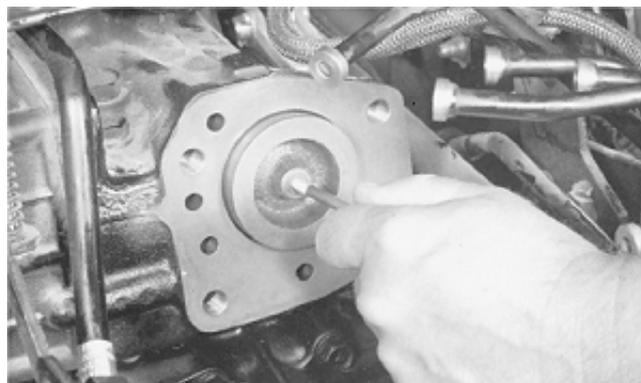


MX,HU,7015,9 -19-16OCT91

M43498  
-UN-31AUG88

### REMOVE ROCKSHAFT PISTON

1. Remove operator's seat. (See Section 80, Group 15.)
2. Remove flow divider and selective control valves (if equipped). (See Group 10 in this section.)
3. Remove rockshaft piston cover. (See Group 15 in this section.)
4. Install M6 cap screw in piston. Pull piston out.



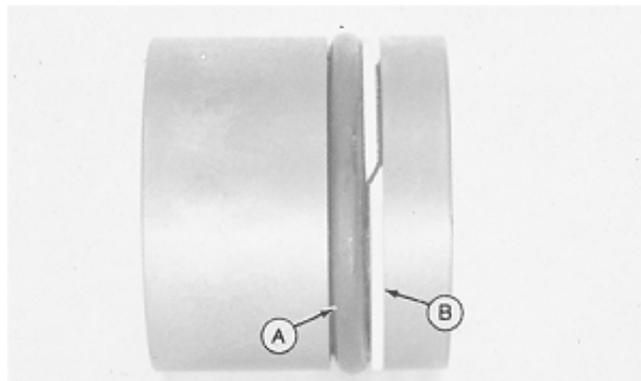
MX,HU,7015,10 -19-16OCT91

M43499  
-UN-31AUG88

5. Inspect cylinder wall and piston for excessive scoring or damage.

|   |                                       |
|---|---------------------------------------|
| Cylinder ID                               | 60.000—60.048 mm<br>(2.362—2.364 in.) |
| Piston OD                                 | 59.94—59.97 mm<br>(2.360—2.361 in.)   |
| Piston to cylinder maximum wear clearance | 0.3 mm<br>(0.012 in.)                 |

6. Replace O-ring (A) and backup ring (B). Be sure backup ring ends DO NOT overlap each other.



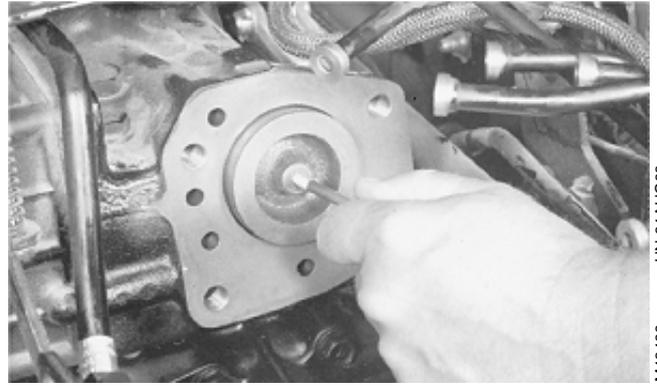
MX,HU,7015,11 -19-16OCT91

M43413  
-UN-31AUG88

70  
15  
6

## INSTALL ROCKSHAFT PISTON

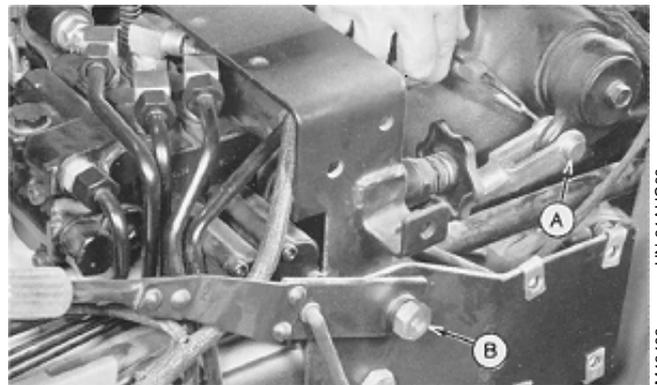
1. Dip piston in clean hydraulic oil. Install piston.
2. Install rockshaft piston cover. (See Group 15 in this section.)
3. Install flow divider and selective control valve. (See Group 10 in this section.)
4. Install operator's seat and sheet metal panels. (See Section 80, Group 15.)



MX,HU,7015,12 -19-16OCT91

## REMOVE ROCKSHAFT HOUSING

1. Remove operator's seat and fenders. (See Section 80, Group 15.)
2. Remove cotter pin and drilled pin (A). Remove lift rod from lift arm.
3. Remove shoulder bolt (B). Remove PTO selector from fender bracket.
4. Remove MFWD rod from selector, if equipped (not shown).



Left Side

MX,HU,7015,13 -19-16OCT91

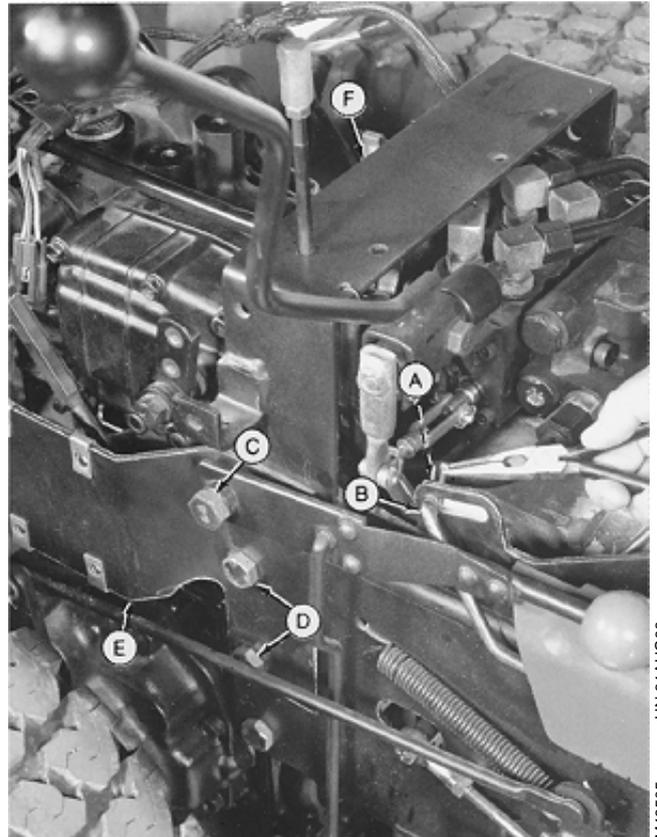
## Rockshaft/Remove Rockshaft Housing

5. Remove cotter pin and washer (A). Remove park brake rod (B) from lock lever.

6. Remove should bolt (C) and two cap screws (D). Remove fender bracket (E).

7. Remove seat bracket (F).

- A—Washer
- B—Park Brake Rod
- C—Shoulder Bolt
- D—Cap Screws (2 used)
- E—Fender Bracket
- F—Seat Bracket



Right Side

IM43505 -JUN-31AUG88

MX,HU,7015,14 -19-16OCT91

## 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.

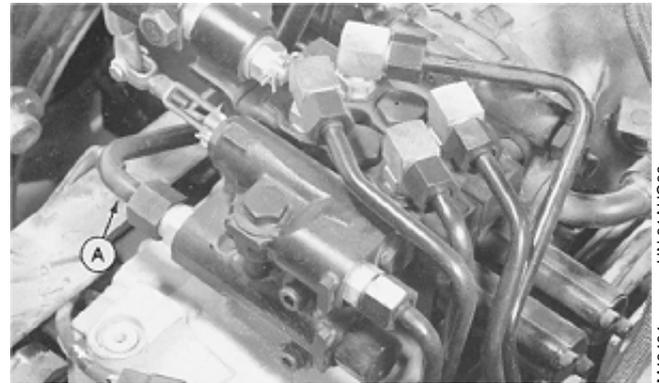
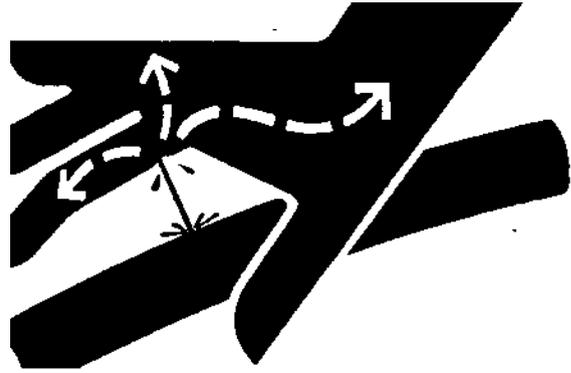
Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

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.

**N** **CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves.

8. Disconnect two lines from flow divider and four lines from selective control valve.

9. Disconnect line (A) from gear pump. Remove line from tractor.



Top View

-UN-23AUG88

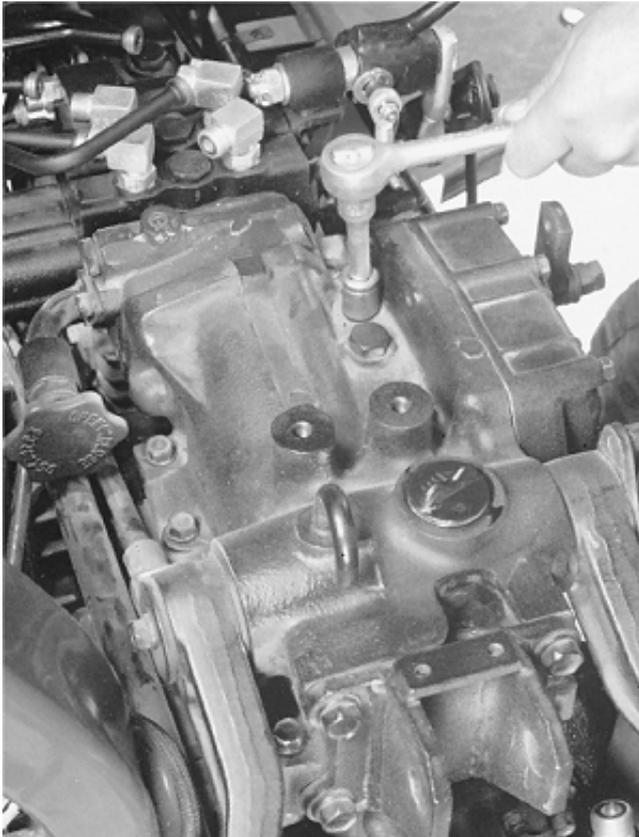
X9811

-UN-31AUG88

M43494

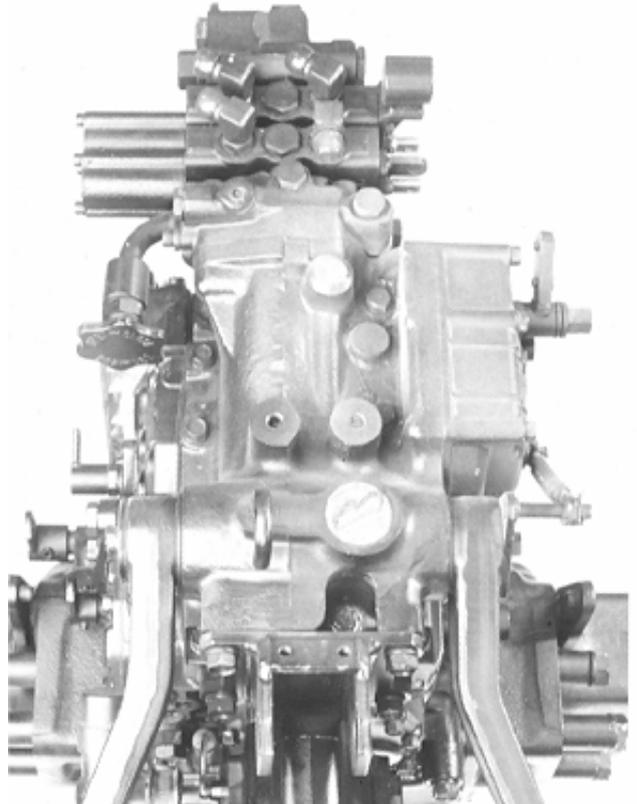
70  
15  
9

MX,HU,7015,15 -19-16OCT91



M43495 -JUN-31AUG88

Early Model Rockshaft Shown



M42234 -JUN-29JUL91

Late Model Rockshaft Shown

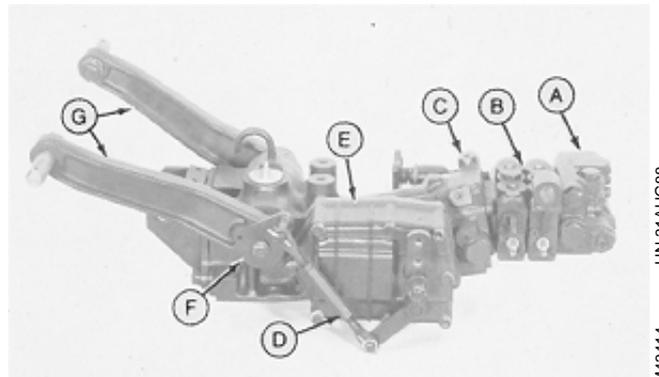
10. Remove eight cap screws and one nut with lock washers to remove rockshaft housing.

MX,HU,7015,16 -19-16OCT91

## DISASSEMBLE ROCKSHAFT HOUSING

1. Remove flow divider (A), selective control valves (B), piston cover (C) and piston.
2. Remove turnbuckle (D), control valve cover and control valve assembly (E).
3. Remove feedback arm (F) and lift arms (G).

- A—Flow Divider
- B—SCV
- C—Piston Cover
- D—Turnbuckle
- E—Control Valve Cover
- F—Feedback Arm
- G—Lift Arms



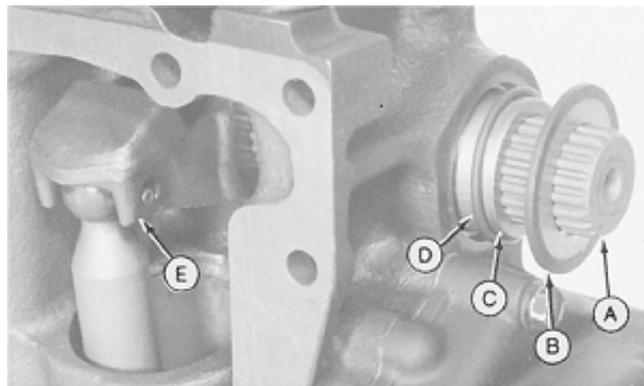
M43414 -JUN-31AUG88

MX,HU,7015,17 -19-16OCT91

4. Remove retainer (B), splined sleeve (C) with O-ring (D). Carefully remove rockshaft (A). Lift crank arm (E) from housing.

5. Remove piston. (See Remove Rockshaft Piston earlier in this group.)

- A—Rockshaft
- B—Retainer
- C—Splined Sleeve
- D—O-ring
- E—Crank Arm



MX,HU,7015,18 -19-16OCT91

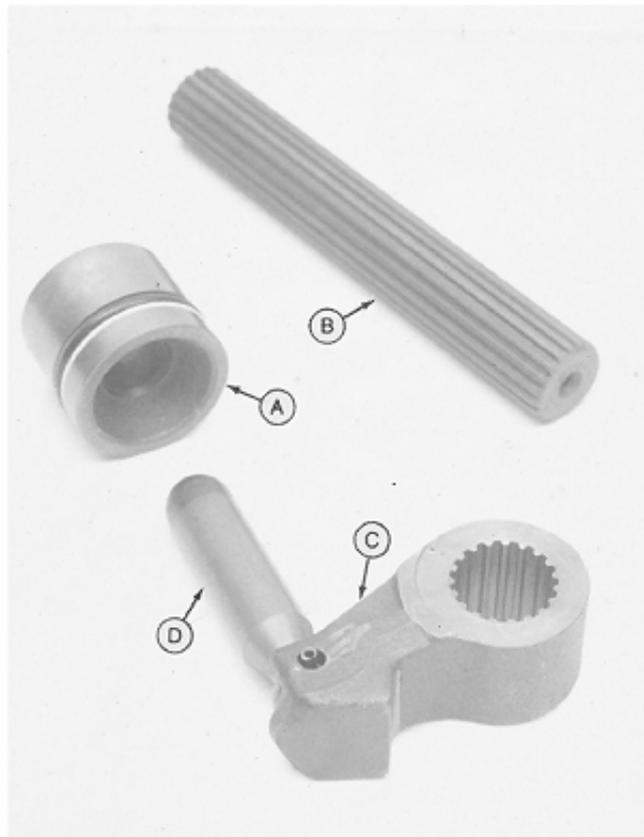
M43415 -UN-31AUG88

### REPAIR ROCKSHAFT HOUSING AND COMPONENTS

1. Inspect piston (A) and cylinder wall. (See Group 15 in this section.)

2. Inspect rockshaft (B) and crank arm (C) splines for excessive wear or damage.

3. Check piston rod (D) for damage or excessive looseness in rod-to-crank connection. Replace as necessary by removing spring pin.



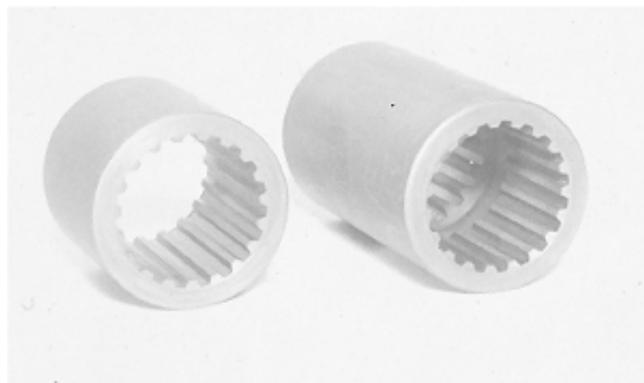
MX,HU,7015,19 -19-16OCT91

M43416 -UN-31AUG88

4. Check splines in sleeve for damage. Examine splined sleeve for wear. Replace as necessary.

Sleeve OD . . . . . 44.95—44.975 mm  
(1.769—1.77 in.)

Sleeve to bushing  
maximum wear clearance . . . . . 0.4 mm  
(0.016 in.)



MX,HU,7015,20 -19-16OCT91

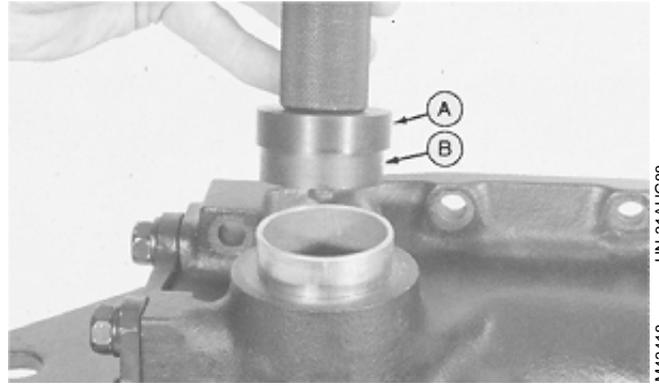
M43417 -UN-31AUG88

5. Check bushings for wear.

Bushing ID ..... 45.00—45.039 mm  
(1.771—1.773 in.)

6. Replace bushings as necessary. Press out old bushings.

7. Press new bushing into housing until outer edge of bushing is 4.2 mm (0.166 in.) below surface of bore. Use a 1-15/16 driver disk (A) and a 1-3/4 in. driver disk (B).

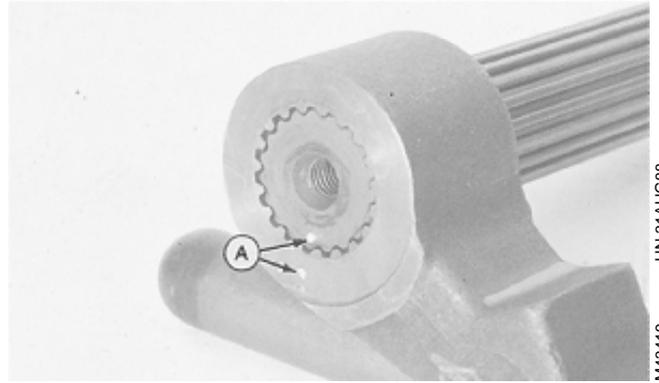


MX,HU,7015,21 -19-16OCT91

M43418 -UN-31AUG88

**ASSEMBLE ROCKSHAFT HOUSING**

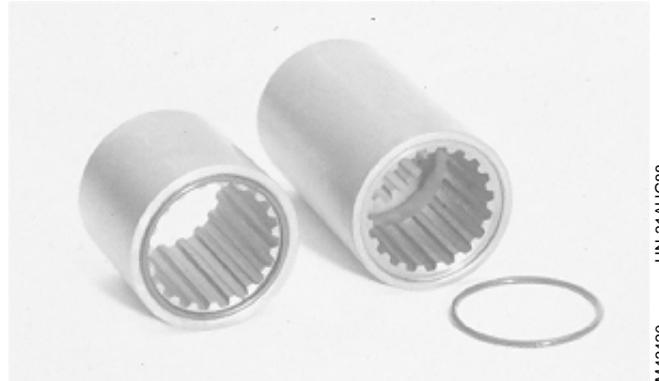
1. Lubricate all mating parts and O-rings with clean hydraulic oil prior to assembly.
2. Fasten piston rod to crank arm with spring pin.
3. Install rockshaft, aligning index marks (A) on crank arm and rockshaft.



MX,HU,7015,22 -19-16OCT91

M43419 -UN-31AUG88

4. Install new O-ring to crank arm end of splined sleeve.

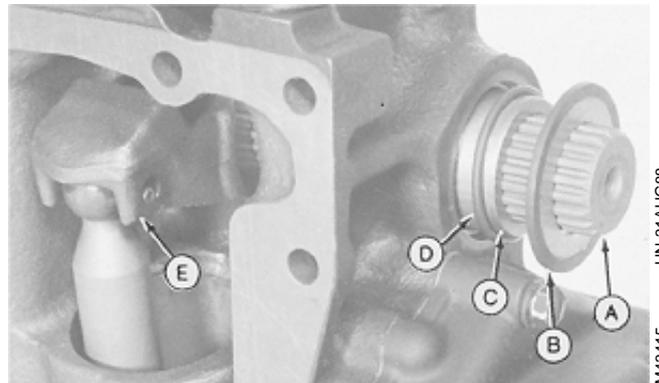


MX,HU,7015,23 -19-16OCT91

M43420 -UN-31AUG88

**IMPORTANT: Be sure splined sleeves are installed O-ring end first.**

5. Grease lightly and install splined sleeve (C) and O-ring (D).
6. Install retainer (B).



MX,HU,7015,24 -19-16OCT91

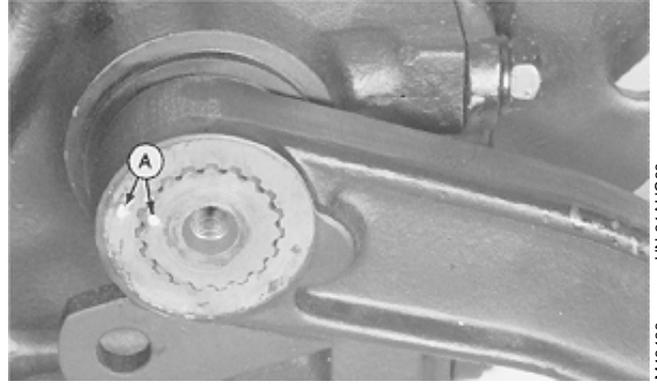
M43415 -UN-31AUG88

70  
15  
12

7. Install lift arm to rockshaft, aligning index marks (A).

8. Install feedback arm and washer.

9. Install lift arm retaining bolts and lock washers. Slightly raise and drop lift arms. Tighten bolts to 52 N·m (38 lb-ft).



MX,HU,7015,25 -19-16OCT91

M43496 -UN-31AUG88

10. Install control valve, using new O-rings. Tighten socket head bolts to 26 N·m (19 lb-ft).

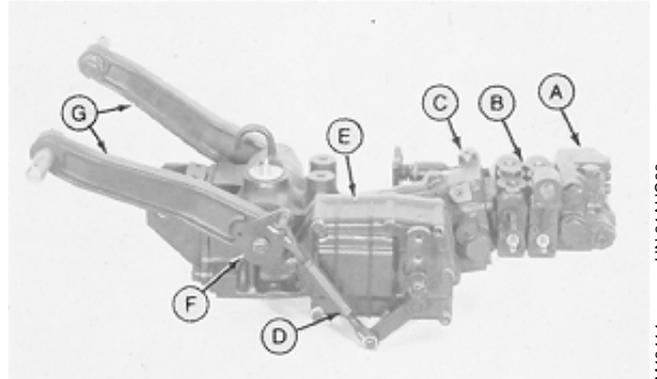
11. Install control valves and cover (E), using new gasket. Install and tighten cap screws diagonally to 27 N·m (20 lb-ft).

12. Install turnbuckle (D).

13. Dip piston in clean hydraulic oil, then install it.

14. Install piston cover (C) using new O-rings. Apply oil to O-rings before installation. Install socket head bolts. (Longer bolts to the top.) Tighten bolts diagonally to 88 N·m (65 lb-ft).

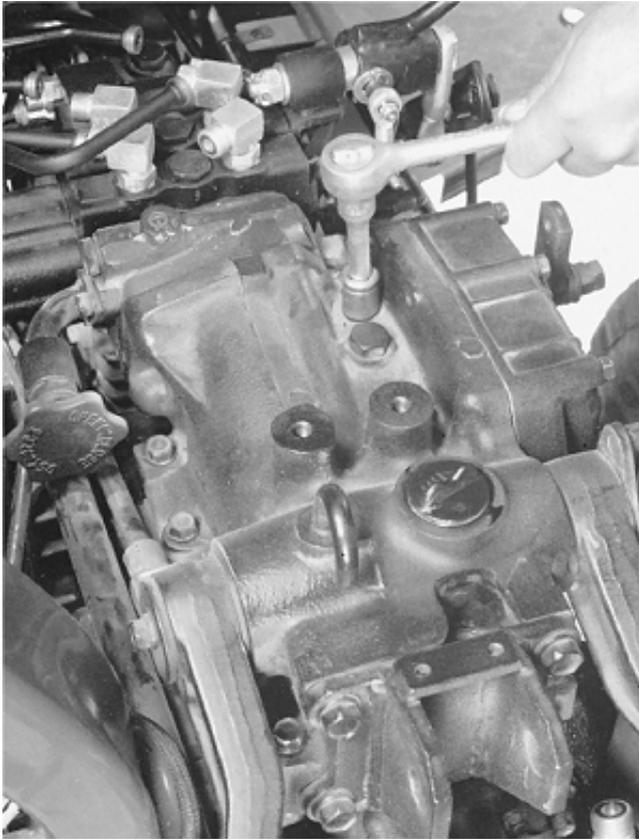
15. Install SCV's (B) and flow divider (A) using new O-rings. Apply oil to O-rings before installation. Install four socket head bolts. Tighten bolts diagonally to 17 N·m (12 lb-ft).



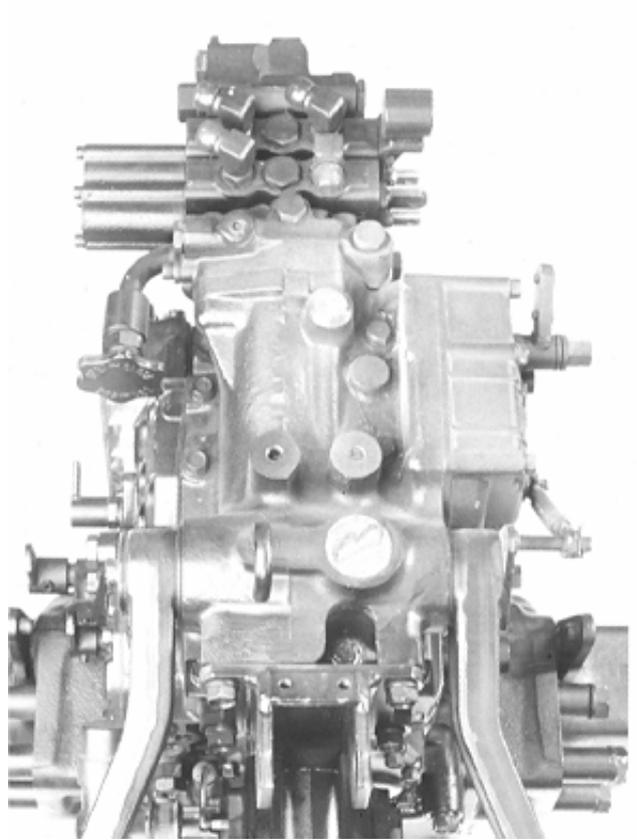
MX,HU,7015,26 -19-16OCT91

M43414 -UN-31AUG88

## INSTALL ROCKSHAFT HOUSING



Early Model Rockshaft Shown



Late Model Rockshaft Shown

1. Replace rockshaft-to-transaxle gasket.
2. Install rockshaft housing. Install and tighten eight cap screws and one nut with lock washers to 53 N-m (38 lb-ft).

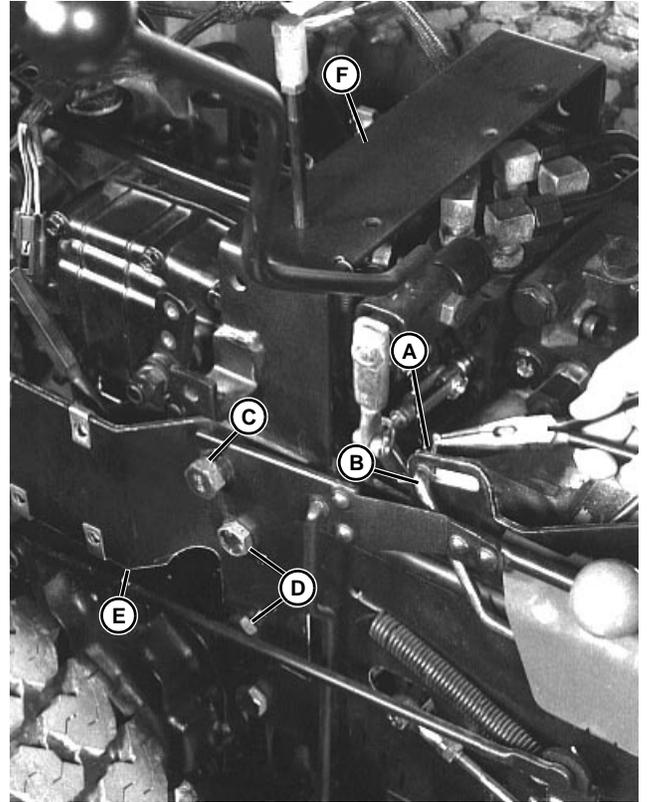
MX,HU,7015,27 -19-16OCT91

3. Install gear pump to flow divider line (A).
4. Connect flow divider and selective control valve lines.



MX,HU,7015,28 -19-16OCT91

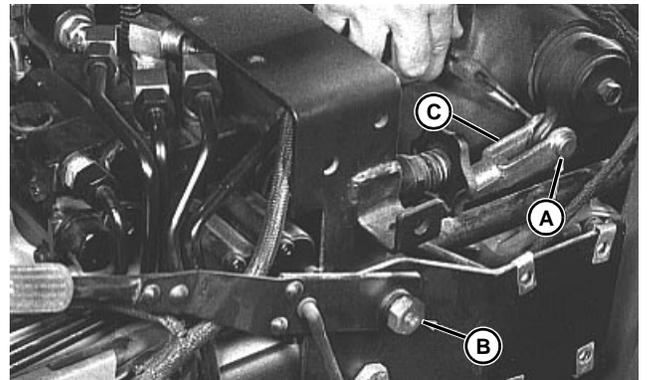
5. Install seat bracket (F).
6. Install right fender bracket (E). Fasten it with two cap screws (D).
7. Install Hi-Lo range selector to fender bracket. Fasten it with shoulder bolt (C).
8. Install park brake rod (B) to lock lever. Fasten it with washer (A) and cotter pin.



M43505

9. Install MFWD rod to selector if equipped (not shown).
10. Install PTO selector to fender bracket. Apply thread lock on shoulder bolt (B) and install.
11. Install lift rod to lift arm. Fasten it with drilled pin (A) and cotter pin.

*NOTE: Rockshaft lift arms should be horizontal with tractor frame when in the full up position. Lift arm adjustment is made by adjusting the lift rod (shorten or lengthen). If adjustment is necessary, remove lift rod, then shorten or lengthen by turning lift rod yoke (C). When adjustment is complete tighten set nut. See Step 11 for installation.*

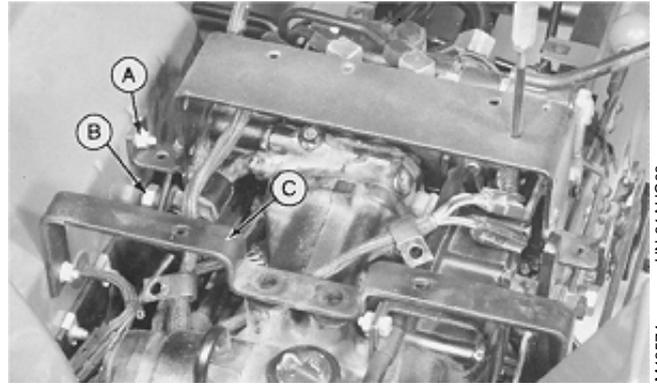


M43493

12. Install fenders and operator's seat. (See Section 80, Group 15).
13. Check level of hydraulic oil. Add oil as needed.

## REMOVE ROCKSHAFT CONTROL VALVE

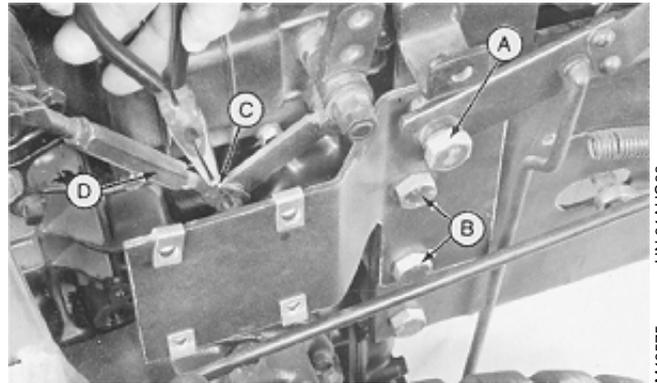
1. Remove seat assembly (See Section 80, Group 15).
2. Remove right fender.
3. Remove bolt (A).
4. Loosen shoulder bolt (B).
5. Remove seat bracket (C) on 655 only.



MX,HU,7015,30 -19-16OCT91

M43574 -UN-31AUG88

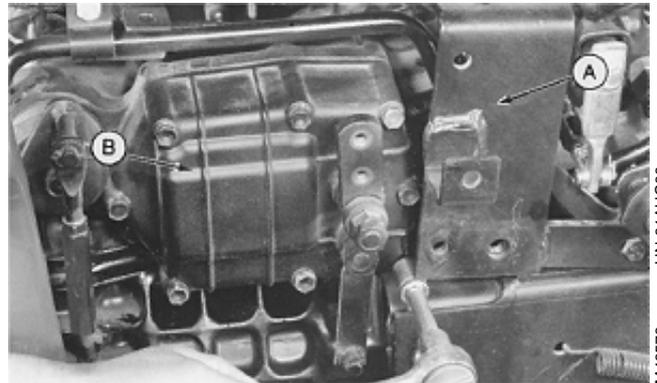
6. Remove shoulder bolt (A) two bolts (B) and fender bracket.
7. Remove cotter key and washer (C).
8. Disconnect valve linkage (D).



MX,HU,7015,31 -19-16OCT91

M43575 -UN-31AUG88

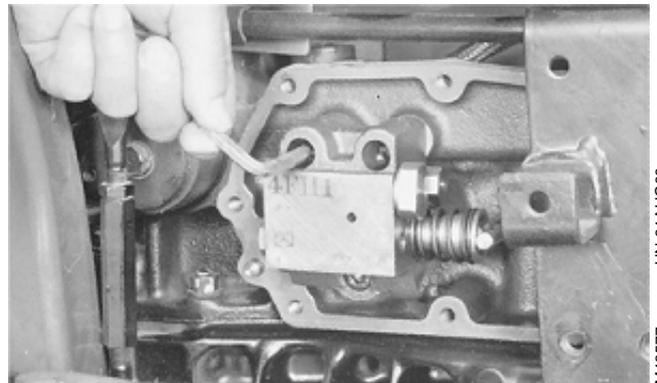
9. Tip seat bracket (A) forward.
10. Remove rockshaft valve cover (B).



MX,HU,7015,32 -19-16OCT91

M43576 -UN-31AUG88

11. Remove three metric hex head bolts.
12. Remove valve.



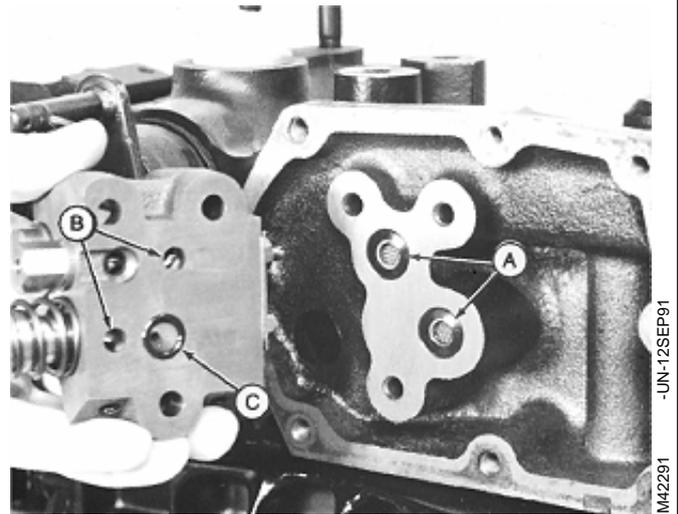
MX,HU,7015,33 -19-16OCT91

M43577 -UN-31AUG88

13. Remove rubber seal washers and 100 mesh screens (A) that align with valve ports (B). Clean or replace screens and seal washers as needed.

14. Remove and discard O-ring (C).

15. Remove all gasket material from mating surfaces of rockshaft housing and valve cover.



M42291 -UN-12SEP91

MX,HU,7015,34 -19-16OCT91

## DISASSEMBLE ROCKSHAFT CONTROL VALVE

1. Remove O-rings from recesses in back of valve.

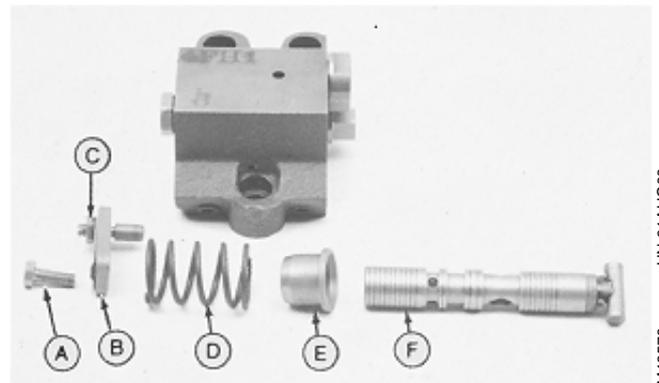
2. Bend lock tab down on bolt (A).

**IMPORTANT: DO NOT remove or attempt to adjust lower valve adjusting screw (C). This is a factory adjustment.**

3. Remove bolt (A) connecting plate (B), and spool assembly (D, E, and F).

*NOTE: Spool and valve body are not serviced. If either is damaged, replace valve assembly.*

4. Inspect spool and bore for scoring and sticking.



M43578 -UN-31AUG88

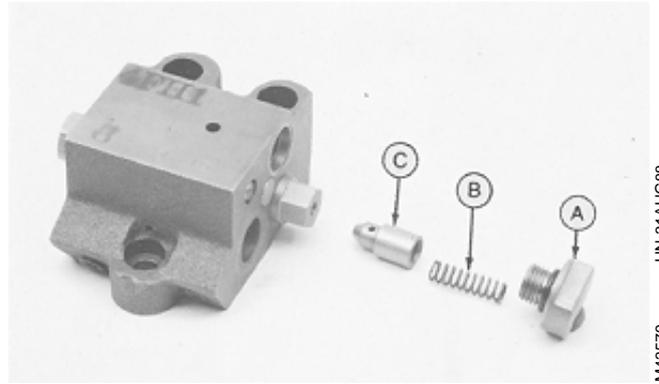
- A—Bolt
- B—Connecting Plate
- C—Nut
- D—Spring
- E—Spring Guide
- F—Spool

MX,HU,7015,35 -19-16OCT91

## Rockshaft/Disassemble Control Valve

5. Remove load check plug (A), spring (B), and poppet (C).

6. Inspect for damage.

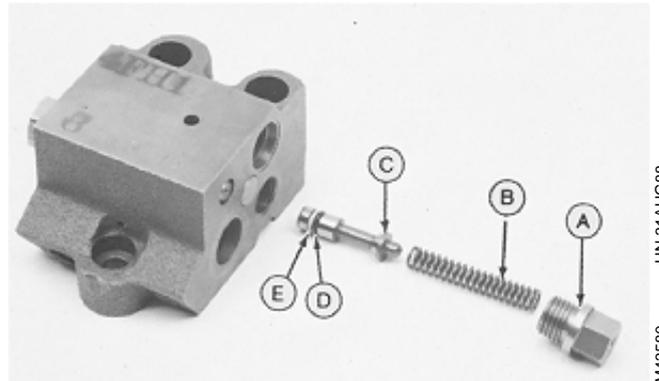


MX,HU,7015,36 -19-16OCT91

M43579 -UN-31AUG88

7. Remove lowering valve plug (A), spring (B), and spool (C). Inspect for damage.

A—Plug  
B—Spring  
C—Spool  
D—O-ring  
E—Back-Up Ring

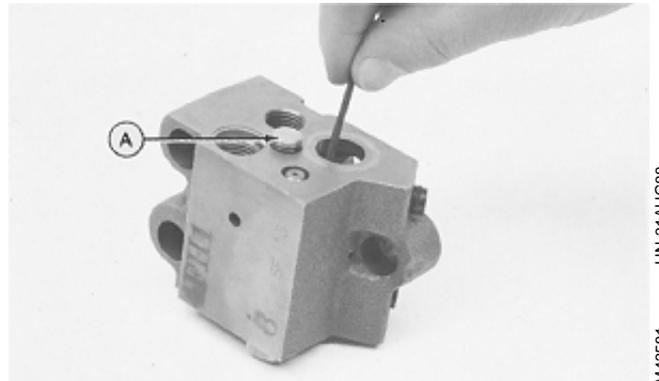


MX,HU,7015,37 -19-16OCT91

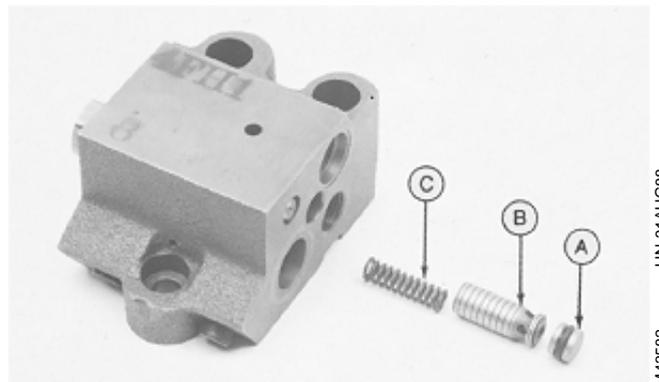
M43580 -UN-31AUG88

8. Insert short end of hex wrench through spool bore and into hole in flow control spool. Carefully pull up until plug (A) can be removed.

9. Remove flow control plug (A), spool (B), and spring (C). Inspect for damage.



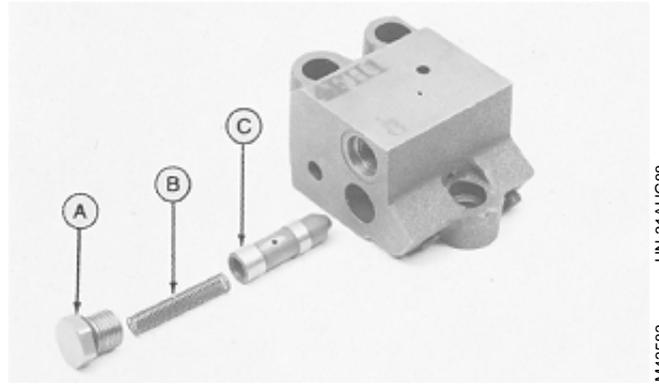
M43581 -UN-31AUG88



M43582 -UN-31AUG88

MX,HU,7015,38 -19-16OCT91

10. Remove unloading valve plug (A), spring (B), and poppet (C). Inspect for damage.

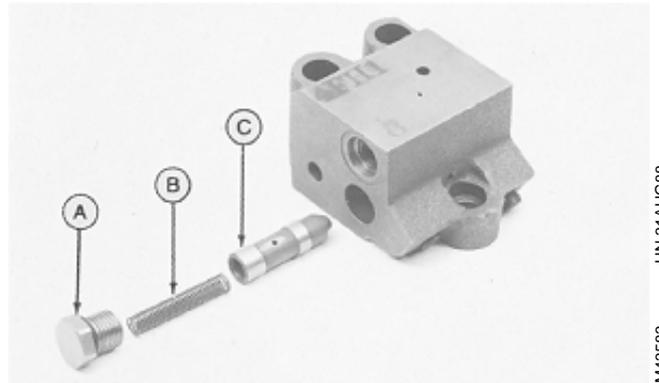


MX,HU,7015,39 -19-16OCT91

M43583 -UN-31AUG88

### ASSEMBLE ROCKSHAFT CONTROL VALVE

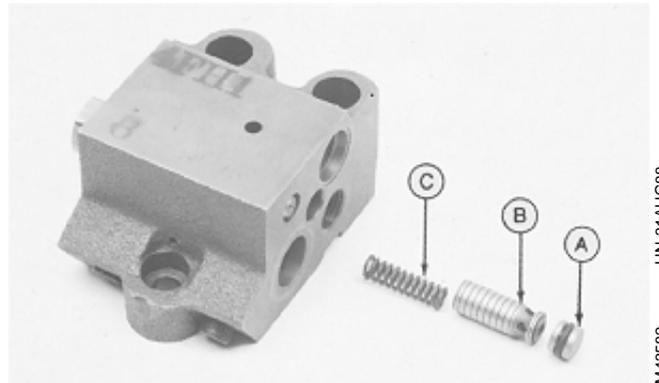
1. Clean and dry all parts.
2. Before assembly, apply clean hydraulic oil on all internal parts.
3. Install new O-ring on unloading valve plug (A).
4. Assemble poppet (C), spring (B), and plug into valve and tighten.



MX,HU,7015,40 -19-16OCT91

M43583 -UN-31AUG88

5. Put flow control spring (C) inside poppet (B).
6. Put new O-ring on plug (A) and install assembly in valve body and tighten.

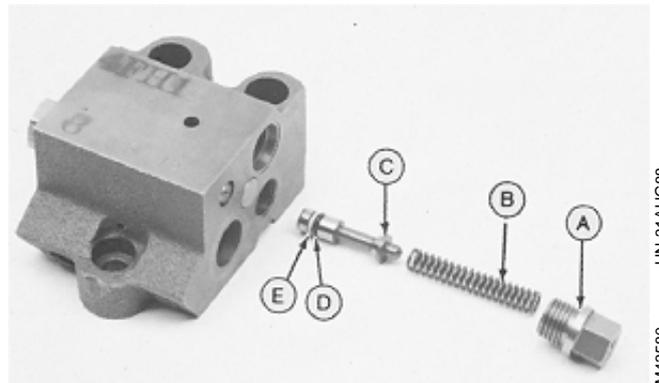


MX,HU,7015,41 -19-16OCT91

M43582 -UN-31AUG88

7. Install new back-up ring (E) and O-ring (D) on lowering valve spool (C).
8. Assemble spool (C), spring (B), and plug (A) into valve using care not to damage O-ring. Tighten plug.

- A—Plug
- B—Spring
- C—Spool
- D—O-Ring
- E—Back-Up-Ring



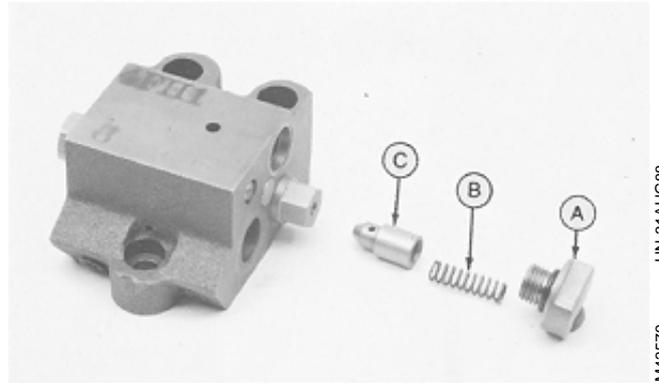
MX,HU,7015,42 -19-16OCT91

M43580 -UN-31AUG88

## Rockshaft/Assemble Control Valve

9. Assemble load check poppet (C) and spring (B) into valve.

10. Put new O-ring on plug (A). Install and tighten plug.



MX,HU.7015,43 -19-16OCT91

M43579 -UN-31AUG88

11. Assemble spring (D) and spring guide (E) onto spool (F).

12. Install spool into valve body.

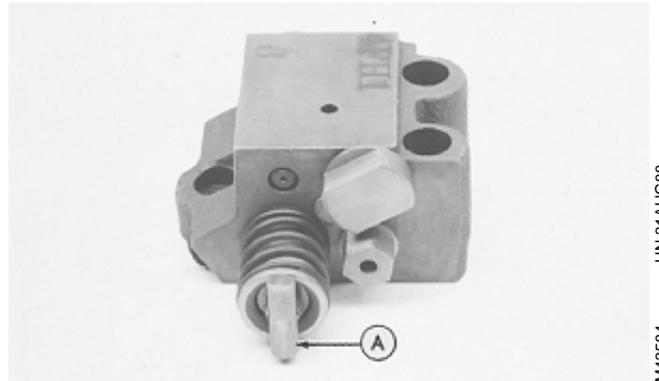
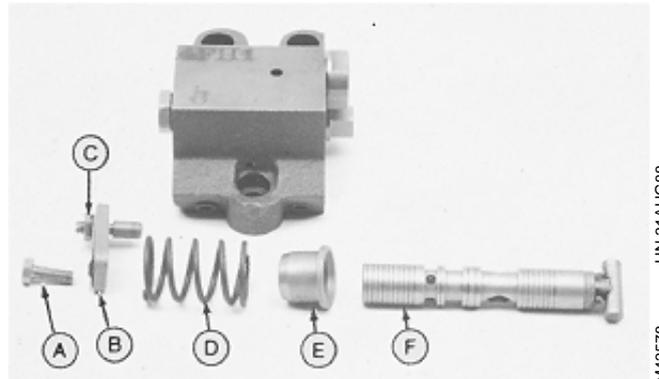
13. Clean the threads of bolt (A) and the internal threads of the spool with clean and cure primer.

14. Apply thread lock and sealer (medium strength) to the threads of the bolt.

15. Align connecting plate (B) to spool and fasten with bolt to 10 N·m (88 lb-in.).

*NOTE: Make certain cross pin (A) on end of spool is at right angles to valve mounting surface.*

16. Bend locking tab up against bolt head.



MX,HU.7015,44A -19-16OCT91

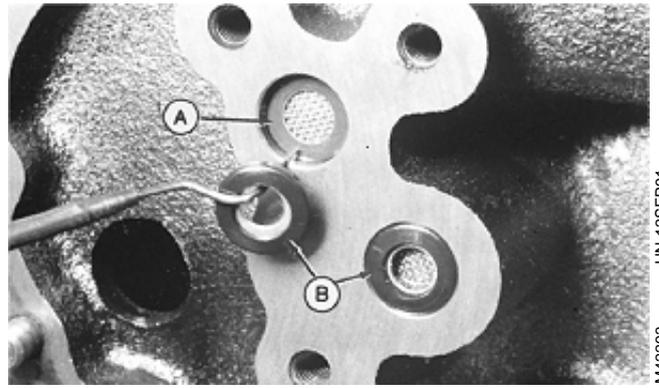
M43578 -UN-31AUG88

M43584 -UN-31AUG88

70  
15  
20

17. Install 100 mesh screens in recesses of rockshaft housing with wide face side of screens (A) to the outside.

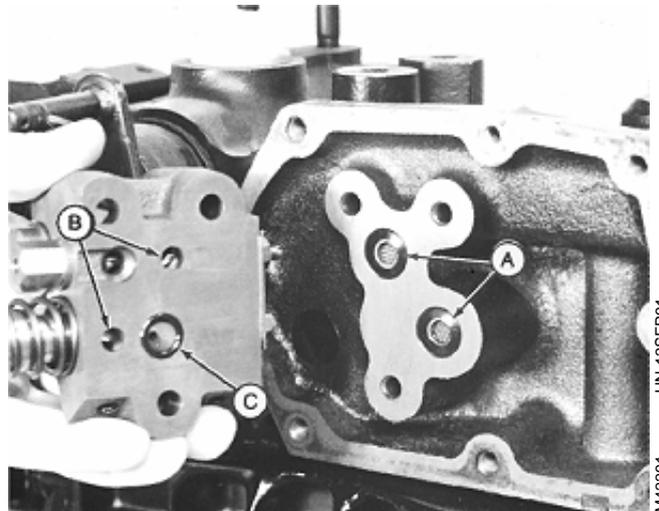
18. Install rubber seal washers (B).



M42293 -UN-12SEP91

19. Install new O-ring (C).

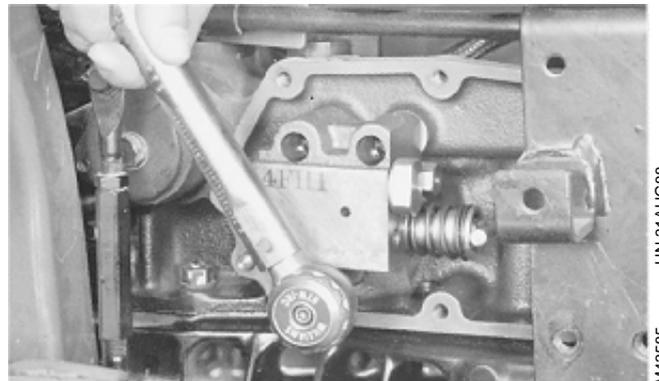
20. Align valve ports (B) with 100 mesh screens and seal washers (A).



M42291 -UN-12SEP91

MX,HU,7015,44B -19-16OCT91

21. Install valve on transaxle with three socket head bolts. Tighten socket head bolts 24 N·m (18 lb-ft).

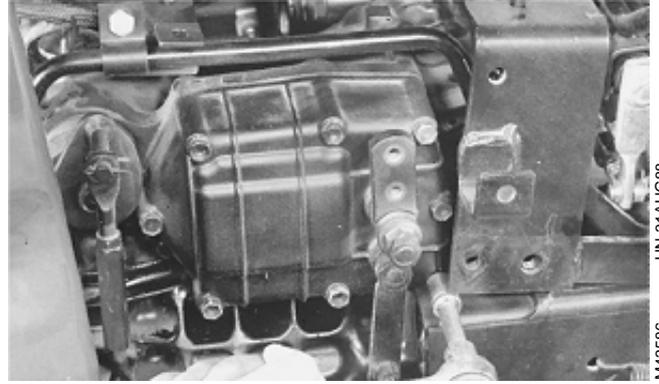


M43585 -UN-31AUG88

MX,HU,7015,45 -19-16OCT91

## Rockshaft/Assemble Control Valve

22. Install new gasket and original cover. Tighten cap screws to 27 N-m (20 lb-ft). Make sure internal linkage is away from valve spool.

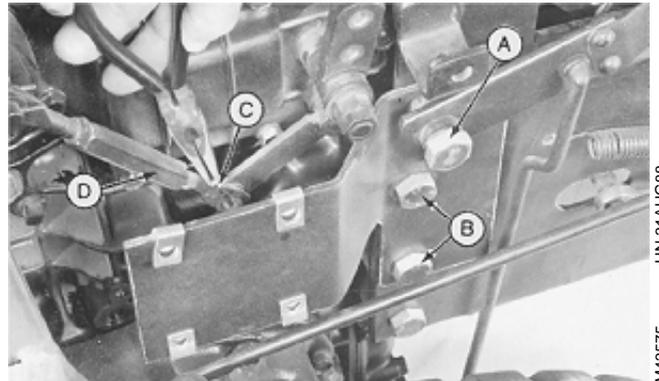


MX,HU,7015,46 -19-16OCT91

23. Reconnect linkage using a washer on each side of turnbuckle (D) and insert cotter key (C).

24. Install fender bracket and two bolts (B). Tighten to 149 N-m (110 lb-ft).

25. Install and tighten shoulder bolt (A).



MX,HU,7015,47 -19-16OCT91

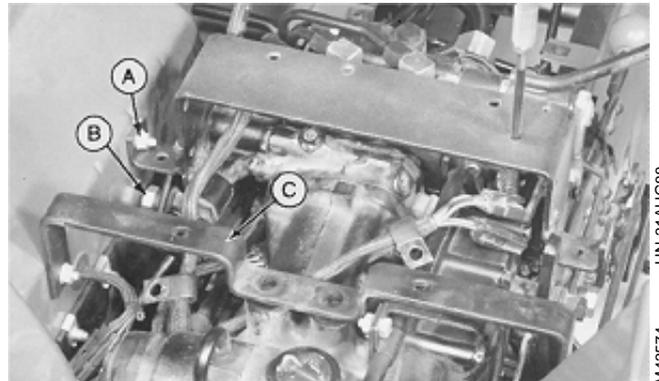
26. Install and tighten fender bolt (A).

27. Install seat bracket (C). (655 only).

28. Tighten shoulder bolts (B).

29. Install right fender.

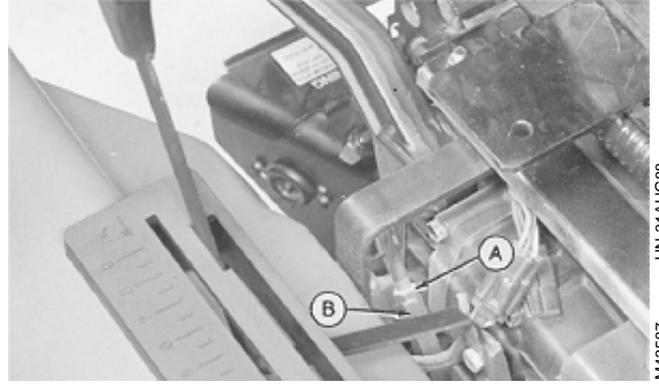
30. Install seat assembly. (See Section 80, Group 15.)



MX,HU,7015,48 -19-16OCT91

## ADJUST ROCKSHAFT CONTROL VALVE

1. Loosen turnbuckle jam nut (A).
2. Start engine and run at full throttle.
3. Place rockshaft lever in full raise position.
4. Turn turnbuckle (B) until the engine loads down.
5. Lengthen turnbuckle another 4 to 6 flats.
6. Cycle lift arms.
7. There should be a small amount of movement in the lift arms at full raise.



M43587 -UN-31AUG88

MX,HU,7015,49 -19-16OCT91

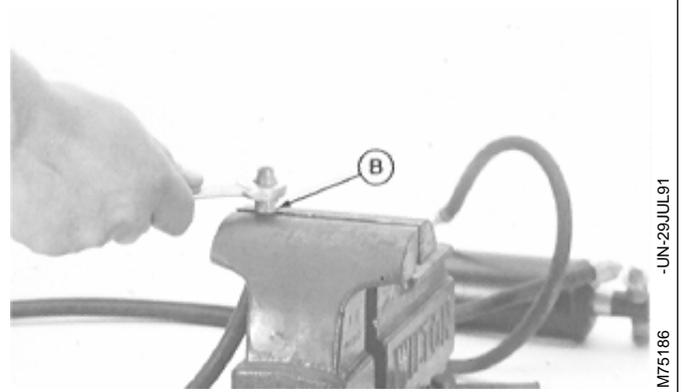
*Rockshaft/Adjust Control Valve*

70  
15  
24



6. Put new hose in vise so end of hose is high enough to accept fitting.

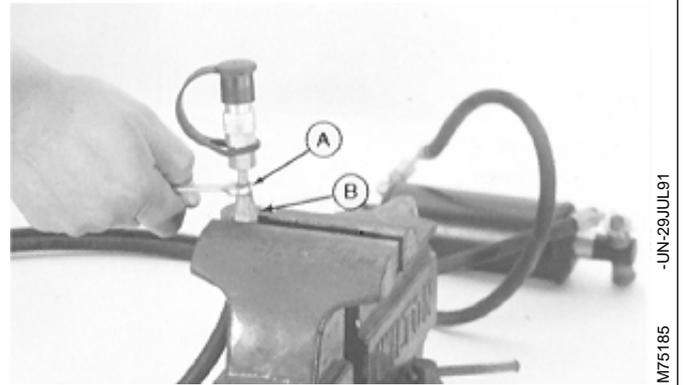
7. Turn hose fitting (B) to the right (counterclockwise) to install it.



M75186 -UN-29JUL91

8. Put hose fitting (B) in the vise.

9. Install coupler fitting until nut (A) is tight against hose fitting.



M75185 -UN-29JUL91

MX,HU,7020,2 -19-16OCT91

# Section 80

## Miscellaneous Repair

### Contents

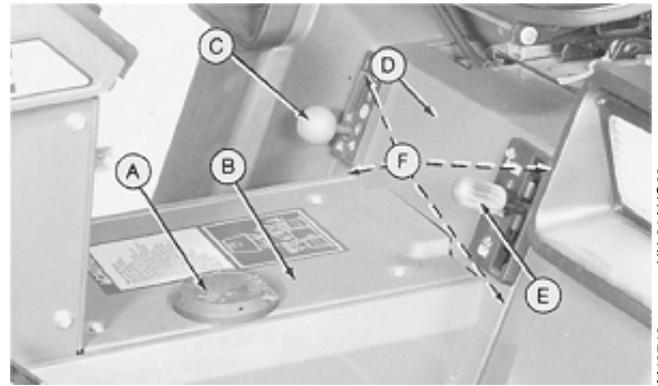
|                                 | Page     |   | Page    |
|---------------------------------|----------|---|---------|
| <b>Group 15—Operator’s Seat</b> |          | <b>Group 20—European Roll-Gard®</b>         |         |
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| North American . . . . .        | 80-15-1  |   |         |
| Install Operator’s Seat—        |          | <b>Group 25—German Rear Hitch</b>           |         |
| North American . . . . .        | 80-15-2  | Exploded View—German Rear Hitch . . . . .   | 80-25-2 |
| Exploded View—                  |          | <b>Group 30—3-Point Hitch</b>               |         |
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| European Seat. . . . .          | 80-15-12 |   |         |
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| European Seat. . . . .          | 80-15-18 |   |         |



## REMOVE OPERATOR'S SEAT—NORTH AMERICAN

*NOTE: On 755/756, 855/856 and 955 tractors, PTO select knob (E), and two-speed select knob (C) must be removed.*

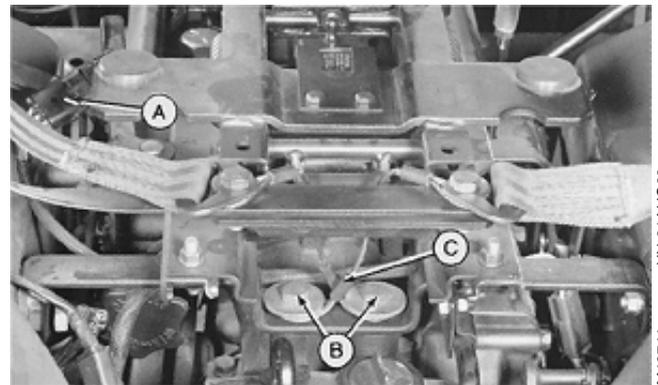
1. Turn mower depth control (A) to the right (clockwise) until it stops.
2. Remove top deck panel (B) by lifting right-rear corner first, then lift depth control so it clears depth control bolt and move it out the right side of operator's station.
3. Remove four bolts (F) under fenders and remove selector panel (D).



A—Mower Depth Control  
B—Deck Panel  
C—Two-Speed Selector  
D—Selector Panel  
E—PTO Selector  
F—Attaching Bolts

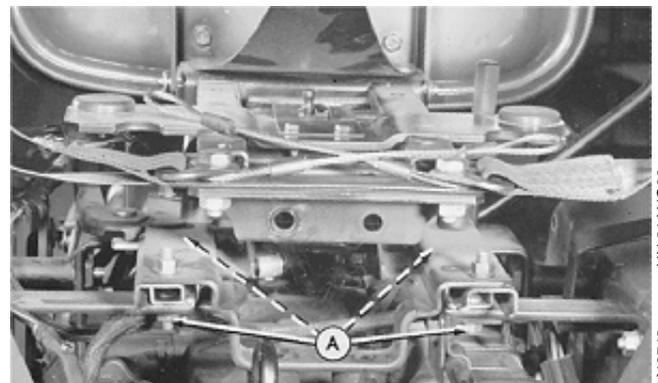
MX,HU,8015,1 -19-16OCT91

4. Disconnect seat switch (A).
5. Remove two bolts, spacers, and large flat washers (B) fastening safety cables (C).



MX,HU,8015,2 -19-16OCT91

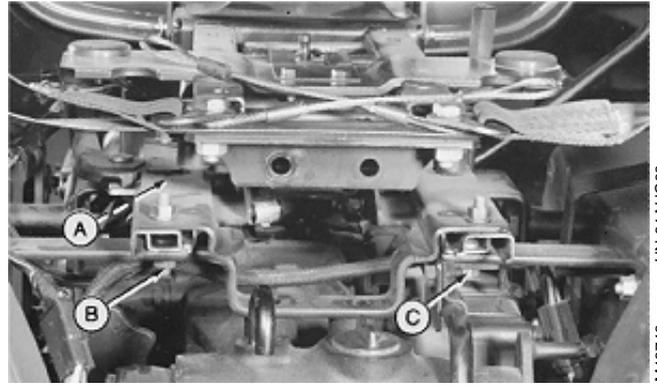
6. Remove nuts (A) fastening seat rails to seat brackets.
7. Remove seat assembly. Inspect, repair and/or replace any damaged parts.



MX,HU,8015,3 -19-16OCT91

## INSTALL OPERATOR'S SEAT—NORTH AMERICAN

1. Align front and rear seat rail studs (A and B) with four tractor mounting bracket holes.
2. Place harness J-clamps over left front stud (A) and rear studs (B and C).
3. Place hydraulic tube clamp over stud (C).
4. Install four nuts on studs and tighten.

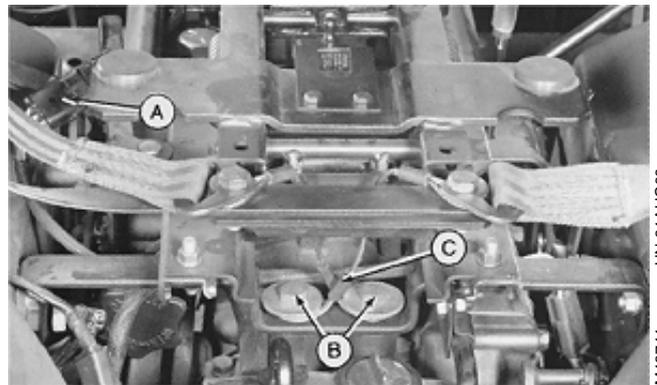


M43743 -UN-31AUG88

MX,HU,8015,4 -19-16OCT91

**NOTE:** Safety cables must be installed in a crossed pattern.

5. Install two bolts, large flat washers, spacers, and safety cables (B).
6. Connect seat switch (A).



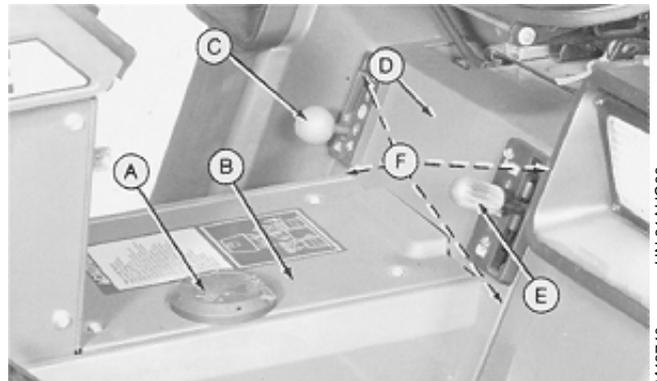
M43741 -UN-31AUG88

MX,HU,8015,5 -19-16OCT91

7. Install select panel (D) with four cap screws (F) under fenders (on 755/756, 855/856, and 955 tractors). Install PTO select knob (E) and two-speed select knob (C).

8. Install top deck panel (B). Make certain mower depth control knob (A) fits over depth control bolt.

- A—Mower Depth Control
- B—Deck Panel
- C—Two-Speed Selector
- D—Selector Panel
- E—PTO Selector
- F—Attaching Bolts



M43740 -UN-31AUG88

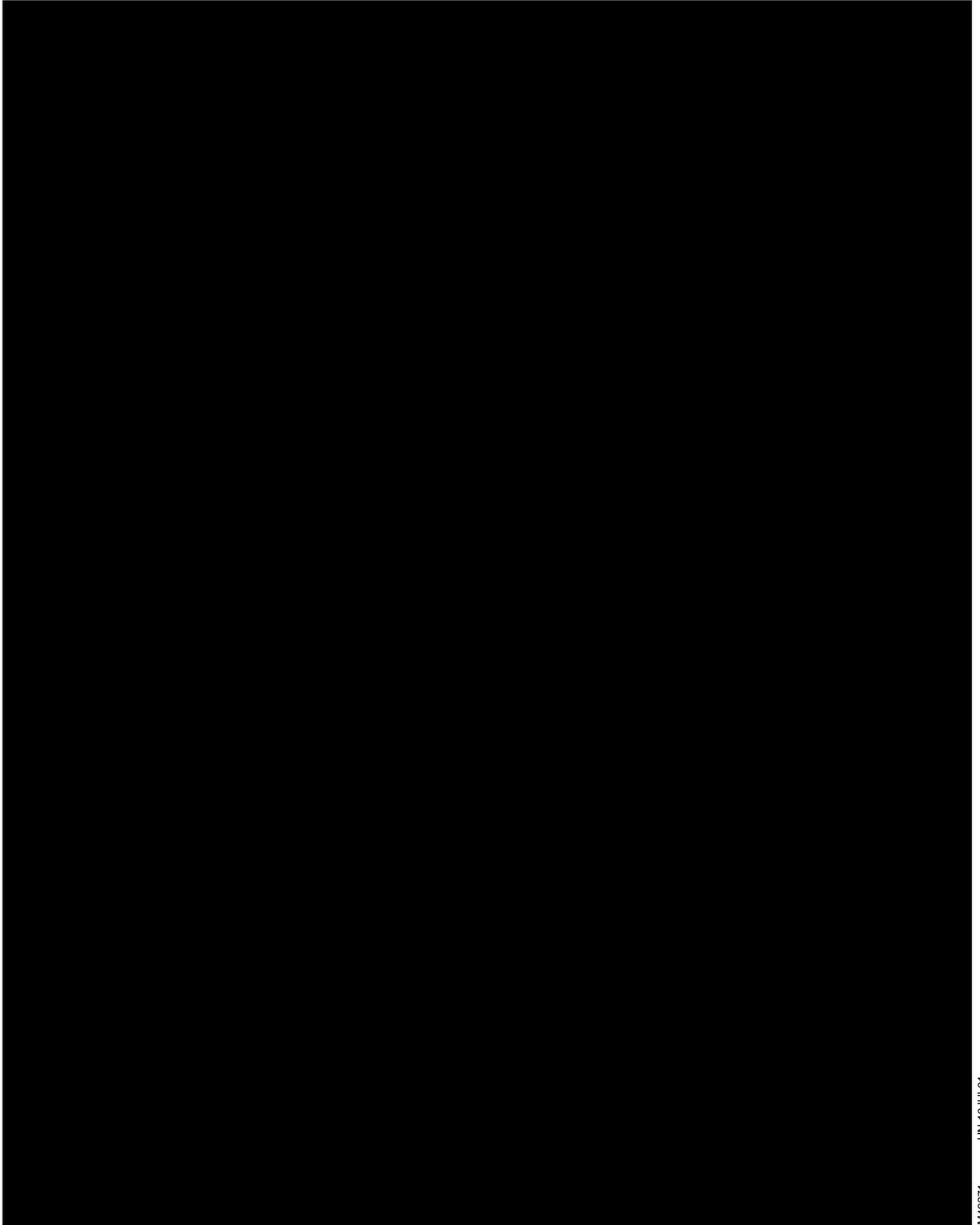
MX,HU,8015,6 -19-16OCT91



## EXPLODED VIEW—EUROPEAN SEAT ASSEMBLY

|                           |                             |                         |                             |
|---------------------------|-----------------------------|-------------------------|-----------------------------|
| A—Seat                    | F—Stop Bumper               | K—Rubber Boot           | O—Fore/Aft Suspension Rails |
| B—Left Fore/Aft Seat Rail | G—Seat Switch Actuator      | L—Rubber Boot Fastening | P—Light Harness             |
| C—Right Fore/Aft Seat     | Bracket                     | Pins                    | Q—Light Assembly            |
| Adjustment Rail           | H—Operator Weight Indicator | M—Height Adjustment     | R—License Plate/Light       |
| D—Suspension Assembly     | I—Seat Switch Assembly      | Step-Bracket Assembly   | Mounting Bracket            |
| E—Damper Assembly         | J—Base Mounting Brackets    | N—Weight Adjustment     |                             |
|                           |                             | Ratchet-Lever Assembly  |                             |

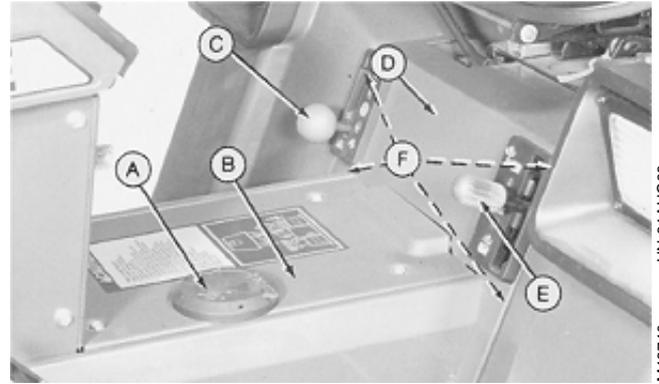
MX,HU,8015,7A -19-16OCT91



## REMOVE OPERATOR'S SEAT—EUROPEAN (EARLY VERSION)

**NOTE:** On 755/756, 855/856 and 955 tractors, PTO select knob (E), and two-speed select knob (C) must be removed. ROLL-GARD® has been removed from most pictures for clarity purposes only.

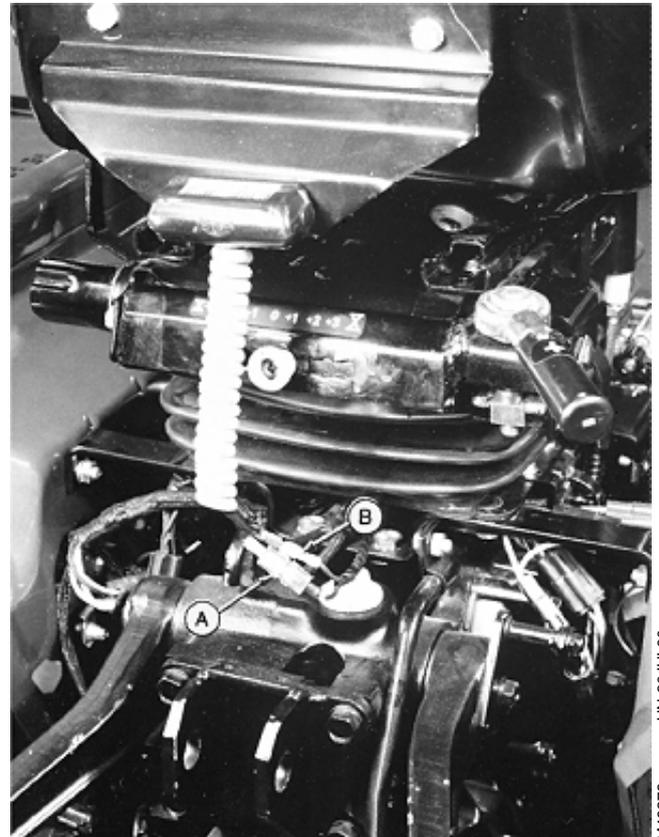
1. Turn mower depth control (A) to the right (clockwise) until it stops.
2. Remove top deck panel (B) by lifting right-rear corner first, then lift depth control so it clears depth bolt and move it out the right side of operator's station.
3. Remove four bolts (F) under fenders (on 755/756, 855/856, and 955 tractors) and remove selector panel (D).



A—Mower Depth Control  
B—Deck Panel  
C—Two-Speed Selector  
D—Selector Panel  
E—PTO Selector  
F—Attaching Bolts

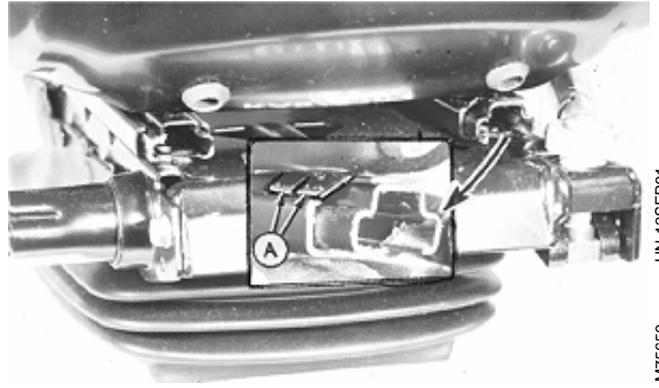
MX,HU,8015,8A -19-16OCT91

4. Disconnect seat light (optional) at connectors (A and B).



MX,HU,8015,8B -19-16OCT91

5. Bend rail stop tabs (A) up to a horizontal position.



M75659 -UN-12SEP91

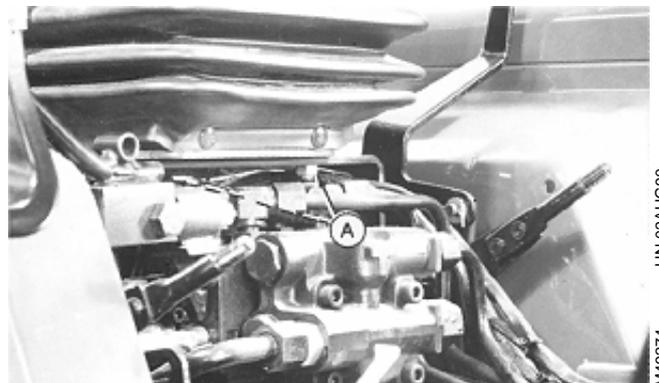
6. Push seat lever (A) up, then slide seat forward off suspension rails.



