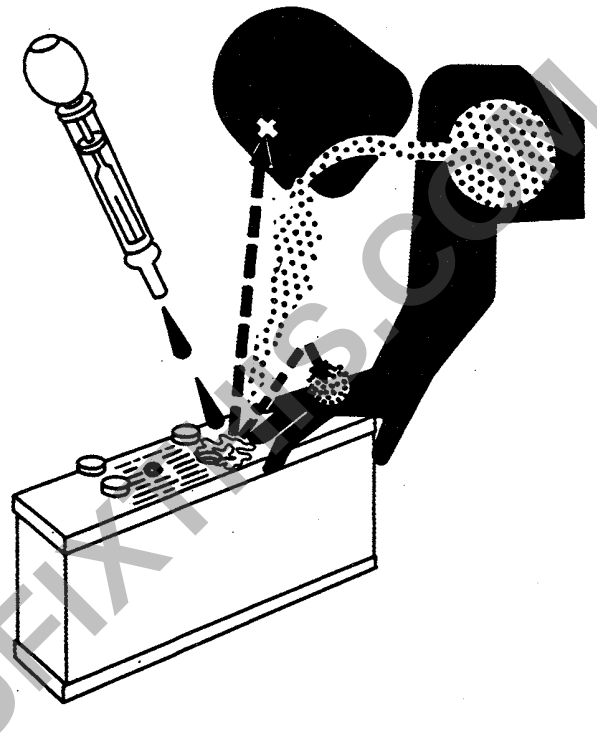
AVOID ACID BURNS

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. Avoid breathing fumes when electrolyte is added.
4. Avoid spilling or dripping electrolyte.

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.

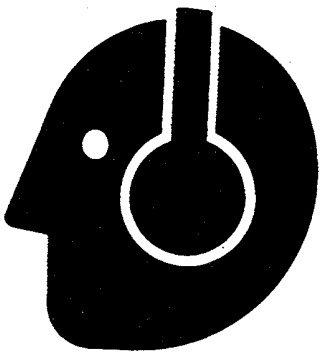


AB6;TS203 U01;ACID 021087

PROTECT AGAINST NOISE

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.

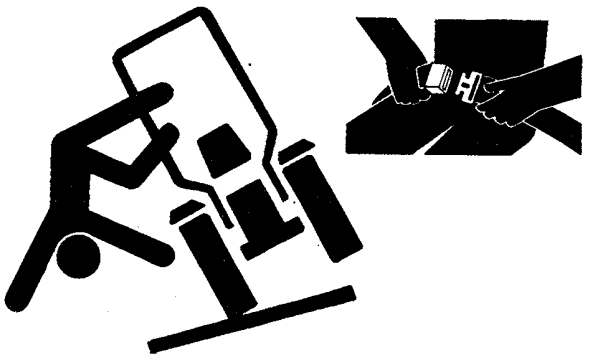


AB6;TS207 053;NOISE 230487

USE SEAT BELT PROPERLY

Use a seat belt when you operate with a roll-over protective structure (ROPS) to minimize chance of injury from an accident such as an overturn.

Do not use a seat belt if operating without a ROPS.

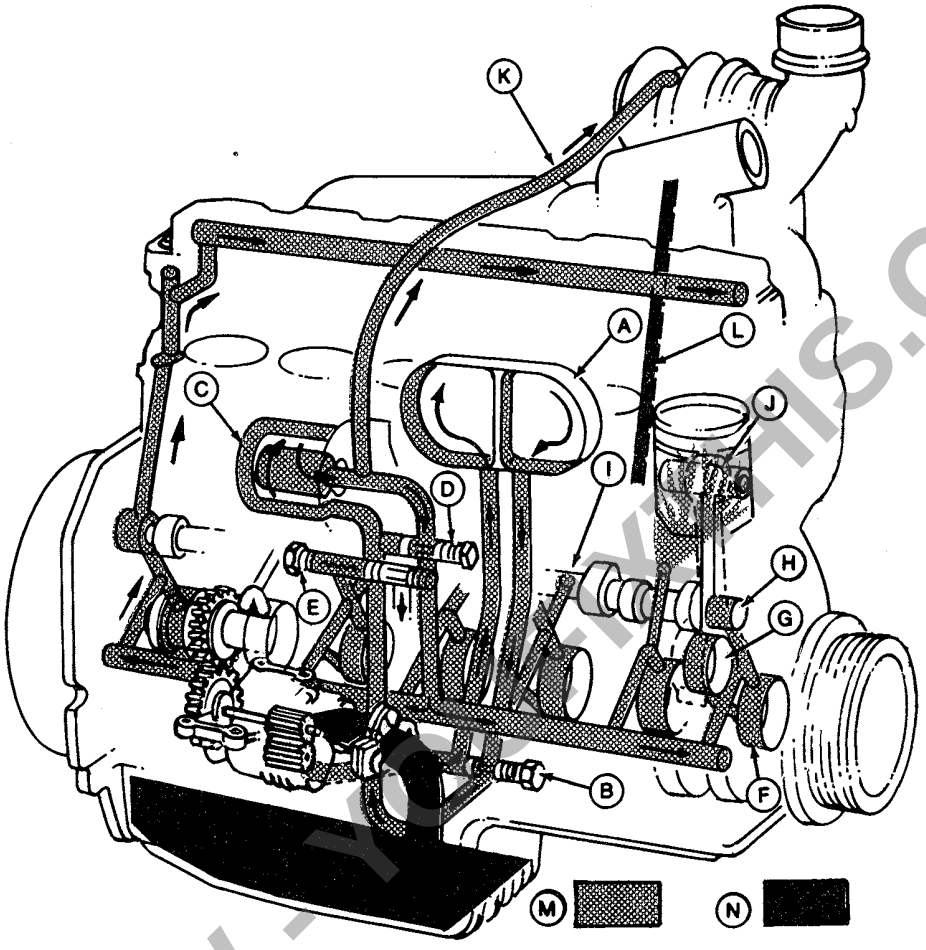


AB6;TS205 053;ROPS1 230487

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LUBRICATION SYSTEM



A—Engine Oil Cooler
B—Oil Cooler Bypass Valve
C—Oil Filter
D—Filter Bypass Valve
E—Oil Pressure Regulating Valve
F—Main Bearings
G—Connecting Rod Bearings
H—Camshaft Bushings
I— Piston Cooling Orifices
J—Piston Pin and Bushing
K—Turbocharger Oil Inlet Line
L—Turbocharger Oil Return Tube
M—Engine Oil Pressure
N—Oil Pan Oil

The engine lubrication system consists of a gear-driven positive displacement pump, oil cooler, oil filter, cooler bypass valves, oil pressure regulating valve and filter bypass valve.

Oil is pumped from the oil pan by the engine oil pump through the engine oil cooler (A) around the oil cooler bypass valve (B) into the engine oil filter (C). On turbocharged engines oil is directed to the top of the oil filter housing through the oil inlet line (K) to lubricate the turbocharger. Oil is then returned through the turbocharger oil return tube (L) and back to the oil pan as non-pressured oil. Passing through the filter, the oil continues around the filter bypass valve (D) and in front of the engine oil pressure regulating valve (E) into the engine oil gallery in the cylinder block. Oil is then distributed, under pressure, to each main bearing (F) and piston cooling orifice (I). Oil from the piston cooling orifices lubricates the piston pin and bushing (J) through a hole in the connecting rod.

Cross-drilled passages in the crankshaft distribute oil from the main bearing journals to the connecting rod journals to lubricate connecting rod bearings (G). Numbers 1, 3, 5, and 7 main bearing supports are also drilled to lubricate the four camshaft bushings (H). A drilled passage from the rear camshaft bushing through the cylinder block and cylinder head provides lubrication to the rocker arm shaft.

A87;RG4149 S11;22005 K 090882

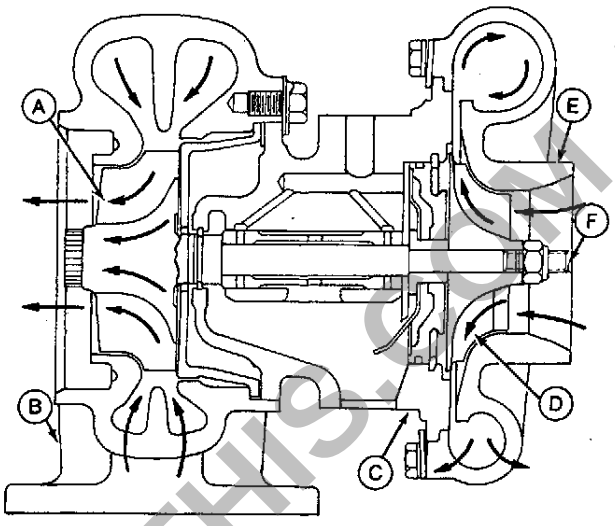
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HOW THE TURBOCHARGER WORKS

Exhaust gases from the engine pass through the turbine housing (B) causing the shaft (F) to rotate before the exhaust gas is discharged to the atmosphere.

The compressor wheel (D), also mounted on shaft (F), rotates in the compressor housing (E). Inlet air is drawn into the housing, where it is compressed and delivered to engine cylinders.



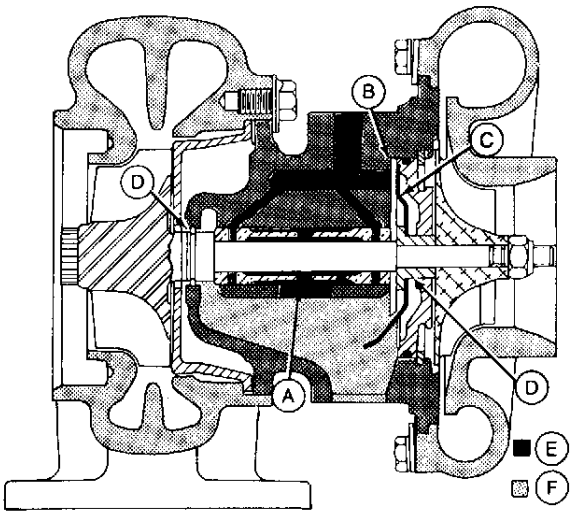
A—Turbine Wheel
B—Turbine Housing
C—Center Housing
D—Compressor Wheel
E—Compressor Housing
F—Shaft

Schwitzer Air Flow
(AiResearch Air Flow Similar)

A88;R28273 N S11;23005 L 290182

Engine oil under pressure from the engine lubrication system is pumped through passage in the bearing housing and directed to the bearing (A), thrust plate (B), and thrust sleeve (C). Oil is sealed from the compressor and turbine by a piston ring (D) at both ends of bearing housing.

The turbocharger contains a single floating bearing that has clearance between the bearing O.D. and the housing wall as well as a clearance between the bearing I.D. and the shaft O.D. These clearances are lubricated by the oil supply and the bearings are protected by a cushion of oil. Discharge oil drains by gravity from the bearing housing to the engine crankcase.



