# 8560
# 8760, and
# 8960 Tractors
# Repair

**For complete service information also see:**




**John Deere Waterloo Works**
**TM1433 (19JUL01)**

LITHO IN U.S.A.
**ENGLISH**

# Introduction

## FOREWORD

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

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

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.

RX,TM1433,IFC -19-08FEB91

## NOTICE TO THE DEALER

**IMPORTANT: The changes listed below make your current TM obsolete. Discard TM1433 dated 23MAY91. Please make this information available to your service department.**

- SECTION 20—

  Dynamometer Test moved to TM1434

- SECTION 30—

  Some information has been eliminated since it appears in the Operator's Manual

- SECTION 40—

  Added New Wiring Harnesses
  Added Hitch Draft Sensing

- SECTION 50—

  24-Speed MST Hi-Lo Clutch Changes
  Revised Section 50 Groups

- SECTION 55—

  Revised Transmission Repair Procedures

- SECTION 60—

  Added Steering Valve Warm-up Check Valve

- SECTION 70—

  Added New Hydraulic Circuit
  Revised Section 70 Groups

- SECTION 80—

  Revised Wheels—Group 05

- SECTION 90—

  Revised Air Quality System Repair

*Major revisions to this TM are listed above. Some Sections and Groups will have specification, procedure, or formatting changes not listed on this notification.*

RX,TM1433,DLR -19-09MAR92

# Contents



**Continued on next page**

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

TM1433-19-19JUL01

# Section 05
# SAFETY



## Contents

Page

## HANDLE FLUIDS SAFELY—AVOID FIRES

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

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

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

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

TS227 -UN-23AUG88

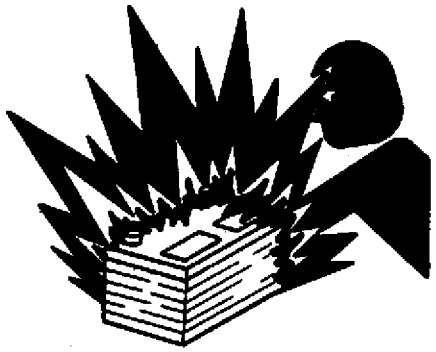
DX,FLAME -19-04JUN90

## PREVENT BATTERY EXPLOSIONS

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

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

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



TS204 -UN-23AUG88

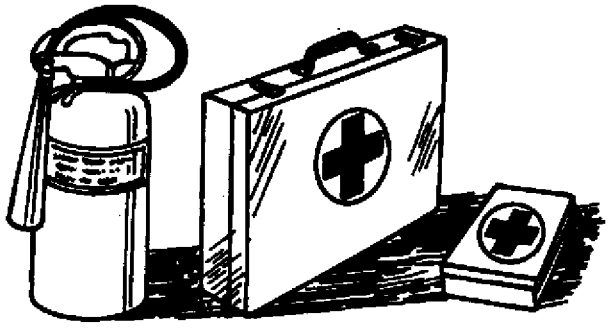
DX,SPARKS -19-04JUN90

## PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

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



TS291 -UN-23AUG88

DX,FIRE2 -19-04JUN90

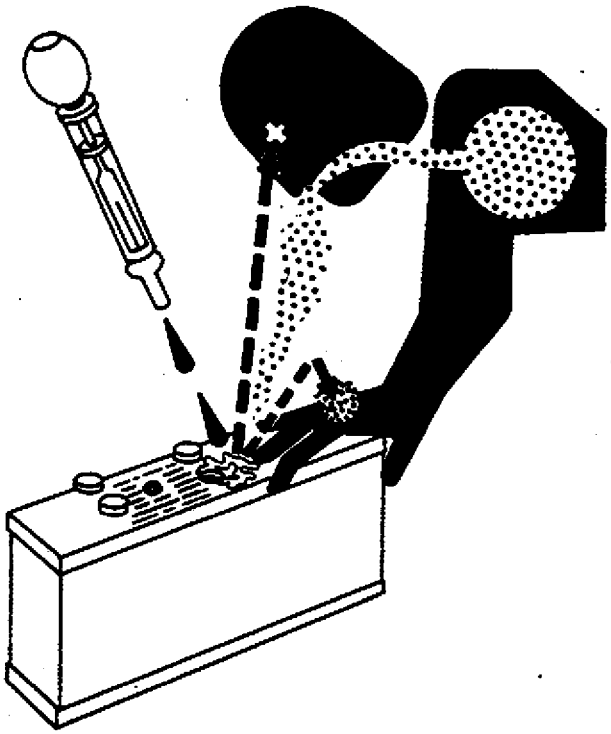
## PREVENT ACID BURNS

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

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

If you spill acid on yourself:
1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 10—15 minutes. Get medical attention immediately.

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



TS203 -UN-23AUG88

DX,POISON -19-04JUN90

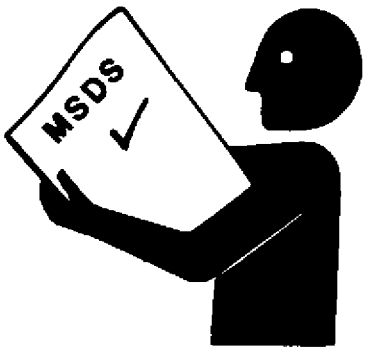
## HANDLE CHEMICAL PRODUCTS SAFELY

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

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

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

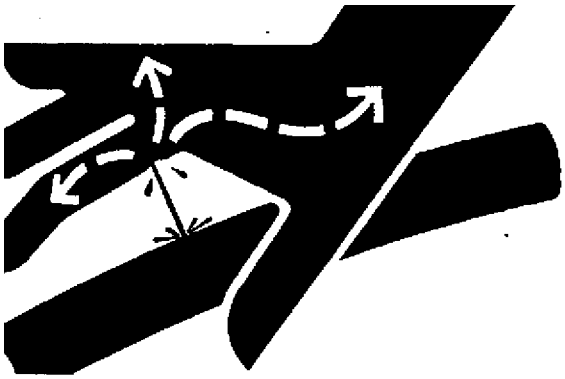
(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)