M49273 -UN-25JUL90

MX,HU,8015,9 -19-16OCT91

7. Remove four nuts (A), two front and two rear, from suspension mounting brackets.

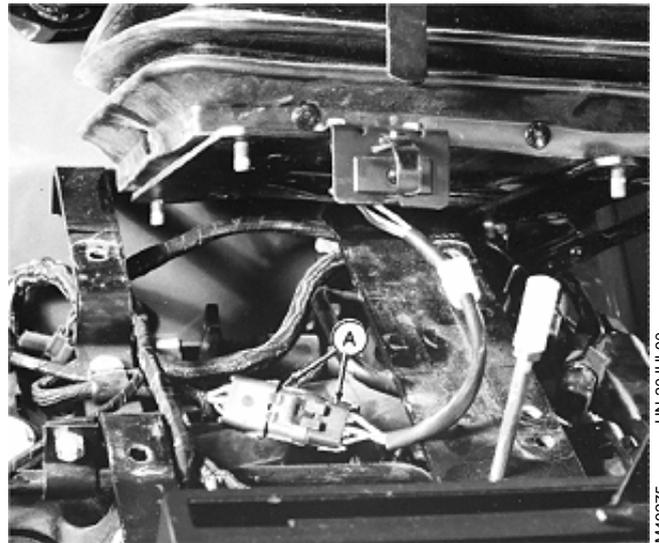


M49274 -UN-02AUG90

MX,HU,8015,10 -19-16OCT91

8. Disconnect seat switch connector (A) to remove suspension to work bench.

9. Inspect, repair and/or replace any damaged parts of the seat and the suspension.

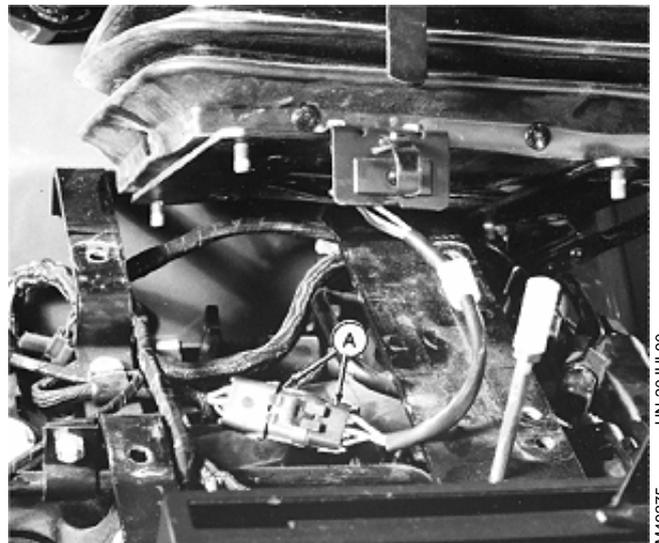


MX,HU,8015,11 -19-16OCT91

### INSTALL OPERATOR'S SEAT—EUROPEAN (EARLY VERSION)

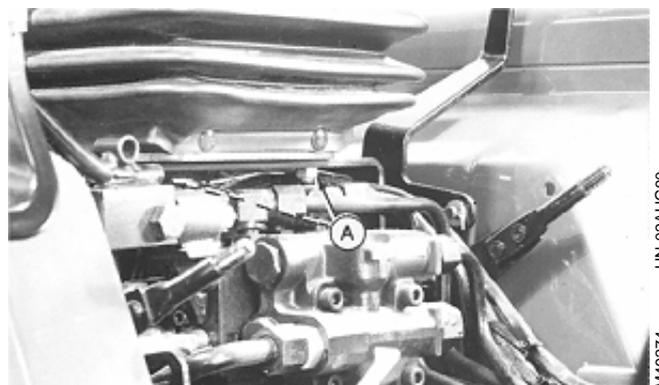
*NOTE: ROLL-GARD® has been removed from most pictures for clarity purposes only.*

1. Rest seat suspension assembly on tractor mounting brackets while you connect seat switch connector to harness connector (A).
2. Align four socket head cap screws with four holes of tractor mounting brackets and foot control pedals lockout rod with side bracket as you set seat assembly in place.



MX,HU,8015,12 -19-16OCT91

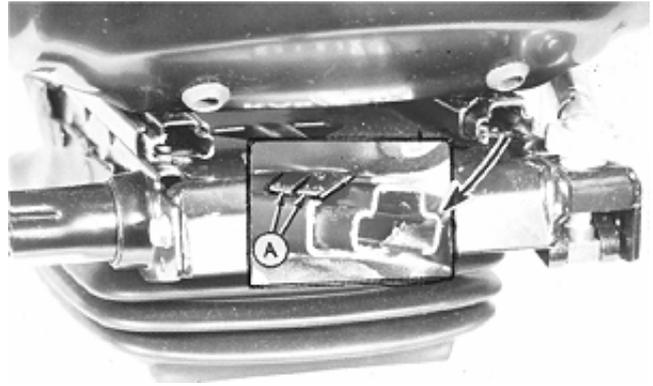
3. Fasten seat assembly to tractor with four nuts (A), two front and two rear.



MX,HU,8015,13 -19-16OCT91

## Operator's Seat/Install Operator's Seat—Early European

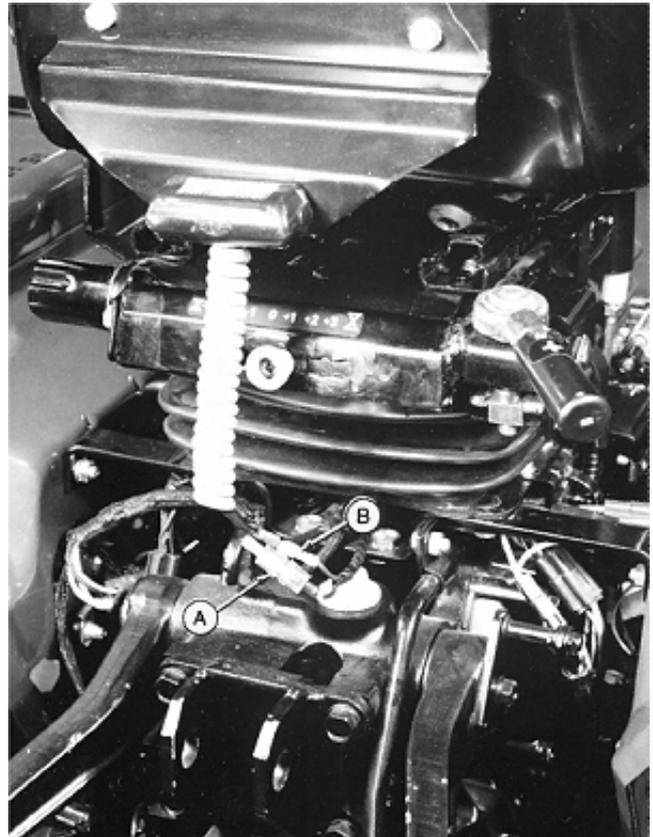
- Slide operator's seat on suspension rails, if removed earlier.
- Bend last two stop tabs (A) down to prevent seat from sliding forward off the suspension rails.



MX,HU,8015,14A -19-16OCT91

M75659  
-UN-12SEP91

- Connect license plate light connectors (A and B) to tractor harness leads, if equipped.
- Install operator's station sheet metal.
- Adjust striker bar bracket so lockout rod is centered inside front tube of bracket. Tighten cap screw to 25 N·m (18 lb-ft).



MX,HU,8015,14B -19-16OCT91

M49272  
-UN-20JUL90

## ADJUST OPERATOR'S SEAT—EUROPEAN

*NOTE: ROLL-GARD® has been removed for clarity purposes only.*

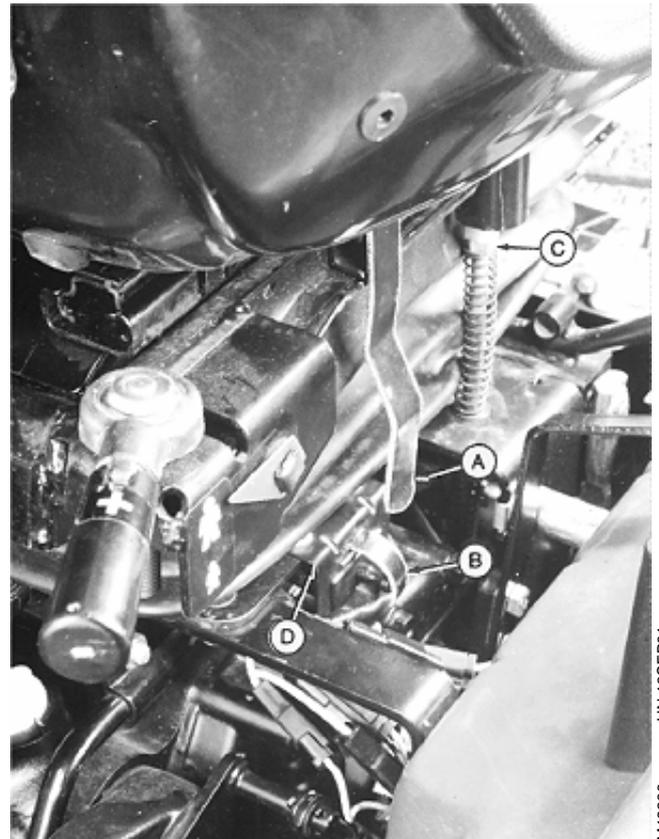
1. Have a helper slowly sit in the operator's seat.
2. Look at the striker bar (A) on the right side of the seat as the helper slowly puts more weight on the seat. It must align with and strike the curved seat switch plunger plate (B) to engage the seat safety switch. This establishes operator presence for the electrical PTO safety circuit.

If the striker bar does not strike the plunger plate, adjust the switch mounting bracket (D) outward until it does. If you adjust the switch bracket out all the way and contact is not made, bend the striker bar inward until it contacts the curved plunger plate, but not too far inward that the switch plunger is bottomed-out inside the switch.

3. Look also at the right-side foot control pedals lockout rod (C). It should be depressed far enough to unlock the pedals for forward or reverse travel when the operator is fully at rest in the seat.

If the pedals lockout rod (C) does not unlock the pedals when the operator is fully at rest in the seat, adjust the rod (with the helper out of the seat) by turning the nut to the left (counterclockwise) to lengthen the rod until the pedals are unlocked.

*NOTE: The operator's height and weight are important to the proper adjustment and safety function of the European seat assembly. If the operator is light-in-weight, and the seat assembly is adjusted for a tall-heavy operator, the striker bar (A) may not reach the plunger plate (B) to engage the seat switch and prevent the PTO from being engaged. Also, the lockout rod (C) may not depress far enough to unlock the right-side foot control pedals and the tractor will not move in either direction.*



A—Striker Bar  
B—Curved Plunger Plate  
C—Pedals Lockout Rod  
D—Switch Mounting Bracket

M42236 -JUN-12SEP91

**N** CAUTION: The operator's height and weight are important to the proper adjustment and safety function of the European seat assembly. Lets say, for example, the operator is short-in-height and light-in-weight with the seat assembly adjusted for a short-light operator. The operator moves out of the seat. The striker bar (A) may not disengage the plunger plate (B) to open the seat switch and shut off the PTO. Also, the lockout rod (C) may not raise high enough to lockout the right-side foot control pedals and allow the tractor to move if either of the pedals are accidentally depressed.



-UN-23AUG88

TS198



-UN-21SEP89

TS671



-UN-12SEP91

IM42237

80-15-11

## ADJUST OPERATOR'S WEIGHT—EUROPEAN SEAT

**IMPORTANT:** If the customer/operator is not present when you install the seat, **BE SURE** to instruct him/her on these seat adjustment procedures when the tractor is delivered.

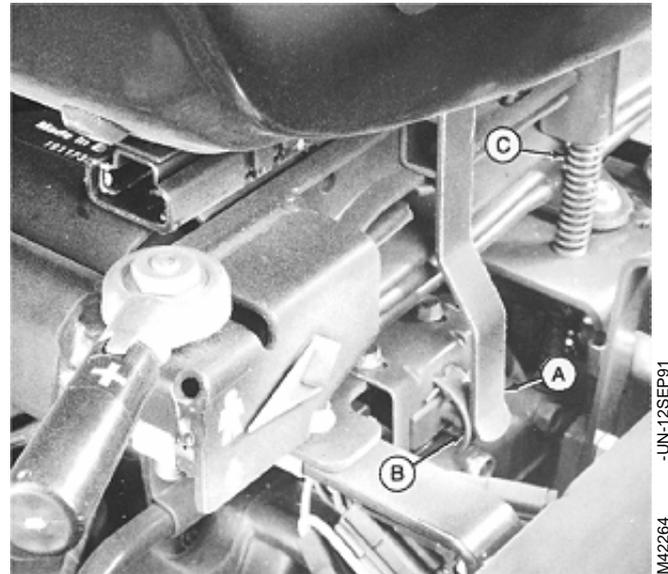
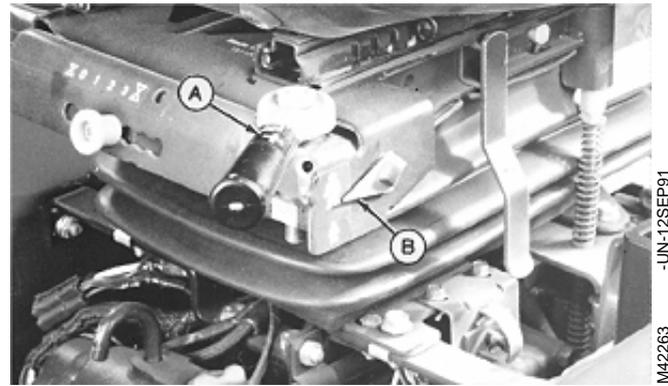
*NOTE: ROLL-GARD® has been removed for clarity purposes only.*

### FOR THE HEAVY OPERATOR:

1. Turn adjustment handle to the positive position (A); then, crank the handle until indicator (B) points to the bottom of the large figure on the decal.
2. Operator sits in seat and bounces seat up and down to see if seat is comfortable without bottoming-out:
  - If seat does bottom-out, operator cranks on handle (in positive position) until seat has a nice cushioned feel without bottoming-out;

*LOOK:* Striker bar (A) must engage striker plate (B) which engages the seat safety switch and establishes operator presence.

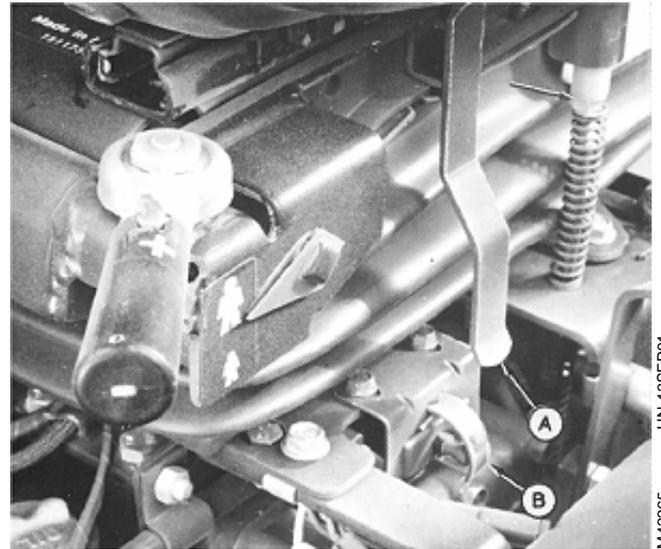
*FEEL:* Lockout rod (C) must be depressed far enough to unlock right-side foot control pedals. Depress both forward and reverse pedals—they should move freely through their full range of motion.



MX,HU.8015,24A -19-16OCT91

- If seat does not bottom-out,

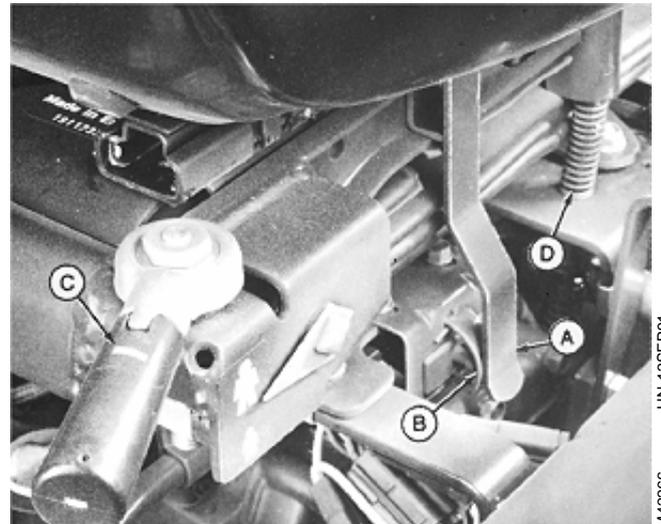
*LOOK:* Striker bar (A) may not engage plunger plate (B).



Turn adjustment handle to the negative position (C) and crank on handle until engagement is made between striker bar (A) and plunger plate (B), without bottoming-out the plunger inside the switch.

*FEEL:* Lockout rod (D) must be depressed far enough to unlock right side foot control pedals. Depress both forward and reverse pedals—they should move freely through their full range of motion.

- A—Striker Bar
- B—Plunger Plate
- C—Negative Position
- D—Lockout Rod



MX,HU.8015,24B -19-16OCT91

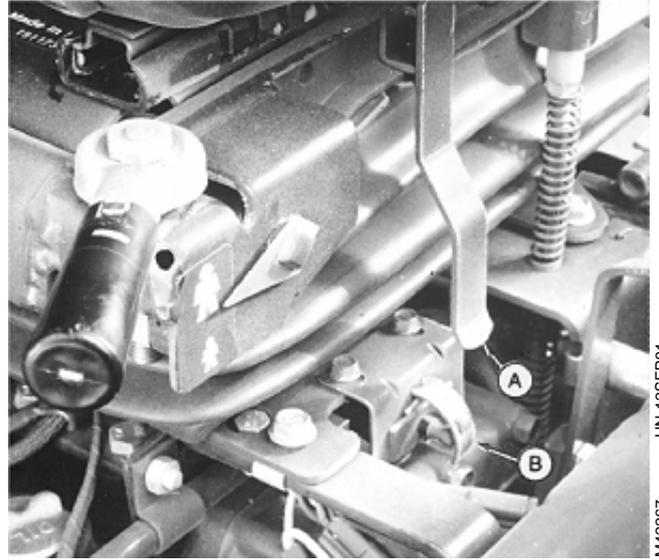
- **VERIFY SAFETY:** Turn the key to the ON position only and engage the PTO lever.

*LOOK: PTO light must come on and magnet must hold PTO lever engaged.*

Raise off the seat.

*LOOK: PTO light must go out within a short time.*

*LISTEN: PTO magnet will make a loud click sound as the striker bar (A) disengages from the plunger plate (B) causing the seat switch to break the current flow to the magnet, disengaging the PTO lever in a short amount of time.*



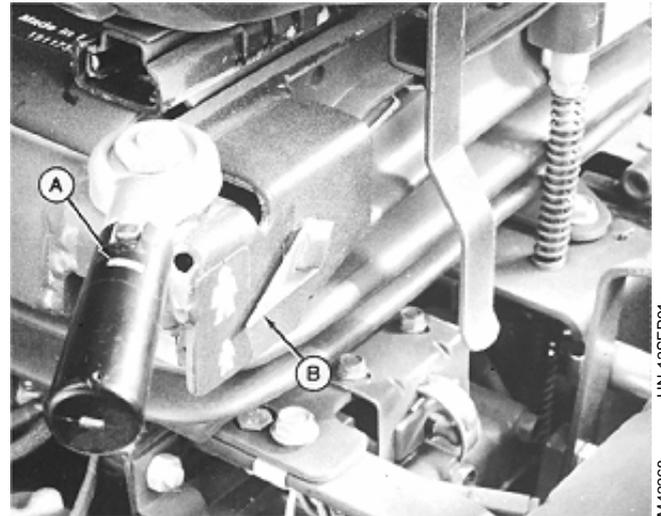
M42267 -UN-12SEP91

MX,HU,8015,24C -19-16OCT91

## ADJUST OPERATOR'S WEIGHT—EUROPEAN SEAT

FOR THE LIGHT OPERATOR:

1. Turn adjustment handle to the negative position (A); then, crank the handle until indicator (B) points to the top of the small figure on the decal.

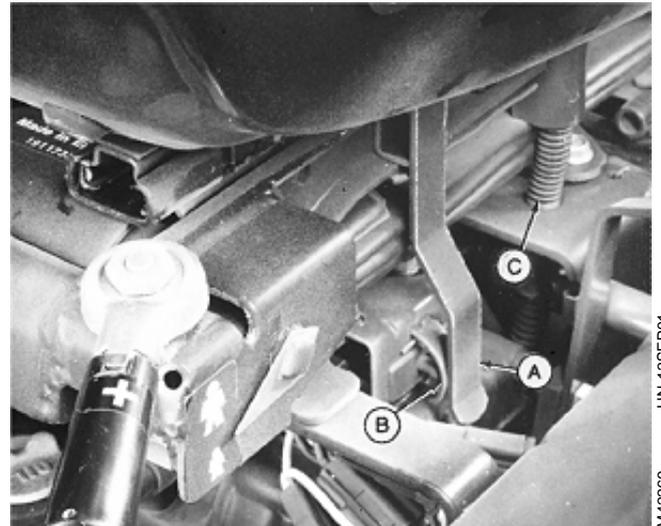


2. Operator sits in seat and bounces seat up and down to see if seat is comfortable without bottoming-out:

- If seat does bottom-out, operator turns adjustment handle to positive position and cranks on handle until seat has a nice cushioned feel without bottoming-out;

*LOOK: Striker bar (A) must engage striker plate (B) which engages the seat safety switch and establishes operator presence.*

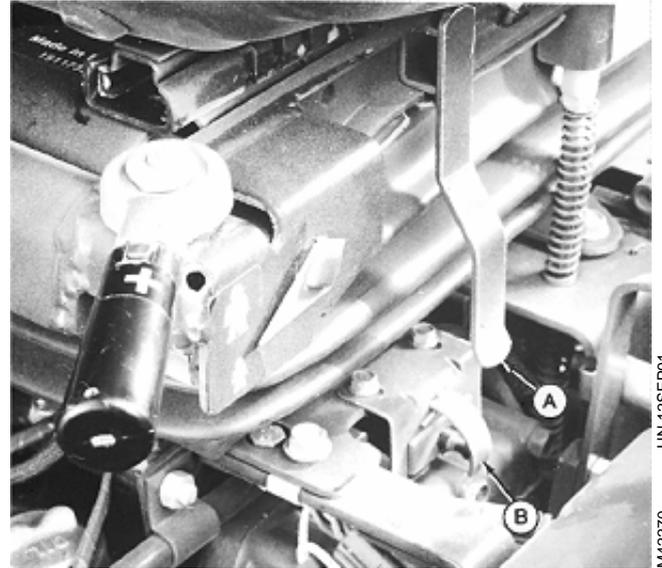
*FEEL: Lockout rod (C) must be depressed far enough to unlock right-side foot control pedals. Depress both forward and reverse pedals—they should move freely through their full range of motion.*



MX,HU.8015,25A -19-16OCT91

- If seat does not bottom-out,

*LOOK: Striker bar (A) may not engage plunger plate (B).*

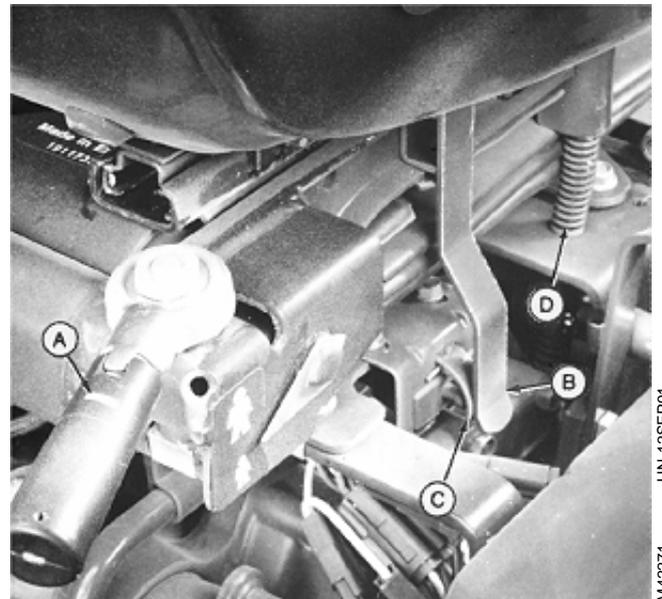


M42270 -JUN-12SEP91

- A-Negative Position
- B-Striker Bar
- C-Plunger Plate
- D-Lockout Rod

Turn adjustment handle to the negative position (A) and crank on handle until engagement is made between striker bar (B) and plunger plate (C), without bottoming-out the plunger inside the switch.

*FEEL: Lockout rod (D) must be depressed far enough to unlock right side foot control pedals. Depress both forward and reverse pedals—they should move freely through their full range of motion.*



M42271 -JUN-12SEP91

MX,HU.8015,25B -19-16OCT91

- **VERIFY SAFETY:** Turn the key to the ON position only and engage the PTO lever.

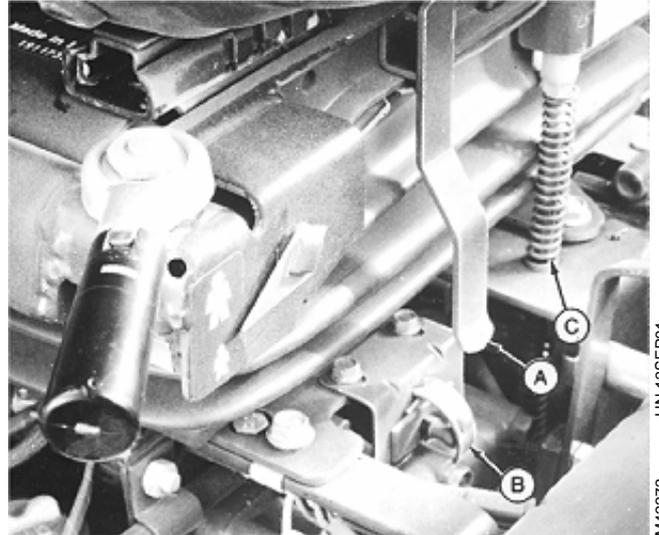
*LOOK: PTO light must come on and magnet must hold PTO lever engaged.*

Raise off the seat.

*LOOK: PTO light must go out within a short time.*

*LISTEN: PTO magnet will make a loud click sound as the striker bar (A) disengages the plunger plate (B) causing the seat switch to break the current flow to the magnet, disengaging the PTO lever in a short amount of time.*

*FEEL: Lockout rod (C) must raise far enough to lockout the right-side foot control pedals and prevent the tractor from moving if either of the pedals are accidentally depressed. Touch each pedal—they must not move.*



M42272 -JUN-12SEP91

MX,HU,8015,25C -19-16OCT91

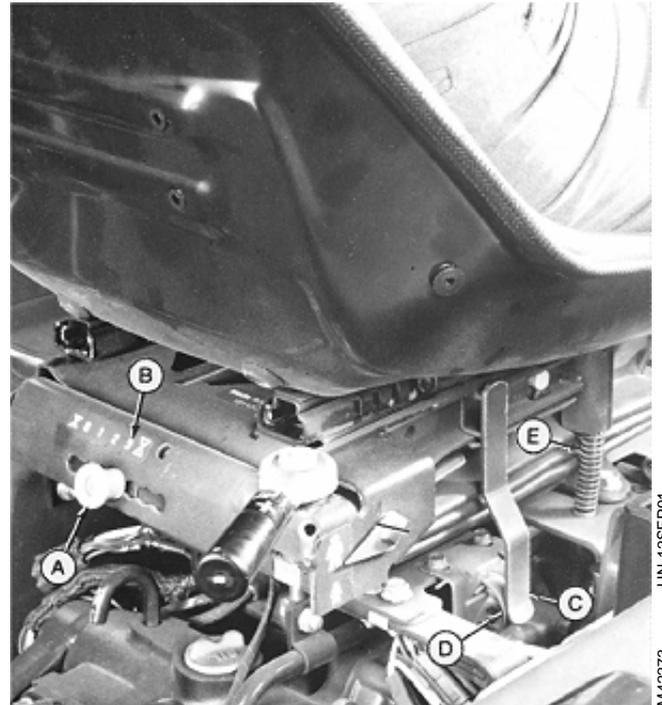
## ADJUST OPERATOR'S HEIGHT—EUROPEAN SEAT

**IMPORTANT:** If the customer/operator is not present when you install the seat, **BE SURE** to instruct him/her on these seat adjustment procedures when the tractor is delivered.

*NOTE:* ROLL-GARD® has been removed for clarity purposes only.

FOR THE TALL OPERATOR:

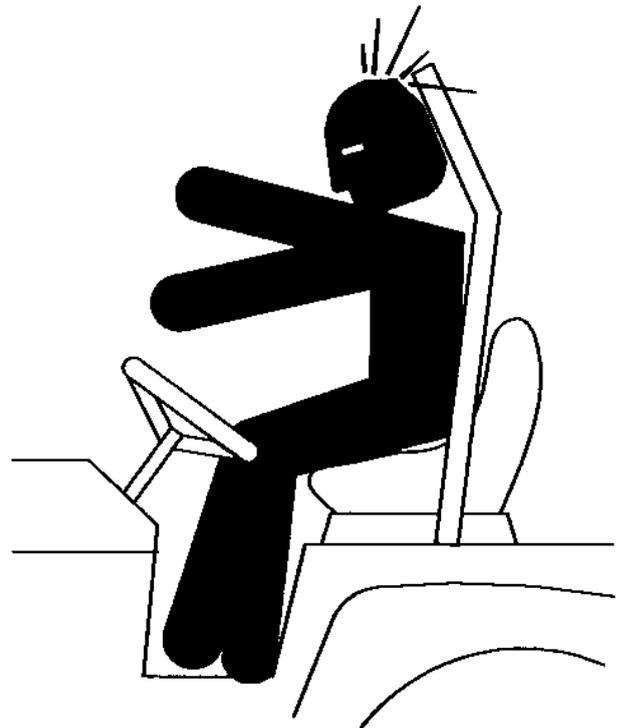
1. Operator sits in seat, pulls out on the colored height adjustment knob (A) and moves it into Setting 3 (B). This allows the seat to raise to its highest limit. Operator must see if there is engagement between striker bar (C) and plunger plate (D) and that lockout rod (E) is depressed far enough to unlock forward and reverse foot control pedals.



**N** **CAUTION:** A tall operator may adjust seat too high and too far back and risk hitting his/her head on the European Roll-Gard® above.

2. Operator carefully bounces seat up and down to see if seat is in a comfortable position to operate all tractor controls without hitting his/her head on the Roll-Gard® above:

- A—Adjustment Knob
- B—Setting 3
- C—Striker Bar
- D—Plunger Plate
- E—Lockout Rod



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- If operator's head comes close to or hits the Roll-Gard®, operator should move height knob to Setting 2 (A) and test the clearance again. Repeat procedure until a comfortable and safe setting is reached.

**LOOK:** Striker bar (B) must engage plunger plate (C) which engages seat safety switch to establish operator presence. If not, turn weight handle from positive position to negative and crank handle until it does (without bottoming out plunger inside the switch).

**FEEL:** Lockout rod (D) must be depressed far enough to unlock right-side foot control pedals. Depress both forward and reverse pedals—they should move freely through their full range of motion. If not, turn adjustment nut (E) to the left (counterclockwise) until pedals lockout is released.

- **VERIFY SAFETY:** Turn the key to the ON position only and engage the PTO lever.

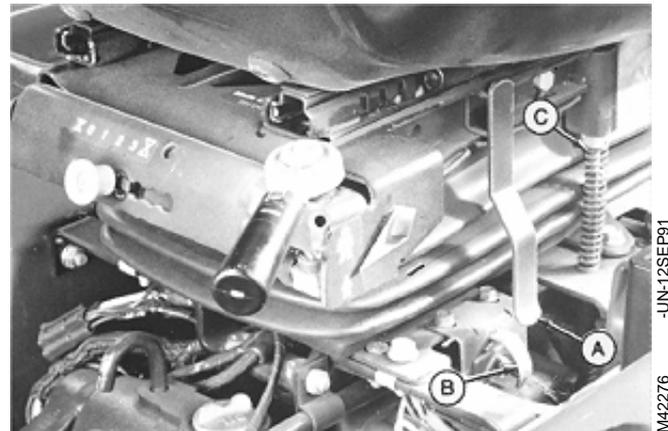
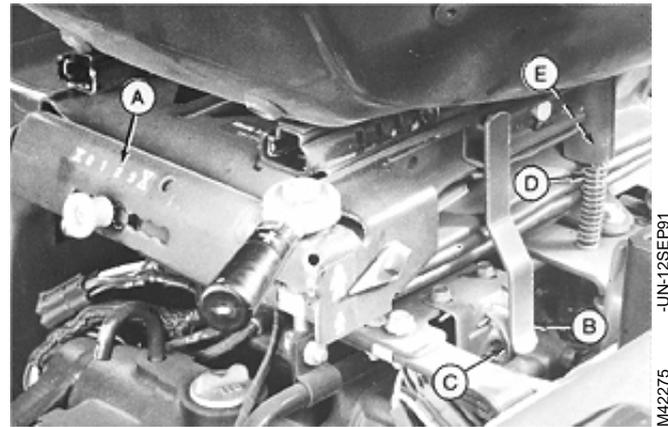
**LOOK:** PTO light must come on and magnet must hold PTO lever engaged.

Raise off the seat.

**LOOK:** PTO light must go out within a short time.

**LISTEN:** PTO magnet will make a loud click sound as the striker bar (A) disengages the plunger plate (B), causing the seat switch to break the current flow to the magnet, disengaging the PTO lever in a short amount of time.

**FEEL:** Lockout rod (C) must raise high enough to lockout the right-side foot control pedals and prevent the tractor from moving if either of the pedals are accidentally depressed. Touch each pedal—they must not move.



A—Setting 2  
B—Striker Bar  
C—Plunger Plate  
D—Lockout Rod  
E—Adjustment Nut

MX,HU,8015,26B -19-16OCT91

## ADJUST OPERATOR'S HEIGHT—EUROPEAN SEAT

FOR THE SHORT OPERATOR:

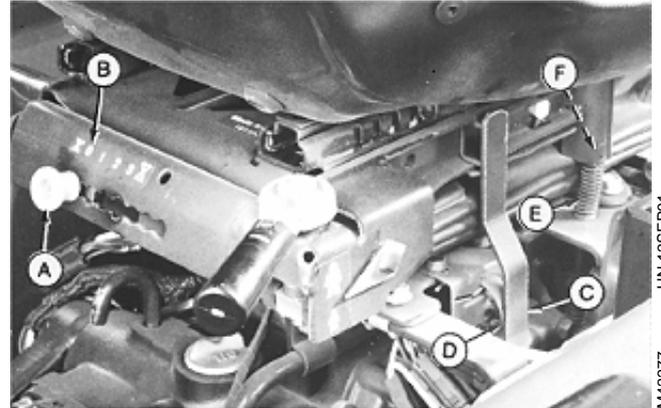
1. Operator sits in seat, pulls out on the colored height adjustment knob (A) and moves it into Setting 0 (B). This lowers the seat to its lowest limit.

2. Operator carefully bounces seat up and down to see if seat is in a comfortable position to operate all tractor controls without bottoming-out:

- If operator cannot reach all tractor controls comfortably, operator should first adjust seat forward on its rails and/or turn weight handle to negative position and crank until a comfortable position is reached without bottoming out.

*LOOK: Striker bar (C) must engage plunger plate (D) which engages seat switch to establish operator presence. If not, adjust weight handle negatively until it does.*

*FEEL: Lockout rod (E) must be depressed far enough to unlock right-side foot control pedals. Depress both forward and reverse pedals—they should move freely through their full range of motion. If not, turn adjustment nut (F) to the left (counterclockwise) until pedals lockout is released.*



A—Adjustment Knob  
B—Setting 0  
C—Striker Bar  
D—Plunger Plate  
E—Lockout Rod  
F—Adjustment Nut

IM42277 -JUN-12SEP01

- **VERIFY SAFETY:** Turn the key to the ON position only and engage the PTO lever.

*LOOK: PTO light must come on and magnet holds PTO lever engaged.*

Raise off the seat.

*LOOK: PTO light must go out within a short time.*

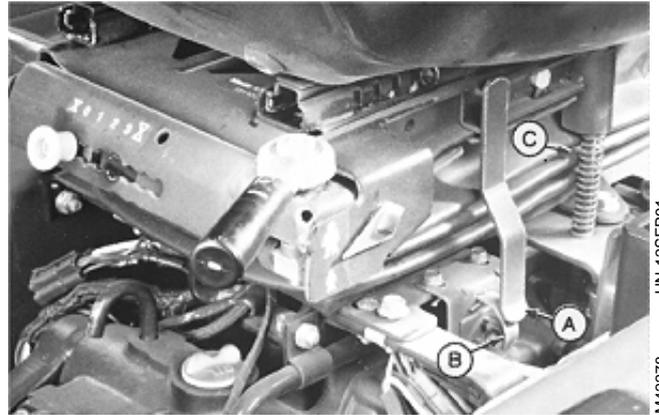
*LISTEN: PTO magnet will make a loud click sound as the striker bar (A) disengages the plunger plate (B) (shown here with slight air gap which is difficult to see from angle photographed), causing the seat switch to break the current flow to the magnet, disengaging the PTO lever in a short amount of time.*

*FEEL: Lockout rod (C) must raise high enough to lockout the right-side foot control pedals and prevent the tractor from moving if either of the pedals are accidentally depressed. Touch each pedal—they must not move.*

**FOR THE MEDIUM OPERATOR:**

The adjustment required for a medium build operator is obtained by various adjustment combinations of the body types mentioned previously.

**IMPORTANT: This European seat should be adjusted each time an operator climbs into the seat to ensure a comfortable and SAFE operating environment. Operators—DO NOT ASSUME THIS SEAT IS ADJUSTED CORRECTLY—take the time to adjust it to suit you before you start the engine, especially when other operators have driven the tractor before you.**



M42278 -UN-12SEP91

MX,HU,8015,27B -19-16OCT91





## EXPLODED VIEW—EUROPEAN ROLL-GARD®

A—M16 x 40 Bolt (2 used)  
B—Lock Washer (8 used)  
C—Flat Washer (8 used)  
D—Left Post Assembly  
E—Structural Permit Decal

F—U-Frame  
G—M20 x 125 Drilled Pin (2 used)  
H—Lock Nut (2 used)

I—Flat Washer (2 used)  
J—Spring Locking Pin (2 used)  
K—Flat Washer (2 used)

L—M20 x 130 Bolt (2 used)  
M—Right Post Assembly  
N—M16 x 120 Bolt (4 used)  
O—M16 x 130 Bolt (2 used)

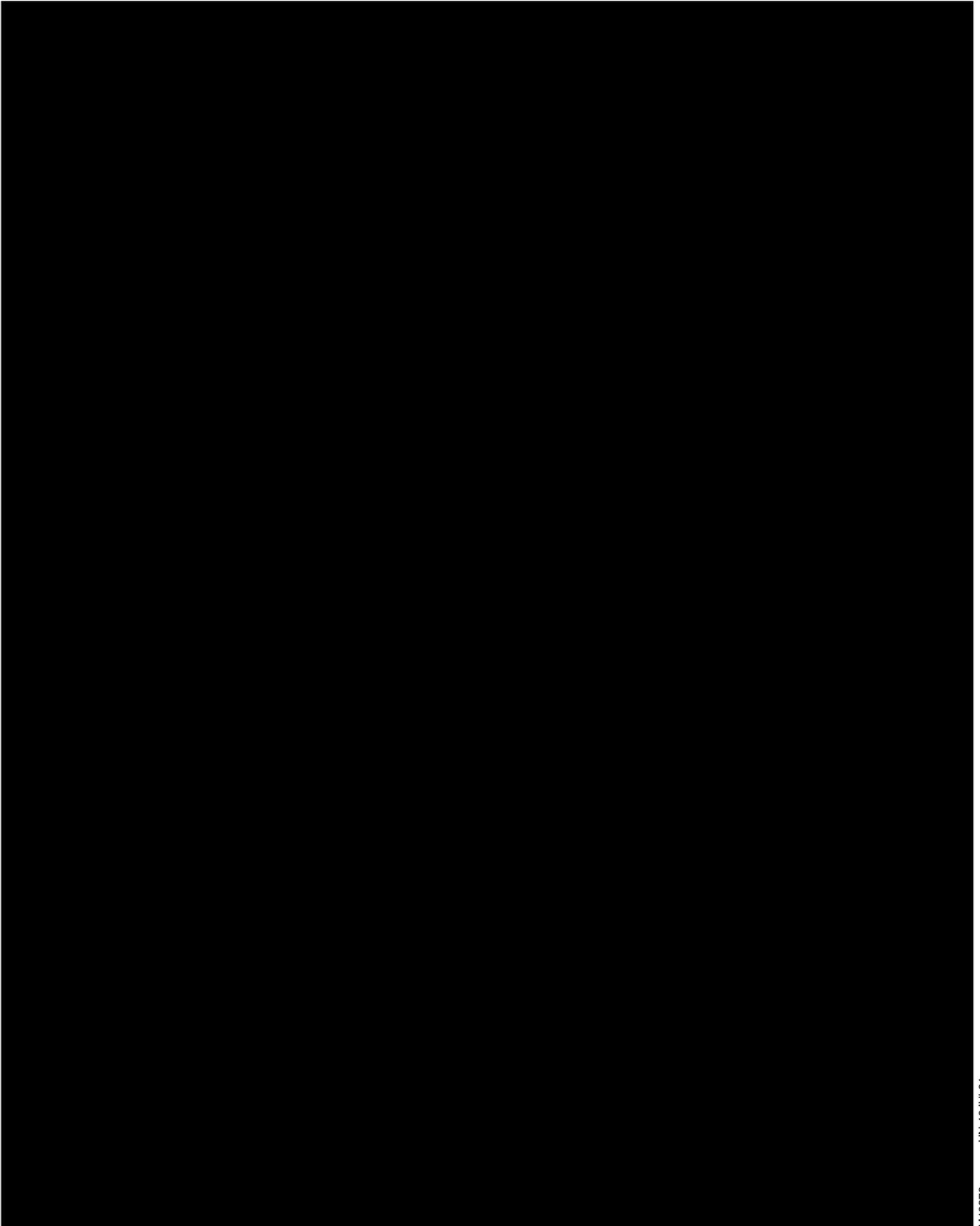
Install structural permit decal (E) on inside of right post, centered between bends in post.

Tighten M16 x 40 (A), M16 x 120 (N), and M16 x 130 (O) bolts to 315 N·m (232 lb-ft).

Install M20 x130 bolts (L) from outside-in. Tighten bolts and nuts (H) to 68 N·m (50 lb-ft).

Install M20 x 125 drilled pin (G) from inside-out so spring locking pin (J) is on outside.

MX,HU,8020,1 -19-16OCT91



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## EXPLODED VIEW—GERMAN REAR HITCH

A—Hitch Receiver Assembly  
B—Nut (4 used)  
C—Lock Washer (4 used)  
D—Hitch Pin With Locking  
Lever

E—M14 x 40 - 8.8 Bolt (4  
used)  
F—Drilled Pin With Welded  
Chain

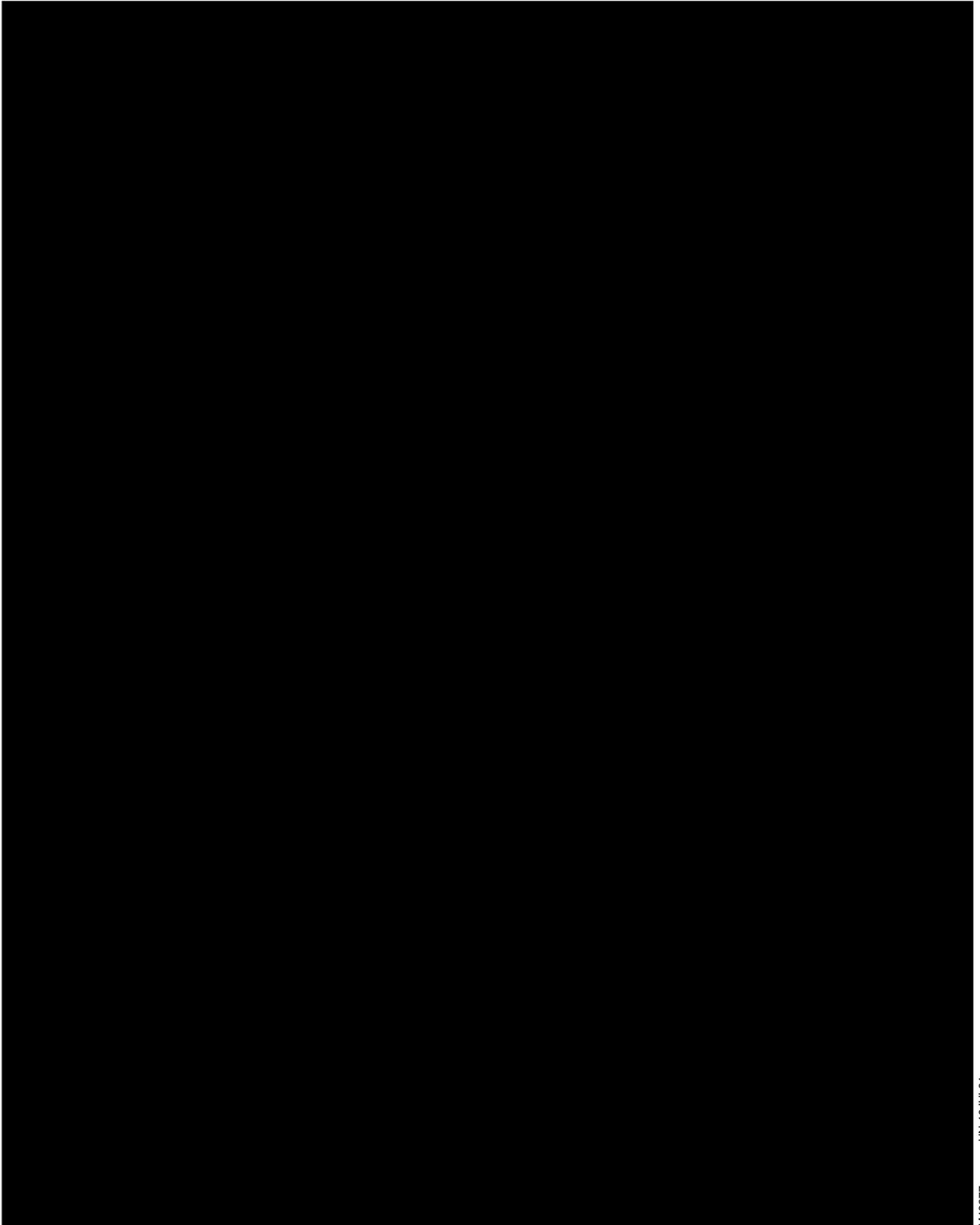
G—Spring Locking Pin  
H—Lock Washer (4 used)

I—M12 x 35 - 10.9 Bolt (4  
used)

Tighten M12 x 35 - 10.9 bolts to 130 N·m (97 lb-ft).

Tighten M14 x 40 - 8.8 bolts to 140 N·m (103 lb-ft).

MX,HU,8025,1 -19-16OCT91



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*German Rear Hitch/Exploded View—German Rear Hitch*

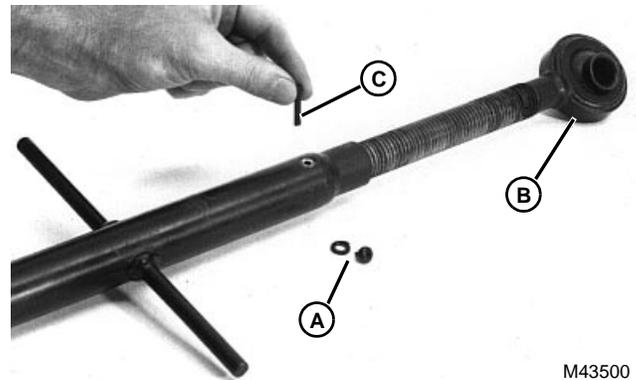
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### REPAIR CENTER LIFT LINK

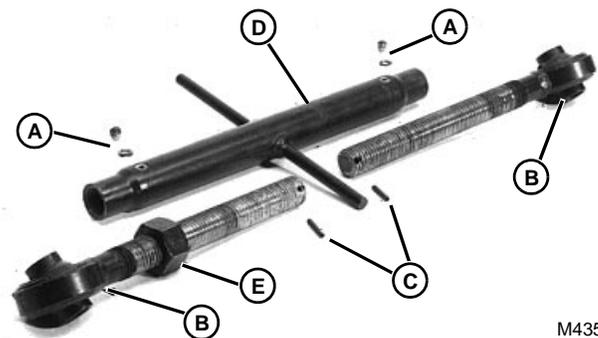
**IMPORTANT:** Improper setting of 3-point hitch can cause bent or broken lift link arms, tire damage, and chain damage. 3-point hitch must not be allowed to swing from side to side with or without attachments. Install spring furnished with tractor to eliminate any lateral movement. Also, review Operators Manual for correct setting for 3-point hitch spread using the spreader bar from each attachment.

1. To disassemble center link, remove two screws and lock washers (A).
2. Thread center link end (B) out until roll pin (C) in end of threaded shaft, is centered in screw hole. Repeat for other end.
3. Turn center link so screw hole faces downward. Tap center link lightly for roll pin to fall out. Thread center link end all-the-way out. Repeat procedure to remove other end.
4. Inspect and repair or replace parts as necessary.
5. For assembly reverse disassembly steps.

A—Screws and Lock Washers    D—Center Link Body  
B—Center Link End (2 used)    E—Jam Nut  
C—Roll Pin (2 used)



M43500



M43501

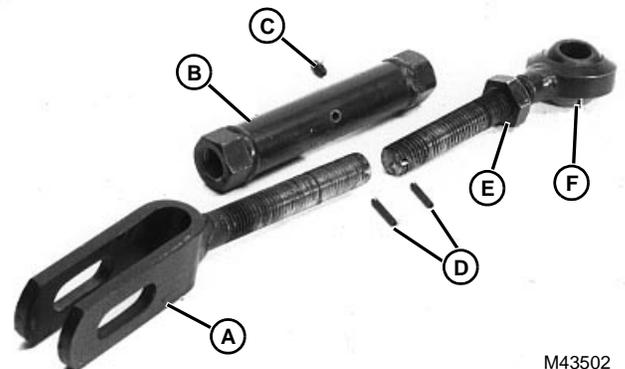
### REPAIR ADJUSTABLE LIFT LINK

**IMPORTANT:** Improper setting of 3-point hitch can cause bent or broken lift link arms, tire damage, and chain damage. 3-point hitch must not be allowed to swing from side to side with or without attachments. Install spring furnished with tractor to eliminate any lateral movement. Also, review Operators Manual for correct setting for 3-point hitch spread using the spreader bar from each attachment.

Disassembly and assembly is the same as center link, except you remove grease fitting instead of two screws and lock washers.

Inspect and repair or replace parts as necessary.

A—Yoke End                                    D—Roll Pin (2 used)  
B—Lift Link Body                            E—Jam Nut  
C—Grease Fitting                            F—Lift Link End



M43502

*3-Point Hitch/Repair Adjustable Lift Link*

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2

# Machine Operational Checkout Procedure

## Contents

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# Group 05 Machine Operational Checkout Procedure

## BEFORE YOU START

This operational checkout procedure is designed for you to perform a quick step-by-step check of the entire machine.

Perform ALL of these checks. These checks will refer you to a specific system of the machine for a more detailed step-by-step method of resolving machine problems. These procedures also provide you a method of evaluating trade-in equipment and performing an annual checkout.

A large majority of typical machine problems can be detected by using these operational checkout procedures and your senses of LOOK, LISTEN, and FEEL.

Perform these checks on a level surface in a large, open area. No special tools or equipment are required. ALL CHECKS ARE PERFORMED WITH YOU IN THE OPERATOR'S SEAT, UNLESS OTHERWISE INSTRUCTED. Perform these checks with a mid or rear PTO drive attachment mounted on the tractor.

Begin with Step 1 and read from left to right. Read each step completely before performing the check.

Do the entire operational checkout procedure, making note of problems that need to be resolved. Once the machine checkout is complete, turn to the appropriate sections in this manual to correct any problems.

MX,HU,21005,1 -19-16OCT91

|  |                        |  |   |   |
|--|------------------------|--|---|---|
| <p><b>FOOT CONTROL PEDAL LOCKOUT CHECK</b></p> | <p>Raise OFF seat.</p> |  | <p>Step on FORWARD, then REVERSE control pedals.</p> <p><i>LOOK/FEEL: Pedals MUST NOT move.</i></p> | <p><b>OK: GO TO ' 1</b></p> <p><b>NOT OK: GO TO SECTION 250</b></p> |
|--|------------------------|--|---|---|

M43932 -UN-31AUG88

MX,HU,21005,2 -19-16OCT91

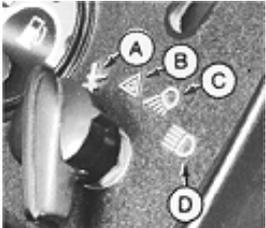
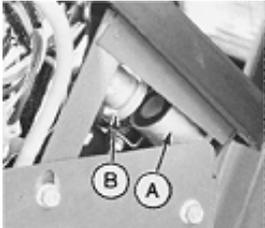
|  |   |  |   |
|--|---|--|---|
| <p><b>INSTRUMENT PANEL LAMPS CHECK</b></p> |  | <p>Turn key switch ON.</p> <p><i>LOOK: Oil pressure, battery discharge and engine preheat lamp ON.</i></p> <p><i>LISTEN: Fuel pump MUST BE operating (rapid, faint clicking sound)—655, 755/756, and early</i></p> | <p><i>model 855/856 tractors only. Late model 855 and all 955 tractors have mechanical fuel transfer pumps.</i></p> |
|--|---|--|---|

M43925 -UN-31AUG88

|  |   |
|--|---|
| <p><i>NOTE: On 655 and 755/756 preheat lamp will go OFF in 8 seconds or less, or may not come on if engine is hot. On 855/856 and 955, preheat lamp will only come ON if ambient temperature is about 40°F (10°C) or less.</i></p> | <p><b>OK: GO TO Æ</b></p> <p><b>NOT OK: GO TO SECTION 240</b></p> |
|--|---|

MX,HU,21005,3 -19-16OCT91

Machine Operational Checkout Procedure/PTO Safety Start Check

|  |   |  |  |
|--|---|--|--|
| <p><b>Æ COOLANT TEMPERATURE LAMP AND NEUTRAL START CHECK</b></p> <p>Key switch OFF.</p>  | <p><b>N CAUTION: BE AWARE</b> that if neutral start system is defective, machine may <b>START</b> and move forward or rearward.</p> <p>Throttle at SLOW idle, foot control pedal in SLOW FORWARD.</p>   |  <p>Turn key switch to START.</p> <p><i>LOOK: Coolant temperature lamp ON, engine MUST NOT crank.</i></p> <p>M43898 -UN-31AUG88</p>   | <p><b>OK: GO TO Æ</b></p> <p><b>NOT OK: GO TO SECTION 240</b></p> <p>MX,HU,21005.4 -19-16OCT91</p> |
| <p><b>Å FUEL GAUGE CHECK</b></p> <p>Turn key switch ON.</p>  |  <p><i>LOOK: Fuel gauge MUST move to indicate approximate fuel level in tank.</i></p> <p>Add a known amount of fuel to tank as needed to verify fuel gauge is working.</p> <p>M43926 -UN-31AUG88</p>  | <p><b>OK: GO TO Å</b></p> <p><b>NOT OK: GO TO SECTION 240</b></p> <p>MX,HU,21005.5 -19-16OCT91</p>   |  |
| <p><b>Ö LIGHT SWITCH CHECK</b></p> <p>Turn key switch ON.</p> <p>Turn light switch to each position.</p>                             |  <p><i>LOOK: Lights should operate (from left to right) as follows:</i></p> <p>A—OFF<br/>         B—Warning lights<br/>         C—Rear work light (if equipped), headlights, and hoodlights<br/>         D—Warning lights, headlights, and hoodlights.</p> <p>M43928 -UN-12SEP91</p> | <p><b>OK: GO TO Ö</b></p> <p><b>NOT OK: GO TO SECTION 240</b></p> <p>MX,HU,21005.6 -19-16OCT91</p>   |  |
| <p><b>Ò PTO SAFETY START CHECK</b></p> <p>Open hood.</p> <p>Turn key switch ON.</p> <p>Engage PTO lever (PTO lamp will come ON).</p> | <p><b>N CAUTION: BE AWARE</b> that if PTO safety circuit is defective, machine may <b>START</b> and PTO may <b>ENGAGE</b>.</p>  |  <p>Briefly turn key switch to START position and release.</p> <p><i>LOOK/LISTEN: PTO magnet (A) will "click" as it disengages from lever (B), and lamp will go out almost instantaneously.</i></p> <p>M43929 -UN-31AUG88</p> | <p><b>OK: GO TO Ò</b></p> <p><b>NOT OK: GO TO SECTION 240</b></p> <p>MX,HU,21005.7 -19-16OCT91</p> |

*Machine Operational Checkout Procedure/PTO/Seat Safety Switch Check*

|   |   |   |   |  |
|---|---|---|---|--|
| <p><b>0</b> STARTING CIRCUIT CHECK (NORMAL OPERATION)</p>     | <p>Master/Park Brake pedal engaged in PARK position.</p> <p>PTO OFF.</p>                                    |  <p>M43898 -UN-31AUG88</p>   | <p>Briefly turn key to START position and release.</p> <p><i>LISTEN: Starter MUST crank engine.</i></p>   | <p><b>OK:</b> GO TO 0</p> <p><b>NOT OK:</b> GO TO SECTION 240</p> <p align="right">MX,HU,21005,8 -19-16OCT91</p>   |
| <p><b>0</b> ENGINE PERFORMANCE CHECK</p> <p>START engine.</p> |  <p>M43933 -UN-31AUG88</p> | <p>Move throttle lever from SLOW to FAST idle.</p>  | <p><i>LISTEN/FEEL: Engine MUST accelerate smoothly WITHOUT hesitation. Engine MUST idle (SLOW and FAST) at constant speed WITHOUT "hunting" or "surging".</i></p>   | <p><b>OK:</b> GO TO 0</p> <p><b>NOT OK:</b> GO TO SECTION 220</p> <p align="right">MX,HU,21005,9 -19-16OCT91</p>   |
| <p><b>0</b> TACHOMETER AND IDLE SPEED CHECK</p>               | <p>START engine and run at SLOW idle, then FAST idle.</p>   |  <p>M43975 -UN-31AUG88</p>  | <p><i>LOOK: Tachometer should read about 1400 rpm at SLOW idle and about 3425 rpm at FAST idle.</i></p> <p><i>LISTEN: Engine rpm increases and decreases smoothly.</i></p> <p><i>FEEL: Engine vibration MUST smooth-out as rpm increases.</i></p>   | <p><b>OK:</b> GO TO 10</p> <p><b>NOT OK:</b> GO TO SECTION 220</p> <p align="right">MX,HU,21005,10 -19-16OCT91</p> |
| <p><b>10</b> PTO/SEAT SAFETY SWITCH CHECK</p>                 | <p>Turn key switch ON.</p>  |  <p>M43927 -UN-31AUG88</p> | <p>ENGAGE PTO lever.</p> <p><i>LOOK: PTO lamp ON.</i></p> <p>Raise OFF seat for 1—2 seconds.</p> <p><i>LOOK: PTO lever MUST DISENGAGE. PTO lamp MUST turn OFF.</i></p> <p><i>LISTEN: You will hear a loud "click" as PTO magnet DISENGAGES.</i></p> | <p><b>OK:</b> GO TO 1!</p> <p><b>NOT OK:</b> GO TO SECTION 240</p> <p align="right">MX,HU,21005,11 -19-16OCT91</p> |

Machine Operational Checkout Procedure/PTO/Seat Switch Bypass Check

**1! PTO OPERATION CHECK**

*NOTE: Have a helper watch PTO shafts from a SAFE distance, they MUST rotate when ENGAGED.*

Run engine at SLOW idle.



M43935 -UN-31AUG88



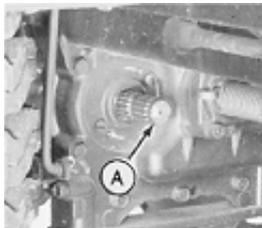
M43927 -UN-31AUG88

Move PTO selector lever to one of the three positions, then ENGAGE PTO lever.

*LOOK: PTO lever MUST remain engaged. PTO dash lamp MUST be ON.*

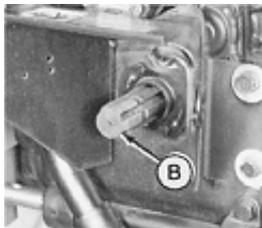
Recycle PTO lever and repeat for other two selector lever positions.

MX,HU,21005,12 -19-16OCT91



M45004 -UN-31AUG88

Mid PTO shaft (A) MUST turn when selector lever is in MIDDLE and DOWN position.



M45005 -UN-31AUG88

Rear PTO shaft (B) MUST turn when selector lever is in MIDDLE and UP position.

**OK: GO TO 1@**

**PTO SHAFTS DON'T TURN: GO TO SECTION 250**

**LAMP NOT ON: GO TO SECTION 240**

MX,HU,21005,13 -19-16OCT91

**1@ PTO/SEAT SWITCH BYPASS CHECK**

Operator OFF seat.

Tilt seat forward.

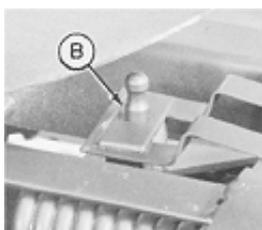
Turn key switch ON.

Move PTO selector lever (A) into rear PTO position.



M43930 -UN-31AUG88

Pull seat switch plunger (B) OUTWARD into OVERRIDE position, then ENGAGE PTO lever.



M43931 -UN-31AUG88

*LOOK: PTO magnet and lever MUST stay ENGAGED. PTO lamp ON.*

**OK: GO TO 1#**

**LEVER/MAGNET DO NOT STAY ENGAGED OR LAMP DOES NOT COME ON: GO TO SECTION 240.**

MX,HU,21005,14 -19-16OCT91

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05  
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Machine Operational Checkout Procedure/PTO Brake Check

1# PTO BRAKE CHECK

**CAUTION:** Perform this check in a clean, open area.

*NOTE: Tractor MUST have a mid PTO and a rear PTO driven attachment installed for this check.*

- PTO LEVER CHECK: mid-mounted attachment.
- START engine and run at 1/3 throttle. Move throttle to FAST idle.
- Move PTO selector lever to the DOWN position (MID PTO).
- ENGAGE PTO lever to drive



M43936 -UN-31AUG88

Be ready to note the time needed to stop PTO rotation of mid-mounted attachment.

Move PTO lever into OFF position.

*LOOK/LISTEN: Attachment MUST STOP in 4 seconds or less from the time the PTO lever is DISENGAGED.*

Move throttle back to 1/3 speed.

(Continued on next page)

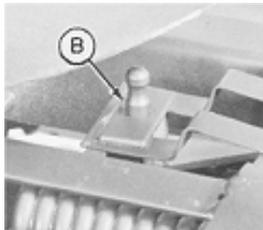
MX,HU,21005,15 -19-16OCT91

(PTO BRAKE CHECK continued)

• PTO/SEAT SWITCH CHECK

ENGAGE PTO lever to drive mid-mounted attachment.

Move throttle to FAST idle.



M43931 -UN-31AUG88

Be ready to note the time needed to stop attachment PTO rotation.

Raise OFF seat so seat switch plunger (B) DISENGAGES.

*LOOK/LISTEN: Attachment MUST STOP in 4 seconds or less from the time the PTO lever kicks OFF.*

Move throttle to 1/3 speed.

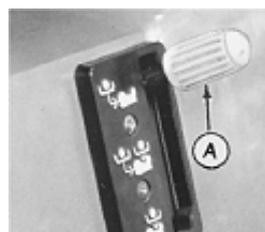
MX,HU,21005,15A-19-16OCT91

• PTO/OVERRIDE SWITCH CHECK

Operator OFF tractor.

**CAUTION:** Keep feet clear of any attachment.

Move PTO selector lever into the UP position (REAR PTO).

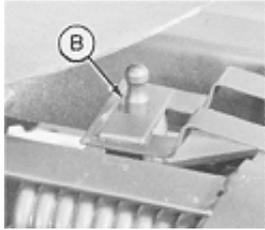


M43930 -UN-31AUG88

Raise seat, then pull plunger (B) outward to engage OVERRIDE switch.

Continued on next page

Machine Operational Checkout Procedure/Master/Park Brake Lock Check



M43931 -UN-31AUG88

ENGAGE PTO lever, then move throttle to FAST idle.



M43936 -UN-31AUG88

Be ready to note the time needed to stop attachment rotation.

Push plunger into OFF position.

**LOOK/LISTEN:**  
Attachment must stop in 4 seconds or less from the time the PTO lever kicks OFF and loud "click" sounds. PTO lamp goes OFF instantly.

Move throttle to SLOW idle.

**OK:** GO TO 1\$

**NOT OK:** GO TO SECTION 250 FOR PTO LEVER CHECK. GO TO SECTION 240 FOR PTO/SEAT SWITCH CHECK, PTO/OVERRIDE SWITCH CHECK, AND PTO LAMP CHECK.

MX,HU,21005,15B-19-16OCT91

**1\$ POWER STEERING CHECK**

Run engine at FAST idle.



M43855 -UN-31AUG88

Turn steering wheel fully left and right.

**LOOK/FEEL:** Wheels **MUST** turn **SMOOTHLY** from stop-to-stop. There **MUST NOT BE** any hesitation or jerky movement. Wheels **MUST** stop turning when steering wheel is **STOPPED**.

**OK:** GO TO 1%

**NOT OK:** GO TO SECTION 260

MX,HU,21005,16 -19-16OCT91

**1% PRIORITY POWER STEERING CHECK**

Run engine at FAST idle.

LOWER attachment to the ground.

Turn steering wheel.

**LOOK/FEEL:** Note effort needed to turn steering wheel and smoothness of turn.



M43855 -UN-31AUG88

Turn steering wheel and RAISE attachment at the same time.

**FEEL:** Steering effort and smoothness of turn **MUST BE** the same.

**OK:** GO TO 1U

**NOT OK:** GO TO SECTION 270

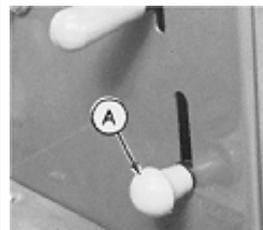
MX,HU,21005,17 -19-16OCT91

**1U MASTER/PARK BRAKE LOCK CHECK**



M43938 -UN-31AUG88

FULLY DEPRESS master/park brake pedal.



M43937 -UN-31AUG88

Raise park brake lever (A) into LOCK position and release master/park brake pedal. Release park brake lever.



M43947 -UN-31AUG88

**LOOK/FEEL:** Master/park brake pedal **MUST** stay in depressed (LOCKED) position. Park brake lever **MUST** stay in LOCK position. Directional foot control pedals **MUST BE LOCKED** in NEUTRAL position.

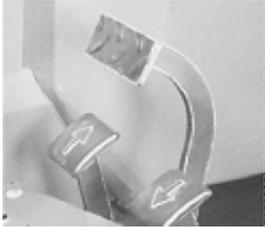
**OK:** GO TO 1&

**NOT OK:** GO TO SECTION 260

MX,HU,21005,18 -19-16OCT91

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6

*Machine Operational Checkout Procedure/Transmission Neutral Return Check*

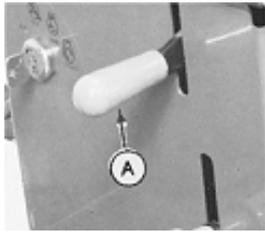
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| <p><b>1&amp; TRANSMISSION NEUTRAL CHECK</b></p>  | <p>START engine and run at HALF throttle.</p>   |  <p>M43947 -UN-31AUG88</p>            | <p>Foot control pedals in NEUTRAL.</p> <p><i>LOOK/FEEL: Machine MUST NOT "creep" forward or rearward.</i></p>   | <p><b>OK: GO TO 1*</b></p> <p><b>NOT OK: GO TO SECTION 250</b></p> <p align="right">MX,HU,21005,19 -19-16OCT91</p> |
| <p><b>1* LEFT AND RIGHT TURN BRAKES CHECK</b></p>  | <p>Perform this check in a clean, wide open area.</p> <p>START engine and run at HALF throttle.</p> <p>Drive tractor in SLOW forward.</p> |  <p>M43939 -UN-09JAN90</p>            | <p>Depress left, then right turn brake pedals.</p> <p><i>LOOK: Left, then right wheels MUST stop turning.</i></p>   | <p><b>OK: GO TO 1(</b></p> <p><b>NOT OK: GO TO SECTION 260</b></p> <p align="right">MX,HU,21005,20 -19-16OCT91</p> |
| <p><b>1( TRANSMISSION DRIVE CHECK</b></p>  | <p>Perform this check in a clean, wide open area.</p> <p>Run engine at FAST idle.</p>   |  <p>M43932 -UN-31AUG88</p>            | <p>Slowly depress forward control pedal through FULL operating range, then do the same for the reverse control pedal.</p> <p><i>FEEL: Tractor MUST accelerate SMOOTHLY to full forward and full reverse speeds.</i></p> | <p><b>OK: GO TO 20</b></p> <p><b>NOT OK: GO TO SECTION 250</b></p> <p align="right">MX,HU,21005,21 -19-16OCT91</p> |
| <p><b>20 TRANSMISSION NEUTRAL RETURN CHECK</b></p> <p>Perform this check in a clean, wide open area.</p> <p>Move two-speed axle lever into HI position.</p>  |  <p>M43932 -UN-31AUG88</p>                             | <p>Run engine at HALF throttle.</p> <p>Fully depress forward control pedal. Release pedal while tractor is moving.</p> |   |  |
| <p><i>LOOK/FEEL: Tractor MUST come to a SMOOTH STOP within 3 seconds.</i></p> <p><i>NOTE: Stopping time may be longer if equipped with additional attachments or shorter if no attachments are installed.</i></p> <p>Repeat this check in reverse.</p> |   |  | <p><b>OK: GO TO 2!</b></p> <p><b>NOT OK: GO TO SECTION 250</b></p> <p align="right">MX,HU,21005,22 -19-16OCT91</p>  |  |

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Machine Operational Checkout Procedure/Cruise Control Release Checks

**2!** CRUISE CONTROL LOCK CHECK

Engine OFF.



M43940 -UN-31AUG88

Hold cruise control lever (A) UP.



M43932 -UN-31AUG88

Slowly depress forward control pedal and release after the first or second notch ENGAGES.

Release cruise control lever.

*LOOK: Both the cruise control lever and forward foot control pedal MUST remain ENGAGED.*

Slowly continue procedure through mid and then full range of travel.

*FEEL: Pawl of foot control linkage ENGAGES each notch of ratchet bracket.*

*LOOK/FEEL: Forward control pedal and cruise control lever MUST stay ENGAGED in any notched position.*

**OK:** GO TO 2@

**NOT OK:** GO TO SECTION 250

MX,HU,21005,23 -19-16OCT91

**2@** CRUISE CONTROL RELEASE CHECKS

Engine OFF.

Check low, mid, and high ranges of travel.



M43940 -UN-31AUG88

Depress forward control pedal.

Pull UP on cruise control lever (A) and HOLD. Release forward foot control pedal at desired point. Release cruise control lever.

*LOOK: Cruise control lever and forward foot control pedal MUST remain ENGAGED.*



M43932 -UN-31AUG88

Depress forward foot control pedal further and release.

*LOOK: Cruise control lever MUST DISENGAGE and return to the bottom of its slot almost instantaneously. Foot control pedals MUST return to NEUTRAL.*

MX,HU,21005,24 -19-16OCT91



M43940 -UN-31AUG88

Reset cruise control lever (A) anywhere in the range of travel.



M43938 -UN-31AUG88

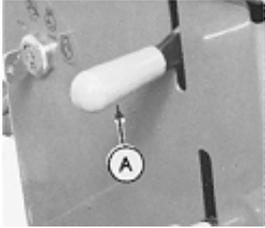
Depress master/park brake.

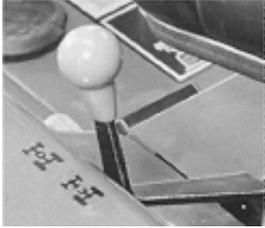
*LOOK: Cruise control lever MUST DISENGAGE and return to the bottom of its slot. The foot control pedals MUST return to NEUTRAL.*

**Continued on next page**

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*Machine Operational Checkout Procedure/Two-Speed Axle Check*

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| <p>Reset cruise control lever anywhere in the range of travel.</p> |  <p>M43940 -UN-31AUG88</p> | <p>Push DOWN on cruise control lever (A).</p> <p><i>LOOK/FEEL: Cruise control lever MUST DISENGAGE and return to the bottom of its slot. The foot control pedals MUST return to NEUTRAL.</i></p> | <p><b>OK:</b> GO TO 2#</p> <p><b>NOT OK:</b> GO TO SECTION 250</p> <p align="right">MX,HU,21005,25 -19-16OCT91</p> |
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| <p><b>2# MECHANICAL FRONT WHEEL DRIVE (MFWD) CHECK</b></p> <p>Perform this check in a wide-open dirt, gravel, or short grassy area.</p> <p>Run engine at SLOW idle.</p> |  <p>M43941 -UN-31AUG88</p> | <p>ENGAGE MFWD lever.</p> <p>Turn steering wheel FULL right.</p> <p>Drive machine slowly forward in SHARP right turn.</p> | <p><i>LOOK: Inside (right) wheel MUST slip or scuff forward.</i></p> <p><i>NOTE: If necessary, repeat test with MFWD DISENGAGED and compare results.</i></p> | <p><b>OK:</b> GO TO 2\$</p> <p><b>NOT OK:</b> GO TO SECTION 250</p> <p align="right">MX,HU,21005,26 -19-16OCT91</p> |
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| <p><b>2\$ DIFFERENTIAL LOCK CHECK</b></p> <p>Perform this check in a wide-open dirt, gravel, or short grassy area.</p> <p>MFWD disengaged, engine at SLOW idle.</p> <p>Drive tractor in a SHARP right turn.</p> |  <p>M43942 -UN-31AUG88</p> | <p>DEPRESS differential lock pedal with heel of left foot.</p> | <p><i>LOOK: Inside (right) front wheel MUST scuff forward slightly while turning.</i></p> <p><i>NOTE: If necessary, repeat check with differential lock DISENGAGED and compare results.</i></p> <p><b>OK:</b> GO TO 2%</p> <p><b>NOT OK:</b> GO TO SECTION 250</p> <p align="right">MX,HU,21005,27 -19-16OCT91</p> |
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| <p><b>2% TWO-SPEED AXLE LEVER CHECK</b></p> <p>Perform this check in a clean, wide-open area.</p> <p>Run engine at HALF throttle.</p> |  <p>M43943 -UN-31AUG88</p> | <p>Put two-speed selector lever in LO-RANGE position.</p> <p>Depress forward control pedal FULLY and note ground speed.</p> <p>STOP, shift lever to HI-RANGE position, repeat check.</p> | <p><b>OK:</b> GO TO 2%</p> <p><b>NOT OK:</b> GO TO SECTION 250</p> <p align="right">MX,HU,21005,27 -19-16OCT91</p> |
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| <p><b>2% TWO-SPEED AXLE LEVER CHECK</b></p> <p>Perform this check in a clean, wide-open area.</p> <p>Run engine at HALF throttle.</p> |  <p>M43943 -UN-31AUG88</p> | <p>Put two-speed selector lever in LO-RANGE position.</p> <p>Depress forward control pedal FULLY and note ground speed.</p> <p>STOP, shift lever to HI-RANGE position, repeat check.</p> | <p align="right"><b>Continued on next page</b></p> |
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Machine Operational Checkout Procedure/Rockshaft Check

*FEEL:* Ground speed should be about **TWICE-AS-FAST** in HI as it was in LO.

*NOTE:* After Serial Number 615000, reverse speed is the same in HI- or LO-range.

**OK:** GO TO 20

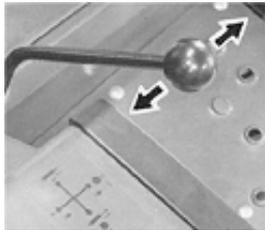
**NOT OK:** GO TO SECTION 250

Put two-speed lever in NEUTRAL, depress forward control pedal.

*LISTEN:* There **MUST NOT BE** any noise or gear clash.

MX,HU,21005,28 -19-16OCT91

**20 SELECTIVE CONTROL VALVE (SCV) CHECK**



M43973 -UN-31AUG88

Slowly pull SCV lever back and release.

*LOOK/FEEL:* Lever **MUST** return to NEUTRAL.

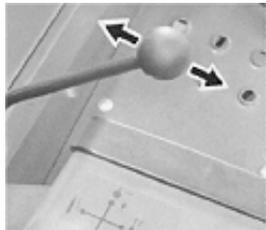
Slowly push lever forward to first stop and release.

*LOOK/FEEL:* Lever **MUST** return to NEUTRAL.

Slowly push lever fully forward past detent into FLOAT position.

*LOOK/FEEL:* Lever **MUST** stay in position.

MX,HU,21005,29 -19-16OCT91



M43974 -UN-31AUG88

Slowly pull SCV lever to the left (toward seat) and release.

*LOOK/FEEL:* Lever **MUST** return to NEUTRAL.

*NOTE:* You will feel a small detent and hear a slight "click" as you move out of neutral—this is **NOT** to be mistaken for the first stop.

Slowly push lever to the right to first stop and release.

*LOOK/FEEL:* Lever **MUST** return to NEUTRAL.

Slowly push lever to the right to first stop then slowly apply more pressure to push lever fully right and release.

*FEEL:* There **MUST BE** two distinctive positions—farthest position is the **REGENERATIVE** function. Released lever **MUST** return to NEUTRAL.

**OK:** GO TO 2&

**NOT OK:** GO TO SECTION 270

MX,HU,21005,30 -19-16OCT91

**2& ROCKSHAFT CHECK**



M43862 -UN-31AUG88

Turn stop valve (A) **FULLY OPEN** (counterclockwise).

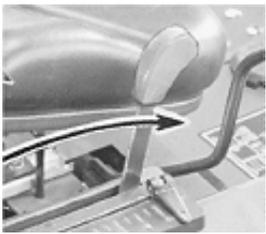
Run engine at FAST idle.