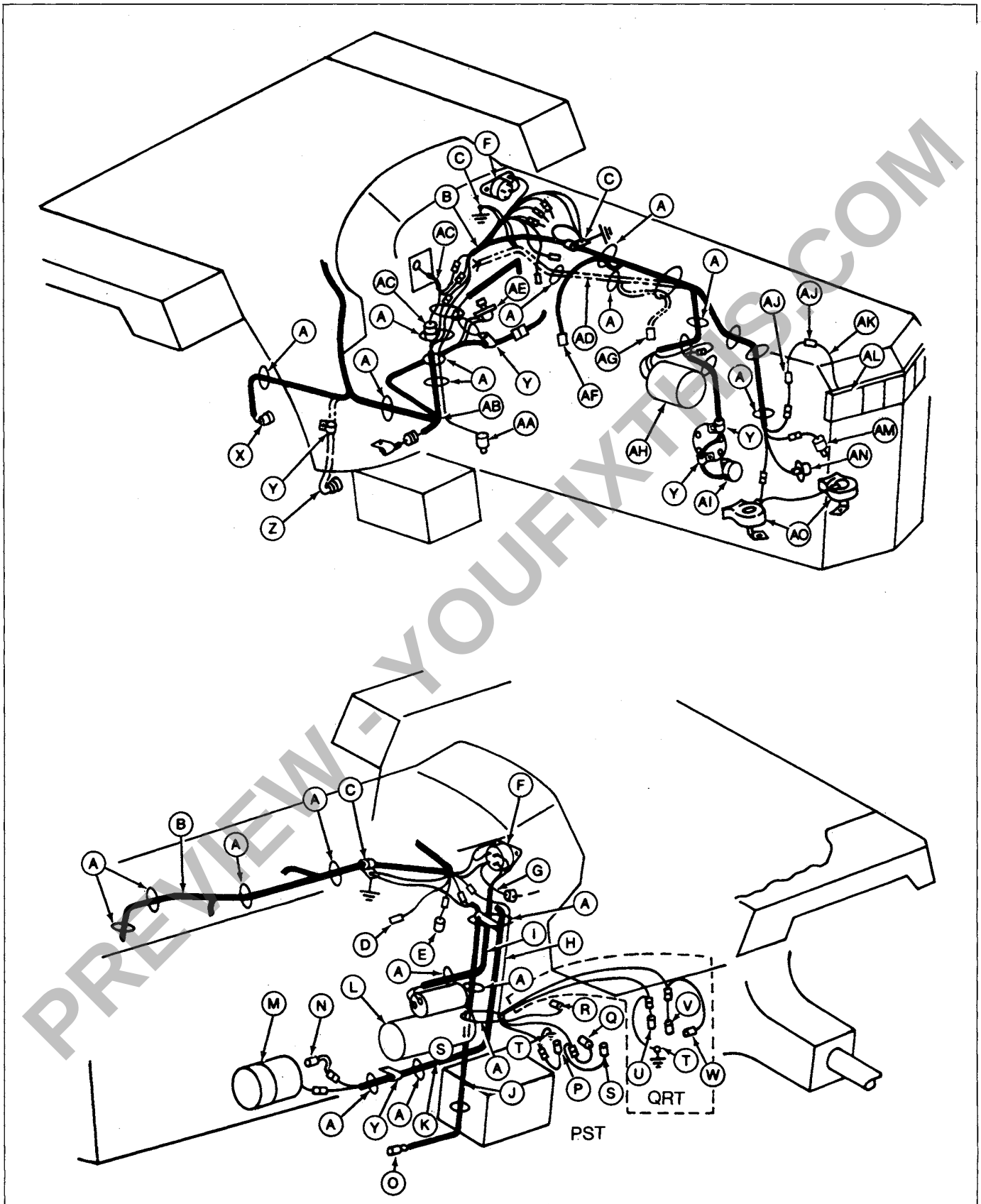
A—Bearing
B—Thrust Plate
C—Thrust Sleeve
D—Pistson Ring
E—Pressure Oil
F—Discharge Oil

Schwitizer Turbocharger Lubrication
(AIResearch Lubrication Similar)

A88;RG4127 S11;23005 B 110882

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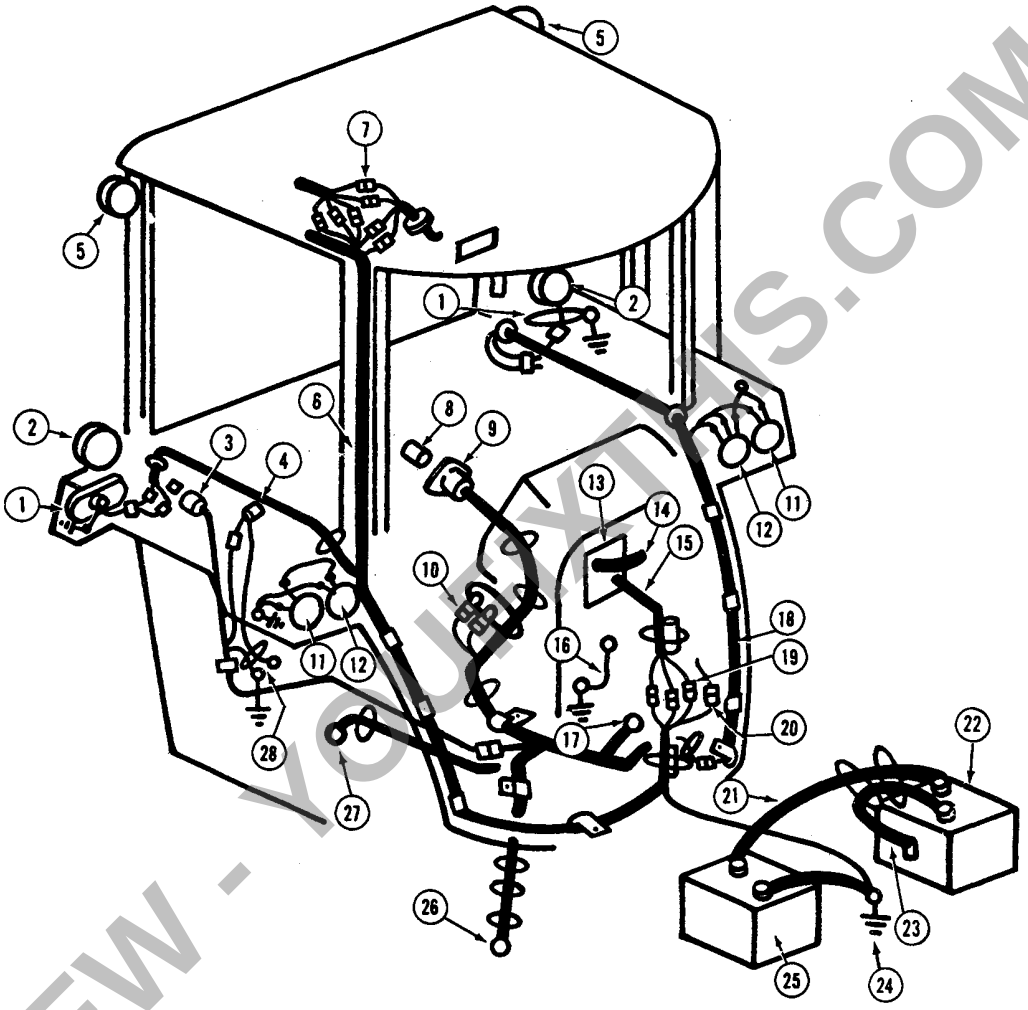
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Harness Diagram of Tractor Equipped with Gauge Cluster and Analog Tachometer

AE2;RW6741 U40;040005 KX3 170682

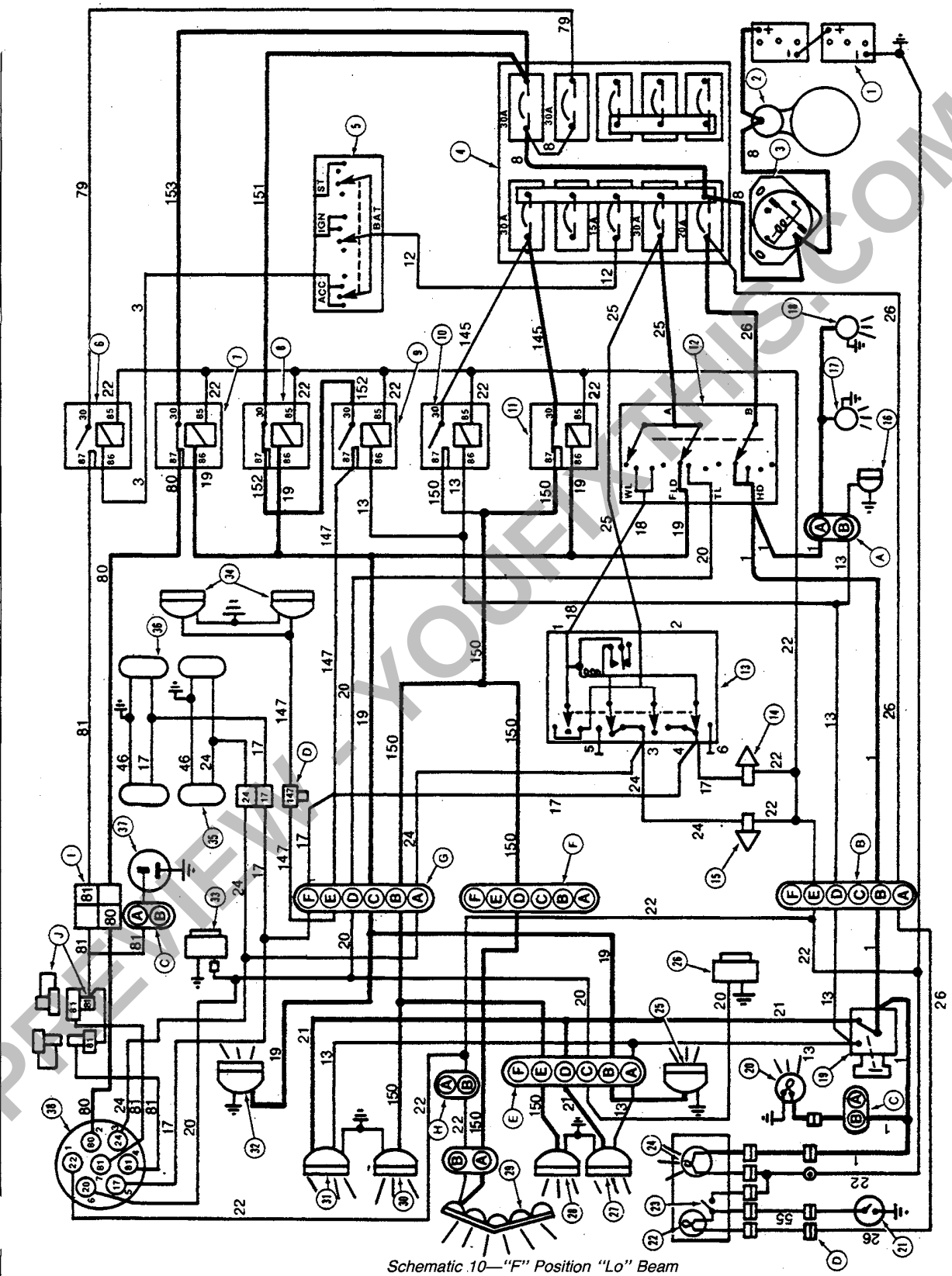
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SOUND-GARD Body Component Identification and Harness Routing

AH6;RW1158 6L 40U;240007 0X3 270186

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Schematic 10—"F" Position "Lo" Beam
(Phase II)

