JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

Compact Utility Tractor
2305

TM2289 FEBRUARY 2011

TECHNICAL MANUAL



JOHN DEERE

North American Version
Litho In U.s.a.

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Manual Description

This technical manual is written for an experienced technician and contains sections that are specifically for this product. It is a part of a total product support program.

The manual is organized so that all the information on a particular system is kept together. The order of grouping is as follows:

- Table of Contents
- Specifications and Information
- Identification Numbers
- Tools and Materials
- Component Location
- Schematics and Harnesses
- Theory of Operation
- Operation and Diagnostics
- Diagnostics
- Tests and Adjustments
- Repair
- Other

Note: Depending on the particular section or system being covered, not all of the above groups may be used.

The bleed tabs for the pages of each section will align with the sections listed on this page. Page numbering is consecutive from the beginning of the Safety section through the last section.

We appreciate your input on this manual. If you find any errors or want to comment on the layout of the manual please contact us.

Safety

Specifications and Information

Engine

Electrical

Power Train

Hydraulics

Steering

Brakes

Miscellaneous

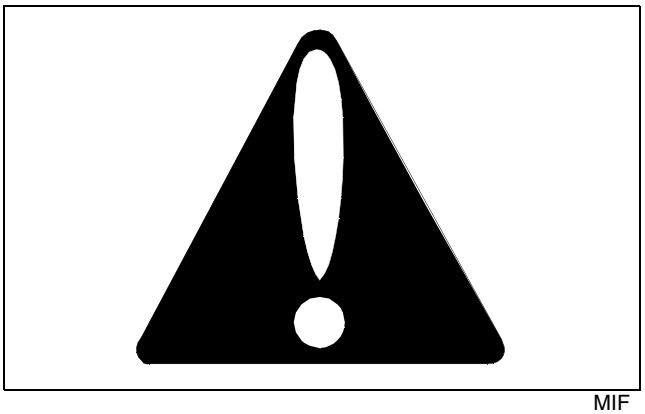
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Recognize Safety Information



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

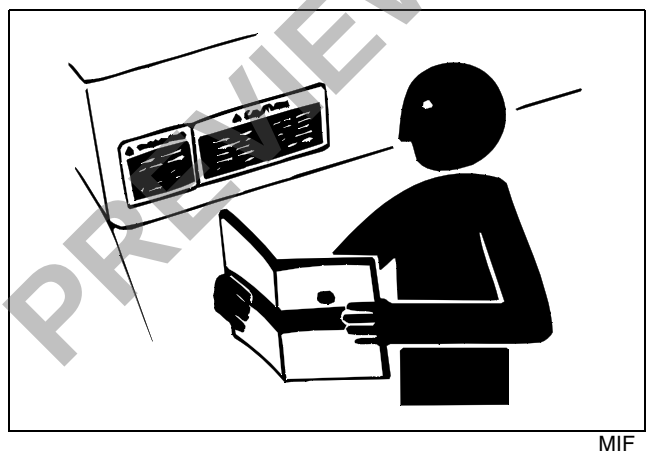
Follow recommended precautions and safe servicing practices.

Understand Signal Words

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

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

Replace Safety Signs



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

Handle Fluids Safely - Avoid Fires

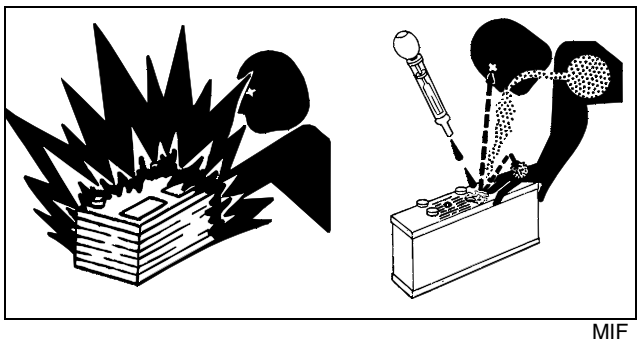
Be Prepared For Emergencies



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- 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.
- 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.

Use Care In Handling and Servicing Batteries



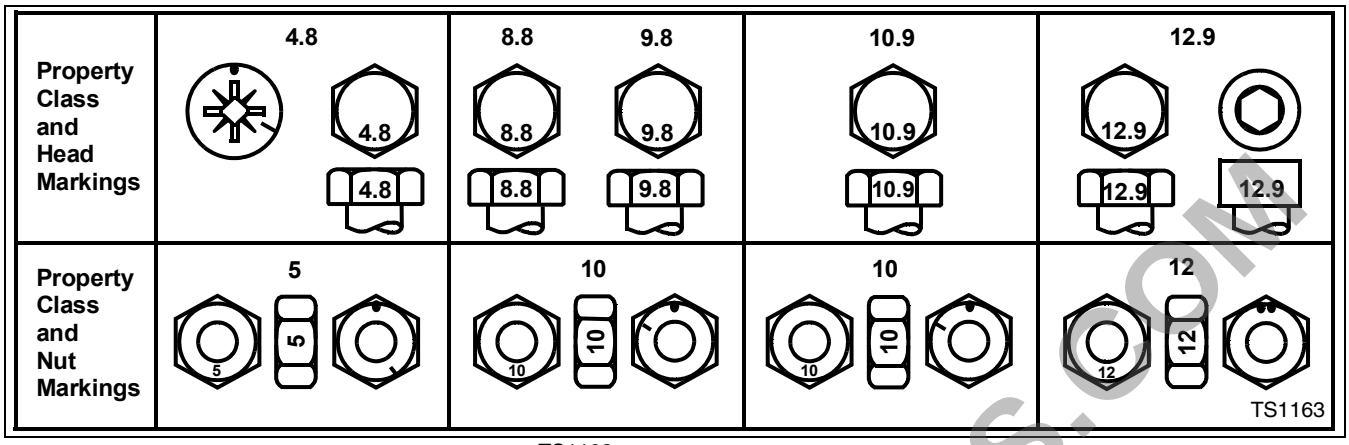
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General Specifications