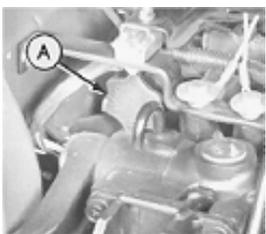
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MX,HU,21005,31 -19-16OCT91

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Machine Operational Checkout Procedure/Rockshaft Stop Valve Check

|                                    |   |   |   |
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| <p>(Rockshaft Check continued)</p> |  <p>Move rockshaft lever fully forward into LOWER position.</p> <p><i>NOTE: It may be necessary to push rockshaft arms down into fully lowered position.</i></p> | <p>Move rockshaft lever fully back into stop quadrant (FULL RAISE position).</p> <p><i>LOOK: Rockshaft MUST raise FULLY.</i></p> <p><i>FEEL: Lever will spring slightly into notched stop quadrant.</i></p> | <p><b>OK:</b> GO TO 2*</p> <p><b>NOT OK:</b> GO TO SECTION 270</p> <p style="text-align: right;">MX,HU,21005,32 -19-16OCT91</p> |
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| <p>2* <b>ROCKSHAFT STOP VALVE CHECK</b></p> <p>Partially LOWER rockshaft.</p> |  <p>Turn stop valve (A) FULLY CLOSED (clockwise).</p> |  |
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| <p>Move rockshaft lever back to RAISE position.</p> <p><i>LOOK: Rockshaft arms MUST NOT MOVE.</i></p> <p><i>LISTEN: System relief valve will give off a humming sound as system goes in RELIEF.</i></p> | <p>Move throttle to SLOW idle, then turn OFF engine.</p> <p>FULLY OPEN stop valve (counterclockwise).</p> | <p><b>OK:</b> Procedure complete.</p> <p><b>NOT OK:</b> GO TO SECTION 270</p> <p style="text-align: right;">MX,HU,21005,33 -19-16OCT91</p> |
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# Section 220

## Engine/Fuel Operation and Tests

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| Engine Surges or Stalls Frequently . . . . .                                 | 220-10-2 | Engine Oil Test Specifications . . . . .                          | 220-10-8           |
| Engine Misses . . . . .  | 220-10-2 | Cooling Fan Installation—955 . . . . .                            | 220-10-9           |
| Engine Does Not Develop Full Power . . . . .                                 | 220-10-2 |   |                    |
| Excessive Black or Gray Exhaust<br>Smoke . . . . .                           | 220-10-3 |   |                    |
| White Exhaust Smoke . . . . .  | 220-10-3 |   |                    |
| Slow Acceleration/Engine Will Not<br>Accelerate/No Fast Idle Speed . . . . . | 220-10-3 |   |                    |
| Abnormal Engine Noise, Loud<br>Knock, or Vibration . . . . .                 | 220-10-3 |   |                    |
| Low Oil Pressure . . . . .   | 220-10-3 |   |                    |
| High Oil Pressure . . . . .  | 220-10-3 |   |                    |
| Oil in Coolant or Coolant in Oil . . . . .                                   | 220-10-3 |   |                    |
| Engine Overheats . . . . .   | 220-10-3 |   |                    |
| Engine Runs Cold . . . . .   | 220-10-3 |   |                    |
| Engine Starts But Then Stops When Key<br>Is Released . . . . .               | 220-10-3 |   |                    |
| Diesel Fuel In Crankcase . . . . .   | 220-10-4 |   |                    |
| Idle Erratic, Can't Keep Air Bled From<br>Injection Lines . . . . .          | 220-10-4 |   |                    |
| Fuel Shut-off Solenoid Releases<br>When Engine Warms Up . . . . .            | 220-10-4 |   |                    |
| White Smoke Coming From<br>Crankcase Breather . . . . .                      | 220-10-4 |   |                    |
| Engine RPM Will Not Lower . . . . .  | 220-10-4 |   |                    |
| Blue Exhaust Smoke . . . . .   | 220-10-4 |   |                    |



# Engine Systems Operational Checkout Procedure

## BEFORE YOU START

Always begin with this group to identify a failure in the engine system. The step-by-step procedures will provide you with a quick check of the system. If a failure is indicated, you will be referred to a more detailed check, adjustment, or test.

This procedure is designed as a quick check of the system. While performing the check, concentrate only on the check you are performing and disregard signals from unrelated components.

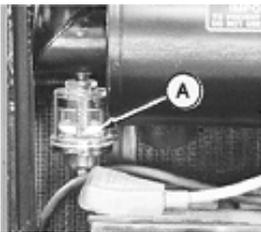
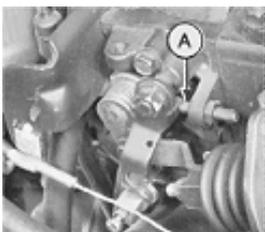
Always start with the first step and follow the sequence from left to right. Read each step completely before performing the check.

MX,22005HU,1 -19-16OCT91

|  |  |   |
|--|--|---|
| <p><b>ENGINE LUBRICATION CHECK</b></p> <p>Open hood. Check engine oil level, condition, and viscosity.</p> |  <p>M43888 -UN-31AUG88</p> <p>Inspect for external engine oil leakage from oil pan gasket, drain plug, valve cover gasket, valve cover nuts (with O-ring), head gasket, fuel injection pump gaskets, oil fill caps, breather, breather cap and hose, dipstick tube, oil pressure switch, and oil filter.</p> <p>On 955 and late 855 tractors:<br/>If engine oil level is high, check mechanical fuel transfer pump for internal leak.</p> | <p>Repair or replace as required then.... GO TO</p> <p>MX,22005HU,2 -19-16OCT91</p> |
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|---|--|---|
| <p><b>ENGINE COOLANT CHECK</b></p> <p>Check for proper coolant level.</p> |  <p>M43889 -UN-31AUG88</p> <p>Inspect for external coolant leakage from radiator, water pump, water pump/thermostat hose, thermostat cover and housing, drain plug, radiator cap, and radiator hoses.</p> <p>Inspect radiator hoses for cracks or hard conditions.</p> <p>Inspect radiator for bent fins, dents, and cracked seams.</p> | <p>Repair or replace as required then.... GO TO</p> <p>MX,22005HU,3 -19-16OCT91</p> |
|---|--|---|

*Engine Systems Operational Checkout Procedure/Throttle Lever Check*

|   |   |   |
|---|---|---|
| <p><b>Æ AIR RESTRICTION INDICATOR CHECK</b></p> <p><b>IMPORTANT:</b> Indicator will not register correctly if the air intake system has a leak prior to the location of the indicator.</p>  |  <p><i>LOOK: Yellow indicator position MUST BE below red mark.</i></p> <p><i>NOTE: It is normal for indicator to show 380 mm (15 in.) vacuum with clean primary element.</i></p>   |   |
| <p>Run engine at FAST idle.                      reading.</p> <p>Pinch rubber inlet boot partially shut to restrict air flow and observe indicator operation.                      Push button to RESET.</p> <p>Indicator should move with moderate restriction.</p> <p>Indicator MUST hold most restricted</p> | <p><b>OK:</b> SYSTEM NORMAL<br/>GO TO 3a</p> <p><b>NOT OK:</b> SEE SECTION 30.</p>  |   |
| <p><b>3a RADIATOR SCREEN CHECK</b></p>  |  <p>Inspect grille, and radiator screen for debris or plugged condition.</p>  | <p>Clean as required then.... GO TO Å</p>   |
| <p><b>Å FAN AND BELT CHECK</b></p>  |  <p>Inspect fan blades. They must be straight and not striking the radiator core or fan shroud.</p> <p>Check fan for loose mounting cap screws.</p> <p>Fan belt should have 10 to 15 mm (0.4 to 0.6 in.) deflection when a 11 kg (24 lb) force is applied midway between alternator and engine sheave.</p> | <p>Repair, replace, or adjust as required, then.... GO TO Ö</p>   |
| <p><b>Ö THROTTLE LEVER CHECK</b></p>  | <p>Engine OFF.</p>  <p>Move throttle lever from SLOW idle position to FAST idle position.</p>  | <p><i>FEEL: Throttle lever MUST move smoothly from SLOW to FAST idle position with a slight drag.</i></p> |
| <p>Move throttle lever to SLOW idle position.</p>   |  <p><i>LOOK: Governor throttle lever MUST contact the SLOW idle stop screw (A).</i></p> <p><i>LOOK: Throttle lever should have a slight gap at bottom of its slot after governor throttle lever has hit the SLOW idle stop. Throttle cable should not have any loaded pressure on it.</i></p>              | <p><b>OK:</b> GO TO Ö</p> <p><b>NOT OK:</b> GO TO ' , GROUP 10</p>  |

M48505 -UN-11DEC89

MX,22005HU,4 -19-16OCT91

M43890 -UN-31AUG88

MX,22005HU,4A -19-16OCT91

M43891 -UN-31AUG88

MX,22005HU,5 -19-16OCT91

M43933 -UN-31AUG88

M43892 -UN-31AUG88

MX,22005HU,6 -19-16OCT91

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*Engine Systems Operational Checkout Procedure/Fuel System Check*

**0 FUEL SYSTEM CHECK**

Be sure fuel tank has the correct grade of diesel fuel in it.



Inspect for external fuel leakage from tank, transfer pump, filter, lines, pump, and nozzles.

Repair leaks or replace defective parts.



Check for water in sediment bowl.

Remove water and debris from sediment bowl and fuel tank.



Disconnect nozzle return hose (A). Use compressed air to check that hose is not plugged. Open fuel tank cap to listen for air flow.

If hose is plugged, clean or replace it.

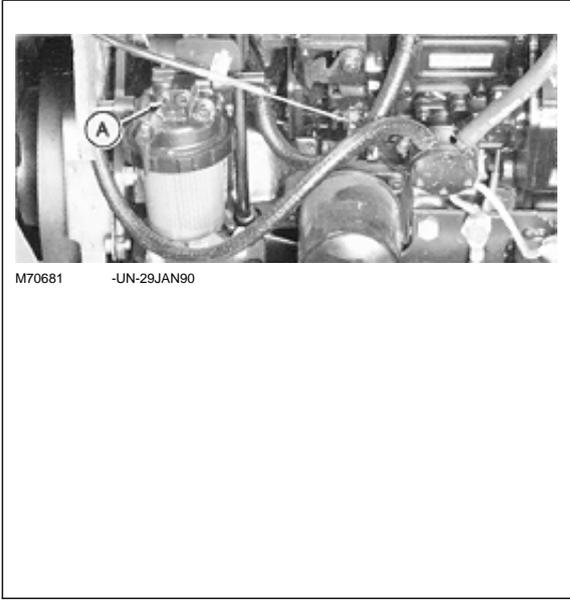


655, 755/756, AND EARLY 855/856 TRACTORS

Engine OFF, turn key switch ON.

*LISTEN: A ticking sound MUST BE heard from the fuel transfer pump.*

If a ticking sound is not heard, test fuel transfer pump. (See Section 240.)



955 AND LATE MODEL 855 TRACTORS

*NOTE: Mechanical fuel transfer pump is driven off an injection pump cam lobe. Fuel flow starts as-soon-as operator turns the key to START position (cranking).*

Disconnect fuel shut-off solenoid connector so the engine will crank but NOT START.

Loosen inlet bleed screw (A).

Turn key to START position.

*LOOK: Fuel MUST flow from inlet bleed screw with NO air bubbles present.*

Tighten inlet bleed screw (A).

Turn key OFF.

Wipe components free of any spilled fuel.

Connect fuel shut-off solenoid connector.



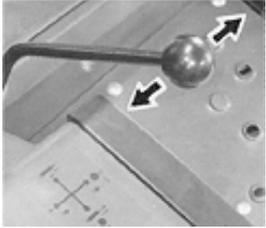
START engine briefly.

*LOOK: Fuel shut-off solenoid MUST pull-in and hold-in.*

If it does not hold-in, test fuel shut-off solenoid. (See Section 240.)

Repair, replace, or clean fuel system components, then....GO TO 0

*Engine Systems Operational Checkout Procedure/Engine Performance Check*

|   |   |   |  |  |
|---|---|---|--|--|
| <p><b>0 ENGINE START CHECK</b></p> <p>Operator on seat.</p> <p>Master/Park brake locked in PARK position.</p> <p>PTO lever OFF.</p> |  <p>M43898 -UN-31AUG88</p>   | <p>Turn key switch to ON position. When preheat light goes out, turn key to START position.</p> <p><i>LISTEN: Starter MUST crank engine.</i></p> <p><i>LISTEN: Engine MUST START.</i></p>                           | <p><b>OK: GO TO Ú</b></p> <p>Starter will not crank engine...SEE SECTION 240.</p> <p>Starter cranks but engine will not start....GO TO A IN GROUP 10</p> <p align="right">MX,22005HU,8 -19-16OCT91</p> |  |
| <p><b>Ú ENGINE OIL PRESSURE CHECK</b></p>   |  <p>M43933 -UN-31AUG88</p>  | <p>Run engine at FAST idle.</p> <p><i>LOOK: Engine oil MUST NOT leak from oil filter.</i></p> <p><i>LOOK: Oil pressure lamp MUST go OUT.</i></p>  | <p><b>OK: GO TO Ú</b></p> <p>Oil leaks.... Tighten or replace engine oil filter.</p> <p>Oil pressure lamp stays ON.... GO TO ; IN GROUP 10</p> <p align="right">MX,22005HU,9 -19-16OCT91</p>           |  |
| <p><b>Û ENGINE IDLE SPEED CHECK</b></p> <p>Run engine at HALF throttle for five minutes to warm engine.</p>                         |  <p>M43975 -UN-31AUG88</p> | <p>Move throttle lever to SLOW idle position.</p> <p><i>LOOK: Tachometer MUST read 1400 ± 50 rpm.</i></p> <p>Move throttle lever to FAST idle position.</p> <p><i>LOOK: Tachometer MUST read 3425 ± 25 rpm.</i></p> | <p><b>OK: GO TO 10</b></p> <p><b>NOT OK: GO TO Ú, GROUP 10.</b></p> <p align="right">MX,22005HU,10 -19-16OCT91</p>   |  |
| <p><b>10 ENGINE PERFORMANCE CHECK</b></p>   |  <p>M43933 -UN-31AUG88</p> | <p>START engine.</p> <p>Move throttle lever from SLOW idle to FAST idle position.</p>   | <p><i>LISTEN: Engine MUST accelerate smoothly, without hesitation.</i></p> <p><i>LOOK: Exhaust gas MUST BE CLEAR.</i></p>  | <p><i>LISTEN: Governor MUST NOT SURGE, it MUST hold engine at a constant rpm.</i></p> <p><i>LISTEN: Engine MUST run smoothly and NOT make any abnormal sounds.</i></p> |
|  <p>M43927 -UN-31AUG88</p>                        |  <p>M43973 -UN-31AUG88</p> | <p>Engage PTO lever, and/or operate hydraulic functions to load engine. You may want to take tractor outside to mow some tall grass for a more meaningful check.</p>  | <p><i>LISTEN: Governor MUST increase and decrease engine rpm smoothly to match load condition.</i></p> <p><i>LOOK: Exhaust gas MUST BE CLEAR.</i></p>  | <p><i>LISTEN: Engine MUST run smoothly and NOT make any abnormal sounds.</i></p> <p align="right"><b>Continued on next page</b></p>                                    |

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05  
4

Engine Systems Operational Checkout Procedure/Operator Complaint Not Identified

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|  <p>M43855 -UN-31AUG88</p> | <p>Turn steering wheel fully right or left to make a sharp turn.</p>   | <p><i>LISTEN: Engine MUST NOT hesitate or stumble.</i></p>   | <p><b>OK:</b> SYSTEM NORMAL</p> <p><b>NOT OK:</b> GO TO ; , GROUP 10</p> <p>MX,22005HU,11 -19-16OCT91</p> |
| <p><b>1!</b> OPERATOR COMPLAINT NOT IDENTIFIED</p>   | <p>If you completed the checkout procedure and DID NOT isolate a malfunction, the problem may be intermittent.</p> <p>Try to duplicate the conditions of the malfunction identified by the operator.</p> | <p>REPEAT THE ENGINE SYSTEM CHECKOUT PROCEDURE UNTIL MALFUNCTION IS IDENTIFIED.</p> <p>MX,22005HU,12 -19-16OCT91</p> |   |



**BEFORE YOU START**

Always perform the system checkout procedure in Group 05 before making any tests or adjustments in this group. The step-by-step procedures in this group provide you with the detailed diagnostic information you will need to isolate a malfunction. Basic diagnostic equipment is used.

It is assumed that you are familiar with the machine and its engine and fuel system components.

Engine rpm and temperature are critical in most engine tests. Be sure to follow test specifications carefully.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the tests.

Upon completing a test or adjustment, check to see whether the problem is corrected by performing the corresponding checkout procedure in Group 05.

|  |  |  |   |
|--|--|--|---|
| <p><b>1 ENGINE OPERATING CHECK</b><br/>Operator on seat.<br/>Master/Park brake pedal locked in PARK position.<br/>PTO lever OFF.</p> | <p>If engine DOES NOT operate properly, select the appropriate symptom.<br/>If engine DOES NOT crank, see Section 240.</p> | <p>ENGINE WILL NOT START OR STARTS HARD: GO TO <b>A</b><br/>ENGINE SURGES OR STALLS FREQUENTLY: GO TO <b>B</b><br/>ENGINE MISSES: GO TO <b>C</b><br/>ENGINE DOES NOT DEVELOP FULL POWER: GO TO <b>D</b><br/>EXCESSIVE BLACK OR GRAY EXHAUST SMOKE: GO TO <b>E</b><br/>WHITE EXHAUST SMOKE: GO TO <b>F</b><br/>SLOW ACCELERATION: GO TO <b>G</b><br/>ABNORMAL ENGINE NOISE: GO TO <b>H</b><br/>WHITE SMOKE COMING FROM CRANKCASE BREATHER: GO TO <b>R</b><br/>CAN'T LOWER ENGINE RPM: GO TO <b>S</b><br/>BLUE EXHAUST SMOKE: GO TO <b>T</b></p> | <p>LOW OIL PRESSURE: GO TO <b>I</b><br/>HIGH OIL PRESSURE: GO TO <b>J</b><br/>OIL IN COOLANT OR COOLANT IN OIL: GO TO <b>K</b><br/>ENGINE OVERHEATS: GO TO <b>L</b><br/>ENGINE RUNS COLD: GO TO <b>M</b><br/>ENGINE STARTS BUT THEN STOPS WHEN KEY IS RELEASED: GO TO <b>N</b><br/>DIESEL FUEL IN CRANKCASE: GO TO <b>O</b><br/>IDLE ERRATIC, CAN'T KEEP AIR BLED FROM INJECTION LINES: GO TO <b>P</b><br/>FUEL SHUTOFF SOLENOID RELEASES WHEN ENGINE WARMS UP: GO TO <b>Q</b><br/>ENGINE RUNS FINE FOR AN HOUR, LOSES POWER THEN STOPS: GO TO <b>U</b></p> |
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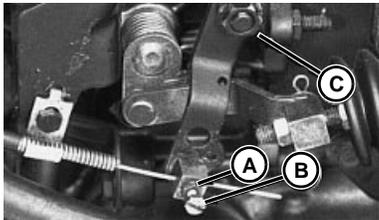
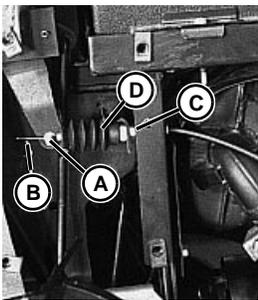
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| <p><b>A ENGINE WILL NOT START OR STARTS HARD</b></p> | <p>Check for proper fuel and fuel quality.<br/>Test fuel transfer pump output.<br/>GO TO 3A or 3B<br/>Bleed fuel system. GO TO 4<br/>Check fuel shut-off solenoid for binding and adjust. (See Section 240.)<br/>Test cold start aid controller. (See Section 240.)<br/>Test engine compression.<br/>GO TO 7<br/>Check and adjust valve clearance. (See CTM-3.)<br/>Improper air restriction indicator installed.</p>  | <p>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing and check to see if plunger is stuck. GO TO 5A or 5B<br/>Remove fuel injection pump and have it tested. (See CTM-3.)<br/>Check cranking speed.<br/>Check for proper oil viscosity.<br/>Air heater control functioning improperly<br/>Broken starter spring in governor assembly.<br/>Improper cylinder head torque, gasket leaking or head warped. (See CTM-3.)</p> |
| <p><b>B ENGINE SURGES OR STALLS FREQUENTLY</b></p>   | <p>Check fuel quality.<br/>Replace fuel filter and air cleaner.<br/>Test fuel transfer pump output.<br/>GO TO 3A or 3B<br/>Check fuel shut-off solenoid adjustment. (See Section 240.)<br/>Bleed fuel system. GO TO 4<br/>Check governor for binding, weight retainer loose.<br/>Test injection nozzles. (See CTM-3.)</p>  | <p>Check injection pump timing. GO TO 5A or 5B<br/>Test cooling system. GO TO 6A or 6B<br/>Check thermostat. (See CTM-3.)<br/>Test engine compression. GO TO 7<br/>Check and adjust valve clearance. (See CTM-3.)<br/>Remove fuel and injection pump and have it tested. (See CTM-3.)<br/>Check for loose or broken engine mounts.</p>  |
| <p><b>C ENGINE MISSES</b></p>                        | <p>Check fuel quality.<br/>Replace fuel filter and air cleaner.<br/>Test fuel transfer pump output.<br/>GO TO 3A or 3B<br/>Bleed fuel system. GO TO 4<br/>Check injection nozzle return line for restriction.<br/>Test injection nozzles. (See CTM-3.)</p>   | <p>Check injection pump timing. GO TO 5A or 5B<br/>Test cooling system if overheating. GO TO 6A or 6B<br/>Check thermostat. (See CTM-3.)<br/>Test engine compression. GO TO 7<br/>Check and adjust valve clearance. (See CTM-3.)</p>  |
| <p><b>D ENGINE DOES NOT DEVELOP FULL POWER</b></p>   | <p>Check and adjust idle speeds. GO TO 8<br/>Check fuel quality.<br/>Replace fuel filter and air cleaner.<br/>Test fuel transfer pump output.<br/>GO TO 3A or 3B<br/>Bleed fuel system. GO TO 4<br/>Check fuel shut-off solenoid for binding and adjust linkage. (See Section 240.)<br/>Check governor linkage and injection pump rack for binding. (See CTM-3.)<br/>Check injection nozzle return line for restriction.<br/>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing.<br/>GO TO 5A or 5B<br/>Test engine compression. GO TO 7</p> | <p>Check and adjust valve clearance. (See CTM-3.)<br/>Check for broken start-up spring in fuel control lever.<br/>Remove fuel injection pump and have it tested. (See CTM-3.)<br/>Vacuum in fuel tank (try with cap removed).<br/>Air leak between fuel tank and injection pump.<br/>Restriction in exhaust system.<br/>Brakes dragging.<br/>Hydraulic system operating against restriction.</p>  |

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| <p><b>E EXCESSIVE BLACK OR GRAY EXHAUST SMOKE</b></p>                            | <p>Check air filter.<br/>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing.<br/>GO TO <b>5A</b> or <b>5B</b></p>  | <p>Test engine compression. GO TO <b>7</b><br/>Remove fuel injection pump and have it tested.<br/>Check thermostat.</p>  |
| <p><b>F WHITE EXHAUST SMOKE</b></p>  | <p>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing.<br/>GO TO <b>5A</b> or <b>5B</b></p>  | <p>Test engine compression. GO TO <b>7</b><br/>Check for cracked head or leaking head gasket.<br/>Piston rings not seated.</p>   |
| <p><b>G SLOW ACCELERATION/ ENGINE WILL NOT ACCELERATE/NO FAST IDLE SPEED</b></p> | <p>Check air filter.<br/>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing.<br/>GO TO <b>5A</b> or <b>5B</b><br/>Check fuel shut-off solenoid for binding and adjust. (See Section 240.)<br/>Check and adjust fast idle speed.<br/>GO TO <b>8</b></p> | <p>Check governor linkage and injection pump rack for binding. (See CTM-3.)<br/>Check for broken start-up spring in fuel control lever.<br/>Gasoline in fuel.<br/>Incorrect hydraulic relief pressure.</p>                         |
| <p><b>H ABNORMAL ENGINE NOISE, LOUD KNOCK, OR VIBRATION</b></p>                  | <p>Check engine oil level<br/>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing.<br/>GO TO <b>5A</b> or <b>5B</b><br/>Check and adjust valve clearance. (See CTM-3.)</p>  | <p>Have injection pump checked for equal fuel delivery.<br/>Inspect pistons, piston pins, pin bushings, connecting rod bearings and rod caps. (See CTM-3.)<br/>Inspect main bearings and bearing caps. (See CTM-3.)</p>            |
| <p><b>I LOW OIL PRESSURE</b></p>   | <p>Test oil pressure indicator light and sender. (See Section 240.)<br/>Check oil pressure. GO TO <b>9</b><br/>Inspect for excessive main bearing clearance. (See CTM-3.)</p>  | <p>Inspect for excessive connecting rod bearing clearance, (See CTM-3.)<br/>Inspect for cracked cylinder block.</p>  |
| <p><b>J HIGH OIL PRESSURE</b></p>  | <p>Test oil pressure indicator light and sender. (See Section 240.)</p>  | <p>Check oil pressure. GO TO <b>9</b></p>  |
| <p><b>K OIL IN COOLANT OR COOLANT IN OIL</b></p>                                 | <p>Test engine compression for leaking cylinder head gasket. GO TO <b>7</b></p>  | <p>Inspect for cracked cylinder block. (See CTM-3.)</p>  |
| <p><b>L ENGINE OVERHEATS</b></p>   | <p>Test water temperature indicator light and sender. (See Section 240.)<br/>Check thermostat. (See CTM-3.)<br/>Test cooling system. GO TO <b>6A</b> or <b>6B</b><br/>Fan installed backwards, see page 220-10-9</p>   | <p>Check for excessive hydraulic system temperature. (See Section 270.)<br/>Test injection nozzles. (See CTM-3.)<br/>Check injection pump timing.<br/>GO TO <b>5A</b> or <b>5B</b><br/>Inspect for scored piston. (See CTM-3.)</p> |
| <p><b>M ENGINE RUNS COLD</b></p>   | <p>Test water temperature indicator light and sender. (See Section 240.)<br/>Check thermostat. (See CTM-3.)</p>  |  |
| <p><b>N ENGINE STARTS BUT THEN STOPS WHEN KEY IS RELEASED</b></p>                | <p>Check fuel shut-off solenoid hold-in circuit. (See Section 240.)</p>  |  |

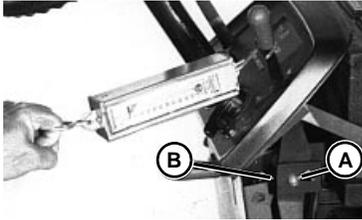
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| <b>O DIESEL FUEL IN CRANKCASE</b>                               | Injector stuck open, bad spray pattern<br>Check engine compression   | Engine being run for short periods of time.   |
| <b>P IDLE ERRATIC, CAN'T KEEP AIR BLED FROM INJECTION LINES</b> | Inspect lines between fuel tank and injection pump for restrictions. Inspect fuel lines and fittings on suction side of fuel transfer pump for openings that could draw air. Check nozzle spray pattern. Have injection pump tested. |   |
| <b>Q FUEL SHUT-OFF SOLENOID RELEASES WHEN ENGINE WARMS UP</b>   | Test and adjust fuel shut-off solenoid.  | Test fuel shut-off solenoid ground circuit.   |
| <b>R WHITE SMOKE COMING FROM CRANKCASE BREATHER</b>             | Check oil level.<br>Check oil pressure. GO TO <b>9</b><br>Check engine compression.<br>GO TO <b>7</b>  | Verify breather tube location.<br>Rings not seated or rings are worn. Check rocker arm bearings for excessive oil flow (leakage). |
| <b>S CAN'T LOWER ENGINE RPM</b>                                 | Check Injection Pump throttle shaft for binding.<br>Injection pump rack binding.   | Reconnect governor linkage link to rack pin.<br>Check for distortion of delivery valve barrel due to over-torquing.               |
| <b>T BLUE EXHAUST SMOKE</b>                                     | Check compression. Remove exhaust manifold and run engine to see what cylinder is smoking.   | Bent piston rod. (See CTM-3)<br>Check condition of cylinder walls, pistons and rings. (See CTM-3)                                 |
| <b>U ENGINE RUNS FINE FOR AN HOUR, LOSES POWER THEN STOPS</b>   |  | Injection pump and injectors are clogged or restricted due to contaminated fuel.  |

*NOTE: Tractor is used in an extremely dusty environment.*

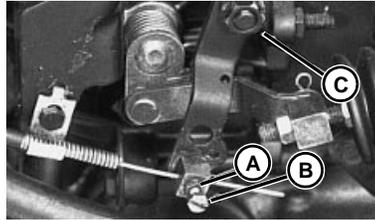
**TESTS & ADJUSTMENTS**

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| <p><b>2 ADJUST THROTTLE CABLE</b></p> |  <p>M43899</p> | <p>Loosen jam nut (A) and set screw (B) on governor throttle lever.<br/>Spring tension will move governor throttle lever up against SLOW idle stop (C).</p>   |
|                                       |  <p>M43900</p> | <p>Move throttle lever within 2mm (1/16-in.) of bottom of its slot (SLOW idle).<br/>Loosen set screw (A) at bottom of throttle lever inside pedestal area.<br/>Move throttle wire (B) forward until 2mm (1/16-in.) is sticking out of anchor.<br/>Tighten set screw (A).</p> <p><b>IMPORTANT: Throttle cable housing MUST BE slack to prevent it from breaking when engine oscillates during acceleration.</b></p> <p><i>NOTE: Set cable jam nut (C) so 6mm (1/4-in.) of threads are exposed whenever cable is installed or replaced. This will provide the proper number of threads to install boot (D) and, at-the-same-time, provide proper slack.</i></p> <p style="text-align: right;"><b>Continued on next page</b></p> |

**ADJUST THROTTLE CABLE**  
**CONTINUED**



M43902



M43899

**IMPORTANT: Steering pedestal panel and dash panel brace MUST BE fastened securely before throttle cable is connected to governor throttle lever.**

Make sure governor throttle lever is up against SLOW idle stop (C).

Tighten set screw (B) and jam nut (A).

Move throttle lever to FAST idle. See that governor throttle lever hits FAST idle stop before throttle lever reaches upper end of slot in dash; a 2 mm (1/16-in.) gap is recommended.

Connect a scale to bottom of the grip on the throttle lever.

See picture left side.

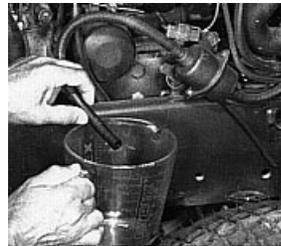
Tighten or loosen lock nut (A) to adjust tension of friction disks (B) until 4.5—7 kg (10—16 lbs.) of force is required to move throttle lever.

Move throttle lever to SLOW idle position.

**3A TEST ELECTRIC FUEL PUMP FLOW AND PRESSURE**

- 655, 755/756, AND EARLY 855 TRACTORS ONLY

*NOTE: Perform test with fuel at room temperature.*



M43913

**FLOW—**

Disconnect fuel pump outlet hose from fuel filter. Collect fuel in a graduated container.

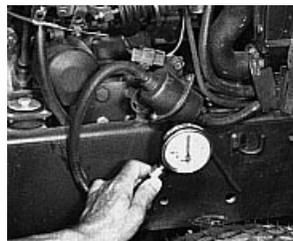
Turn ignition switch to ON position for 30 seconds. DO NOT start engine. Record measurement.

**TEST SPECIFICATIONS - ELECTRIC FUEL PUMP**

Fuel temperature—15—25°C (59—77°F)

Minimum fuel flow —200 ml (7 oz.) for 30 seconds

Minimum fuel pressure—21 kPa (3 psi)



M43914

**PRESSURE—**Connect gauge from JDG-356 Fuel Pump Pressure Test Kit to outlet hose.

Turn ignition switch to ON position. DO NOT start engine.

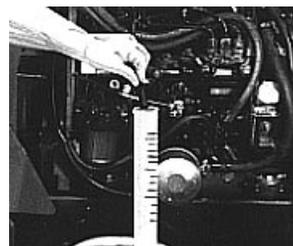
Record pressure reading.

**OUT OF SPEC:** Replace electric fuel pump.

**3B TEST MECHANICAL FUEL PUMP FLOW AND PRESSURE**

- LATE 855 AND ALL 955 TRACTORS

*NOTE: Perform test with fuel at room temperature.*



M70682

**FLOW—**

Disconnect fuel shut-off solenoid connector to prevent STARTING engine.

Disconnect fuel pump outlet hose from fuel filter. Collect fuel in a graduated container.

Turn ignition switch to START (cranking) position for 30 seconds. DO NOT start engine.

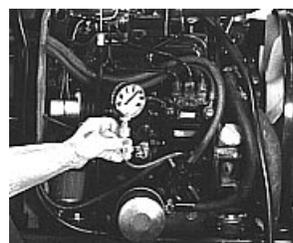
Record measurement.

**TEST SPECIFICATIONS - MECHANICAL FUEL PUMP**

Fuel temperature—15—25°C (59—77°F)

Minimum fuel flow —115 ml (4 oz.) for 30 seconds

Minimum fuel pressure—29 kPa (4.2 psi)



M70683

**PRESSURE—**

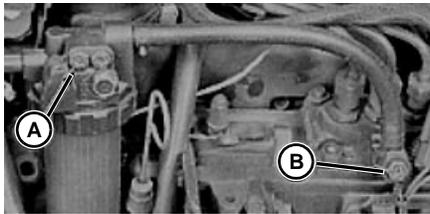
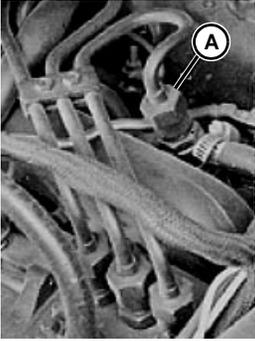
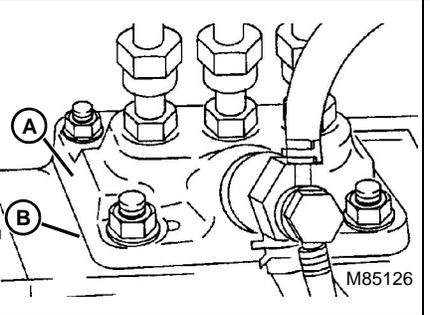
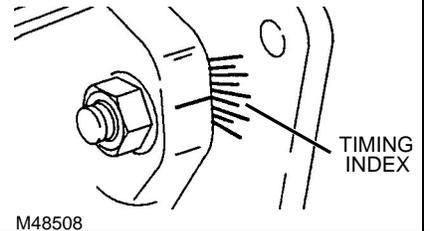
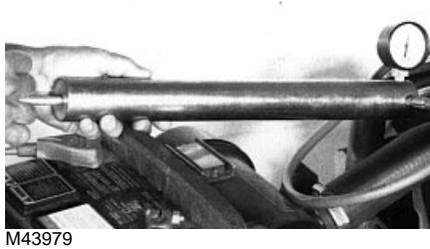
Connect gauge from JDG-356 Fuel Pump Pressure Test Kit to outlet hose.

Turn ignition switch to START position for 30 seconds.

Record pressure reading.

**OUT OF SPEC:**

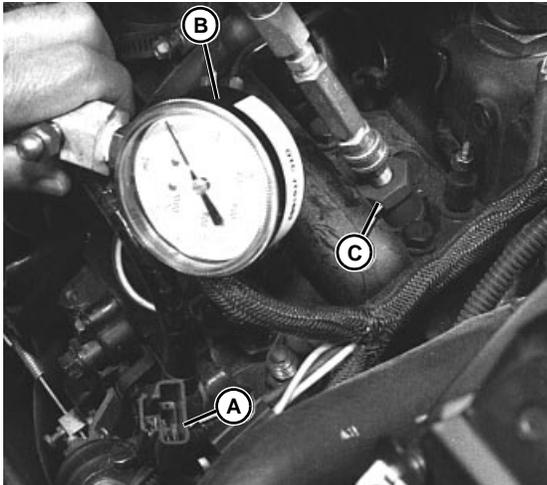
Replace mechanical fuel pump.

|   |   |   |
|---|---|---|
| <p><b>4 BLEED FUEL INJECTION SYSTEM</b></p>   |  <p>M43915</p>   | <p>Loosen rear bleed screw (A) on fuel filter. Turn key switch to ON position. Fuel transfer pump will run. Tighten bleed screw (A) when fuel appears WITHOUT air bubbles. Loosen bleed screw (B). Turn key switch to ON position. Fuel transfer pump will run. Tighten bleed screw (B) when fuel appears WITHOUT air bubbles.</p>  |
| <p><b>IMPORTANT:</b><br/>When loosening or tightening fuel injection lines, DO NOT turn pump delivery valve fittings. Turning pump fittings can damage pump internally.</p> |  <p>M43916</p>   | <p>START engine. If engine runs rough, loosen fuel injection line at No. 3 injection nozzle (A). Tighten fuel line when fuel appears at nozzle WITHOUT air bubbles. If engine DOES NOT START, loosen fuel injection line at No. 3 injection nozzle (A). Crank engine over with starter. Tighten fuel line when fuel appears at nozzle WITHOUT air bubbles. Repeat procedure for numbers 2 and 1 injection nozzles if necessary. If engine DOES NOT START, repeat bleed procedure.</p> |
| <p><b>5A FUEL INJECTION PUMP TIMING—655 AND 755/756 TRACTORS</b></p>  |  <p>M85126</p>  | <p><b>IMPORTANT:</b> Fuel injection pump timing is set at factory and <b>MUST NOT</b> be changed. If pump has been serviced or if setting was changed (evidenced by removed or wrinkled paint) set back to original position. <b>DO NOT</b> use old shims. Remove sealant from housing (A). Timing could be affected. Install one NEW 0.5 mm (0.020 in.) shim (B). Tighten four nuts to 20 N•m (180 lb-in.).</p>  |
| <p><b>5B FUEL INJECTION PUMP TIMING—855/856 AND 955 TRACTORS</b></p>  |  <p>M48508</p> | <p>Position index timing between 3 &amp; 4. Tighten nuts to 26 N•m (19 lb-ft.).</p>   |
| <p><b>6A TEST COOLING SYSTEM</b><br/><b>⚠ CAUTION: DO NOT</b> remove radiator cap until radiator hose is cool to the touch.</p>   |  <p>M43979</p> | <p>Connect D-05104ST Cooling System Pressure Pump to radiator. Pressurize cooling system to 117kPa (17 psi). Watch pressure gauge for pressure decrease. If pressure decreases, check radiator, radiator hoses, freeze plugs, and connections for leakage. Repair or replace parts as necessary.</p>  |
| <p><b>6B TEST RADIATOR CAP</b></p>  |  <p>M43980</p> | <p>Install radiator cap on D-05104ST Cooling System Pressure Pump. Use water to wet the radiator cap seal. Pressurize radiator cap until it OPENS. Watch pressure gauge for a pressure decrease.</p> <p><b>TEST SPECIFICATIONS - RADIATOR CAP</b></p> <p>Opening pressure—97—104 kPa<br/>Minimum pressure—90 kPa (13 psi)<br/>After 15 seconds if cap leaks; retighten then test again. If radiator cap does not meet specifications, replace cap.</p>                                |

**7 CYLINDER COMPRESSION PRESSURE TEST**

**▲ CAUTION:** Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting fuel injection lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles that eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. If any fluid is injected under the skin, it must be surgically removed within a few hours by a doctor who is familiar with this type of injury or gangrene may develop.

*NOTE:* Start and run engine approximately 5 minutes until engine reaches normal operating temperature.



M43993

Remove air cleaner. Remove fuel injection nozzles. (See CTM-3)  
Remove heat protectors from injector nozzle ports.  
Disconnect fuel shut-off solenoid wiring lead (A).

*NOTE:* Motorite Compression Tester can be used using JTO1681 Adaptor and JDG472 Adaptor.

Connect JTO1682 Pressure Gauge and Hose (B) to fuel nozzle port using JDG472 Adaptor (C) for 655 and 755/756 Tractors, on all 855/856 and 955 Tractors use JDG560 Adaptor (C).

**IMPORTANT:** DO NOT overheat starting motor during test.

Crank engine for a few seconds with starting motor. Record pressure reading for each cylinder.

**8 TEST SPECIFICATIONS - CYLINDER COMPRESSION PRESSURE**

Minimum compression pressure (all)—  
2308 kPa (335 psi)

Maximum compression difference between  
cylinders—490 kPa (71 psi)

If pressure reading is LOW, check piston rings and valves for wear or damage. (See CTM-3) Check air cleaner housing, elements and hoses for signs of leakage.

Connect fuel shut-of solenoid wiring lead.  
Install heat protectors and new gaskets.  
Install fuel injection nozzles. (See CTM-3)  
Install air cleaner.  
Bleed fuel injection system. (See 4)

**ADJUST SLOW AND FAST IDLE**



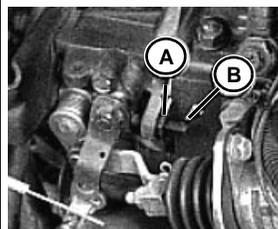
M43994

START and warm engine to operating temperature.  
Disconnect throttle cable. Use a photo tachometer such as JTO5719 to check engine rpm. Follow manufacturer's instructions. Read rpm at flywheel. Hold injection pump throttle lever forward (away from flywheel) and read photo tachometer.

**ENGINE IDLE SPEED SPECIFICATIONS**

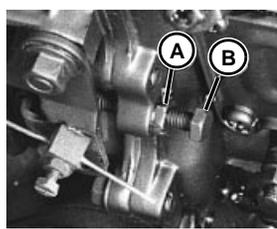
SLOW idle—  
1450 ± 50 rpm  
FAST idle—  
3425 ± 25 rpm

655/755/756



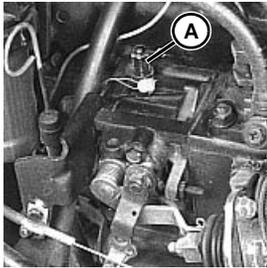
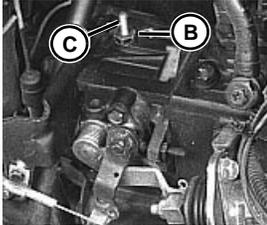
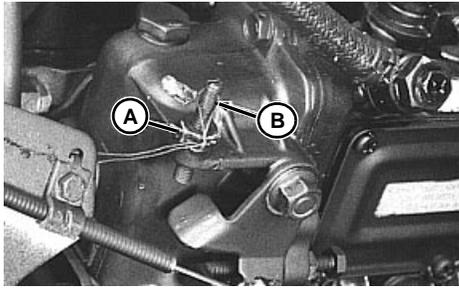
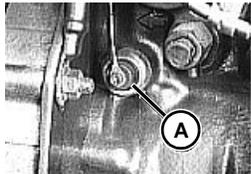
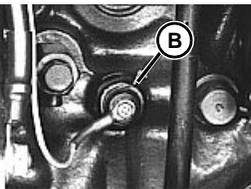
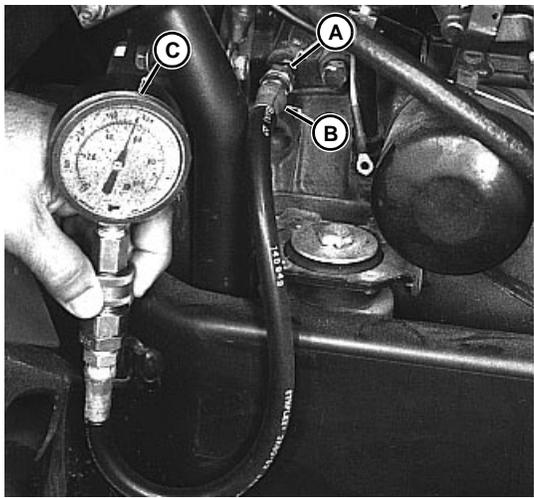
M43995

855/856 and 955



M43996

If SLOW idle rpm is NOT correct, loosen nut (A) and turn screw (B) to adjust SLOW idle.  
After adjustment, tighten nut (A).  
Hold injection pump throttle lever rearward (toward flywheel) and read photo tachometer.

|   |   |  |  |
|---|---|--|--|
|  <p>M43998</p>  <p>M43999</p> | <p>On 655 and 755/756 Tractors, if FAST idle rpm is NOT correct, remove wire nut (A). Loosen nut (B). Turn screw (C) until FAST idle speed is to specification. After adjustment, tighten nut (B). Install nut (A). If engine will NOT meet FAST idle specification, replace governor spring. (See CTM-3)</p> |  <p>M44000</p>   | <p>On 855/856 and 955 Tractors, if FAST idle rpm is NOT correct, remove wire and loosen nut (A). Turn screw (B) until FAST idle speed is to specification. After adjustment, tighten nut (A).</p> <p>To adjust throttle cable. GO TO ②</p> |
| <p><b>9 ENGINE OIL PRESSURE TEST</b></p>  |  <p>M43948</p>  <p>M44010</p>  | <p>Disconnect wiring lead and remove oil pressure sender (A), for 655 and 755/756 Tractors, or (B) for 855/856 and 955 Tractors.</p> <p><i>NOTE: On 755/756 Tractors, the flywheel bolt may have to be backed out slightly to clear test hose fitting.</i></p>   |  |
|  <p>M44011</p>   | <p><b>A—JTO3349 Adaptor</b><br/> <b>B—JTO3017 Hose</b><br/> <b>C—JTO5577 Gauge</b></p>  | <p>Install JTO3349 Adaptor (A) in oil pressure sender port. Connect JTO3017 Hose (B) and a 0—700 kPa (0—100 psi) gauge JTO5577 (C).</p> <p>START and warm engine to operating temperature. Move throttle to FAST idle. Record pressure reading.</p> <p><b>TEST SPECIFICATION—ENGINE OIL PRESSURE</b><br/>         365 ± 69 kPa (53 ± 10 psi)</p> |  |
| <p>If pressure reading is LOW, check oil pressure regulating valve for a broken spring or a stuck or damaged valve. (See CTM-3)</p>   | <p>If oil pressure regulating valve is not damaged, add shims to inside of cap. Each 1 mm (0.039 in.) of shim thickness INCREASES oil pressure approximately 14 kPa (2.0 psi).</p>  | <p>IF PRESSURE DOES NOT INCREASE: Check for a worn or damaged oil pump. (See CTM-3)</p> <p>Install oil pressure sender and sender wiring lead.</p>   |  |

## COOLING FAN INSTALLATION—955

### PROBLEM:

Cooling fan installed backwards and/or is contacting the crankshaft pulley.

### SOLUTION:

1. Fan will have "JT" stamped in black ink on the front side of the cooling fan. This mark should face the radiator.
2. Measure from the front of the engine block (next to the cup plug above the water pump) to the rear edge of the fan blade. Dimension should be 107mm (4.212 in.), if not, add a washer (M802003) between the fan and hub to move the fan forward 2mm.

*NOTE: Clearance between the cooling fan and lower pulley on crankshaft should be 5—6mm (.2 in.). (measured from one of the three raised nubs on the pulley)*



# Section 240

## Electrical Operation and Tests

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240

## BEFORE YOU START

Always begin with this group to identify a failure in the electrical system. The step-by-step procedures in this group provide you a quick check of the system. No tools are required to perform these checks. If a failure is detected, you will be referred to a more detailed check, adjustment, or test.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the check.

This procedure is designed as a quick check of the system. While performing the check, concentrate only on the check you are performing and disregard signals from unrelated components. If you are unfamiliar with the operation or location of system components, refer to Group 15 in this section.

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MX,24005HU,1 -19-16OCT91

|  |   |   |   |
|--|---|---|---|
| <p>;<br/>;<br/><b>INSTRUMENT<br/>PANEL LAMPS<br/>CHECK</b></p> | <p>Lock master/park brake pedal into PARK position.</p> |  <p style="font-size: small;">M43925      -UN-31AUG88</p> | <p>Turn key switch ON.</p> <p><i>LOOK: Oil pressure, battery discharge, and engine preheat lamp ON.</i></p> |
|--|---|---|---|

|  |  |
|--|--|
| <p><i>NOTE: On 655 and 755/756 tractors preheat lamp will go OFF in 8 seconds or less or may not come ON if engine is hot or ambient temperature is above 4.4°C (40°F).</i></p> <p><i>On later 855 and all 955, setting is 18°C (64°F) or less.</i></p> <p><i>On early 855/856, preheat lamp will only come ON if ambient temperature is about 4.4°C (40°F) or less.</i></p> | <p><b>OK:</b> GO TO ' '</p> <p><b>NOT OK:</b> GO TO ; , GROUP 10</p> |
|--|--|

MX,24005HU,2 -19-16OCT91

Electrical System Checkout/Lighting Circuit Check

**COOLANT LAMP AND NEUTRAL START CHECK**

**CAUTION:** Be aware that if neutral start system is defective, machine will START and move in either direction.

Throttle at SLOW idle, control pedal in SLOW forward.



M43898 -UN-31AUG88

Turn key switch to START.

**LOOK:** Coolant temperature lamp ON, engine MUST NOT crank.

**NOTE:** Oil pressure lamp and preheat lamp may be ON.

**OK:** GO TO Æ

LAMP NOT ON: GO TO 0, GROUP 10.

ENGINE STARTS: GO TO 0, GROUP 10.

MX,24005HU,3 -19-16OCT91

**FUEL GAUGE CHECK**



M43926 -UN-31AUG88

Turn key switch ON.

**LOOK:** Fuel gauge MUST move to indicate approximate fuel level in tank.

**LISTEN:** On tractors with electric fuel transfer pumps, you will here the clicking sound of the pump.

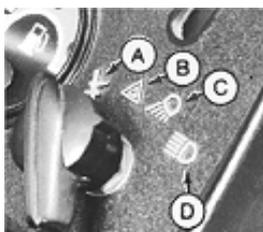
ADD a KNOWN amount of fuel to tank as needed to verify fuel gauge operation.

**OK:** GO TO Å

**NOT OK:** GO TO Ú, GROUP 10.

MX,24005HU,4 -19-16OCT91

**LIGHTING CIRCUIT CHECK**



M43928 -UN-12SEP91

Turn key switch ON.

Turn light switch to each position.

**LOOK:** Lights should operate as follows:

- A-OFF.
- B-Warning lights FLASH.
- C-Rear work light (if equipped), headlights, and hoodlights ON.
- D-Hoodlights, headlights, and warning lights ON.

**NOTE:** The tachometer and fuel gauge lamps are ON when switch is in positions C and D.

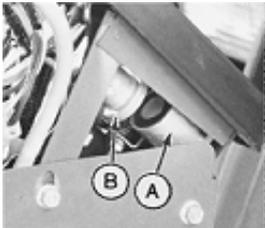
**OK:** GO TO Ö

**NOT OK:** GO TO Ü, GROUP 10.

MX,24005HU,5 -19-16OCT91

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## Electrical System Checkout/PTO Check

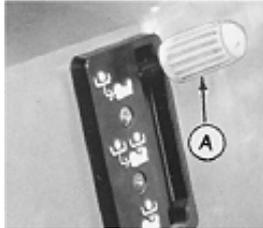
|   |  |   |   |
|---|--|---|---|
| <p>0 STARTING CIRCUIT CHECK</p>   | <p>Master/park brake ON.<br/>PTO OFF.</p>  |  <p>Turn key to START.<br/><i>LISTEN: Starter MUST crank engine. Engine MUST START.</i></p> <p>M43898 -UN-31AUG88</p>  | <p>OK: GO TO 0<br/>NOT OK: GO TO 10, GROUP 10.</p> <p>MX,24005HU,6 -19-16OCT91</p>  |
| <p>0 PTO SAFETY START CHECK</p> <p>Open hood.<br/>Operator ON seat.</p> | <p>Turn key switch ON.<br/>Engage PTO lever.<br/><i>LOOK: PTO lamp ON.</i><br/><b>CAUTION: Be aware that if PTO safety circuit is defective, machine will START and PTO will ENGAGE.</b></p> |  <p>Briefly turn key switch to START and release.<br/><i>LOOK/LISTEN: PTO magnet (A) will "click" as it DISENGAGES from lever (B). PTO lamp OFF.</i></p> <p>M43929 -UN-31AUG88</p>                                       | <p>OK: GO TO 0<br/>NOT OK: GO TO 10, GROUP 10.</p> <p>MX,24005HU,7 -19-16OCT91</p>  |
| <p>0 PTO/SEAT SWITCH CHECK</p>  | <p>Operator ON seat.<br/>Turn key switch to ON position ONLY.</p>  |  <p>Engage PTO lever.<br/><i>LOOK: PTO lamp ON.</i><br/>Raise OFF seat for 1—2 seconds.<br/><i>LOOK/LISTEN: PTO magnet will "click" as it DISENGAGES.</i><br/><i>LOOK: PTO lamp OFF.</i></p> <p>M43927 -UN-31AUG88</p> | <p>OK: GO TO 0<br/>NOT OK: GO TO 10, GROUP 10.</p> <p>MX,24005HU,8 -19-16OCT91</p>  |
| <p>U PTO CHECK</p>  | <p>Operator ON seat.<br/>Key switch ON.<br/>PTO selector lever set at mid or mid/rear position.</p>  |  <p>Engage PTO lever.<br/><i>LOOK: Magnet MUST be ENGAGED with lever. PTO lamp ON.</i></p> <p>M43927 -UN-31AUG88</p>   | <p>OK: GO TO U<br/>MAGNET NOT ENGAGED: GO TO 1#, GROUP 10<br/>INDICATOR LAMP NOT ON: GO TO 1\$, GROUP 10.</p> <p>MX,24005HU,9 -19-16OCT91</p> |

Electrical System Checkout/PTO/Seat Switch Bypass Check

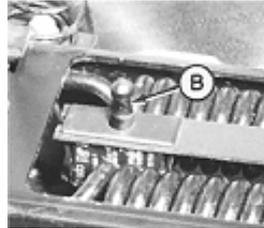
Ü PTO/SEAT SWITCH BYPASS CHECK

Tilt seat forward.

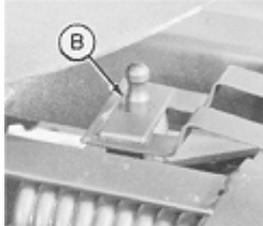
Turn key switch ON.



M43930 -UN-31AUG88



M42279 -UN-12SEP91



M43931 -UN-31AUG88

Move PTO selector lever (A) to rear PTO.

Pull seat switch (B) OUT into OVERRIDE position.

Engage PTO lever.

*LOOK: Lever magnet MUST ENGAGE. PTO lamp ON.*

Move PTO selector to mid/rear position.

*LOOK/LISTEN: PTO magnet MUST DISENGAGE. A loud "click" sound as magnet DISENGAGES. PTO lamp OFF.*

**OK:** PROCEDURE COMPLETE.

**NOT OK:** GO TO 1#, GROUP 10.

MX,24005HU,10 -19-16OCT91

## ABOUT THIS GROUP

This group contains tests for the major components of the different electrical circuits. If a component in a circuit does test OK, you must then understand the theory of operation for the entire circuit to locate the problem. You will be referred to Group 15—Theory of Operation to explain how individual circuits work. Read that information and be sure you understand the operation of the circuit.

Once you understand the circuit operation, use the individual circuit diagram or the total system

schematic diagrams to trace current flow to locate the problem. It is generally best to use a probe tester, test light or volt/ohm meter to trace current flow. Start at the component that has the malfunction and trace the current flow backwards toward the battery. After you have isolated the problem and made the needed repairs, perform the operational check (Group 05) for that circuit. This will verify that the problem has been corrected.

MX,24010HU,1 -19-16OCT91

## BEFORE YOU START

Always perform the System Checkout in Group 05 before making any tests in this group. The step-by-step procedures in this group provide you with the detailed diagnostic information you need to isolate a malfunction. Basic diagnostic equipment is used. It is assumed that you are familiar with the machine and its electrical components. If you need

additional information, read the Theory of Operation in Group 15.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the test.

MX,24010HU,2 -19-16OCT91

## TEST EQUIPMENT

Where appropriate, use a good flashlight tester, probe light tester, and/or volt/ohm meter to perform the diagnostic tests in this group.



M42297  
-UN-23SEP91

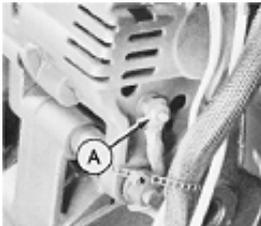
MX,HU,24010,2A -19-16OCT91

## Electrical System Diagnosis/System Grounds Check

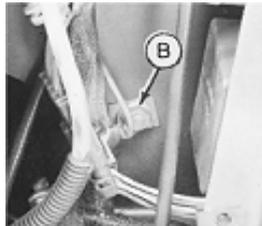
### SYSTEM GROUNDS CHECK

Key switch OFF.

Open hood and remove engine side panels.



M43982 -UN-08SEP88



M43983 -UN-08SEP88



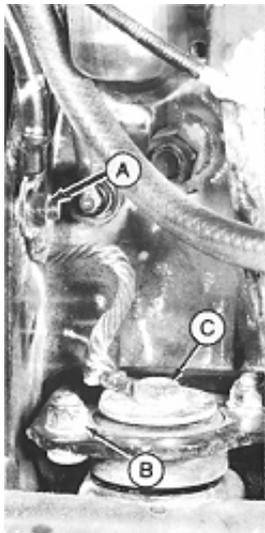
M42280 -UN-12SEP91

Verify the system grounds using an appropriate tester. Check for good continuity between battery negative (-) terminal and the following:

Alternator ground terminal (A).

Pedestal ground connection (B) at steering column support.

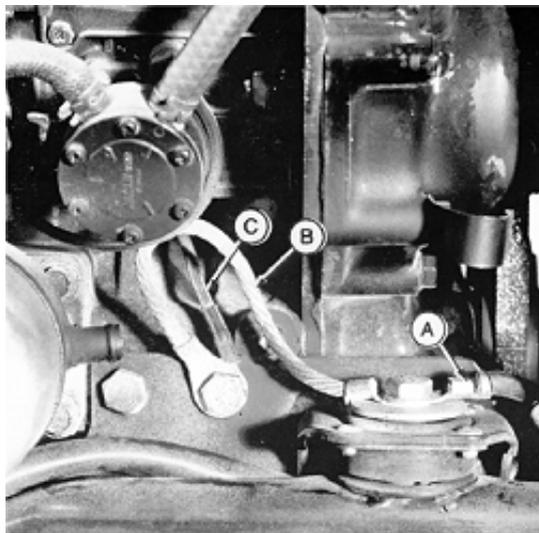
MX,24010HU,3 -19-16OCT91



M42296 -UN-23SEP91

Battery ground connection (A) at right-side engine starter-mounting plate.

Frame ground (B) at engine mount and jumper cable mounting hardware (C).



M48506 -UN-11DEC89

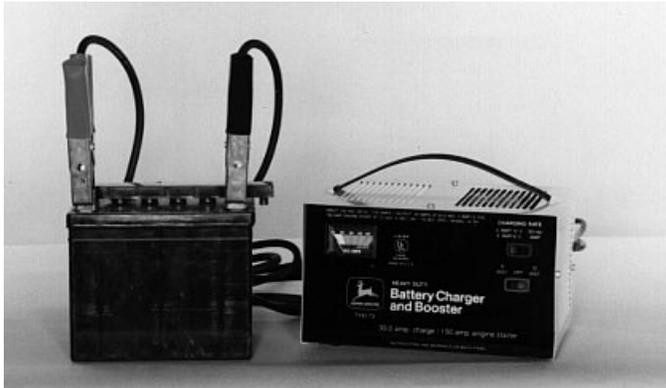
Radiator hose removed for clarity.

Battery ground wire (A), ground strap (B) and wire harness ground (C).

**OK:** TEST BATTERY, GO TO A

**NOT OK:** CLEAN, TIGHTEN, AND/OR REPLACE GROUND CONNECTIONS OR WIRES AS NEEDED BEFORE TESTING BATTERY OR PERFORMING OTHER DIAGNOSES.

MX,24010HU,4 -19-16OCT91

|  |  |  |  |
|--|--|--|--|
| <p><b>A TEST BATTERY</b></p> <p>If problem is with starting circuit, perform all battery tests. If problem is with other components, perform battery tests ONLY if starter DOES NOT crank engine satisfactorily.</p> | <p>Check electrolyte level in each cell of battery. If low, add the proper amount of clean soft water.</p> | <p>Test the specific gravity of each cell with a hydrometer.</p> <p>Specifications are listed at right.</p>  | <p>ALL CELLS LESS THAN 1.175: GO TO <b>C</b></p> <p>ALL CELLS MORE THAN 1.225 WITH LESS THAN 50 POINTS VARIATION: GO TO <b>D</b></p> <p>ALL CELLS LESS THAN 1.225 WITH LESS THAN 50 POINTS VARIATION: GO TO <b>B</b></p> <p>VARIATION MORE THAN 50 POINTS: REPLACE BATTERY</p> |
| <p><b>B TEST BATTERY VOLTAGE</b></p>   | <p>Test battery voltage with voltmeter or JTO5685 Battery Tester.</p>                                      | <p><i>NOTE: Battery DOES NOT need to be DISCONNECTED from tractor.</i></p>   | <p>12.4 VOLTS OR MORE: GO TO <b>F</b></p> <p>LESS THAN 12.4 VOLTS: GO TO <b>2</b></p>  |
| <p><b>C CHARGE BATTERY</b></p>   |  <p>M49598</p>          |  | <p>Connect charger to battery and charge at a SLOW rate.</p> <p>The maximum charging time at BOOST setting is 10 minutes. Allow an additional 5 minutes for each 10° F below 70° F.</p>  |
|  |  | <p>IF BATTERY DID NOT NEED WATER AT STEP <b>A</b> AND IS ACCEPTING 10-AMP CHARGE: GO TO <b>E</b></p> <p>IF BATTERY REQUIRED WATER AT STEP <b>A</b> OR IF ALL CELLS WERE BELOW 1.175 BUT BATTERY IS ACCEPTING A 10-AMP CHARGE: GO TO <b>D</b></p> <p>IF BATTERY DOES NOT ACCEPT A 10-AMP CHARGE AFTER 10 MINUTES AT BOOST SETTING: REPLACE BATTERY.</p> |  |

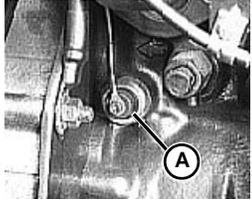
*Electrical System Diagnosis/Continue Charging Battery*

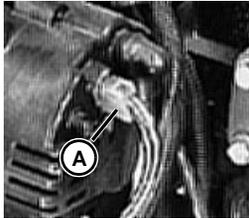
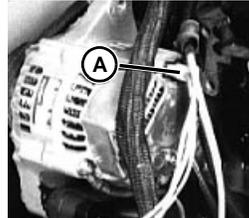
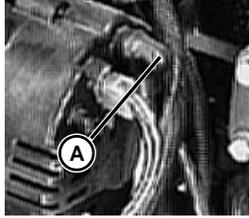
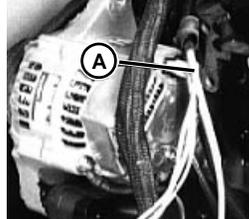
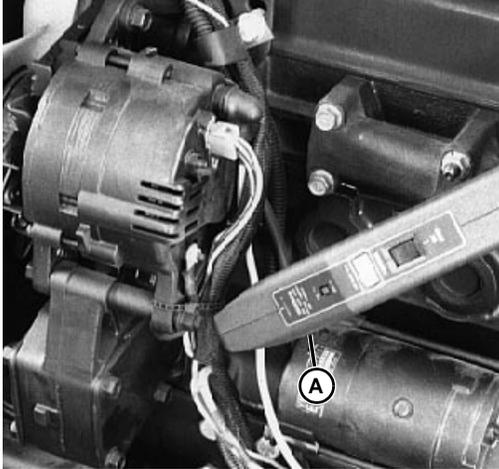
|                                      |                                   |  |   |  |
|--------------------------------------|-----------------------------------|--|---|--|
| <p><b>D INCREASE CHARGE RATE</b></p> | <p>Set charger at 15-25 amps.</p> | <p><b>IMPORTANT:</b><br/> <b>Decrease charge rate if battery gases or bubbles excessively or becomes too warm to hold.</b></p> | <p>Check specific gravity after 30 minutes (60 minutes for maintenance free batteries).</p> | <p>IF VARIATION BETWEEN CELLS IS MORE THAN 50 POINTS: REPLACE BATTERY.</p> <p>IF VARIATION BETWEEN CELLS IS LESS THAN 50 POINTS: GO TO E</p> |
|--------------------------------------|-----------------------------------|--|---|--|

MX,24010HU,9 -19-16OCT91

|   |  |   |  |   |
|---|--|---|--|---|
| <p><b>E CONTINUE CHARGING BATTERY</b></p> <p><b>IMPORTANT:</b><br/> <b>Decrease charge rate if battery gases or bubbles too much or if battery gets too warm to hold.</b></p> | <p>Continue charging battery until specific gravity is 1.230—1.265 points.</p> | <p>IF BATTERY WAS DISCHARGED AT A SLOW RATE (OR DISCHARGE RATE IS UNKNOWN)—CHARGE BATTERY AT 10—15 AMPS FOR 6—12 HOURS (MAINTENANCE FREE BATTERIES MAY REQUIRE 12—24 HOURS) THEN: GO TO F</p> |  | <p>IF BATTERY WAS DISCHARGED AT A FAST RATE—CHARGE BATTERY AT 20—25 AMPS. BATTERY MAY REQUIRE 2—4 HOURS CHARGING TIME (MAINTENANCE FREE BATTERIES MAY NEED 4—8 HOURS) THEN: GO TO F</p> |
|---|--|---|--|---|

MX,24010HU,10 -19-16OCT91

|  |   |   |   |
|--|---|---|---|
| <p><b>F BATTERY LOAD TEST</b></p>      |  <p>M36665</p>   | <p>Connect JT05685 Tester to battery.</p> <p>Follow instructions on back of meter for testing battery.</p>  | <p><b>OK: GO TO 1</b></p> <p><b>NOT OK: REPLACE BATTERY</b></p>   |
| <p><b>1 DASH LAMP TEST</b></p>         | <p>If any lamp DOES NOT operate properly, go to the appropriate test as listed at right.</p> <p>If a good battery will not hold charge (current draw on battery when key is in "OFF" position). See alternator ground test.</p> | <p>OIL PRESSURE LAMP TEST: GO TO <b>2</b></p> <p>BATTERY DISCHARGE LAMP TEST: GO TO <b>3</b> (ALTERNATOR WARNING LAMP TEST)</p> <p>ALTERNATOR GROUND TEST: GO TO <b>3A</b></p> <p>ENGINE PREHEAT LAMP TEST: GO TO <b>5</b></p> <p>COOLANT TEMPERATURE LAMP TEST: GO TO <b>6</b></p> <p>PTO LAMP TEST: <b>14</b></p> |   |
| <p><b>2 OIL PRESSURE LAMP TEST</b></p> | <p>Turn key switch ON.</p>  |  <p>M43948</p>   | <p>Disconnect wire (A) from oil pressure switch and ground it to engine block.</p> <p><i>LOOK: Lamp should be ON.</i></p> <p>LAMP ON: REPLACE OIL PRESSURE SENSOR.</p> <p>LAMP NOT ON: CHECK BULB, THEN REFER TO CIRCUIT DIAGRAM IN GROUP 15 TO DIAGNOSE MALFUNCTION IN THE LAMP CIRCUIT.</p> |

|  |   |   |  |   |
|--|---|---|--|---|
| <p><b>3 BATTERY DISCHARGE (ALTERNATOR) LAMP SHORT CIRCUIT TEST</b></p> <p>Check 10-amp fuse.</p> | <p>Key switch OFF.</p> <p>Remove indicator lamp socket from dash panel.</p> <p>Remove bulb. Visually check that bulb is good.</p>       |  <p>M43949</p>  <p>M42300</p>   | <p>Unplug connector (A) from back of alternator.</p> <p>Check for continuity between brown wire and ground.</p>  | <p>CONTINUITY: BROWN WIRE FROM ALTERNATOR TO BULB SOCKET IS SHORTED TO GROUND.</p> <p>NO CONTINUITY: GO TO <b>4</b></p> |
| <p><b>3A ALTERNATOR GROUND TEST</b></p>  | <p>Key switch OFF.</p> <p>Install ammeter inserts with positive battery cable.</p> <p>Remove red B+ lead (A) on rear of alternator.</p> |  <p>M43949</p>  <p>M42300</p> | <p>OUTPUT NEAR ZERO: ALTERNATOR DIODES ARE DEFECTIVE ALLOWING CURRENT TO PASS TO GROUND. REMOVE AND REPAIR ALTERNATOR AS NEEDED. SEE COMPONENT TECHNICAL MANUAL CTM3 (10AUG93) ON DIODE REPAIR.</p> <p><i>NOTE: There is normally a very small current drain through alternator.</i></p> <p>OUTPUT WELL ABOVE ZERO: THERE IS ANOTHER CURRENT DRAW. CONTINUE DIAGNOSTICS. GO TO <b>3</b>, <b>4</b>, OR OTHER APPLICABLE TESTS FOR CURRENT DRAW.</p> |   |
| <p><b>4 ALTERNATOR REGULATED CURRENT OUTPUT TEST</b></p>   | <p>Remove left engine side panel.</p> <p>Turn lights on for a few minutes to discharge battery.</p>                                     |  <p>M43950</p>  | <p>Connect JTO5712 Current Gun (A) over red wire on back of alternator. Always check voltage at regulator (DC or AC).</p> <p>Be sure selector switch on current gun is set for DC current.</p>   |   |



M43951

Turn load knob (A) fully counterclockwise, then connect JT05685 Battery Tester to battery. (Conventional voltmeter can also be used).

START engine and run at FULL throttle.

Amp output (read on current gun) should start out high until battery voltage comes up to 13.8—14.7. After battery voltage comes up, amp output should start to decrease.

AMP OUTPUT DOES NOT DECREASE, BATTERY VOLTAGE GOES ABOVE 15: Replace Regulator.

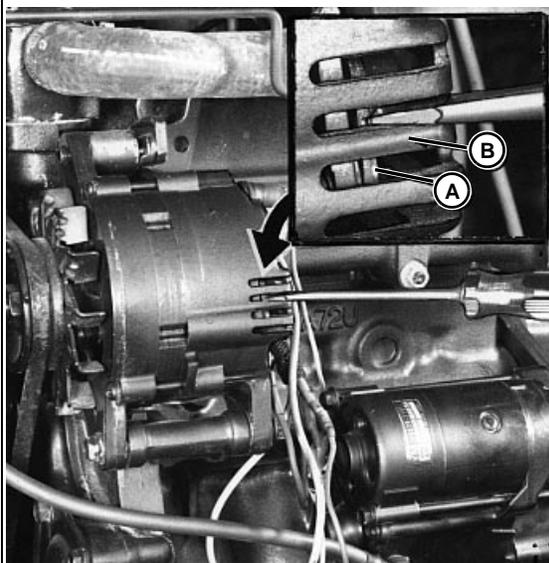
AMP OUTPUT IS HIGH BUT BATTERY VOLTAGE DOES NOT INCREASE: Test Battery (Beginning Of This Group) And Verify Ground Connections.

AMP OUTPUT IS LOW BUT BATTERY VOLTAGE EVENTUALLY INCREASES OR AMP OUTPUT IS BELOW BATTERY VOLTAGE: GO TO **4A** OR **4B**

**4A ALTERNATOR UNREGULATED CURRENT OUTPUT TEST—35 AMP**

Connect JTO5712 Current Gun as instructed in step 4.

Be sure selector switch on current gun is set for DC current.



M36661

START engine and run at FULL throttle.

Use a screwdriver to ground regulator (A) to alternator frame (B).

Insert screwdriver blade through cooling fins on back side of alternator. Touch blade tip to base of regulator and to alternator frame.

Read output on ammeter.

**IMPORTANT: Complete this test IN LESS THAN 10 SECONDS or battery WILL BE DAMAGED.**

OUTPUT 35 AMPS OR MORE: Alternator is ok, malfunction is in charging system wiring. Refer to the charging system circuit diagram in Group 15 to diagnose malfunction.

OUTPUT LESS THAN 35 AMPS: Check each stator lead for continuity to ground. (See CTM3) If yes, look for pinched wire at engine shrouding. Stator leads should not have continuity to ground. Verify ground connections at battery, harness, and regulator. Check wiring between battery and regulator to insure battery voltage at (red) B+ connection. See Note.

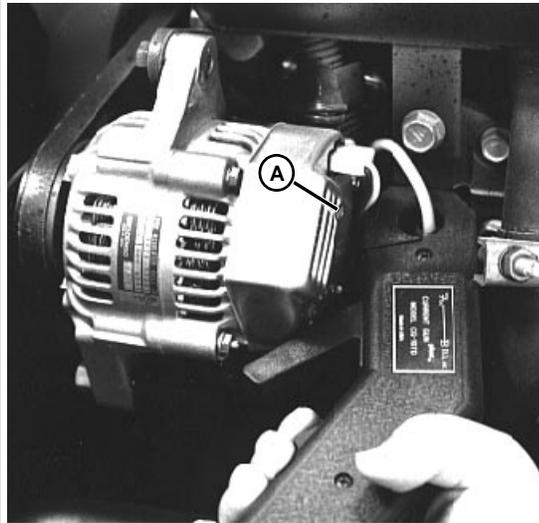
**IMPORTANT: No voltage at B+ (voltage sensing) terminal at regulator will normally result in an overcharge/ battery failure situation.**

*NOTE: If AC voltage is tested; a grounded (shorted) stator can still show good AC volts if tested directly at wires coming from under flywheel. This problem does not show up until the shorted stator is connected to the regulator. If AC voltage is checked at the regulator after the wires are connected, voltage will show low or zero. Repair or replace stator.*

**4B ALTERNATOR UNREGULATED CURRENT OUTPUT TEST—40 AMP**

Connect JTO5712 Current Gun as instructed in step 4.

Be sure selector switch on current gun is set for DC current.



M48576

**NOTE:** If AC voltage is tested; a grounded (shorted) stator can still show good AC volts if tested directly at wires coming from under flywheel. This problem does not show up until the shorted stator is connected to the regulator. If AC voltage is checked at the regulator after the wires are connected, voltage will show low or zero. No voltage at B+ (voltage sensing) terminal at regulator will normally result in an overcharge/ battery failure situation. Repair or replace stator.

START engine and run at FULL throttle.

Insert a Phillips screwdriver through small round hole (A) to ground terminal "F" screw to rear cover.

Read output on ammeter.

**IMPORTANT: Complete this test IN LESS THAN 10 SECONDS or battery WILL BE DAMAGED.**

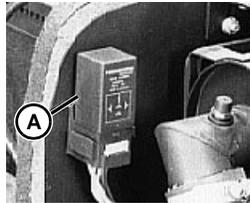
**OUTPUT 40 AMPS OR MORE:**  
Alternator is ok, malfunction is in charging system wiring. Refer to the charging system circuit diagram in Group 15 to diagnose malfunction.

**OUTPUT LESS THAN 40 AMPS:**  
Check each stator lead for continuity to ground. (See CTM3) If yes, look for pinched wire at engine shrouding. Stator leads should not have continuity to ground. Verify ground connections at battery, harness, and regulator. Check wiring between battery and regulator to insure battery voltage at B+ connection. See Note.

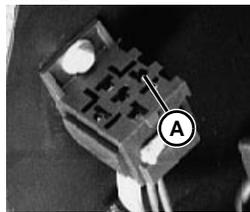
**5 ENGINE PREHEAT CIRCUIT CHECK**

Check 10-amp fuse and bulb before continuing diagnosis.

**NOTE:** If lamp stays on at all times, GO TO **5A**



M43952



M43953

Remove preheat controller (A) from socket.

Turn key switch ON.

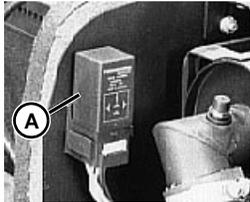
Connect jumper wire from gray lead terminal (B) to ground.

LOOK: Lamp ON.

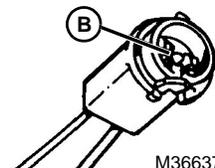
LAMP ON: GO TO **5B** OR **5C**

LAMP NOT ON: Control module probably ok. Malfunction is in lamp circuit. See theory information on engine preheat circuit (GROUP 15) for diagnosis.

**5A ENGINE PREHEAT LAMP SHORT CIRCUIT CHECK**



M43952



M36637

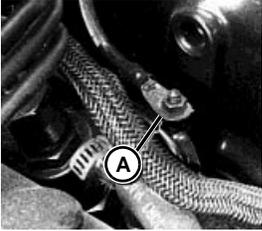
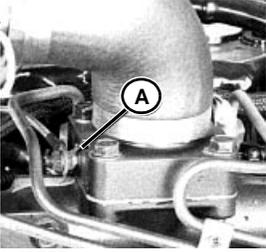
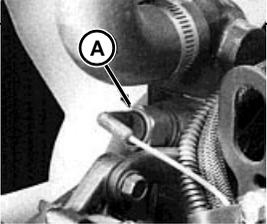
Remove preheat controller (A) from socket.

Remove bulb socket from dash and remove bulb.

Check for continuity between terminal with gray lead (B) and ground.

CONTINUITY: GRAY WIRE TO CONTROLLER IS SHORTED, REPAIR OR REPLACE.