TS1132 -UN-26NOV90

DX,MSDS,NA -19-15MAR91

## AVOID HIGH-PRESSURE FLUIDS



X9811 -UN-23AUG88

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

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

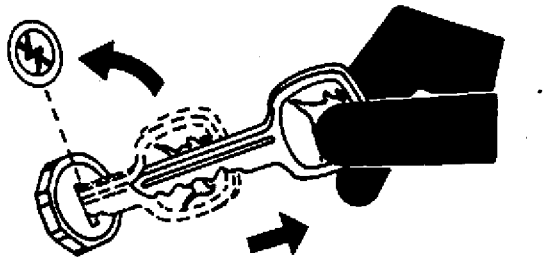
Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

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

DX,FLUID -19-09AUG91

## PARK MACHINE SAFELY

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



TS230 -UN-24MAY89

DX,PARK -19-04JUN90

# Section 50
# MECHANICAL SHIFT TRANSMISSION

## Contents



**Continued on next page**

## SPECIFICATIONS

| Item | Measurement | Specification |
|---|---|---|
| Filter Relief Valve Spring | Free Length<br>Test Length | 76 mm (3.0 in.) (approx.)<br>49.3 mm at 51.6—56.9 N<br>(1.9 in. at 11.6—12.8 lb force) |
| Filter Relief Valve Housing-to-Bracket *(Early Models)* | Torque | 48 N·m (35 lb-ft) |
| Filter Relief Valve Housing-to-Cover *(Later Models)* | Torque | 74 N·m (55 lb-ft) |

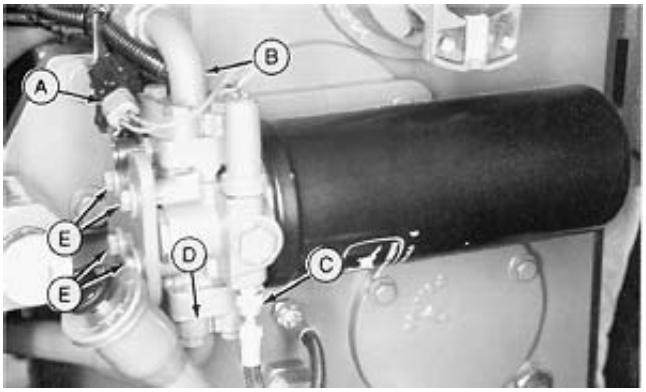
RX14335005,1B -19-15NOV91

## REMOVE FILTER RELIEF VALVE HOUSING *(EARLY MODELS)*

1. Disconnect filter restriction sensor lead (A) and remove sensor leak-off line (C).

2. Remove filter housing-to-control valve line (B) and pump-to-filter housing line (D).

3. Remove cap screws (E) to remove filter relief valve housing.



RW14659 -UN-24FEB89

**A—Filter Restriction Sensor Connector**
**B—To Control Valve**
**C—Leak-Off Line**
**D—From Pump**
**E—Cap Screws**

RX14335005,2 -19-05MAR91

## DISASSEMBLE AND ASSEMBLE FILTER RELIEF VALVE HOUSING

*NOTE: The filter restriction valve assembly and the fitting with orifice are used only on early model tractors.*

*Parts (A—C) are serviceable only as a kit.*

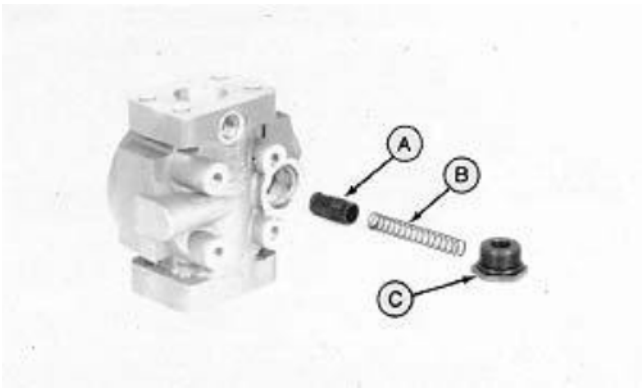
1. Remove plug (C) to remove filter restriction valve (A) and spring (B). Inspect parts for excessive wear or damage. Replace the valve, spring, and plug as a set.

**NEW SPRING SPECIFICATION**

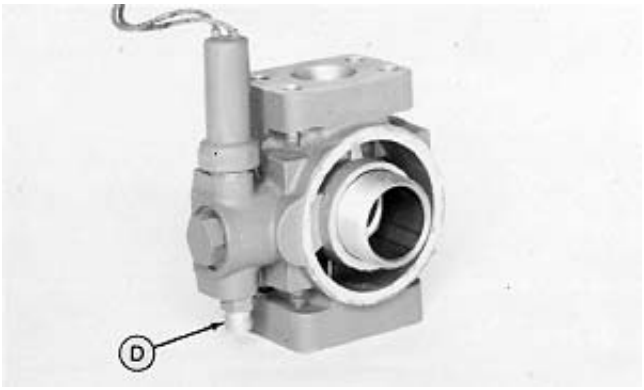
| | |
|---|---|
| Free Length | 76 mm (3.0 in.) (approximate) |
| Test Length | 49.3 mm at 51.6—56.9 N (1.9 in. at 11.6—12.8 lb force) |