Metric Fastener Torque Values



TS1163

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

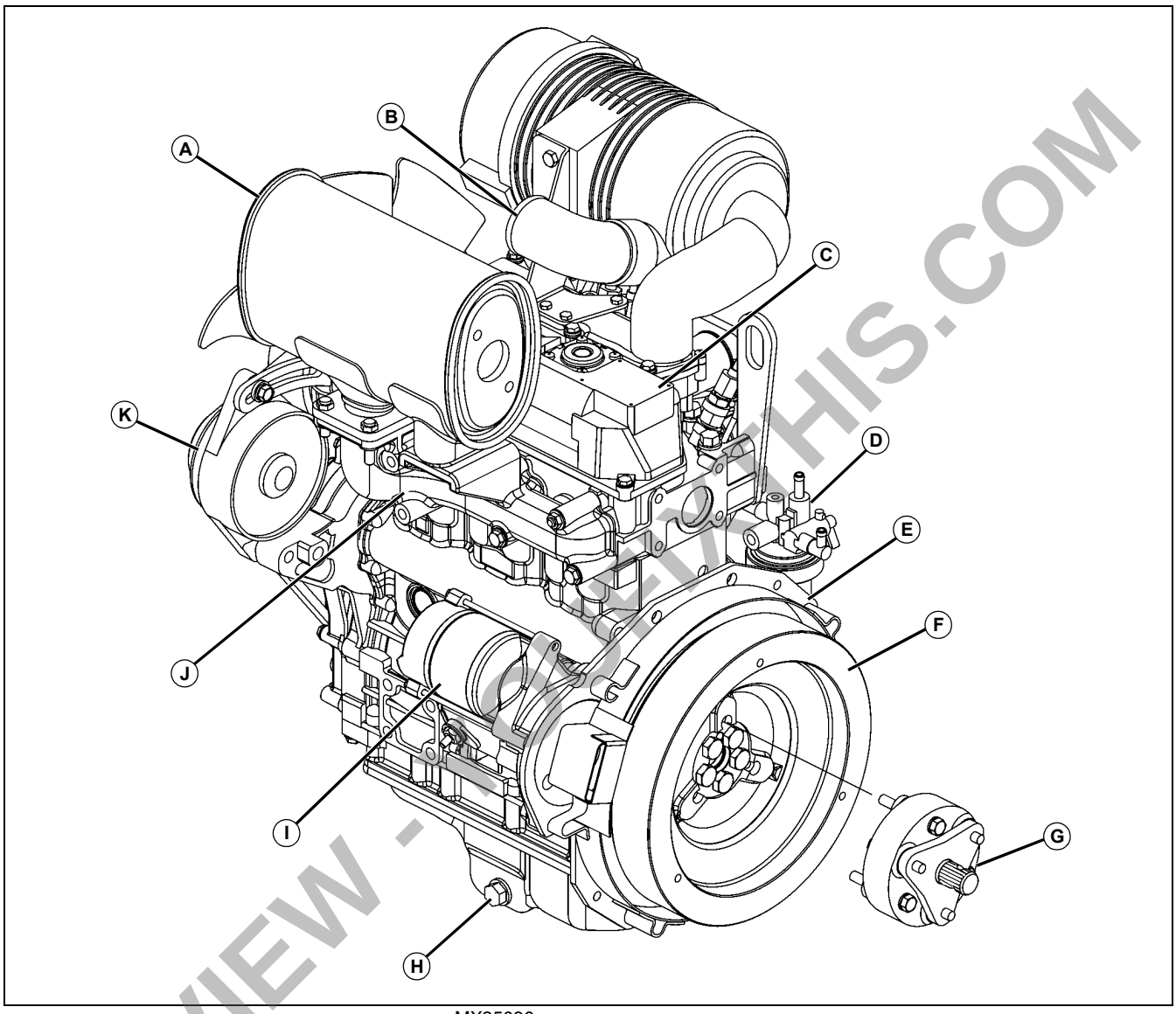
[a] **"Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated (yellow dichromate—Specification JDS117) without any lubrication.**

Reference: JDS-200

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Component Location **Engine**

Left Rear View:



MX35096

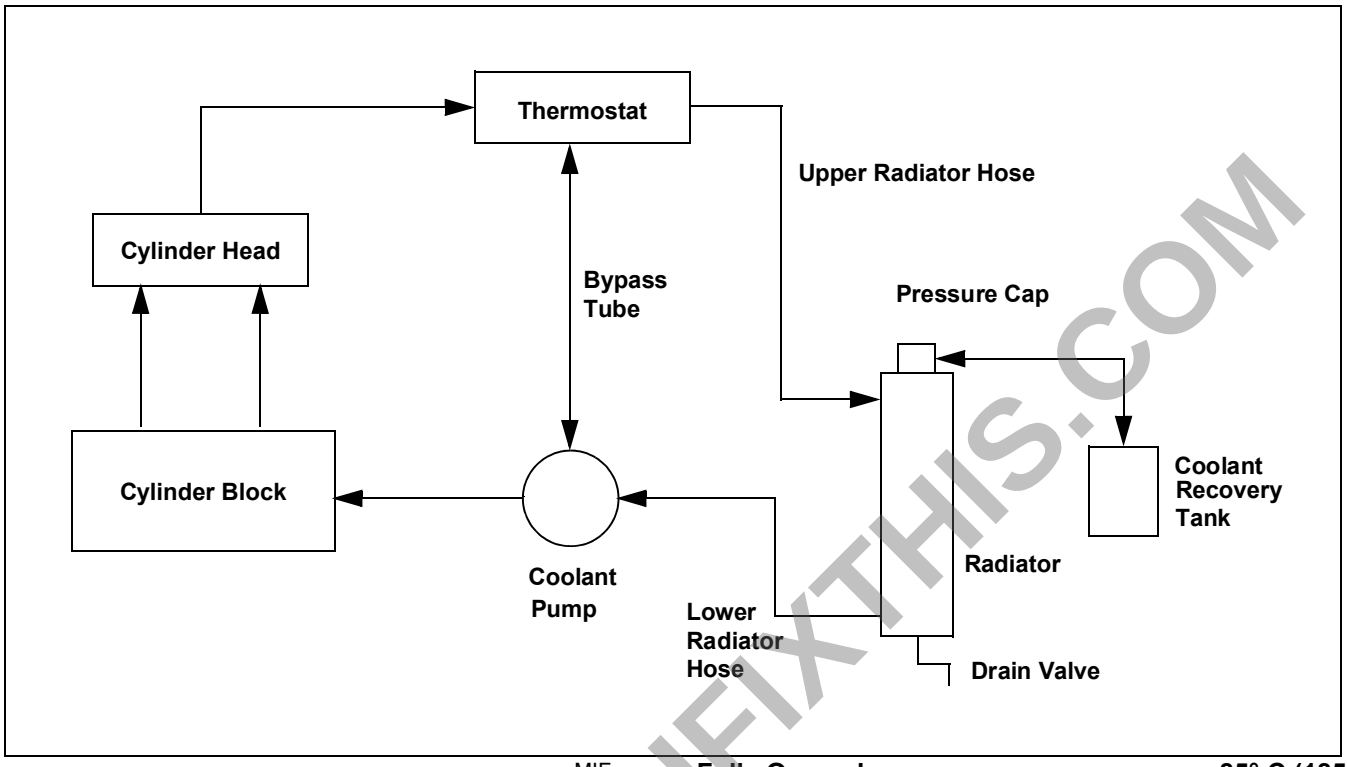
A- Muffler
B- Air Intake
C- Rocker Cover
D- Fuel Filter
E- Flywheel Cover
F- Flywheel
G- Isolator Assembly
H- Oil Drain
I- Starting Motor
J- Exhaust Manifold
K- Alternator

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Theory of Operation

Cooling System Operation



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Function:

The coolant pump circulates coolant through the cooling system, drawing hot coolant from the engine block, circulating it through the radiator for cooling.

Theory of Operation:

The pressurized cooling system includes the radiator, water pump, fan and thermostat.