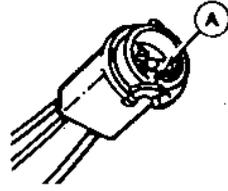
NO CONTINUITY: INSTALL BULB AND SOCKET, THEN ... GO TO **5B** OR **5C**

|   |  |   |  |   |
|---|--|---|--|---|
| <p><b>5B ENGINE PRE-HEAT CONTROLLER TEST—655 AND 755/756</b></p> <p>Open hood.<br/>Use flashlight tester.</p> |  <p>M43954</p>  | <p>Place test light on glow plug terminal (A).<br/>Turn key switch ON.</p> <p><i>LOOK: Dash lamp ON, test light ON.</i></p>   | <p>Dash lamp will be ON for 9 seconds or less, test light ON for 30 seconds or less.</p> <p><i>Note: Hotter engine temperatures will reduce times that lamps are ON.</i></p>       | <p><b>OK:</b> PREHEAT CONTROLLER IS OK. CHECK GLOW PLUGS.</p> <p><b>NOT OK:</b> CHECK FUSIBLE LINK FROM STARTER TO MODULE SOCKET (RED WIRE). REPLACE CONTROL MODULE AS NEEDED.</p>                    |
| <p><b>5C ENGINE PREHEAT CONTROLLER TEST—855/856 AND 955</b></p> <p>Open hood.<br/>Use flashlight tester.</p>  | <p><i>NOTE: On 855/856, module only operates when temperature is below 4.4° C (40° F) on early models, and 18° C (64° F) on later 855 models.</i></p>      | <p>IF temperature is not below 4.4 C (40 F), module can be removed from tractor and placed in refrigerator or freezer.</p> <p>Install module on tractor and perform tests quickly before module warms up.</p> |  |   |
|  <p>M43955</p>              | <p>Place test light on air heater terminal (A).<br/>Turn key switch ON.</p> <p><i>LOOK: Dash lamp ON for 15 seconds, test light ON for 45 seconds.</i></p> |   | <p><b>OK:</b> PREHEAT CONTROLLER IS OK. CHECK AIR HEATER.</p> <p><b>NOT OK:</b> CHECK FUSIBLE LINK FROM STARTER TO MODULE SOCKET (RED WIRE). REPLACE CONTROL MODULE AS NEEDED.</p> |   |
| <p><b>6 COOLANT TEMPERATURE LAMP CHECK</b></p> <p>If lamp stays ON <b>6A</b> all times, GO TO</p>             | <p>Turn key switch ON.</p>   |  <p>M43956</p>   | <p>Disconnect wire from temperature sensor (A) and ground it.</p> <p><i>LOOK: Lamp ON.</i></p>   | <p><b>LAMP ON:</b> TEST SENSOR AND REPLACE AS NEEDED.</p> <p><b>LAMP NOT ON:</b> CHECK BULB AND 10 AMP FUSE. THEN REFER TO CIRCUIT DIAGRAM IN SECTION 15 TO DIAGNOSE COOLANT TEMPERATURE CIRCUIT.</p> |

Electrical System Diagnosis/Transmission Neutral Start Test

6a COOLANT TEMPERATURE LAMP SHORT CIRCUIT TEST

Key switch OFF.  
Disconnect wire from coolant temperature sensor.



M36636 -UN-08SEP88

Remove bulb socket from dash and remove bulb.

Check for continuity between terminal with orange/white wire (A) and ground.

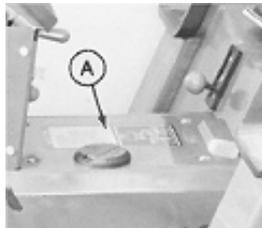
CONTINUITY: ORANGE/WHITE WIRE FROM SOCKET TO SENSOR IS SHORTED TO GROUND. REPAIR OR REPLACE.

NO CONTINUITY: TEST SENSOR AND REPLACE AS NEEDED.

MX,24010HU,24 -19-16OCT91

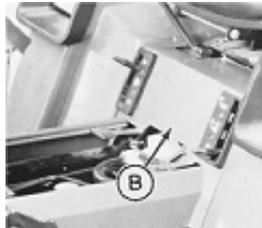
0 TRANSMISSION NEUTRAL START TEST

The transmission neutral start switch is NON-ADJUSTABLE. If machine started with control pedal depressed, use the following procedure to replace switch:



M43957 -UN-31AUG88

Remove operator platform sheet metal (A) and seat platform sheet metal (B).



M43958 -UN-31AUG88

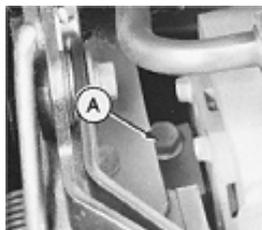
MX,24010HU,25 -19-16OCT91



M43959 -UN-31AUG88

Disconnect transmission control rod (A) from transmission.

NOTE: Access control rod from right side frame under fender.



M43960 -UN-31AUG88

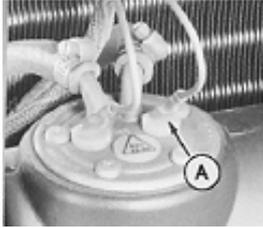
Remove bolt (A) and remove swashplate with neutral start switch.

Remove neutral start switch from swashplate and install new switch.

REPEAT STEP ' IN GROUP 05.

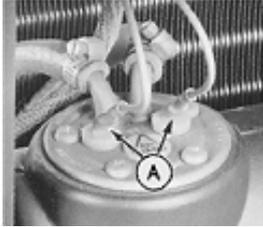
MX,24010HU,26 -19-16OCT91

Electrical System Diagnosis/Fuel Gauge Sender Bench Test

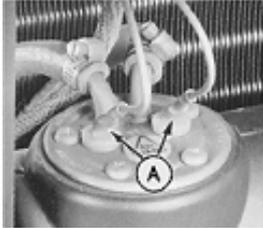
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| <p><b>U FUEL GAUGE FULL TEST</b></p> | <p>Remove front grille screen.</p> <p>Turn key switch ON.</p> |  <p>M43961 -UN-31AUG88</p> | <p>Disconnect black/white wire (A) from sender.</p> <p><i>LOOK: Fuel gauge MUST read FULL.</i></p> | <p><b>GAUGE READS FULL: CONNECT WIRE, THEN ... GO TO 8a</b></p> <p><b>GAUGE DOES NOT READ FULL: CHECK VOLTAGE AT YELLOW LEAD ON GAUGE AND GROUND (BLACK) ON GAUGE. REPLACE AS NEEDED.</b></p> |
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240  
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11

MX,24010HU,27 -19-16OCT91

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| <p><b>8a FUEL GAUGE EMPTY TEST</b></p> | <p>Turn key switch ON.</p> |  <p>M43962 -UN-31AUG88</p> | <p>Use a jumper wire to short across the two terminals (A) on sender.</p> <p><i>LOOK: Fuel gauge MUST read EMPTY.</i></p> <p><b>GAUGE READS EMPTY: GO TO 8b</b></p> <p><b>GAUGE DOES NOT READ EMPTY: VERIFY GROUND (BLACK WIRE). REPLACE GAUGE AS NEEDED.</b></p> |  |
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MX,24010HU,28 -19-16OCT91

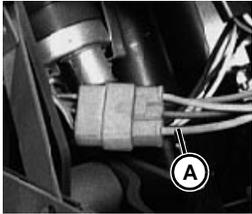
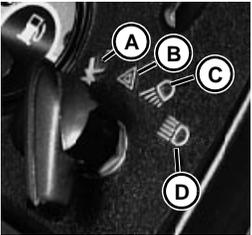
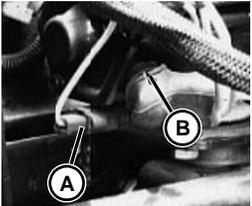
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| <p><b>8b FUEL GAUGE SENDER IN-TANK TEST</b></p> | <p>Key switch OFF.</p> <p>Disconnect both wires from fuel gauge sender.</p> |  <p>M43962 -UN-31AUG88</p> | <p>Measure resistance across terminals on sender (A).</p> <p>Resistance reading will depend on fuel level in tank.</p> | <p><b>RESISTANCE APPROXIMATELY 2-192 OHMS: SENDER OK.</b></p> <p><b>RESISTANCE ABOVE OR BELOW 2-192 OHMS: GO TO 8c</b></p> |
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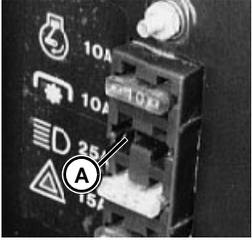
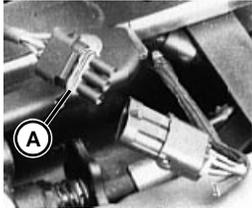
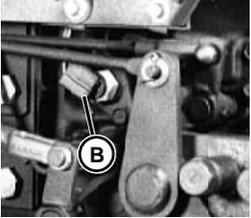
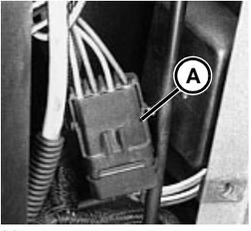
MX,24010HU,29 -19-16OCT91

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| <p><b>8c FUEL GAUGE SENDER BENCH TEST</b></p> | <p>Remove sender from fuel tank.</p> | <p>Place ohmmeter across terminals of sender.</p> <p>Move float arm to empty position, then full position.</p> | <p><b>RESISTANCE SPEC</b></p> <p><b>EMPTY—0—6 OHMS</b></p> <p><b>FULL—178—192 OHMS</b></p> | <p><b>IN SPEC: SENDER OK.</b></p> <p><b>OUT OF SPEC: REPLACE SENDER.</b></p> |
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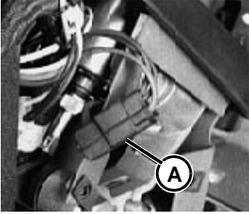
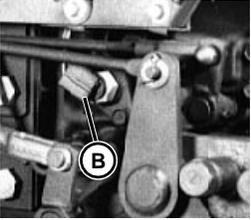
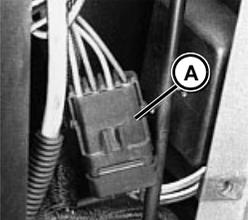
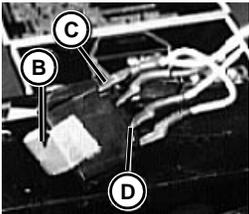
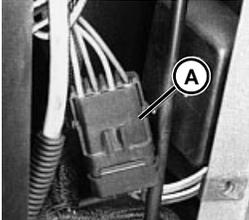
MX,24010HU,30 -19-16OCT91

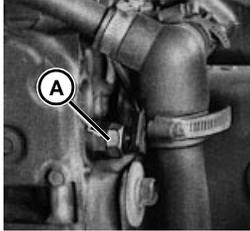
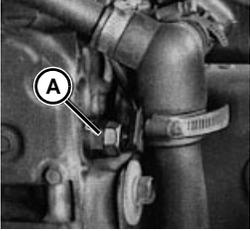
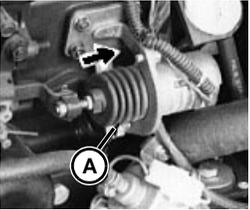
240  
10  
12

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| <p><b>9 LIGHTING CIRCUIT NO-LIGHTS-WORK TEST</b></p> <p>If warning lamps DO NOT flash properly, replace flasher unit.</p> | <p>Key switch ON.</p>   |  <p>M43963</p> | <p>Check for voltage at terminal with yellow/red wire (A) of light switch connector.</p>   | <p><b>VOLTAGE:</b> VERIFY THAT THERE IS VOLTAGE AT "BAT" TERMINAL (WHITE/BLACK WIRE) ON KEY SWITCH, THEN ... GO TO <b>9A</b></p> <p><b>NO VOLTAGE:</b> REFER TO CIRCUIT DIAGRAM IN GROUP 15.</p> |
| <p><b>9A LIGHT SWITCH TEST</b></p>  | <p>Key switch OFF.</p>  |  <p>M43928</p> | <p>Verify continuity of switch in each position:</p> <p>(A) OFF—NONE<br/>(B) WARN—BAT + WA<br/>(C) WORK—BAT + HU + FL<br/>(D) RUN—BAT + HU + WA</p>  | <p><b>OK:</b> LIGHT SWITCH OK. REFER TO CIRCUIT DIAGRAM IN GROUP 15.</p> <p><b>NOT OK:</b> REPLACE LIGHT SWITCH, THEN REPEAT <b>4</b>, GROUP 05.</p>   |
| <p><b>10 STARTER CIRCUIT TEST</b></p>   | <p>If starter cranks engine but engine DOES NOT START: GO TO <b>16</b></p> <p>If starter does not crank or cranks engine SLOWLY or ERRATICALLY: GO TO <b>17</b></p> |   | <p><b>⚠ Caution: Be aware that engine could START and run during this test.</b></p> <p>Engage and LOCK master/park brake.</p> <p>Throttle at SLOW idle.</p>                                  |  |
|  <p>M43964</p>                         | <p>Disconnect purple wire (A) from starter solenoid.</p> <p>Connect jumper wire to terminal. Jump across to large starter terminal (B).</p>                         |   | <p>STARTER RUNS: MALFUNCTION IS IN STARTING CIRCUIT (PURPLE WIRES). REFER TO CIRCUIT DIAGRAM GROUP 15 FOR DIAGNOSIS.</p> <p>STARTER DOES NOT RUN: REPAIR STARTER AS INSTRUCTED IN CTM-3.</p> |  |

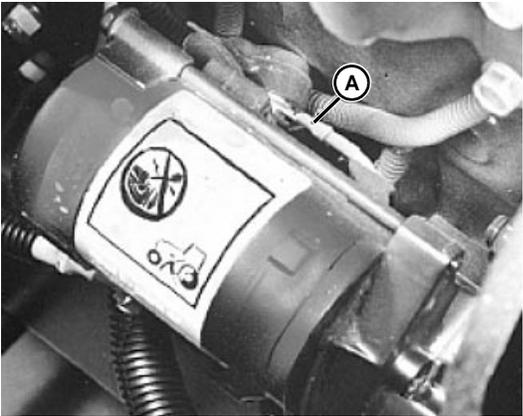
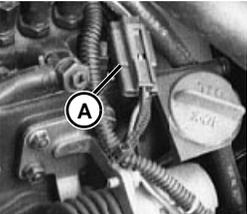
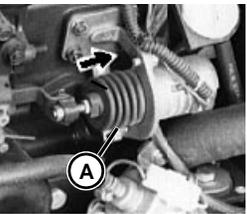
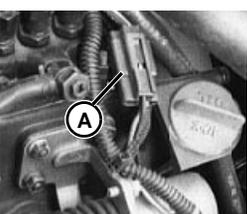
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| <p><b>11 PTO SAFETY START TEST</b></p> <p><i>NOTE: PTO safety circuit is controlled by the key switch. This test checks the function of the key switch.</i></p> <p>Master/park brake locked in PARK position.</p> <p>Use flashlight tester.</p> | <p>Turn key switch ON.</p> <p>Remove PTO 10-amp fuse (second from top) from fuse block.</p>   |  <p>M43965</p>  | <p>Put test light on left side terminal of fuse holder (A).</p> <p>Briefly turn key to START. Test light should go OFF with key in START position.</p>   | <p><b>OK:</b> KEY SWITCH OK. REFER TO PTO CIRCUIT DIAGRAM IN GROUP 15.</p> <p><b>NOT OK:</b> TEST KEY SWITCH CONTINUITY USING INFORMATION ON FOLDOUT WIRING DIAGRAM IN GROUP 15.</p> |
| <p><b>12 SEAT SWITCH TEST</b></p>   | <p>Tilt seat forward.</p> <p>Key switch OFF.</p> <p>Separate 3-pin connector for seat switch.</p>   |  <p>M43966</p>  | <p>Check continuity across terminals of connector (A).</p> <p>OFF SEAT—NO CONTINUITY.</p> <p>SWITCH DEPRESSED—CONTINUITY BETWEEN PINK/WHITE AND YELLOW WIRES.</p> <p>SWITCH PULLED UP (OVERRIDE)—CONTINUITY BETWEEN BLUE AND YELLOW WIRES.</p> | <p>SEAT SWITCH OK: CONNECT SEAT SWITCH, GO TO <b>12A</b></p> <p><b>NOT OK:</b> REPLACE SEAT SWITCH THEN, REPEAT <b>6</b> GROUP 05.</p>   |
| <p><b>12A TIME DELAY CONTROL (TDC) MODULE DELAY FUNCTION TEST</b></p> <p><b>IMPORTANT: Be sure to perform Step 12 before this test.</b></p> <p>Turn key switch ON.</p>  |  <p>M42295</p>  <p>M43967</p> | <p>Verify good ground at black wire at PTO switch connector (B), this is done because of inaccessibility of TDC 4-pin connector (A).</p> |  | <p><b>GOOD GROUND:</b> REPLACE TDC MODULE, THEN ... GO TO <b>7</b>, GROUP 05.</p> <p><b>POOR GROUND:</b> CLEAN CONNECTIONS AS NEEDED, THEN ... GO TO <b>7</b>, GROUP 05.</p>         |

240  
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14

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| <p><b>13 PTO MAGNET VOLTAGE TEST</b></p>  | <p>Key switch ON.<br/>Operator ON seat.<br/>Use flashlight tester.</p>   | <br>M43968   | <p>Check for voltage at blue wires on PTO lever magnet connector (A).<br/><br/>Replace striker plate if smaller than 1.5 inch (38 mm) in diameter.</p>  | <p>VOLTAGE: REPLACE MAGNET.<br/><br/>NO VOLTAGE: GO TO <b>13A</b></p>   |
| <p><b>13A TIME DELAY CONTROL (TDC) MODULE PTO TEST</b></p> <p>Key switch ON.<br/>Operator ON seat.<br/>Use flashlight tester.</p> | <br>M42295<br><br><br>M43967 | <p>Check for voltage at blue wires on PTO connector (B), this is done because of inaccessibility of TDC 4-pin connector (A).</p>  |   | <p>VOLTAGE: WIRES TO MAGNET BROKEN OR CONNECTOR NOT TIGHT. REPAIR OR REPLACE.<br/><br/>NO VOLTAGE: GO TO <b>13B</b></p>   |
| <p><b>13B TDC INPUT VOLTAGE TEST</b></p>  | <p>Raise seat and remove seat switch from its bracket.<br/>Tape seat switch plunger CLOSED (B).<br/><br/>Turn key switch to ON position ONLY.<br/><br/>Use flashlight tester.</p>              | <br>M42298<br><br><br>M43967 | <p>Check for voltage at yellow wire (C) and pink/white wire (D) of seat switch, this is done because of inaccessibility of TDC 4-pin connector (A).</p> | <p>NO VOLTAGE: PROBLEM IN ACCESSORY WIRING (YELLOW WIRE) REFER TO GROUP 15.<br/><br/>VOLTAGE: VERIFY GROUND AT BLACK WIRES ON TDC CONNECTOR, THEN REPLACE TDC MODULE AS NEEDED.</p> |

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| <p><b>14 PTO INDICATOR LAMP TEST</b></p>   | <p>Key switch ON, engine OFF.</p> <p>Operator ON seat.</p> <p>PTO lever ENGAGED.</p> <p><i>NOTE: If PTO dash indicator lamp is not on, check bulb and fuse first, then proceed with diagnosis.</i></p> <p>Use flashlight tester.</p> |  <p>M43981</p>   | <p>Check for voltage at terminals on indicator lamp switch (A).</p> <p>If voltage at only one terminal. replace switch.</p> | <p>VOLTAGE BOTH TERMINALS:<br/>PROBLEM IS IN BLACK GROUND WIRE FROM SWITCH.</p> <p>NO VOLTAGE:<br/>PROBLEM IS IN YELLOW WIRE FROM FUSE TO BULB OR IN BLUE WIRE FROM BULB TO SWITCH.</p>                                      |
| <p><b>15 PTO SELECTOR SWITCH TEST</b></p> <p>Test seat switch (Step 12) before performing this test.</p> | <p>Key switch ON.</p> <p>Seat switch in override (up) position.</p> <p>Use flashlight tester.</p>  |  <p>M43981</p>   | <p>Check for voltage at terminals on PTO selector switch (A).</p> <p>If voltage at only one terminal, REPLACE SWITCH.</p>   | <p>VOLTAGE BOTH TERMINALS:<br/>PROBLEM IN WIRING BETWEEN SWITCH AND CLUTCH. SEE CIRCUIT DIAGRAM, GROUP 15.</p> <p>NO VOLTAGE:<br/>PROBLEM IN ACCESSORY CIRCUIT (YELLOW WIRES). REFER TO PTO CIRCUIT DIAGRAM, (GROUP 15).</p> |
| <p><b>16 FUEL SHUTOFF SOLENOID TEST</b></p>  | <p>Open hood, remove right side panel.</p> <p>Lock master/park brake in PARK position.</p>   |  <p>M43969</p> | <p>Briefly turn key switch to start.</p> <p><i>LOOK: Solenoid plunger (A) MUST move in.</i></p>                             | <p>SOLENOID MOVES:<br/>GO TO <b>16C</b></p> <p>SOLENOID DOES NOT MOVE: GO TO <b>16A</b></p>  |

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16

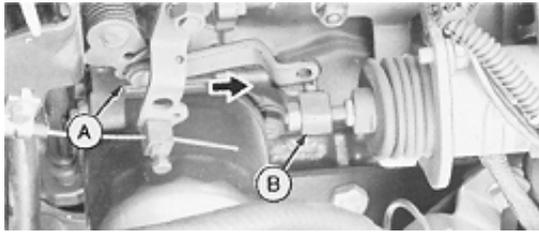
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| <p><b>16A FUEL SHUTOFF SOLENOID PULL-IN TEST</b></p> <p>Key switch OFF.</p> <p><i>Note: Pull -in circuit activated by starter. Solenoid pulls in when starter runs.</i></p> |  <p>M42281</p> | <p>Disconnect white solenoid wire (A) from back side of starter.</p>   | <p>Connect jumper wire to battery positive terminal.</p> <p><b>Important: Do not jump wire more than 1 second or solenoid may be damaged.</b></p> <p>Briefly JUMP to "white" solenoid wire.</p> <p><i>LOOK: Solenoid MUST PULL-IN.</i></p>  |
|   |   | <p>SOLENOID PULLS-IN: DISASSEMBLE STARTER (CTM-3) AND CHECK ELECTRICAL CONNECTIONS.</p> <p>SOLENOID DOES NOT PULL-IN: (verify linkage moves freely by hand) GO TO <b>16B</b></p> |   |
| <p><b>16B FUEL SHUTOFF SOLENOID GROUND CIRCUIT TEST</b></p>   | <p>Key switch OFF.</p>  |  <p>M43971</p>   | <p>Separate connector (A) at solenoid.</p> <p>Check for good continuity between harness side of connector and ground at battery negative post.</p> <p><b>GOOD GROUND:</b> Voltage must be 12 volts DC. REPLACE SOLENOID.</p> <p><b>POOR/NO GROUND:</b> CLEAN AND TIGHTEN SYSTEM GROUNDS (BEGINNING OF THIS GROUP). REPEAT TEST.</p> |
| <p><b>16C FUEL SHUTOFF SOLENOID HOLD-IN TEST</b></p>  | <p>Turn key switch ON.</p>  |  <p>M43969</p>  | <p>Push solenoid plunger (A) FULLY IN.</p> <p><i>LOOK: Solenoid MUST stay IN.</i></p> <p><b>SOLENOID STAYS IN:</b> GO TO <b>16E</b></p> <p><b>SOLENOID DOES NOT STAY IN:</b> Disconnect linkage and repeat. GO TO <b>16D</b></p>  |
| <p><b>16D FUEL SHUTOFF SOLENOID VOLTAGE TEST</b></p>  | <p>Key switch ON.</p> <p>Use flashlight tester.</p>   |  <p>M43971</p>  | <p>Check for voltage at yellow wire on solenoid connector (A). Minimum voltage is 9 volts D.C.</p> <p><b>VOLTAGE:</b> VERIFY GROUND (STEP 16B), REPLACE SOLENOID AS NEEDED.</p> <p><b>NO VOLTAGE:</b> REFER TO CIRCUIT DIAGRAM IN GROUP 15.</p>   |

Electrical System Diagnosis/Starter AMP Draw Test

1<sup>e</sup> **ADJUST FUEL SHUTOFF SOLENOID—655 AND 755/756**

Disconnect fuel shutoff lever from solenoid plunger.

Turn key switch ON, push solenoid plunger FULLY IN.



M43972 -UN-31AUG88

Push fuel shutoff arm (A) toward solenoid until it STOPS.

Turn adjustable link (B) until it ALIGNS with lever hole.

Turn link OUT two additional turns and assemble.

AFTER ADJUSTMENT: GO TO 0, GROUP 05.

IF ENGINE STILL DOES NOT START, TEST FUEL PUMP AS INSTRUCTED IN SECTION 220.

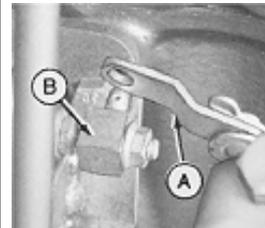
MX,24010HU,47 -19-16OCT91

240  
10  
17

1<sup>f</sup> **ADJUST FUEL SHUTOFF SOLENOID—855/856 AND 955**

Disconnect fuel shutoff lever from solenoid plunger.

Turn key switch ON, push solenoid plunger FULLY IN.



M43989 -UN-07SEP88

Push fuel shutoff arm (A) toward solenoid until it STOPS.

Turn adjustable link (B) until it ALIGNS with lever hole.

Turn link OUT two additional turns and assemble.

AFTER ADJUSTMENT: GO TO 0, GROUP 05.

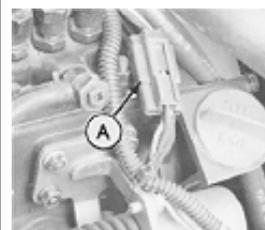
IF ENGINE STILL DOES NOT START, TEST FUEL PUMP AS INSTRUCTED IN SECTION 220.

MX,24010HU,48 -19-16OCT91

1& **STARTER AMP DRAW TEST**

Before performing starter draw test, test battery as instructed in the beginning of this group.

Remove right side panel.



M43971 -UN-31AUG88

Separate connector (A) from fuel shutoff solenoid so ENGINE WILL NOT START during test.

MX,24010HU,49 -19-16OCT91

Electrical System Diagnosis/Starter No Load Test—Running



M43951 -UN-31AUG88

*NOTE: Battery location varies, some tractors have the battery located behind the front grille.*

**IMPORTANT: Before making any test connections, turn load knob (A) on meter counterclockwise FULLY.**

Connect JTO5685 Battery Tester to tractor battery: Red lead to positive (+) terminal, black lead to negative (-) terminal.

Check engine rpm while CRANKING. Use JTO28201 or JTO1638 Photo Tachometer.

Adjust load knob clockwise until battery voltage reads the same as when cranking.

Again, crank engine with starter. Meter should read 230 amps or less.

Turn load knob counterclockwise FULLY.

230 AMPS OR LESS BUT RPM IS LOW: GO TO 1%<sub>b</sub>

230 AMPS OR LESS AT 300 RPM: STARTER OK.

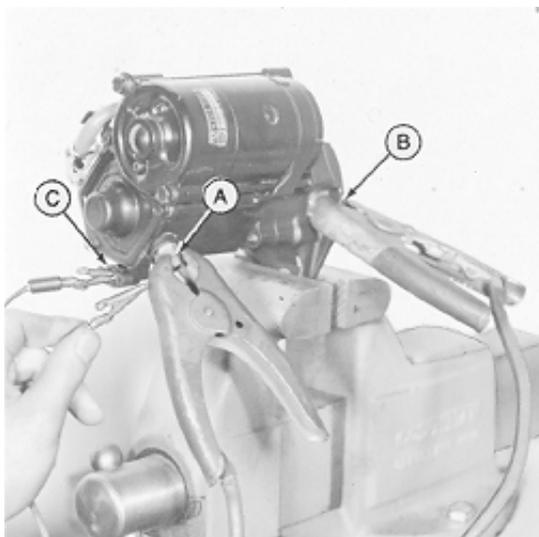
MORE THAN 230 AMPS: GO TO 1%<sub>b</sub>

MX,24010HU,50 -19-16OCT91

1%<sub>a</sub> **STARTER NO LOAD TEST—RUNNING**

Disconnect battery ground cable.

Remove starter to bench.



M36656 -UN-29AUG88

Mount starter in a vise.

Use jumper cables to connect starter to tractor battery or one of similar capacity.

Connect positive clamp to starter common terminal (A). Connect negative clamp to starter body (B).

Connect a jumper wire to starter terminal (C). Jump wire to positive cable clamp as shown.

Starter **MUST** engage and run.

SOLENOID “CLICKS” OR CHATTERS, MOTOR DOES NOT RUN: REPLACE SOLENOID.

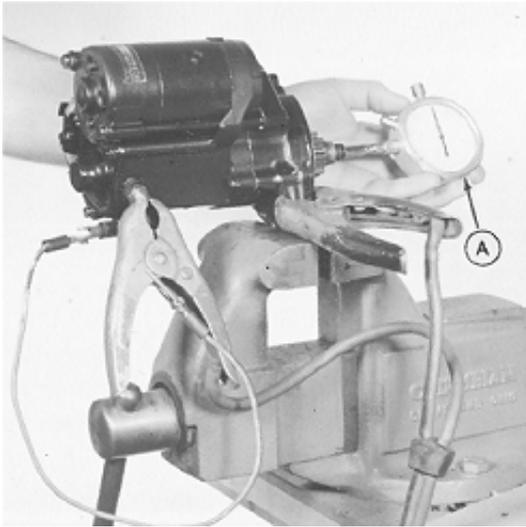
PINION GEAR ENGAGED BUT MOTOR DOES NOT RUN: REPAIR OR REPLACE STARTER MOTOR. (SEE SECTION 40.)

STARTER ENGAGES AND RUNS: GO TO 1%<sub>b</sub>

MX,24010HU,51 -19-16OCT91

Electrical System Diagnosis/Starter No Load Test—AMP Draw

1%<sub>b</sub> STARTER NO  
LOAD  
TEST—RPM



M36657 -UN-29AUG88

Mount starter in a vise and connect to a battery as instructed in Step 17A.

With starter RUNNING, check no load rpm with D-05011ST Tachometer (A) or JTO28201 or JTO1638 Photo Tachometer. Follow manufacturer instructions with tachometer.

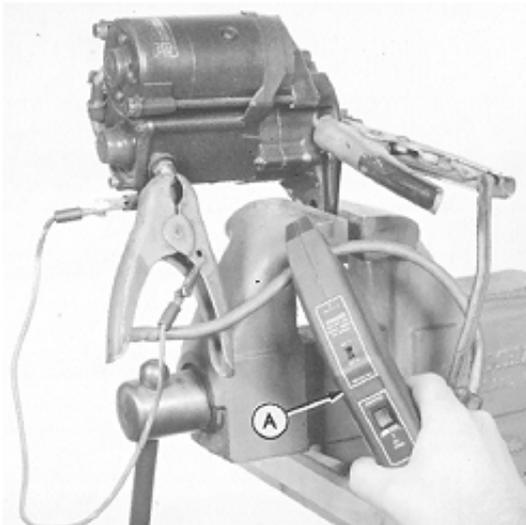
No load rpm SHOULD BE about 3000.

RPM ABOUT 3000: GO TO 1%<sub>c</sub>

RPM BELOW 3000: BE SURE BATTERY IS OF PROPER SIZE AND IS FULLY CHARGED. REPEAT TEST AS NEEDED WITH FULLY CHARGED BATTERY. IF BATTERY IS OK, REPAIR OR REPLACE STARTER (SEE CTM-3).

MX,24010HU,52 -19-16OCT91

1%<sub>C</sub> STARTER NO  
LOAD  
TEST—AMP  
DRAW



M36658 -UN-29AUG88

Mount starter in a vise and connect to a battery as instructed in Step 17A.

With starter RUNNING, check amperage with JTO5712 Current Gun (A).

Starter SHOULD draw 90 amps or less at 3000 rpm.

AMPERAGE 90 OR LESS: STARTER OK. MALFUNCTION IS IN WIRING ON TRACTOR CONNECTIONS AND GROUNDS.

AMPERAGE MORE THAN 90: REPAIR OR REPLACE STARTER. (SEE CTM-3).

MX,24010HU,53 -19-16OCT91

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## ABOUT THIS GROUP

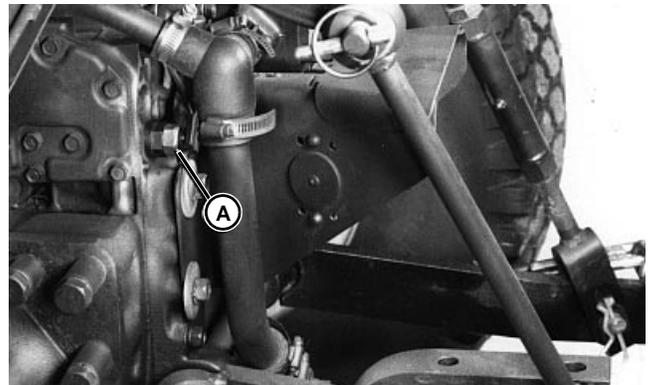
This Group contains information on the location of electrical components along with information on how to access them. Also in this Group is theory of operation. The theory is limited to a description of each circuit and an explanation of how the circuit functions. At the end of this Group you will find the different electrical schematic diagrams that will aid you in your service and diagnosis of the electrical system.

## COMPONENT LOCATIONS

The information that follows will help you locate and access many of the electrical components. Obvious components such as the starter, alternator, key switch, etc. will not be shown. See CTM-3 (10Aug 93 or later) for more specific information on removal and installation of electrical components.

### PTO LAMP SWITCH

The PTO lamp switch (A) is located on the rear of the transaxle (left side).

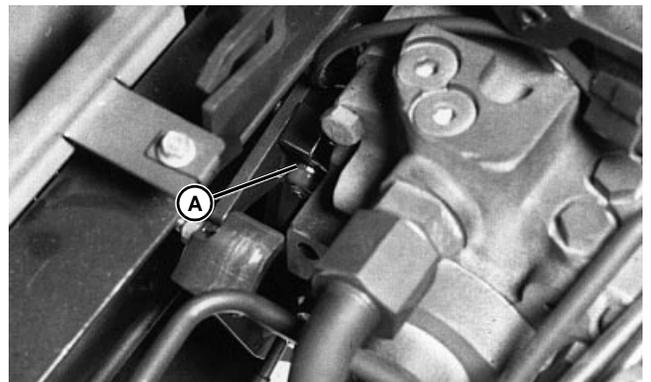


M47000

### TRANSMISSION NEUTRAL START SWITCH

The transmission neutral start switch (A) is attached to the inside of the swashplate bracket located on the right side of the hydrostatic transmission.

It aligns with the cam roller of the neutral return bracket.

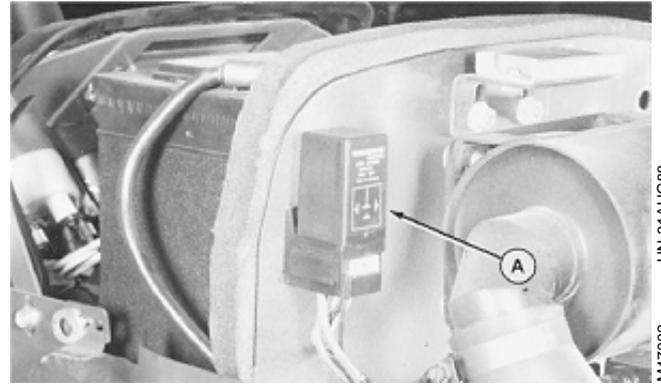


M47001

## THERMO-START CONTROL MODULE

The thermo-start control module (A) is located on the upper right side of the engine firewall.

Open hood to access it.



MX,24015HU,5 -19-16OCT91

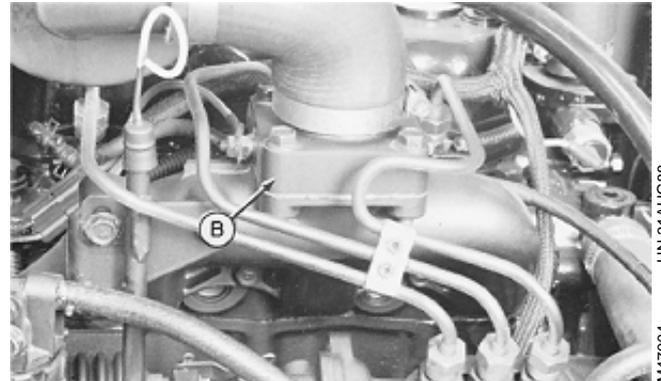
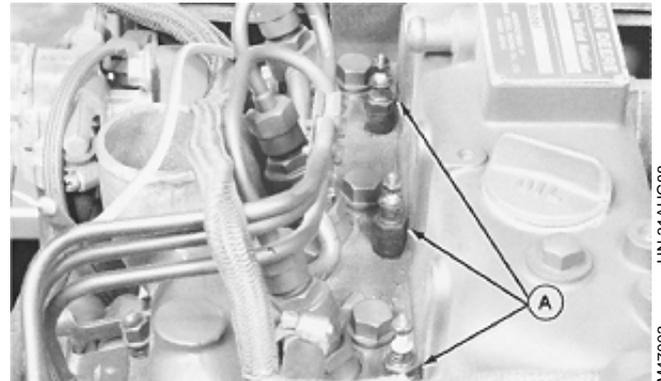
M47002  
-UN-31AUG88

## THERMO-START COMPONENTS

**GLOW PLUGS (655 AND 755/756 MODELS ONLY):** The glow plugs (A) are located on the top of the engine cylinder head, between the fuel injectors and the rocker arms cover.

**AIR HEATER (855/856 AND 955 MODELS ONLY):** The air heater element (B) is located in-line between the engine air cleaner and the intake manifold.

Open hood and remove air cleaner canister and hose to access either of them.



MX,24015HU,6 -19-16OCT91

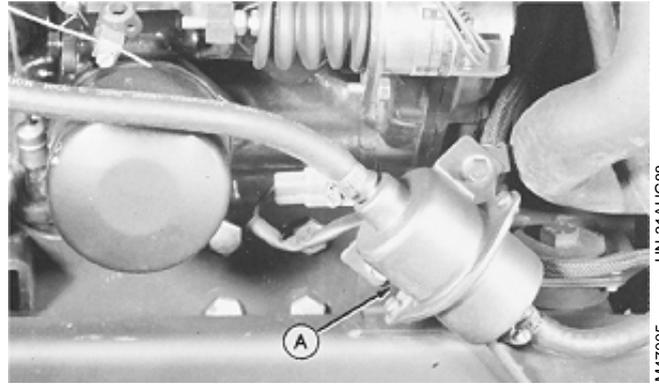
M47003  
-UN-31AUG88

M47004  
-UN-31AUG88

## FUEL TRANSFER PUMP

The fuel transfer pump (A) is located on the right side of the engine on all 655, 755/756, and 856 tractors. Only early 855 tractors had the electric fuel transfer pump. Late 855 and all 955 tractors use a mechanical fuel transfer pump that is driven off one of the lobes of the fuel injection pump cam shaft.

Open hood and remove right side engine panel to access.



M47005 -UN-31AUG88

240  
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3

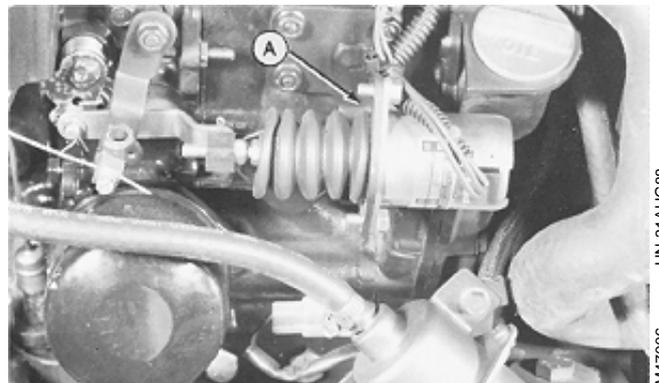
MX,24015HU,7 -19-16OCT91

## FUEL SHUTOFF SOLENOID

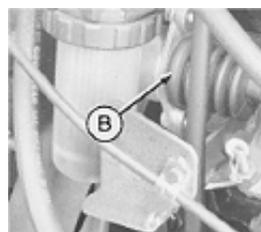
The fuel shutoff solenoid (A) (655 and 755/756 models) is located on the right, front side of the engine.

The fuel shutoff solenoid (B) (855/856 and 955 models) is located on the right, rear side of the engine, behind the fuel filter.

Open hood and remove right side engine panel to access it.



M47006 -UN-31AUG88



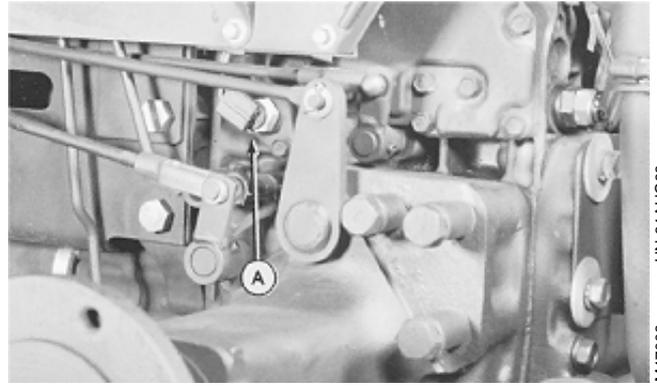
M43991 -UN-07SEP88

MX,24015HU,8 -19-16OCT91

## PTO SELECTOR SWITCH

The PTO selector switch (A) is located on the left side of the transaxle, above the final drive axle housing.

*NOTE: Various components removed for clarity only.*

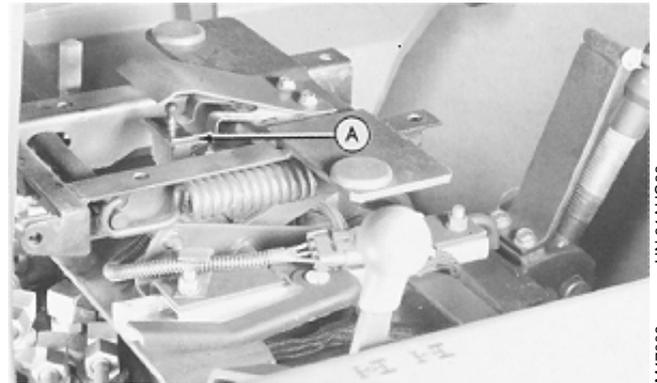


MX,24015HU,9 -19-16OCT91

M47008  
-UN-31AUG88

## PTO SAFETY SEAT SWITCH

The PTO safety seat switch (A) is located under the tractor seat on the slide suspension.



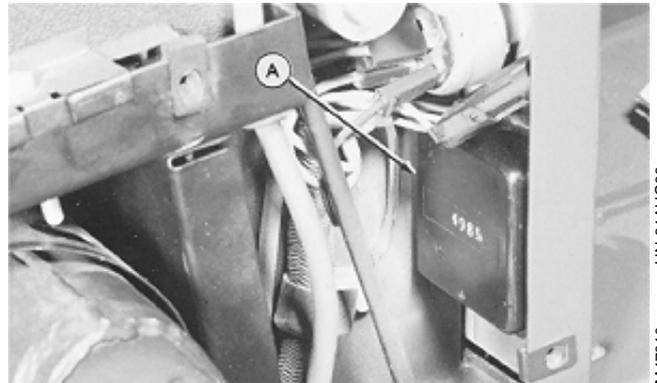
MX,24015HU,10 -19-16OCT91

M47009  
-UN-31AUG88

## TIME DELAY CONTROL (TDC) MODULE

The time delay module (A) is located in the pedestal compartment under the key switch.

Open hood and remove left side pedestal panel to access it.



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M47010  
-UN-31AUG88

## PTO MAGNET

The PTO magnet (A) is located inside the pedestal compartment above the key switch.

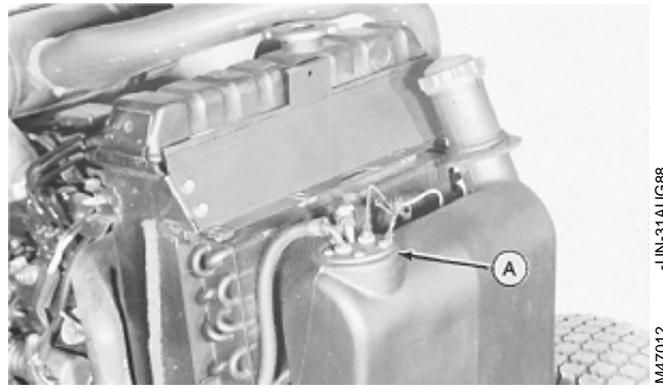


MX,24015HU,12 -19-16OCT91

M47011  
-UN-31AUG88

## FUEL GAUGE SENDER

The fuel gauge sending unit (A) is mounted on the top right side of the fuel tank located at the front of 655, 755/756, 856, and early 855 tractors.



240  
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5  
-UN-31AUG88  
M47012

On late 855 and all 955 tractors, the fuel gauge sending unit (A) is located on the top left side of the fuel tank under the hood, inside the pedestal compartment.

Raise hood to gain access to both.



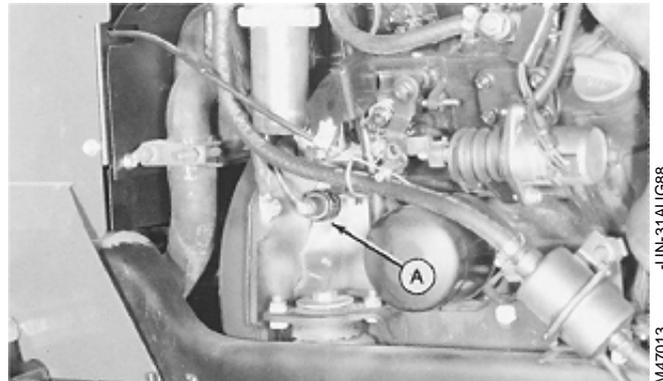
-UN-23SEP91  
M42299

MX,24015HU,13 -19-16OCT91

## OIL PRESSURE SENDER

The oil pressure sender switch (A) is located on the right side of the engine, just to the rear of the oil filter.

Open hood and remove right side engine panel to access it.



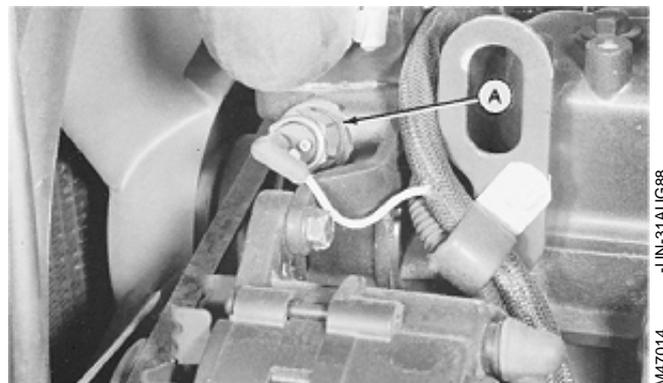
-UN-31AUG88  
M47013

MX,24015HU,14 -19-16OCT91

## WATER TEMPERATURE SENDER

The water temperature sender switch (A) is located in the thermostat housing under the top radiator hose, near the alternator.

Open hood and remove left side engine panel to access it.



-UN-31AUG88  
M47014

MX,24015HU,15 -19-16OCT91

## WARNING LIGHT FLASHER ELEMENT

The warning light flasher element (A) is located under the dash panel, near the warning light switch.

Open hood to access it.



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M47015 -UN-31AUG88

## **ELECTRICAL CIRCUIT OPERATION**

The next several pages contain the various electrical circuits and their theory of operation. There have been several changes to the electrical harnesses over the years and these circuit theories are generic in nature. Therefore, you will be able to better understand each circuit if you reference the appropriate electrical schematic for the tractor you are servicing at the same time.

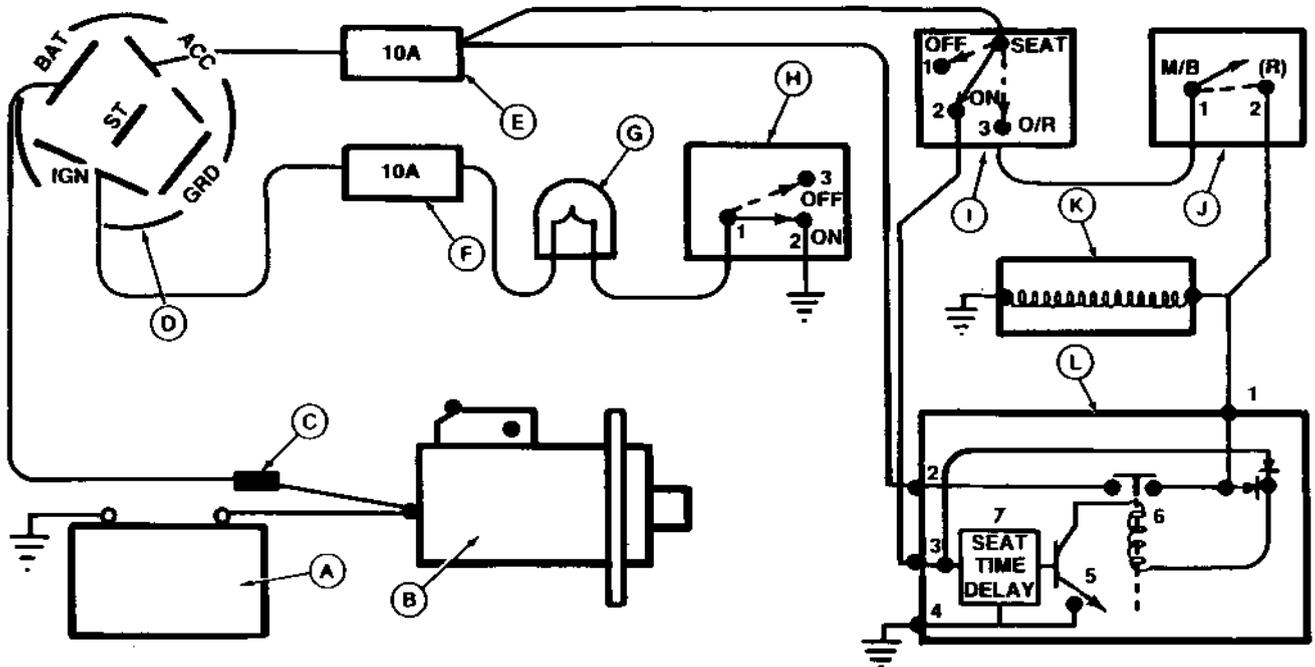
The following electrical circuits are covered:

- PTO Circuit Operation
- Fuel Transfer Pump Circuit Operation
- Engine Preheat Circuit Operation
- Fuel Shutoff Circuit Operation
- Starting Circuit Operation
- Charging Circuit Operation
- Oil Pressure Circuit Operation
- Coolant Temperature Circuit Operation
- Fuel Gauge Circuit Operation
- Lighting Circuit Operation

MX,24015HU,17 -19-16OCT91

240  
15  
7

PTO CIRCUIT OPERATION



A—Battery  
B—Starter  
C—Fusible Link

D—Key Switch  
E—Fuse  
F—Fuse

G—Indicator Lamp  
H—PTO Lamp Switch  
I—Seat Switch

J—PTO Selector Switch  
K—PTO Magnet  
L—TDC Module

The PTO circuits supply current to the PTO magnet, safety interlocks, and dash indicator lights.

Battery current (A) flows to the starter (B) common terminal, through the protective 16-gauge fusible link (C) to the key switch (D) "BAT" terminal.

When the key switch is in the ON position, current flows through the "ACC" terminal through the 10-amp fuse (E) to the seat switch (I). Current also flows at the same time through the "IGN" terminal through the 10-amp fuse (F) to the PTO dash lamp (G) and PTO lamp switch (H).

PTO SELECTOR IN MID, MID/REAR, OR REAR POSITION—OPERATOR ON SEAT

*NOTE: In this story, the letter references are to components, number references are to circuits.*

When the operator is on the seat, current flows through the closed seat switch contacts (I-2) to the TDC module time delay circuit (L-3). Current within the TDC flows from (L-3) to the relay coil (L-6) and time delay element (L-7).

The energized time delay element closes a transistor (L-5), completing the relay coil path to ground (L-4).

The energized relay coil (L-6) pulls the contact points closed, allowing current to flow from terminal (L-2) to (L-1) and to the PTO magnet (K).

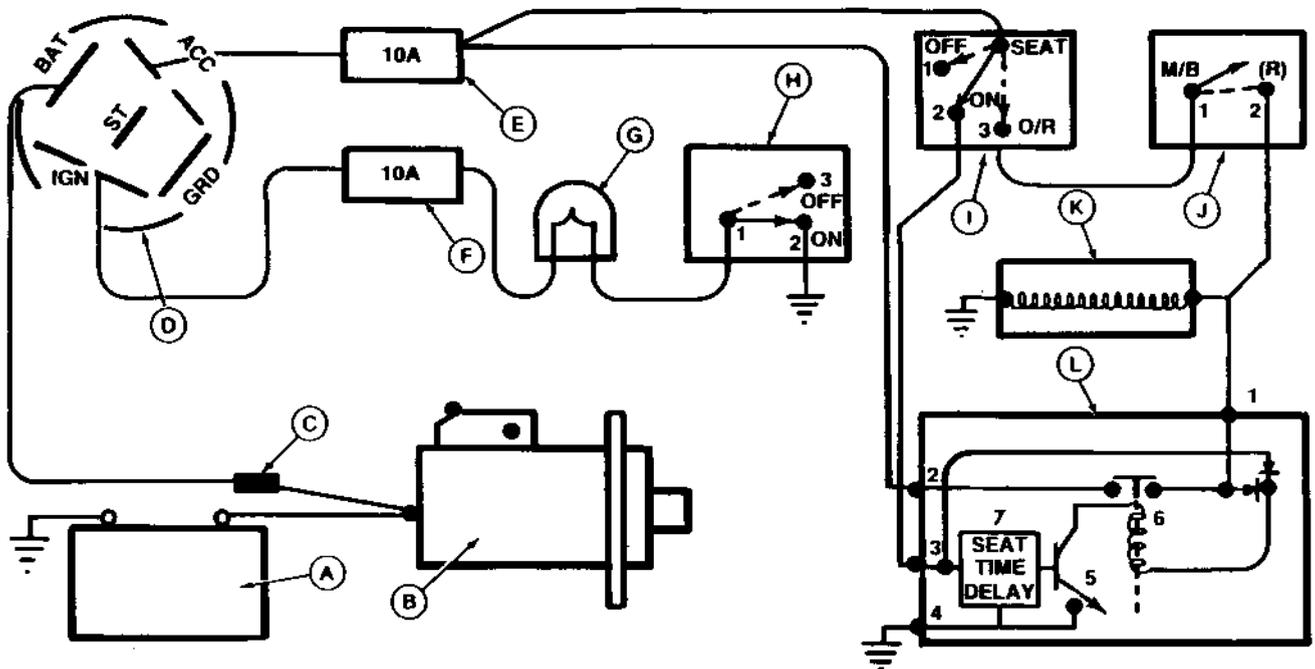
The energized PTO magnet (K) magnetically "locks" onto the PTO dash lever locking plate inside the dash compartment. When the PTO dash lever is manually moved forward into the engaged position, the linkage forces the PTO valve spool rearward to engage the PTO clutch and release the PTO brake. This rearward spool movement also pushes against the PTO lamp switch (H), causing it to close. Current now flows through the closed PTO lamp switch to ground, which lights up the dash indicator lamp (G).

The PTO selector lever is always set at one of the three operational positions. The PTO selector switch (J) is actuated (by internal transaxle components) only when the PTO selector lever is moved up into the rear PTO position.

(Continued on the next page)

M43867 -19-11DEC89

PTO CIRCUIT OPERATION (CONTINUED)



A—Battery  
B—Starter  
C—Fusible Link

D—Key Switch  
E—Fuse  
F—Fuse

G—Indicator Lamp  
H—PTO Lamp Switch  
I—Seat Switch

J—PTO Selector Switch  
K—PTO Magnet  
L—TDC Module

PTO SELECTOR MID, MID/REAR, OR REAR POSITION—OPERATOR OFF SEAT

If operator leaves the seat, the seat switch contact opens (I-1), breaking the current path to the TDC seat delay element (L-7) and to the relay coil (L-6). However, the relay coil does not open because it continues to receive current flow from terminal (L-2) through the "locked in" contact points (L-6).

Approximately one to two seconds after current path to the TDC seat delay element (L-7) is broken, the time delay element (L-7) opens the transistor (L-5), breaking the relay coil's (L-6) path to ground. The relay coil (L-6) is de-energized, opening the contact points, which, in turn, breaks the current flow to the PTO magnet (K).

The magnetic field collapses between the magnet and the PTO dash lever locking plate. Spring tension in the PTO valve instantly forces the spool to move forward engaging the PTO brake and disengaging the PTO clutch. This forward spool movement opens the PTO lamp switch contact (H) which breaks the current path to ground and the PTO dash indicator

lamp (G) turns off. At this same instant, the PTO magnet hinged bracket is pulled away from the PTO dash lever locking plate by the PTO valve linkage, creating a loud "click" sound as it hits the pedestal panel.

Returning to the seat re-energizes the PTO circuits that re-energize the magnet. The PTO dash lever must be returned to the OFF position to re-establish the magnetic field between the lever locking plate and the magnet before PTO operation can be re-engaged.

PTO SELECTOR IN REAR POSITION—OPERATOR OFF SEAT

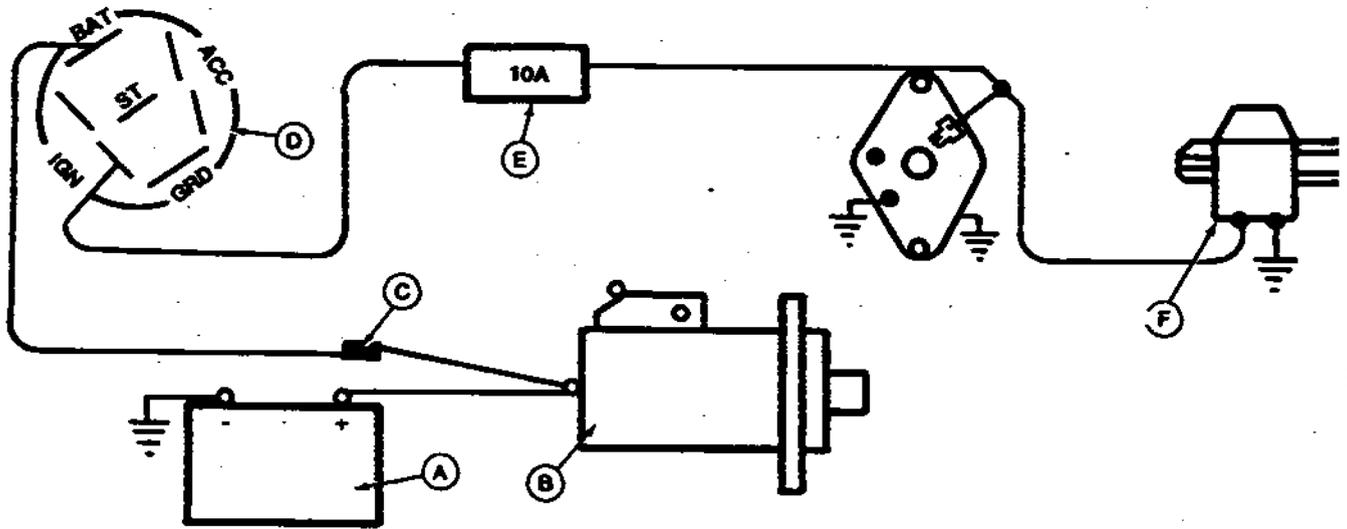
Raise seat and pull the seat switch plunger (I) outward into override position (I-3).

Current flows from the 10-amp fuse (E) through the seat switch contact (I-3) to the PTO selector switch (J-1). The PTO selector lever must be in the rear (up) position (J-2). Current then flows directly to the PTO magnet (L). The PTO magnet is energized at all times when the system is in the override mode.

240  
15  
9

M43867 -19-11DEC89

## FUEL TRANSFER PUMP OPERATION



A—Battery  
B—Starter

C—Fusible Link  
D—Key Switch

E—Fuse

F—Fuel Transfer Pump

The fuel transfer pump is used on all 655 and 755/756 models, and early 855/856 units. Later 855 and all 955 models use a mechanical fuel pump driven by a lobe of the injection pump cam shaft.

The fuel transfer pump pulls fuel from the fuel tank and supplies it under pressure to the fuel injection pump.

Current flows from the battery (A) to the starter (B) common terminal and to the key switch (D) "BAT" terminal. The starter to key switch connection is protected by a 16-gauge fusible link (C).

Turning the key switch to ON or to START allows current to flow through the "IGN" terminal, the 10-amp

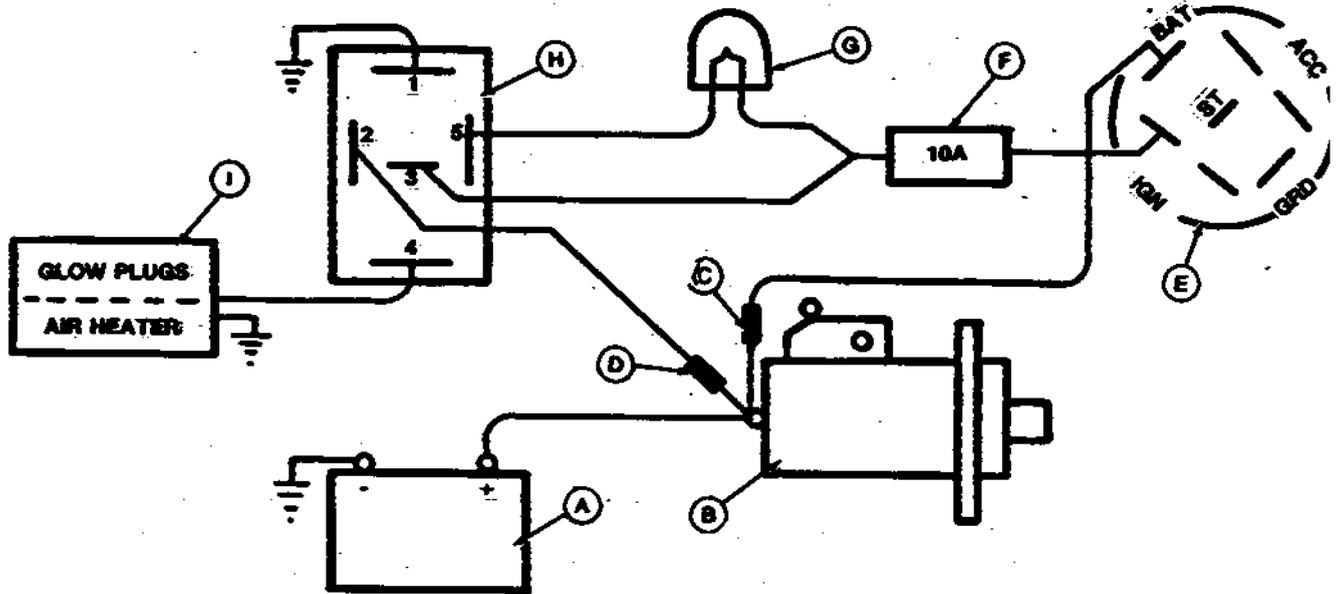
fuse (E), the alternator tie point, and the fuel transfer pump (F) to ground.

Current flowing through the fuel pump energizes an electromagnet which retracts the pump plunger against a compression spring. The pump plunger actuates a stop switch when fully retracted. The stop switch breaks the current flow to the electromagnet allowing the compression spring to return the pump plunger to its extended position. The electromagnet re-energizes and the cycle is repeated. This cycle is repeated many times per second to create the pumping action.

MX,24015HU,19 -19-16OCT91

M43869 -19-01MAY89

## ENGINE PREHEAT CIRCUIT OPERATION



A—Battery  
B—Starter  
C—Fusible Link

D—Fusible Link  
E—Key Switch

F—Fuse  
G—Indicator Lamp

H—Preheat Controller  
I—Glow Plugs/Air Heater

The engine preheat circuit regulates current flow to the glow plugs (655 and 755/756 models) or air heater (855/856 and 955 models) used to assist in cold weather starting.

Current flows from the battery (A) to the starter (B) common terminal, the key switch (E) "BAT" terminal and the control module (H) No. 2 terminal. The key switch and control module connections contain 16-gauge fusible links (C and D).

When the key switch is in the ON or START position, current flows through the "IGN" terminal to the 10-amp (F), the dash mounted wait light (G), and the control module (H) No. 3 terminal.

Current flows from the No. 3 terminal through the module temperature sensor to ground (Terminal 3 to 1). The sensed value is a combination of air and machine temperatures. When the sensed temperature is below predetermined limits (cold weather), the control module completes a path to ground which lights the dash wait lamp (Terminal 5 to 1).

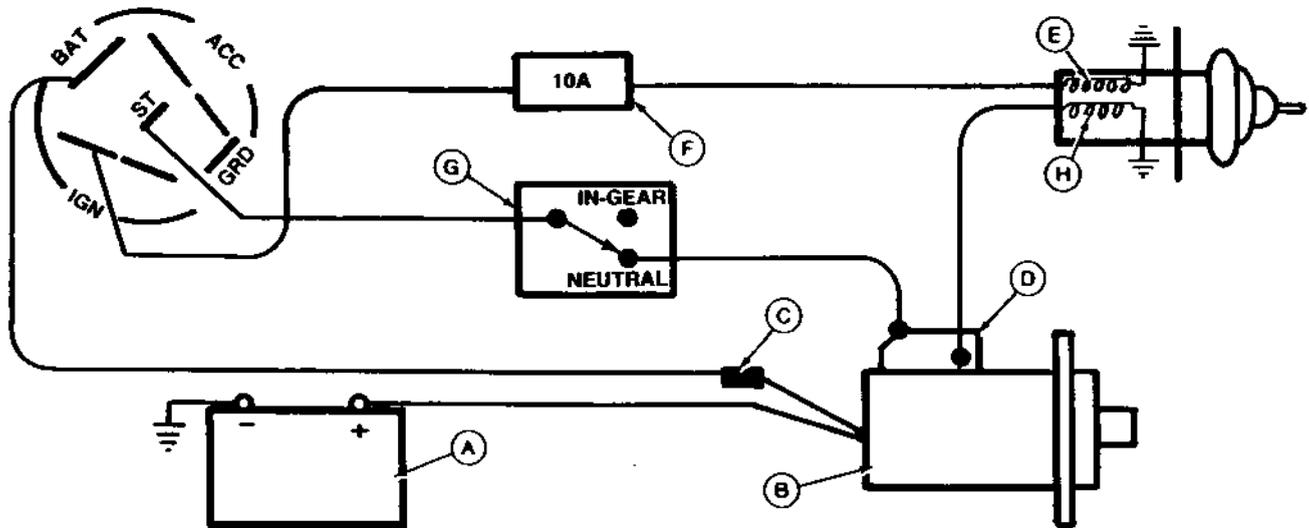
Internal switching also completes the battery to glow plug/air heater circuit (Terminal 2 to 4).

The wait and heat times for the 655 and 755/756 models vary based on temperatures sensed by the control module. The maximum wait light time is eight seconds and the maximum glow plug heat time is 30 seconds.

The wait and heat times for the 855/856 and 955 models are constant. Whenever the sensed temperature is below 4°C (40°F) the dash wait lamp lights for 15 seconds and the air heater glows for 45 seconds.

The engine may be started after the dash wait lamp goes out. Once the wait light goes out, the glow plugs or air heater will remain on to assure smooth engine start and warm up. The glow plugs or air heater will turn off when the predetermined time or temperature limit is reached.

**FUEL SHUTOFF CIRCUIT OPERATION**



A—Battery  
B—Starter

C—Fusible Link  
D—Starter Solenoid

E—Hold-In Coil  
F—Fuse

G—Neutral Start Switch  
H—Pull-In Coil

The fuel shutoff solenoid mechanically actuates the shutoff lever of the fuel injection pump.

The solenoid plunger is controlled by pull-in coil (H) and hold-in coil (E).

Current flows from the battery (A) to the starter (B) common terminal and to the key switch “BAT” terminal. The starter to key switch connection contains a 16-gauge fusible link (C).

Turning the key switch to the START position allows current to flow through the “IGN” terminal and 10-amp fuse (F) to energize the solenoid hold-in coil (E). The hold-in coil draws 1 amp. Current also flows through

the “ST” terminal to the transmission neutral start switch (G).

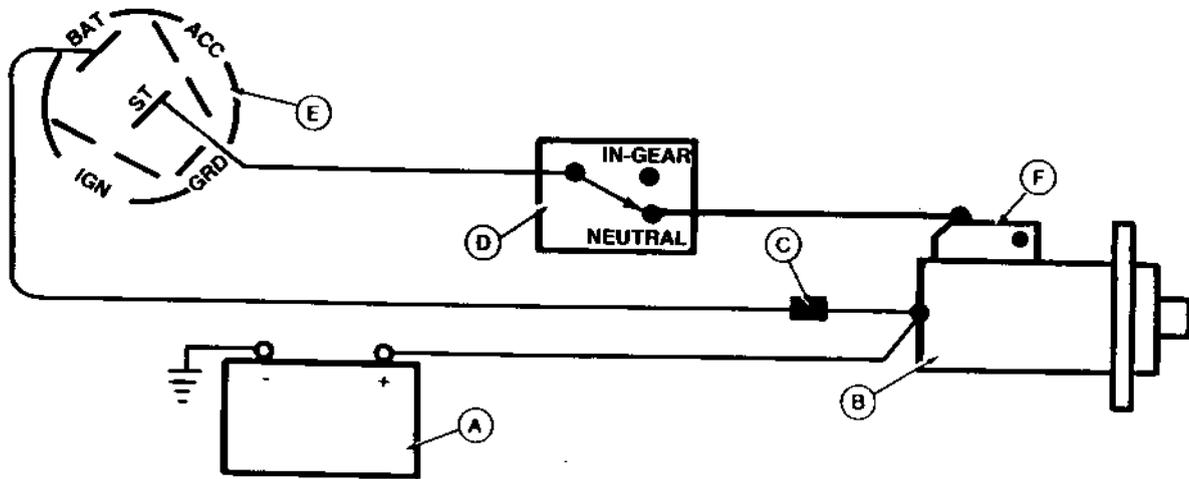
When the transmission is in neutral (switch contacts closed), current flows to the starter solenoid (D). As the starter solenoid energizes, internal contacts close allowing current to flow to the fuel shutoff solenoid pull-in coil (H). Both pull-in coil and starter engage simultaneously. The pull-in coil draws 50 amps.

The pull-in coil (H) remains energized until the key switch is released from the START position. The hold-in coil (E) holds the plunger in a retracted position until the key switch is turned OFF.

MX,24015HU,21 -19-16OCT91

M43870 -19-11DEC89

## STARTING CIRCUIT OPERATION



A—Battery  
B—Starter

C—Fusible Link  
D—Neutral Start Switch

E—Key Switch

F—Solenoid

Current flows from the battery (A) to the starter (B) common terminal and to the key switch (E) "BAT" terminal. The starter to key switch connection contains a 16-gauge fusible link (C).

Turning the key switch to the START position allows current to flow through the "ST" terminal to the transmission neutral start switch (D).

The current path to the starter motor solenoid (F) is only completed when the transmission switch (D) is in the closed position (foot control pedals in NEUTRAL).

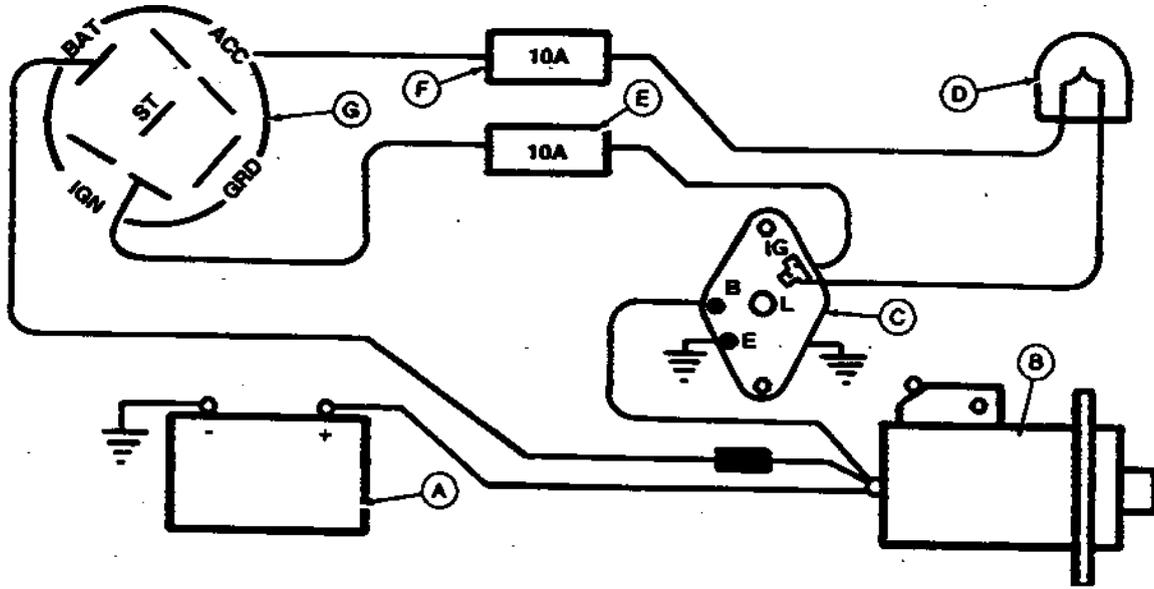
With the transmission switch closed and the key switch in START position, the starter solenoid (F) is energized. Current flows from the battery through internally closed solenoid contacts to the starter motor windings.

The starter motor will remain engaged until the key switch is released from START or the transmission is moved from NEUTRAL.

M43871 -19-11DEC89

MX,24015HU,22 -19-16OCT91

**CHARGING CIRCUIT OPERATION**



A—Battery  
B—Starter

C—Alternator  
D—Indicator Lamp

E—Fuse  
F—Fuse

G—Key Switch

The early tractors used a 35 amp alternator. The later tractors use a 40 amp alternator. Both systems operate the same way.

The charging system utilizes an alternator, with regulated output, to maintain proper battery state-of-charge.

The alternator is designed to provide high current output, even at relatively low engine speeds.

Current output from the alternator (C) flows to the common terminal on the starter (B) and to the positive battery terminal (A).

Alternator output is determined by the amount of magnetism in the field coil. The amount of magnetism

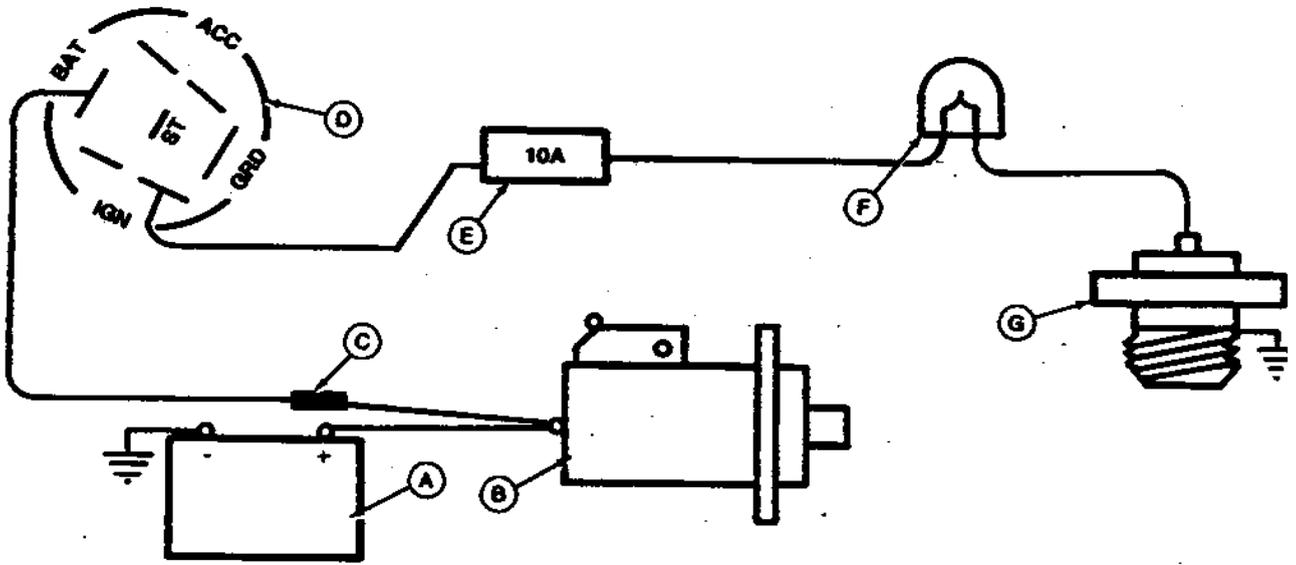
is proportional to the field voltage. The field voltage is controlled by the built-in regulator.

The regulator monitors battery voltage from current flowing through the key switch (G) and the 10-amp fuse (E) to the alternator. The regulator adjusts the field voltage to keep the battery charged.

Charging system operation is monitored by the regulator and is indicated by the alternator warning lamp (D). The warning lamp will light whenever the system current draw is greater than the alternator output. Normally, this only occurs when cranking the engine.

M43872 -19-01MAY89

## OIL PRESSURE CIRCUIT OPERATION



A—Battery  
B—Starter

C—Fusible Link  
D—Key Switch

E—Fuse  
F—Indicator Lamp

G—Oil Pressure Switch

The oil pressure lamp circuit warns the operator if the engine oil pressure drops below 48 kPa (7 psi).

Current flows from the battery (A) to the starter (B) common terminal and to the key switch (D) "BAT" terminal. The starter to key switch connection contains a 16-gauge fusible link (C).

Turning the key switch to ON or START allows current to flow through the "IGN" terminal to the 10-amp fuse (E), the dash indicator lamp (F), and the engine mounted pressure switch (G).

The sensor unit contains a normally-closed switch which allows the dash lamp to light whenever the key switch is ON and the engine is NOT running.

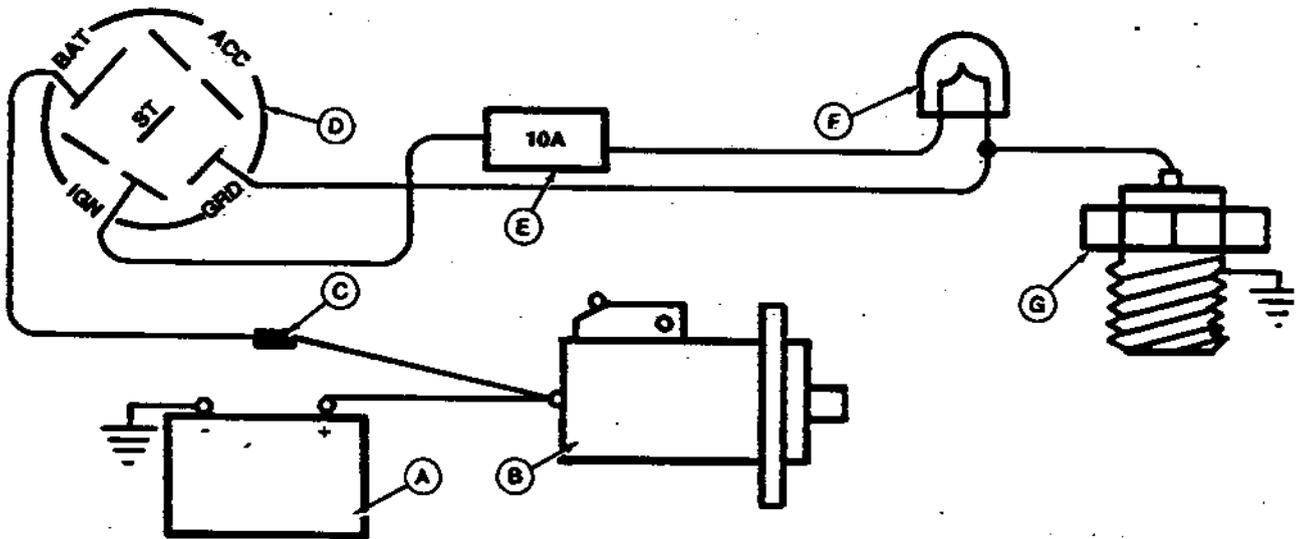
During engine START-UP, the dash lamp will be lit momentarily, until engine oil pressure increases enough to OPEN the sensor switch contacts and the lamp turns OFF.