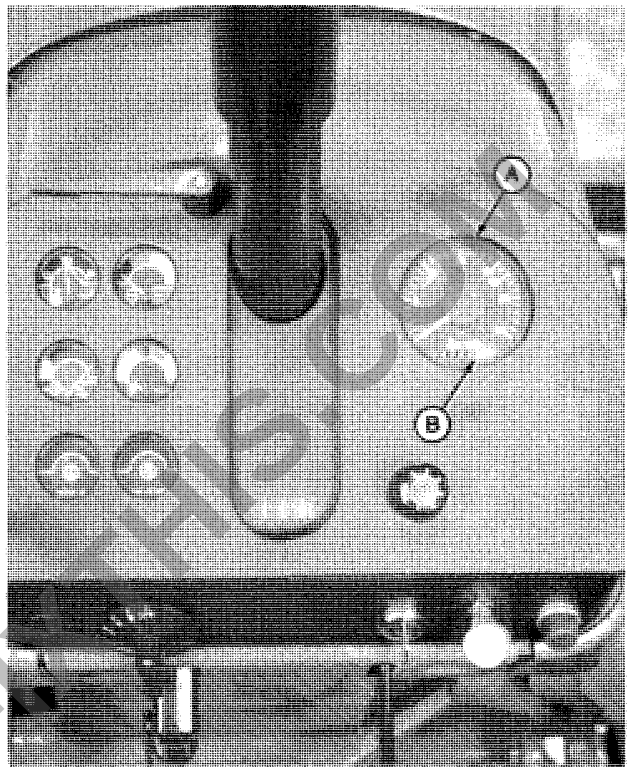
AH7;RW1296 8L 40U;240107 JX3 091187

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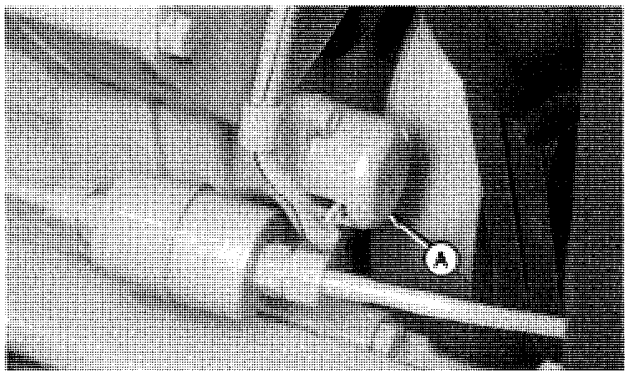
HOW THE ANALOG TACHOMETER WORKS

The analog tachometer (A) is an electronic tachometer with a dial pointer display. The analog tachometer displays engine rpm and the hourmeter (B) records true engine hours. The hourmeter operates only when engine rpm is sensed.



AI1;RW7562 40U;240032 AX3 270782

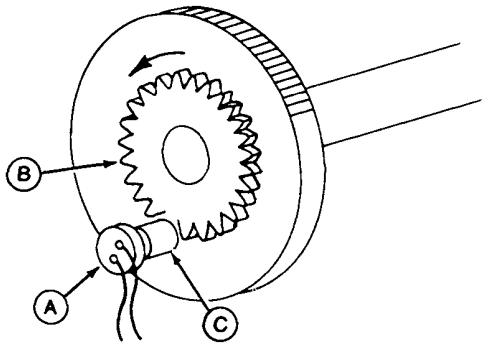
The engine rpm sensor (A) is located on the lower right side of the engine block on the timing gear cover.



AI1;RW7645 40U;240032 BX3 270782

The speed pickup (A) is a reluctance sensor that outputs voltage of one polarity as ferrous metal (reluctor) (B) approaches the pickup pole piece (sensor) (C) and output voltage of the opposite polarity as the metal moves away from the pole piece.

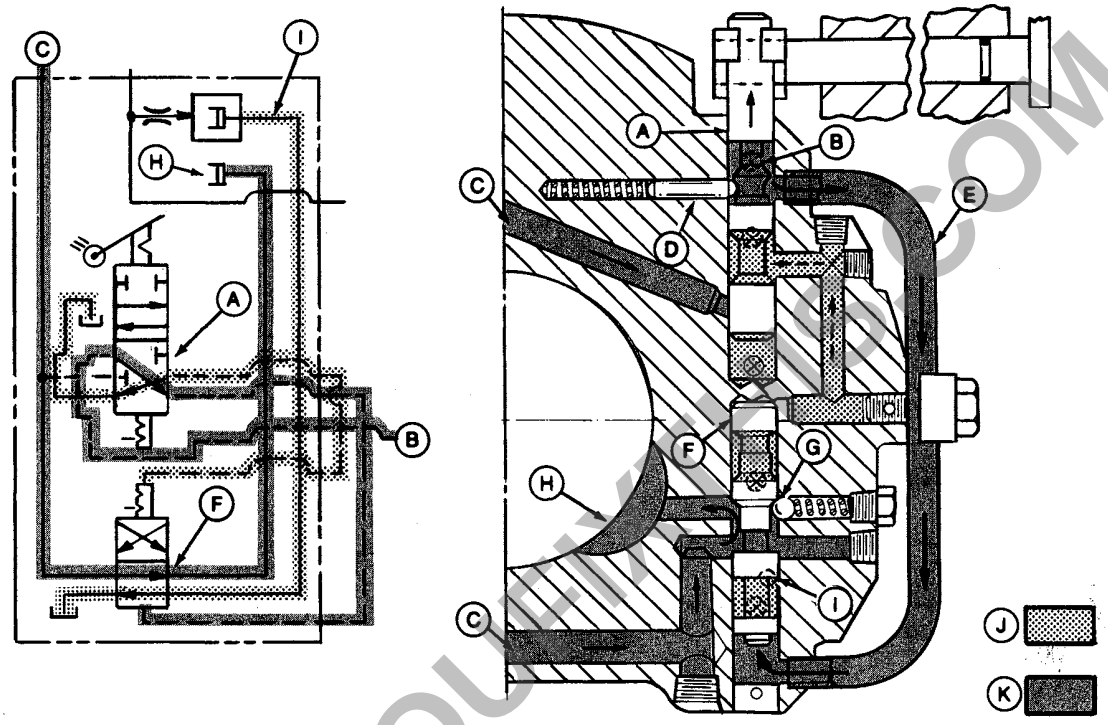
The voltage increases with the speed of the metal which results in increased signal strength.



AI1;RW4203 40U;240032 CX3 270782

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DIRECT DRIVE CLUTCH OPERATION (40,42,4450)



A—Control Valve
B—Clutch Pressure Oil
C—System Pressure Oil
D—Detent Pin
E—Oil Line
F—Shift Valve
G—Detent Ball
H—To Clutch Piston
I—From Brake Piston
J—Pressure Free Oil
K—Transmission Control Pressure Oil

Shifting the control valve (A) up with the speed selector lever blocks the flow of system pressure oil (C) through the valve. Clutch pressure oil (B) flows through the valve and to the bottom of the shift valve (F), shifting it up.

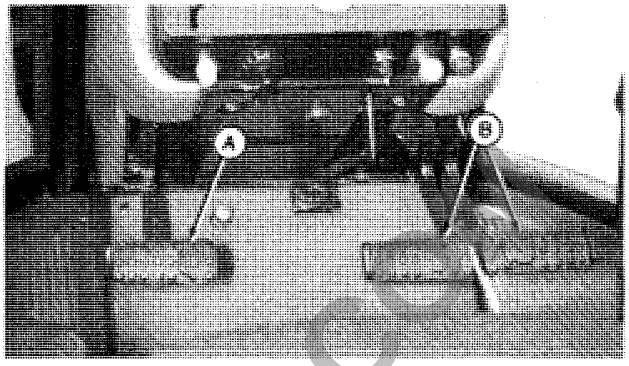
This allows system pressure oil to flow through it to engage the direct drive clutch (H). The "OFF" element (Brake, I) is routed to sump through the shift valve.

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9. With engine running at slow idle, depress clutch pedal (A).

10. Apply both brake pedals (B).

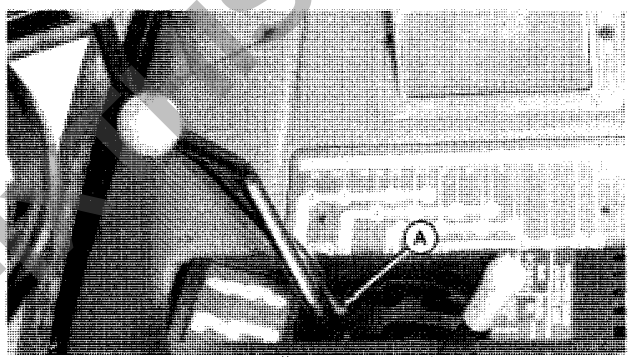


AX8;RW8006 50U;250060 RX2 210782

11. Move range selector lever to 'D' range.

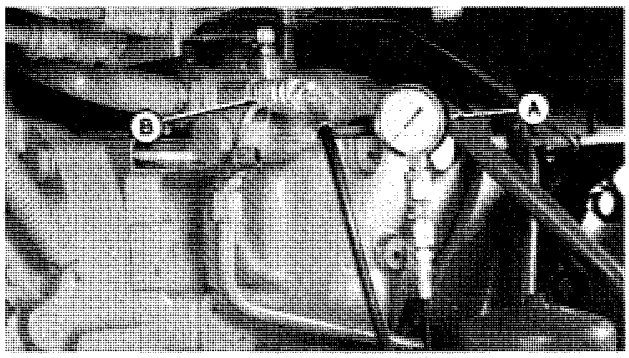
12. Pull shift lever rearward to 'TOW' (A) position.

13. Slowly release clutch pedal.



AX8;RW7973 50U;250060 SX2 110887

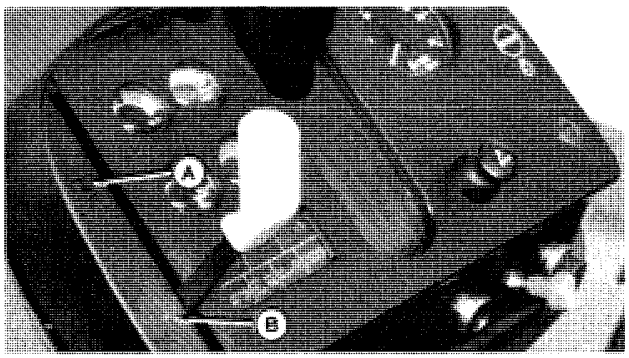
14. Adjust engine speed to obtain 70 kPa (0.7 bar) (10 psi) lube pressure (B) reading.



AX8;RW7972 50U;250060 TX2 030987

15. Engage PTO clutch (A), then brake (B). Note lube pressure reading in each position. If reading changes more than 20 kPa (0.2 bar) (3 psi), there is excessive leakage in circuit with the lower pressure.