During the warm-up period, the thermostat remains closed and the impeller type coolant pump draws coolant from the bypass tube. Coolant from the pump flows to the cylinder block water jacket and up through the cylinder head providing a fast warm-up.

Once the engine has reached operating temperature, the thermostat opens and coolant is pumped from the bottom of the radiator via the lower radiator hose into the cylinder block. Here it circulates through the block and around the cylinders.

From the block, coolant is then directed through the cylinder head, and into thermostat housing. With the thermostat open; warm engine coolant passes through the housing into the top of the radiator where it is circulated to dissipate heat.

Specifications:

Start to Open . . . . . 69.5 - 72.5° C (157 - 163° F)

Fully Opened . . . . . 85° C (185° F)

When coolant system pressure exceeds **88.2 kPa (12.8 psi)**, a valve in the radiator cap opens to allow coolant to discharge into the coolant recovery tank.

When temperature is reduced, a vacuum is produced in the radiator and coolant is drawn back out of the coolant recovery tank through a valve in the radiator cap.

A coolant temperature sensor (C) informs the operator of the engine coolant temperature and warns of a high temperature condition by lighting a lamp.

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Diagnostics

System: Engine Troubleshooting and Diagnostics

Park machine safely before performing diagnostic procedures. See “Park Machine Safely” in the Safety section.

Caution: Avoid Injury! Engine radiator fluid is extremely hot during operation.

Caution: Avoid Injury! The engine may start to rotate at any time. Keep hands away from all moving parts when testing.

System: Engine Oil Diagnostics

Symptom: Crankcase Contamination

Problem	Cause - Solution
1. Fuel in crankcase.	a. Broken or seized piston ring - replace rings and check cylinder.
	b. Seized intake/exhaust valve - replace valve and check valve guide.
	c. Piston ring, piston or cylinder worn - bore or hone cylinder and replace piston.
2. Water in crankcase.	a. Leaking cylinder head gasket - replace head gasket.
	b. Cracked water jacket - repair or replace water jacket.

Symptom: Low Oil Pressure

Problem	Cause - Solution
1. Oil level low.	a. Add oil.
2. Oil filter clogged.	a. Replace Oil Filter.
3. Incorrect viscosity	a. Check oil for too low viscosity, or coolant-or-fuel-diluted engine oil.
	b. Change engine oil.
4. External oil leaks	a. Repair as necessary
5. Oil pressure relief valve worn.	a. Clean, adjust or replace relief valve.

Symptom: Low Oil Pressure

Problem	Cause - Solution
6. Oil pump defective.	a. Remove and inspect oil pump. See “Oil Pump” on page 93.
7. Coolant in oil.	a. See “Symptom: Coolant in Oil or Oil in Coolant” on page 42.
8. Fuel in oil.	a. Broken or seized piston ring. Replace rings and check cylinder.
	b. Seized intake or exhaust valve. Check valve guides and stems.
	c. Piston ring, piston or cylinder worn. Bore or hone cylinder and replace piston.
9. Oil pump screen clogged or pick-up tube cracked.	a. Remove oil pan and clean screen. Replace pick-up tube. See “Oil Pan and Strainer” on page 78.
10. Intake/Exhaust valves worn.	a. Check valve guides and stems.
11. Crankshaft pin or bearing worn.	a. Regrind crank and replace bearings.
12. Connecting rod bolt loose.	a. Check for damage and re-torque bolts.
13. Excessive volume of fuel injected.	a. Check fuel injector pump and injectors.
14. Broken or seized piston ring.	a. Replace rings and check cylinder.
15. Excessive main or connecting rod bearing clearance.	a. Determine bearing clearance. See “Connecting Rod Bearing Clearance Check” on page 80.
16. Piston ring, piston or cylinder worn.	a. Bore or hone cylinder and replace piston.
17. Piston ring end gaps not correct.	a. Stagger piston ring gaps.
18. Piston rings installed incorrectly.	a. Install piston rings correctly.

Symptom: High Oil Pressure

Problem	Cause - Solution
1. High Oil Pressure	a. Improper engine oil viscosity/ type - replace engine oil and filter.
	b. Oil pressure relief valve failed. Inspect oil pressure relief valve. See “Oil Pump” on page 93.

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Tests and Adjustments

Cylinder Compression Test

Reason:

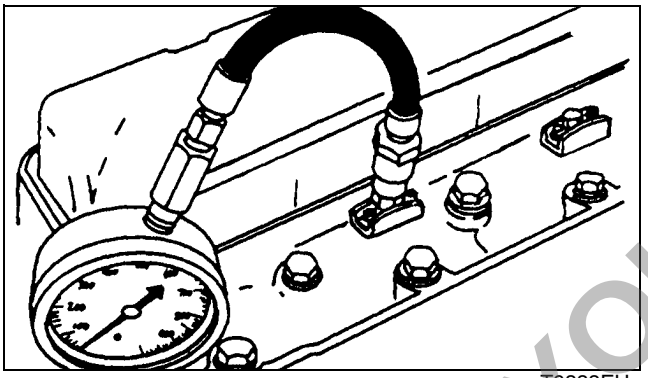
To determine the condition of the pistons, rings, cylinder walls and valves.

Equipment:

- JT01682 Compression Gauge Assembly
- JDG472 Adapter

Procedure:

1. Run engine for 5 minutes to bring to operating temperature. Shut off engine.
2. Remove injection nozzles.



T6333EU

3. Remove heat protector from end of fuel injection nozzle, and install on JDG472 adapter.
4. Install JT01682 Compression Gauge Assembly and JDG472 Adapter in injection port.
5. Disconnect fuel shutoff solenoid electrical connector on rear of governor.

Important: Avoid Damage! DO NOT overheat starting motor during test.

6. Crank engine for three seconds with starting motor.
7. Record pressure reading for each cylinder.

Compression Pressure Specifications:

Cylinder Compression Pressure
(@ 250 rpm Cranking Speed). . . . . 3432 kPa (498 psi)
(Minimum) . . . . . 2746 kPa (398 psi)
Difference Between Cylinders (Maximum). 245 kPa (36 psi)

Note: Pressure listed is for 300 meters (1000 ft) above sea level. Reduce specification an additional 4% for each 300 meters (1000 ft) of altitude above this level.

Results:

- If pressure reading is below specification, squirt clean engine oil into cylinders through injector ports and repeat test.
- If pressure increases significantly, check piston, rings, and cylinder walls for wear or damage.
- If pressure does not increase significantly after retest, check for leaking valves, valve seats or cylinder head gasket.