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15

M43873 -19-01MAY89

MX,24015HU,24 -19-16OCT91

## COOLANT TEMPERATURE CIRCUIT OPERATION



A—Battery  
B—Starter

C—Fusible Link  
D—Key Switch

E—Fuse  
F—Indicator Lamp

G—Temperature Switch

The coolant temperature circuit warns the operator, through a dash warning lamp, when the engine coolant temperature exceeds 110°C (230°F).

Current flows from the battery (A) to the starter (B) common terminal and to the key switch (D) "BAT" terminal. The starter to key switch connection contains a 16-gauge fusible link (C).

When the key switch is in the ON or START position current flows to the 10-amp fuse (E), the dash warning lamp (F), and the engine coolant temperature switch (G).

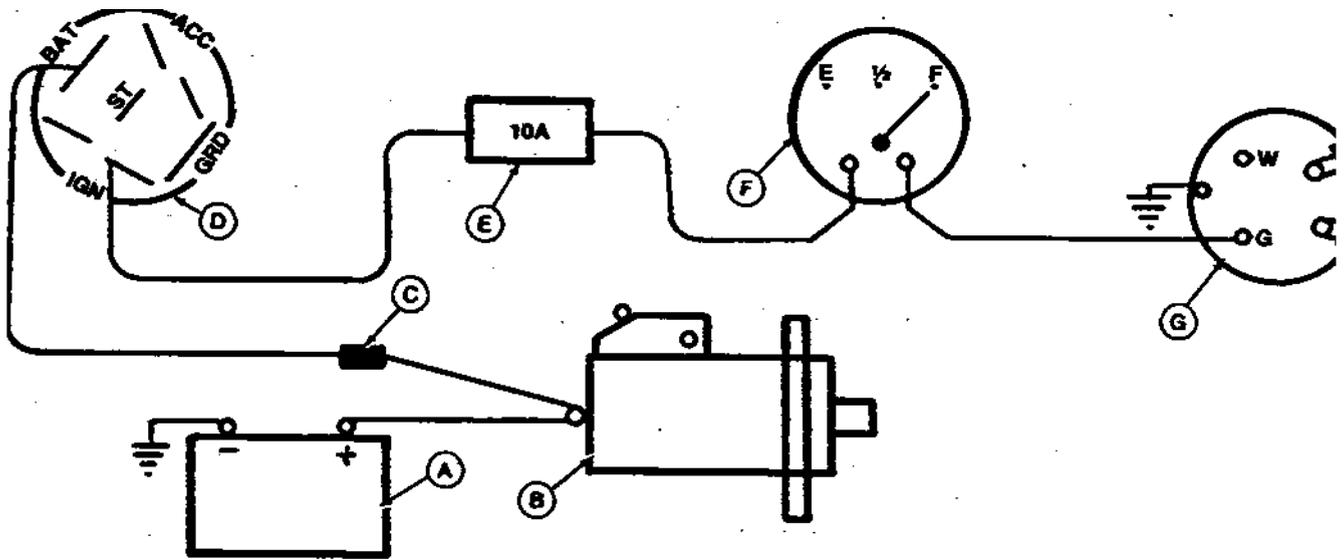
The sensor is a normally-open switch. The switch will close, completing a circuit path to ground, only when coolant temperature goes above 110°C (230°F). When the switch closes, the dash warning lamp will light.

A separate wire, from the dash lamp to the key switch ground terminal, allows the warning lamp to be "test-lit" when the key switch is in the START position. This is done because the warning lamp might never light, this way the operator is assured the lamp is good and will light if coolant temperature exceeds 110°C (230°F).

M43874 -19-01MAY89

MX,24015HU,25 -19-16OCT91

### FUEL GAUGE CIRCUIT OPERATION



A—Battery  
B—Starter

C—Fusible Link  
D—Key Switch

E—Fuse  
F—Fuel Gauge

G—Fuel Level Sensor

Fuel level is monitored by a dash mounted dial gauge. The dial gauge is electrically connected to an in-tank float type sending unit.

Current flows from the battery (A) to the starter (B) common terminal and to the key switch (D) "BAT" terminal. The starter to key switch connection contains a 16-gauge fusible link (C).

When the key switch is in the ON or START position current flows to the "IGN" terminal, the 10-amp fuse (E), the fuel gauge (F), and fuel level sensor (G).

The fuel level sensor consists of a ball float connected to a variable resistor. The ball float and resistor position varies with fuel level. Circuit resistance decreases as fuel level decreases.

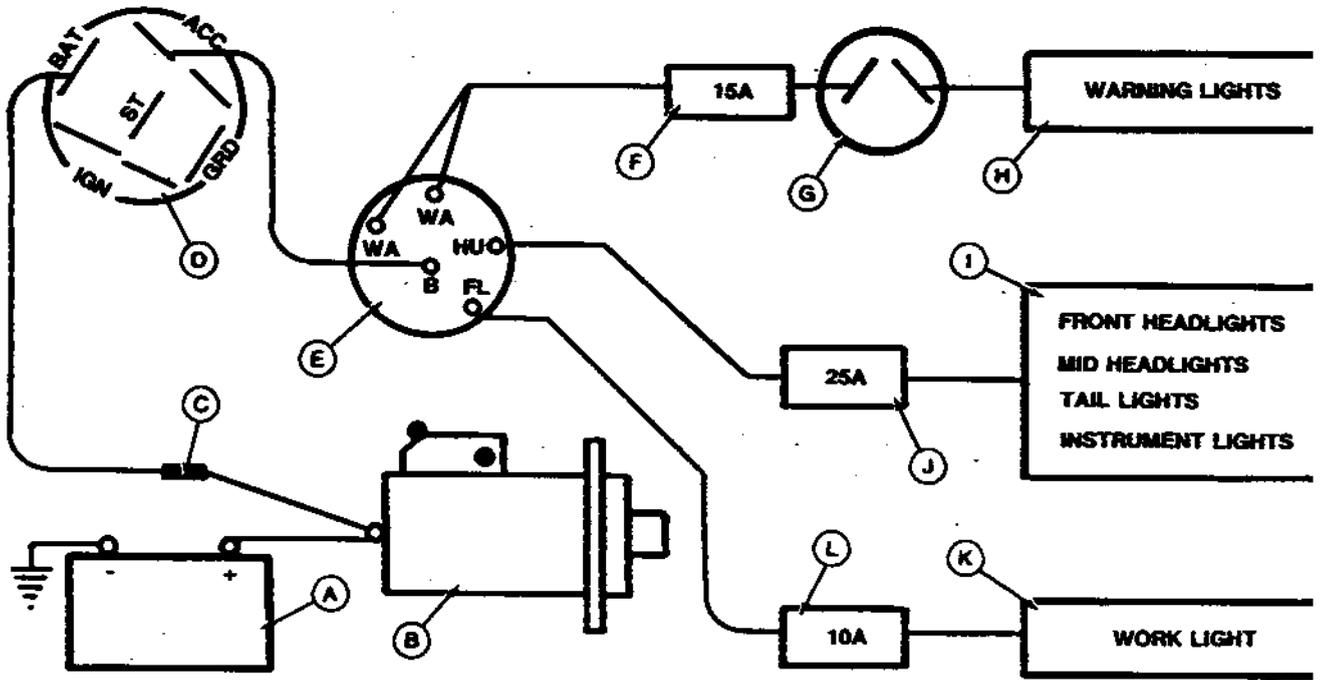
The fuel gauge is calibrated to reflect changes in circuit resistance (fuel level) through dial movement. When the fuel level is low, the resistance is decreased to the point that dial reads EMPTY, time to refill the tank.

240  
15  
17

M43875 -19-01MAY89

MX,24015HU,26 -19-16OCT91

**LIGHTING CIRCUIT OPERATION**



A—Battery  
B—Starter  
C—Fusible Link

D—Key Switch  
E—Light Switch  
F—Fuse

G—Flasher Unit  
H—Warning Lights  
I—Lights

J—Fuse  
K—Rear Work Light  
L—Fuse

Current flows from the battery (A) to the starter (B) common terminal and to the key switch (D) "BAT" terminal. The starter to key switch connection contains a 16-gauge fusible link (C).

When the key switch is in the "ACC" or ON position, current flows to the "ACC" terminal to the light switch (E) terminal.

The light switch has four positions (see electrical schematics for switch functional chart). Depending on the selected function, current flows through the appropriate terminal(s) to the protective fuses (F, J, or L), the lighting components (H, I or K), and to ground.

The warning light circuit contains a flasher element (G).

M43876 -19-28APR89

## **655, 755/756, 855/856, AND 955 ELECTRICAL SCHEMATIC DIAGRAMS**

The electrical schematic diagrams found on the following pages are separated chronologically by harness changes. Find the diagram that corresponds to the features found on the tractor being serviced. A brief summary of harness changes is provided on the left hand page to aid you in using the proper diagram.

Listed below are the electrical schematic diagrams provided:

- EARLY 655, 755/756, AND 855/856 SCHEMATIC
- LATE 655, SECONDARY 755 AND 855 SCHEMATIC
- LATE 855 AND ORIGINAL 955 SCHEMATIC
- LATE 755 SCHEMATIC
- EARLY 855 AND 955 EUROPEAN SCHEMATIC
- LATE 855 AND 955 EUROPEAN SCHEMATIC
- 755 EUROPEAN SCHEMATIC

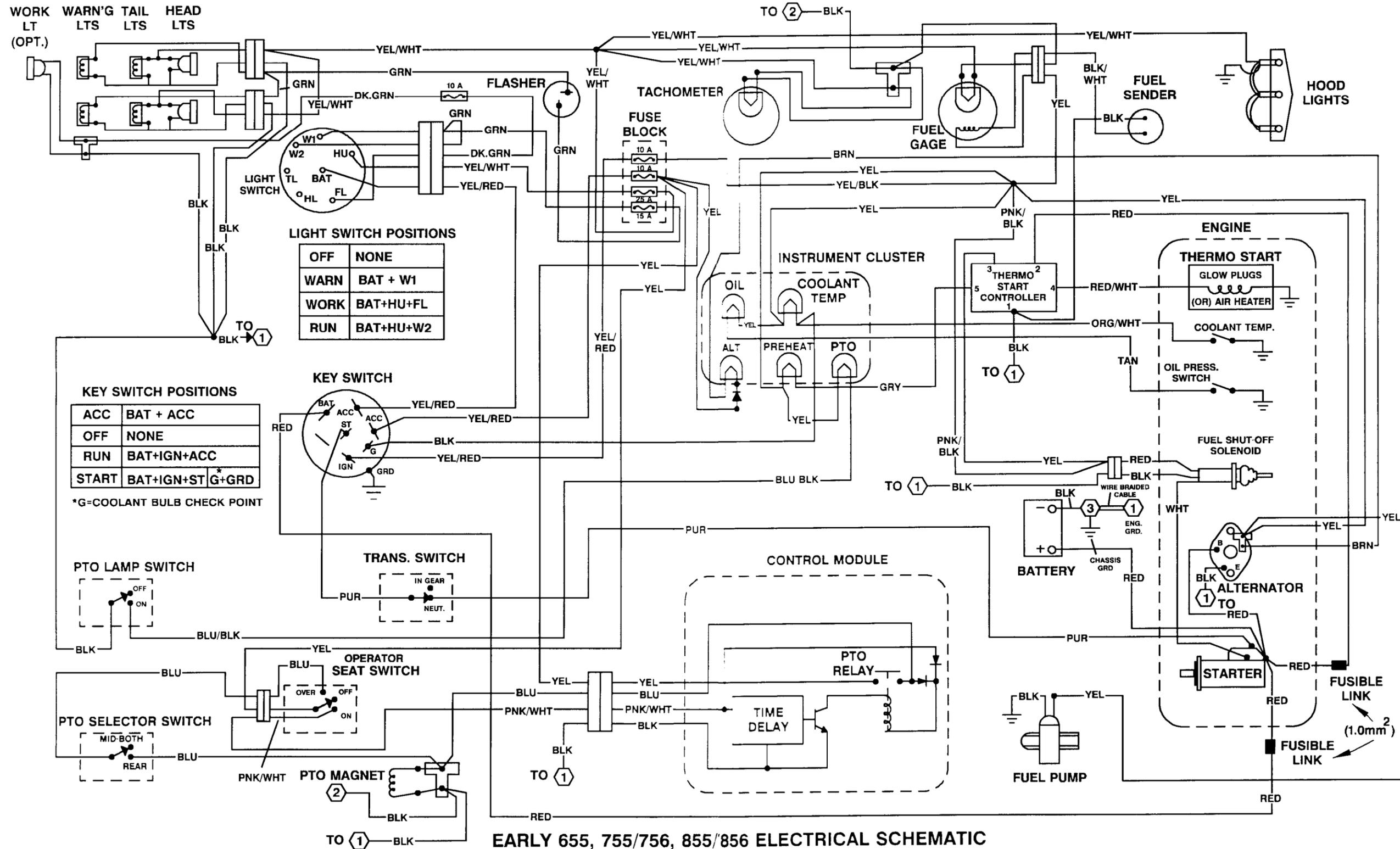
MX,24015HU,28 -19-16OCT91

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15  
19

## **EARLY 655, 755/756, AND 855/856 ELECTRICAL SCHEMATIC—**

- The original harness design with multiple component grounds.
- The battery located in the steering pedestal area.
- The fuel tank in front of the radiator, inside the grille.
- The exhaust muffler at rear of engine.
- 35 AMP alternator.

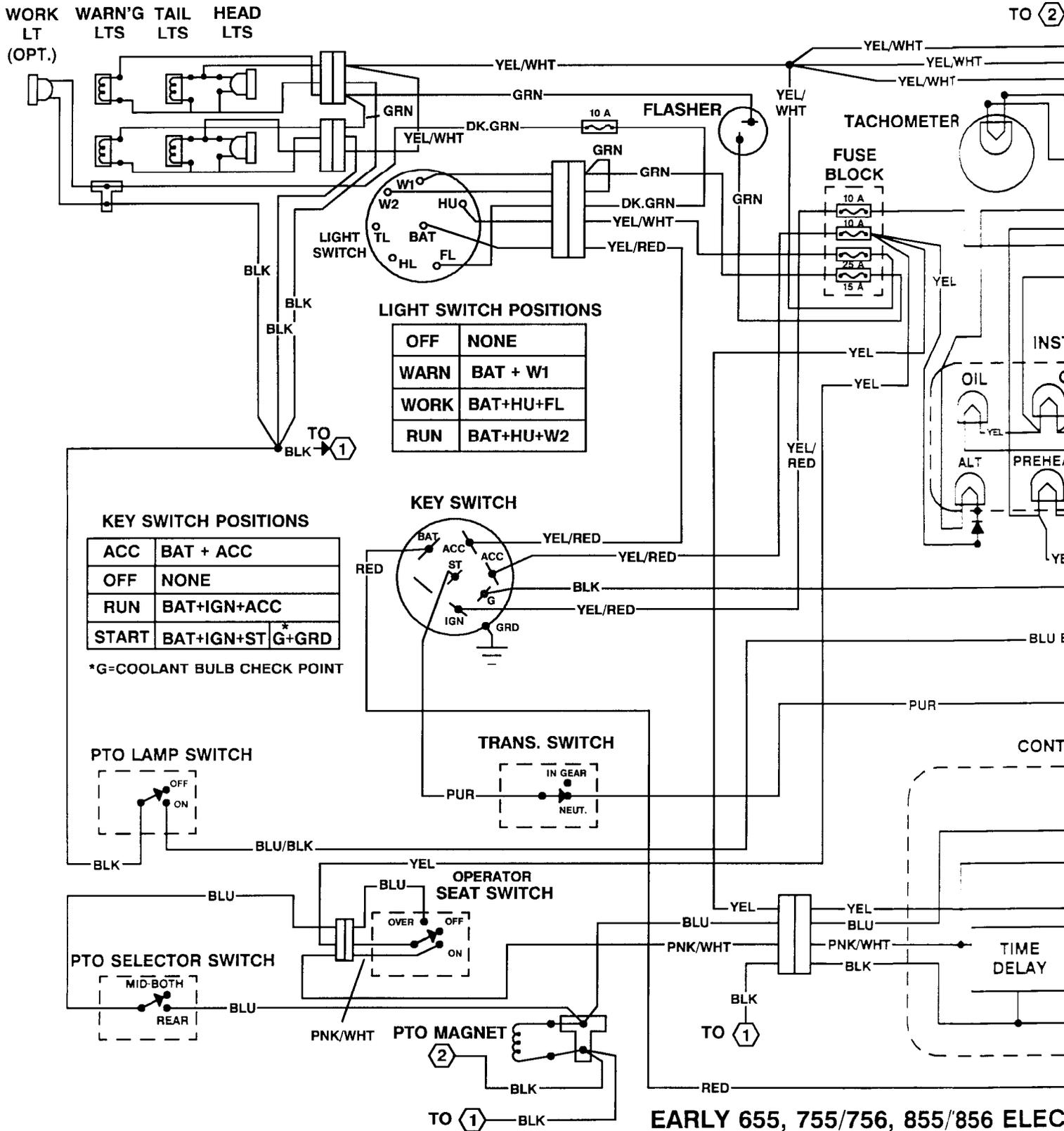
MX,24015HU,28A -19-16OCT91



EARLY 655, 755/756, 855/856 ELECTRICAL SCHEMATIC

WIRING HARNESS NUMBERS  
 655 AM102054, 755/756 AM102145, 855/856 AM102053

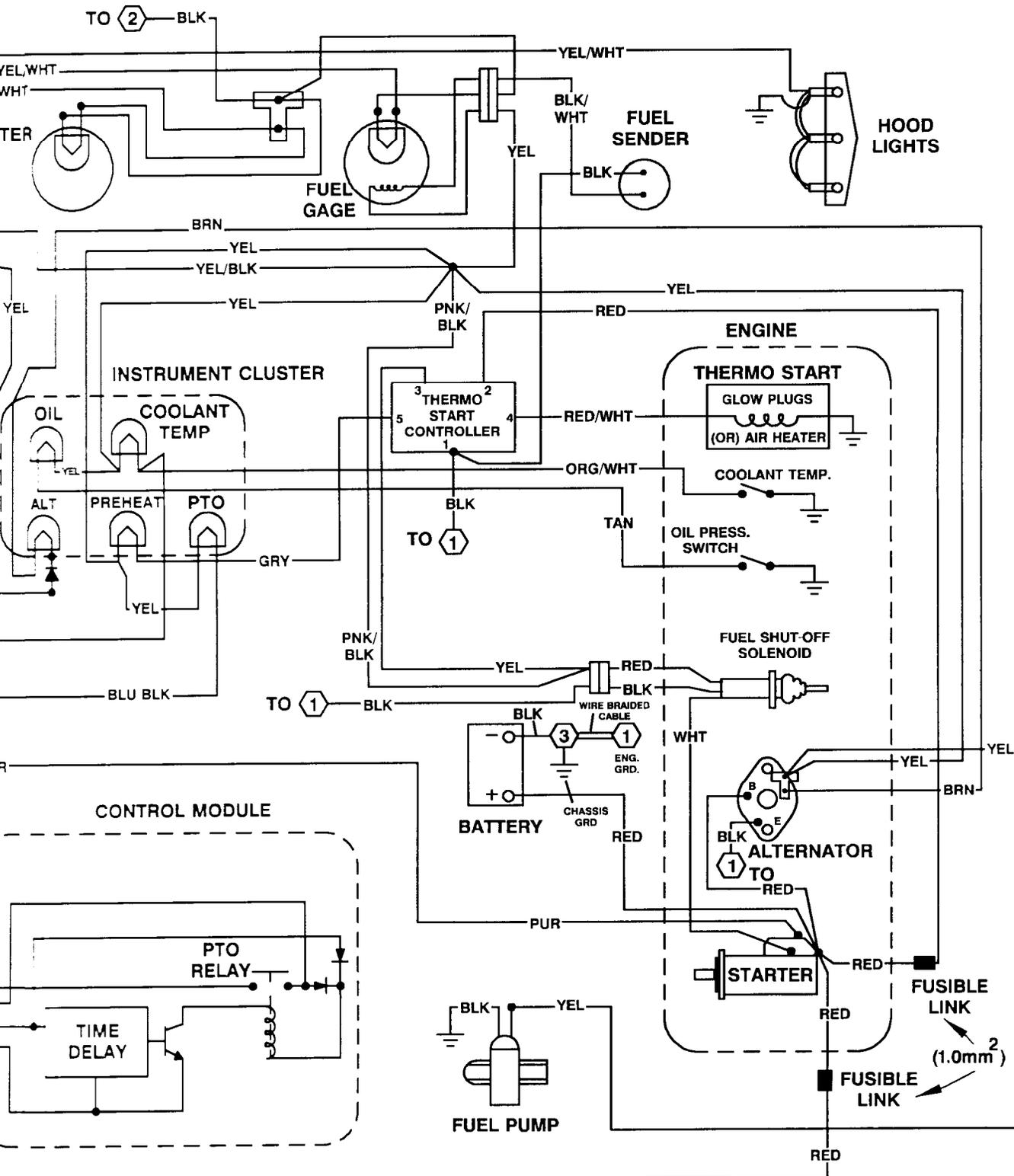
M42200



EARLY 655, 755/756, 855/856 ELEC

WIRING HARNESS NUM  
655 AM102054, 755/756: AM102145, 855

M42200



## 5/856 ELECTRICAL SCHEMATIC

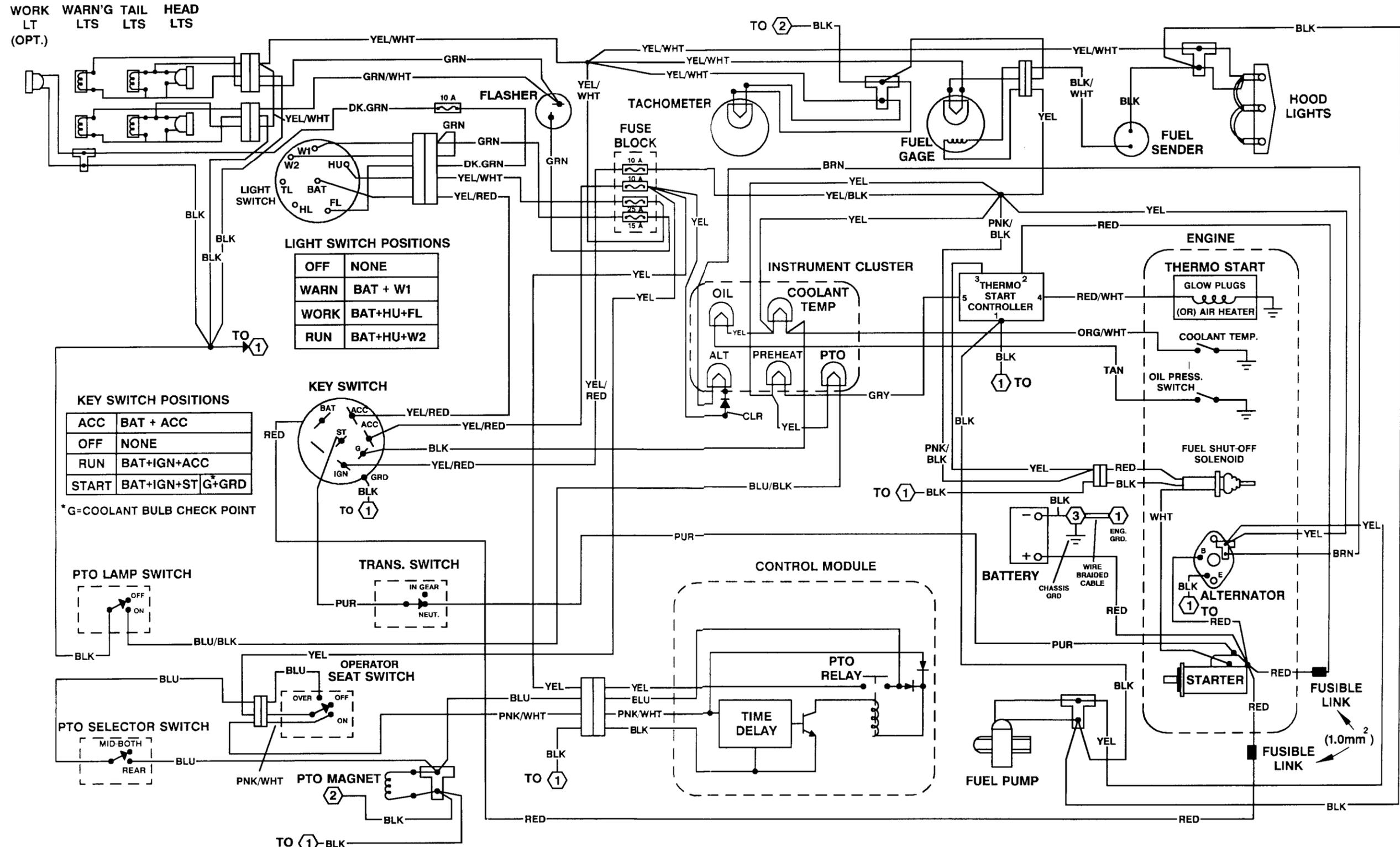
HARNESS NUMBERS

856: AM102145, 855/856 AM102053

## **LATE 655, SECONDARY 755 AND 855 ELECTRICAL SCHEMATIC—**

- The secondary harness design with single ground through the harness.
- The new E-coat paint process introduced.
- 35 AMP alternator.

MX,24015HU,29 -19-16OCT91



**LIGHT SWITCH POSITIONS**

|      |           |
|------|-----------|
| OFF  | NONE      |
| WARN | BAT + W1  |
| WORK | BAT+HU+FL |
| RUN  | BAT+HU+W2 |

**KEY SWITCH POSITIONS**

|       |                  |
|-------|------------------|
| ACC   | BAT + ACC        |
| OFF   | NONE             |
| RUN   | BAT+IGN+ACC      |
| START | BAT+IGN+ST G+GRD |

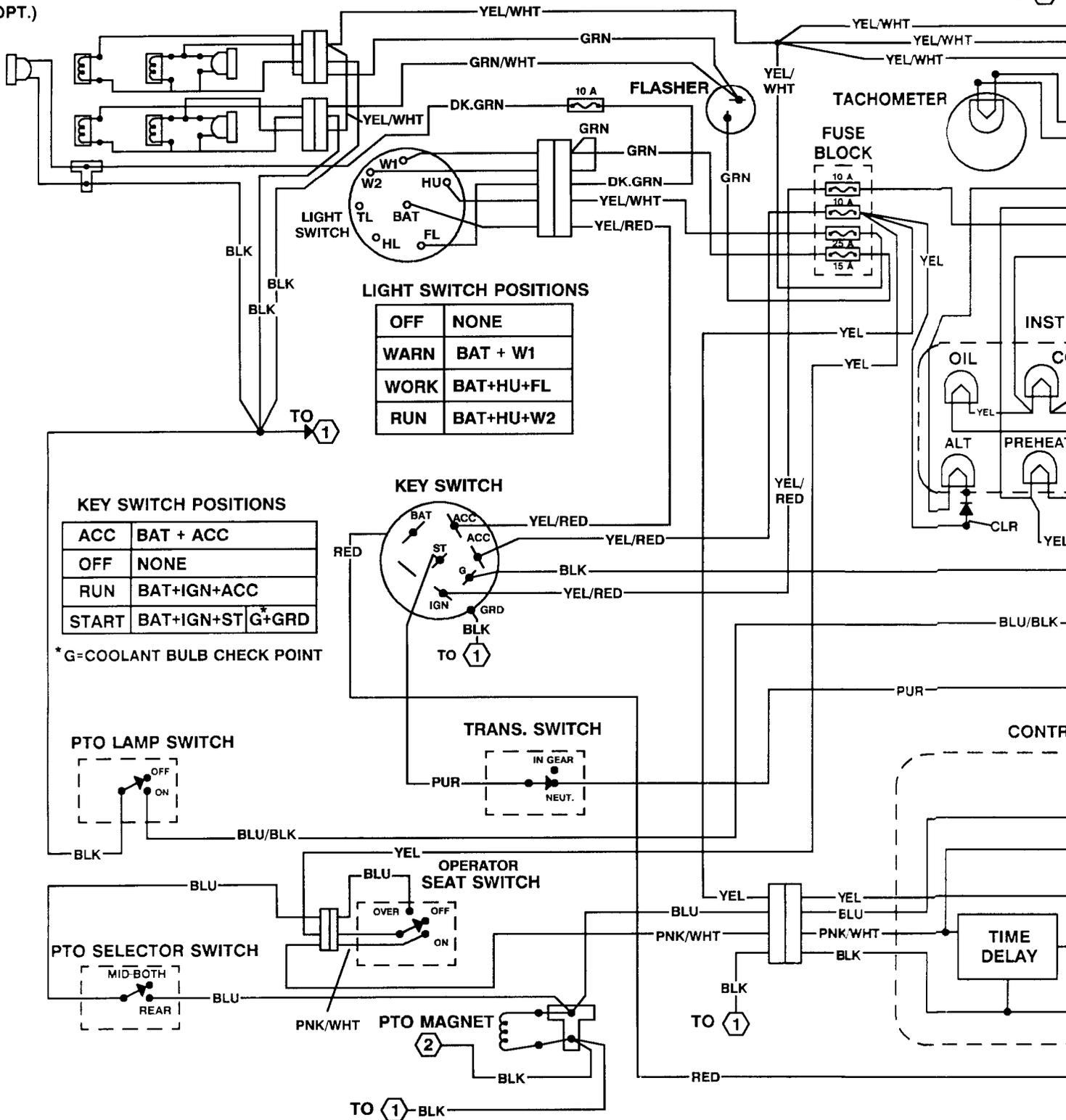
\*G=COOLANT BULB CHECK POINT

**LATE 655, SECONDARY 755, SECONDARY 855 ELECTRICAL SCHEMATIC**  
**WIRING HARNESS NUMBERS - 655 AM105090, 755 AM105091, 855 AM105092**

M42201

WORK LT  
 WARN'G LTS (OPT.)  
 TAIL LTS  
 HEAD LTS

TO 2



**LIGHT SWITCH POSITIONS**

|      |           |
|------|-----------|
| OFF  | NONE      |
| WARN | BAT + W1  |
| WORK | BAT+HU+FL |
| RUN  | BAT+HU+W2 |

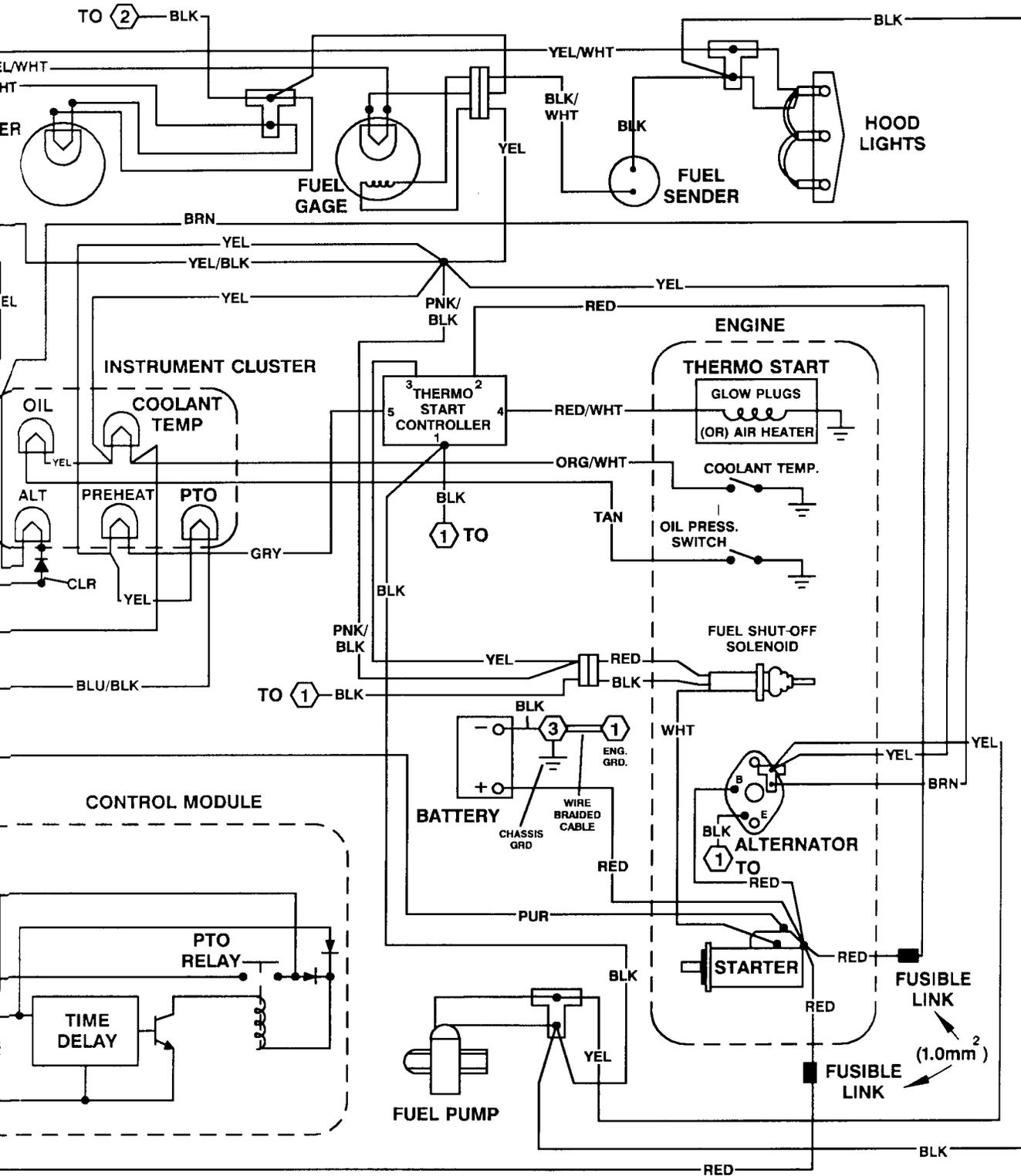
**KEY SWITCH POSITIONS**

|       |                  |
|-------|------------------|
| ACC   | BAT + ACC        |
| OFF   | NONE             |
| RUN   | BAT+IGN+ACC      |
| START | BAT+IGN+ST G*GRD |

\*G=COOLANT BULB CHECK POINT

**LATE 655, SECONDARY 755, SECONDARY 855  
 WIRING HARNESS NUMBERS - 655 AM105090, 755**

M42201



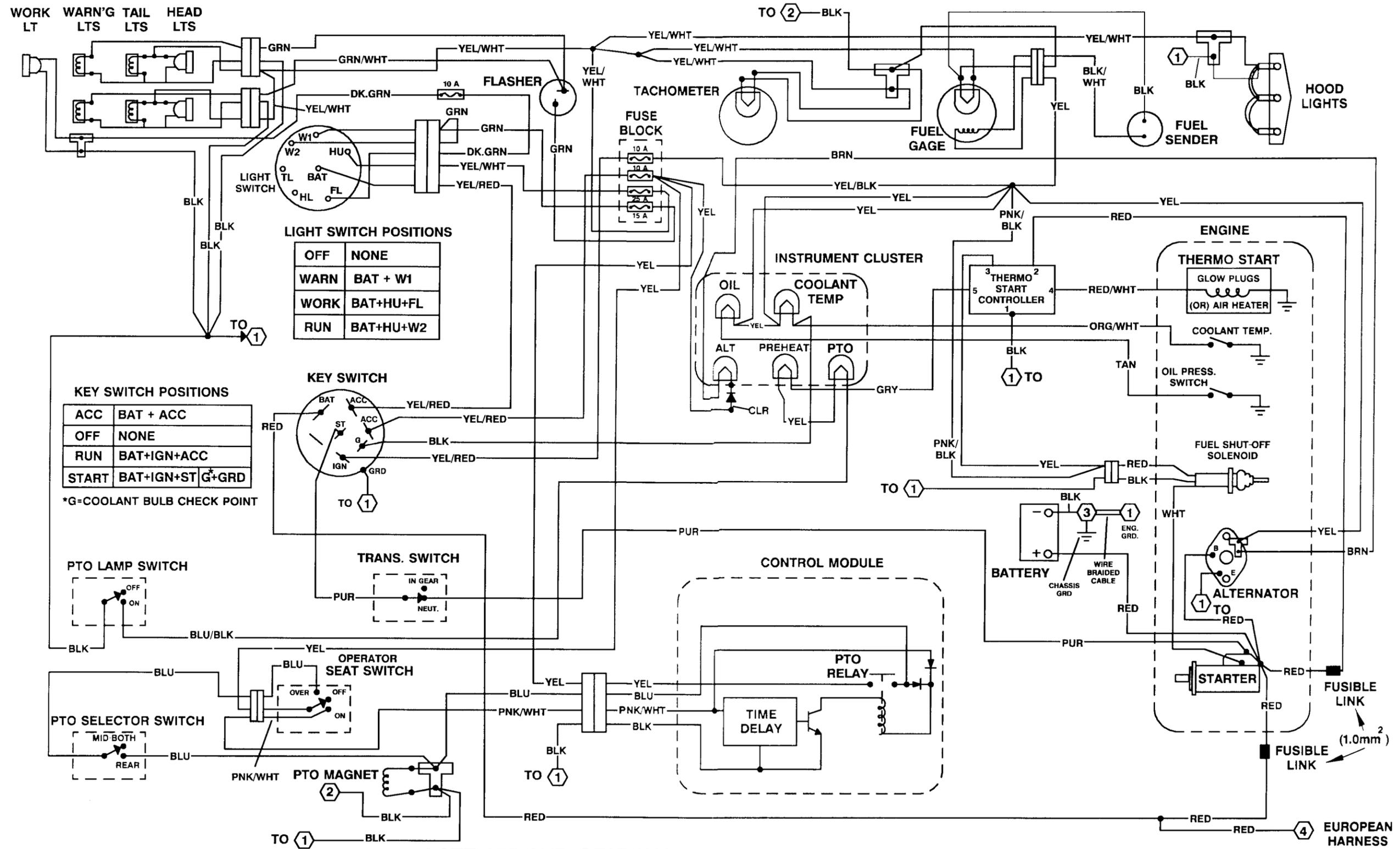
## SECONDARY 855 ELECTRICAL SCHEMATIC

1105090, 755 AM105091, 855 AM105092

## **LATE 855 AND ORIGINAL 955 ELECTRICAL SCHEMATIC—**

- The battery and fuel tank locations were switched.
- 40 AMP alternator.
- European harness lead connection incorporated in North American harness.
- Exhaust muffler moved to top of engine.

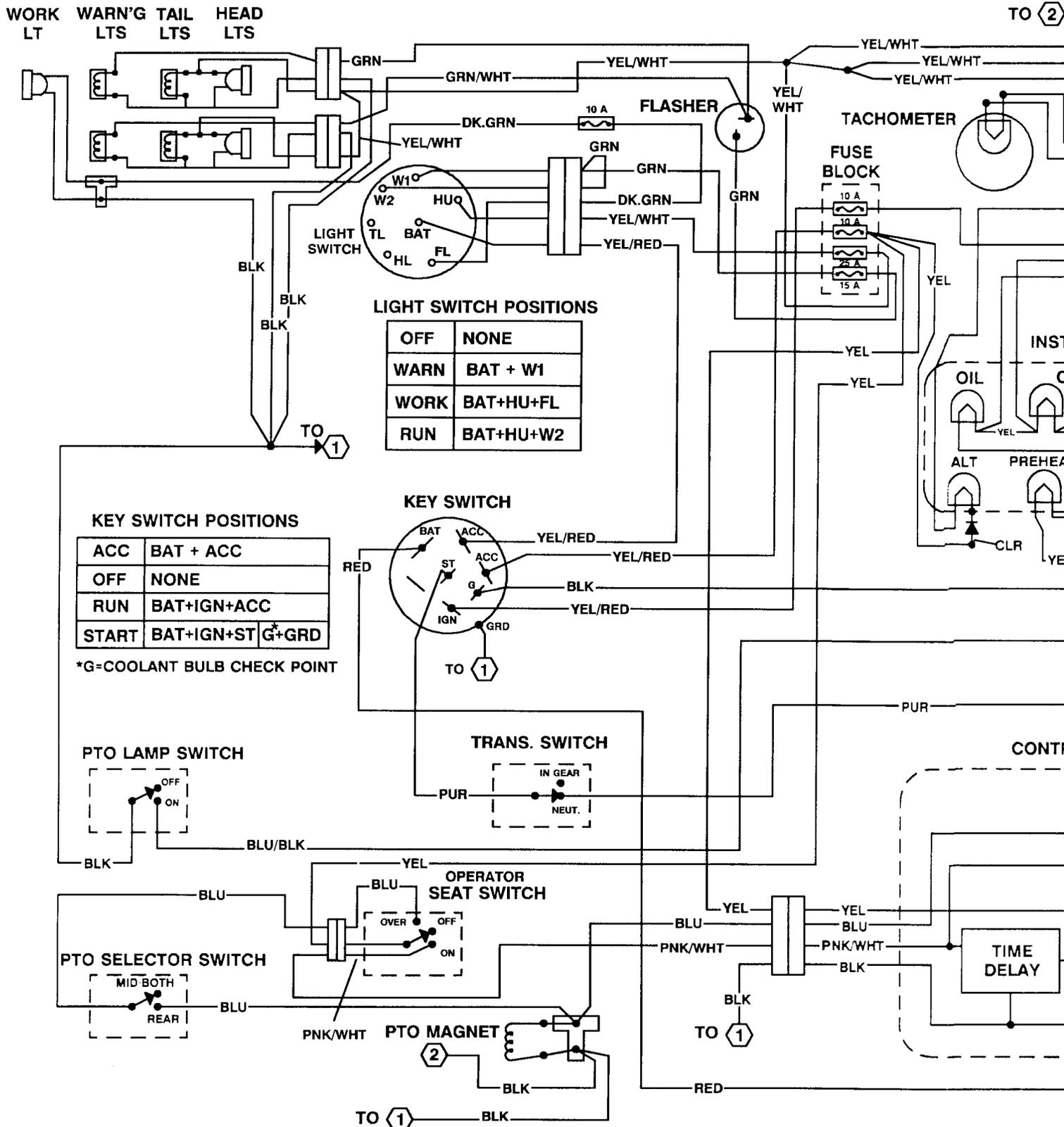
MX,24015HU,30 -19-16OCT91



LATE 855 AND ORIGINAL 955 ELECTRICAL SCHEMATIC

WIRING HARNESS NUMBER AM106740

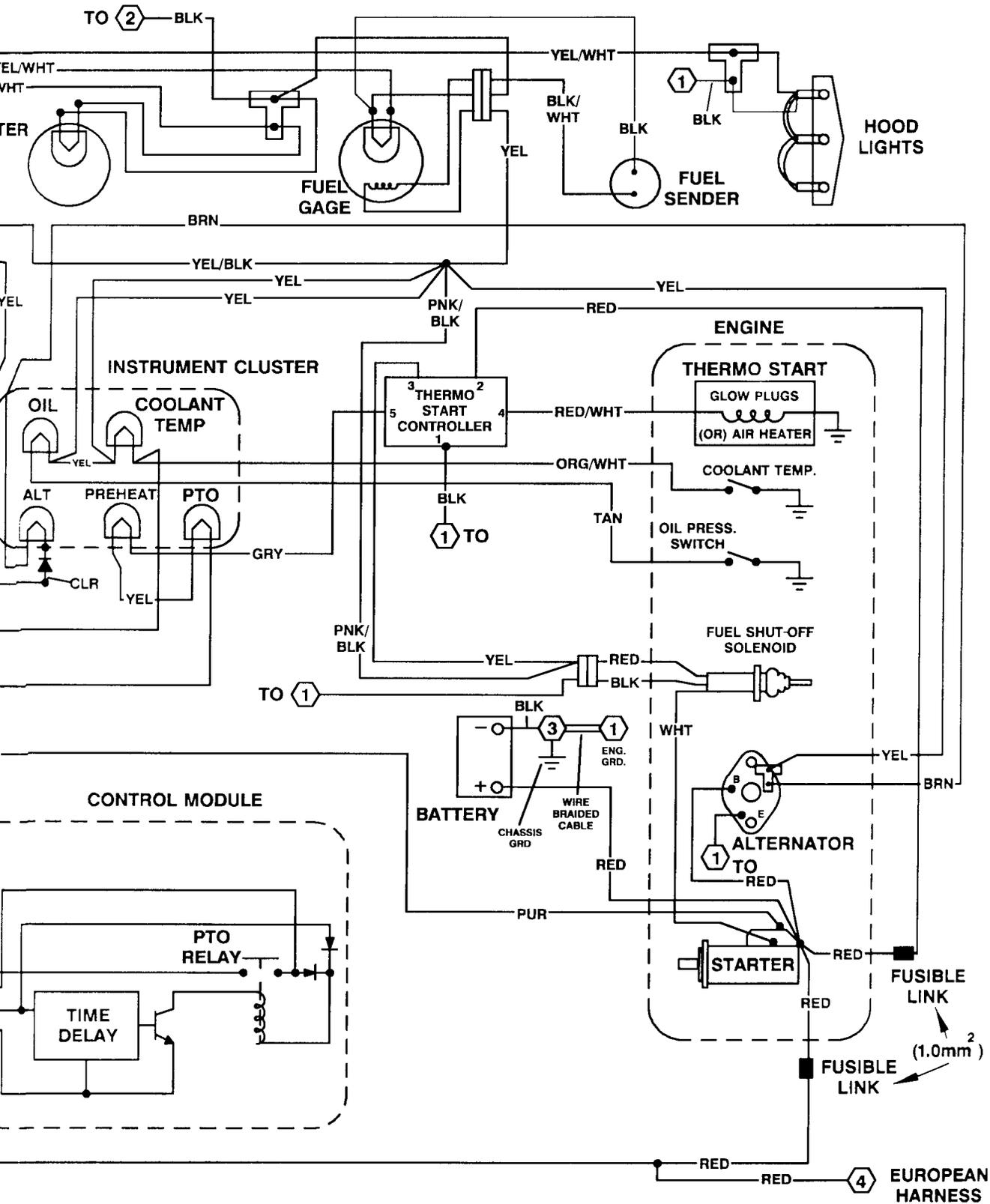
M42202



LATE 855 AND ORIGINAL 955 ELECTRICAL

WIRING HARNESS NUMBER AN

M42202



# 55 ELECTRICAL SCHEMATIC

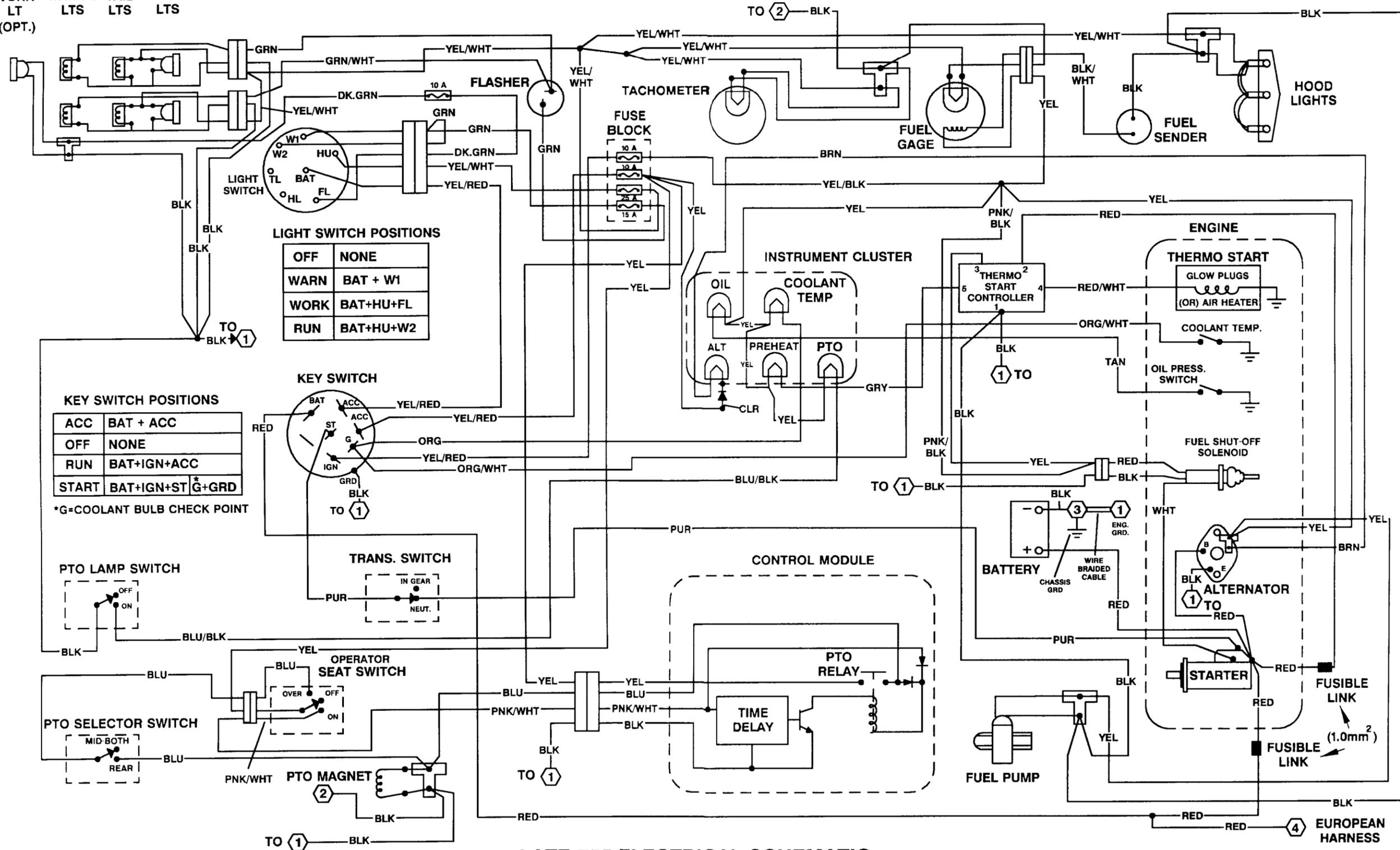
NUMBER AM106740

## **LATE 755 ELECTRICAL SCHEMATIC—**

- European harness lead connection incorporated in North American harness.
- 40 AMP alternator.

MX,24015HU,31 -19-16OCT91

WORK WARN'G TAIL HEAD  
LT LTS LTS LTS  
(OPT.)

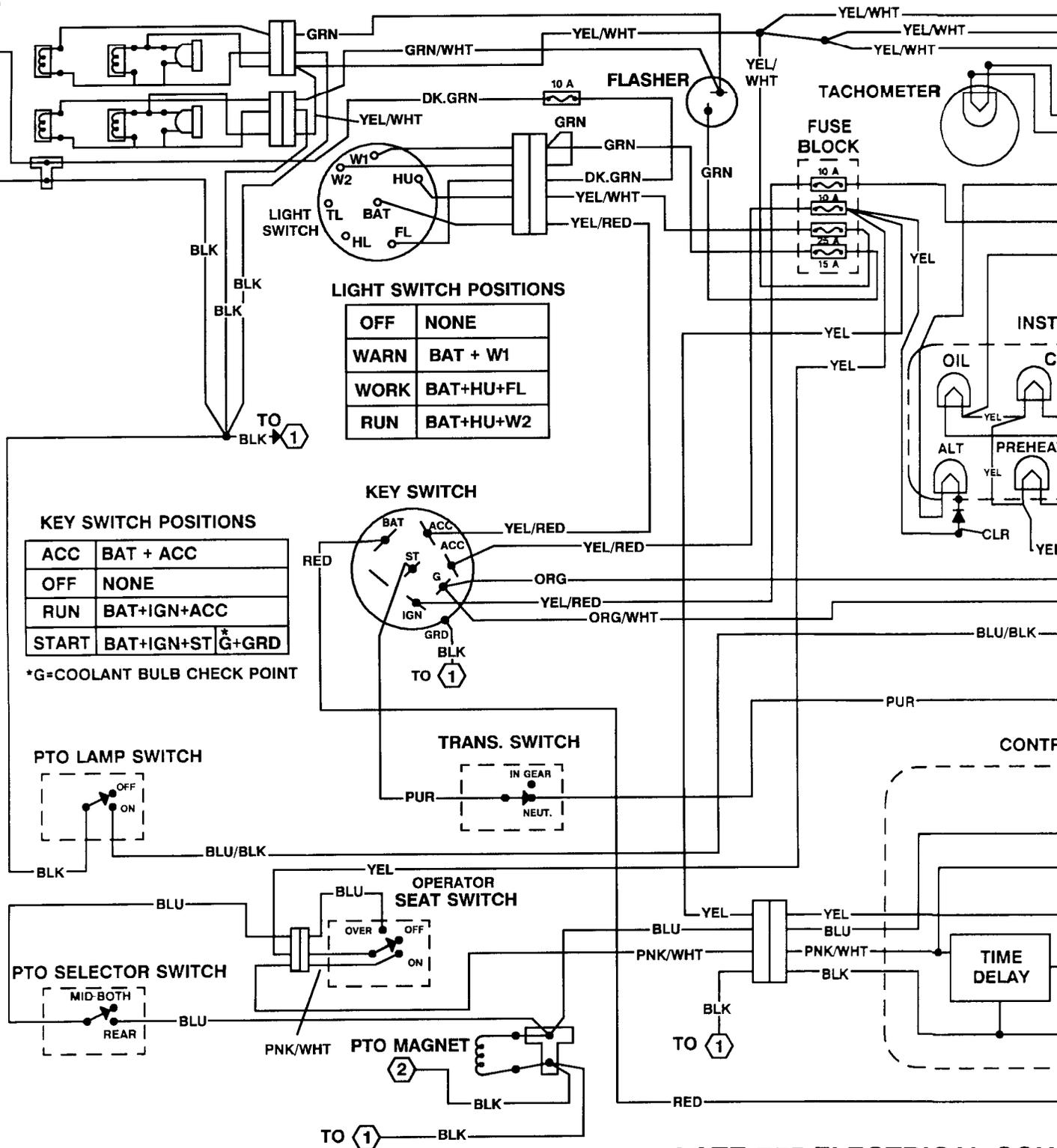


**LATE 755 ELECTRICAL SCHEMATIC**  
**WIRING HARNESS NUMBER AM108177**

M42203

WORK WARN'G TAIL HEAD  
 LT LTS LTS LTS  
 (OPT.)

TO 2



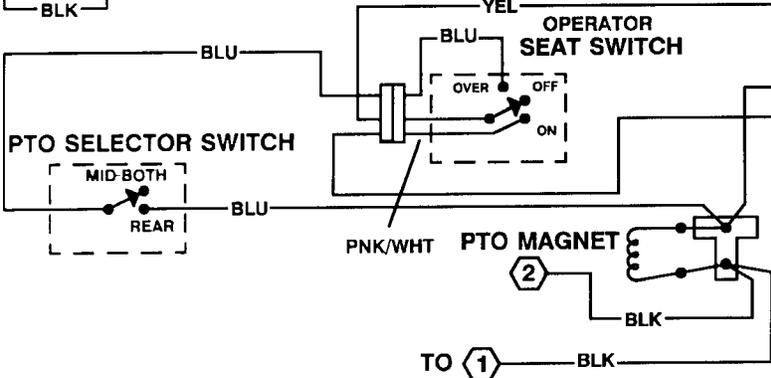
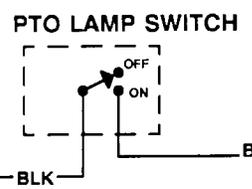
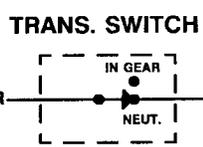
**LIGHT SWITCH POSITIONS**

|      |           |
|------|-----------|
| OFF  | NONE      |
| WARN | BAT + W1  |
| WORK | BAT+HU+FL |
| RUN  | BAT+HU+W2 |

**KEY SWITCH POSITIONS**

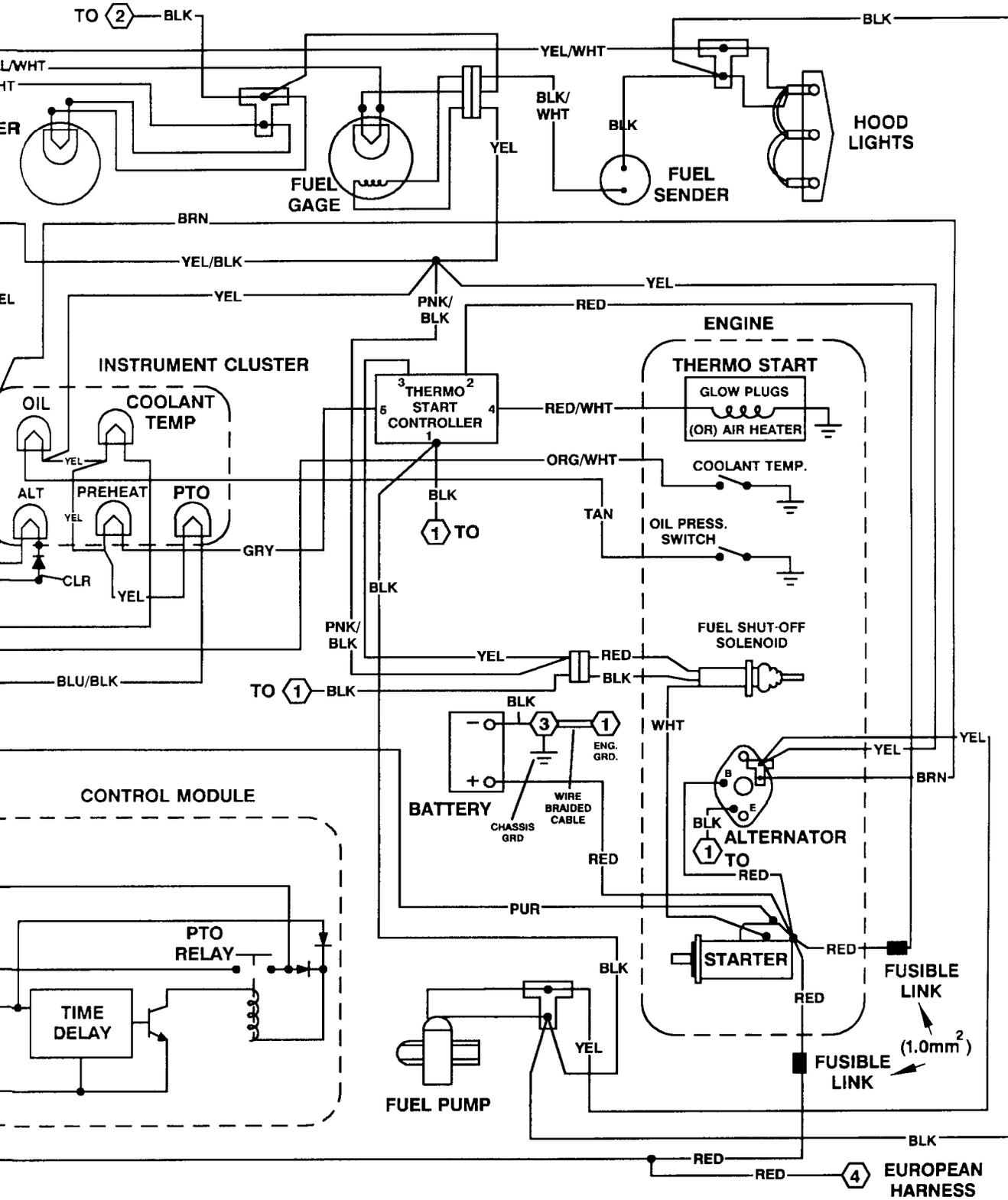
|       |                   |
|-------|-------------------|
| ACC   | BAT + ACC         |
| OFF   | NONE              |
| RUN   | BAT+IGN+ACC       |
| START | BAT+IGN+ST *G+GRD |

\*G=COOLANT BULB CHECK POINT



**LATE 755 ELECTRICAL SCHEMATIC**  
**WIRING HARNESS NUMBER AM**

M42203



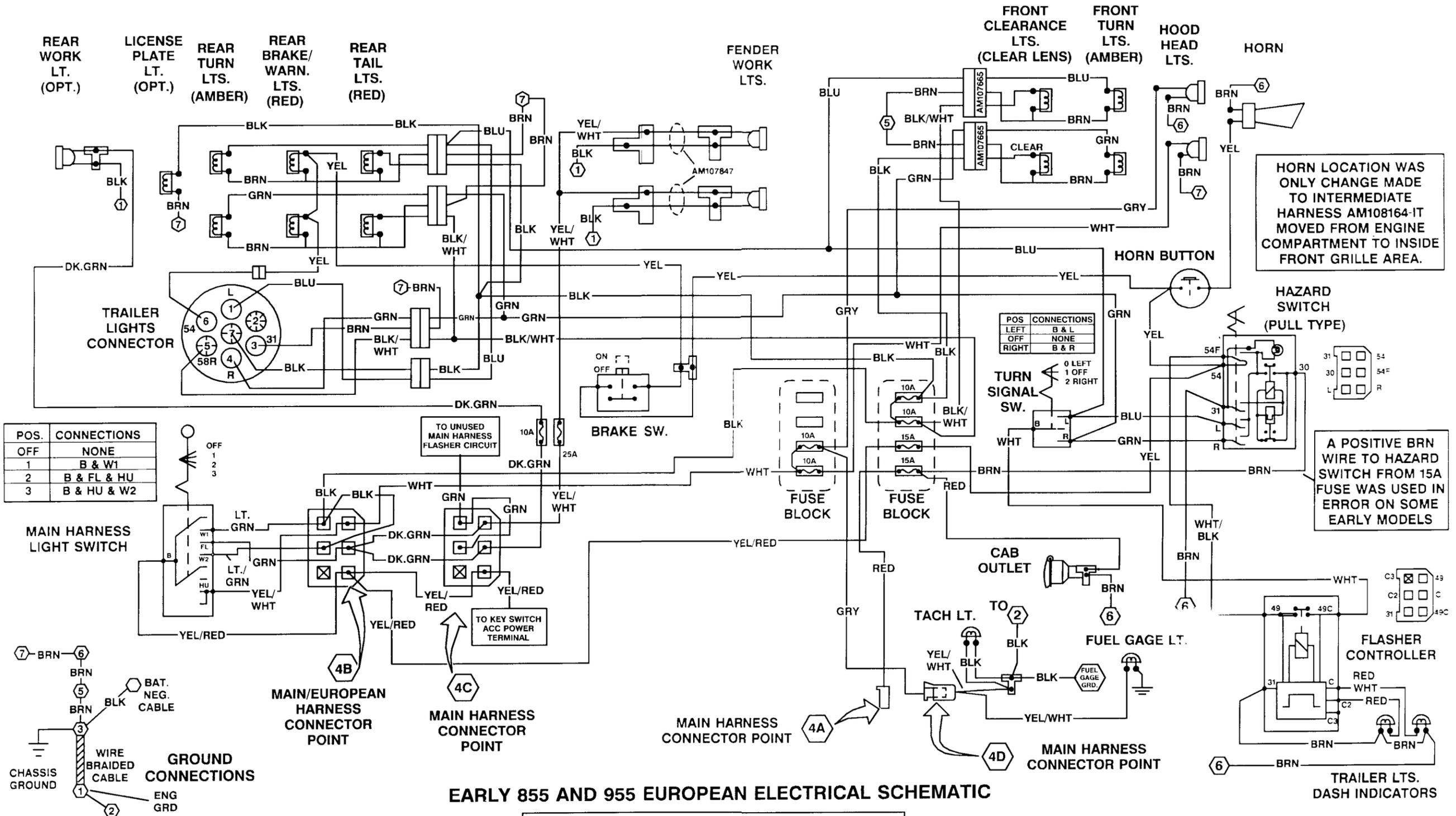
**WIRING SCHEMATIC**

**NUMBER AM108177**

## **EARLY 855 AND 955 EUROPEAN ELECTRICAL SCHEMATIC—**

- Horn location moved from top of engine to inside front grille area.
- Pull type hazard switch.
- Brown hot lead instead of red hot lead from 15 amp fuse to No. 30 terminal of hazard switch on some models.

MX,24015HU,32 -19-16OCT91



| POS. | CONNECTIONS |
|------|-------------|
| OFF  | NONE        |
| 1    | B & W1      |
| 2    | B & FL & HU |
| 3    | B & HU & W2 |

| POS   | CONNECTIONS |
|-------|-------------|
| LEFT  | B & L       |
| OFF   | NONE        |
| RIGHT | B & R       |

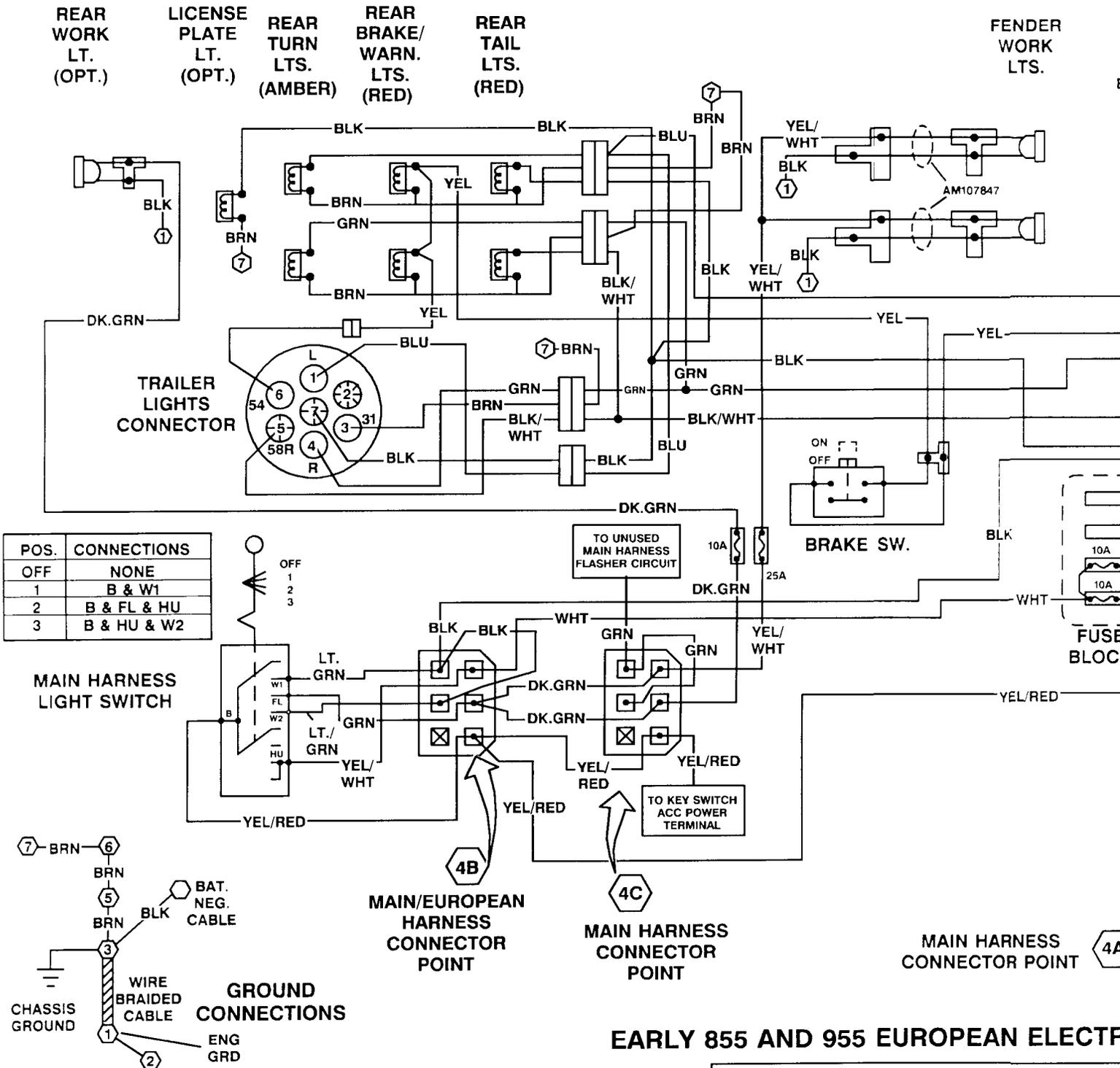
HORN LOCATION WAS ONLY CHANGE MADE TO INTERMEDIATE HARNESS AM108164-IT MOVED FROM ENGINE COMPARTMENT TO INSIDE FRONT GRILLE AREA.

A POSITIVE BRN WIRE TO HAZARD SWITCH FROM 15A FUSE WAS USED IN ERROR ON SOME EARLY MODELS

**EARLY 855 AND 955 EUROPEAN ELECTRICAL SCHEMATIC**

**AM107845 AND AM108164 HARNESSES**

M42204

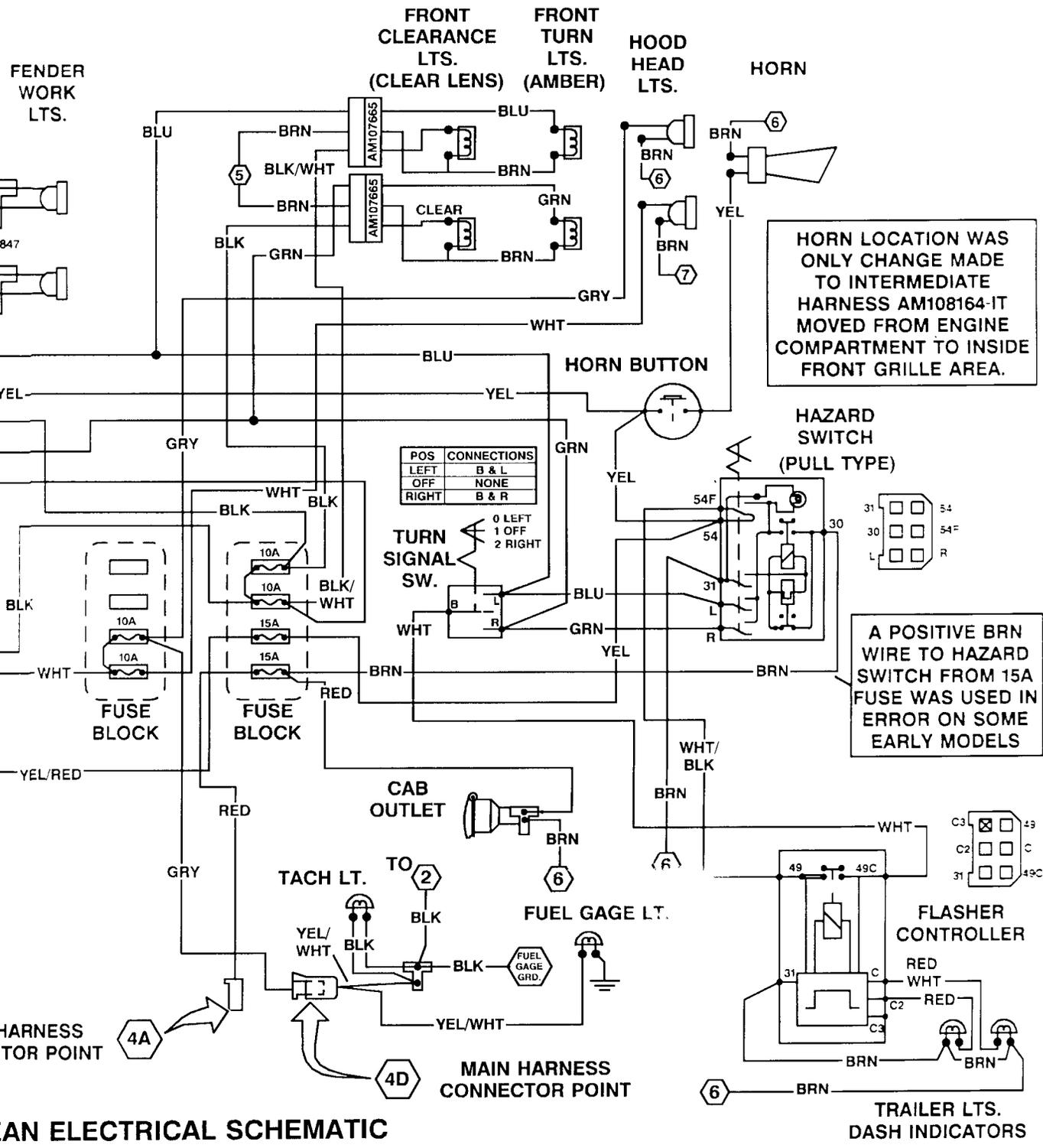


| POS. | CONNECTIONS |
|------|-------------|
| OFF  | NONE        |
| 1    | B & W1      |
| 2    | B & FL & HU |
| 3    | B & HU & W2 |

EARLY 855 AND 955 EUROPEAN ELECTRIC

AM107845 AND AM108164 HARN

M42204



HORN LOCATION WAS ONLY CHANGE MADE TO INTERMEDIATE HARNESS AM108164-IT MOVED FROM ENGINE COMPARTMENT TO INSIDE FRONT GRILLE AREA.

A POSITIVE BRN WIRE TO HAZARD SWITCH FROM 15A FUSE WAS USED IN ERROR ON SOME EARLY MODELS

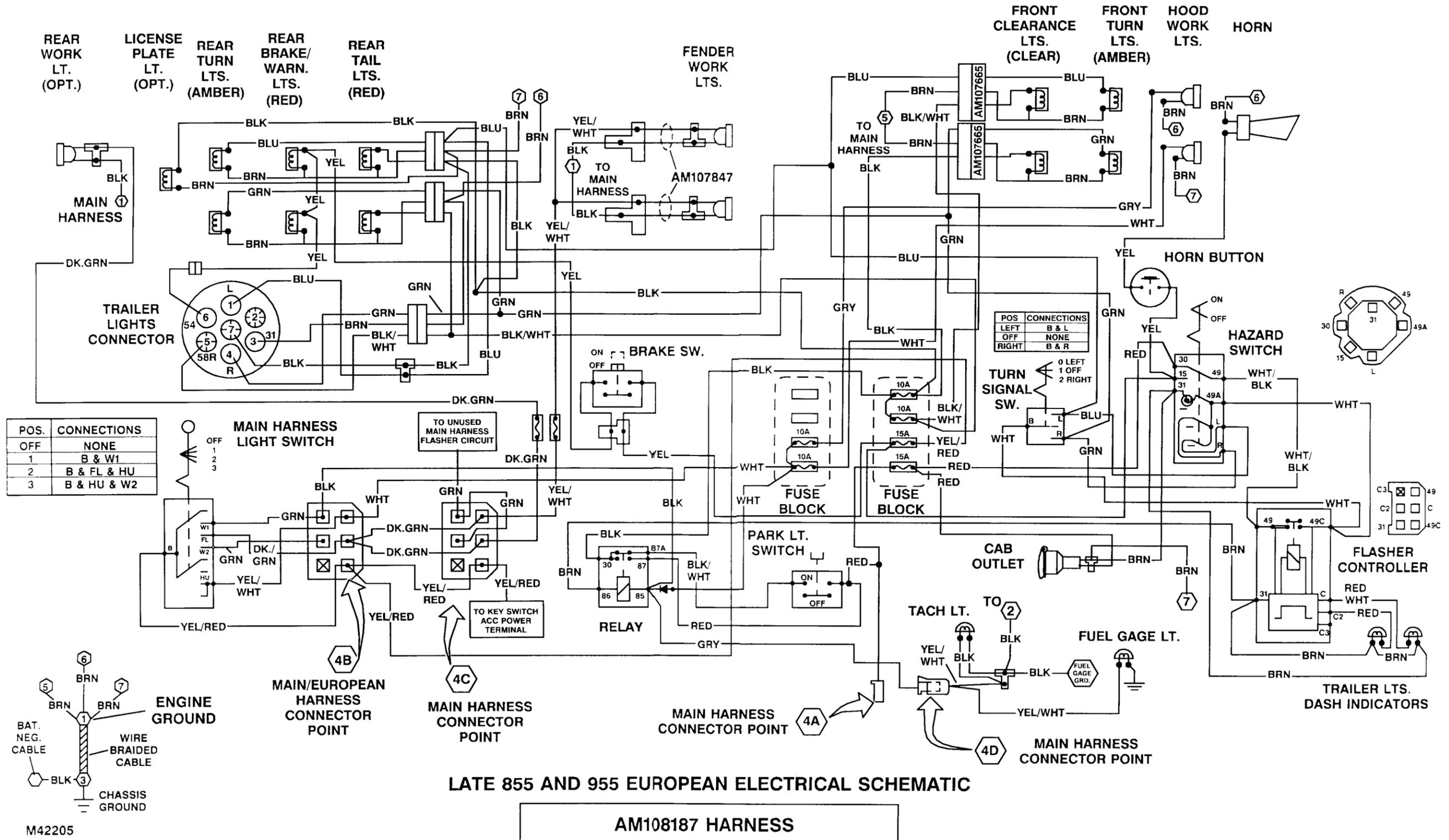
AN ELECTRICAL SCHEMATIC

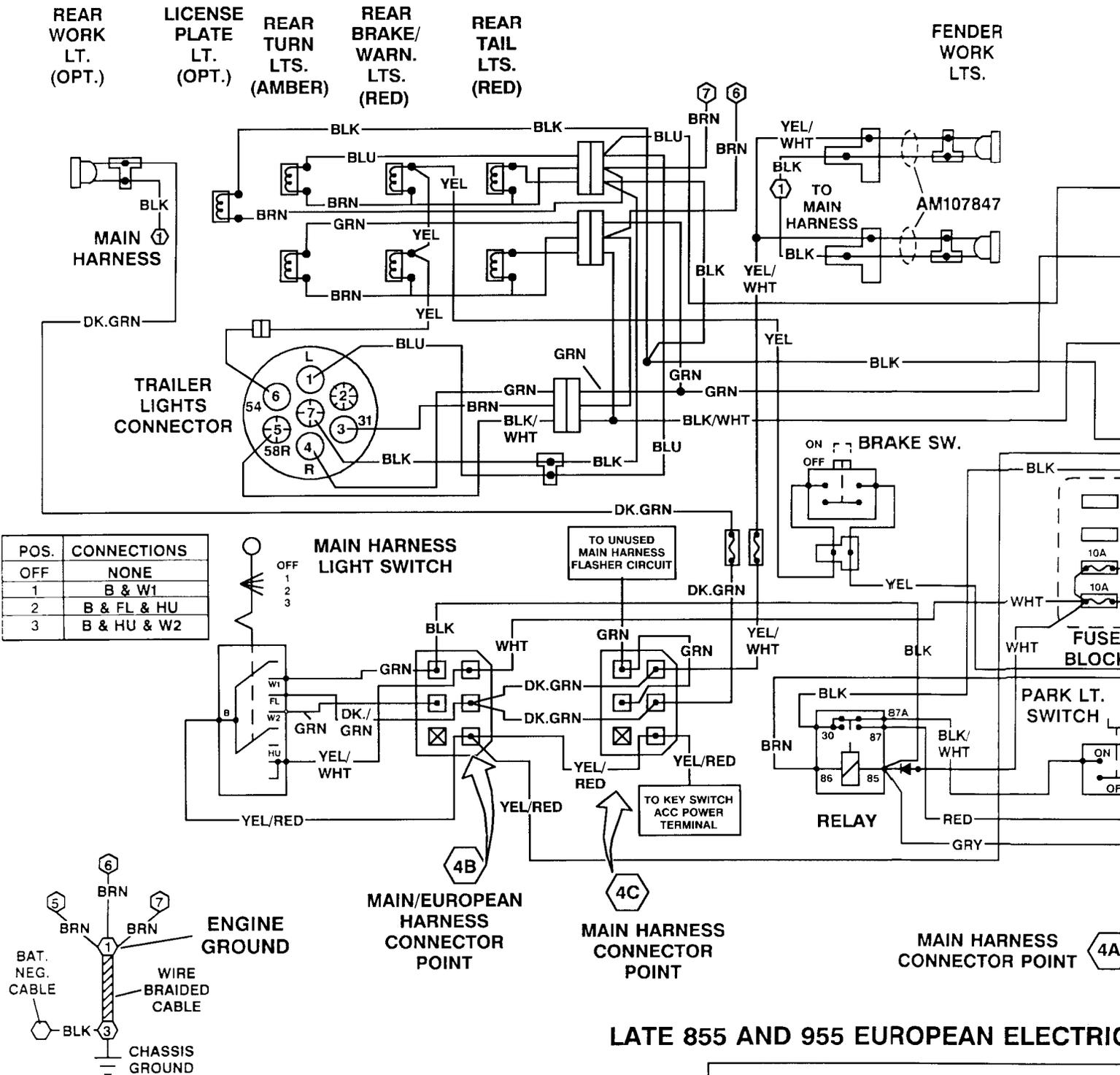
AM108164 HARNESSSES

## **LATE 855 AND 955 EUROPEAN ELECTRICAL SCHEMATIC—**

- Push button type hazard switch.
- Park light circuit added.