2. Remove fitting (D) containing an orifice for sensor leak-off circuit. Make sure the orifice is open and clean.

**A—Valve**
**B—Spring**
**C—Plug**
**D—Fitting with Orifice**



RW14660 -UN-24FEB89



RW14663 -UN-24FEB89

RX14335005,3 -19-06MAY91

## INSTALL FILTER RELIEF VALVE HOUSING *(EARLY MODELS)*

1. Install relief valve housing on bracket and tighten cap screws (E).

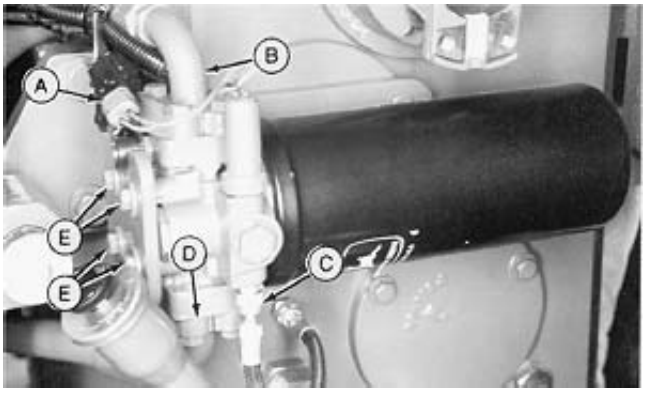
**TORQUE SPECIFICATION**

| | |
|---|---|
| Filter Relief Valve Housing-to-Bracket Cap Screws | 48 N·m (35 lb-ft) |

2. Connect filter housing-to-control valve line (B) and pump-to-filter housing line (D).

3. Connect sensor leak-off line (C).

4. Connect sensor lead (A).



RW14659 -UN-24FEB89

**A—Filter Restriction Sensor Connector**
**B—To Control Valve**
**C—Leak-Off Line**
**D—From Pump**
**E—Cap Screws**

RX14335005,2B -19-15NOV91

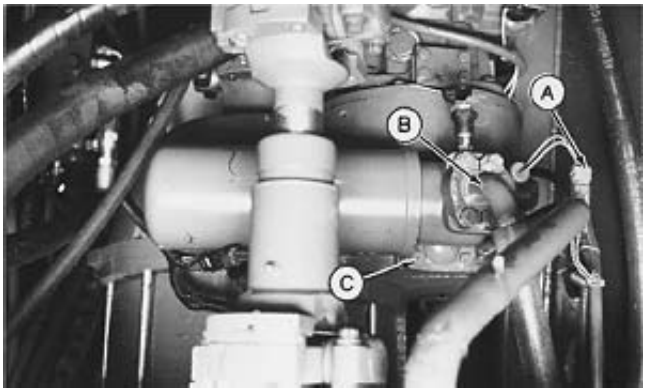
## REMOVE FILTER RELIEF VALVE HOUSING *(LATER MODELS)*

1. Disconnect filter restriction sensor lead (A).

2. Remove pump-to-filter housing line (B).

3. Remove four housing-to-front cover cap screws (C) and remove housing.

4. Scrape and clean gasket surface on cover and housing.




-UN-28JAN91
RW18797

RX14335005,5 -19-15NOV91

## DISASSEMBLE AND ASSEMBLE FILTER RELIEF VALVE HOUSING *(LATER MODELS)*

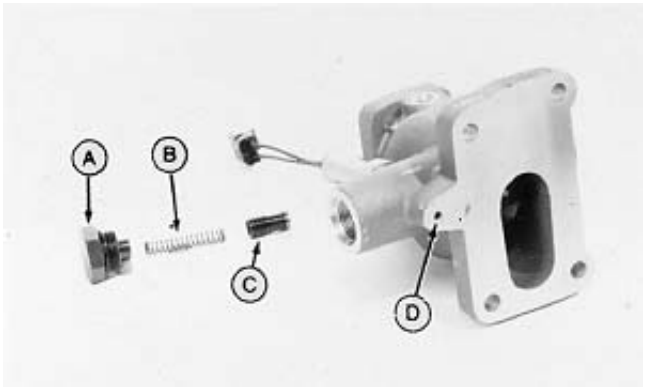
*NOTE: Parts (A—C) are serviceable as a kit.*

1. Remove plug (A) to remove filter restriction valve (C) and spring (B). Inspect parts for excessive wear or damage. Replace the valve, spring and plug as a set.

**NEW SPRING SPECIFICATION**

| | |
|---|---|
| Free Length | 76 mm (3.00 in.) (approximate) |
| Test Length | 49.3 mm at 51.6—56.9 N (1.9 in. at 11.6—12.8 lb-force) |

2. Make sure relief passage (D) is open.




-UN-28JAN91
RW18777

**A—Plug with O-Ring**
**B—Spring**
**C—Valve**
**D—Relief Passage**

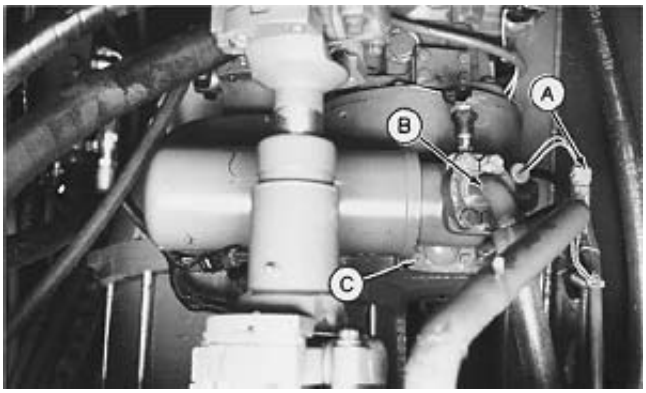
RX14335005,6 -19-04FEB91

## INSTALL FILTER RELIEF VALVE HOUSING *(LATER MODELS)*

1. Install new gasket and housing onto cover and tighten four cap screws (C) to 74 N·m (55 lb-ft).

2. Connect pump to filter housing line (B).

3. Connect sensor lead (A).




-UN-28JAN91
RW18797

RX14335005,3B -19-15NOV91

## SPECIAL OR ESSENTIAL TOOLS

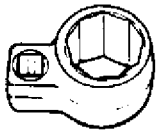
*NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).*