16. Position PTO lever into position which gives highest lube pressure and continue test.

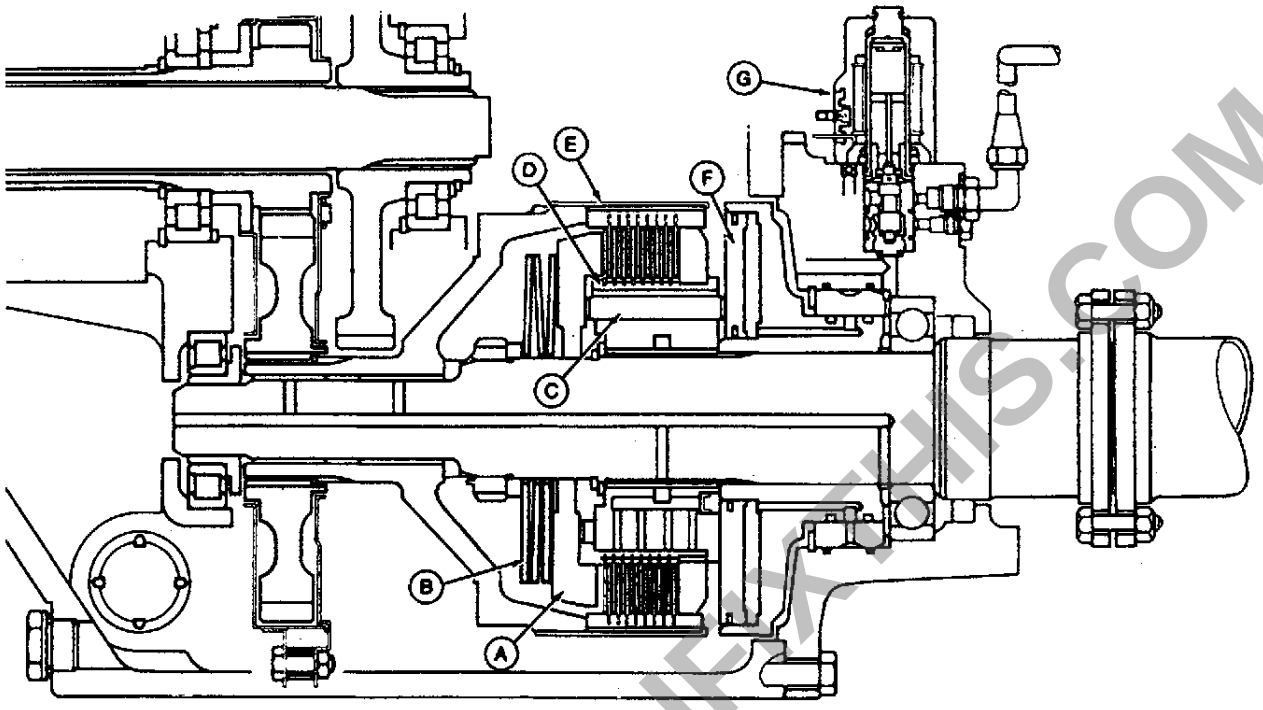


AX8;RW7974 50U;250060 VX2 210782

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MFWD CLUTCH OPERATION



A—Release Plate
B—Engagement Springs
C—Pin
D—Hub with Disks
E—Drum with Plates
F—Release Piston
G—Solenoid Valve

The MFWD clutch is spring engaged and hydraulically disengaged. This means that the MFWD is engaged by shutting off the oil flow to the clutch.

Control oil for the MFWD clutch flows from the pressure regulating valve to the MFWD solenoid valve (G). When the MFWD switch is in the engaged position, no current flows to the solenoid. The valve spring holds the valve closed, stopping oil flow to the clutch.

The clutch disks are splined to the hub (D). The separator plates are splined to the always rotating clutch drum (E). When the MFWD is engaged, the Belleville springs (B) compress the disks and plates together, turning the MFWD driveshaft.

When MFWD is disengaged, the solenoid is energized, opening the valve. Pressure oil flows through the valve and clutch housing to the clutch drum. The release piston (F) is forced against pin (C) which forces release plate (A) to compress Belleville engagement srings (A). This removes pressure from the disks and plates. The clutch drum with plates (E) still turns but power is not transfered to MFWD driveshaft.

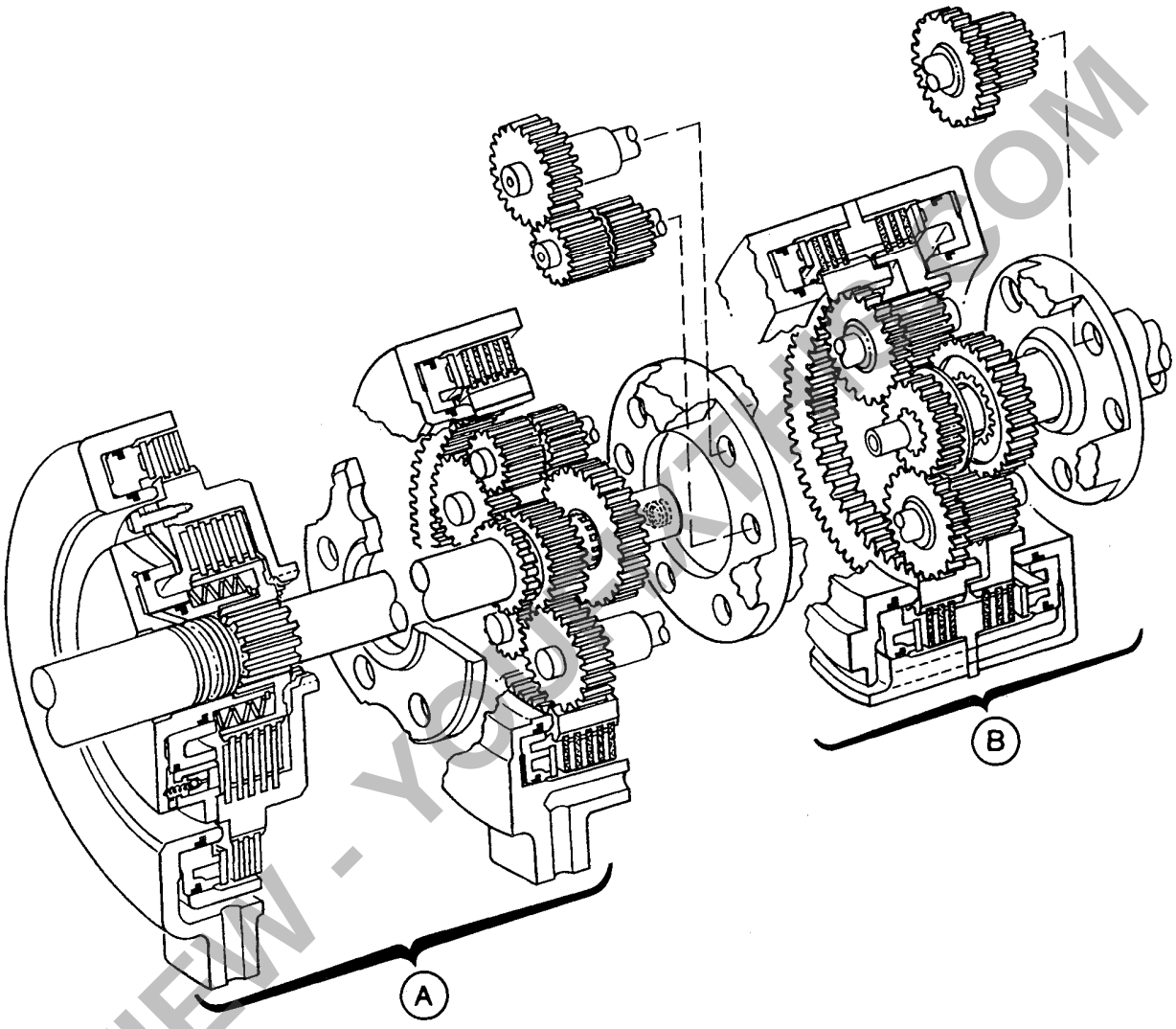
The solenoid valve is equipped with a check ball which isolates the MFWD clutch control circuit. This prevents momentary pressure drops from cycling the clutch on and off.

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AL1;RW1015 2 50U;255030 BC4 261083

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OUTPUT PLANETARY OPERATION



The output planetary is divided into two sections. The front section (B-B1 and B2) is referred to as the speed compound planetary. The rear section (A-B3, B4 and C3) is referred to as the direction compound planetary.

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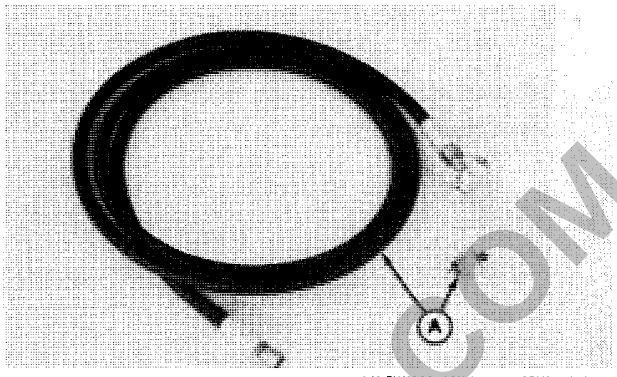
AK8;RW7027 L 50U;255005 KX5 240582

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ACCUMULATOR CHECKING AND RECHARGING PROCEDURE

CAUTION: Use dry nitrogen only. Oxygen (air) and hydraulic oil vapors can ignite under pressure at normal operating temperatures.

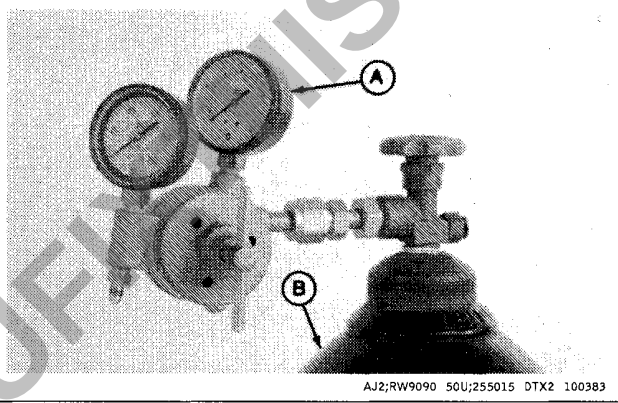
Obtain D-15041NU Nitrogen Charging Kit (A).



AJ2;RW9108 50U;255015 CRX2 100383

Obtain a low pressure regulator (A)* and tank of dry nitrogen (B).

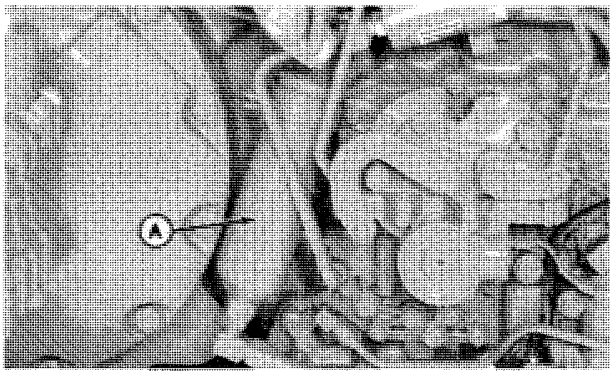
*Obtain from a local welding supplier.



AJ2;RW9090 50U;255015 DTX2 100383

A. CHECKING LEVEL OF CHARGE AND RECHARGING SYSTEM ACCUMULATOR

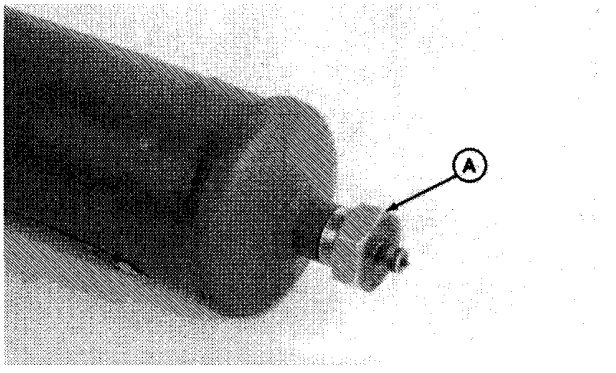
1. Remove accumulator (A).