MX,24015HU,33 -19-16OCT91





LATE 855 AND 955 EUROPEAN ELECTRICAL

AM108187 HARNESS

ER  
K

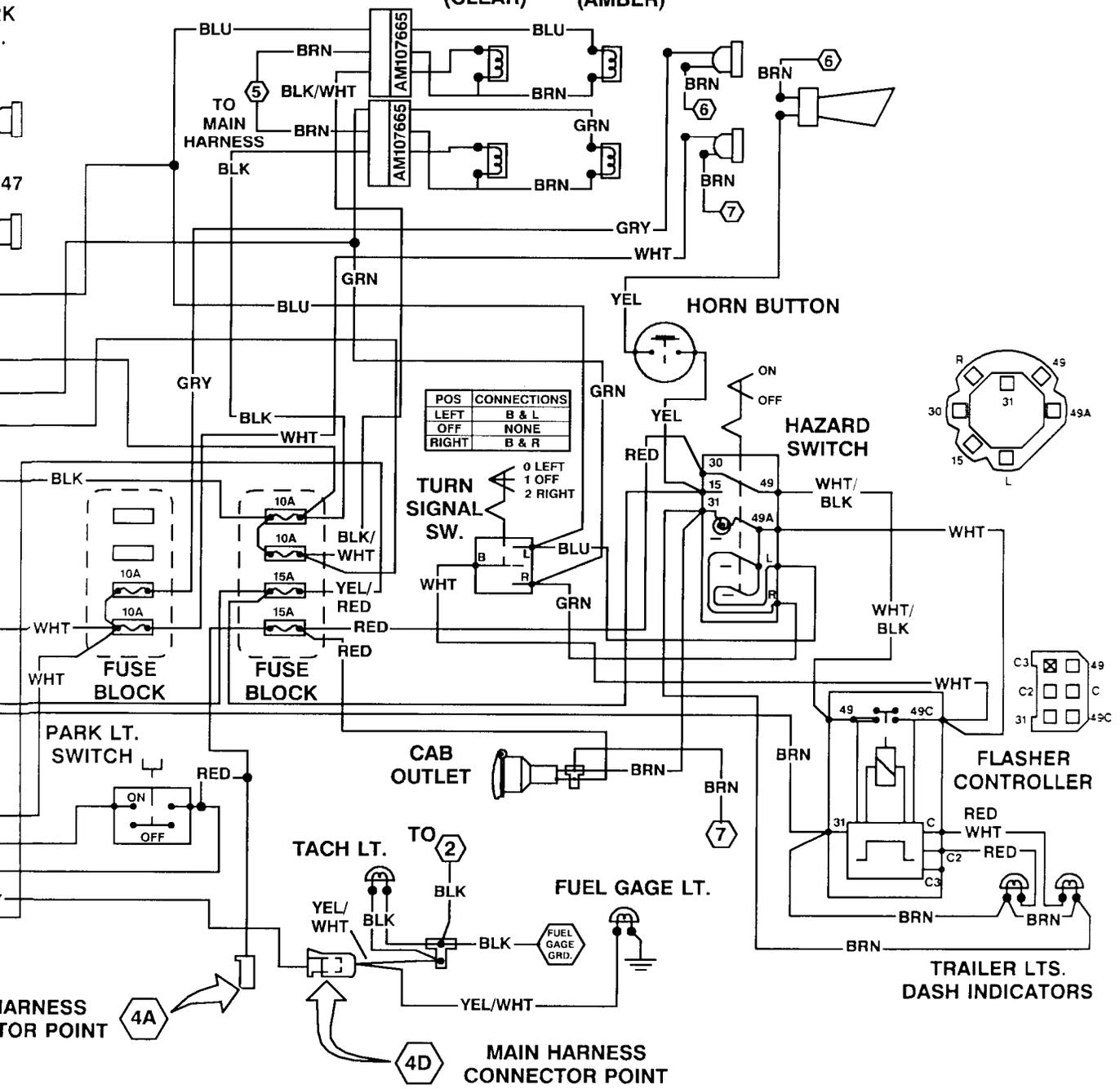
47

HARNESS  
TOR POINT

# WIRING ELECTRICAL SCHEMATIC

HARNESS

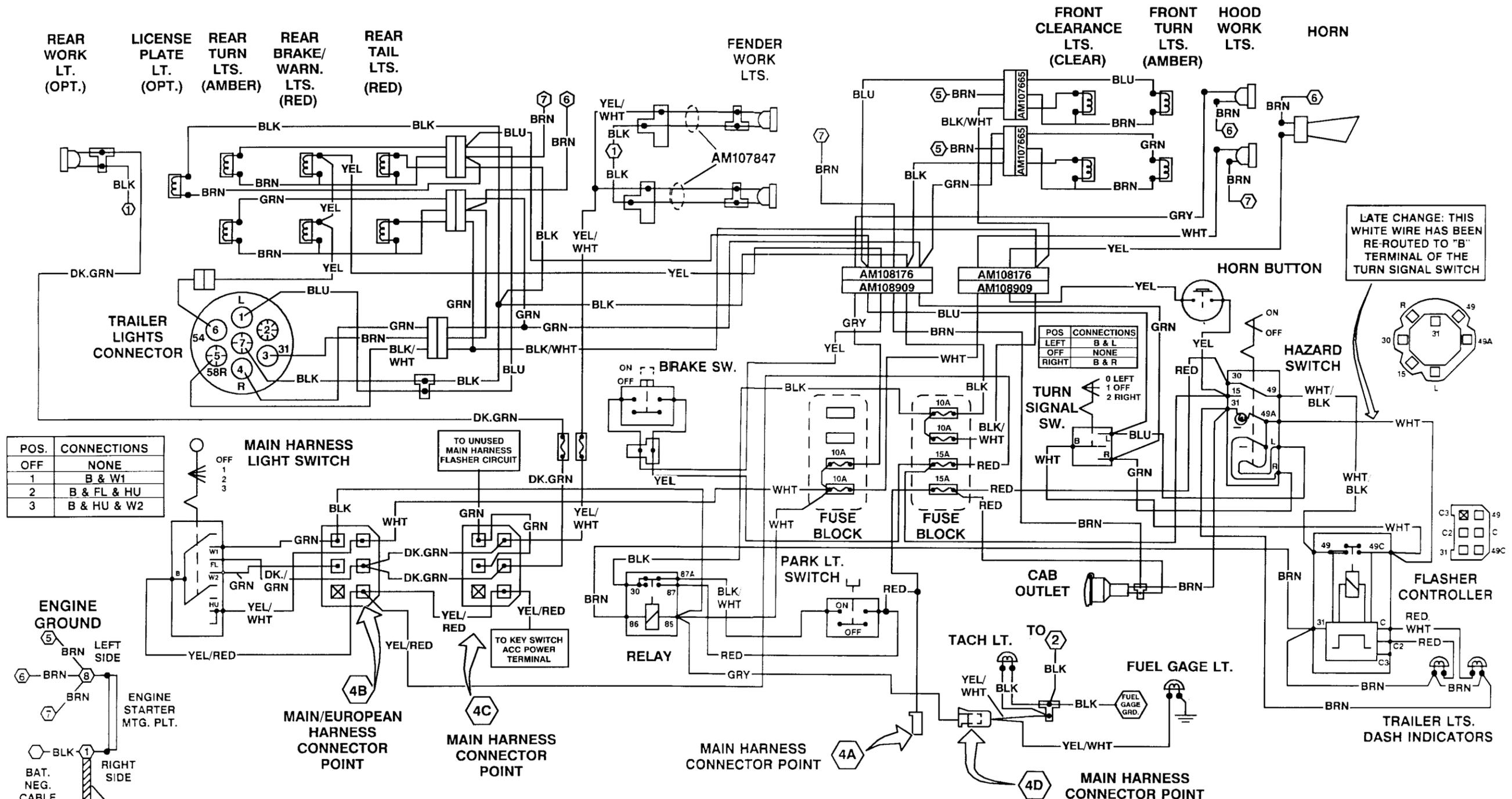
FRONT CLEARANCE LTS. (CLEAR)    FRONT TURN LTS. (AMBER)    HOOD WORK LTS.    HORN



## **755 EUROPEAN ELECTRICAL SCHEMATIC—**

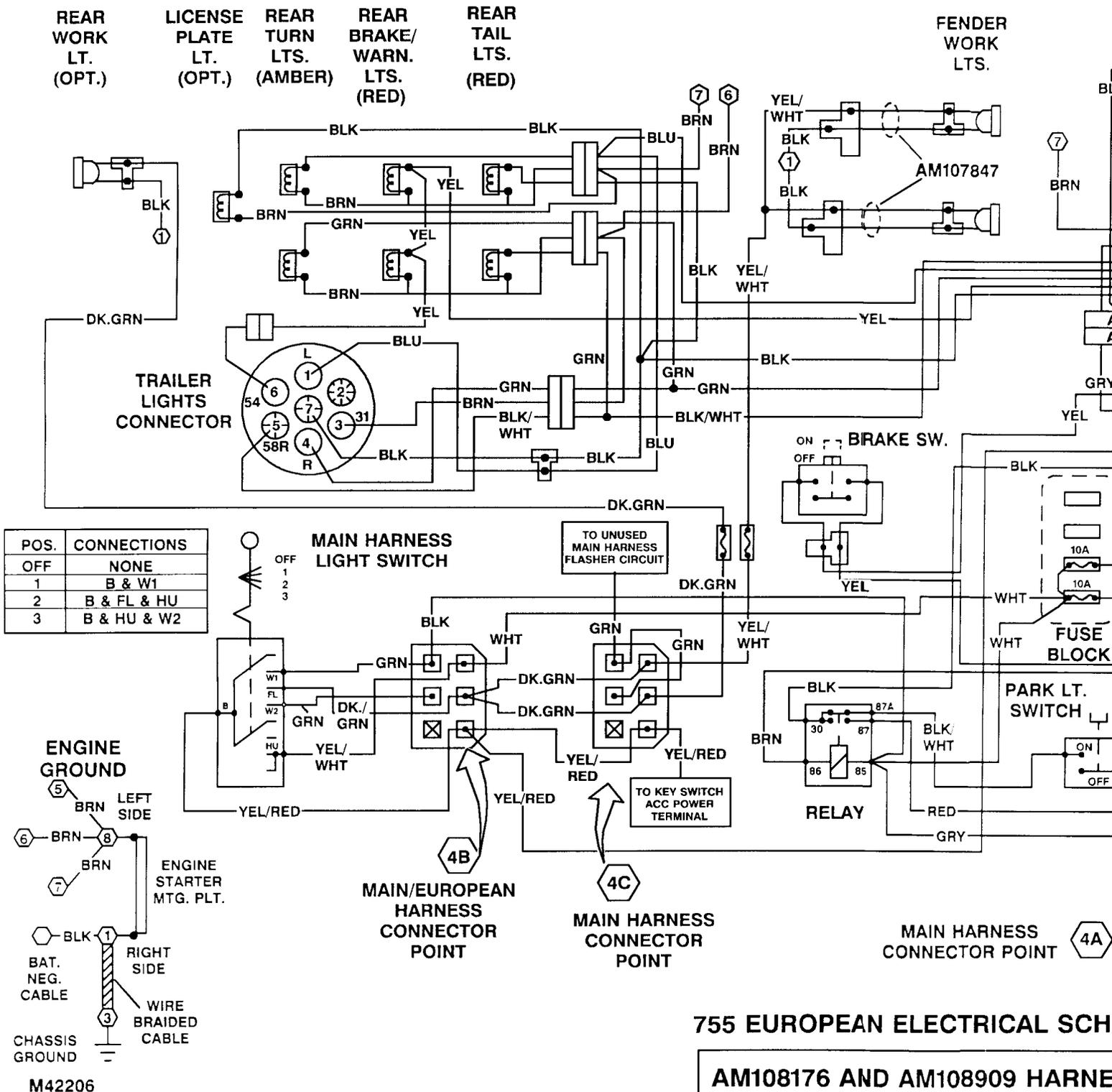
- Harness had to be split because available area inside steering pedestal was insufficient.
- Push button type hazard switch.

MX,24015HU,34 -19-16OCT91



**755 EUROPEAN ELECTRICAL SCHEMATIC**  
**AM108176 AND AM108909 HARNESSES**

M42206

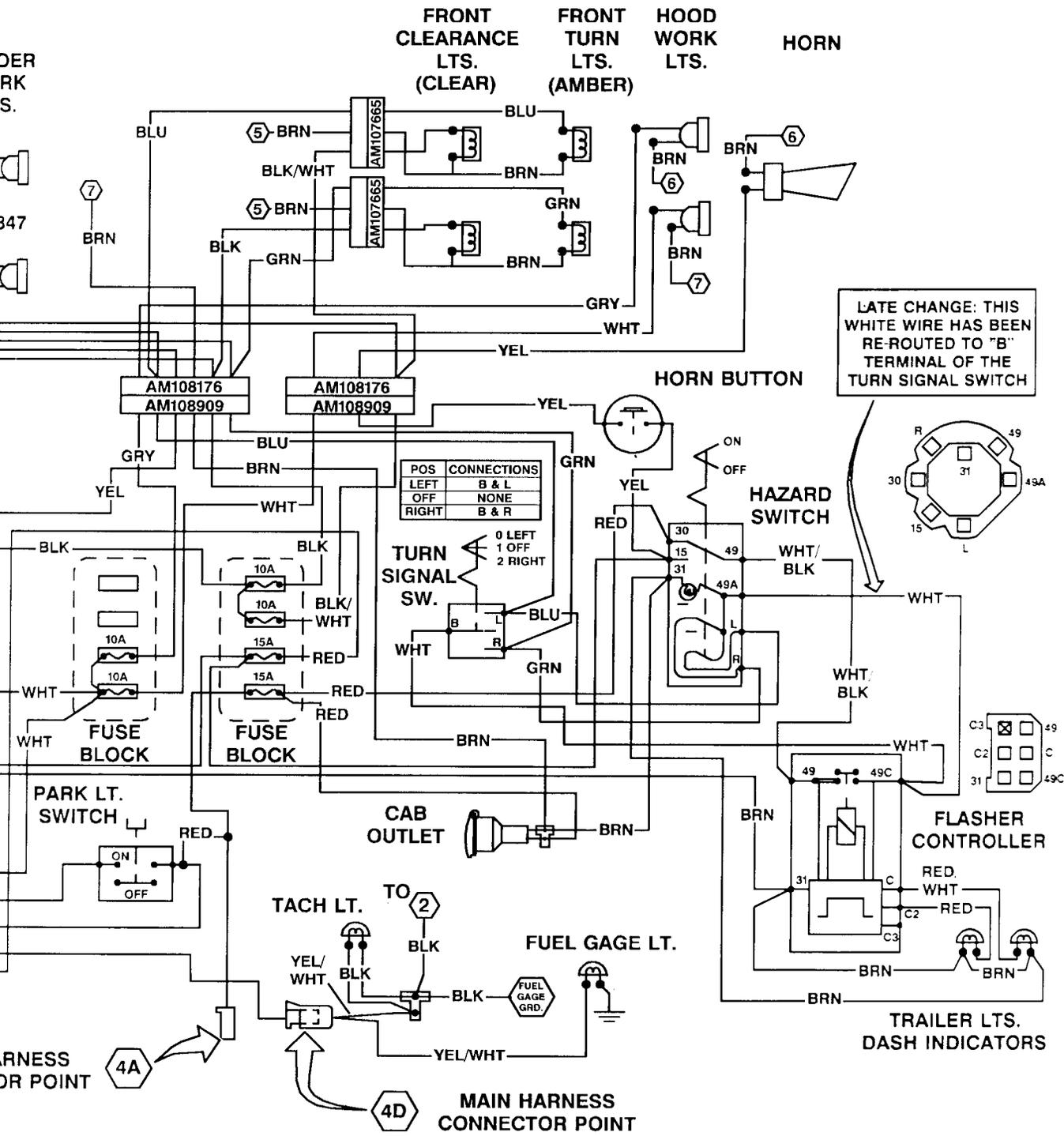


755 EUROPEAN ELECTRICAL SCHEMATIC

AM108176 AND AM108909 HARNESS

DER  
RK  
S.

347



### WIRING SCHEMATIC

### AM108909 HARNESSES

240  
15  
34

# Section 250

# Power Train Operation and Tests

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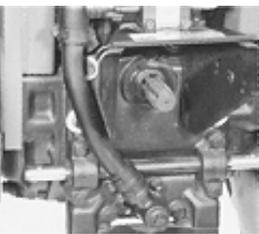
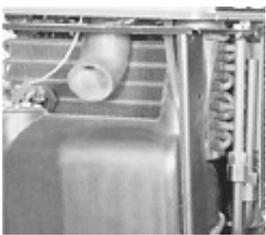
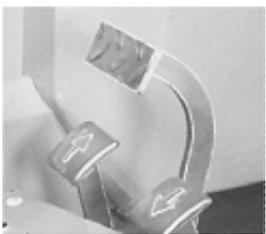
## BEFORE YOU START

Always begin with this group to identify a failure in the power train. The step-by-step procedures in this group provide you a quick-check of the system. No tools are required to perform these checks. If a failure is detected, you will be referred to a more detailed check, adjustment, and/or test.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the check.

This procedure is designed as a quick-check of the system. While performing the check, concentrate only on the check you are performing and disregard signals from unrelated components.

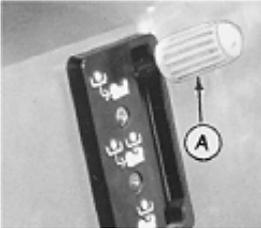
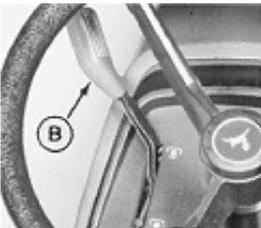
MX,25005HU,1 -19-16OCT91

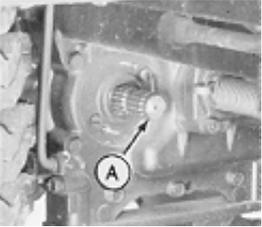
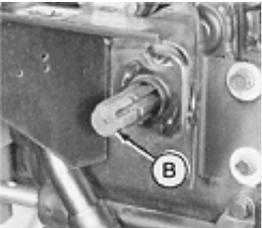
|  |   |  |   |
|--|---|--|---|
| <p><b>TRANSMISSION AND TRANSAXLE OIL LEAK CHECK</b></p> <p>Check hydraulic oil level, condition and viscosity.</p> |  <p>M45000 -UN-31AUG88</p>  |  <p>M45001 -UN-31AUG88</p> <p>Inspect for external hydraulic oil leakage from transmission filter, drain plug, lines, fittings, and final drive gaskets.</p> | <p><b>OK:</b> GO TO ' '</p> <p><b>NOT OK:</b> REPAIR OR REPLACE, THEN .... GO TO ' '</p> <p style="text-align: right;">MX,25005HU,2 -19-16OCT91</p>                                   |
| <p><b>OIL COOLER CHECK</b></p> <p>Remove grille.</p>   |  <p>M45002 -UN-31AUG88</p> | <p>Inspect hydraulic oil cooler for debris, plugged condition, oil leakage, or bent cooling fins.</p>  | <p><b>OK:</b> GO TO Æ</p> <p><b>NOT OK:</b> CLEAN OR REPLACE, THEN .... GO TO Æ</p> <p style="text-align: right;">MX,25005HU,3 -19-16OCT91</p>  |
| <p><b>TRANSMISSION NEUTRAL CHECK</b></p>   |  <p>M43947 -UN-31AUG88</p> | <p>Control pedals in NEUTRAL position.</p> <p>Run engine at HALF throttle.</p>   | <p><i>LOOK: Machine MUST NOT creep in NEUTRAL.</i></p> <p><b>OK:</b> GO TO Å</p> <p><b>NOT OK:</b> GO TO ' ', GROUP 10</p> <p style="text-align: right;">MX,25005HU,4 -19-16OCT91</p> |

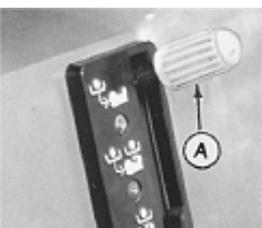
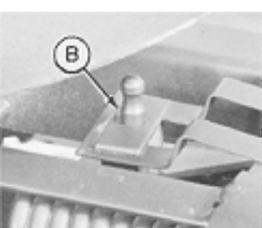
Power Train System Checkout/Differential Lock Check

|  |   |   |   |   |
|--|---|---|---|---|
| <p><b>Ä TRANSMISSION NEUTRAL RETURN CHECK</b></p> <p>Move two-speed axle lever to FAST position.</p>   |  <p>M43932 -UN-31AUG88</p>   | <p>Run engine at HALF throttle.</p> <p>Depress forward control pedal FULLY; while machine is moving, release pedal.</p> <p>Repeat for reverse.</p>  | <p><i>FEEL: Machine MUST come to a SMOOTH STOP in approximately 3 seconds or less.</i></p> <p><i>NOTE: Stopping time may vary with different attachments and operator preference.</i></p> | <p><b>OK:</b> GO TO 0</p> <p><b>NOT OK:</b> GO TO Ä, GROUP 10.</p> <p>MX,25005HU,5 -19-16OCT91</p>  |
| <p><b>0 TRANSMISSION DRIVE CHECK</b></p> <p>Run engine at FULL throttle.</p>   |  <p>M43932 -UN-31AUG88</p>   | <p>Depress control pedal from SLOW forward to FAST forward. Repeat for reverse.</p> <p><i>LOOK: Machine MUST move and increase speed, slow down, change direction and increase speed when moved from FULL forward to FULL reverse.</i></p> <p><i>FEEL: Speed increase MUST BE SMOOTH. Transmission suction line MUST NOT be too hot to touch.</i></p> |   | <p><b>OK:</b> GO TO 0</p> <p><b>NOT OK:</b> GO TO Ä, GROUP 10.</p> <p>MX,25005HU,6 -19-16OCT91</p>  |
| <p><b>0 TRANSAXLE DIFFERENTIAL LOCK CHECK</b></p> <p>Run engine at SLOW idle. MFWD DISENGAGED.</p> <p>Move control pedal to SLOW forward position.</p> |  <p>M43942 -UN-31AUG88</p> | <p>Turn steering wheel to the right.</p> <p>Depress differential lock and turn right.</p>   | <p><i>LOOK: Machine MUST try to go straight forward when steering wheel is turned or inside front tire MUST show scuffing or skidding on the ground.</i></p>                              | <p><b>OK:</b> GO TO 0</p> <p><b>NOT OK:</b> GO TO 10, GROUP 10.</p> <p>MX,25005HU,7 -19-16OCT91</p> |

Power Train System Checkout/Seat Switch PTO By-Pass (Override) Check

|   |  |  |                                 |
|---|--|--|---------------------------------|
| <p><b>0 PTO LINKAGE CHECK</b></p> <p>Remove mid PTO shaft cover, if equipped.</p> | <p>Operator ON seat.</p> <p>Run engine at SLOW idle.</p> | <p>Move PTO selector lever (A) to each of the three positions, then ENGAGE PTO lever (B).</p> <p><i>FEEL: PTO selector for lever MUST have three detent positions.</i></p>  <p>M43930 -UN-31AUG88</p>  <p>M45003 -UN-31AUG88</p> | <p>MX,25005HU,8 -19-16OCT91</p> |
|---|--|--|---------------------------------|

|  |   |  |   |
|--|---|--|---|
|  <p>M45004 -UN-31AUG88</p>  <p>M45005 -UN-31AUG88</p> | <p>If there are no implements on tractor, have another person observe mid (A) and rear (B) PTO shafts.</p> <p><i>LOOK: PTO shafts MUST rotate when selector lever is moved to appropriate position.</i></p> | <p>Move PTO selector lever to mid and rear PTO position.</p> <p><i>LOOK: Lever MUST BE between tabs on PTO quadrant.</i></p> | <p><b>OK:</b> GO TO Ú</p> <p><b>NOT OK:</b> GO TO 1!, GROUP 10.</p> <p>MX,25005HU,9 -19-16OCT91</p> |
|--|---|--|---|

|  |   |   |  |
|--|---|---|--|
| <p><b>Ú SEAT SWITCH PTO BY-PASS (OVERRIDE) CHECK</b></p> <p>Tilt seat forward.</p> <p>Run engine at SLOW idle.</p> |  <p>M43930 -UN-31AUG88</p>  <p>M43931 -UN-31AUG88</p> | <p>Move PTO selector lever (A) to REAR PTO.</p> <p>Pull seat switch (B) OUTWARD into PTO OVERRIDE position.</p> <p>Engage PTO lever.</p> <p><i>LOOK: PTO MUST stay engaged and PTO lamp MUST BE ON.</i></p> <p>Move PTO selector lever (A) to MID/REAR PTO position.</p> <p><i>LOOK/LISTEN: PTO magnet will make a loud click sound as it DISENGAGES the PTO lever. PTO lamp MUST GO OFF.</i></p> | <p><b>OK:</b> GO TO Ú</p> <p>PTO DISENGAGES: GO TO SECTION 240.</p> <p>MX,25005HU,10 -19-16OCT91</p> |
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250  
05  
3

Power Train System Checkout/Mechanical Front Wheel Drive (MFWD) Linkage Check

**Ü PTO BRAKE CHECK**

*NOTE: Tractor must have a PTO driven attachment installed for this check.*

Run engine at FAST idle.  
Engage PTO lever to drive attachment.



M45006 -UN-31AUG88

Move PTO lever to OFF position.  
Note the time needed to STOP attachment drive shaft rotation.  
**LOOK/LISTEN: Attachment MUST STOP in 4 seconds or less.**

**OK: GO TO 10**  
**NOT OK: GO TO SECTION 240 AND/OR GROUP 10, THIS SECTION.**

MX,25005HU,11 -19-16OCT91

**10 TWO-SPEED AXLE LINKAGE CHECK**

Run engine at HALF throttle.  
Move two-speed axle lever to SLOW speed position.



M43943 -UN-31AUG88

Depress forward control pedal to FULL speed position.  
**LOOK: Observe ground speed.**  
Repeat check with axle lever in FAST speed position.

*LOOK: Ground speed MUST BE approximately twice as fast.*

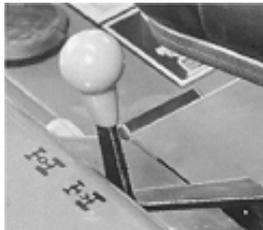
Move axle lever to NEUTRAL position.  
*LOOK: Axle lever MUST BE between tabs on two-speed axle quadrant.*

**OK: GO TO 1!**  
**NOT OK: GO TO 1@, GROUP 10.**

MX,25005HU,12 -19-16OCT91

**1! MECHANICAL FRONT WHEEL DRIVE (MFWD) LINKAGE CHECK**

Run engine at SLOW idle.  
Turn steering wheel to the right.



M43941 -UN-31AUG88

Move control pedal to SLOW forward position.  
Move MFWD lever forward to ENGAGED position and turn right.

**LOOK: Inside front tire MUST spin or show scuffing on the ground.**

**OK: GO TO 1@**  
**NOT OK: INSPECT FOR DAMAGED MFWD LINKAGE OR DRIVE SHAFT. DAMAGED FRONT AXLE IF DRIVE SHAFT IS TURNING. DAMAGED TRANSAXLE MFWD ASSEMBLY. (SEE SECTION 50.)**

MX,25005HU,13 -19-16OCT91

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4

*Power Train System Checkout/Cruise Control Adjustment Check*

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| <p><b>1@ CRUISE CONTROL LOCK/RELEASE CHECK</b></p> <p>Engine OFF.</p> |  <p>M45007 -UN-31AUG88</p> | <p>Depress forward control pedal SLIGHTLY.</p> <p>Engage cruise control lever and release your foot first then your hand.</p> |  |
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| <p><i>LOOK/FEEL: Forward control pedal and cruise control lever MUST stay in set position.</i></p> <p>Push DOWN on cruise control lever.</p> <p><i>LOOK/FEEL: Forward control pedal and cruise control lever MUST return to NEUTRAL.</i></p> | <p>Repeat procedure through FULL RANGE of forward pedal travel.</p> | <p><b>OK:</b> GO TO 1#</p> <p><b>NOT OK:</b> GO TO 1#, GROUP 10.</p> <p>MX,25005HU,14 -19-16OCT91</p> |
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| <p><b>1# CRUISE CONTROL RELEASE CHECK (FORWARD)</b></p> <p>Engine OFF.</p> |  <p>M43932 -UN-31AUG88</p> | <p>Depress forward control pedal.</p> <p>Engage cruise control.</p> <p>Press forward pedal SLIGHTLY and release.</p> | <p><i>LOOK/FEEL: Cruise control MUST DISENGAGE and forward control pedal MUST return to NEUTRAL.</i></p> | <p><b>OK:</b> GO TO 1\$</p> <p><b>NOT OK:</b> GO TO 1#, GROUP 10.</p> <p>MX,25005HU,15 -19-16OCT91</p> |
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| <p><b>1\$ CRUISE CONTROL RELEASE CHECK (MASTER/PARK BRAKE)</b></p> <p>Engine OFF.</p> |  <p>M43938 -UN-31AUG88</p> | <p>Depress forward control pedal.</p> <p>Engage cruise control.</p> <p>Press master/park brake pedal.</p> | <p><i>LOOK/FEEL: Cruise control MUST DISENGAGE and forward control pedal MUST return to NEUTRAL.</i></p> | <p><b>OK:</b> GO TO 1%</p> <p><b>NOT OK:</b> GO TO 1#, GROUP 10.</p> <p>MX,25005HU,16 -19-16OCT91</p> |
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| <p><b>1% CRUISE CONTROL ADJUSTMENT CHECK</b></p> <p>Engine OFF.</p> <p>Master/park brake pedal DISENGAGED.</p> <p>Cruise control DISENGAGED.</p> |  <p>M45008 -UN-31AUG88</p> | <p>Depress reverse control pedal.</p> <p>Pull UPWARD on cruise control lever.</p> | <p><i>LOOK/FEEL: Cruise control MUST NOT ENGAGE. Reverse control pedal MUST travel to FULL speed position.</i></p> | <p><b>OK:</b> GO TO 10</p> <p><b>NOT OK:</b> GO TO 1#, GROUP 10.</p> <p>MX,25005HU,17 -19-16OCT91</p> |
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250  
05  
5

*Power Train System Checkout/Operator Complaint Not Identified*

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| <p><b>10 FORWARD CONTROL PEDAL CHECK</b></p> <p>Engine OFF.</p>                                       |  <p>M43932 -UN-31AUG88</p>  | <p>Depress forward control pedal to FULL speed position.</p>  | <p><i>LOOK: Bottom of forward control pedal should be 10 mm (3/8 in.) above top of footrest.</i></p>  | <p><b>OK:</b> GO TO 1&amp;</p> <p><b>NOT OK:</b> GO TO 1\$, GROUP 10.</p> <p align="right">MX,25005HU,18 -19-16OCT91</p> |
| <p><b>1&amp; REVERSE CONTROL PEDAL CHECK</b></p> <p>Engine OFF.</p>                                   |  <p>M45007 -UN-31AUG88</p>  | <p>Pull UPWARD on cruise control lever and HOLD.</p> <p>Depress reverse control pedal then release.</p>                             | <p><i>LOOK/FEEL: Cruise control MUST NOT ENGAGE. Reverse pedal MUST return to NEUTRAL.</i></p>  | <p><b>OK:</b> GO TO 1*</p> <p><b>NOT OK:</b> GO TO 1%, GROUP 10.</p> <p align="right">MX,25005HU,19 -19-16OCT91</p>      |
| <p><b>1* SEAT LOCKOUT ROD CHECK</b></p> <p>Engine OFF.</p> <p>Master/park brake pedal DISENGAGED.</p> |  <p>M43947 -UN-31AUG88</p>  | <p>Operator OFF seat.</p> <p>Depress forward and reverse control pedals.</p> <p><i>LOOK/FEEL: Control pedals MUST NOT MOVE.</i></p> | <p>Operator ON seat.</p> <p>Depress control pedals.</p> <p><i>LOOK/FEEL: Control pedals MUST MOVE FREELY through their FULL RANGE of travel.</i></p>  | <p><b>OK:</b> SYSTEM NORMAL</p> <p><b>NOT OK:</b> GO TO 10, GROUP 10.</p> <p align="right">MX,25005HU,20 -19-16OCT91</p> |
| <p><b>1( OPERATOR COMPLAINT NOT IDENTIFIED</b></p>  | <p>If you completed the checkout procedure and DID NOT isolate a malfunction, the problem may be INTERMITTENT.</p> <p>Try to duplicate the conditions of the malfunction identified by the operator.</p> |   | <p>REPEAT SYSTEM CHECKOUT IN THIS GROUP.</p> <p>IF MALFUNCTION IS NOT IDENTIFIED AFTER REPEATING SYSTEM CHECKOUT PROCEDURE; FACTORY ASSISTANCE IS AVAILABLE THROUGH THE DEALER TECHNICAL ASSISTANCE CENTER (DTAC).</p> <p align="right">MX,25005HU,21 -19-16OCT91</p> |  |

## ABOUT THIS GROUP

Always perform the system checkout procedure in Group 05 BEFORE making any tests or adjustments in this group. The step-by-step procedures in this group provide you with the detailed diagnostic information you will need to correct a malfunction. Basic diagnostic equipment is used.

It is assumed that you are familiar with the machine and its power train components.

Complete the following visual checks before doing any tests or adjustments:

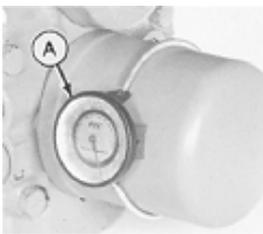
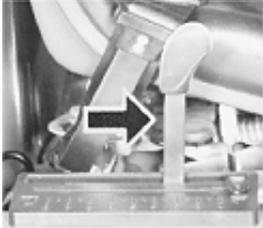
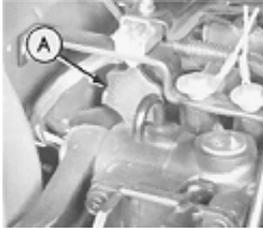
- Oil level and condition.
- External leaks from lines and fittings.
- Loose linkage.

Engine rpm and oil temperature are critical in most hydraulic tests. Be sure to follow test specifications carefully.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the test.

Upon completing a test or adjustment, check to see whether the problem is corrected by performing the checkout procedure in Group 05.

MX,25010HU,1 -19-16OCT91

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| <p><b>HYDRAULIC OIL WARM-UP PROCEDURE</b></p>  |  <p style="font-size: small;">M43859 -UN-31AUG88</p>                  | <p>Install JDG282 Temperature Gauge (A) on transmission oil filter.</p>   |  <p style="font-size: small;">M43860 -UN-31AUG88</p> <p>Put cardboard or paper around oil cooler to restrict air flow.</p> |  |
|  <p style="font-size: small;">M43861 -UN-31AUG88</p> | <p>Lock master/park brake pedal into PARK position.</p> <p>Run engine at FAST idle.</p> <p>Move rockshaft control lever FORWARD to lower lift arms.</p> |  <p style="font-size: small;">M43862 -UN-31AUG88</p> | <p>Turn stop valve (A) to CLOSED position.</p> <p>Move rockshaft control lever REARWARD to raise lift arms.</p> <p>Periodically cycle all hydraulic functions to distribute heated oil.</p>                   | <p>Heat oil to temperature specified in test.</p> <p>After oil is heated, turn stop valve to OPEN position.</p> <p>After test is completed and before tractor is returned to customer, make sure you remove cardboard or paper from around oil cooler.</p> |

MX,25010HU,2 -19-16OCT91

Power Train Tests and Adjustments/Adjust Transmission Neutral

**ADJUST TRANSMISSION NEUTRAL**

Mechanical front wheel drive **DISENGAGED**.  
Master/park brake **OFF**.  
Two-speed axle lever in **SLOW** speed position.



M45009 -UN-31AUG88

**SAFELY** raise rear wheels are off the ground.

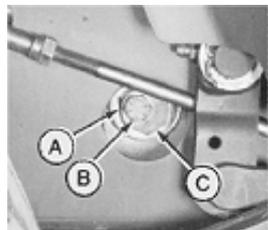
**SAFELY** support tractor with jackstands under axle housings. **MAKE SURE** there is proper **CLEARANCE** from all moving parts.

**CAUTION:** Use **EXTREME CAUTION** when doing this adjustment because drive wheels **WILL ROTATE** in forward or reverse direction as soon as the engine is **STARTED**. Make sure **MFWD** is disengaged **BEFORE** you **START** the engine; otherwise, it may pull the tractor **OFF** the

jackstands.

Foot control pedals in **NEUTRAL** position.

Run engine at **HALF** throttle.



M45010 -UN-31AUG88

**IMPORTANT:** Drive wheels will stop turning with eccentric in two different positions (**180 degrees** apart). You **MUST BEGIN** the adjustment with **NARROW SIDE (A)** of eccentric towards **REAR** of tractor and the **WIDE SIDE (C)** towards the **FRONT**.

Loosen cap screw (**B**) inside right frame. Turn eccentric until drive wheels **STOP TURNING**. Continue turning eccentric until you find the midpoint between the start of forward and reverse wheel rotation. Hold eccentric at that point and tighten cap screw. Cycle foot controls forward to reverse to neutral several times to check adjustment.

**AFTER ADJUSTMENT:** GO TO **Æ**, GROUP 05.

MX,25010HU,3 -19-16OCT91

Power Train Tests and Adjustments/Movement In One Direction Only

**Æ ADJUST TRANSMISSION NEUTRAL RETURN SPRING**

*NOTE: The return spring length is only an initial setting. Length may vary with different attachments and operator preference.*



M45011 -UN-31AUG88

Turn nut (A) until return spring length is approximately 133 mm (5.2 in.).

**AFTER ADJUSTMENT: GO TO Æ, GROUP 05.**

MX,25010HU,4 -19-16OCT91

**Å POWER TRAIN DRIVE TEST**

If unit DOES NOT operate properly, select the appropriate symptom from list at right.

After selecting the appropriate symptom, go to that step and perform the following checks, tests, or adjustments in the order shown to isolate and repair malfunctions.

- MOVEMENT IN ONE DIRECTION ONLY: GO TO 4a
- NO MOVEMENT IN EITHER DIRECTION: GO TO 4b
- LOW POWER/WHEELS STALL TOO EASILY: GO TO 4c
- TRACTOR WILL NOT REACH FULL SPEED: GO TO 4d
- TRANSMISSION OPERATING HOT: GO TO 4e

MX,25010HU,5 -19-16OCT91

**4a MOVEMENT IN ONE DIRECTION ONLY**

- Inspect transmission control linkage for wear or damage. (See Section 50.)
- Inspect main relief inlet check for damaged valve seat, valve, or broken spring. (See Section 50.)
- Inspect transmission main relief cartridge for damaged valve seat, valve, or broken spring. (See Section 50.)
- Test transmission main relief valve opening pressure: GO TO Ü
- Disassemble transmission and inspect for internal leakage or damage. (See Section 50.)

MX,25010HU,6 -19-16OCT91

Power Train Tests and Adjustments/Tractor Will Not Reach Full Speed

4b NO MOVEMENT  
IN EITHER  
DIRECTION

Inspect transmission control linkage for wear or damage. (See Section 50.)

Test charge pump pressure: GO TO 0

Inspect transaxle suction screen for plugged condition. (See Section 50.)

Check charge relief valve: GO TO 0

Adjust charge relief valve: GO TO 0

Test charge pump flow: GO TO U

Inspect main relief inlet checks for damaged valve seat, valve, or broken spring. (See Section 50.)

Disassemble transmission and inspect for internal leakage or damage. (See Section 50.)

MX,25010HU,7 -19-16OCT91

4c LOW  
POWER/WHEELS  
STALL TOO  
EASILY

Test charge pump pressure: GO TO 0

Inspect transaxle suction screen for plugged condition. (See Section 50.)

Check charge relief valve: GO TO 0

Adjust charge relief valve: GO TO 0

Test charge pump flow: GO TO U

Inspect main relief inlet check for damaged valve seat, valve, or broken spring. (See Section 50.)

Disassemble transmission and inspect for internal leakage or damage. (See Section 50.)

MX,25010HU,8 -19-16OCT91

4d TRACTOR WILL  
NOT REACH FULL  
SPEED

Inspect transmission control linkage for wear or damage. (See Section 50.)

Inspect throttle linkage for wear or damage. (See Section 220.)

Check engine fast idle. (See Section 220.)

Inspect main relief inlet check for damaged valve seat, valve, or broken spring. (See Section 50.)

Inspect transmission main relief cartridge for damaged valve seat, valve, or broken spring. (See Section 50.)

Test transmission main relief valve opening pressure: GO TO U

Disassemble transmission and inspect for internal leakage or damage. (See Section 50.)

MX,25010HU,9 -19-16OCT91

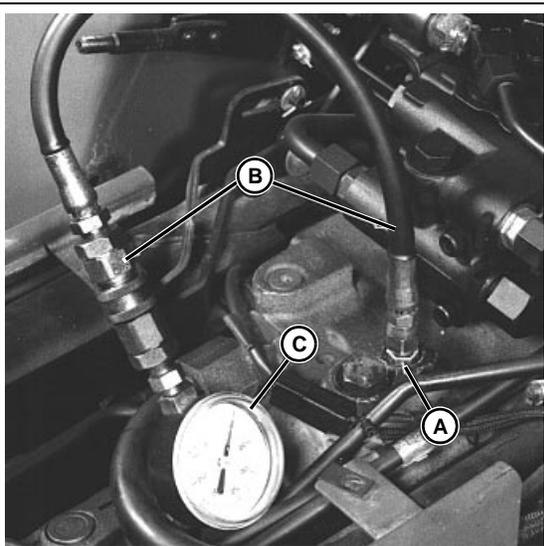
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| <p><b>4E TRANSMISSION OPERATING HOT</b></p> | <p>Inspect oil cooler for debris.</p> <p>Inspect oil cooler inlet and return lines for restrictions.</p> <p>Inspect oil cooler by-pass valve for damaged spring, valve, valve seat, or stuck valve. (See Section 50.)</p> <p>Test charge pump pressure: GO TO <b>5</b></p> <p>Inspect transaxle suction screen for plugged condition. (See Section 50.)</p> <p>Check charge relief valve: GO TO <b>6</b></p> <p>Adjust charge relief valve: GO TO <b>7</b></p> <p>Test charge pump flow: GO TO <b>8</b></p> <p>Inspect main relief inlet check for damaged valve seat, valve or broken spring. (See Section 50.)</p> <p>Inspect transmission main relief cartridge for damaged valve seat, valve or broken spring. (See Section 50.)</p> <p>Test transmission main relief valve opening pressure: GO TO <b>9</b></p> <p>Disassemble transmission and inspect for internal leakage or damage. (See Section 50.)</p> |
|---|--|

**5 TRANSMISSION CHARGE PUMP PRESSURE TEST**

Heat hydraulic oil to 43°C (110°F). See **1** in this group.

**⚠ CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves in all directions several times.

Remove platform shield and seat panel.



M45012

**ESSENTIAL TOOLS**

A—JTO5488 Connector  
 B—JTO3017 Hose  
 C—JTO3344 Gauge 2000 kPa (300 psi)

**SPECIFICATIONS**

Oil temperature—43°C (110°F)  
 Engine speed—fast idle (3450 pump rpm)  
 Charge pressure—827—1241 kPa (120—180 psi)

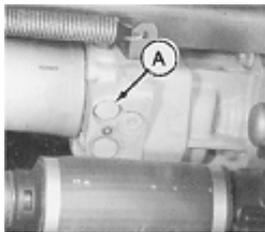
Make test connections from JTO1765 and JTO5738 Consumer Products Hydraulic Fitting kits.

Run engine at TEST SPECIFICATIONS.

*LOOK: Record pressure reading.*

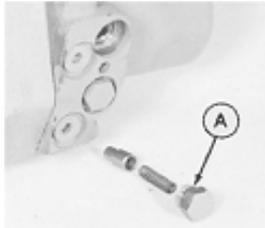
CHARGE PRESSURE LOW: GO TO **6**

**0 CHARGE RELIEF VALVE CHECK**



M45013 -UN-31AUG88

Remove charge relief valve plug (A) and check for a broken spring or a stuck or damaged valve.



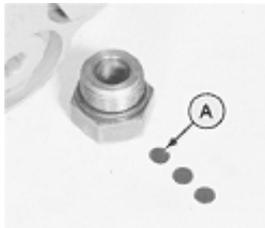
M45014 -UN-31AUG88

CHARGE RELIEF VALVE OK: GO TO 0

CHARGE RELIEF VALVE DAMAGED: REPLACE AND CHECK CHARGE PRESSURE, THEN ... GO TO 0, GROUP 05.

MX,25010HU,12 -19-16OCT91

**0 ADJUST CHARGE RELIEF VALVE**



M45015 -UN-31AUG88

If charge relief valve is NOT damaged, ADD shims (A) in spring retainer to INCREASE charge pressure.

*NOTE: One 0.03 mm (0.001 in.) shim will change charge relief valve opening pressure by approximately 7 kPa (1 psi).*

Check charge pressure.

CHARGE PRESSURE OK: GO TO 0, GROUP 05.

CHARGE PRESSURE LOW: GO TO U

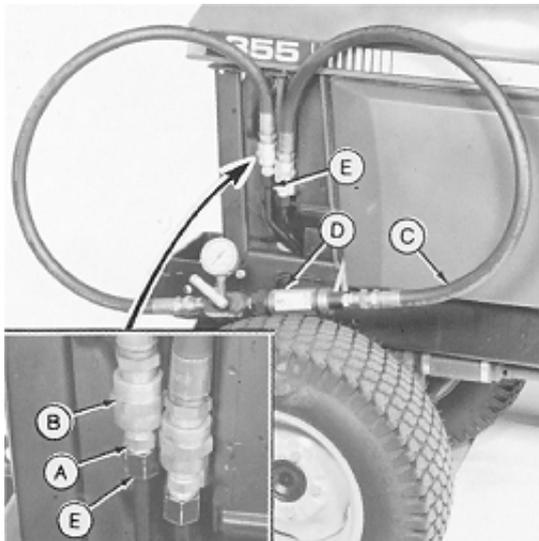
MX,25010HU,13 -19-16OCT91

**U TRANSMISSION CHARGE PUMP FLOW TEST**

Heat hydraulic oil to 43°C (110°F), See ; in this group.

**CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves.

*NOTE: Line (E) is oil cooler inlet.*



M45016 -UN-31AUG88

**ESSENTIAL TOOLS**

- A—JTO3367 Connector
- B—JTO3369 Coupler
- C—JTO5531 Hose
- D—STD12 Flowmeter

**SPECIFICATIONS**

- Oil temperature . . . . . 43°C (110°F)
- Engine speed . . . . . 3425 ± 25 rpm
- Minimum pump flow . . . . . 15 L/min. (4 gpm)

250  
10  
6

Power Train Tests and Adjustments/Transmission Relief Valve High Pressure Test

Make test connections from JTO5738 Consumer Products Hydraulic Fitting kit and JTO5469 Flowmeter Kit.

Run engine at TEST SPECIFICATIONS.

LOOK: Record pressure reading.

CHARGE PUMP FLOW BELOW SPEC, INSPECT FOR:

DAMAGED OR WORN CHARGE PUMP.

INTERNAL TRANSMISSION LEAKAGE, WEAR, OR DAMAGE.

MX,25010HU,14 -19-16OCT91

**Ü TRANSMISSION RELIEF VALVE HIGH PRESSURE TEST**

Heat hydraulic oil to 43°C (110°F), See ; in this group.

**N CAUTION: To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in**

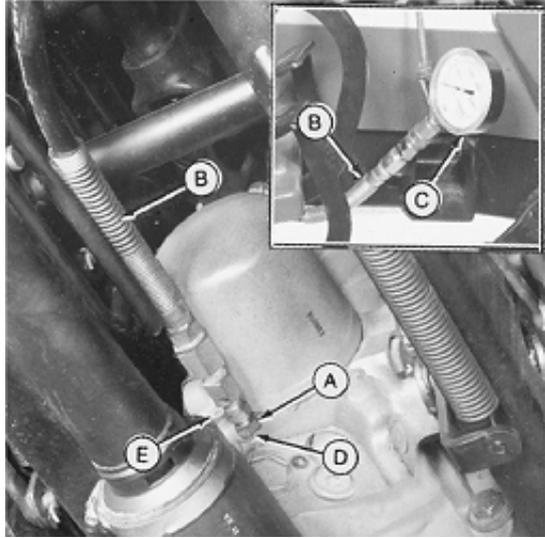
**the system by stopping the engine and operating all hydraulic control valves.**

NOTE: If reverse test port is used, remove MFWD drive shaft.



M45018 -UN-31AUG88

250  
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7



M45017 -UN-31AUG88

**ESSENTIAL TOOLS**

- A—JTO5488 Connector
- B—JTO3364 Hose
- C—JTO3362 Gauge 70,000 kPa (100,000 psi)

**SPECIFICATIONS**

- Oil temperature . . . . . 43°C (110°F)
- Engine speed . . . . . fast idle
- System pressure . . . . . 41370—44817 kPa (6000—6500 psi)

Make test connections from JTO5738 Consumer Products Hydraulic Fitting kit.

Install fittings into forward (D) or reverse (E) pressure test ports.

Move two-speed axle lever to FAST speed position.

Depress brake pedals.

**N CAUTION: Tractor may move slightly during test.**



M43932 -UN-31AUG88

Run engine at TEST SPECIFICATIONS.

Move control pedal to SLOW forward or reverse position.

LOOK: Record pressure reading.

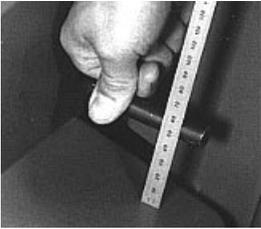
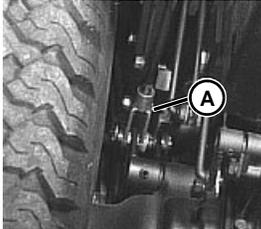
IF SYSTEM PRESSURE IS LOW, INSPECT FOR:

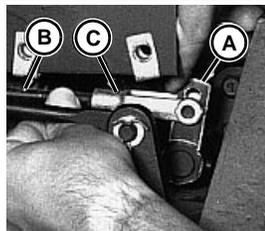
DAMAGED HIGH PRESSURE RELIEF VALVE; REPLACE IF NECESSARY.

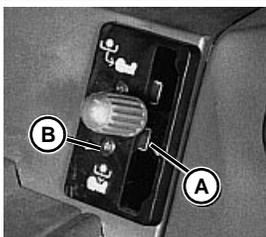
INTERNAL TRANSMISSION LEAKAGE, WEAR, OR DAMAGE.

MX,25010HU,15 -19-16OCT91

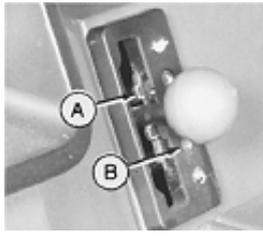
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8

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| <p><b>10</b> ADJUST TRANSAXLE DIFFERENTIAL LOCK PEDAL</p> | <p>Run engine at SLOW idle.</p> <p>Depress control pedal to SLOW forward position and ENGAGE differential lock pedal. STOP the engine.</p> |  <p>M45019</p>  <p>M45020</p> | <p>HOLD differential lock pedal in ENGAGED position.</p> <p>The bottom of pedal must be approximately 15 mm (0.6 in.) from footrest. If necessary, adjust yoke (A) until dimension is correct.</p> | <p>AFTER ADJUSTMENT GO TO <b>6</b>, GROUP 05</p> <p>IF DIFFERENTIAL LOCK STILL WILL NOT ENGAGE:</p> <p>REPAIR TRANSAXLE DIFFERENTIAL LOCK ASSEMBLY. (SEE SECTION 50.)</p> |
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| <p><b>11</b> ADJUST PTO LEVER AND PTO SELECTOR LEVER</p> <p>Remove left wheel and fender.</p> |  <p>M45006</p> | <p>Move PTO lever to OFF position.</p> |  <p>M45021</p> | <p>Disconnect PTO valve linkage.</p> <p>Pull PTO valve arm (A) and PTO rod (B) REARWARD. Turn yoke (C) until hold-in yoke aligns with hole-in arm.</p> <p>Connect PTO valve linkage.</p> |
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|  |  |   |
|--|--|---|
|  <p>M45022</p> | <p>Move PTO selector lever to MID and REAR PTO positions.</p> <p><i>LOOK: Lever MUST BE between tabs (A) of PTO quadrant.</i></p> <p>If necessary, loosen screws (B). Move PTO quadrant until lever is between tabs. Tighten screws.</p> | <p>AFTER ADJUSTMENT: GO TO <b>7</b>, GROUP 05.</p> <p>IF PTO STILL DOES NOT ENGAGE/DISENGAGE:</p> <p>Disconnect adjustable link from arm on side of transmission and shift by hand.</p> <p>If PTO can be engaged/disengaged properly, external linkage is binding or is out of adjustment.</p> <p>If arm moves but does not engage/disengage PTO(S), PTO linkage is not shifting PTO selector valve (hydraulic valving problem).</p> <p>IF SELECTOR SHAFT IN SIDE OF TRANSMISSION CASE IS STUCK/BINDING: Try to free up by operating arm with vise grips or large pliers.</p> <p>IF STILL BINDING OR ROTATES HARD, IT MAY NEED TO BE DRIVEN FROM CASE TO CLEAN/SERVICE.</p> <p>USE THE FOLLOWING PROCEDURE:</p> <p>Drive spring pin out and remove arm from shaft.</p> <p>Remove PTO cover from rear of transmission.</p> <p>If needed, rotate shaft so that inner arm on shaft clears PTO reduction shaft.</p> <p>Drive shaft to inside of case and remove. Clean/service and reinstall.</p> <p>IF PTO STILL DOES NOT ENGAGE,</p> <p>DISASSEMBLE TRANSAXLE (SEE SECTION 50) AND INSPECT FOR:</p> <ul style="list-style-type: none"> <li>Damaged PTO valve or selector lever linkage.</li> <li>Damaged PTO valve.</li> <li>Damaged PTO clutch pack.</li> <li>Damaged PTO brake pack.</li> <li>Damaged PTO gears or shift collar.</li> </ul> |
|--|--|---|

**1@ ADJUST TRANSAXLE TWO-SPEED AXLE LEVER**



M45023 -UN-31AUG88

Move two-speed axle lever to "N" (NEUTRAL) position.

**LOOK: Lever MUST BE between tabs (A) on two-speed axle quadrant.**

If necessary, loosen screws (B). Move quadrant until lever is between tabs. Tighten screws.

AFTER ADJUSTMENT: GO TO 10, GROUP 05.

IF TWO-SPEED AXLE DOES NOT ENGAGE:

REPAIR TRANSAXLE TWO-SPEED AXLE ASSEMBLY. (SEE SECTION 50.)

MX,25010HU,18 -19-16OCT91

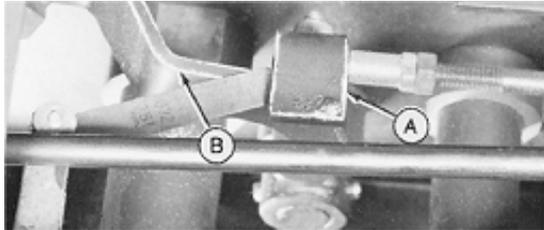
**1# ADJUST CRUISE CONTROL LOCK**

*NOTE: Before adjusting cruise control linkage, inspect linkage for wear or damage. Repair or replace as necessary. (See Section 50.)*

Remove platform shield.

Master/park brake DISENGAGED.

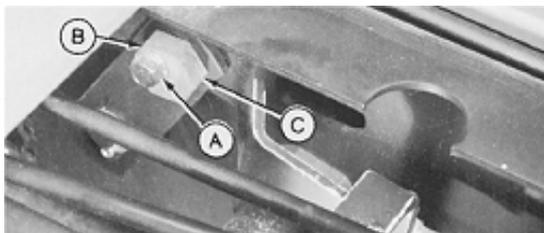
Cruise control lever DISENGAGED.



M45024 -UN-31AUG88

Depress REVERSE control pedal.

Pawl (A) MUST BE 1—3 mm (0.04—0.12 in.) ABOVE ratchet (B).



M45025 -UN-31AUG88

If adjustment IS necessary, loosen cap screw (A).

**IMPORTANT: NARROW SIDE (B) of eccentric MUST face towards FRONT of tractor.**

Turn eccentric (C) until pawl is 1—3 mm (0.04—0.12 in.) ABOVE ratchet. Hold eccentric and tighten cap screw.

AFTER ADJUSTMENT: GO TO 1@, GROUP 05.

MX,25010HU,19 -19-16OCT91

**1\$ ADJUST FORWARD CONTROL PEDAL**

Master/park brake DISENGAGED.



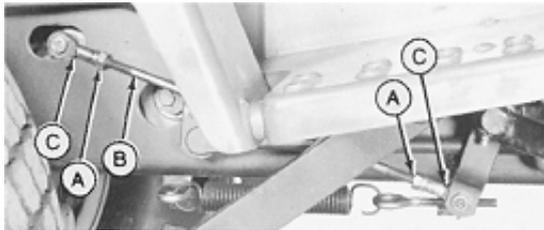
M45026 -UN-31AUG88

Depress control pedal to FULL speed position.

Bottom of control pedal MUST BE 7—10 mm (0.3—0.4 in.) ABOVE footrest.

Continued on next page

Power Train Tests and Adjustments/Adjust Seat/Control Pedals Lockout Rod



Loosen nuts (A).  
Turn rod (B) until specification is obtained.  
**IMPORTANT: Ball joints (C) MUST BE PARALLEL after nuts are tightened.**  
Hold ball joints and tighten nuts.

AFTER ADJUSTMENT:  
GO TO 10, GROUP 05.

M45027 -UN-31AUG88

MX,25010HU,20 -19-16OCT91

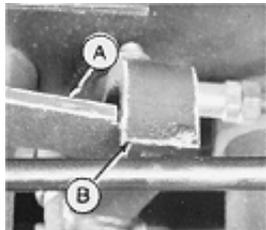
1% **ADJUST REVERSE CONTROL PEDAL**

Master/park brake DISENGAGED.  
Remove platform shield.



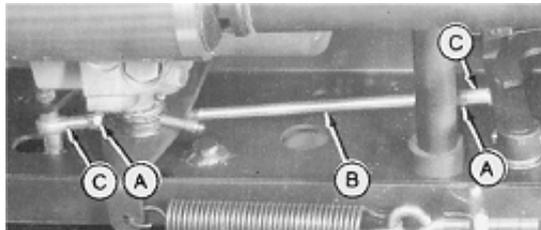
Speed control pedals in NEUTRAL position.  
Pull UPWARD on cruise control lever.

M45007 -UN-31AUG88



*LOOK: Ratchet (A) MUST contact pawl (B) at the FIRST notch.*

M45028 -UN-31AUG88



Loosen nuts (A).  
Turn rod (B) until ratchet contacts pawl at the FIRST notch.  
**IMPORTANT: Ball joints (C) MUST BE PARALLEL after nuts are tightened.**

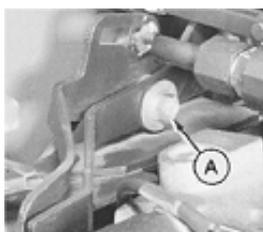
**Hold ball joints and tighten nuts.**

M45029 -UN-31AUG88

AFTER ADJUSTMENT:  
GO TO 1&, GROUP 05.

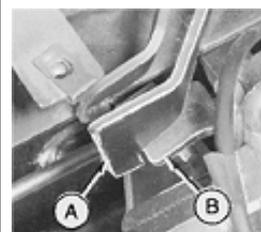
MX,25010HU,21 -19-16OCT91

10 **ADJUST SEAT/CONTROL PEDALS LOCKOUT ROD**



Remove platform shield and seat panel.  
Loosen nut (A).

M45030 -UN-31AUG88



Pull lock arm (A) REARWARD until lock arm is tight against cam (B).  
Tighten nut.

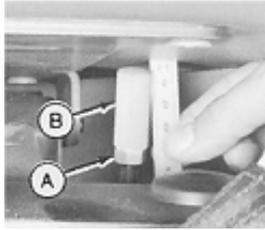
M45031 -UN-31AUG88

**Continued on next page**

*Power Train Tests and Adjustments/Adjust Seat/Control Pedals Lockout Rod*

Move seat to the MOST REARWARD position.

Operator OFF seat.



M45032 -UN-31AUG88

Loosen lock nut (A).

Turn plastic cap (B) until cap is 1—2 mm (0.04—0.08 in.) away from bottom of seat plate.

Hold cap and tighten lock nut.

AFTER ADJUSTMENT:  
GO TO 1\*, GROUP  
05.

MX,25010HU,22 -19-16OCT91

250  
10  
11

250  
10  
12

## **POWER TRAIN OPERATION**

This group divides the power train into the following functional systems:

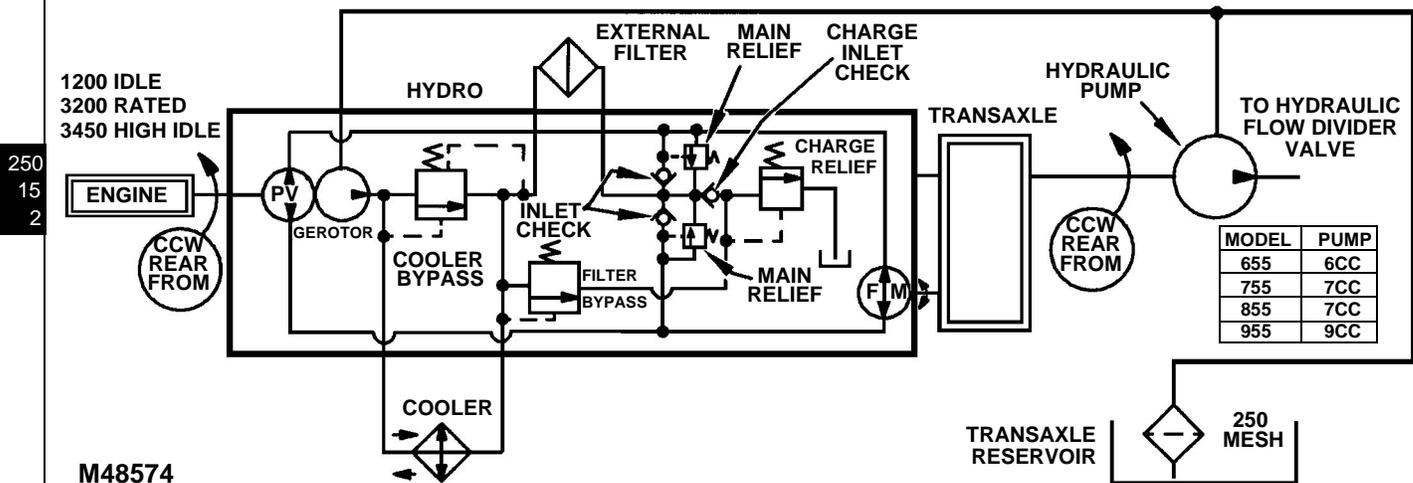
- Hydrostatic Transmission Operation.
- Foot Control Linkage Operation.
- Transaxle Operation.
- MFWD Operation.

This group will provide the necessary information needed to understand how these systems work individually and together as an entire system. It is assumed that you have an adequate understanding of how the diesel engine operates; so, that will not be explained.

MX,HU,25015,1A -19-16OCT91

250  
15  
1

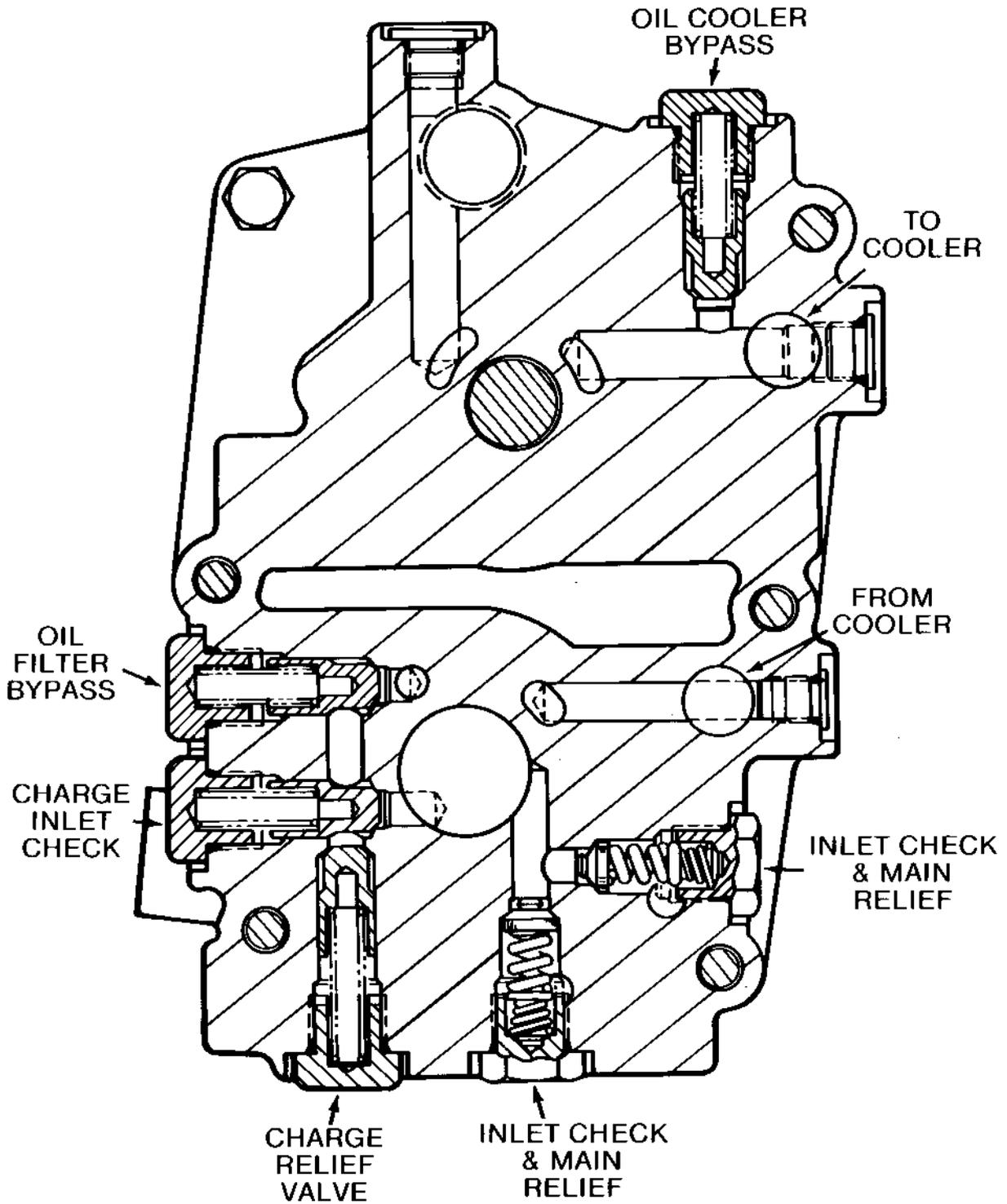
## HYDROSTATIC TRANSMISSION GENERAL OPERATION



Whenever the engine is running, the transmission and hydraulic systems are filled with charge oil generated from their shaft driven pumps. Oil is drawn through the 250 mesh screen from the transaxle reservoir by the hydraulic pump at the rear of the transaxle and by the charge pump at the front of the hydrostatic transmission, a shared reservoir system. The hydrostatic transmission has a fixed, gerotor-type charge pump that forces the oil out through the oil cooler and external filter. Both the oil cooler and filter have a bypass valve, located in the center section, to ensure oil will always be supplied to the hydro should the cooler and/or filter become plugged.

From the filter, oil flows through the two inlet check valves of the center section into the transmission variable-displacement, axial-piston pump and to the fixed-displacement, axial-piston motor. The charge relief valve provides sufficient back-pressure to keep the hydro lubricated. It is set between 120—180 psi and is shim adjustable. There are two, non-adjustable, closed-loop main system relief valves (one for each direction) located in the center section, which are set at 6000—6500 psi.

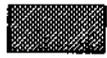
CROSS-SECTION VIEW—HYDRO CENTER SECTION



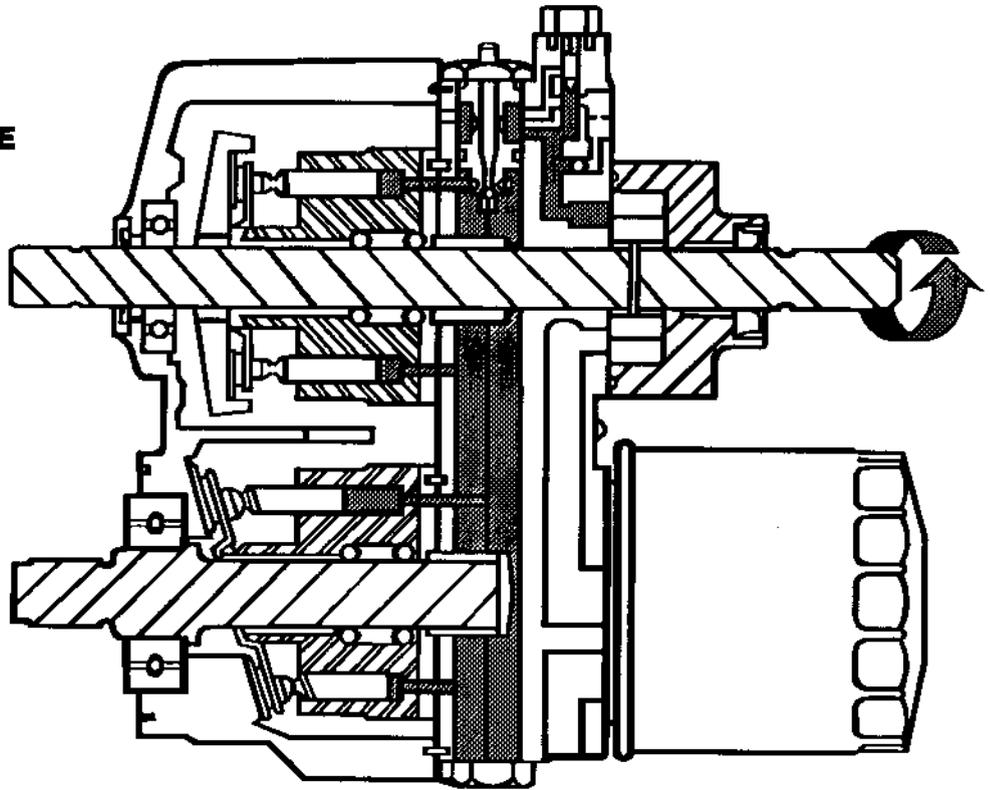
250  
15  
3

M70519 -19-12SEP91

## NEUTRAL OPERATION



**CHARGE  
PRESSURE  
OIL**



M42289

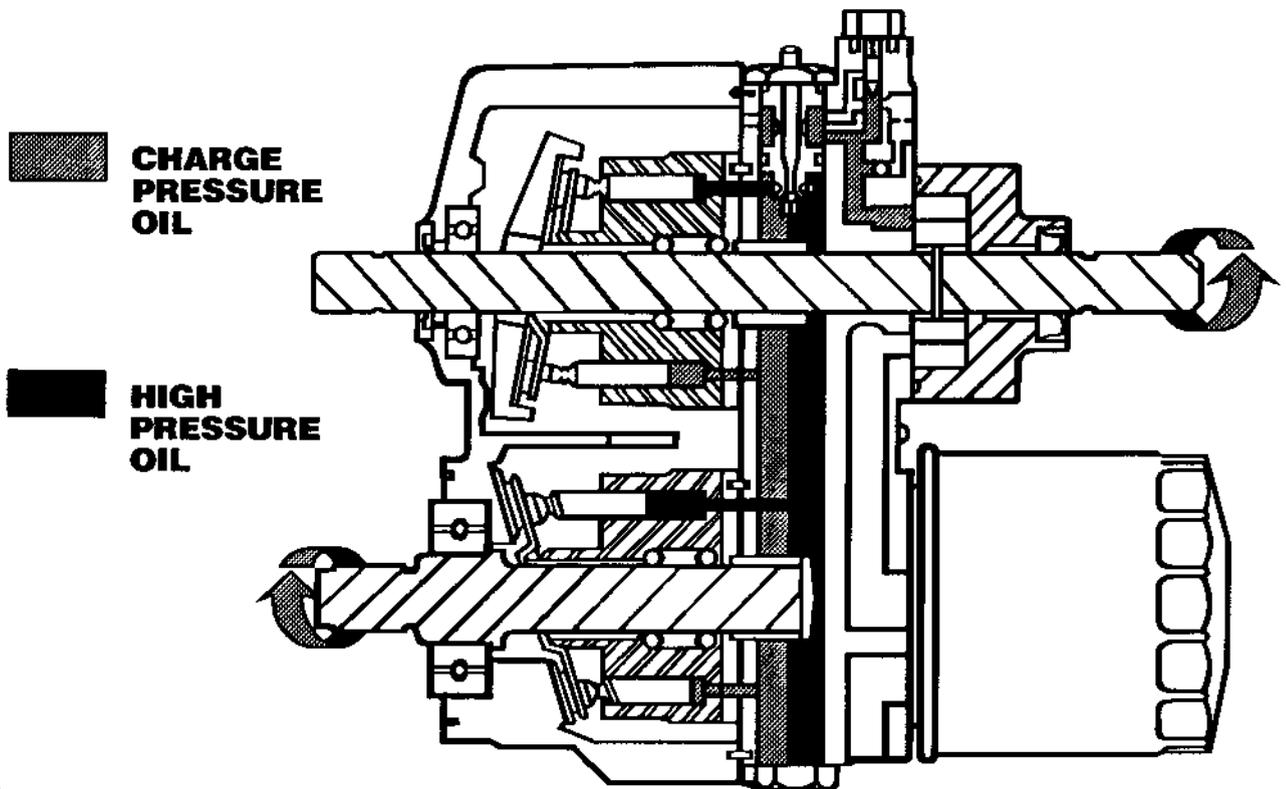
When the foot control pedals are in neutral, only the charge pump and the variable-displacement pump are rotating. They are connected to the engine drive shaft (which turns in a counterclockwise direction) via their shared splined shaft. When the swashplate is in the

neutral vertical-plane, the displacement of the piston cylinders of the pump are equalled and non high-pressure generating. Charge pressure alone is not great enough to turn the motor.

MX,25015HU,1D -19-16OCT91

M42289 -19-23SEP91

**FORWARD OPERATION**



As the operator depresses the forward foot control pedal, the swashplate of the variable-displacement pump rotates, via mechanical linkages, away from the vertical plane of the neutral position. A change in displacement inside the piston cylinder bores results. This change in displacement generates high-pressure oil in the closed-loop from the variable-displacement pump to the fixed-displacement motor. This high-pressure oil enters the motor inlet port and pushes against the pistons, which transfer the

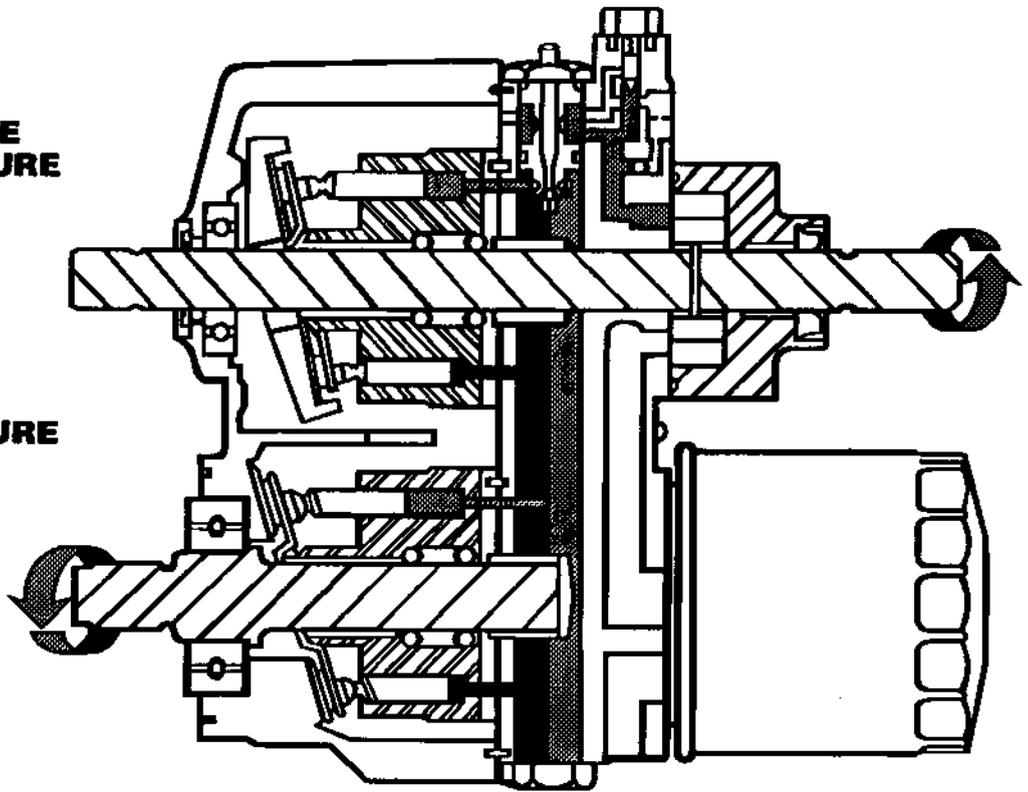
pressure against the incline of the fixed-displacement swashplate, forcing the cylinder block and drive shaft of the motor to rotate. Whenever the variable-swashplate of the pump is in the opposite plane as the motor fixed-swashplate, the motor drive shaft will turn in the same direction as the pump drive shaft. Bolted to the end of the motor drive shaft is the transaxle input gear, which drives the transaxle and the MFWD.