Throttle Cable Adjustment

Reason:

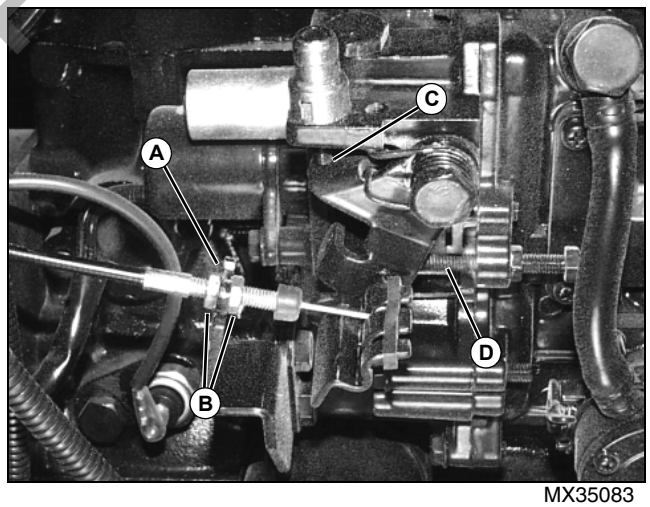
To ensure that throttle cable is allowing throttle lever on governor to reach full high idle and slow idle positions.

Equipment:

- (2) 10 mm Open End Wrenches

Procedure:

1. Park machine in NEUTRAL safely with park brake LOCKED. See “Park Machine Safely” in the Safety section.



MX35083

2. Inspect cable and bracket on engine (A). An equal amount of threads should be showing on front and rear of bracket. If not, loosen jam nuts and adjust cable case. Tighten jam nuts.
3. Place throttle lever in fast position.
4. Loosen jam nuts (B).
5. Adjust nuts (B) so the throttle lever is contacting the stop screw. Tighten nuts.
6. Move throttle hand lever all the way to slow speed position. Make sure the throttle lever on governor housing travels all the way to the stop screw (D) and there is some cable slack.

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Tests and Adjustment Specifications

Specifications:

Valve Clearance	0.15 - 0.25 mm (0.006 - 0.010 in.)
Connecting Rod Side Play	0.2 - 0.4 mm (0.008 - 0.016 in.)
Connecting Rod Bearing Clearance	0.02 - 0.05 mm (0.001 in.)
Crankshaft End Play	0.11 - 0.25 mm (0.004 - 0.001 in.)
Crankshaft Main Bearing Clearance	0.02 - 0.05 mm (0.001 - 0.001 in.)
Camshaft End Play	0.05 - 0.15 mm (0.002 - 0.006 in.)
Alternator Drive Belt Deflection (@98 N (22 lb) Applied Force)	10 - 15 mm (0.4 - 0.6 in.)

Fuel Injection Nozzle:

Opening Pressure	11800 - 12800 kPa (1711 - 1856 psi)
Leakage at 11032 kPa (1600 psi)	None for a minimum of 10 seconds
Chatter and Spray Pattern at 11800 - 12800 kPa (1711 - 1856 psi):	
Slow Hand Lever Movement	Chatter Sound

Repair Specifications

Valve Train:

Rocker Arm Shaft OD	11.97 - 11.98 mm (0.471 - 0.472 in.)
Wear Limit	11.95 mm (0.470 in.)
Rocker Arm and Shaft Support Bushings ID	12.00 - 12.02 mm (0.472 - 0.473 in.)
Wear Limit	12.07 mm (0.475 in.)
Oil Clearance	0.02 - 0.05 mm (0.001 - 0.002 in.)
Wear Limit	0.13 mm (0.005 in.)
Push Rod Bend (maximum)	0.0 - 0.03 mm (0.0 - 0.001 in.)

Cylinder Head:

Cylinder Head Flatness	0.00 - 0.05 mm (0.000 - 0.002 in.)
Service Limit	0.15 mm (0.006 in.)

Valves:

Valve Seat Angles:

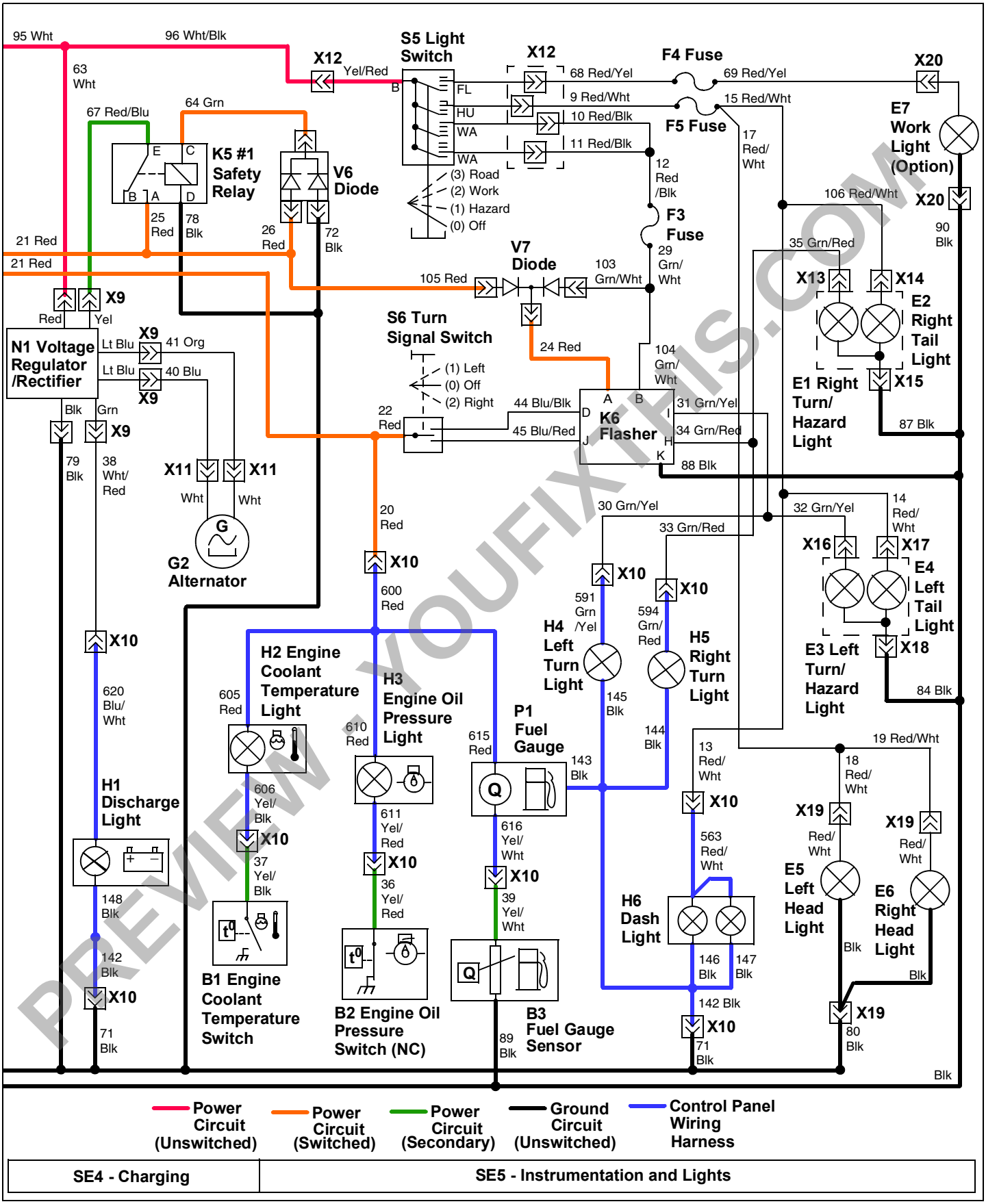
Exhaust Valve	45°
Intake Valve	30°
Lower Seat Surface	70°
Upper Seat Surface	15°
Intake Valve Head Margin	0.9 - 1.1 mm (0.035 - 0.043 in.)
Exhaust Valve Head Margin	1.0 - 1.2 mm (0.039 - 0.047 in.)
Wear Limit	0.50 mm (0.02 in.)