DX,TOOLS -19-05JUN91

RW17445 -UN-16NOV89

Box End Adapter . . . . . JDG669

Remove and install transmission pressure sensor



JDG669A -19-11APR90

## SERVICE EQUIPMENT AND TOOLS

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

| Name | Use |
|---|---|
| D01045AA Bushing, Bearing and Seal Driver Set | Install oil seal and bearing for clutch valve arm shaft |

RX14335010,1 -19-12APR90

## OTHER MATERIAL

| Number | Name | Use |
|---|---|---|
| TY9375 (TY9374*) | Pipe Sealant | Install transmission lube orifice and Hi-Lo control oil port plug |

* *Smaller Size*

RX14335010,2 -19-12APR90

## SPECIFICATIONS

| Item | Measurement | Specification |
|---|---|---|
| Clutch Valve Springs | Free Length—Outer (Longer)<br>Test Length | 56 mm (2.2 in.) (approx.)<br>47 mm at 201—307 N<br>(1.85 in. at 45—53 lb force) |
| | Free Length—Inner (Shorter)<br>Test Length | 54 mm (2.1 in.) (approx.)<br>39 mm at 113—133 N<br>(1.5 in. at 25—30 lb force) |
| Clutch Valve | OD | 15.840—15.856 mm<br>(0.6236—0.6243 in.) |
| | Bore ID | 15.881—15.907 mm<br>(0.6252—0.6263 in.) |
| Engagement Override Valve Spring | Free Length<br>Test Length | 29.5 mm (1.2 in.) (approx.)<br>21 mm at 26—32 N<br>(0.8 in. at 5.8—7.1 lb force) |
| Engagement Override Valve | OD | 13.916—13.932 mm<br>(0.5479—0.5485 in.) |
| | Bore ID | 13.987—14.013 mm<br>(0.5507—0.5517) |
| Clutch Lube Valve Spring | Free Length<br>Test Length | 48 mm (1.9 in.) (approx.)<br>(30 mm at 55—67 N<br>(1.2 in. at 12.5—15.0 lb force) |
| Clutch Lube Valve | OD | 17.399—17.425 mm<br>(0.6850—0.6860 in.) |
| | Bore ID | 17.469—17.495 mm<br>(0.6878—0.6888 in.) |
| Pressure Regulating Valve Spring | Free Length<br>Test Length | 126 mm (5.0 in.) (approx.)<br>100 mm at 308—376 N<br>(3.9 in. at 69—85 lb force) |
| Pressure Regulating Valve | OD | 15.821—15.837 mm<br>(0.6229—0.6235 in.) |
| Pressure Regulating Valve | Bore ID | 15.862—15.888 mm<br>(0.6245—0.6255 in.) |
| Lube Relief Valve Spring | Free Length<br>Test Length | 52 mm (2.0 in.) (approx.)<br>37 mm at 20—24 N<br>(1.5 in. at 4.5—5.5 lb force) |

Continued on next page

| Item | Measurement | Specification |
|---|---|---|
| Lube Relief Valve | OD | 22.212—22.236 mm (0.8745—0.8755 in.) |
| | Bore ID | 22.288—22.314 mm (0.8775—0.8785 in.) |
| Transmission Control Valve Housing-to-Case | Torque | 24 N·m (18 lb-ft) |

RX14335010,1B -19-15NOV91

## REMOVE TRANSMISSION CONTROL VALVE HOUSING

**CAUTION: Escaping fluid under pressure can penetrate the skin causing serious injury. Relieve pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Keep hands and body away from pinholes and nozzles which eject fluids under high pressure. Use a piece of cardboard or paper to search for leaks. Do not use your hand.**

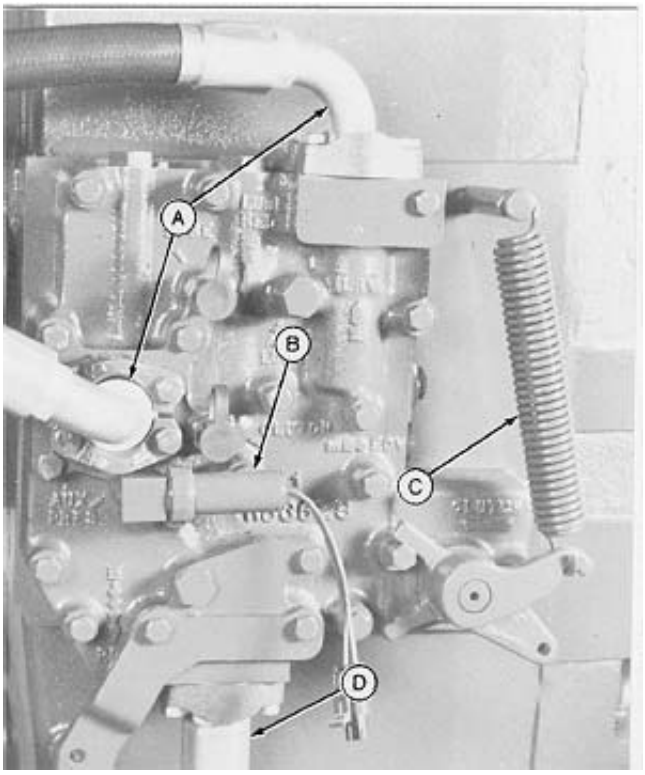
**If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type injury or gangrene may result.**