MX,25015HU,1E -19-16OCT91

**REVERSE OPERATION**

 **CHARGE  
PRESSURE  
OIL**

 **HIGH  
PRESSURE  
OIL**



M42292

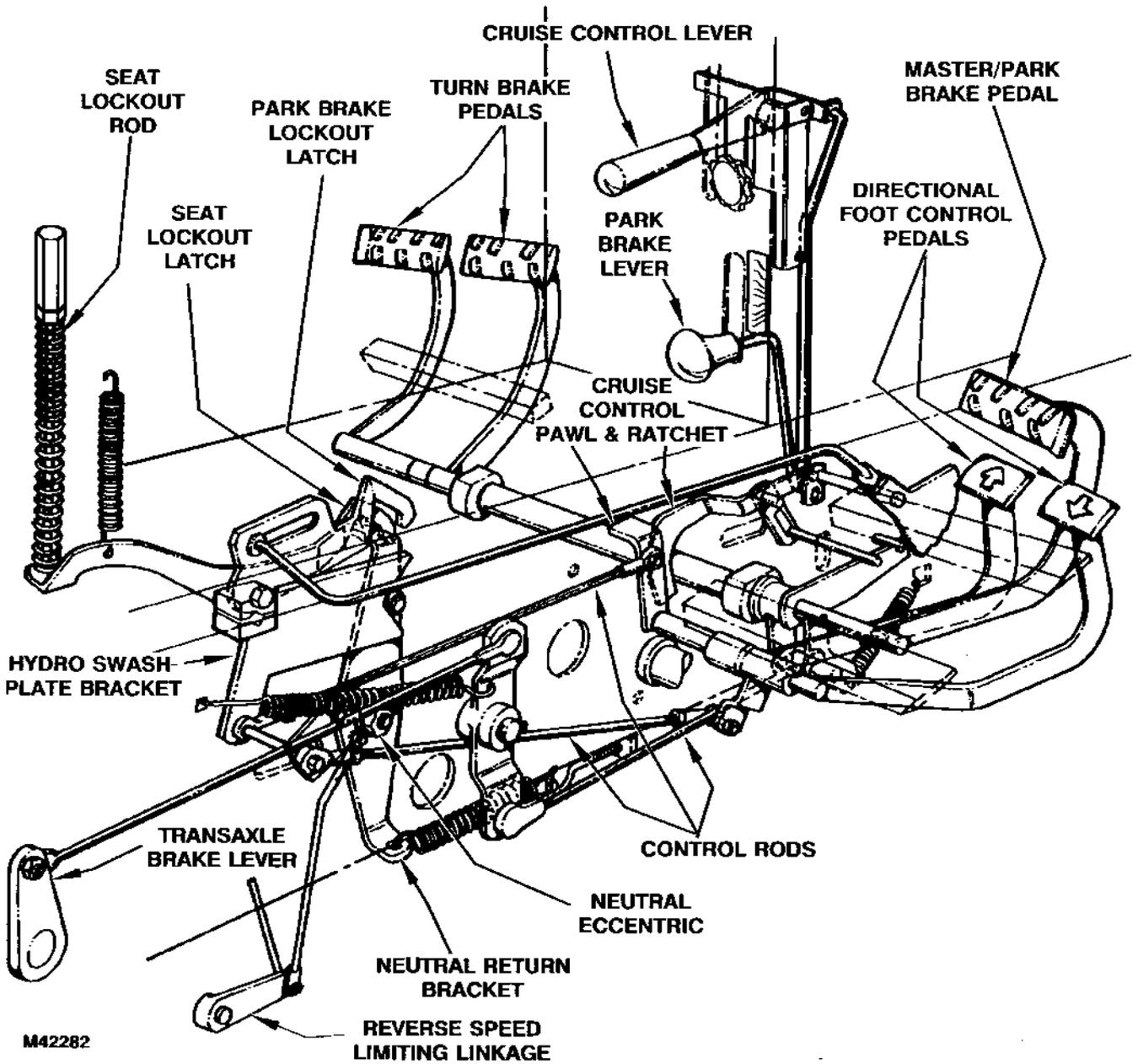
As the operator depresses the reverse foot control pedal, the swashplate of the variable-displacement pump rotates, via mechanical linkages, away from the vertical plane of the neutral position. A change in displacement inside the piston cylinder bores results. This change in displacement generates high-pressure oil in the closed-loop from the variable-displacement pump to the fixed-displacement motor. This high-pressure oil enters the motor inlet port and pushes against the pistons, which transfer the

pressure against the incline of the fixed-displacement swashplate, forcing the cylinder block and drive shaft of the motor to rotate. Whenever the variable-swashplate of the pump is in the same plane as the motor fixed-swashplate, the motor drive shaft will turn in the opposite direction as the pump drive shaft. Bolted to the end of the motor drive shaft is the transaxle input gear, which drives the transaxle and the MFWD.

MX,25015HU,1F -19-16OCT91

M42292 -19-23SEP91

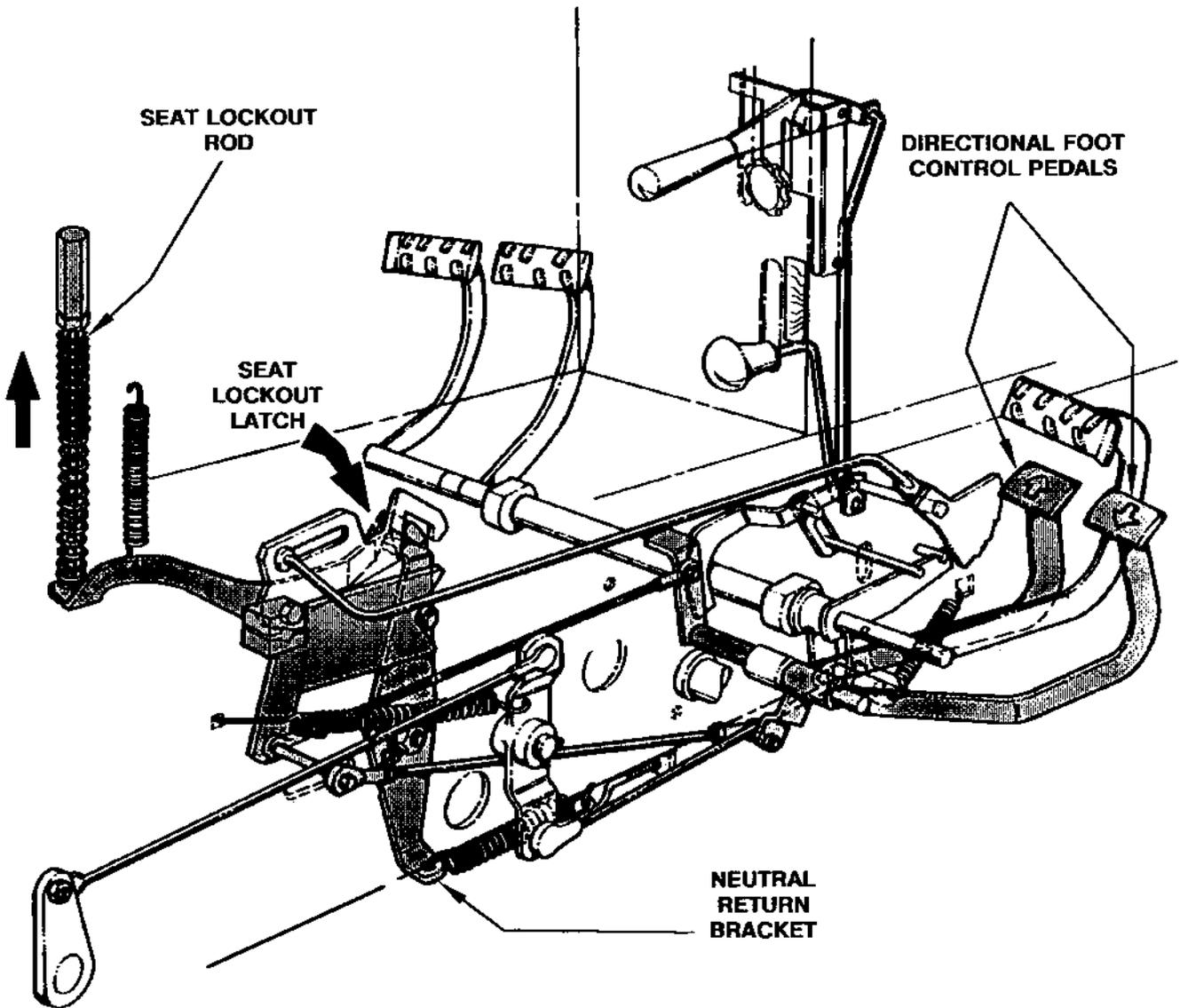
## FOOT CONTROL LINKAGE OPERATION



The right side foot pedals help control ground speed and direction through linkages to the hydro pump swashplate. This drawing shows and keys out the major components. Familiarize yourself with these terms and component locations as they will be repeated often in these theory stories.

*NOTE: In the following drawings, only the primary components associated with the function being explained will be highlighted.*

**SEAT LOCKOUT OPERATION**



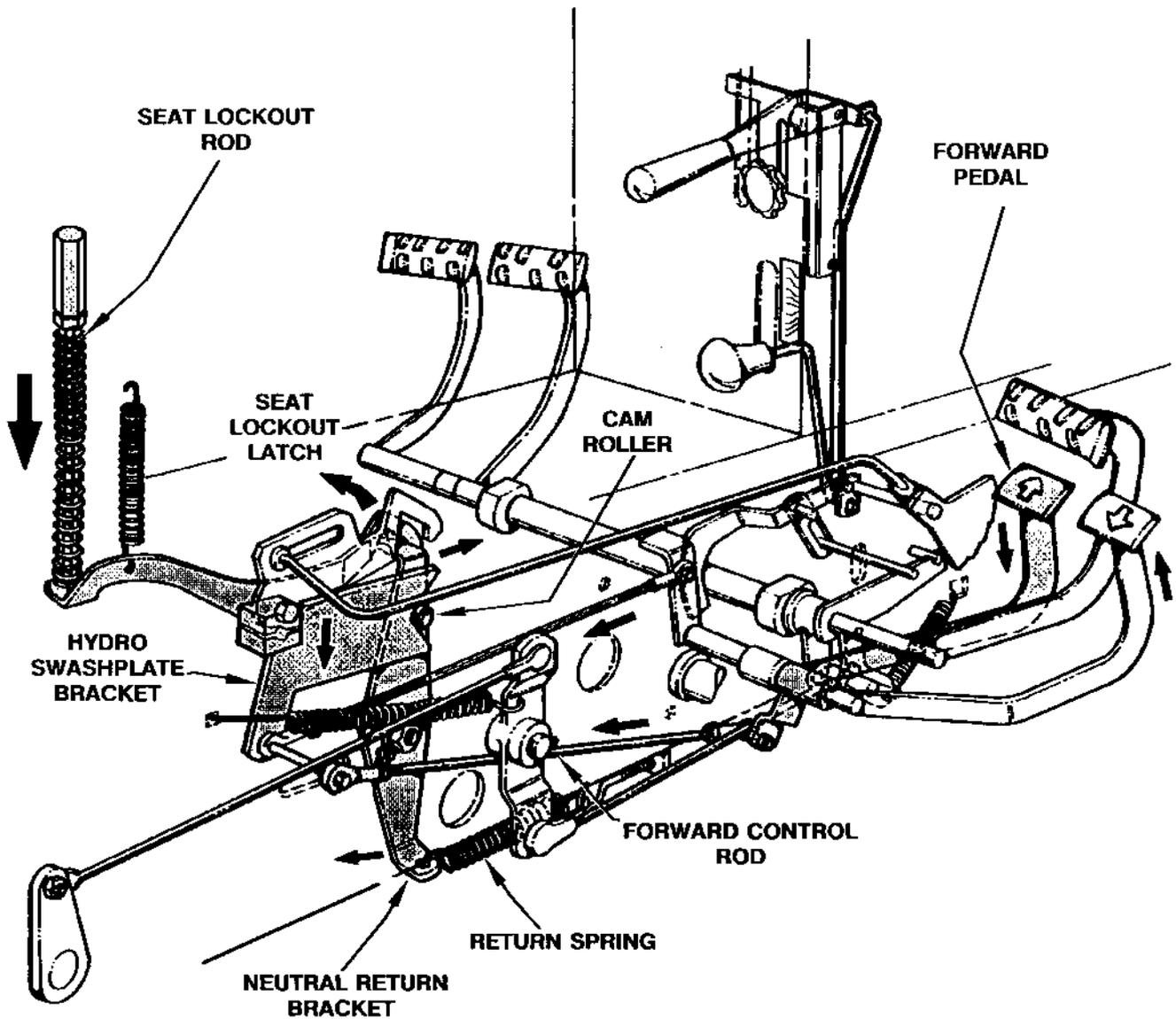
M42283

When the operator is out of the seat, the seat lockout rod is relaxed enough to allow the lockout latch to move down and engage the top of the neutral return bracket. This prevents the neutral return bracket from pivoting forward. Consequently, this locks-out the hydro swashplate bracket and both directional foot

control pedal linkages. If the operator is getting on or off the tractor and accidentally depresses one of the right-side foot control pedals, while he is off the seat, the seat lockout linkage will prevent the tractor from moving.

250  
15  
8

## FORWARD OPERATION



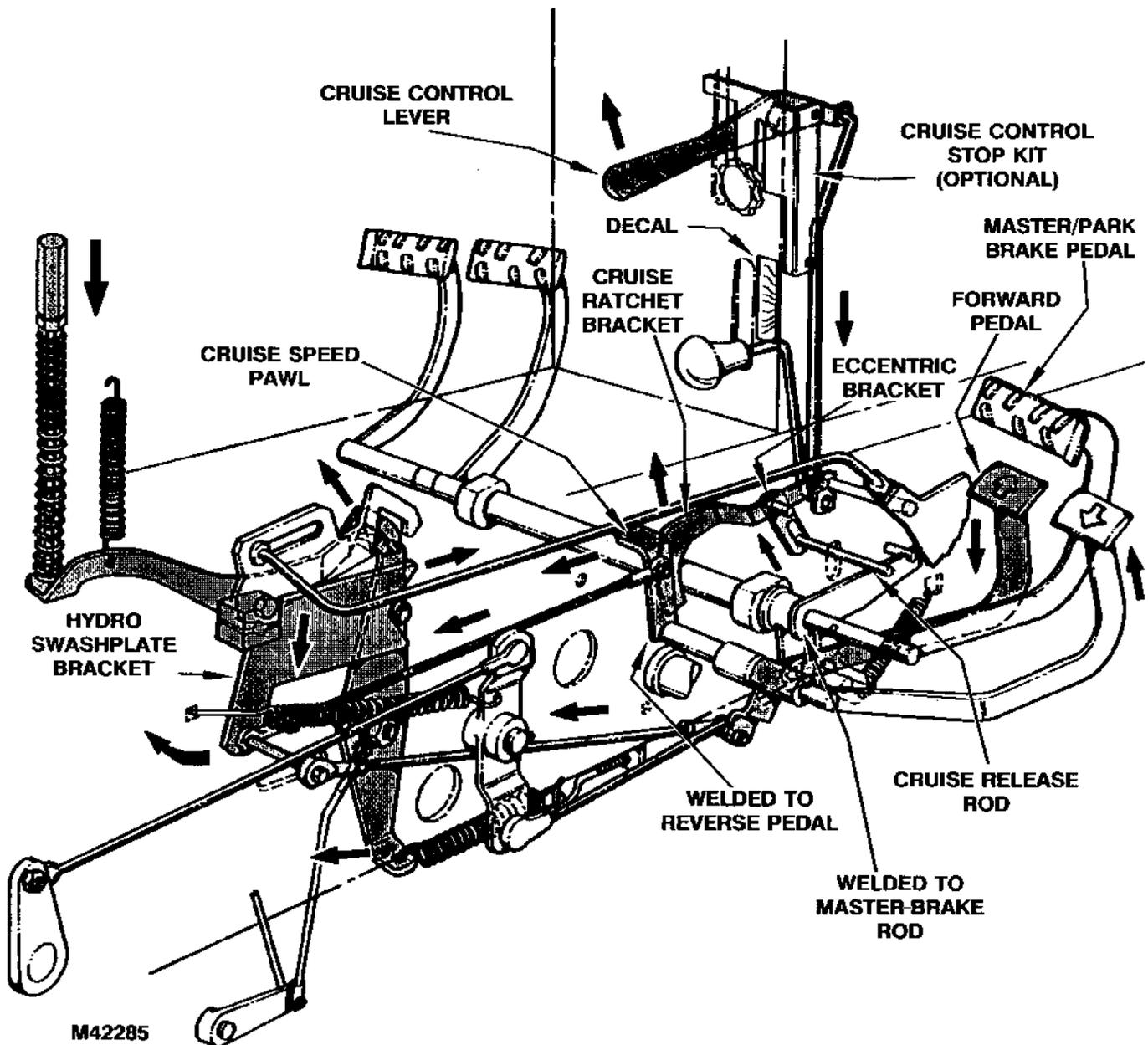
M42284

When the operator is sitting on the seat, the seat lockout rod is depressed which moves the lockout latch up to unlock the neutral return bracket. This in turn frees-up the neutral return bracket, swashplate bracket, and the forward/reverse control pedal linkages. When the forward foot control pedal is depressed, the control rod moves towards the rear and causes the hydro pump swashplate bracket to pivot downward and propel the tractor forward. Consequently, the cam roller of the neutral return

bracket is forced up the swashplate bracket ramp causing the top portion of the neutral return bracket to move forward while the bottom portion moves rearward. The rearward movement of the bottom part of the neutral return bracket stretches the neutral return spring. The tension generated in the neutral return spring will pull the linkage back into neutral when the operator removes his foot from the forward control pedal.

MX,25015HU,2C -19-16OCT91

## CRUISE CONTROL OPERATION

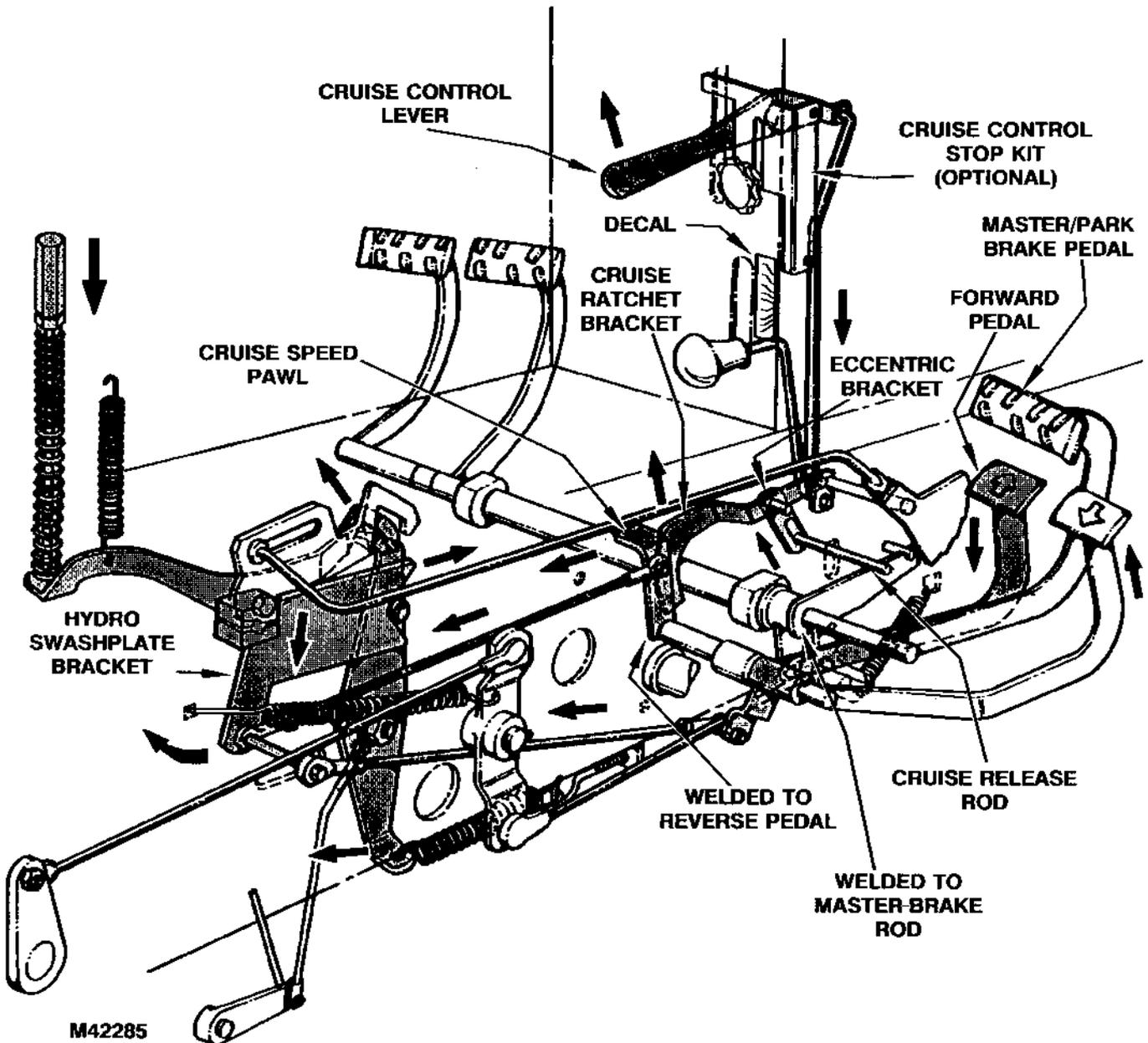


The cruise control lever allows the operator to lock a desired ground speed into position and permit him to remove his foot from the control pedal without the linkage automatically returning to neutral. When the forward pedal is depressed and the cruise lever is moved up, the cruise speed pawl becomes engaged in one of the notches of the cruise ratchet bracket. This holds the hydro swashplate bracket at one ground speed position for extended periods of time.

The operator does not have to continually hold his foot on the pedal, which becomes uncomfortable and lends itself to inconsistent ground speeds.

An optional Cruise Control Stop Kit pre-sets a desired operating ground speed that the operator can return to time-after-time.

(Continued on the next page)



**CRUISE CONTROL OPERATION (Continued)**

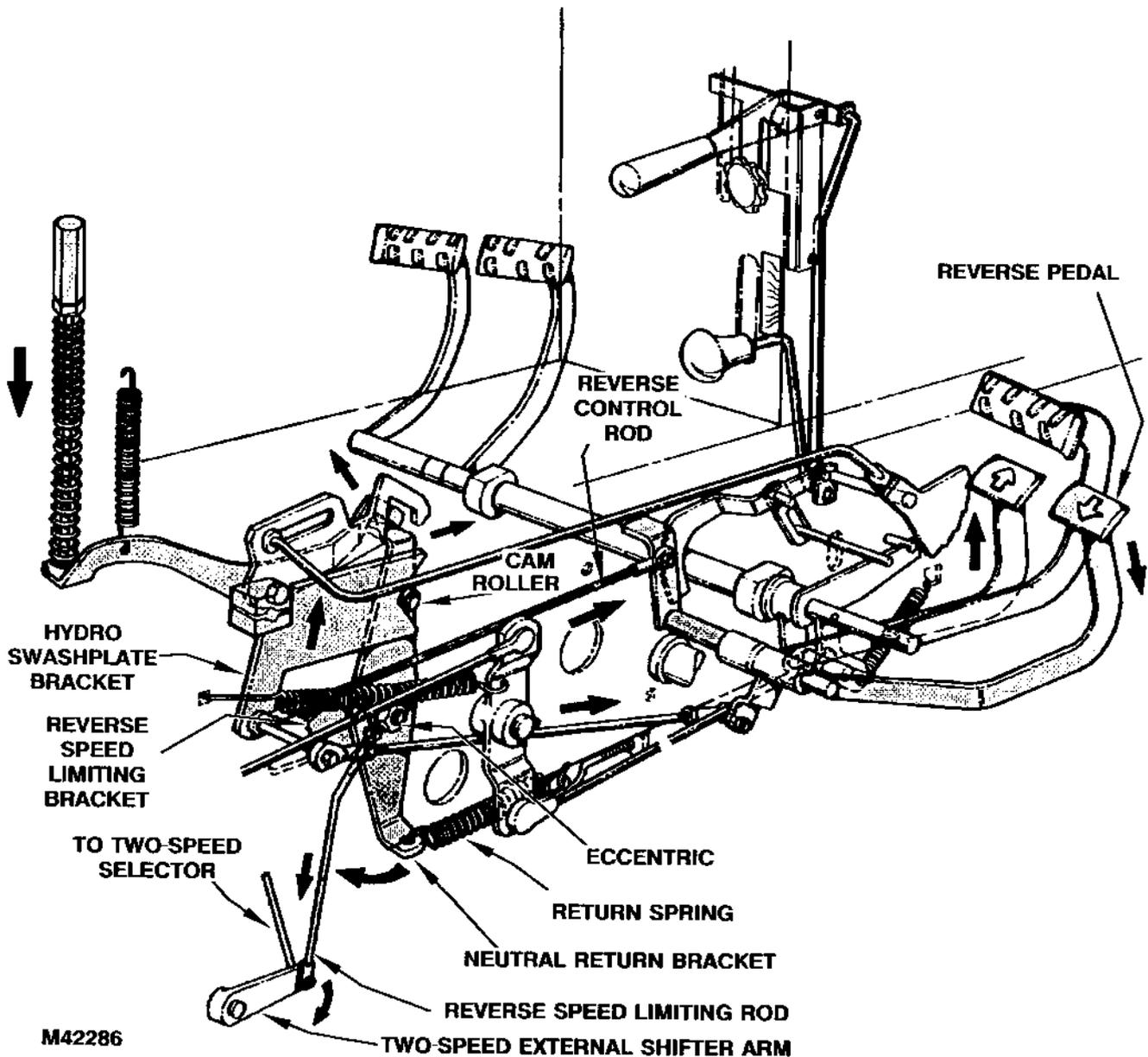
The cruise control linkage can be disengaged in three quick ways:

- depress the forward pedal further—this causes the cruise speed pawl to move out of the cruise ratchet bracket, which immediately causes the cruise control lever linkage to drop down into the disengaged position,
- depress the master/park brake pedal—this causes the cruise release rod of the master/park brake

linkage to move down in the eccentric bracket slot to pull the cruise ratchet bracket down and away from the cruise speed pawl, which immediately causes the cruise control lever linkage to drop down into the disengaged position,

- depress the cruise control lever—this causes the cruise ratchet bracket to move down and away from the cruise speed pawl, which immediately causes the cruise control lever linkage to drop down into the disengaged position.

## REVERSE OPERATION



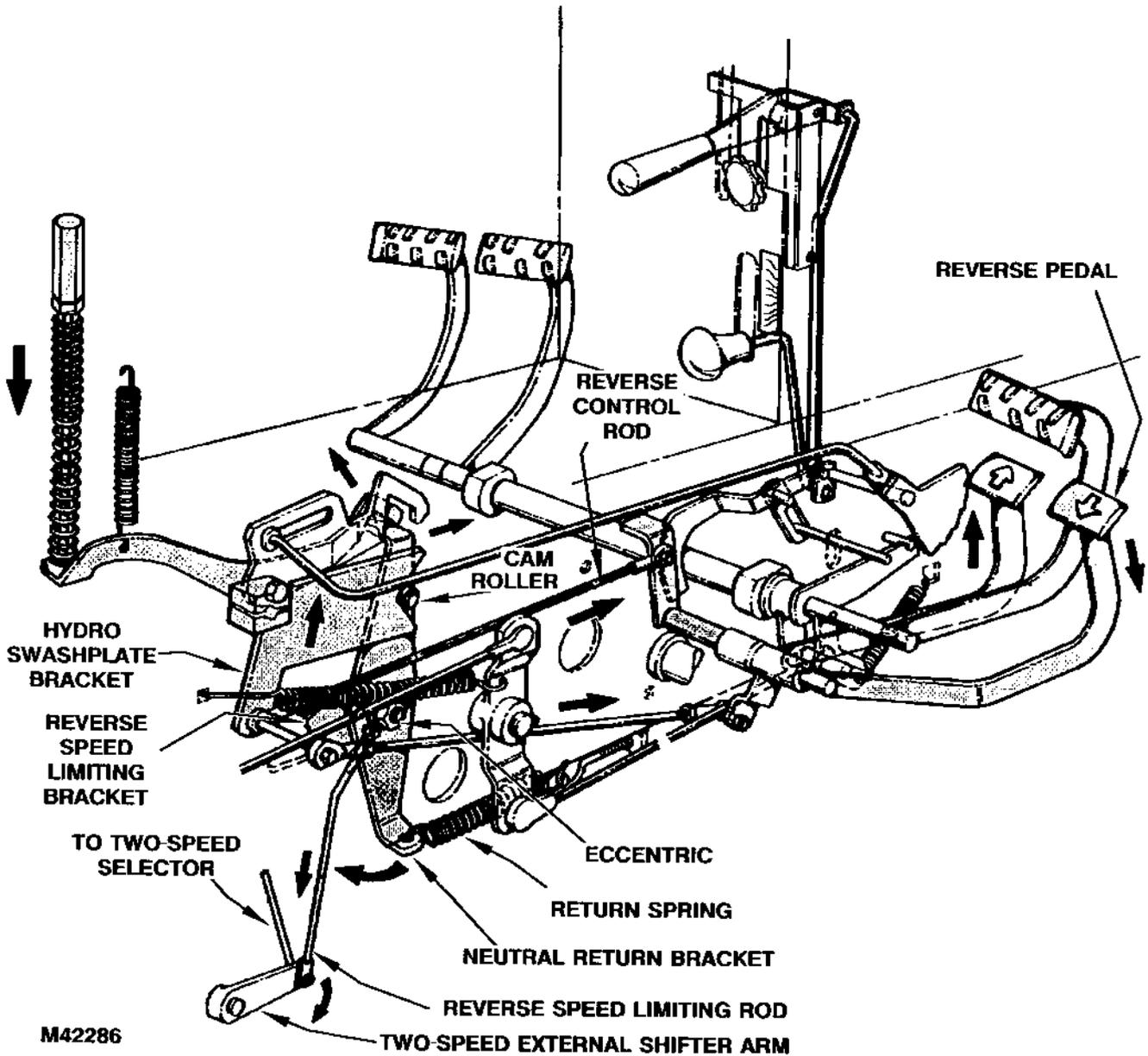
When the operator is sitting on the seat, the seat lockout rod is depressed which moves the lockout latch up to unlock the neutral return bracket. This in turn frees-up the neutral return bracket, swashplate bracket, and the forward/reverse control pedal linkages. When the reverse foot control pedal is depressed, the control rod moves forward and causes the hydro pump swashplate bracket to pivot upward and propel the tractor forward. Consequently, the cam roller of the neutral return bracket is forced down the

swashplate bracket ramp causing the top portion of the neutral return bracket to move forward while the bottom portion moves rearward. The rearward movement of the bottom part of the neutral return bracket stretches the neutral return spring. The tension generated in the neutral return spring will pull the linkage back into neutral when the operator removes his foot from the reverse control pedal.

(Continued on the next page)

M42286

TWO-SPEED EXTERNAL SHIFTER ARM



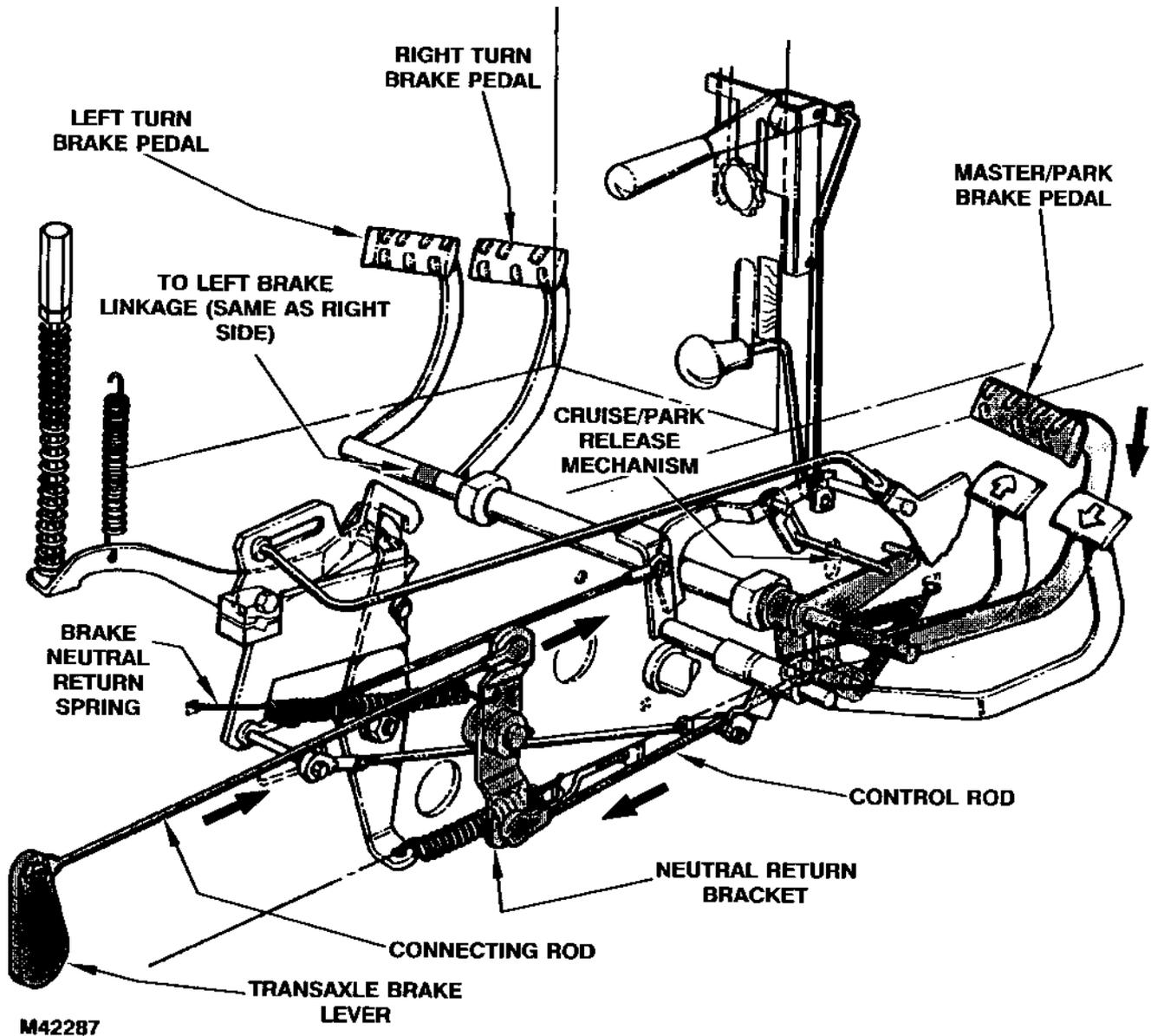
**REVERSE OPERATION (Continued)**

On early tractors, reverse travel was limited by the length of the slot in the frame. This meant in LO-range, reverse speed would be half of the HI-range. On later units the slot was lengthened and linkage was added to allow the reverse speed to be the same in HI- or LO-range. This was done to benefit back and forth operation when using a loader.

When the two-speed range selector is moved down into the HI-range position, the reverse speed limiting

rod moves down which also rotates the limiting bracket up to prevent the forward/reverse connecting rod from moving fully forward in the frame slot. So actually, the HI-range reverse speed is being limited to gain increased reverse speed in LO-range. When the two-speed selector is moved up into LO-range, the limiting rod moves up and rotates the limiting bracket down and away from the forward/reverse connecting rod to permit full slot travel.

## MASTER BRAKE AND TURN BRAKE OPERATION

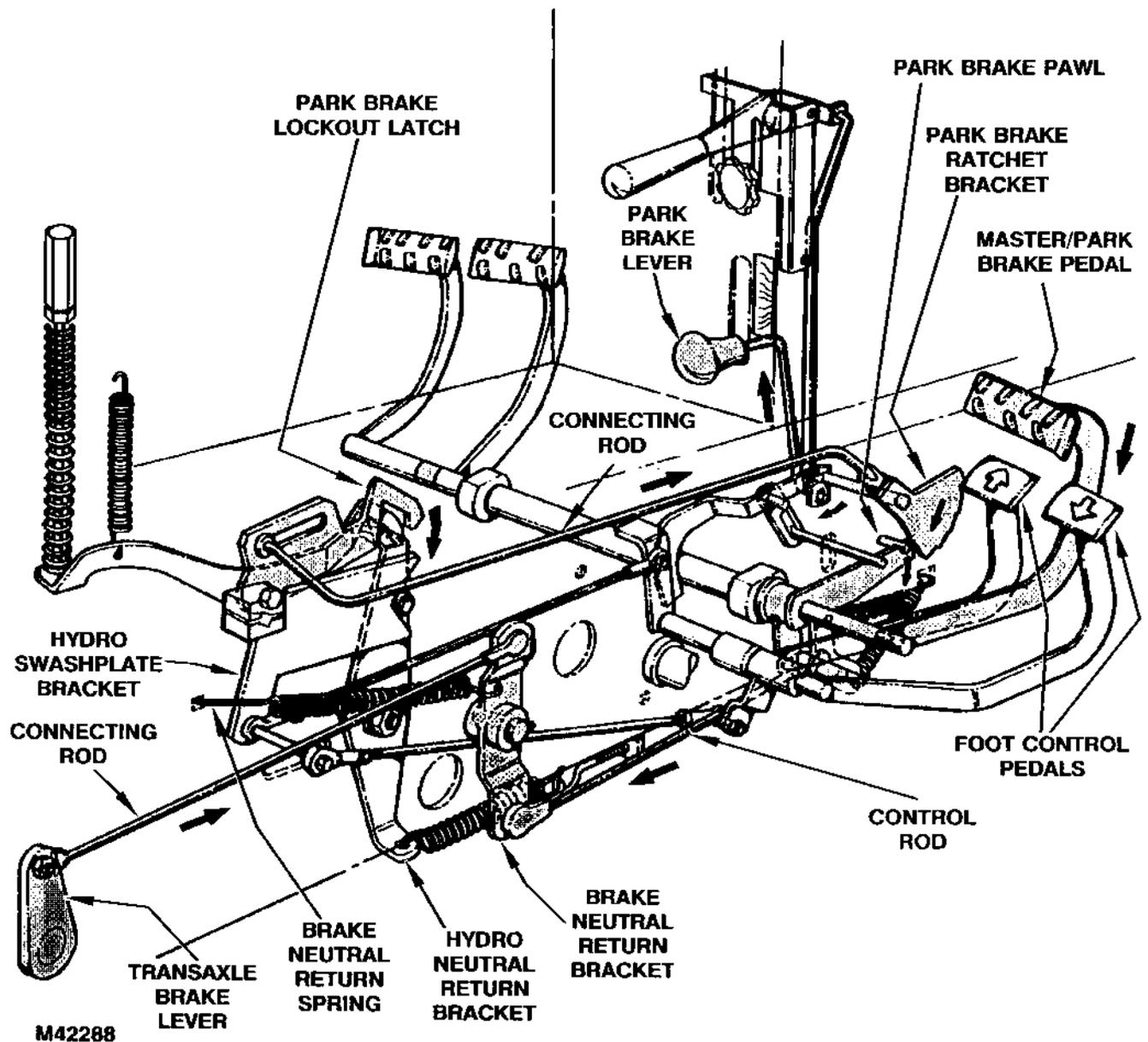


When the operator depresses the master brake pedal, the brake linkage on both sides of the frame are actuated at the same time because of the internal through-rod that connects both sets of linkages. The control rods cause the break system neutral return brackets to move reward at the bottom and forward at the top. The forward, top rotation of the neutral return brackets pull forward on the transaxle brake connecting rods and external brake levers, engaging the transaxle brakes. The brake systems neutral return springs stretch in the process and provide the

necessary tension to return the system linkage to neutral when the operator removes his foot.

Conversely, the left-side turn brakes operate separately. When the operator depresses the inside turn brake pedal, the internal through-rod actuates only the right-side brake linkage (independent of the master brake pedal assembly). Likewise, the outside turn brake pedal actuates only the left-side brake linkage (independent of other linkages).

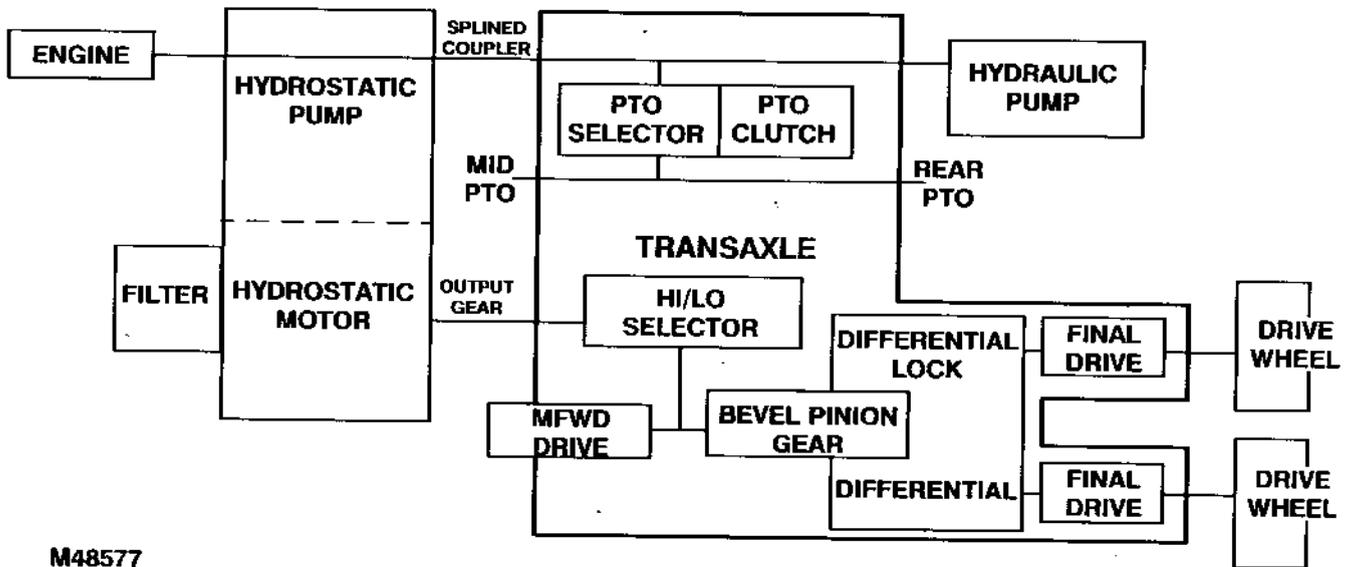
## MASTER/PARK BRAKE OPERATION



To engage the master/park brake, the operator must first depress the master/park brake pedal so the park brake pawl moves down to gain clearance for the park brake ratchet bracket. Next, the operator raises the park brake lever to rotate the park brake ratchet bracket rearward to engage the park brake pawl as the master/park brake pedal is released by the

operator. At the same time, the ratchet connecting rod moves forward proportionately to gradually engage the park brake lockout latch with the hydro neutral return bracket. Consequently, this locks-out the hydro neutral return bracket, hydro swashplate bracket, and the forward/reverse foot control pedals.

## TRANSAXLE OPERATION



M48577

The transaxle consists of the following mechanical flows:

- hydraulic pump drive • mid/both/rear PTO • HI/LO range • differential lock • final drive • MFWD (if equipped)

Transaxle serial number is imbedded in a flat surface located just below the left rockshaft lift arm.

The hydraulic pump is driven off the rear of the main PTO input drive shaft. This drive shaft is connected by a splined coupler to the hydrostatic pump drive shaft. The hydrostatic pump drive shaft is connected directly to the engine flywheel drive shaft.

The main PTO input drive shaft also has the main input gear that drives the PTO clutch. The mid and/or rear PTO drive is selected by the operator by moving the shift collar via the shift linkage.

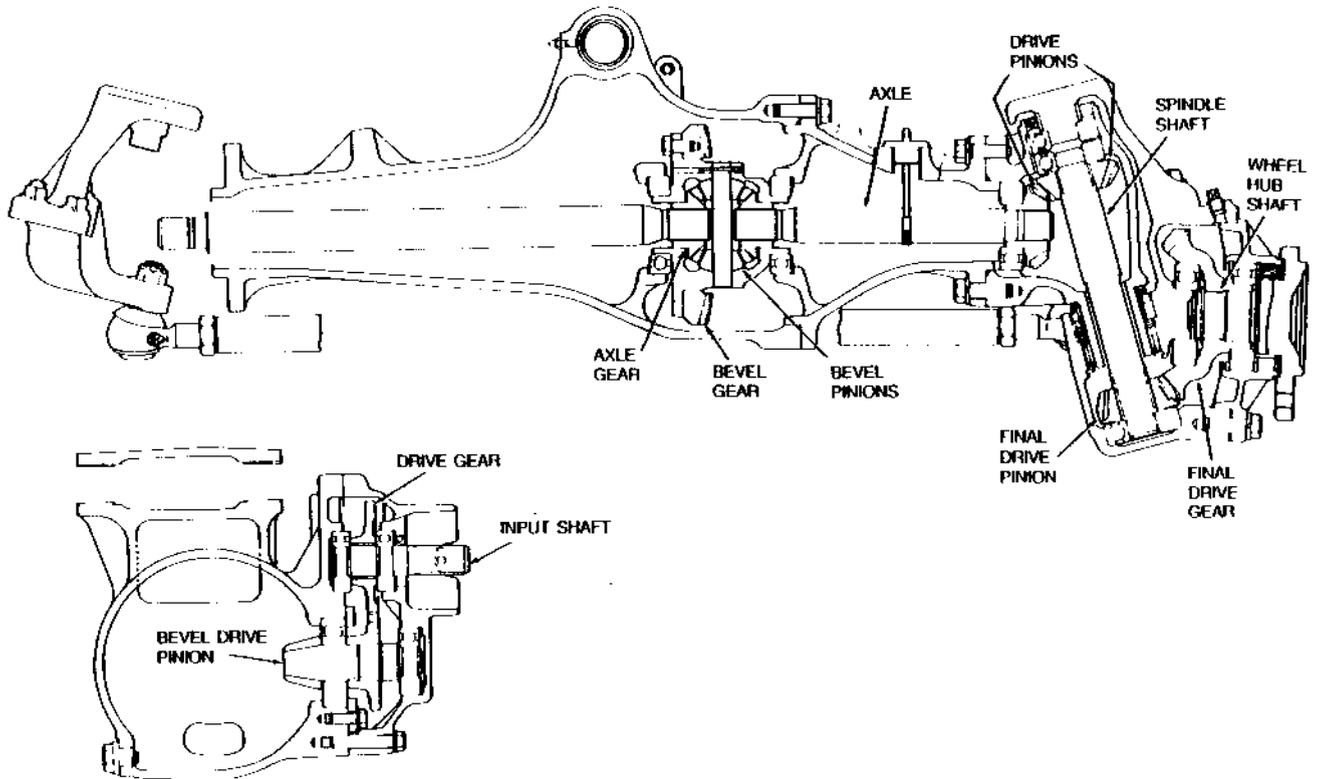
Power flow is transmitted from the engine through the hydrostatic transmission pump into the hydrostatic motor and drive shaft output gear. This hydro output gear transmits power through the HI/LO selector quadrant into the spiral-beveled pinion shaft and ring gear of the differential assembly. The left side differential assembly bevel pinion gear transfers the power to the axle gears of the left differential planetary final drive and out the drive axle to the left drive wheel.

The differential lock uses a sliding collar with pins to engage the right side differential beveled pinion gear to lock the left and right axles together. Thus power is transfer equally to the axle gears of the right differential planetary final drive and out the drive axle to the right drive wheel.

The optional MFWD (standard equipment on 955) is engaged by a sliding shift collar.

MX,25015HU,3 -19-16OCT91

## MECHANICAL FRONT WHEEL DRIVE (MFWD) OPERATION



The MFWD drive shaft is bearing supported at both ends. The MFWD drive shaft transmits the torque through the input shaft, to the drive gear, to the bevel

drive pinion, to the MFWD differential gears and out to the final drive assemblies.

MX,25015HU,4 -19-16OCT91

250  
15  
17

M48579 -19-11DEC89

250  
15  
18

# Steering and Brake Operation and Tests

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| Tractor Drive Check . . . . .                  | 260-05-2 |
| Operator Complaint Not Identified . . . . .    | 260-05-2 |

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260



# Group 05

## Steering and Brakes System Checkout

### ABOUT THIS GROUP

Always begin with this group to identify a failure in the steering and brakes systems. The step-by-step procedures will provide you with a quick check of the systems. No tools are required to perform these checks. If a failure is indicated you will be referred to a more detailed check, adjustment, or test.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the check.

This procedure is designed as a quick check of the systems. While performing a check, concentrate only on the check you are performing and disregard signals from unrelated components.

MX,HU,26005,1 -19-16OCT91

#### STEERING SYSTEM CHECK

Run engine at FULL throttle.



M43855 -UN-31AUG88

Turn steering wheel FULL left, then FULL right.

*LOOK: Front wheels MUST turn FULL left then FULL right.*

*FEEL: Smooth, constant effort should be felt.*

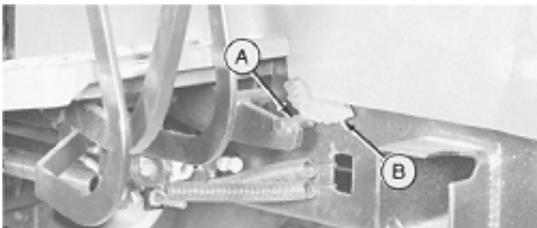
*FEEL: A solid stop should be felt at the end of a full turn.*

**OK:** GO TO '   
**NOT OK:** GO TO ' OR Æ, IN GROUP 10.

MX,HU,26005,2 -19-16OCT91

#### MASTER/PARK BRAKE PEDAL TRAVEL CHECK

Engage park brake.



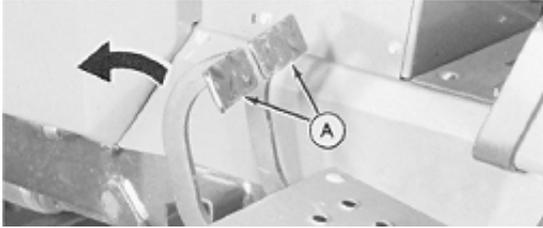
M43856 -UN-31AUG88

*LOOK: Master/park brake locking pawl (A) MUST ENGAGE ratchet bracket (B) in any of the first six notches.*

**OK:** GO TO Æ   
**NOT OK:** GO TO Å, IN GROUP 10.

MX,HU,26005,3 -19-16OCT91

Steering and Brakes System Checkout/Operator Complaint Not Identified

|   |  |   |   |
|---|--|---|---|
| <p><b>Ä TURN BRAKE PEDALS TRAVEL CHECK</b></p>  |  <p>M43857 -UN-31AUG88</p>  | <p>PULL both turn brake pedals (A) at the same time BY HAND.</p> <p><i>LOOK: Pedals should be EVEN with each other at the end of travel.</i></p>  | <p><b>OK:</b> GO TO Ä.</p> <p><b>NO OK:</b> GO TO Ö, IN GROUP 10.</p> <p>MX,HU,26005,4 -19-16OCT91</p>                    |
| <p><b>Ä TRACTOR DRIVE CHECK</b></p> <p>Run engine at FAST idle. Operate unit under NO LOAD and then under LOAD conditions.</p> <p>Perform this check in an open area.</p> |  <p>M43858 -UN-31AUG88</p>  | <p>Operate machine in FORWARD and REVERSE. Make FULL left and FULL right turns. Use TURN BRAKES to assist in some turns.</p> <p><i>LOOK: Front wheels MUST turn FULL left and FULL right. When TURN BRAKES are used the appropriate rear tire will SLOW DOWN or STOP.</i></p> <p><i>FEEL: Smooth constant effort should be felt through steering wheel. Brakes should feel solid.</i></p> | <p><b>NOT OK:</b> CHECK TRANSMISSION OIL LEVEL.</p> <p><b>OIL LEVEL OK:</b> GO TO Ö.</p> <p>MX,HU,26005,5 -19-16OCT91</p> |
| <p><b>Ö OPERATOR COMPLAINT NOT IDENTIFIED</b></p>   | <p>If you completed the checkout procedure and DID NOT isolate a malfunction, the problem may be intermittent.</p> <p>Try to duplicate the conditions of the malfunction identified by the operator.</p> | <p><b>REPEAT SYSTEM CHECK-OUT IN THIS GROUP.</b></p> <p><b>IF MALFUNCTION IS NOT IDENTIFIED AFTER REPEATING SYSTEM CHECK-OUT PROCEDURE; FACTORY ASSISTANCE IS AVAILABLE THROUGH THE DEALER TECHNICAL ASSISTANCE CENTER (DTAC).</b></p>  | <p>MX,HU,26005,6 -19-16OCT91</p>  |

# Steering and Brakes System Test and Adjustments

## ABOUT THIS GROUP

The step-by-step procedures in this group provide you with the detailed diagnostic information you will need to perform a test. Basic tools and diagnostic equipment are used.

It is assumed that you are familiar with the machine and its steering and brakes systems components.

Complete the following visual checks before doing any tests or adjustments:

- Oil level and condition.
- External leaks from lines and fittings.
- Loose linkages.

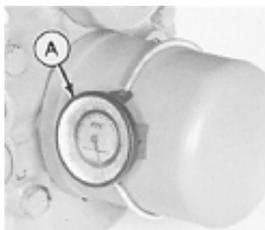
Engine rpm and oil temperature are critical in most hydraulic tests. Be sure to follow test specifications carefully.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the test.

Upon completing a test or adjustment, repeat check to see whether the problem has been corrected.

MX,HU,26010,1 -19-16OCT91

### HYDRAULIC OIL WARM-UP PROCEDURE



M43859 -UN-31AUG88

Install JDG282 Temperature Gauge (A) on transmission oil filter.



M43860 -UN-31AUG88

Put cardboard or paper around oil cooler to restrict air flow.

**IMPORTANT: Don't forget to remove cardboard or paper from around oil cooler after tests and adjustments are completed or damage to vital components may occur.**

MX,HU,26010,2 -19-16OCT91

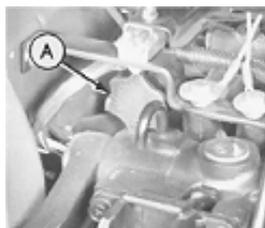


M43861 -UN-31AUG88

Engage master/park brake.

Run engine at FAST idle.

Move rockshaft control lever FORWARD.



M43862 -UN-31AUG88

Turn "STOP" valve (A) to CLOSED position. Move rockshaft control lever REARWARD to raise lift arms.

Periodically cycle all hydraulic functions to distribute heated oil.

Heat oil to temperature specified in test.

After oil is heated, turn "STOP" valve to OPEN position and REMOVE cardboard or paper from around oil cooler.

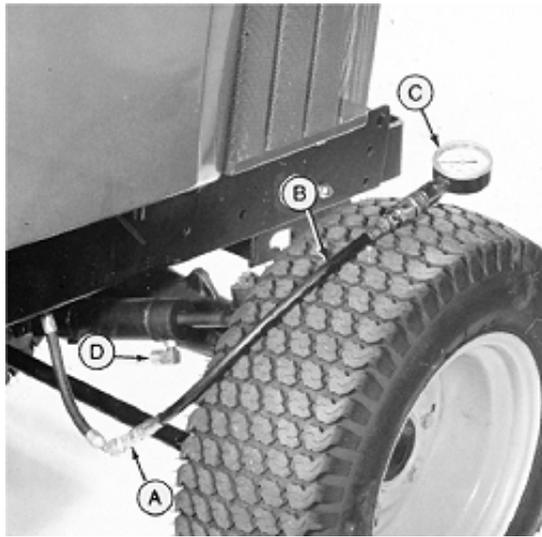
MX,HU,26010,3 -19-16OCT91

Steering and Brakes System Test and Adjustments/Steering System Leakage Test

**STEERING RELIEF VALVE PRESSURE TEST**

Heat hydraulic oil to 43°C (110°F), See ; in this group.

**CAUTION:** To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves.



M46000 -UN-31AUG88

**ESSENTIAL TOOLS**

- A—Connector
- B—JTO3017 Hose
- C—JTO3345 Gauge 20,000 kPa (3,000 psi)
- D—ORFS Cap

**TEST SPECIFICATIONS**

- Oil Temperature . . . . . 43°C (110°F)
- Engine Speed . . . . . FULL throttle
- Relief Valve Pressure . . . . . 10687 kPa (1550 psi)

Make test port connections from JTO1765 and JTO5738 Consumer Products Hydraulic Fitting kits.

START engine and run at TEST SPECIFICATIONS.

Move steering wheel to FULL right turn. HOLD in this position. Read pressure.

**OK:** GO TO Æ.

**NOT OK:** REPLACE RELIEF VALVE CARTRIDGE. CARTRIDGE IS NOT ADJUSTABLE. SEE SECTION 60, GROUP 05.

MX,HU,26010,4 -19-16OCT91

**Æ STEERING SYSTEM LEAKAGE TEST**

Heat hydraulic oil to 43°C (110°F), See ; in this group.

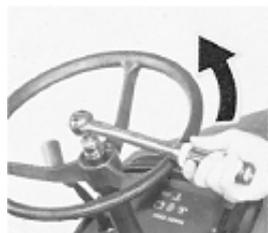
Run engine at SLOW idle.



M43864 -UN-31AUG88

With wheels turned in a FULL right position, turn steering wheel with a constant torque of 6.8 N-m (60 lb-in.).

Count the rpm.



M43865 -UN-31AUG88

With wheels turned in a FULL left position, turn steering wheel with a constant torque of 6.8 N-m (60 lb-in.).

Count the rpm.

**SPECIFICATIONS**

- Oil Temperature . . . . . 43°C (110°F)
- Engine Speed . . . . . SLOW idle
- Maximum Right Turn rpm . . . . . 5 rpm
- Maximum Left Turn rpm . . . . . 5 rpm

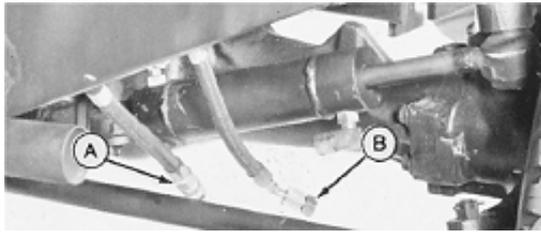
5 RPM OR LESS: STEERING SYSTEM OK — GO TO Æ.

MORE THAN 5 RPM: GO TO 3a.

MX,HU,26010,5 -19-16OCT91

**3a STEERING VALVE LEAKAGE TEST**

STOP engine.



M43866 -UN-31AUG88

**IMPORTANT: O-Ring Face Seal (ORFS) plugs MUST BE USED to plug pressurized hydraulic hoses.**

**CAUTION: To avoid injury from escaping hydraulic oil under pressure, relieve the pressure in the system by stopping the engine and operating all hydraulic control valves.**

Disconnect hydraulic hoses (A and B) from steering cylinder.

Install ORFS caps on cylinder fittings and ORFS plugs in ends of hoses.

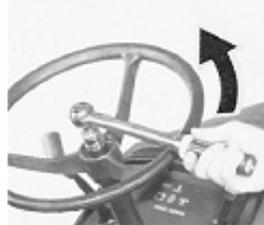
Run engine at SLOW idle.



M43864 -UN-31AUG88

With wheels turned in a FULL right position, turn steering wheel with a constant torque of 6.8 N·m (60 lb-in.).

Count the rpm.



M43865 -UN-31AUG88

With wheels turned in a FULL left position, turn steering wheel with a constant torque of 6.8 N·m (60 lb-in.).

Count the rpm.

**SPECIFICATIONS**

Oil Temperature . . . . . 43°C (110°F)  
 Engine Speed . . . . . SLOW idle  
 Maximum Right Turn rpm . . . . . 5 rpm  
 Maximum Left Turn rpm . . . . . 5 rpm

5 RPM OR LESS: STEERING VALVE OK — REMOVE AND REPLACE STEERING CYLINDER.

MORE THAN 5 RPM: REMOVE AND REPAIR STEERING VALVE. SEE SECTION 60.

MX,HU,26010,6 -19-16OCT91

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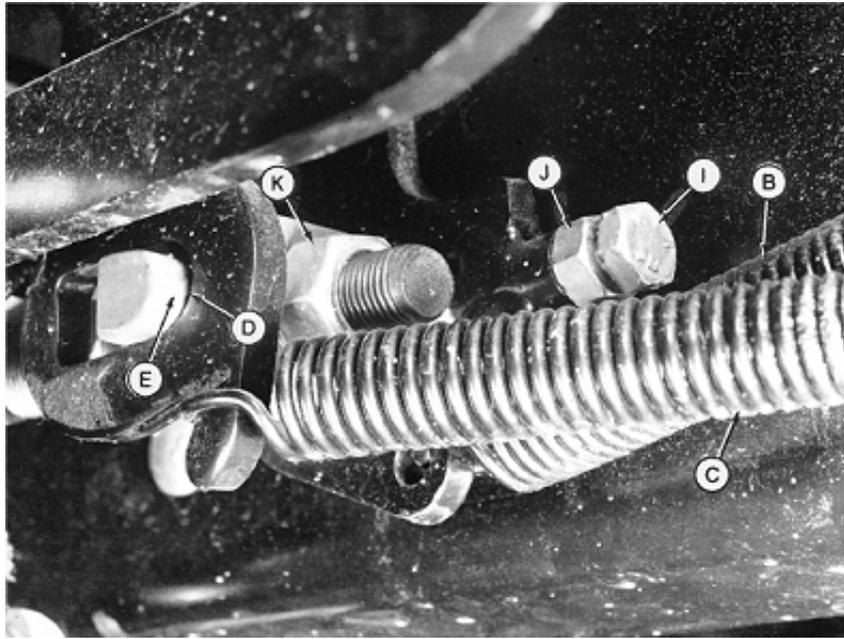
Steering and Brakes System Test and Adjustments/Steering Valve Leakage Test

|  |   |  |  |
|--|---|--|--|
| <p><b>Ä ADJUST MASTER/PARK BRAKE PEDAL FREEPLAY</b></p> <p><i>NOTE: Reference both the photograph and the line art on the following pages at the same time to better understand this adjustment procedure.</i></p> | <p>First, lock the master/park brake pedal (A) in the FIRST NOTCH of the park brake ratchet bracket.</p> <p>DO NOT REMOVE return springs (B, C, and Q).</p> <p>Loosen rear jam nuts (F) first, then front jam nuts (K) on both sets of adjuster linkages.</p> <p>Loosen front jam nuts (J) so you can back-off alignment bolts (I) until the ends of the bolts are flush with the rear edge of jam nuts (L) on both sets of adjuster linkages.</p> <p>Adjust the master/park brake linkage first (right side).</p> <p>Put a large screwdriver behind the pivot point of the pivot bracket (M) and push against the front edge of the adjustment rod (G) mounting pin with just enough force to overcome spring pressure and hold linkage in the engaged position.</p> <p>Turn rear jam nut (F) forward against spacer and adjuster block (E) until adjuster block's right tab is seated against the front end of the master/park brake pedal arm slot (D). Turn the front jam nut (K) rearward until it is snug against adjuster block (E). Tighten rear jam nut (F). Remove the screwdriver.</p> <p>Repeat the above procedure for the left side linkage.</p> <p>Release the park brake and complete the following step for both</p> | <p>linkages:</p> <p>Turn alignment bolt (I) rearward until end of bolt seats against adjuster block's left tab. Adjust bolt further until adjuster block is perpendicular or square to pedal arms (D and H), as shown in the line drawing.</p> <p>Left and right turn brakes (S and T) MUST BE equal when depressed. If not, adjust left side alignment bolt until both pedals are equal when pulled forward by hand into engaged position.</p> <p><i>NOTE: Freeplay (U) is the distance of pedal travel from initial contact the foot to the point of engagement of the brake plates and disks (resistance beyond return spring tension being felt).</i></p> <p>The amount of freeplay (U) of the master/park brake pedal (A) generated by the above adjustment procedure allows ample brake engagement in the first park setting and also allows for easy disengagement of both the park brake and cruise control linkage.</p> | <p>AFTER ADJUSTMENT: TEST DRIVE TRACTOR. THEN RECHECK MASTER/PARK BRAKE PEDAL FREEPLAY AND TURN BRAKE PEDALS ALIGNMENT—THEY MUST BE EQUAL. RE-ADJUST IF NECESSARY.</p> |
|--|---|--|--|

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MX,HU,26010,8A -19-16OCT91

## ADJUST MASTER/PARK BRAKE PEDAL FREEPLAY



M42303 -UN-09OCT91

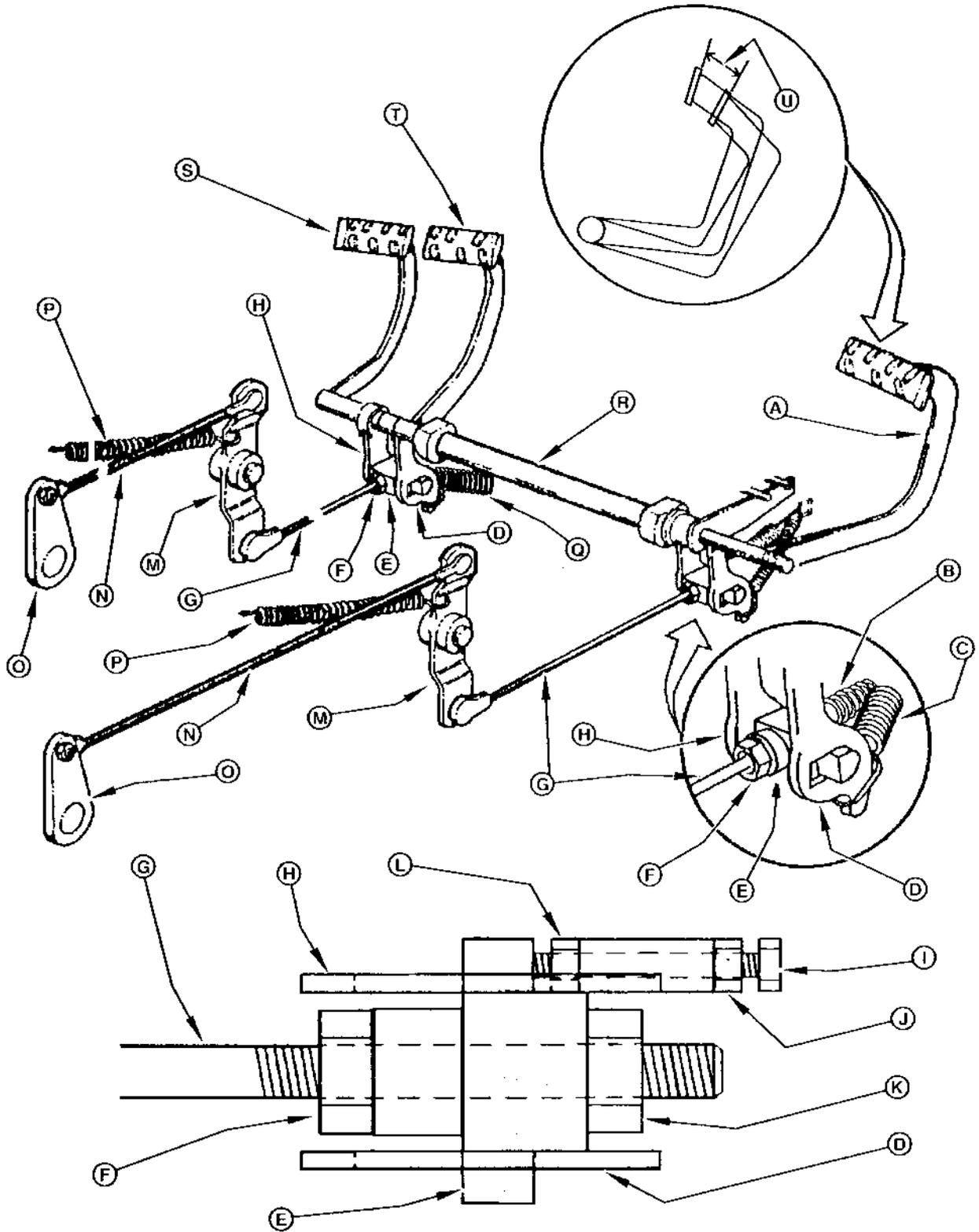
A—Master/Park Brake Pedal  
 B—Right Turn Brake Pedal  
 Return Spring  
 C—Master/Park Brake Pedal  
 Return Spring  
 D—Master/Park Brake Pedal  
 Arm  
 E—Adjuster Block

F—Rear Jam Nut  
 G—Adjuster Rod  
 H—Right Turn Brake Pedal  
 Arm  
 I—Alignment Bolt  
 J—Front Alignment Bolt Jam  
 Nut

K—Front Adjuster Rod Jam  
 Nut  
 L—Rear Alignment Bolt Jam  
 Nut  
 M—Pivot Bracket  
 N—Connecting Rod  
 O—External Brake Lever Arm

P—Return Spring  
 Q—Left Turn Brake Pedal  
 Return Spring  
 R—Cross Shafts  
 S—Left Turn Brake Pedal  
 T—Right Turn Brake Pedal  
 U—Freeplay

MX,HU,26010,8B -19-16OCT91



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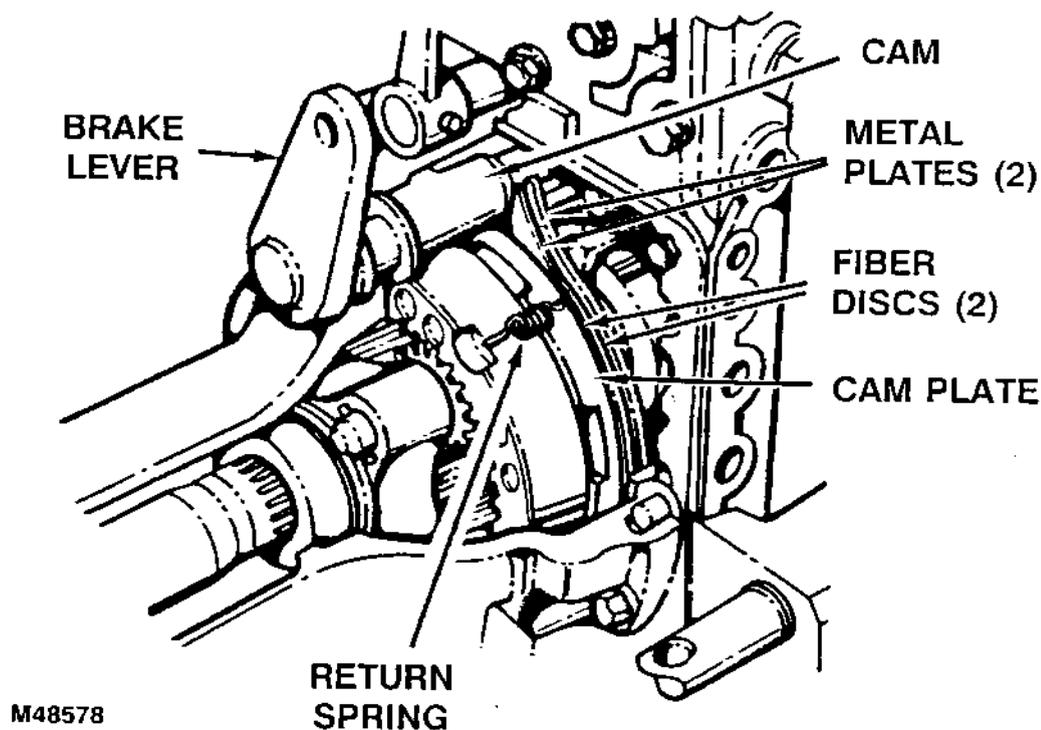
M42302 -UN-09OCT91

Steering and Brakes System Test and Adjustments/Adjust Turn Brake Pedals Freeplay

|   |   |  |
|---|---|--|
| <p>Ö <b>ADJUST TURN BRAKE PEDALS FREEPLAY</b></p> <p><b>IMPORTANT: Both left and right brake linkages MUST BE ADJUSTED EQUALLY.</b></p> | <p>Pull DOWN on both turn brake pedals at the same time BY HAND.</p> <p><i>LOOK: Position of turn brake pedals MUST BE EQUAL. If unequal, see steps in previous module.</i></p> | <p><b>OK: PROCEDURES COMPLETE.</b></p> <p><b>NOT OK: GO TO Å, THIS GROUP.</b></p> <p>MX,HU,26010,9 -19-16OCT91</p> |
|---|---|--|

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8

**BRAKES OPERATION**



*Left Side, Rear View*

The controls include a left and right turn brake pedal. Both are located on the left side. A master/park brake pedal is located on the right side.

The brakes work on a cam and a roller ball and cavity plate arrangement to sandwich two brake fiber disks between two metal plates to stop or help turn the tractor.

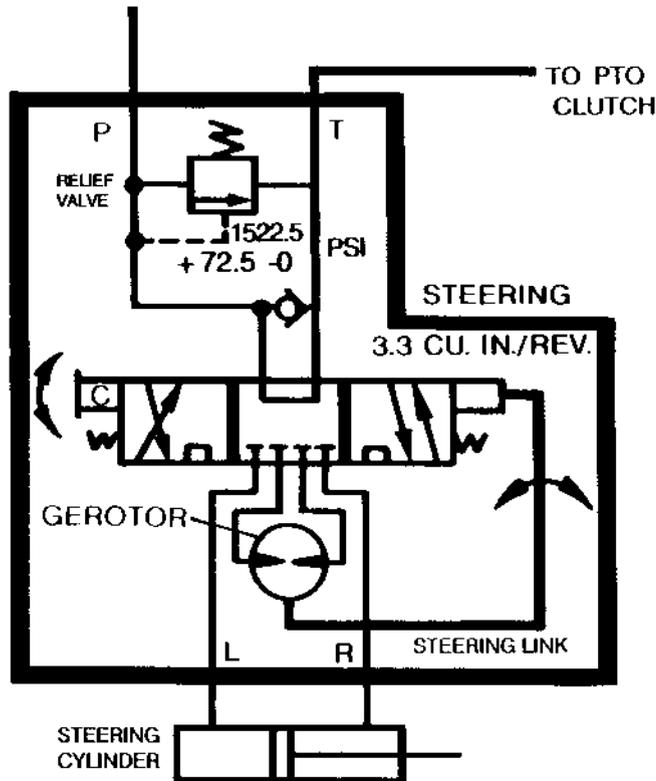
When a brake lever is actuated, the brake cam rotates against the cam plate finger (hidden by the

cam in this drawing) which forces the cam plate's cavity ramps to roll up on three balls. This moves the metal plates and rotating fiber discs (splined to the axle shaft) together and stop the axle from turning. When the brake lever is released, the three return springs pull the cam plate and cam back into neutral position to release the metal plates from the fiber discs and allow them and the axle shaft to turn freely.

MX,25015W,1 -19-16OCT91

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M48578  
-19-01OCT91

## STEERING OPERATION



The steering system consists of a cylinder, a self-centering control valve and a gerotor-type pump. These are hydraulically and mechanically interconnected.

When in neutral (steering wheel not being turned), oil entering the power steering valve goes directly to the control valve and looped back out to the PTO clutch. The oil in the steering cylinder is trapped.

When the steering wheel is turned to the left, the control valve is positioned to allow pressure oil to go to the gerotor, back through the control valve and into the piston end of the cylinder. Return oil from the rod end is directed back through the control valve and out to the PTO clutch.

In a right turn, the control valve is positioned to the opposite side allowing pressure oil to enter the gerotor from the opposite direction, back through the control valve and into the rod end of the cylinder. Return oil from the piston end of the cylinder is directed back through the control valve and out to the PTO clutch.

Anytime the rotation of the steering wheel stops, oil flow from the gerotor stops and the control valve is returned to neutral position by the centering springs.

The relief valve and check valve protect the steering system from shock loads.

MX,26015W,2 -19-16OCT91

# Section 270

## Hydraulic Operation and Tests

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**BEFORE YOU START**

Always begin with this Group to identify a failure in the hydraulic system. The step-by-step procedures in this Group provide you a quick check of the system. No tools are required to perform these checks. If a failure is indicated, you will be referred to a more detailed check, adjustment, or test.

Always start with the first step and follow the sequence from left to right. Read each step completely before performing the check.

**HYDRAULIC TROUBLESHOOTING CHART**

| PROBLEM OR SYMPTOM  | SOLUTION       |
|---|----------------|
| Hydraulic pump noise. . . . .                                   | GO TO <b>A</b> |
| No hydraulic functions/no power steering . . . . .              | GO TO <b>B</b> |
| Hydraulic functions are slow . . . . .                          | GO TO <b>C</b> |
| Hydraulic oil overheats. . . . .                                | GO TO <b>D</b> |
| No hydraulic functions/power steering works or is slow. . . . . | GO TO <b>E</b> |
| Rockshaft hitch will not lift . . . . .                         | GO TO <b>F</b> |
| Selective control valves fail or function erratically . . . . . | GO TO <b>G</b> |
| Auxiliary hydraulics fail or operate slowly. . . . .            | GO TO <b>H</b> |
| Hydraulic pump leaks. . . . .                                   | GO TO <b>I</b> |
| No hydraulic system pressure . . . . .                          | GO TO <b>J</b> |

270  
05  
1

**A HYDRAULIC PUMP NOISE**

**PUMP CAVITATION**

1. Check hydraulic oil level.
2. Check for correct hydraulic oil type and viscosity.
3. Check suction pipe fittings for air leaks.
4. Check reservoir screen (filter) and vent for plugging.
5. Hydraulic pump seal leak.
6. Hydraulic pump bolts loose or housing distorted.
7. Hydraulic pump scored or worn.
8. Pump drive coupler worn or damaged.
9. Hydraulic lines not clamped properly.
10. Hydraulic pump running to fast or direction of rotation wrong.
11. Hydraulic pump inlet line restricted.
12. Hydraulic pump has worn or broken parts.
13. Hydraulic pump is not priming. Fill filter 1/2 full of oil before installing.