Valve Recession:

Intake and Exhaust	0.40 - 0.60 mm (0.016 - 0.024 in.)
Wear Limit Intake	0.9 mm (0.035 in.)
Wear Limit Exhaust	0.8 mm (0.031 in.)
Valve Stem Diameter:	
Intake	5.96 - 5.98 mm (0.234 - 0.235 in.)
Exhaust	5.95 - 5.96 mm (0.234 - 0.235 in.)

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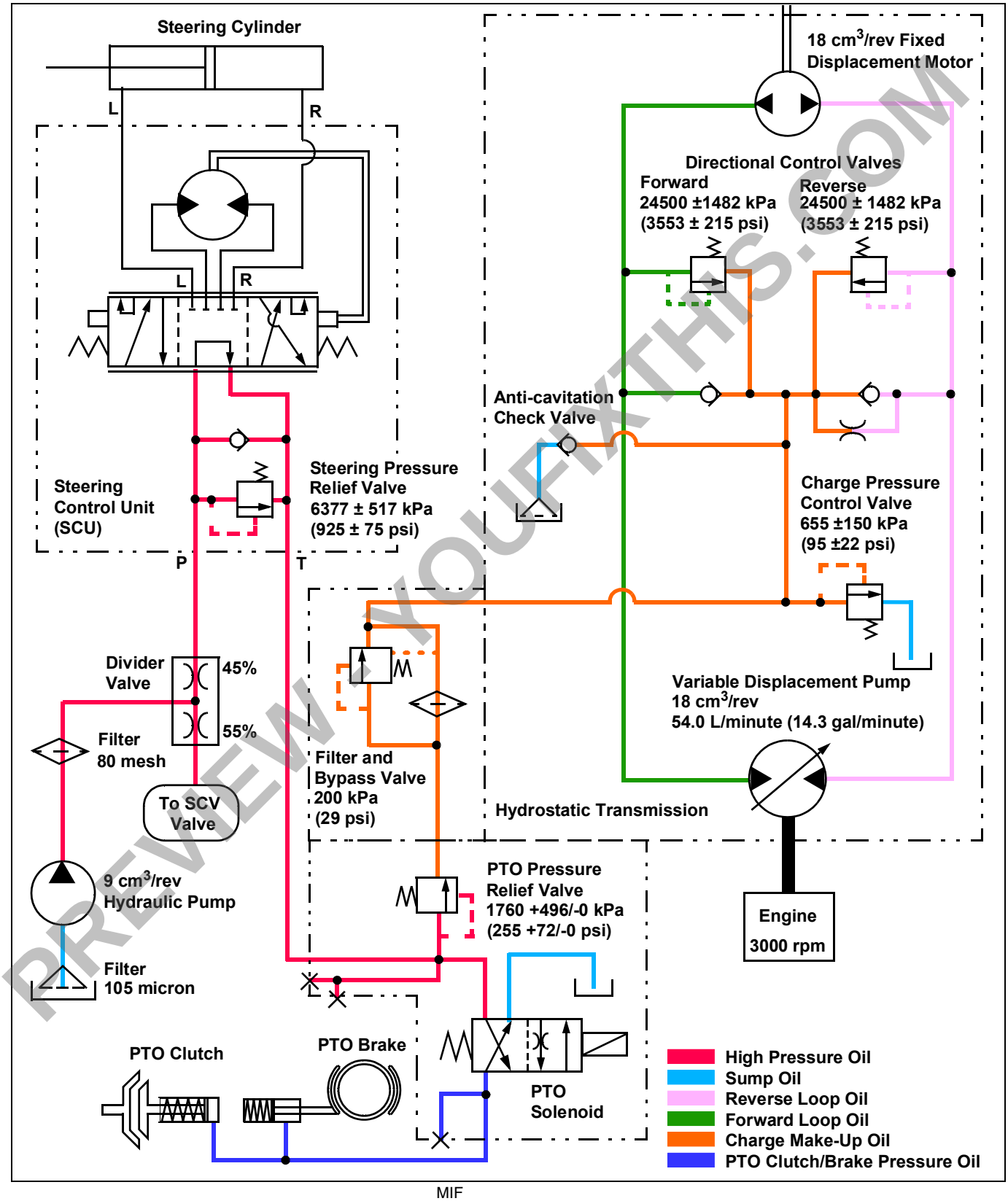
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Schematics and Harnesses

Steering and Drive Hydraulic Schematic



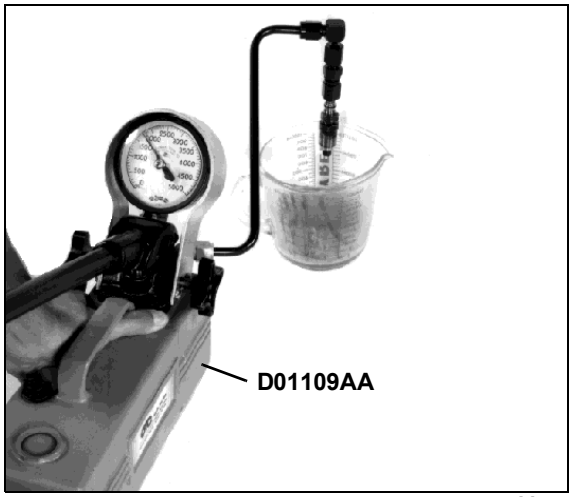
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1. Connect fuel injection nozzle to D01109AA Diesel Fuel Injection Nozzle Tester using parts from D01110AA Adapter Set and 23622 Straight Adapter.

Important: Avoid Damage! Use clean, filtered diesel fuel when testing injection nozzles for best results.

Procedure 1:

Test fuel injection nozzle opening pressure following the Nozzle Tester manufacturer's instructions.

Specification:

Fuel Injection Nozzle Opening Pressure 11800 - 12800 kPa (1712 - 1856 psi)

Results:

- If pressure reading does not meet specification, disassemble injection nozzle and inspect nozzle assembly for contamination or stuck valve. If necessary, add or remove shims to change opening pressure.

Procedure 2:

Test fuel injection nozzle leakage following the nozzle tester manufacturer's instructions.

1. Dry nozzle completely using a lint-free cloth.
2. Pressurize nozzle to **11032 kPa (1600 psi)**.
3. Watch for leakage from nozzle spray orifice. Leakage time should be a minimum of 10 seconds.