1. Relieve hydraulic pressure by stopping engine and operating all hydraulic control valves.

2. Remove and cap cooler lines (A) and filter line (D).

3. Remove clutch valve spring (C). Remove lube pressure sensor (B) using JDG669 Box End Adapter.

4. Remove 20 cap screws to remove control valve housing.

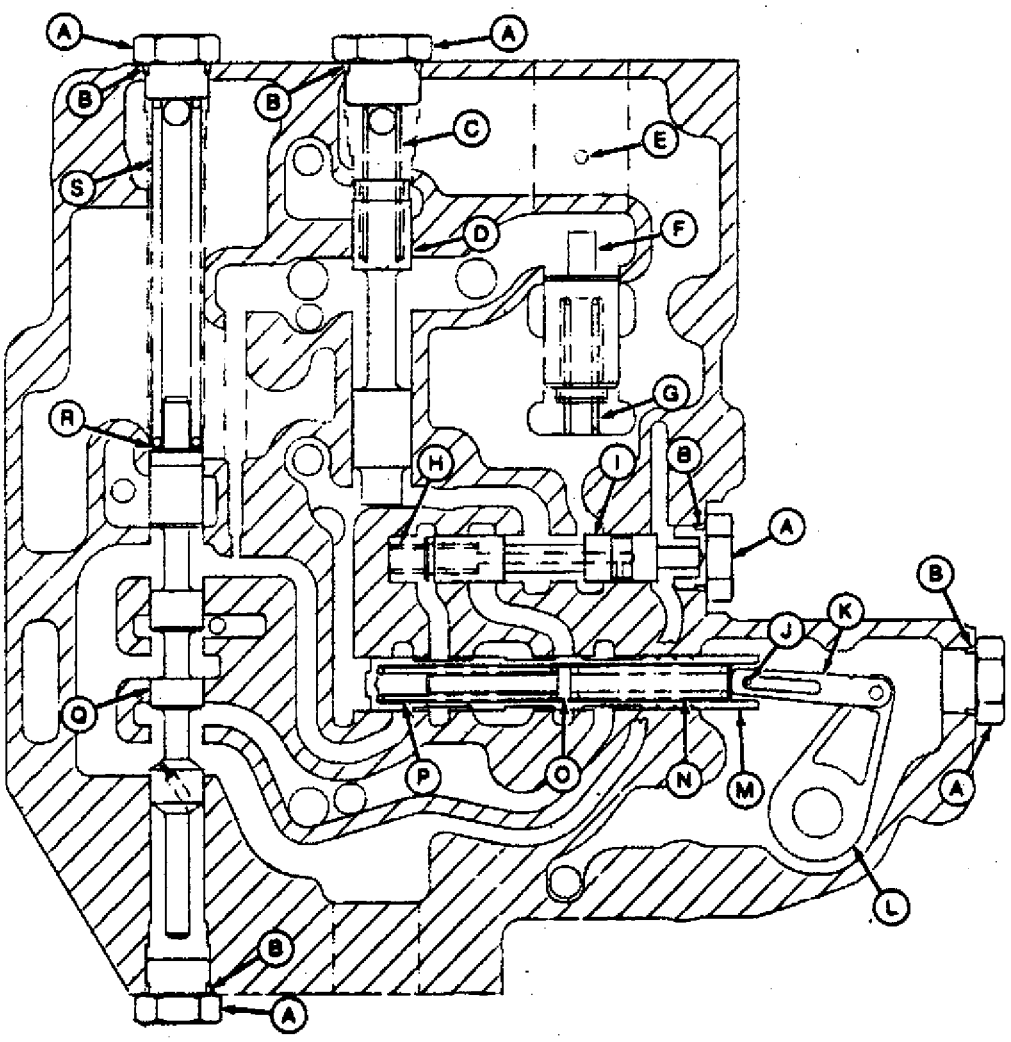



RW14447 -UN-24FEB89

**A—Oil Cooler Lines**
**B—Lube Oil Pressure Sensor**
**C—Clutch Valve Spring**
**D—Oil Filter Line**

RX14335010,4 -19-12APR90

## TRANSMISSION CONTROL VALVE—CROSS-SECTIONAL VIEW

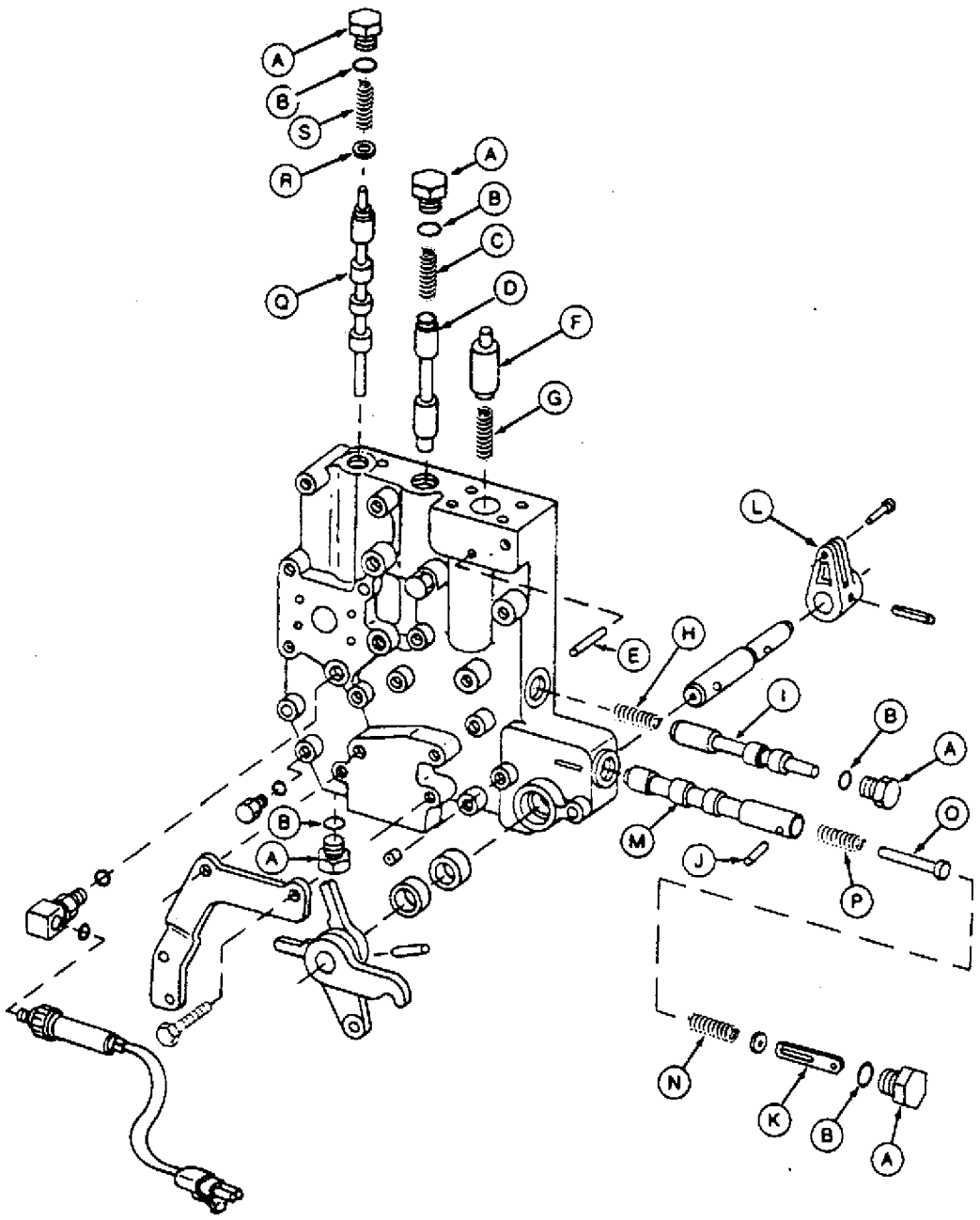



50
10
4

**A—Plug**
**B—O-Ring**
**C—Spring**
**D—Clutch Lube Valve**
**E—Pin**
**F—Lube Relief Valve**
**G—Spring**
**H—Spring**
**I—Engagement Override Valve**
**J—Pin**
**K—Link**
**L—Inner Arm**
**M—Clutch Valve**
**N—Spring**
**O—Headed Pin**
**P—Spring**
**Q—Pressure Regulating Valve**
**R—Shims**
**S—Spring**

RX14335010,5 -19-12APR90

## TRANSMISSION CONTROL VALVE—EXPLODED VIEW




RW14448 -UN-24FEB89

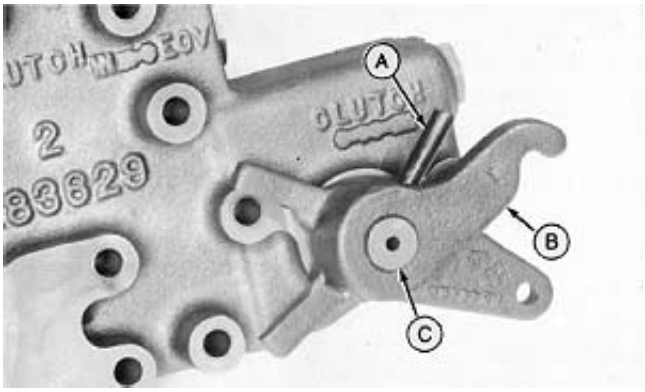