AJ2;RW9091 50U;255015 DJX2 100383

2. Remove slotted plug from gas port of system accumulator.

3. Install 2364 Adapter (A) with one washer and sure-seal nut into gas port of system accumulator.

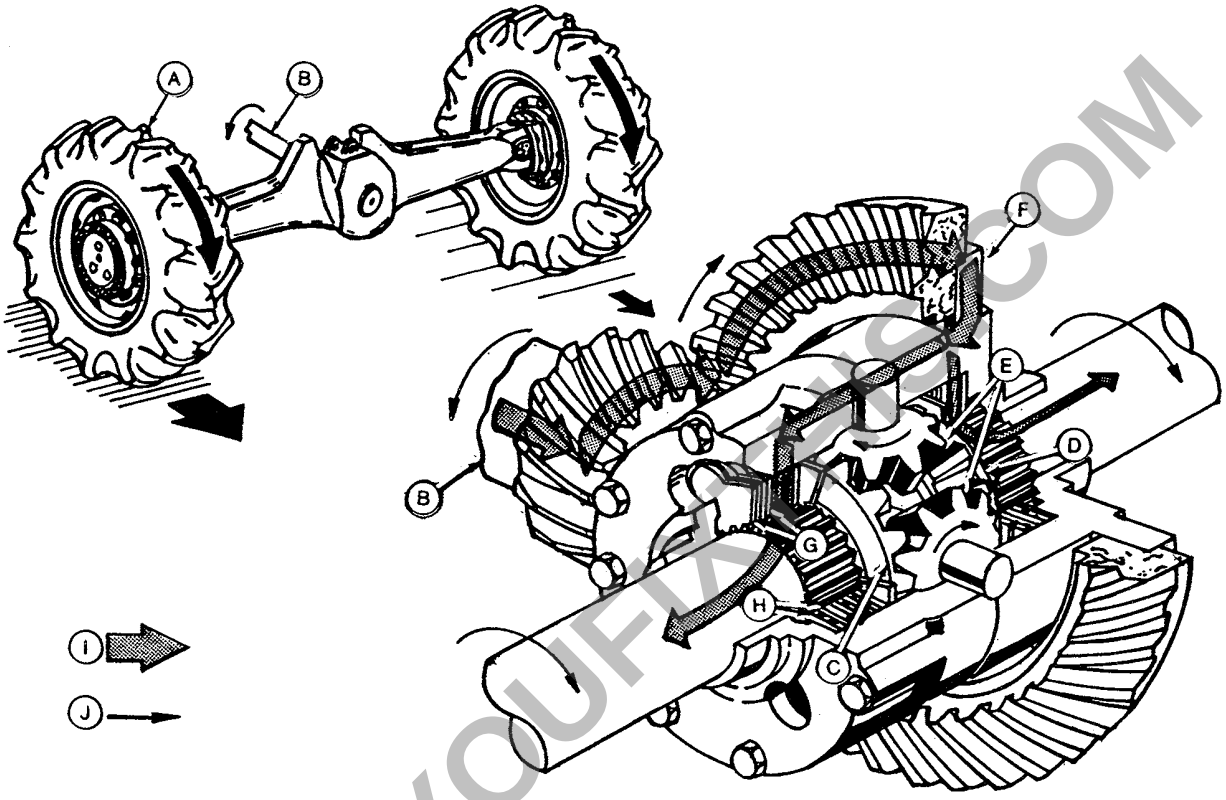


AJ2;RW9092 50U;255015 CTX2 100383

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DIFFERENTIAL OPERATION (UNEQUAL TRACTION)



A—Tire With Most Traction
B—Drive Shaft
C—R.H. Drive Gear
D—L.H. Drive Gear
E—Pinion Gears
F—Differential Housing
G—Clutch Disks
H—Clutch Plates
I—Power Flow
J—Rotation Direction

As available traction changes, tire with better traction (A) can use more power. Self-limiting differential action begins to occur.

When one wheel begins to slip more than the other, wheel with better traction hold its drive shaft (B) and drive gear (C) from rotating. Wheel with less traction provides less resistance against its drive gear (D).

Pinion gears (E) continue to be driven by rotating differential housing (F). These pinion gears push against bevel drive gears as before. Angle of gear teeth tries to force meshed gears apart. On the side with more traction, pinion gears begin to "walk" around drive gear and push against restraining force transmitted from tire. Drive gear is wedged outward and com-presses a clutch pack with disks (G) splined to axle and plates (H) tanged to housing. Disks begin to slip less against plates as compressing force increases. As the pack slippage decreases driveshaft begins to receive driving force through the differential housing.

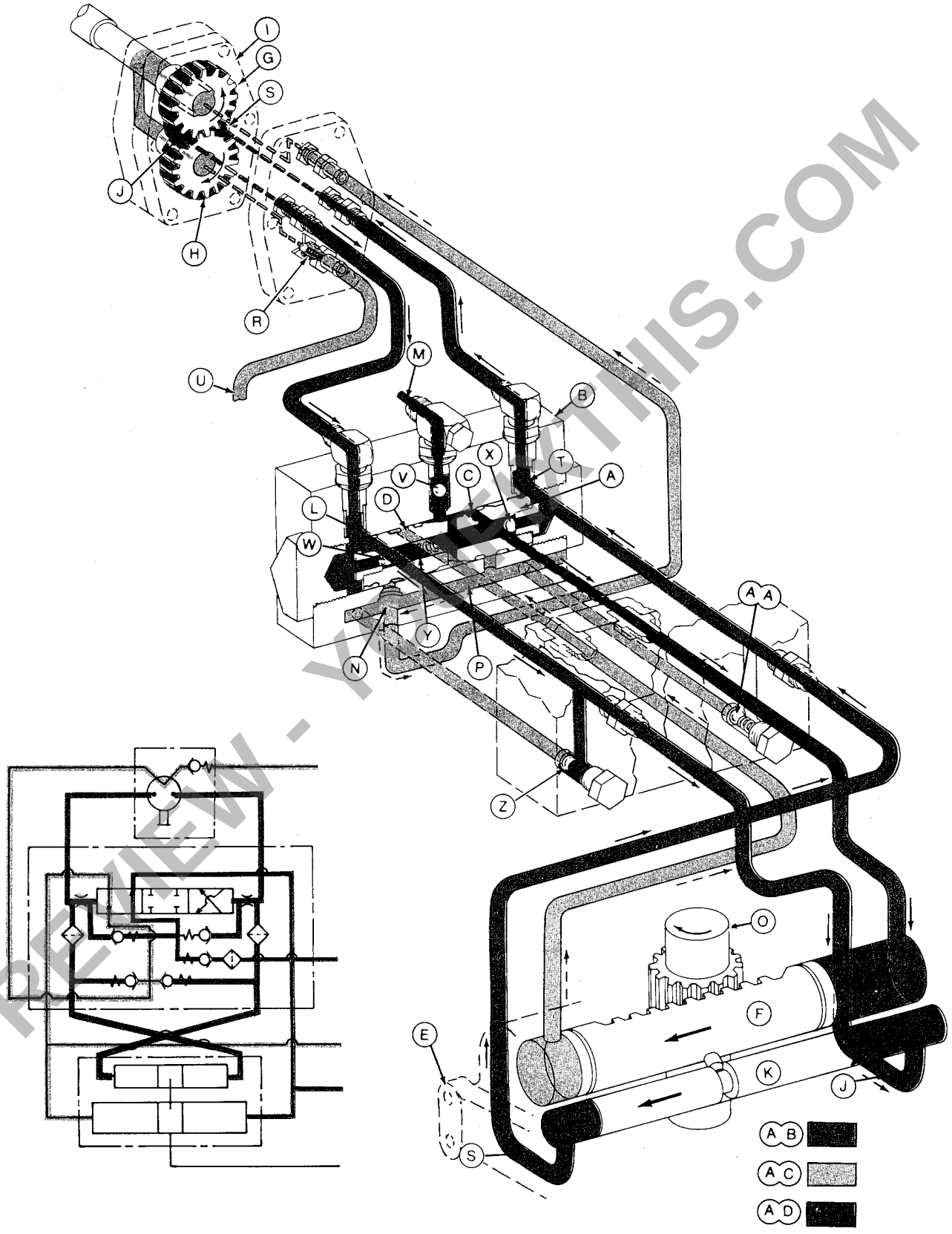
Since the tire with less traction is exerting less force trying to keep its axle from turning, the bevel gear does not force the drive gear outward and its clutch pack increases its slip. Less drive force is being transmitted to this drive shaft. As long as the difference in traction between tires remains the same, the clutch pack on the side with less traction will continue to slip more than pack for other side.

With MFWD engaged, differential works to automatically balance driving power to available traction.

AL1;RW5820L 255030 HX2 180882

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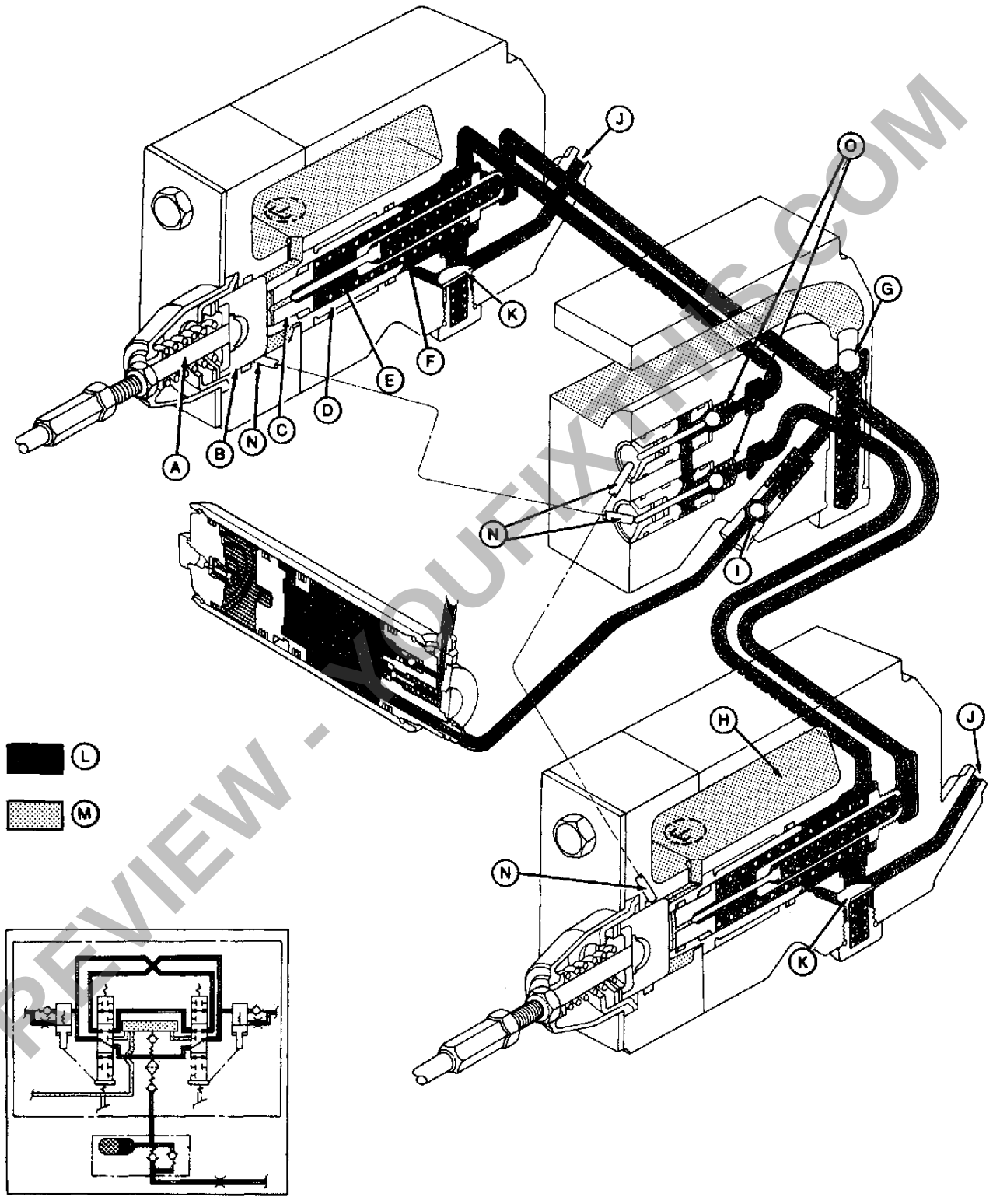


Right Turn Power Steering

AI6;RW6882 60U;260005 JX3 050582

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Dual Pedal Braking

AY3;RW9210C 60U;260010 GX2 230383

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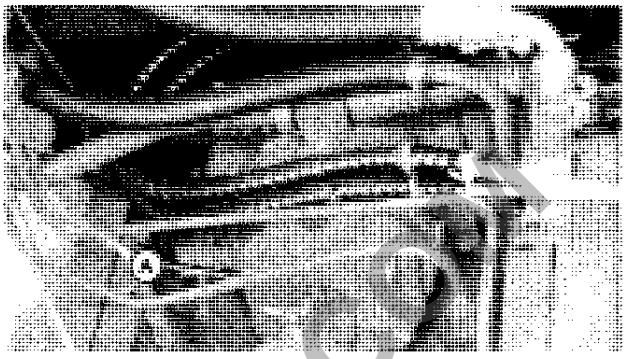
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MAIN HYDRAULIC PUMP FUNCTION

Main hydraulic pump (A) provides high-pressure oil to hydraulic system for various functions.