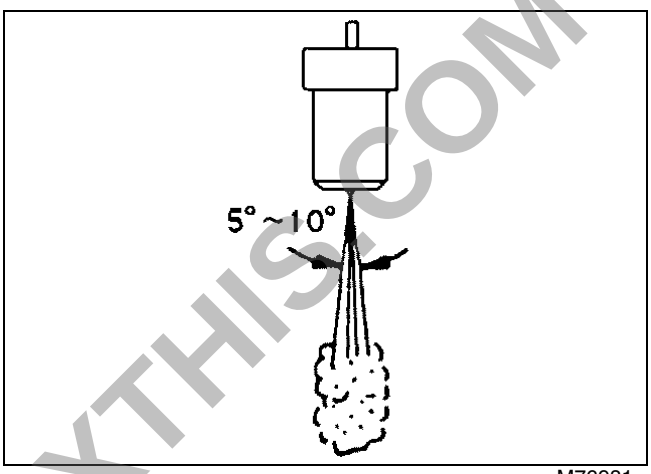
Results:

- If leakage time does not meet specification, disassemble injection nozzle and inspect nozzle assembly for contamination. Inspect valve seating surface. Replace nozzle assembly if necessary.

Procedure 3:

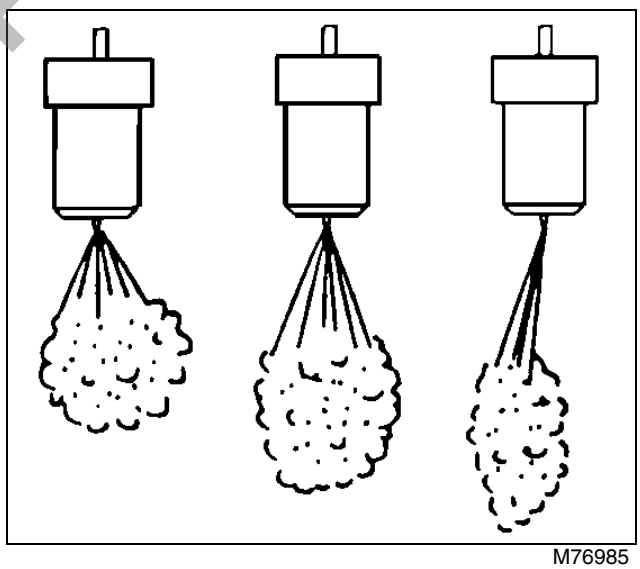
Test fuel injection nozzle chatter and spray pattern following the Nozzle Tester manufacturer's instructions.

1. Pressurize nozzle to **11800 - 12800 kPa (1712 - 1856 psi)**.
2. Listen for “chatter” sound and watch spray pattern.



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Picture Note: Correct Injection Angle



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Picture Note: Incorrect Injection Angle

Specifications:

Slow Hand Lever Movement . . . . . Chatter Sound
Slow Hand Lever Movement Fine Stream Spray Pattern
Fast Hand Lever Movement . . . . . Fine Atomized Spray Pattern

Results:

- If nozzle chatter or spray pattern does not meet specifications, disassemble injection nozzle and inspect nozzle assembly for contamination. See “Fuel Injection

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Fuel Shutoff Solenoid Removal and Installation

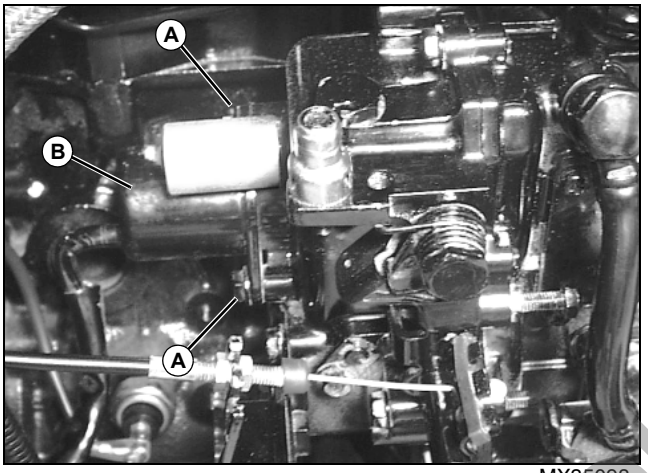
1. Park machine safely. See “Park Machine Safely” in the Safety section.

2. Allow engine to cool.

3. Turn the fuel shut-off valve on the fuel filter/water separator to the closed position.

4. Remove the air cleaner assembly.

5. Clean around the fuel shutoff solenoid using a parts cleaning solvent or steam cleaner.



MX35098

6. Disconnect the electrical connector to the fuel shutoff solenoid.

7. Remove the two solenoid mounting cap screws (A) and remove solenoid (B) from governor housing.

8. Test fuel solenoid. See “Fuel Shutoff Solenoid Tests” in Electrical section.

9. Installation is in reverse of removal. Check condition of O-ring on solenoid before installing.

Fuel Control and Governor Linkage Removal and Installation

Removal:

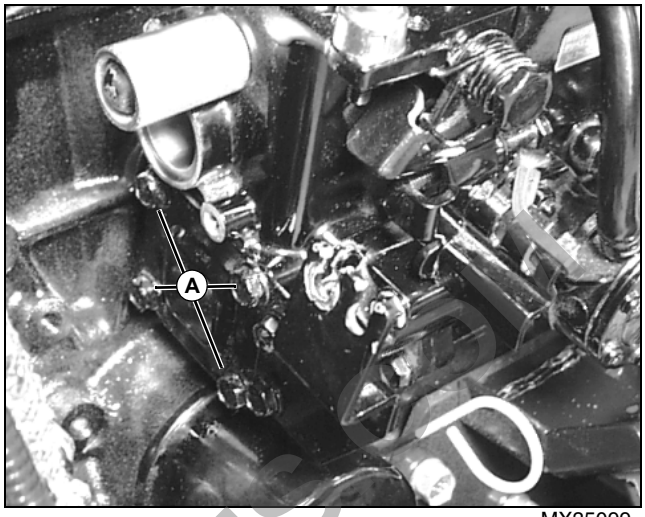
1. Park machine safely. See “Park Machine Safely” in the Safety section.

2. Allow engine to cool.

3. Disconnect throttle cable.

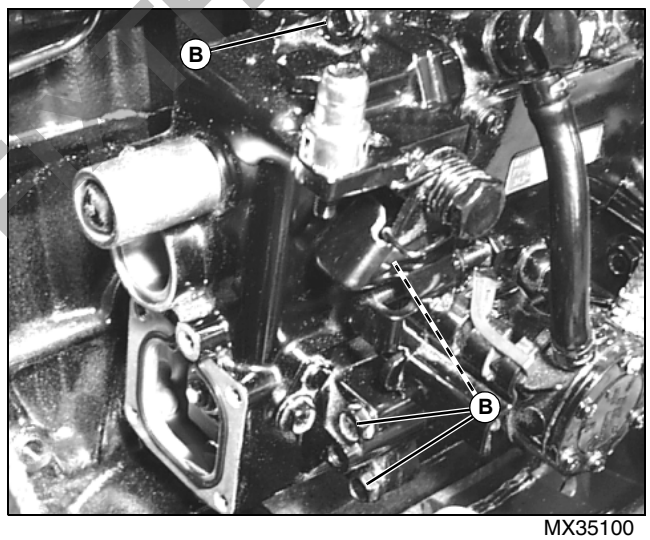
4. Disconnect and remove fuel shutoff solenoid.