**B NO HYDRAULIC FUNCTIONS/NO POWER STEERING**

1. Check hydraulic oil level, type and viscosity.
2. Check suction line for air leaks (includes suction line and fittings to hydrostatic transmission charge pump).
3. Hydraulic pump seals leaking including pump shaft seal.
4. Check for plugged reservoir screen and vent. (Includes checking brake linings, if brakes are used excessively on an incline, instead of diff-lock, abnormal wear occurs. Brake lining material plugs screen and filter.)
5. Check for damaged or missing hydraulic pump coupler.
6. Hydraulic pump damaged (scored or worn).
7. System relief valve stuck open.
8. Cracked flow divider housing.

**C HYDRAULIC FUNCTIONS ARE SLOW**

1. See **B** —No Hydraulic Functions.
2. Rate-of-drop/stop valve turned in.
3. Hydraulic pump scored or worn.
4. System relief valve setting too low.
5. Proportional flow divider valve installed incorrectly—755/756/855/856.
6. 100 mesh screen between rockshaft control valve and rockshaft housing plugged.
7. Unload valve or flow control valve leaking or malfunction.
8. Rockshaft spool valve scored.

**D HYDRAULIC OIL OVERHEATS**

1. Hydraulic system operated extensively in relief.
2. Operating with stop valve closed and rockshaft control lever rearward.
3. Stop valve stuck closed or pump pressure set too high.
4. Improperly adjusted feedback linkage (system in relief, control valve not neutralized).
5. Selective control valves not neutralizing.
6. System relief valve set too low or pump flow is dumping through a relief valve.
7. Leak in rockshaft cylinder, implement relief valve or system leakage is excessive.
8. Implement relief valve set too low or leaking.
9. Transmission cooler plugged or inadequate cooling system.
10. Transmission operating extensively in relief.
11. Cooler bypass valve stuck open.
12. Transmission closed loop relief valve set too low.
13. Tractor overloaded.
14. Pinched or restricted hydraulic line or low oil level in reservoir.
15. Improperly matched hydraulic component or implement.
16. Auxiliary hydraulic jumber hose not installed after implement was removed.

**E NO HYDRAULIC FUNCTIONS/POWER STEERING WORKS OR IS SLOW**

1. Check hydraulic oil level, type and viscosity.
2. Check suction line for air leak.
3. Check for plugged reservoir screen and vent. (Includes checking brake linings, if brakes are used excessively on an incline, instead of diff-lock, abnormal wear occurs. Brake lining material plugs screen and filter.)
4. Scored hydraulic pump.
5. Rockshaft piston cover cracked.
6. Tractors without SCV: hydraulic oil diverter plug installed (plug use for SCV kits and auxiliary hydraulic kits).
7. Auxiliary hydraulic jumper hose not installed.
8. 100 mesh screen between rockshaft control valve and rockshaft housing plugged.
9. O-ring blown between rockshaft control valve and rockshaft housing.
10. Unloading valve stuck open.
11. Check for damaged or missing hydraulic pump coupler.
12. Hydraulic pump damaged (scored or worn).
13. Flow control valve or relief valve stuck open.
14. Protective rubber cover left on SCV when installed blocking passages.

270  
05  
3

**F ROCKSHAFT HITCH WILL NOT LIFT**

1. See **E** —No Hydraulic Functions.
2. Auxiliary hydraulic jumper hose not installed or plug not removed.
3. Stop valve closed.
4. System relief valve setting too low.
5. Load too great.
6. Implement relief valve setting too low or valve leaking.
7. Rockshaft piston scored or seals leaking.
8. 100 mesh screen between rockshaft control valve and rockshaft housing plugged.
9. Unloading valve stuck open.
10. Rockshaft spool valve scored or seals failed.
11. Flow control valve stuck open.
12. Lower valve stuck open.
13. Lever linkage bent.

**G SELECTIVE CONTROL VALVES FAIL OR FUNCTION ERRATICALLY**

1. See **E** —No Hydraulic Functions.
2. Relief valve stuck open.
3. Selective control valve rubber protector not removed when SCV's were installed.
4. Coupler tips battered causing hydraulic lock.
5. Diverter plug not installed.

### **H** AUXILIARY HYDRAULICS FAIL OR OPERATE SLOWLY

1. See **B** —No Hydraulic Functions.
2. Diverted plug not installed.
3. 100 mesh screen between rockshaft control valve and rockshaft housing plugged.
4. Selective control valves are not neutralized.
5. Rockshaft control valve is in raised position.

### **I** HYDRAULIC PUMP LEAKS

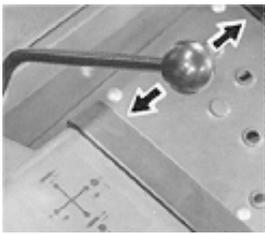
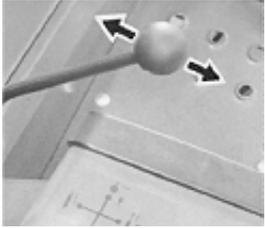
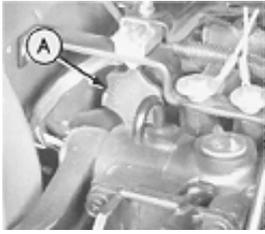
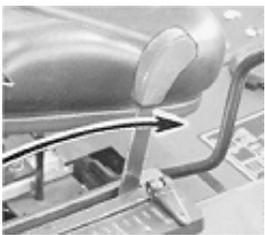
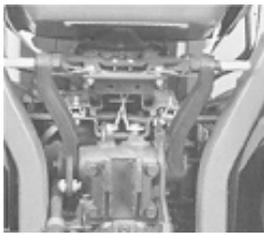
1. Seal installed incorrectly or damaged on installation.
2. Pressure in pump case due to drain line restriction.
3. Misalignment of drive coupling.
4. Damaged shaft.
5. Incorrect valve (closed center) or line blocked on pressure side.

270  
05  
4

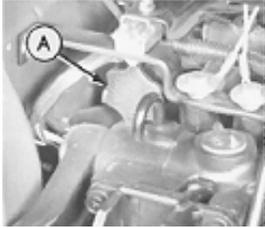
### **J** NO HYDRAULIC SYSTEM PRESSURE

1. System relief valve not set high enough.
2. Oil bypassing to reservoir due to misadjusted or stuck valves.
3. Pump running too slowly.
4. Cold oil or fluid or incorrect fluid.
5. Air leak or restriction at inlet line.
6. Internal wear of pump parts.
7. Low fluid level.
8. Broken internal pump parts.

## Hydraulic System Checkout/Rockshaft Free Play Check

|  |  |   |  |   |
|--|--|---|--|---|
| <p><b>SELECTIVE CONTROL VALVE (SCV) CHECK</b></p>  |  <p>M43973 -UN-31AUG88</p>    | <p>Pull SCV lever REARWARD and release.</p> <p><i>LOOK: Lever MUST return to NEUTRAL.</i></p>                 | <p>Push lever FORWARD to first stop and release.</p> <p><i>LOOK: Lever MUST return to NEUTRAL.</i></p>   | <p>Push lever FULLY FORWARD to FLOAT position.</p> <p><i>LOOK: Lever MUST stay in FLOAT position.</i></p> <p style="text-align: right;">MX,HU,27005,2 -19-16OCT91</p>       |
|  <p>M43974 -UN-31AUG88</p>   | <p>Pull SCV lever to the LEFT (toward seat) and release.</p> <p><i>LOOK: Lever MUST return to NEUTRAL.</i></p> | <p>Push lever to the RIGHT to first stop and release.</p> <p><i>LOOK: Lever MUST return to NEUTRAL.</i></p>   | <p>Push lever FULLY RIGHT slowly and release.</p> <p><i>FEEL: There MUST BE two separate positions (farthest position is REGENERATIVE function). Lever MUST return to NEUTRAL.</i></p> | <p><b>OK: GO TO ' 270</b></p> <p><b>NOT OK: GO TO SECTION 70, GROUP 10 FOR REPAIR.</b></p> <p style="text-align: right;">MX,HU,27005,3 -19-16OCT91</p>                      |
| <p><b>ROCKSHAFT CHECK</b></p>  |  <p>M43862 -UN-31AUG88</p>  | <p>Turn stop valve (A) is FULLY OPEN.</p>   | <p>Run engine at FAST idle.</p> <p style="text-align: right;">MX,HU,27005,4 -19-16OCT91</p>  |   |
|  <p>M43946 -UN-31AUG88</p> | <p>Push rockshaft lever FULLY FORWARD to LOWER rockshaft.</p>  | <p><i>NOTE: It may be necessary to push rockshaft arms down to get rockshaft arms fully lowered.</i></p>      | <p>Pull rockshaft lever FULLY REARWARD into stop quadrant.</p> <p><i>LOOK: Rockshaft MUST raise FULLY.</i></p>   | <p><b>OK: GO TO Æ</b></p> <p><b>NOT OK: GO TO ð GROUP 10, THEN REFER TO SECTION 70, GROUP 15 AS NEEDED.</b></p> <p style="text-align: right;">MX,HU,27005,5 -19-16OCT91</p> |
| <p><b>Æ ROCKSHAFT FREE PLAY CHECK</b></p>  | <p>Raise rockshaft FULLY.</p>  |  <p>M43912 -UN-31AUG88</p> | <p>Move lift arms (A) UP and DOWN by hand to check for free play in FULL RAISE position.</p> <p><i>FEEL: There MUST BE some FREE PLAY.</i></p>   | <p><b>FREE PLAY: GO TO Æ</b></p> <p><b>NO FREE PLAY: GO TO ð, GROUP 10</b></p> <p style="text-align: right;">MX,HU,27005,6 -19-16OCT91</p>                                  |

Hydraulic System Checkout/Operator Complaint Not Identified

|  |   |   |   |  |
|--|---|---|---|--|
| <p><b>Ä</b> <b>ROCKSHAFT STOP VALVE CHECK</b></p> <p>Raise rockshaft.</p>  |  <p>M43862 -UN-31AUG88</p>                           | <p>Turn stop valve (A) <b>FULLY CLOSED</b> (clockwise).</p>   | <p>Push rockshaft lever <b>FORWARD</b> to LOWER position.</p> <p><i>LOOK: Rockshaft arms <b>MUST NOT MOVE.</b></i></p> <p><b>OPEN</b> stop valve after check is complete.</p>   | <p><b>OK:</b> GO TO <b>Ö</b></p> <p><b>NOT OK:</b> <b>DISASSEMBLE AND REPAIR STOP VALVE (SEE SECTION 70, GROUP 10).</b></p> <p>MX,HU,27005,7 -19-16OCT91</p>   |
| <p><b>Ö</b> <b>POWER STEERING PRIORITY CHECK</b></p>   | <p><b>LOWER</b> mower (or attachment) to ground.</p> <p>Turn steering wheel and note effort needed.</p>                               |  <p>M43855 -UN-31AUG88</p> | <p>Turn steering wheel and <b>RAISE</b> attachment <b>AT THE SAME TIME.</b></p> <p><i>FEEL: Steering effort <b>MUST BE THE SAME.</b></i></p>  | <p><b>OK:</b> GO TO <b>Ö</b></p> <p><b>NOT OK:</b> <b>DISASSEMBLE AND REPAIR FLOW DIVIDER (SEE SECTION 70, GROUP 10).</b></p> <p>MX,HU,27005,8 -19-16OCT91</p> |
| <p><b>Ö</b> <b>OPERATOR COMPLAINT NOT IDENTIFIED</b></p> <p>If you completed the checkout procedure and <b>DID NOT</b> isolate a malfunction, the problem may be intermittent.</p> | <p>Try to duplicate the conditions of the malfunction as identified by the operator.</p> <p>Repeat the system checkout procedure.</p> |   | <p>If malfunction <b>IS NOT</b> identified after repeating the hydraulic system checkout procedure, factory assistance is available through the Dealer Technical Assistance Center (DTAC).</p> <p>MX,HU,27005,9 -19-16OCT91</p> |  |

# Group 10 Hydraulic System Tests and Adjustments

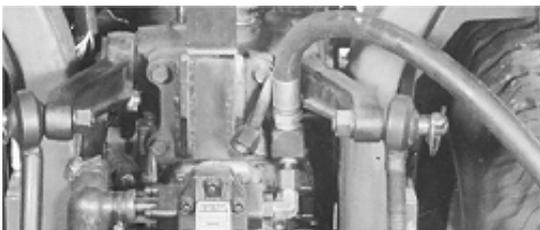
*NOTE: Use the torque specifications charts in Section 10, Group 15, anytime you are fastening hydraulic hoses, lines, and fittings—unless otherwise stated in a particular module.*

MX,HU,27010,1 -19-16OCT91

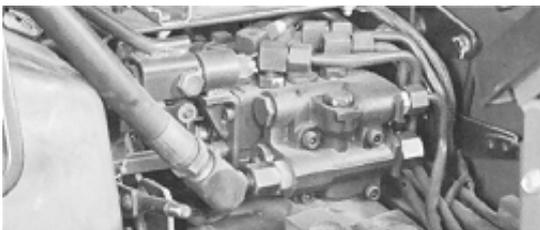
**HYDRAULIC PUMP FLOW TEST**

Remove pump outlet line.

Install C/P flowrater and hose where line was removed.



M48000 -UN-31AUG88



M43905 -UN-31AUG88

**ESSENTIAL TOOLS**

- JTO5738 and JTO1765 C/P Fitting Kit
- JTO5469 - Flowrater
- (2)JTO3368 45° Connectors

**SPECIFICATIONS**

|           |                                     |
|-----------|-------------------------------------|
| Engine    | 3450 rpm                            |
| Pump flow | 655—16 L/min. (4.2 gpm)             |
|           | 755/756/855/856—22.5 L/min. (6 gpm) |
|           | 955—26.5 L/min. 7 gpm)              |

270  
10  
1

**IMPORTANT: OPEN the flowrater control valve FULLY BEFORE STARTING ENGINE. Closing control valve completely may damage hydraulic pump.**

Oil **MUST BE** at NORMAL operating temperature. **FLOW LOW: GO TO SECTION 70, GROUP 05.**

Run engine at TEST SPECIFICATIONS.

*LOOK: Record flow reading.*

**FLOW OK: GO TO ' .**

MX,HU,27010,1A -19-16OCT91

**SYSTEM RELIEF VALVE PRESSURE TEST WITHOUT SCV**

Install 3000 PSI gauge in test port on top of rockshaft inlet block.

Oil **MUST BE** normal operating temperature.

**Continued on next page**

Hydraulic System Tests and Adjustments/System Relief Valve Pressure Test With SCV



M43906 -UN-31AUG88

**ESSENTIAL TOOLS**

- JTO5738 and JTO1765 C/P Fitting Kit
- JTO3366 90° Elbow Connector
- JTO3017 Hose
- JTO3345 3000 PSI Gauge

**SPECIFICATIONS**

|                                 |  |
|---------------------------------|--|
| Engine speed . . . . .          | Half throttle                          |
| Relief valve pressure           |  |
| 655, 755/756, 855/856 . . . . . | 13652—14617 kPa<br>(1980 psi—2120 psi) |
| 955 . . . . .                   | 16665—17650 kPa<br>(2417—2560 psi)     |

CLOSE rockshaft stop valve FULLY.



M43907 -UN-31AUG88

MOMENTARILY move rockshaft control lever to FULL RAISE position.

*LOOK: Record test pressure.*

PRESSURE LOW: ADD SHIME AND RETEST.

MX,HU,27010,2 -19-16OCT91

**Æ SYSTEM RELIEF VALVE PRESSURE TEST WITH SCV**

Install 3000 psi gauge at quick coupler.

Oil MUST BE at normal operating temperature.



M43908 -UN-31AUG88

**ESSENTIAL TOOLS**

- JTO5738 and JTO1765 C/P Fitting Kit
- JTO3340—Quick Coupler
- JTO3343—Fitting
- JTO3002—Fitting
- JTO3017—Hose
- JTO3345—3000 PSI Gauge

**SPECIFICATIONS**

|                                 |                                      |
|---------------------------------|--------------------------------------|
| Engine speed . . . . .          | Half speed throttle                  |
| Relief valve pressure           |                                      |
| 655, 755/756, 855/856 . . . . . | 13,652—14,617 kPa<br>(1980—2120 psi) |
| 955 . . . . .                   | 16,665—17,650 kPa<br>(2417—2560 psi) |

Pressure quick coupler with SCV lever.

*LOOK: Record test pressure.*

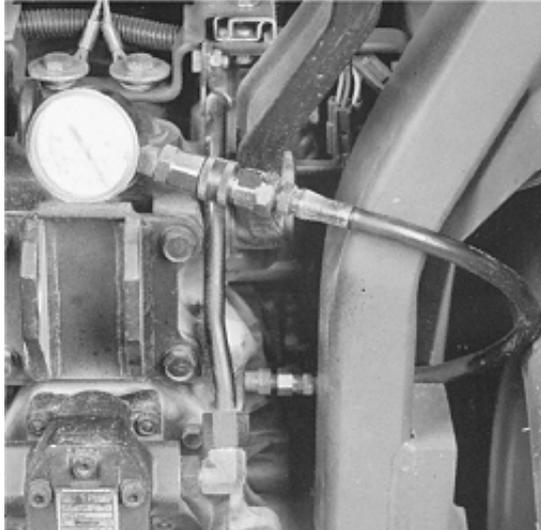
PRESSURE LOW: ADD SHIMS AND RETEST.

MX,HU,27010,3 -19-16OCT91

**Å TRANSAXLE LUBE PRESSURE TEST**

Install gauge test port at right rear of transaxle (1/4 in. pipe plug).

Oil **MUST BE** at normal operating temperature.



M43909 -UN-31AUG88

**ESSENTIAL TOOLS**

- JTO 5738 and JTO 1765 C/P Fitting Kit
- JTO5486—Connector
- JTO3017—Hose
- JTO3363—30 PSI Gauge

**SPECIFICATIONS**

|                                 |                         |
|---------------------------------|-------------------------|
| Engine speed . . . . .          | 3450 rpm                |
| Lube pressure                   |                         |
| 655, 755/756, 855/856 . . . . . | 21—41 kPa<br>(3—6 psi)  |
| 955 . . . . .                   | 41—76 kPa<br>(6—11 psi) |

270  
10  
3

Run engine at TEST SPECIFICATIONS.

*LOOK: Record test pressure.*

PRESSURE LOW: CHECK LUBE RELIEF MAY BE STUCK OPEN OR EXCESSIVE WEAR OF PARTS IN THE PTO LUBE CIRCUIT.

MX,HU,27010,4 -19-16OCT91

**Ö PTO CLUTCH ENGAGEMENT PRESSURE TEST**

Install gauge in test port at left rear of transaxle (1/4 in. pipe plug).

Oil **MUST BE** normal operating temperature.



M48557 -UN-11DEC89

**ESSENTIAL TOOLS**

- JTO5738 and JTO1765 Fitting Kit
- JTO3365—45° Connector
- JTO3017—Hose
- JTO3344—300 PSI Gauge

**SPECIFICATIONS**

|                           |                   |
|---------------------------|-------------------|
| Engine speed . . . . .    | 3450 rpm          |
| Clutch pressure . . . . . | 827 kPa (120 psi) |

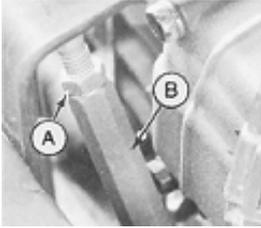
Run engine at test specifications.

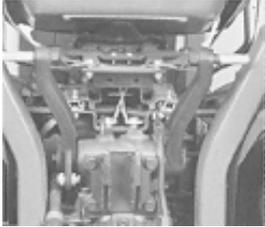
*LOOK: Record test pressure.*

Hydraulic System Tests and Adjustments/Rockshaft Leakage Test

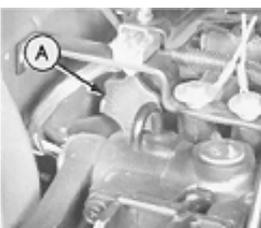
PRESSURE LOW: ADD SHIMS TO DELAY RELIEF VALVE (B) AND RETEST.

MX,HU,27010,5 -19-16OCT91

|  |   |  |  |  |
|--|---|--|--|--|
| <p>0 <b>ADJUST ROCKSHAFT VALVE</b></p> |  <p>M43911 -UN-31AUG88</p> | <p>Place rockshaft lever in FULL RAISE position.</p> |  <p>M43986 -UN-07SEP88</p> | <p>Loosen turnbuckle jamnut (A).</p> <p>Engine at HIGH idle.</p> <p>Turn turnbuckle (B) until engine LOADS DOWN.</p> |
|--|---|--|--|--|

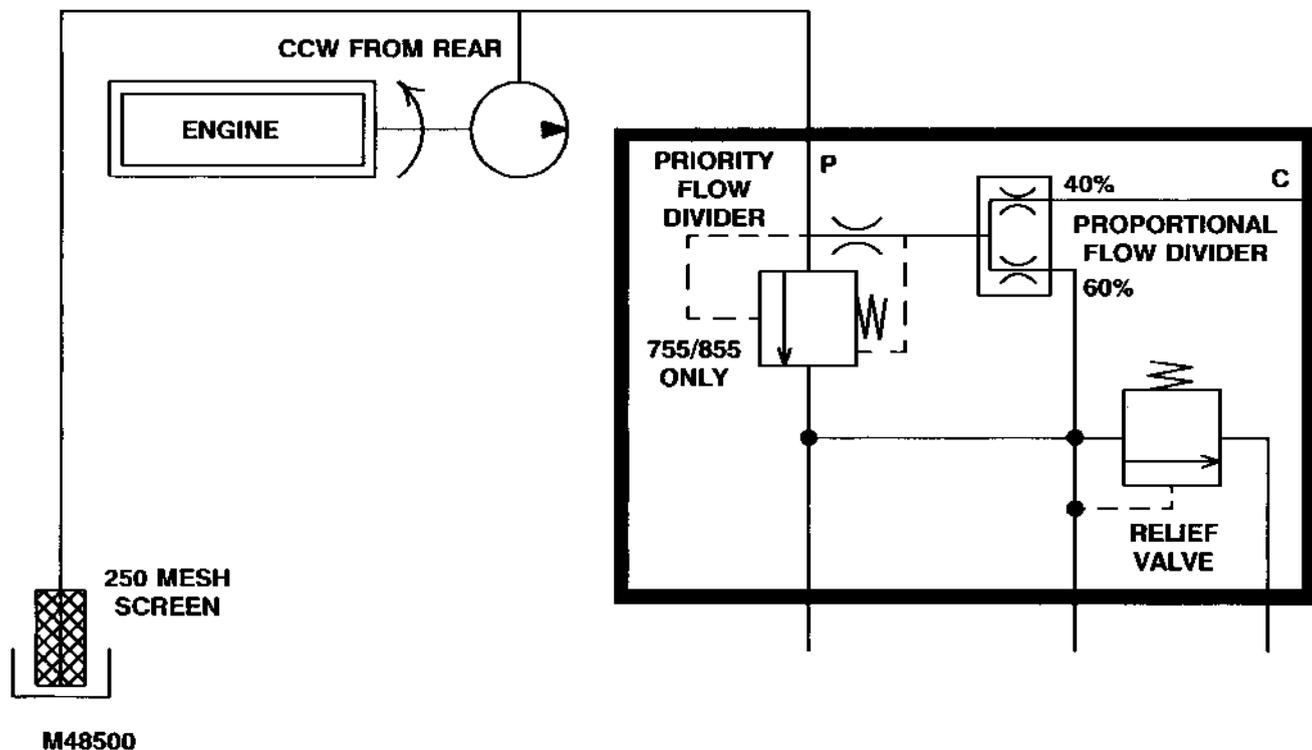
|  |  |   |  |
|--|--|---|--|
| <p>Lengthen turnbuckle 4 to 6 flats.</p> |  <p>M43912 -UN-31AUG88</p> | <p>Cycle lift arms several times.</p> <p><i>LOOK: Lift arms should have a small amount of play at FULL RAISE.</i></p> | <p>270<br/>10<br/>4</p> <p>MX,HU,27010,6 -19-16OCT91</p> |
|--|--|---|--|

|   |   |   |  |
|---|---|---|--|
| <p>0 <b>ROCKSHAFT LEAKAGE TEST</b></p> <p>Oil MUST BE at normal operating temperature 50°C (120°F).</p> | <p>Rockshaft valve adjustment MUST BE CORRECT.</p> <p>Install implement or weight box weighing 350 kg (770 lbs.).</p> |  <p>M43911 -UN-31AUG88</p> | <p>Place rockshaft lever in FULL RAISE position.</p> <p>STOP engine.</p> <p>Measure amount of DROP at END of draft arms.</p> <p><b>SPECIFICATION</b></p> <p>2 mm (0.079 in.) in one minute</p> |
|---|---|---|--|

|   |                              |   |  |
|---|------------------------------|---|--|
| <p>IN SPEC: SYSTEM NORMAL.</p> <p>OUT OF SPEC: CONTINUE</p> | <p>CLOSE stop valve (A).</p> |  <p>M43862 -UN-31AUG88</p> | <p>Repeat test.</p> <p><b>LEAKAGE SPECIFICATION</b></p> <p>2 mm (0.079 in.) in one minute</p> <p>OPEN stop valve (A) after test is complete.</p> |
|---|------------------------------|---|--|

|  |  |
|--|--|
| <p>IN SPEC: With stop valve CLOSED, check and repair the following:</p> <ul style="list-style-type: none"> <li>Leaking or misadjusted lowering valve.</li> <li>O-rings between rockshaft control valve and rockshaft housing.</li> <li>Scored rockshaft valve spool or housing.</li> <li>Stop valve damaged or leaking.</li> </ul> | <p>OUT OF SPEC: With stop valve CLOSED, check and repair the following:</p> <ul style="list-style-type: none"> <li>Implement relief valve</li> <li>Rockshaft piston O-rings</li> <li>Scored rockshaft cylinder</li> <li>Cracked piston cover</li> </ul> <p>MX,HU,27010,7 -19-16OCT91</p> |
|--|--|

HYDRAULIC PUMP AND FLOW CONTROL OPERATION



| MODEL   | PUMP                      | GPM     | SYSTEM RELIEF | PRIORITY FLOW VALVE | PROPORTIONAL FLOW DIVIDER |
|---------|---------------------------|---------|---------------|---------------------|---------------------------|
| 655     | 6cc(0.31in <sup>3</sup> ) | 4.0 GPM | 2050±71 PSI   | NOT USED            | 40% / 60%                 |
| 755/756 | 7cc(0.43in <sup>3</sup> ) | 5.6 GPM | 2050±71 PSI   | 4.25 GPM            | 40% / 60%                 |
| 855/856 | 7cc(0.43in <sup>3</sup> ) | 5.6 GPM | 2050±71 PSI   | 4.25 GPM            | 40% / 60%                 |
| 955     | 9cc(0.55in <sup>3</sup> ) | 7.2 GPM | 2488±71 PSI   | NOT USED            | 30% / 70%                 |

Oil is drawn from the transaxle through a 250 mesh screen by the gerotor-type gear pump. The pump is driven by the engine through the hydro pump shaft and the transaxle main PTO shaft. Oil is pumped to the flow control housing "P" port.

The flow control housing for all models contains a proportional flow divider and system relief valve. The proportional flow divider supplies adequate flow to the power steering system first.

The 755/756 and 855/856 also have a flow-sensitive priority valve to allow enough flow to the rockshaft and SCV's, if equipped.

The relief valve protects the hydraulic system from excessive pressure build up. The relief valve is shim adjustable.

## ROCKSHAFT OPERATION

The rockshaft control valve is located on the right side of the rockshaft. The slow return stop valve (rate-of-drop valve) is located on the left side of the rockshaft, it controls rate of flow to and from the rockshaft cylinder.

The rockshaft cylinder controls the 3-point hitch and mid-mower lift system, unless the tractor has an optional mid-lift cylinder.

The high pressure relief valve protects the rockshaft system from high pressure shock loads. The check valve prevents high pressure shock loads from going back into the rockshaft control valve circuit.

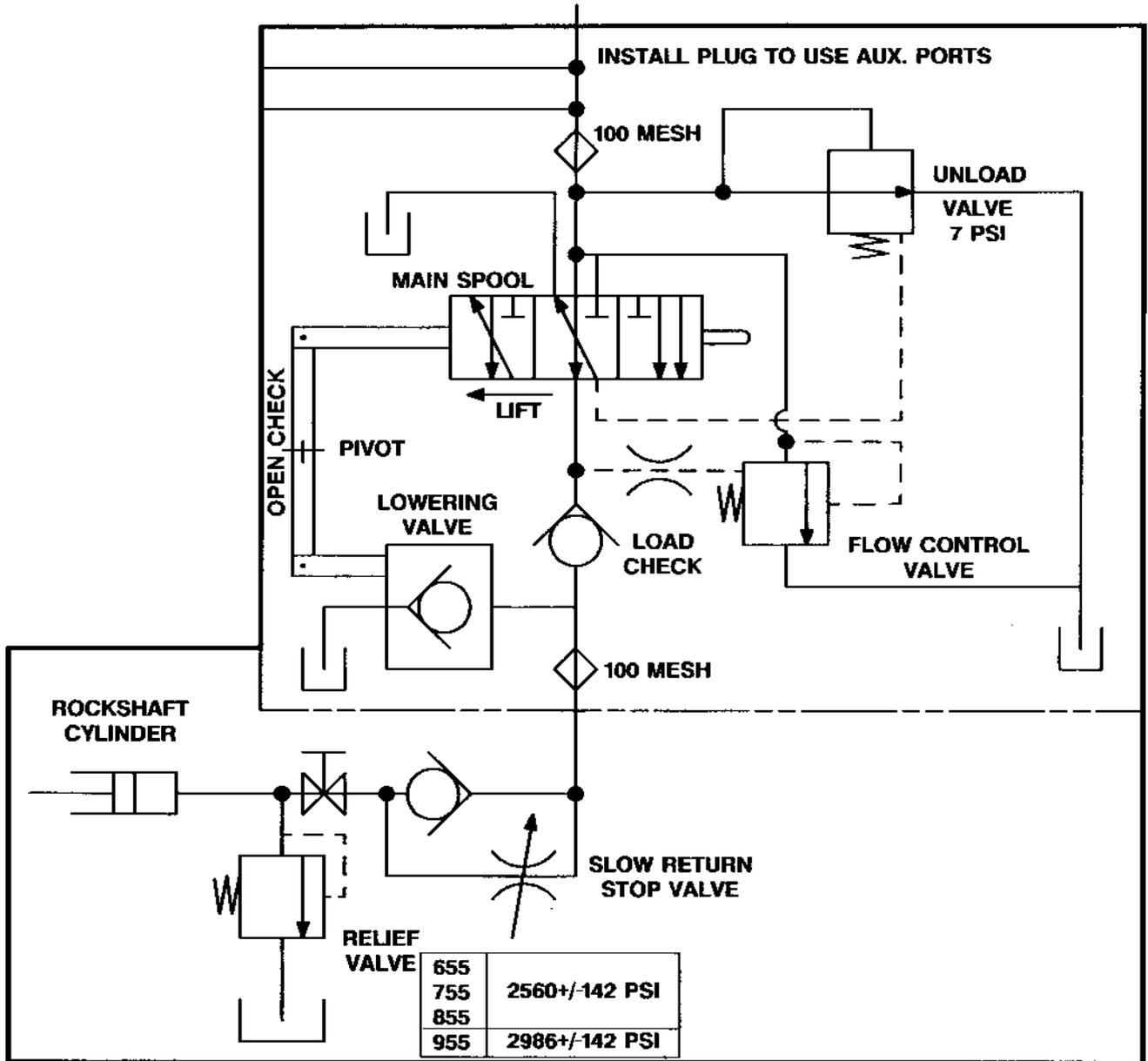
When the rockshaft control lever is in the neutral position, the unloading valve is open to sump. Pump output unseats the unloading valve and oil returns to sump. The load check valve and lowering valve

remain seated and trap the oil in the rockshaft cylinder.

With the rockshaft lever moved to the rear into raise position, the main spool is moved to allow fluid to flow into the back of the unloading valve to close it. Oil pressure builds and oil flows through the main spool and the flow control restrictor. This closes the flow control valve and unseats the load check valve. Fluid is directed to the rockshaft cylinder to raise the rockshaft arms. The arms will raise until the spool is shifted by the rockshaft feed back linkage.

When the rockshaft lever is moved forward to lower the lift arms, the unloading valve is open to sump, just as in neutral. Mechanically the lowering valve is unseated and the rockshaft cylinder oil is directed to sump.

MX,HU,27015,2 -19-16OCT91



M48502

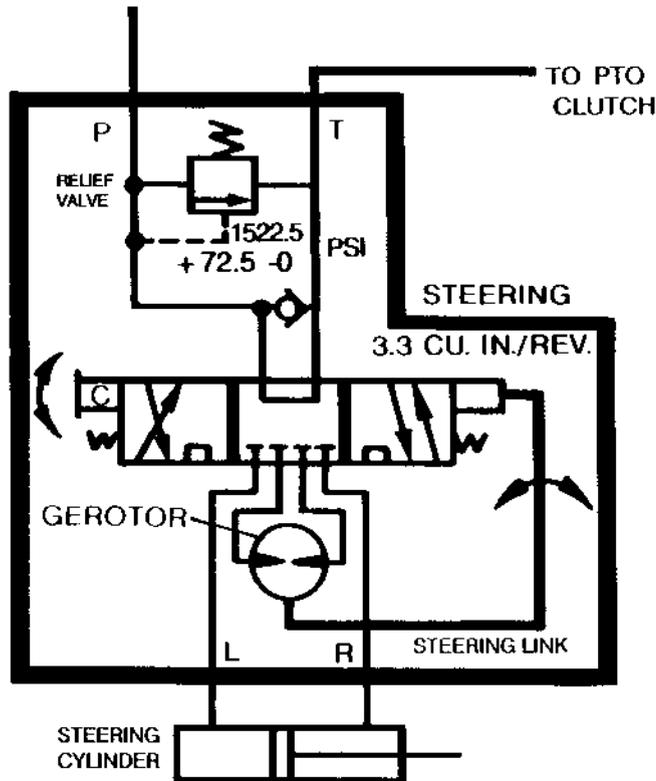
Neutral Position Shown

MX,HU,27015.3 -19-16OCT91

270  
15  
3

M48502 -19-23SEP91

## STEERING VALVE OPERATION



Neutral Position Shown

The steering valve consists of a self-centering control valve with a gerotor-type pump. They are hydraulically and mechanically interconnected inside the valve.

When in neutral (steering wheel not being turned), oil entering the valve goes to the control valve and is directed back out of the steering valve to the PTO clutch. The oil in the steering cylinder is trapped.

When the steering wheel is turned to the left, the control valve is positioned to allow pressure oil to go to the gerotor, back to the control valve and to the piston end of the cylinder. Return oil from the rod end is directed to the control valve and out of the power steering valve.

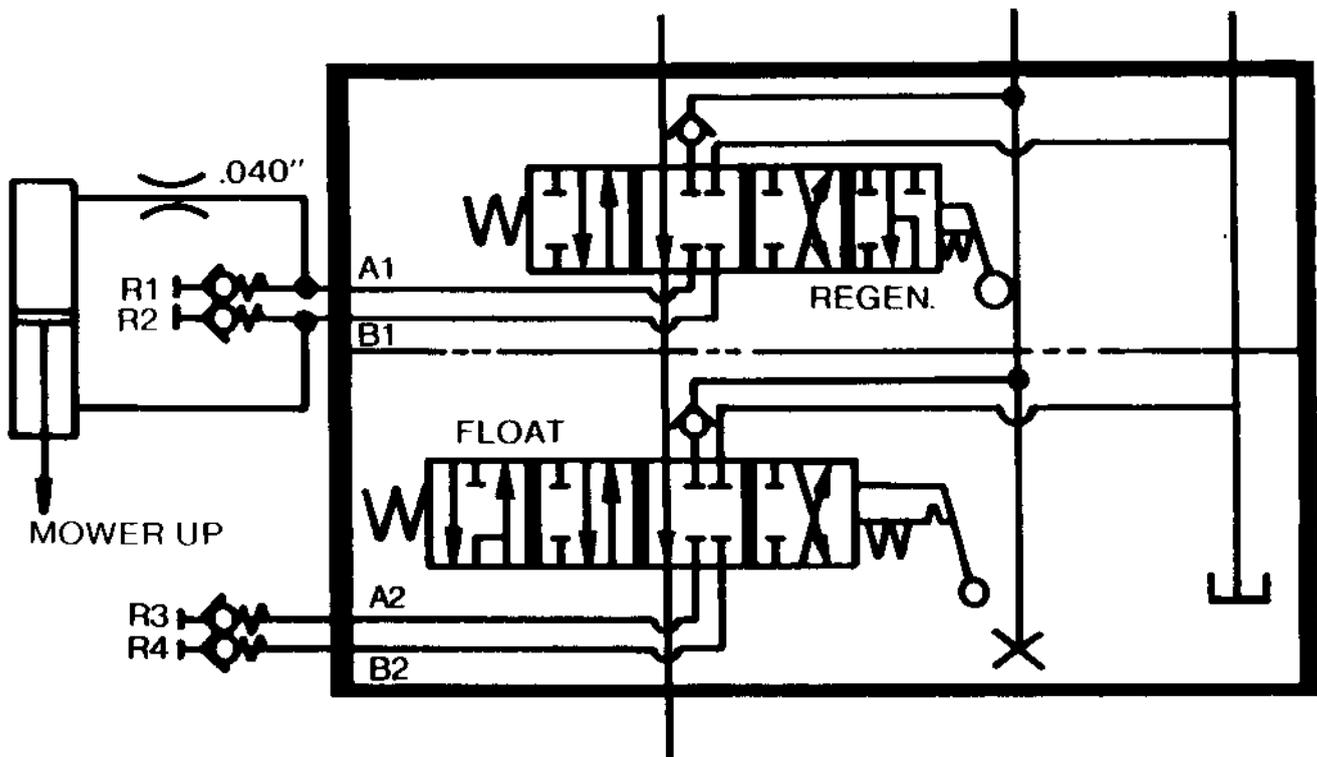
In a right turn, the control valve is positioned to the opposite side. Pressure oil goes to the gerotor as in a left turn but is directed to the rod end of the cylinder, reversing the cylinder operation and sending the oil in the piston end back through the control valve to sump.

When the rotation of the steering wheel stops, oil flow from the gerotor stops and the control valve is returned to neutral position by the centering springs.

The relief valve and check valve protect the steering system from shock loads.

MX,HU,27015.4 -19-16OCT91

## SELECTIVE CONTROL VALVE OPERATION



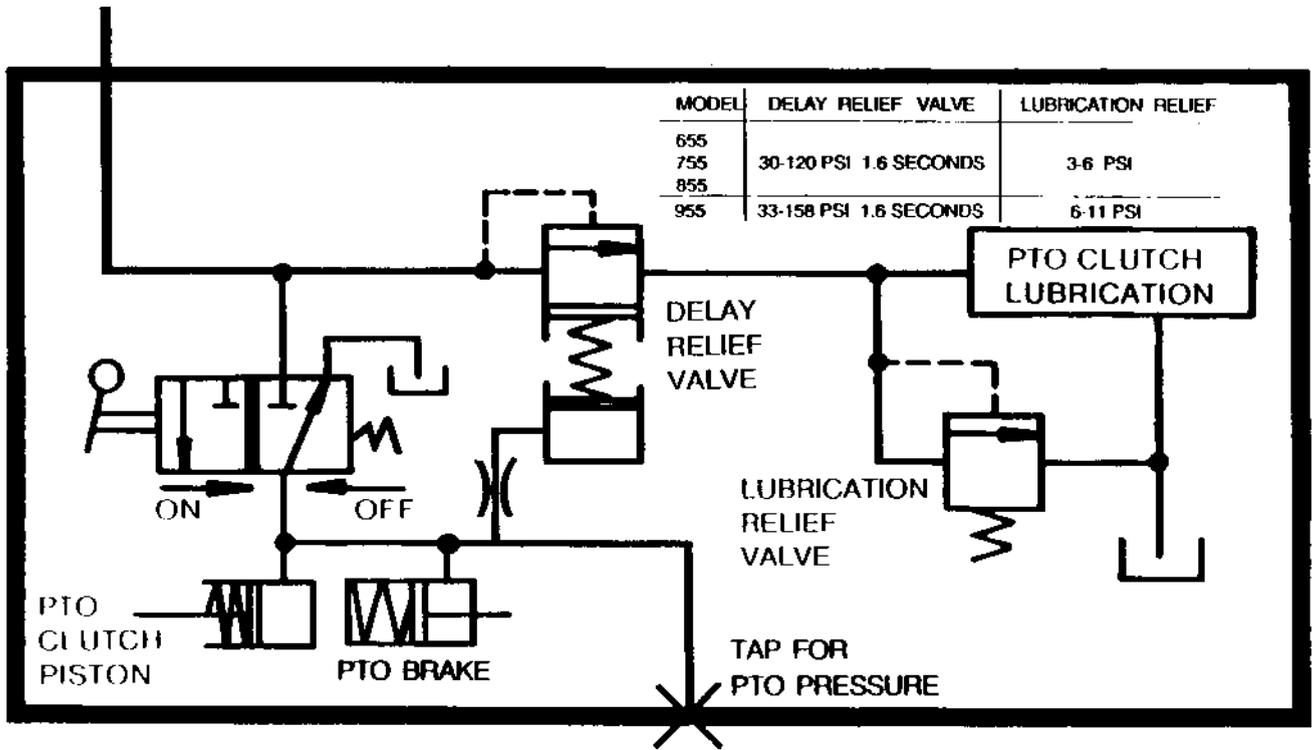
The selective control valve is a dual valve with one control lever. Both valves have a neutral, a pressure/return and a return/pressure position. The front valve also has a regenerative position and the rear valve has a float position. When the regenerative spool is pushed all-the-way in (full outward position by the control lever), high pressure oil is directed out the pressure port and the return oil is directed back into the pressure port. This speeds up the function. The operator must hold the control lever in the regenerative position—there is no detent provided.

When the float spool is pushed all-the-way in (full forward position by the control lever), high pressure oil is blocked and both ports are connected allowing oil to flow in either direction. A detent holds the control lever in the float position until the operator pulls it out of float.

When the optional mid-mower lift cylinder is installed to the regenerative valve, a 1 mm (0.040 in.) orifice in the cylinder is used to slow down the oil flow, so the mower does not raise or lower too fast.

MX,HU,27015.5 -19-16OCT91

**PTO SYSTEM OPERATION**



Off Position Shown

The PTO system includes a PTO clutch, PTO brake, delay relief valve, clutch control valve, lubrication relief valve and lubrication circuit.

The PTO clutch control valve is a two position control valve that directs fluid to the clutch/brake circuit when it is moved to the ON position. In the OFF position, it dumps fluid from the clutch/brake circuit back to sump.

When the PTO is OFF, hydraulic pressure shifts the delay relief to direct inlet pressure to the lubrication circuit. At the same time fluid in the clutch/brake circuit is channeled to the sump to release the clutch and apply the brake.

When the PTO is ON, hydraulic fluid is channeled to the back side of the delay relief. Fluid is not directed to the clutch/brake circuit until pressure builds up to specified reading and shifts the delay relief valve to close off inlet pressure. This pressure is channeled to the clutch/brake circuit to apply the clutch and release the brake.

The clutch brake lubrication system relief valve provides specified pressured lubrication oil to the clutch and brake.

MX,HU,27015.6 -19-16OCT91

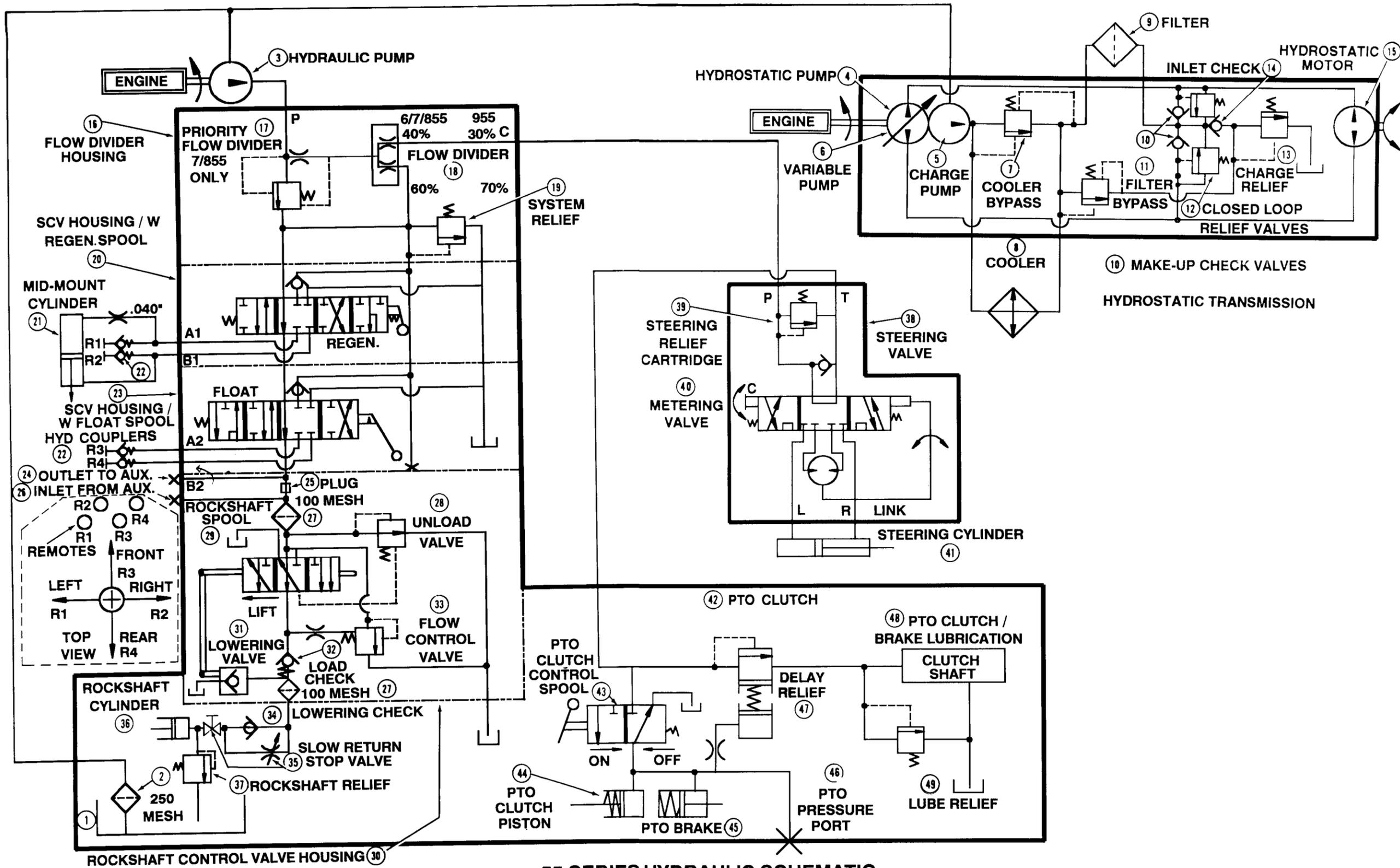
270  
15  
6



## 655, 755/756, 855/856, AND 955 HYDRAULIC SYSTEM SCHEMATIC

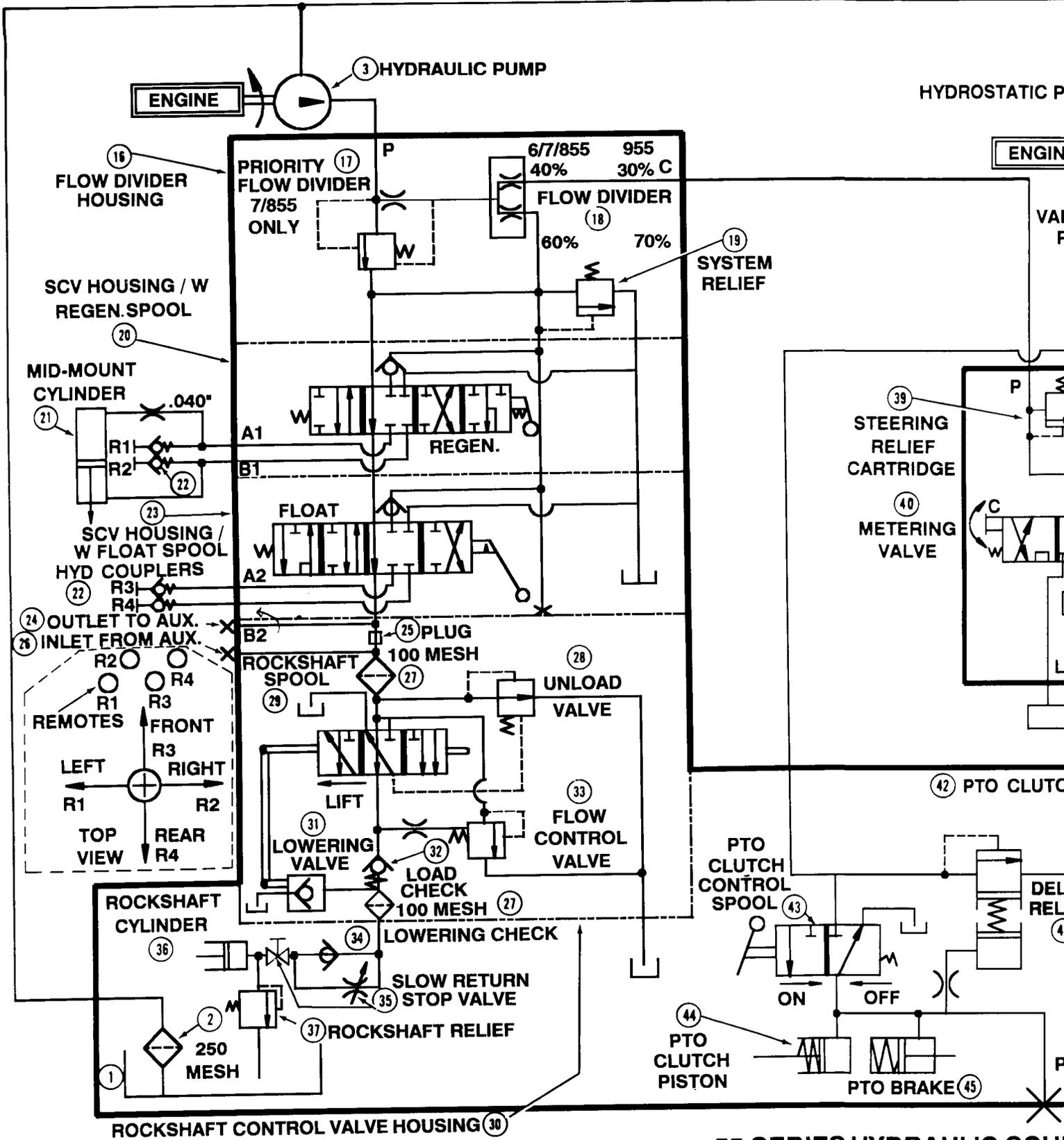
- |  |   |   |   |
|--|---|---|---|
| 1—Transaxle Reservoir  | 14—Inlet Check  | 25—Plug (Install to use<br>at 102 kPa (7.5 psi), located in<br>piston cover.) | 10494—10998 kPa   |
| 2—250 Mesh Screen (55<br>Micron)                                       | 15—Hydrostatic Motor  | 26—Auxiliary Hydraulic Inlet  | 40—Metering Valve   |
| 3—Hydraulic Pump<br>655 = 5 cc<br>755/756/855/856 = 7 cc<br>955 = 9 cc | 16—Flow Divider Housing   | 27—100 Mesh Screen  | 41—Steering Cylinder  |
| 4—Hydrostatic Transmission   | 17—Priority Flow Divider<br>Valve (755/756/855/856<br>only)                           | 28—Unloading Valve<br>Start closing at 48 kPa (7<br>psi)                      | 42—PTO Clutch   |
| 5—Charge Pump 5.8 cc (.35<br>in. <sup>3</sup> )                        | 18—Flow Divider Valve<br>40%/60% for<br>655/755/756/855/856<br>30%/70% for 955        | 29—Rockshaft Spool Valve  | 43—PTO Clutch Control<br>Valve Spool  |
| 6—Hydrostatic Pump<br>(variable output)                                | 19—System Relief Valve<br>655/755/756/855/856 =<br>13652—14617 kPa<br>(1980—2120 psi) | 30—Rockshaft Control Valve<br>Housing   | 44—PTO Clutch Piston  |
| 7—Oil Cooler Bypass Valve<br>552—896 kPa (80—130 psi)                  | 955 = 16665—17650 kPa<br>(2417—2560 psi)  | 31—Lowering Valve<br>(mechanically opened)                                    | 45—PTO Brake  |
| 8—Transmission Oil Cooler  | 20—SCV Housing With<br>Regenerative Spool   | 32—Load Check Valve   | 46—PTO Pressure Test Port   |
| 9—Oil Filter   | 21—Mid-Mount Cylinder   | 33—Flow Control Valve   | 47—Delay Relief Valve<br>Delay—1.6 seconds<br>655/755/756/855/856 =<br>207—827 kPa (30—120<br>psi)    |
| 10—Make-up Check Valves  | 22—Hydraulic Couplers   | 34—Lowering Check (located<br>in piston cover)                                | 955 = 228—1089 kPa<br>(33—158 psi)  |
| 11—Filter Bypass Valve<br>138—207 kPa (20—30 psi)                      | 23—SCV Housing With Float<br>Spool  | 35—Slow Return/Stop Valve   | 48—PTO Clutch/Brake<br>Lubrication  |
| 12—Closed Loop Relief Valve<br>41370—44818 kPa<br>(6000—6500 psi)      | 24—Auxiliary Hydraulic<br>Outlet (located in piston<br>cover)                         | 36—Rockshaft Cylinder   | 49—Lube Relief Valve<br>655/755/756/855/856 =<br>21—41 kPa (3—6 psi)<br>955 = 41—76 kPa (6—11<br>psi) |
| 13—Charge Relief Valve<br>965—1379 kPa (140—200 psi)                   |   | 37—Implement Relief Valve   |   |
|  |   | 38—Steering Valve   |   |
|  |   | 39—Steering Relief Valve<br>Cartridge   |   |

MX,HU,27020,1 -19-16OCT91



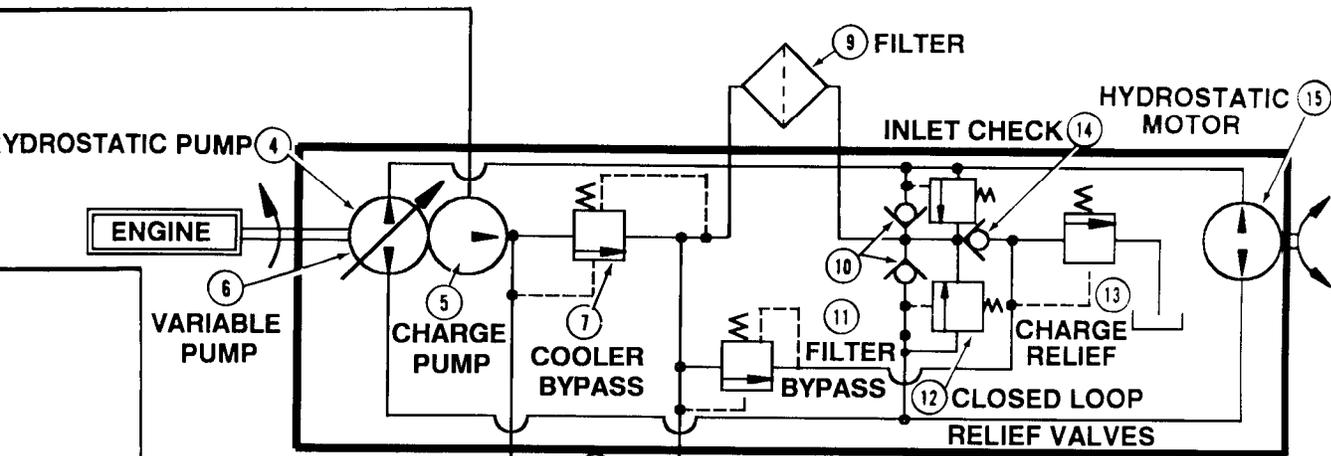
55 SERIES HYDRAULIC SCHEMATIC

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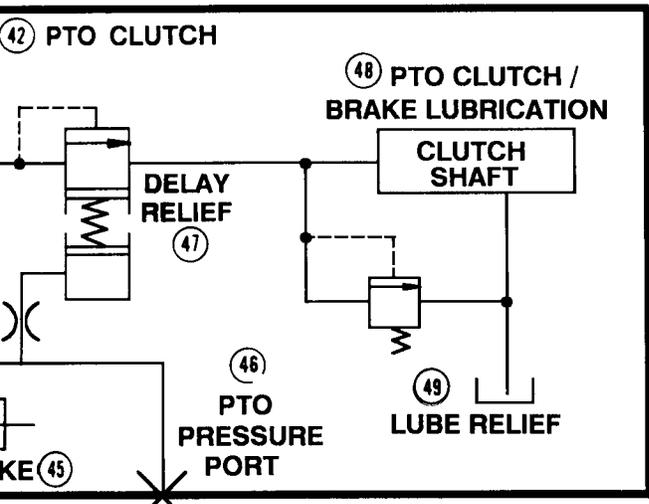
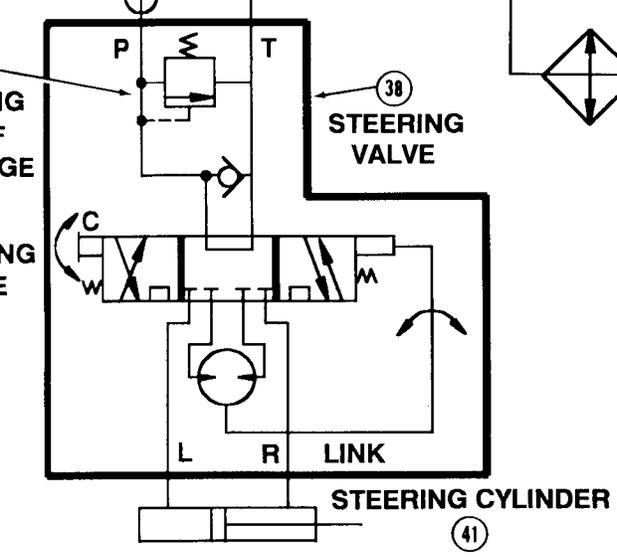


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10 MAKE-UP CHECK VALVES  
 HYDROSTATIC TRANSMISSION

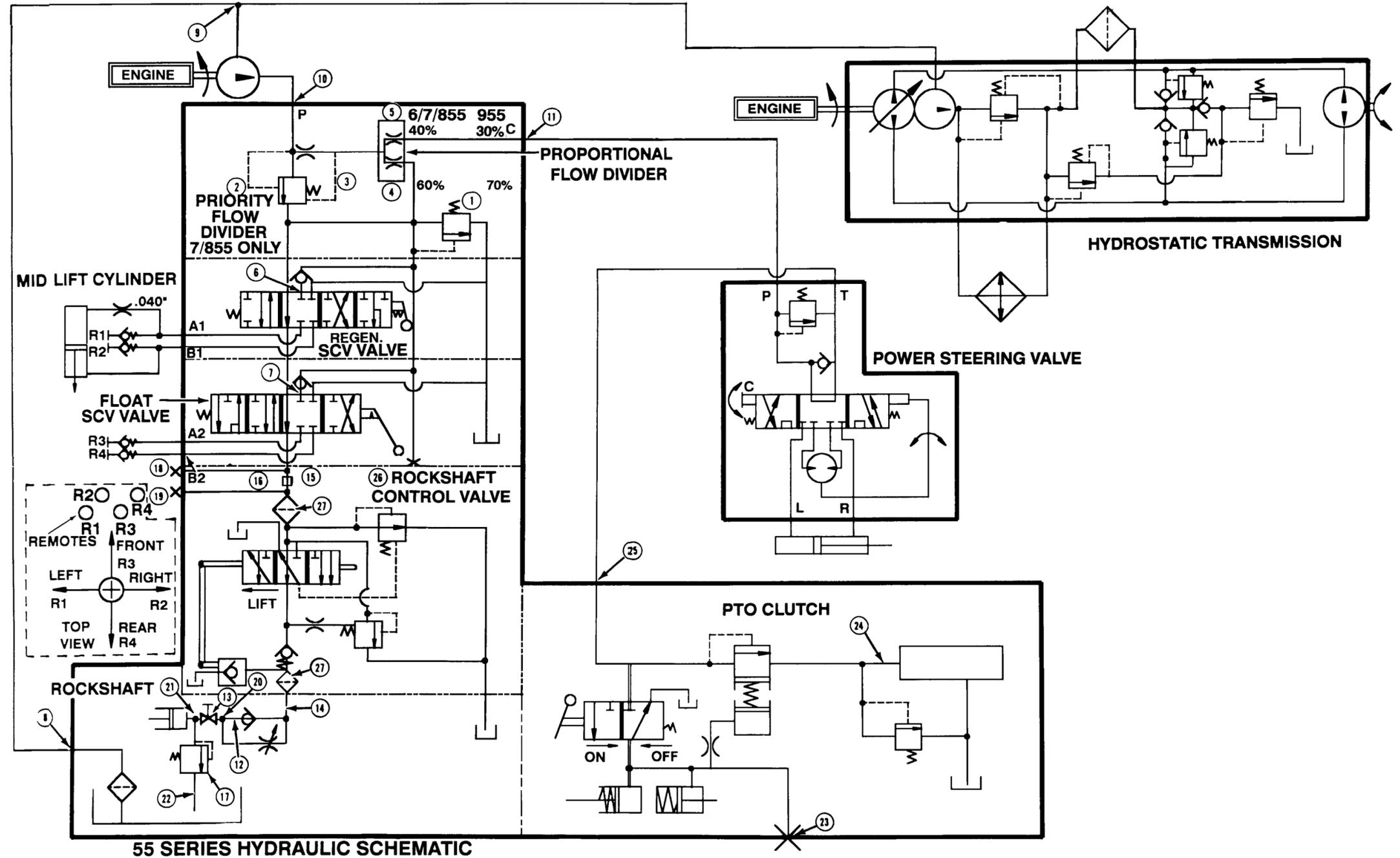
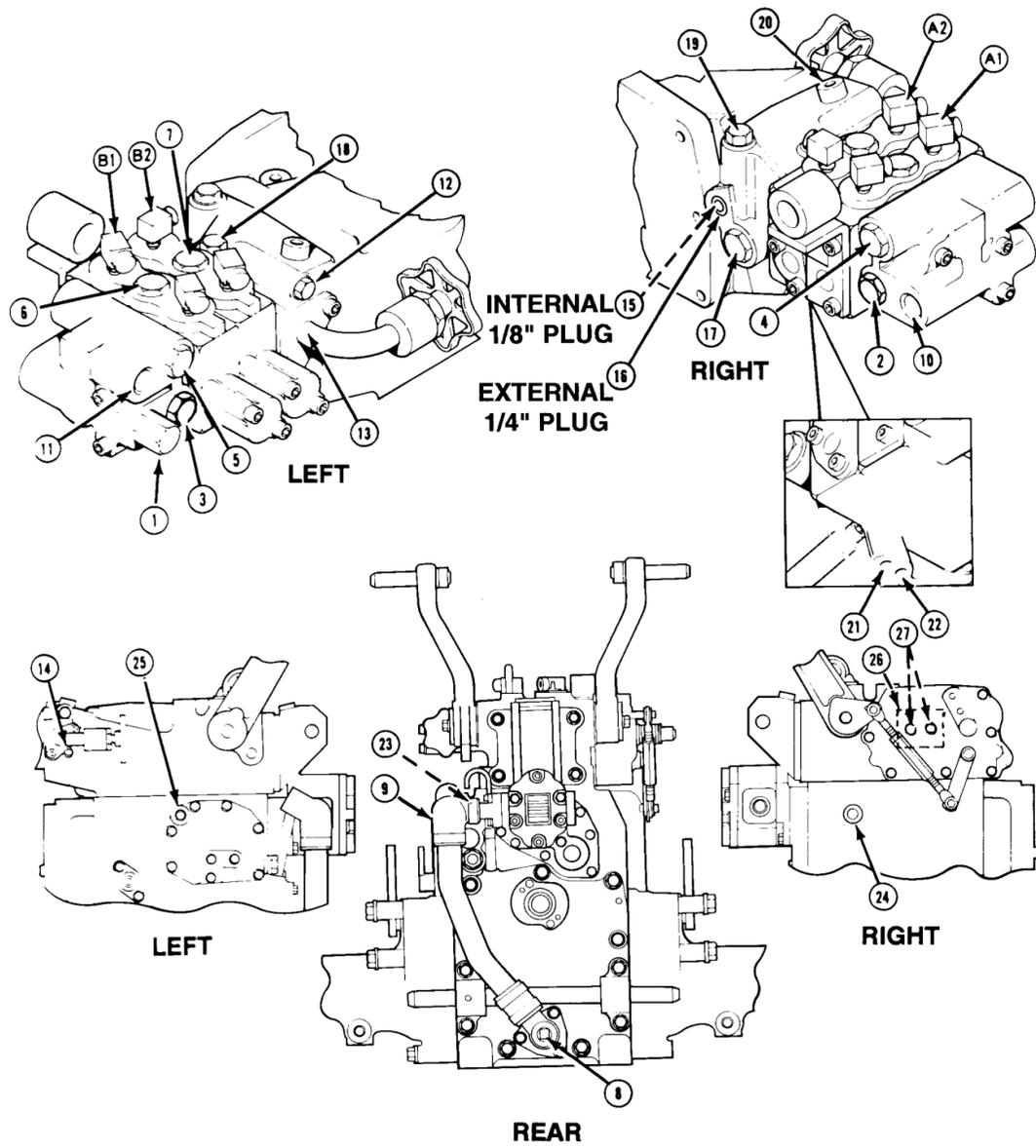


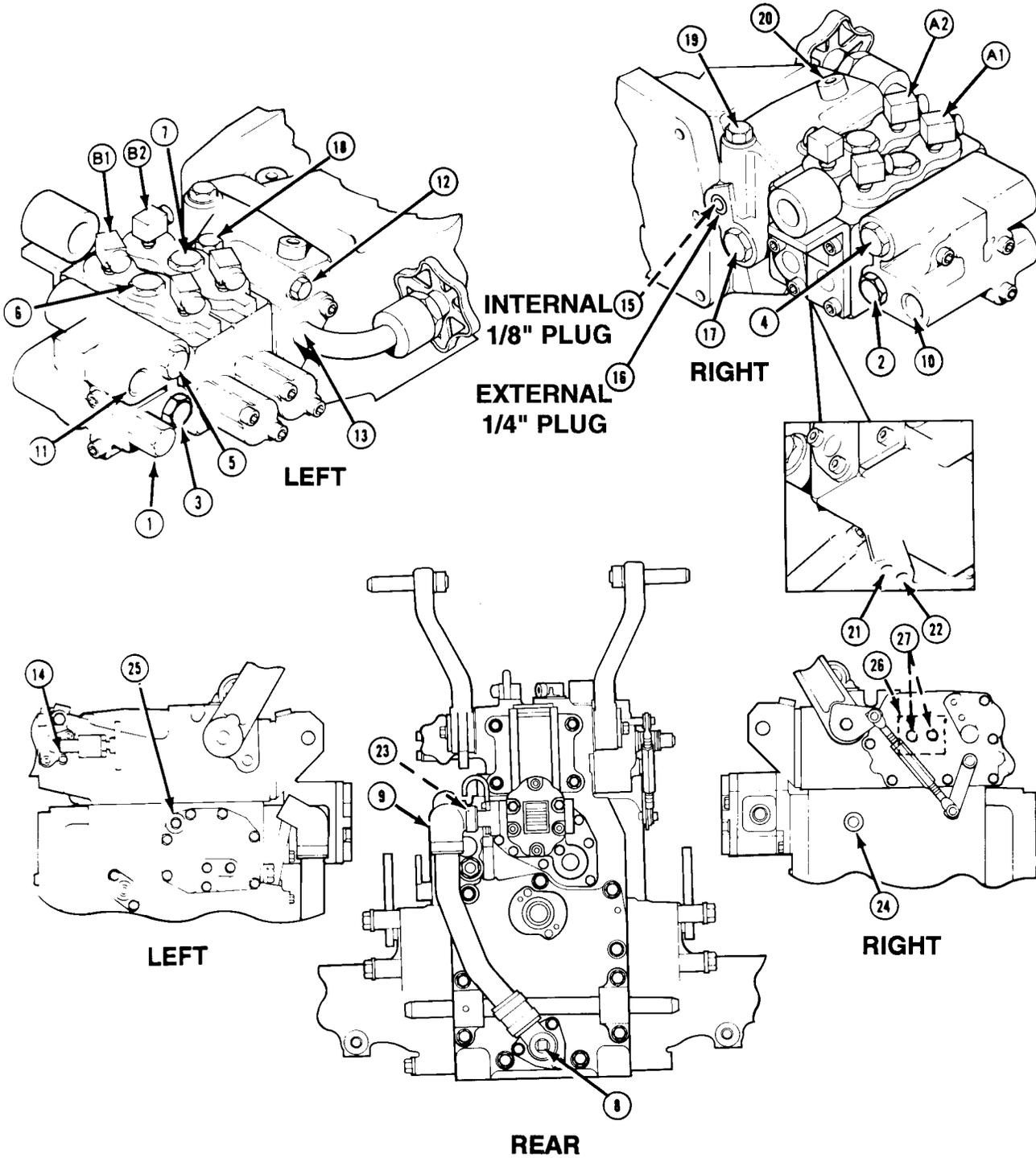
**HYDRAULIC SCHEMATIC**

## HYDRAULIC SCHEMATIC WITH LOCATION DRAWINGS

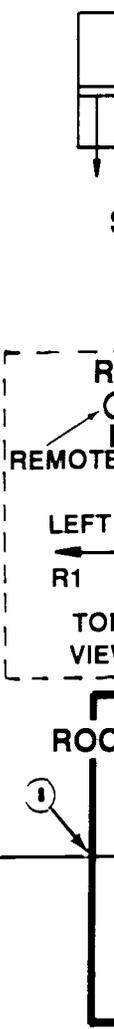
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|----------------------------------|---|------------------------------------|----------------------------------|
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| 2—Priority Flow Divider          | 11—Proportional Flow Divider Outlet To Power Steering Inlet | 17—Rockshaft Relief Valve          | 23—PTO Clutch Pressure Port      |
| 3—Priority Flow Divider          |   | 18—Auxiliary Outlet Port           | 24—PTO Clutch Lubrication Port   |
| 4—Proportional Flow Divider      | 12—Slow Return Stop Valve Inlet                             | 19—Auxiliary Inlet Port            | 25—PTO Clutch Inlet              |
| 5—Proportional Flow Divider      | 13—Slow Return Stop Valve                                   | 20—Slow Return Stop Valve Inlet    | 26—Rockshaft Control Valve       |
| 6—Regenerative Spool Check Valve | 14—Rockshaft Control Valve Outlet                           | 21—Slow Return Stop Valve Outlet   | 27—100 Mesh Screens              |
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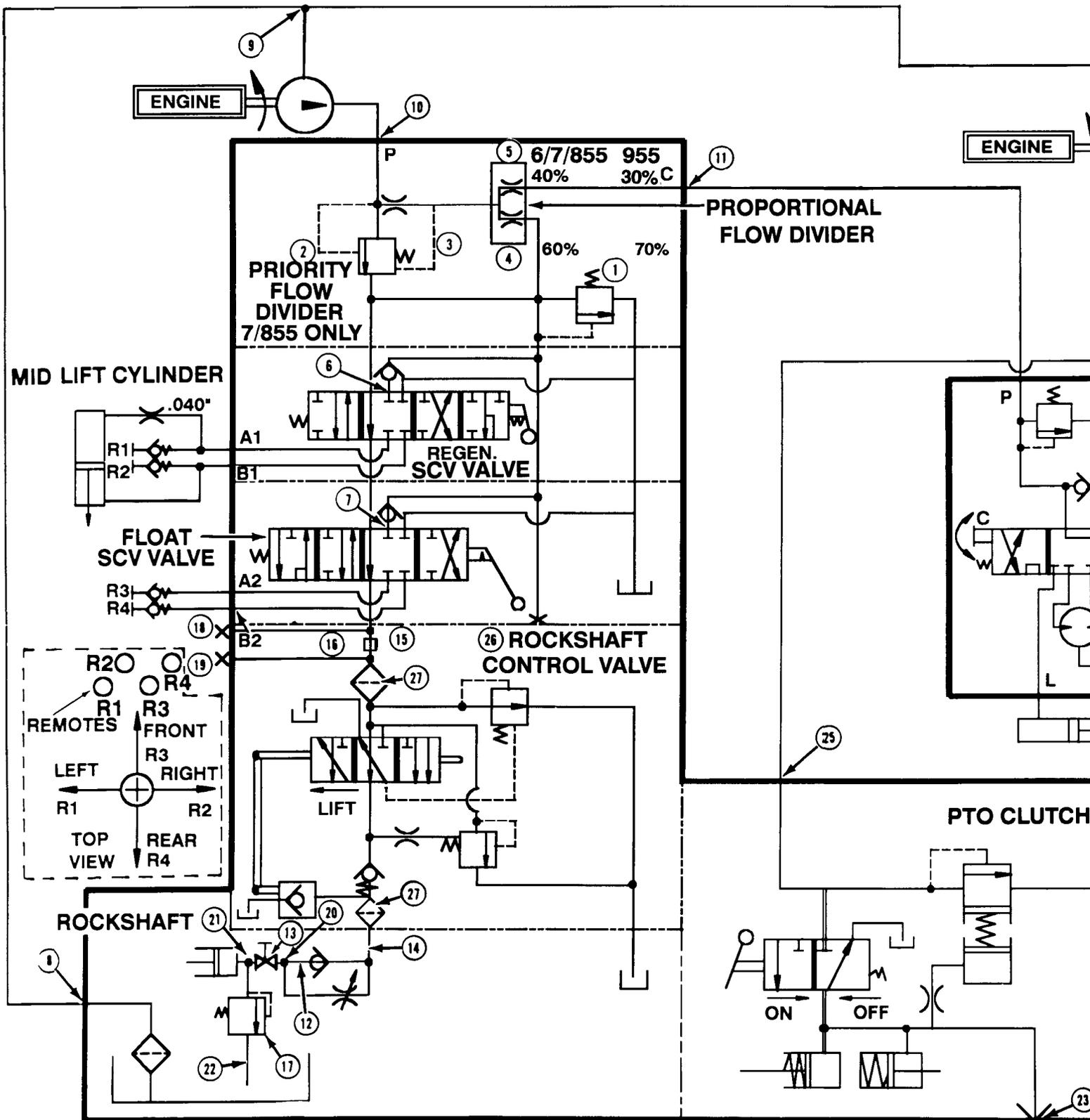
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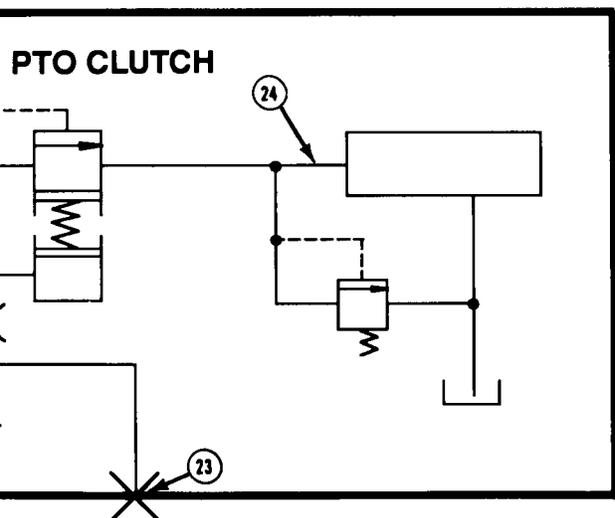
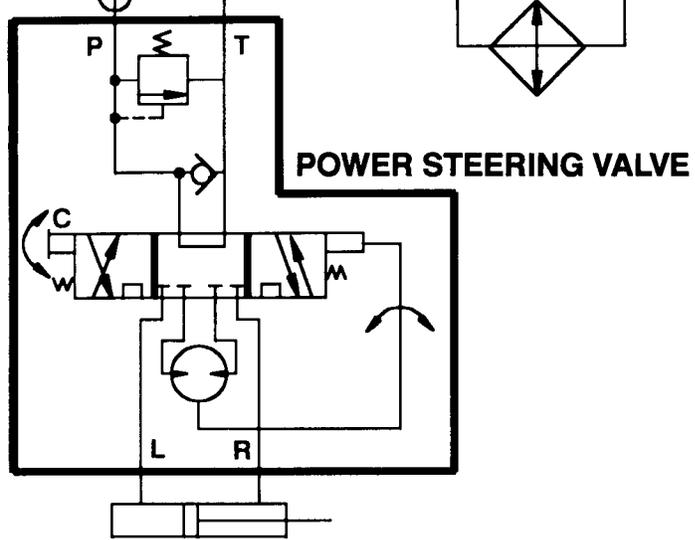
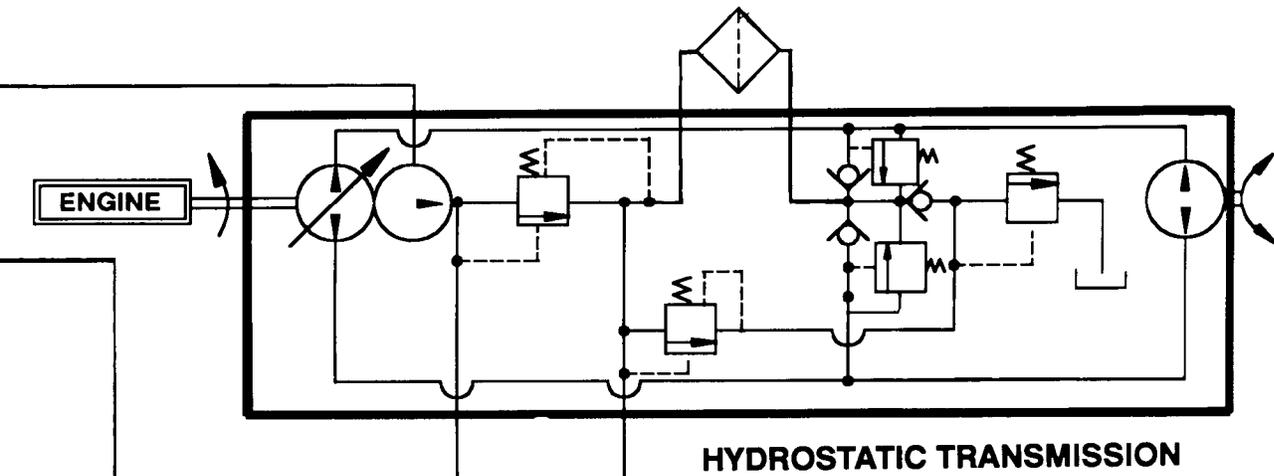


MID LIFT





**55 SERIES HYDRAULIC SCHEMATIC**



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