Main pump is a variable displacement radial piston pump. A stroke control valve controls pump displacement. Pump is driven by engine crankshaft through a special coupler.

4050, 4250, and 4450 Tractors use 50 cm_3 (3.0 cu. in.) pump. 4650 and 4850 Tractors use 65 cm_3 (4.0 cu. in.) pump.



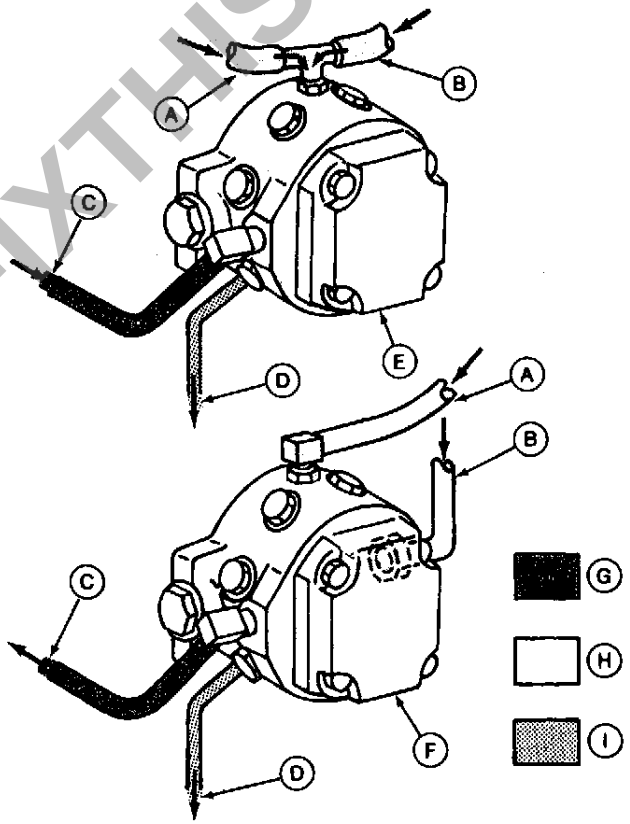
AY8;RW7053 70U;270015 AX2 120887

HOW HYDRAULIC PUMP PIPES ARE ROUTED

Charge oil flows from oil cooler (B) and hydraulic reservoir (A) into inlet ports.

High-pressure oil flows into hydraulic system from pump outlet port (C).

Drain line (D) carries any oil which passes by pump shaft seal to sump.



A—From Hydraulic Reservoir
B—From Oil Cooler
C—To Hydraulic System
D—Drain to Sump
E—50 cm_3 (3.0 cu. in.) Pump
F—65 cm_3 (4.0 cu. in.) Pump
G—High Pressure Oil
H—Charge Oil
I—Pressure-Free Oil

AY8;RWC127 99 70U;270015 BX2 281087

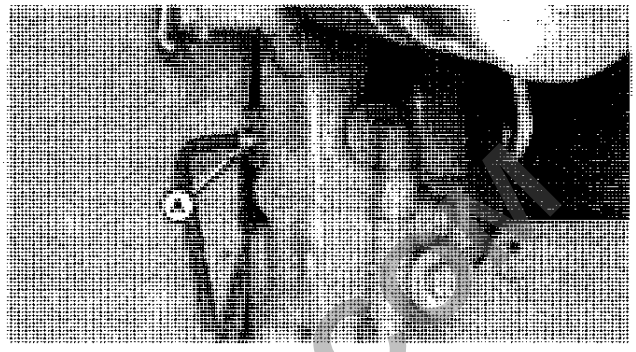
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TEST PRESSURE REGULATING VALVE

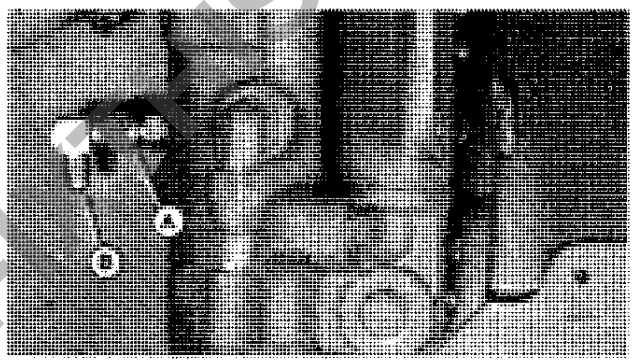
CAUTION: Before removing plug from test port in seat valve housing, sit on tractor seat and move height adjustment lever up and down several times to make sure all pressure oil has been discharged from housing.

1. Remove test port plug (A).



AJ1;RW7049 70U;270035 LX2 110582

2. Install JT05483 elbow (A) and JT05486 fitting (B) from JT05470 Pressure Test Kit in test port.



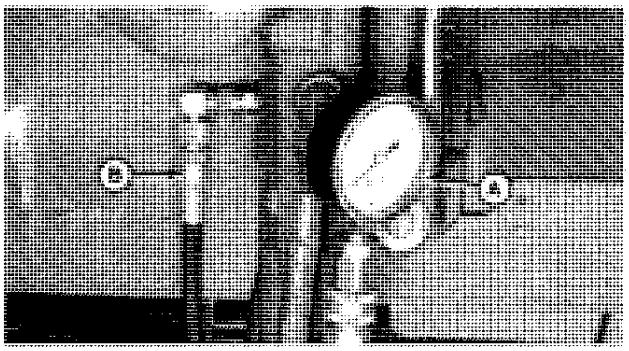
AJ1;RW7050 70U;270035 MX2 110582

3. Connect JT05471 0 to 7000 kPa (0 to 70 bar) (0 to 1000 psi) gauge (A) to JT05498 hose (B).

4. Install hose and gauge to test port.

5. Start tractor and check pressure reading. Pressure should be 2000 to 2200 kPa (20 to 22 bar) (290 to 320 psi).

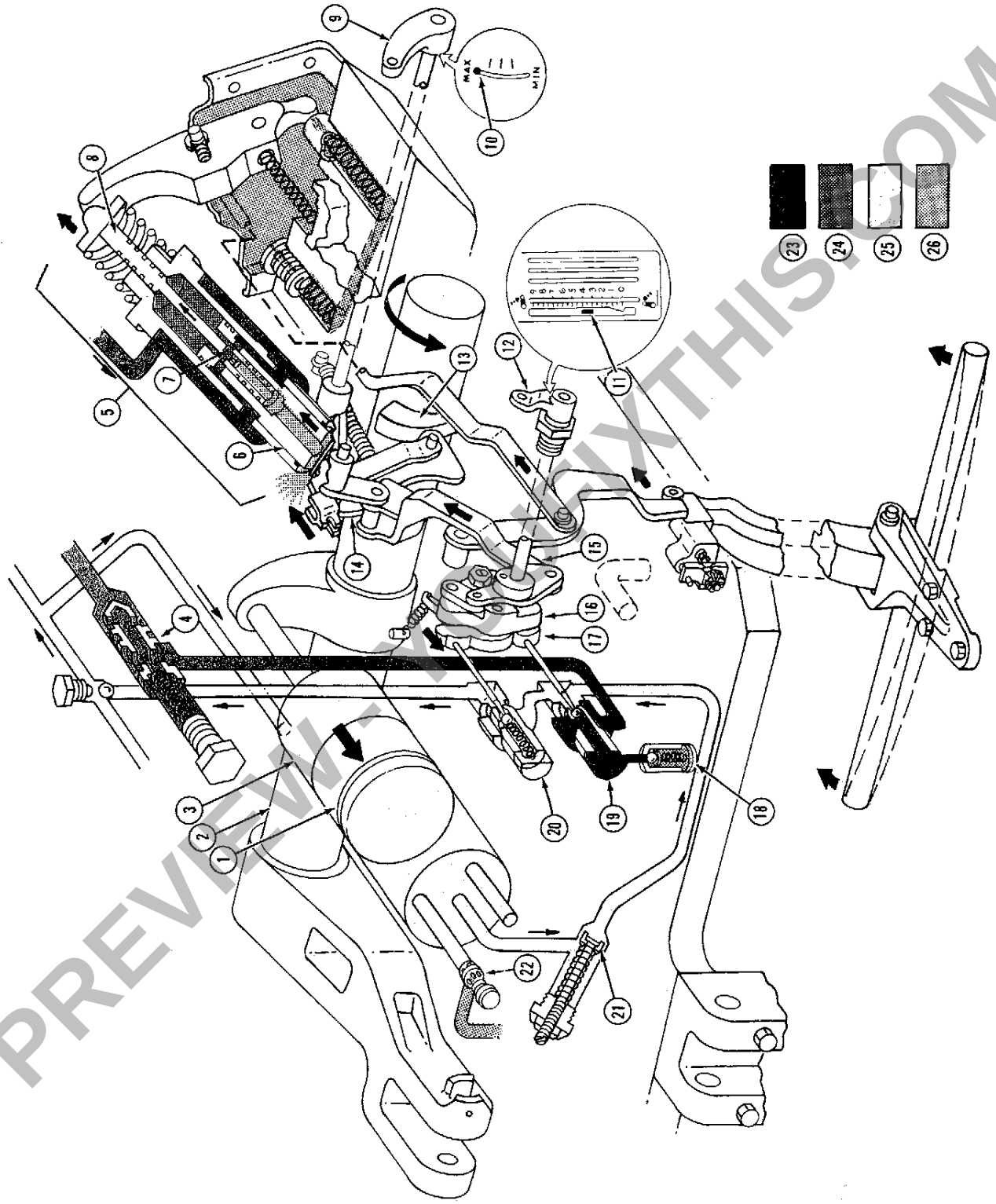
6. Adjust pressure regulating valve if reading is not within specifications.