Note: Pooled oil will drain out when the governor cover is removed. Use suitable container to catch oil.



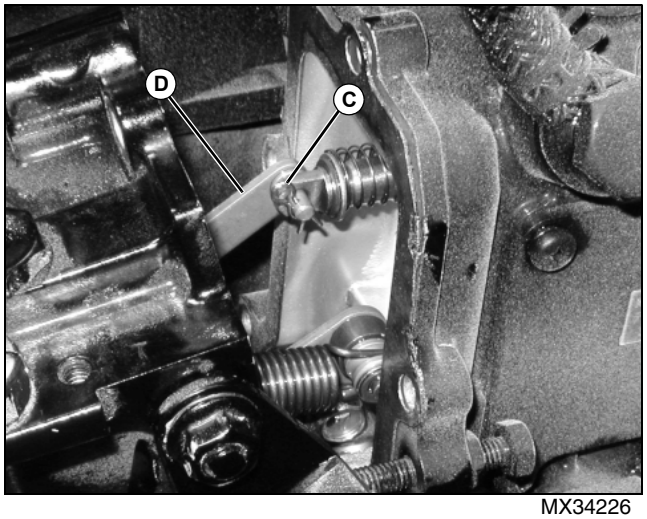
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5. Remove the four cap screws (A) and governor cover.



MX35100

6. Remove cap screws (B) attaching governor housing to injector pump body.

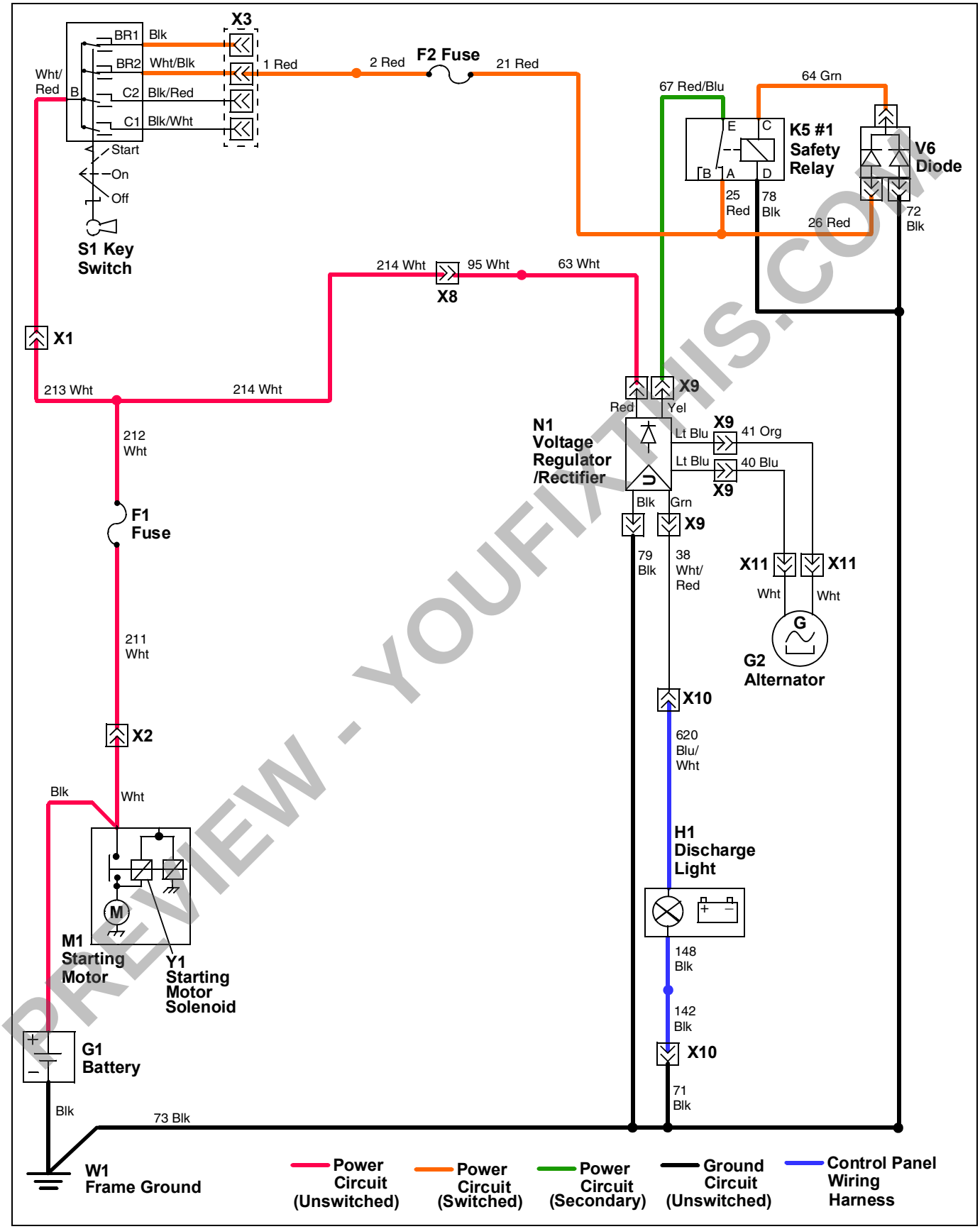


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Charging Circuit Schematic



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X- Plate
Y- Bearing
Z- Forward Pedal
AA- Bolt (4 used)
AB- Forward Pedal Arm
AC- Reverse Pedal Arm
AD- Reverse Pedal
AE- Pin (2 used)
AF- Pin (2 used)
AG- Bolt
AH- Plate
AI- Bearing (4 used)
AJ- Spring
AK- Reverse Pedal Shaft
AL- Bolt (8 used)
AM- Pin
AN- Rod
AO- Washer (2 used)
AP- Torsional Dampener
AQ- Arm
AR- Bracket
AS- Control Rod[1]
AT- Washer (2 used)
AU- Pin
AV- Arm
AW- Bearing (2 used)
AX- Washer (2 used)
AY- Bearing
AZ- Snap Ring
BA- Forward Pedal Shaft
BB- Plate
BC- Cap Screw