**A—Plug**
**B—O-Ring**
**C—Spring**
**D—Clutch Lube Valve**
**E—Pin**
**F—Lube Relief Valve**
**G—Spring**
**H—Spring**
**I—Engagement Override Valve**
**J—Pin**
**K—Link**
**L—Inner Arm**
**M—Clutch Valve**
**N—Spring**
**O—Headed Pin**
**P—Spring**
**Q—Pressure Regulating Valve**
**R—Shims**
**S—Spring**

RX14335010,6 -19-12APR90

## DISASSEMBLE, INSPECT, AND ASSEMBLE TRANSMISSION CONTROL VALVE HOUSING

1. Push pin (A) out to remove operating arm (B).

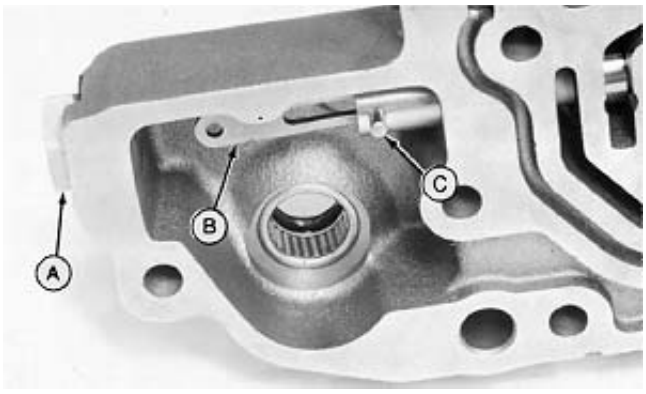
2. Pull inner arm and shaft (C) out the back of valve housing.




RX14335010,7 -19-12APR90

3. Remove plug (A).

4. Push link (B) into valve (against spring pressure) to remove pin (C) and remove clutch valve.




RX14335010,8 -19-12APR90

5. Inspect clutch valve springs (A) and (B).

**NEW SPRING SPECIFICATION**

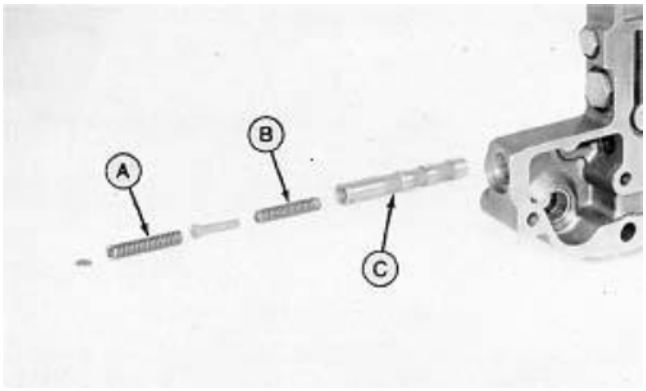
| | |
|---|---|
| Outer (Longer) Spring (A) | |
| Free Length | 56 mm (2.2 in.) (approximate) |
| Test Length | 47 mm at 201—237 N (1.85 in. at 45—53 lb force) |
| Inner (Shorter) Spring (B) | |
| Free Length | 54 mm (2.1 in.) (approximate) |
| Test Length | 39 mm at 113—133 N (1.5 in. at 25—30 lb force) |