AJ1;RW7051 70U;270035 MX2 110582

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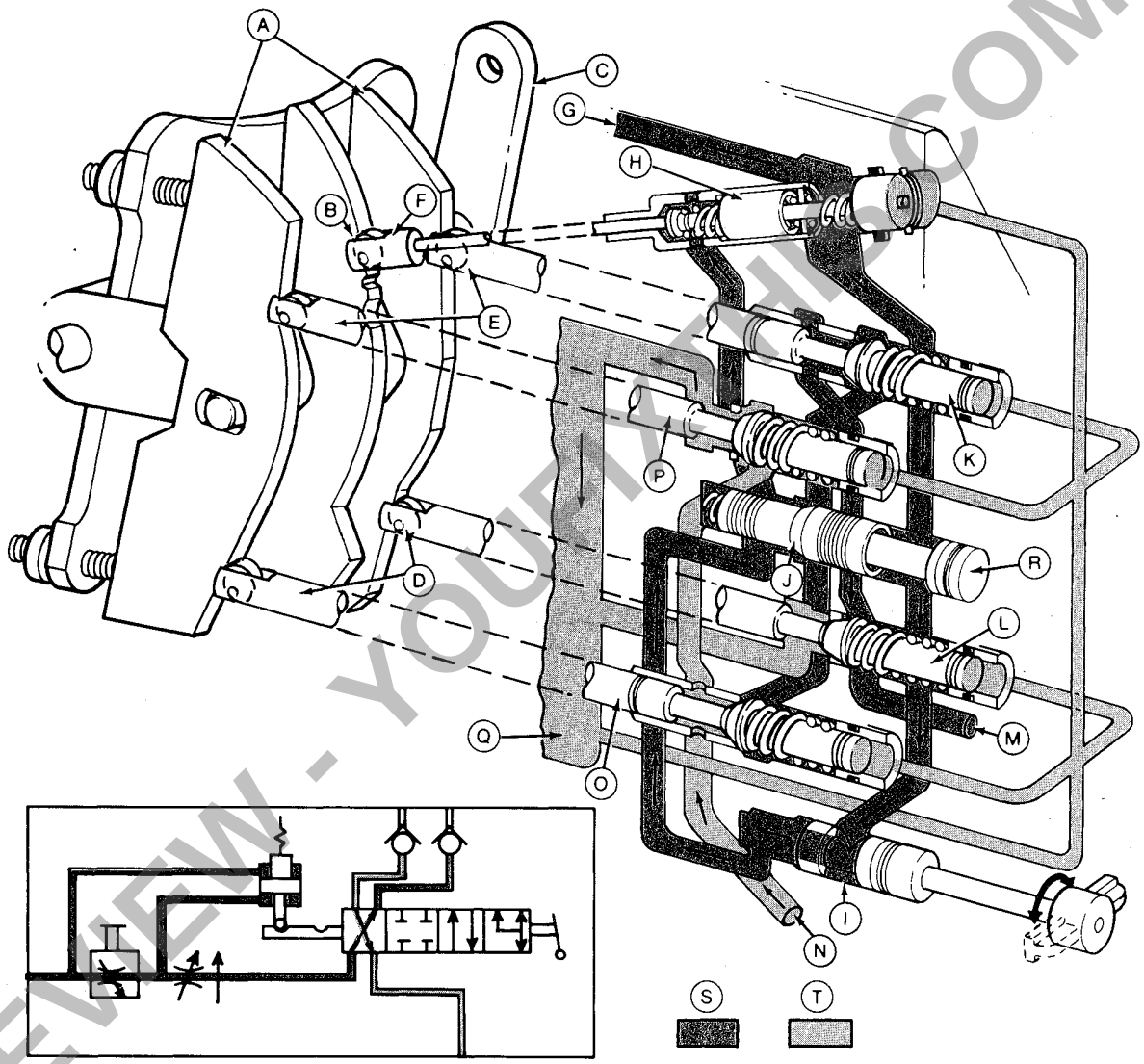


Rockshaft Lower—"MAX" Load Sensing

AZ1;RW7486C 70C;270040 IX2 260782

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SCV—Retract

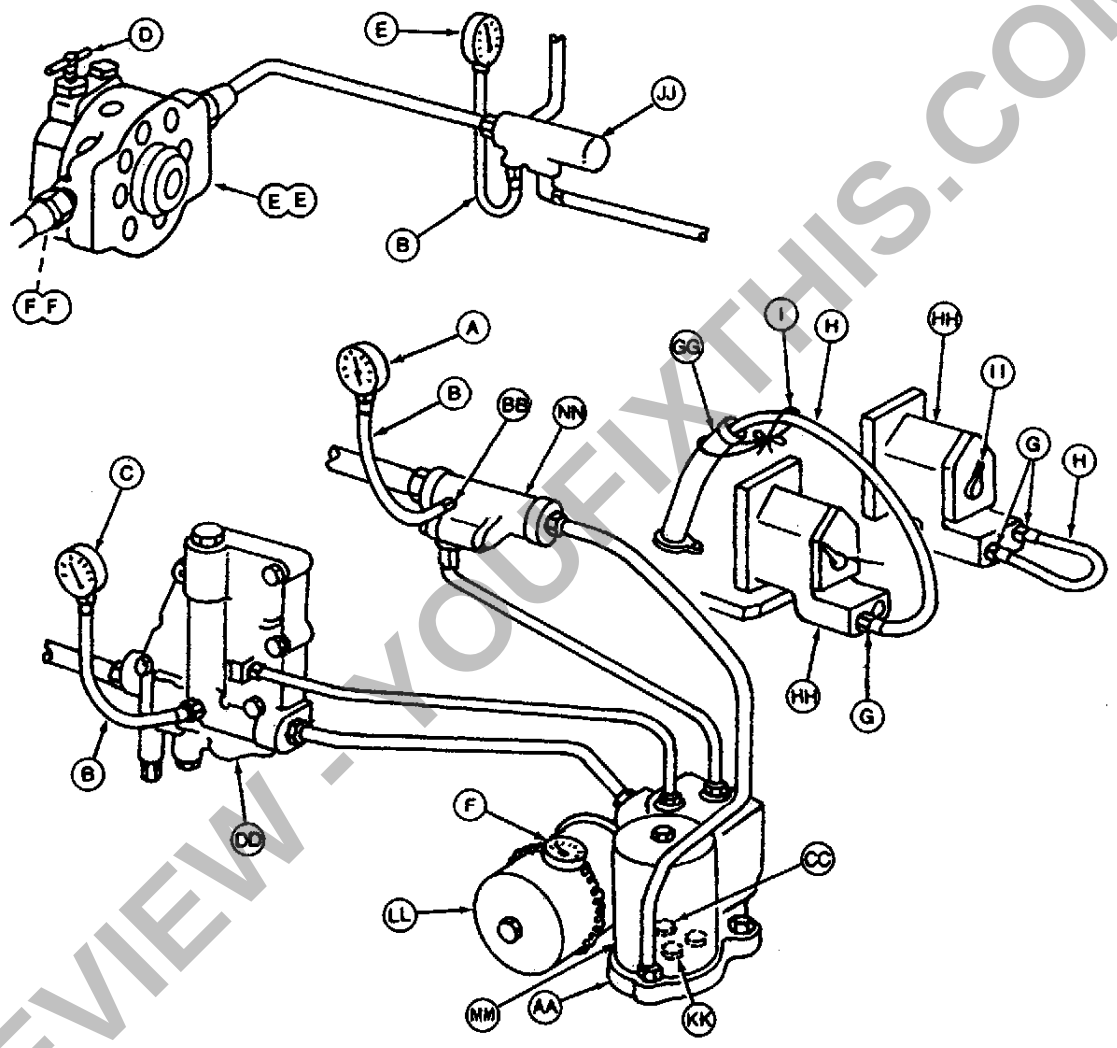
AZ2;RW7059 C 70U;270050 HX2 270782

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6

INSTALL TEST EQUIPMENT:



A—0-410 kPa (0-4.0 bar) (0-60 psi) Gauge (Lube Pressure)
B—Test Hose
C—0-2100 kPa (0-21 bar) (0-300 psi) Gauge (Clutch Pressure)
D—Destroking Screw
E—0-35000 kPa (0-350 bar) (0-5000 psi) Gauge (High Pressure)
F—38-116°C (100-240°F) Temperature Gauge*
G—ISO SCV Coupler Plug
H—SAE R2 Hose (½ in. x 48 in.)
I—Tie Hose to Filter Tube
AA—Filter Relief Valve Housing
BB—Lube Test Port with DR
CC—Transmission Filter Relief Valve Plug
DD—Pressure Regulating Valve Housing with DR
EE—Main Hydraulic Pump
FF—Stroke Control Valve Adjusting Screw
GG—Transmission Oil Filler Tube
HH—SCV
II—SCV Metering Lever
JJ—PCV Housing with DR
KK—Return Oil Filter Relief Valve Plug
LL—Transmission Filter
MM—Return Hydraulic Oil Filter
NN—Return Oil Manifold

*A more accurate check of hydraulic temperature may be made using a digital multimeter. (See Section 270, Group 60 , optional method for determining oil temperature.

HEAT OIL TO 44°C (110°F) (SEE HEATING THE HYDRAULIC OIL.)

GO TO 7

RECORD PRESSURE AND FLOW ON HYDRAULIC TESTING RECORD SHEET. SEE PAGE 270-60-38

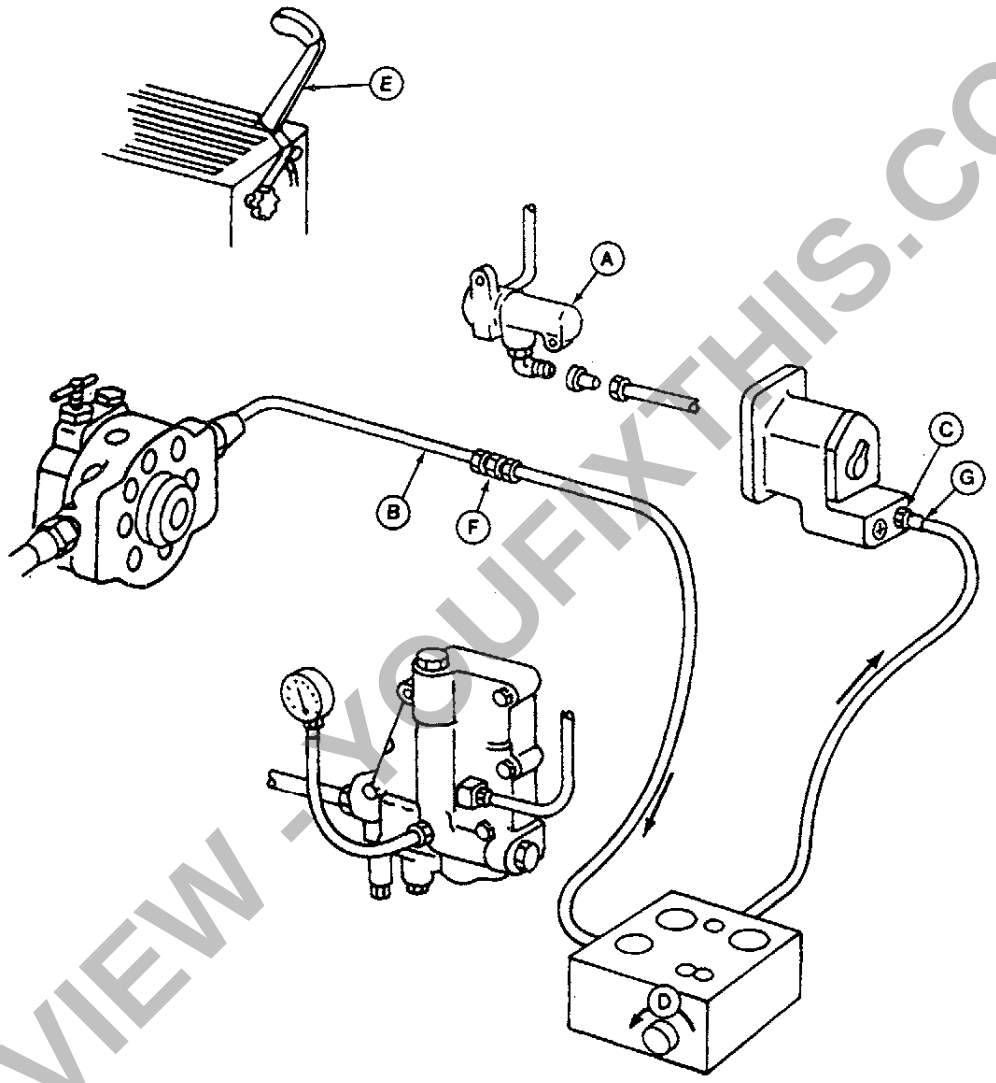
AJ2;RW9111 70U;270060 BMX2 220987

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FLOW METER CONNECTIONS FOR MAIN PUMP FLOW CHECK STEP 58



Remove PCV (A). Plug holes in clutch housing with screws or plastic caps. Plug oil line to RS housing. Connect flow meter between PCV inlet oil tube (B) and RH side of an SCV (C). Tie SCV control lever rearward (E) and fully open flow meter control valve (D).