*NOTE: Inner spring is shorter and must be installed first.*

6. Inspect valve (C) OD and valve bore ID for damage or wear.

**SPECIFICATION**

| | |
|---|---|
| Valve OD | 15.840—15.856 mm (0.6236—0.6243 in.) |
| Bore ID | 15.881—15.907 mm (0.6252—0.6263 in.) |




RX14335010,9 -19-12APR90

7. Remove plug (B) to remove engagement override valve (A) and spring (D).

**NEW SPRING SPECIFICATION**

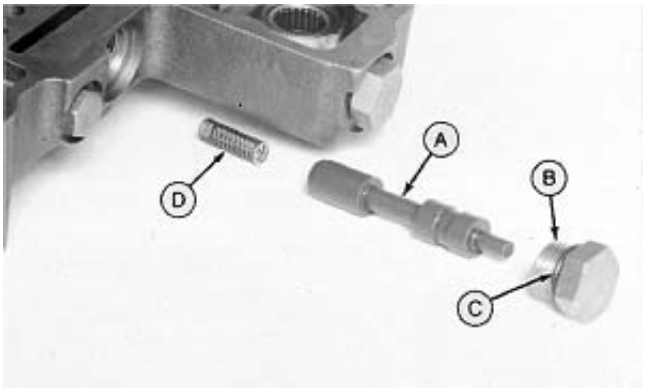
| | |
|---|---|
| Free Length | 29.5 mm (1.2 in.) (approximate) |
| Test Length | 21 mm at 26—32 N (0.8 in. at 5.8—7.1 lb force) |

8. Inspect valve OD and bore ID for damage or wear.

**SPECIFICATION**

| | |
|---|---|
| Valve OD | 13.916—13.932 mm (0.5479—0.5485 in.) |
| Bore ID | 13.987—14.013 mm (0.5507—0.5517 in.) |

9. Replace O-ring (C) on plug.




-UN-24FEB89
RW14452

**A—Engagement Override Valve**
**B—Plug**
**C—O-Ring**
**D—Spring**

RX14335010,10 -19-12APR90

10. Remove plug (A) to remove clutch lube valve spring (B) and valve (C).

**NEW SPRING SPECIFICATION**

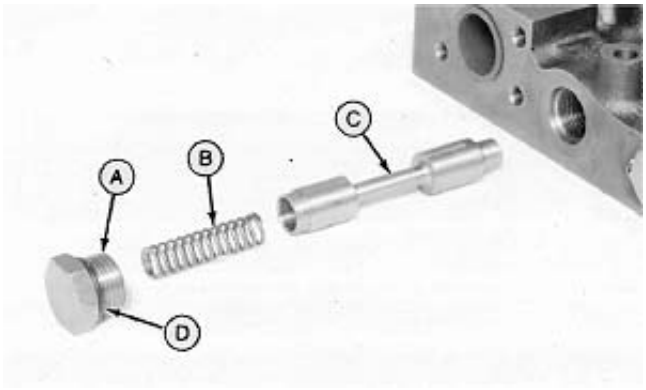
| | |
|---|---|
| Free Length | 48 mm (1.9 in.) (approximate) |
| Test Length | 30 mm at 55—67 N (1.2 in. at 12.5—15.0 lb force) |

11. Inspect valve OD and bore ID for damage or wear.

**SPECIFICATION**

| | |
|---|---|
| Valve OD | 17.399—17.425 mm (0.6850—0.6860 in.) |
| Bore ID | 17.469—17.495 mm (0.6878—0.6888 in.) |

12. Replace O-ring (D) on plug.




-UN-24FEB89
RW14453

**A—Plug**
**B—Spring**
**C—Clutch Lube Valve**
**D—O-Ring**

RX14335010,11 -19-12APR90

13. Remove plug (E), pressure regulating valve (C), shim (B) and spring (A).

**NEW SPRING SPECIFICATION**

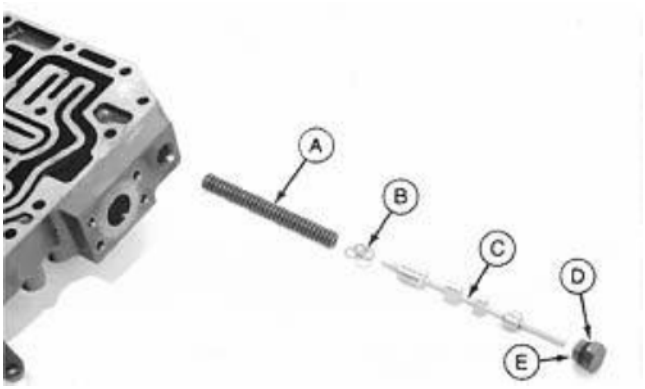
| | |
|---|---|
| Free Length | 126 mm (5 in.) (approximate) |
| Test Length | 100 mm at 308—376 N (3.9 in. at 69—85 lb force) |

14. Inspect valve OD and bore ID for damage or wear.

**SPECIFICATION**

| | |
|---|---|
| Valve OD | 15.821—15.834 mm (0.6229—0.6235 in.) |
| Bore ID | 15.862—15.888 mm (0.6245—0.6255 in.) |

15. Replace O-ring (D) on plug.




RW14454 -UN-16MAR90

**A—Spring**
**B—Shim**
**C—Pressure Regulating Valve**
**D—O-Ring**
**E—Plug**

RX14335010,12 -19-12APR90

16. Pull retaining pin (A) out, to remove lube relief valve (B) and spring (C).

**NEW SPRING SPECIFICATION**

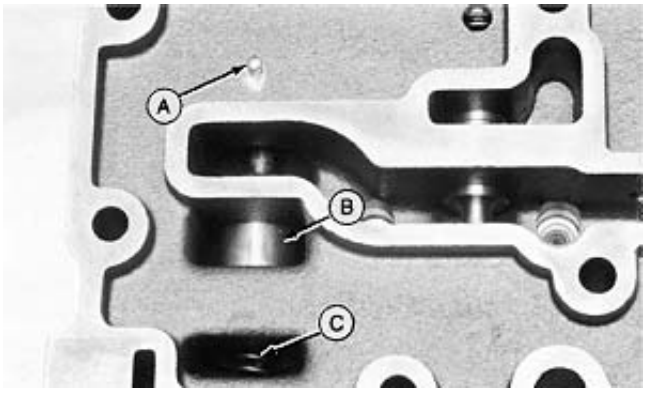
| | |
|---|---|
| Free Length | 52 mm (2.0 in.) (approximate) |
| Test Length | 37 mm at 20—24 N (1.5 in. at 4.5—5.5 lb force) |

17. Inspect valve OD and bore ID for damage or wear.

**SPECIFICATION**

| | |
|---|---|
| Valve OD | 22.212—22.238 mm (0.8745—0.8755 in.) |
| Bore ID | 22.288—22.314 mm (0.8775—0.8785 in.) |

18. Install spring (C), valve (B), and retaining pin (A).

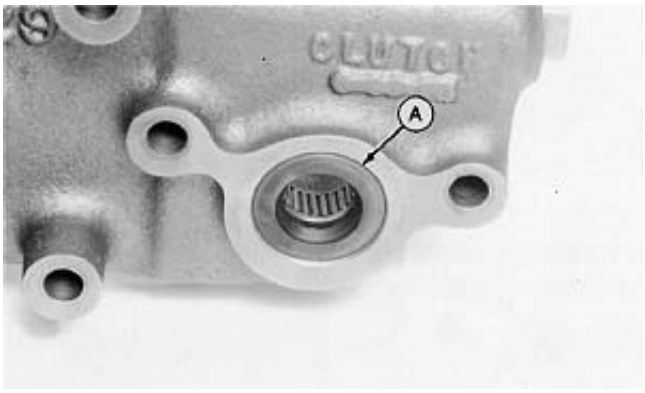



RW14455 -UN-24FEB89

RX14335010,13 -19-12APR90

19. Install seal (A), using a D01045AA Bushing, Bearing and Seal Driver Set, with sealing lip toward inside of housing, flush with finished surface as shown.

20. Coat sealing lip with clean hydraulic oil.




RW14456 -UN-24FEB89

RX14335010,14 -19-12APR90

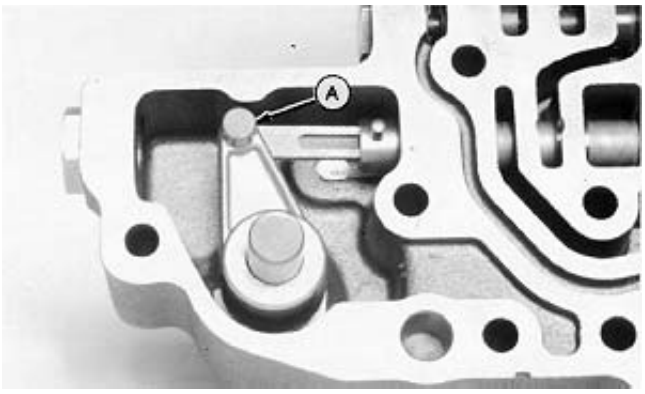
21. Install roller bearing (A) flush with finished surface on inside of housing.

22. Lubricate roller bearing with clean hydraulic oil.


RX14335010,15 -19-15NOV91

*NOTE: Pin is a slip fit.*

23. Install pin (A) making sure it does not fall out during installation of the valve housing assembly.



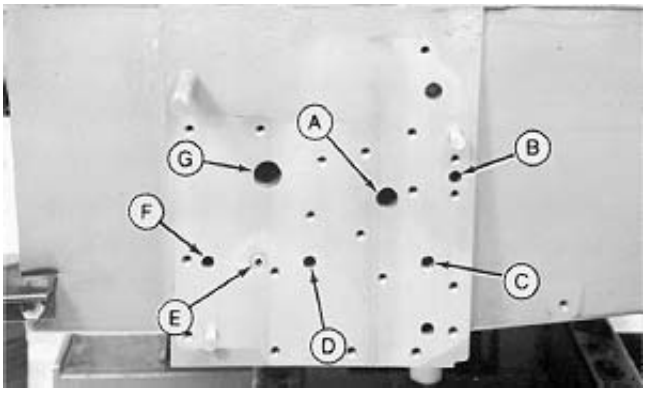

RX14335010,16 -19-12APR90

*NOTE: Hi-Lo control oil port (C) is plugged on 12-speed Syncro tractors.*

24. Check all oil ports and passages to make sure they are open and clean.

25. Coat threads of orifice (E) (also Hi-Lo control oil port plug (C) on 12-speed Syncro tractors) with TY9375 Pipe Sealant before installing.

**A—Clutch Valve Sump**
**B—Clutch Valve Arm Sump**
**C—Hi-Lo Control Oil**
**D—Clutch Engagement Pressure**
**E—Transmission Lube**
**F—Clutch Lube**
**G—Lube Relief Valve Sump**




RX14335010,17 -19-12APR90