A—PCV Housing
B—PCV Housing Inlet Oil Line
C—RH Side of SCV
D—Open Flow Meter Control Valve
E—SCV Lever Tied
F—0092 Connector
G—AR93820 ISO Coupler

GO TO 58

AC2;RW9128 70C;270065 COX2 100683

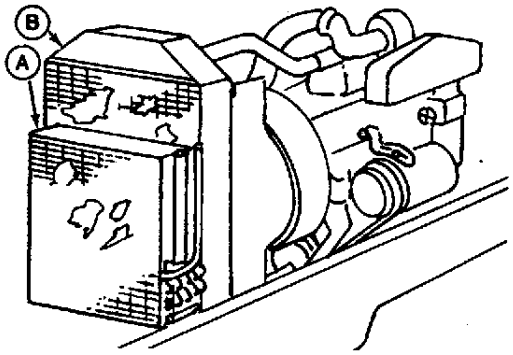
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35

The following are causes of suction normal or high, discharge high.

1. Restricted air flow through condenser (A) or radiator (B).



NOTE: Reversed heater hoses may also cause this problem. If heater hoses are hot, see Step **54**

Clean, then:
GO TO **32**

2. TEV thermal bulb is loose or corroded at evaporator tail pipe.

3. System is overcharged with R-12.

4. TEV is stuck open or there is air in system.

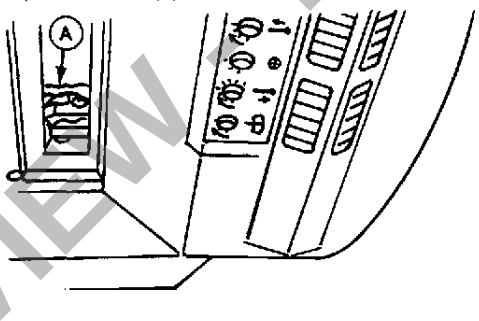
GO TO **36**

AJ4;RW3623L 90U;290010 AAX2 260782

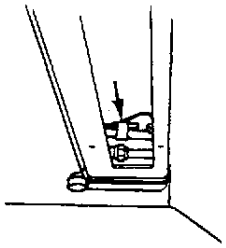
36

Inspect TEV thermal bulb.

1. Remove recirculation filter. Open insulating tape (A) on evaporator outlet pipe.



2. Inspect thermal bulb for corrosion and looseness.



OK:
GO TO **37**

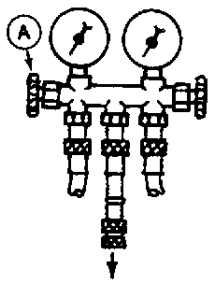
Not OK:
Repair, Then:
GO TO **32**

AJ4;RW3624L,RW3625L 90U;290010 ABX2 260782

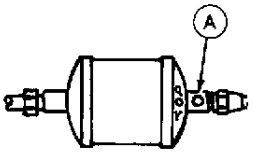
37

Engine at 2000 rpm with compressor operating.

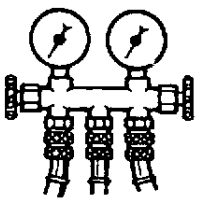
1. Open low side (LH) valve (A) to discharge R-12 slowly.



2. Close low side (LH) valve when bubbles appear in sight glass (A).



3. Check gauge pressures and compare to chart in step **32**



Discharge Pressure High:
GO TO **39**

Pressures Normal:
GO TO **38**

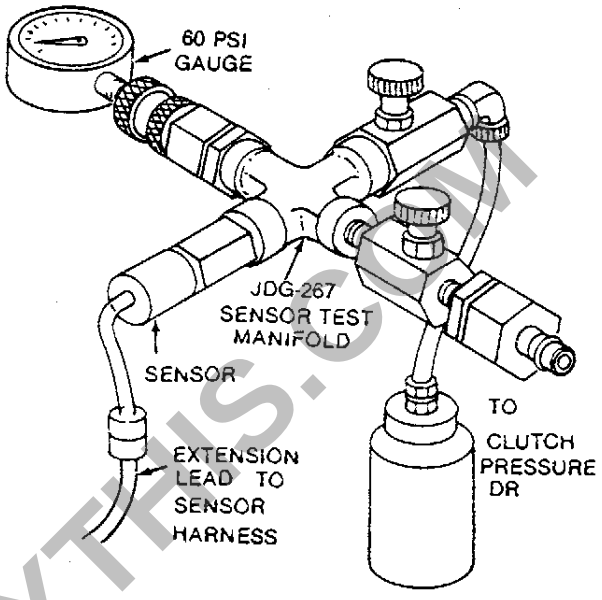
AJ4;RW3626L,RW3629L,RW3609L 90U;290010 ACX2 201282

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JDG267

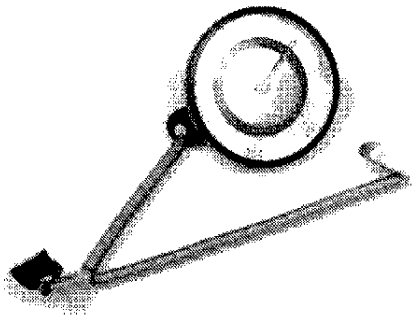
The Sensor Test Manifold is used to test pressure sensors in the INVESTIGATOR II Warning System. Use with JDG365 or JDG382 test lead extensions. Use of a 10 ft test hose from JTO5470 hydraulic kit allows operational check of sensors at operators seat.



AC1;RW5194 99U;JDG267 050286

JDG282

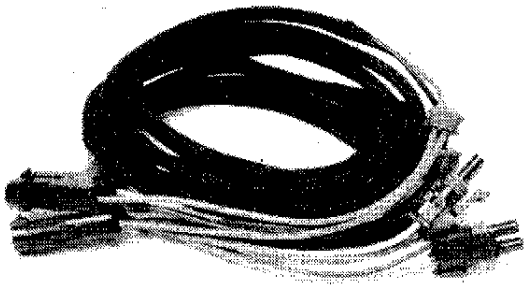
The externally mounted temperature gauge measures hydraulic oil temperature when the accuracy of oil temperature is required to determine operating specifications of electrical and hydraulic components.



AC1;RW7659 99U;JDG282 030184

JDG365 WIRING HARNESS

Used with JDG-267 INVESTIGATOR II Sensor Tester.



AC1;RW1175 9 99U;299005 AX 180386

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- Group 06—4650 and 4850 Power Steering
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- Group 05—PERMA-CLUTCH™ Transmission Operation
- Group 10—Power Shift Transmission Hydraulic System Operation and Tests
- Group 15—Main Hydraulic Pump
- Group 20—QUAD-RANGE™ Transmission Hydraulic Valves
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- Group 05—Purchased Tools
- Group 10—Fabricated Tools
- Group 15—Test Equipment Calibration

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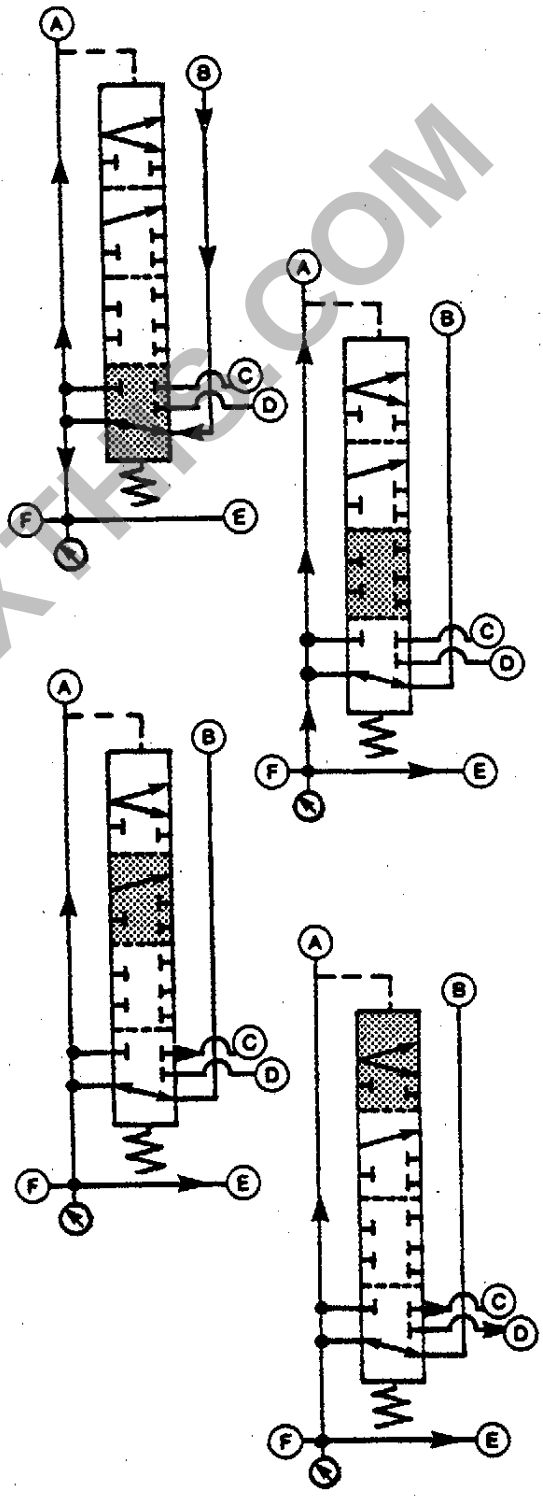
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When system pressure is below 1000 kPa (10.0 bar) (145 psi) (cold oil, restricted filter, or at start-up), the spring will shift the valve fully up. This stage opens a passage from the transmission control circuit to the priority system maintenance circuit. If the filter relief valve is in a bypass stage, unfiltered oil will flow through the maintenance circuit and provide a secondary source of oil to the pressure regulating valve for transmission controls. At start-up, the valve allows control circuit oil to flow through the maintenance circuit in the opposite direction where it is orificed to sump.

When control circuit pressure increases above 1000 kPa (10.0 bar) (145 psi), the valve will shift down and close off the maintenance circuit. Between 1000 kPa (10.0 bar) (145 psi) and 1200 kPa (12.0 bar) (175 psi), the pressure regulating valve sends oil to the transmission controls.

When control circuit demands are satisfied, pressure will increase on the head end of the valve. If pressure increases above 1200 kPa (12.0 bar) (175 psi), the valve will shift down to its third stage and begin sending oil to the cooler circuit. This is the normal stage of operation.

If the pressure increases to approximately 1350 kPa (13.5 bar) (195 psi), the valve will protect the cooler by shifting further down and dumping oil to sump. If pressure should drop below 830 kPa (8.3 bar) (120 psi), a sensor in the control circuit will activate a "stop engine" warning.



A—To Transmission Controls
B—From System Maintenance
C—To Cooler
D—To Sump
E—To MFWD Solenoid
F—From Filter

AK9;RW1275 & SOU;255010 AQX5 110887

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