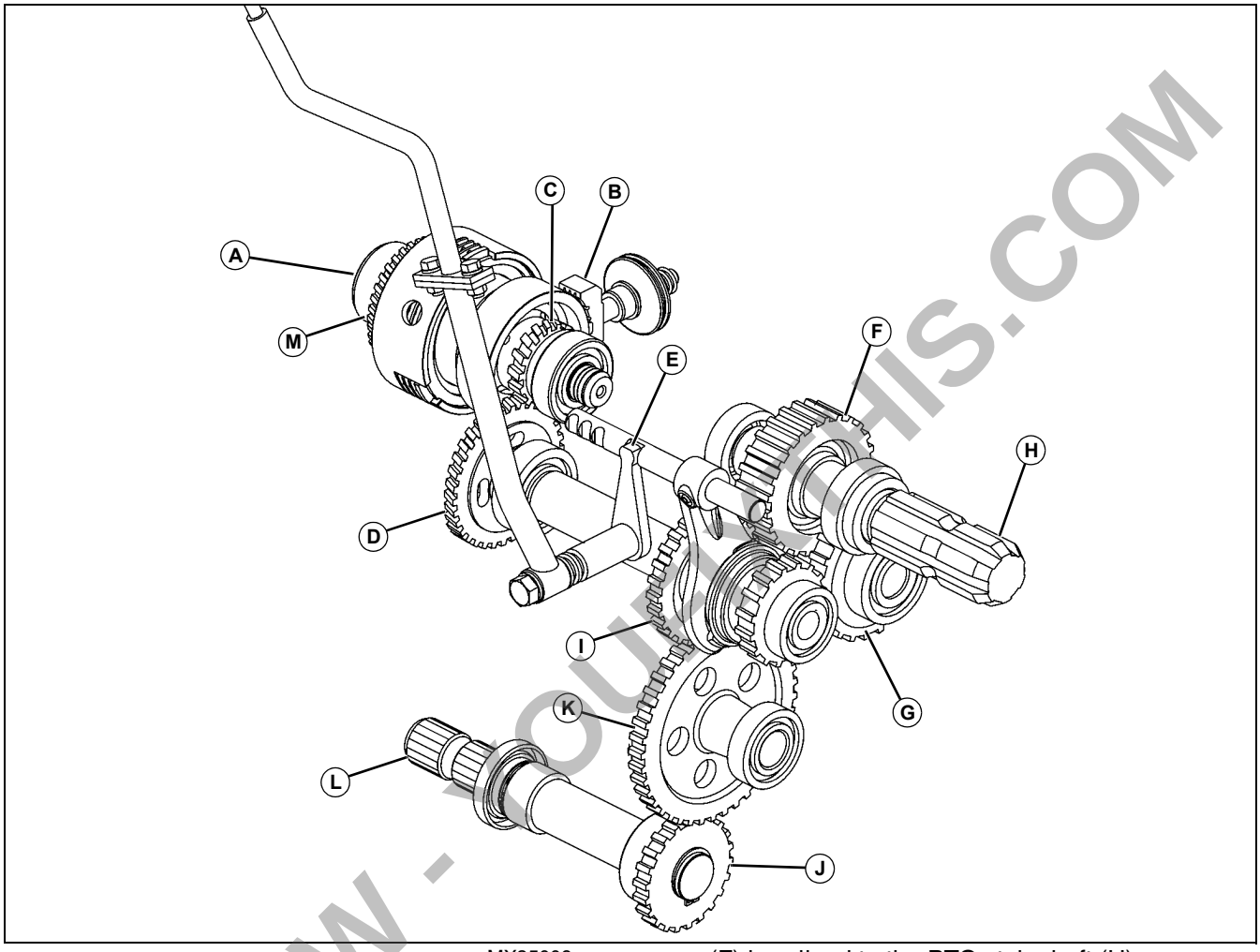
1. See "Hydraulic Control" component location page.

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Rear and Mid PTO

PTO Theory of Operation



MX35009

Operation:

The PTO is driven from the transmission hydrostatic pump output shaft. The shaft is coupled directly to the PTO clutch (A).

The PTO is activated with a switch controlled hydraulic solenoid valve. When the solenoid valve is activated, fluid pressure pushes the PTO brake (B) away from the PTO collar and presses the PTO clutch plates together. With the PTO clutch engaged the PTO gear (C) rotates.

The PTO gear meshes with the PTO range gear (D) and shaft which rotates when the PTO clutch is engaged.

A shift lever and arm (E) are used to engage either the rear PTO or mid PTO. When shifted to the rear, the shift fork and collar couple the PTO range shaft to the rear gear of the shaft. The rear gear meshes to the rear PTO stub shaft gear (F) through the PTO idler gear (G). The stub shaft gear (F) is splined to the PTO stub shaft (H).

When the shift lever and arm (E) arm shifted forward, the shift fork and collar couple the PTO range shaft to the front gear (I) of the shaft.

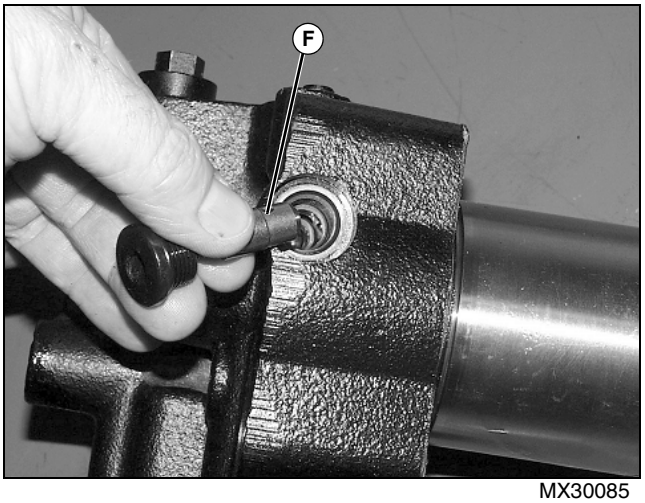
The front gear meshes to the mid PTO stub shaft gear (J) through the idler gear (K). The stub shaft gear (J) is splined to the PTO stub shaft (L).

When the PTO switch is placed in the OFF position, the solenoid is deactivated and hydraulic pressure is stopped from going to the PTO clutch and brake. Internal springs separate the clutch plates and a set of springs presses the clutch brake (B) against the PTO collar stopping any PTO rotation.

A gear splined to the input of the PTO meshes to and drives an idler gear which drives the hydraulic gear pump.

If the engine overheats the PTO will stop. See “W7 PTO Cutout Schematic” on page 128 in the Electrical section.

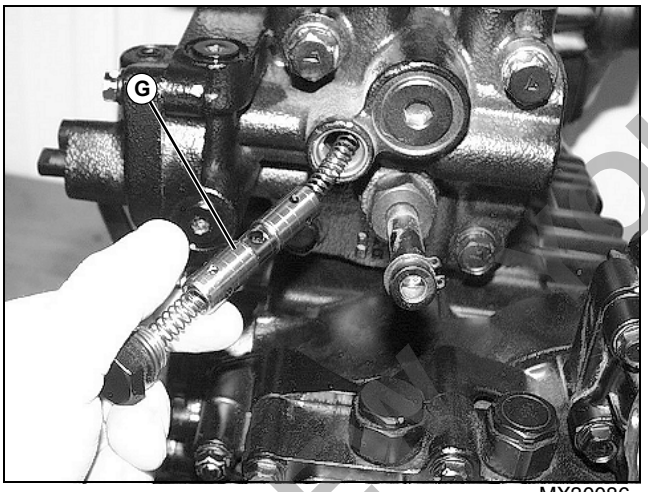
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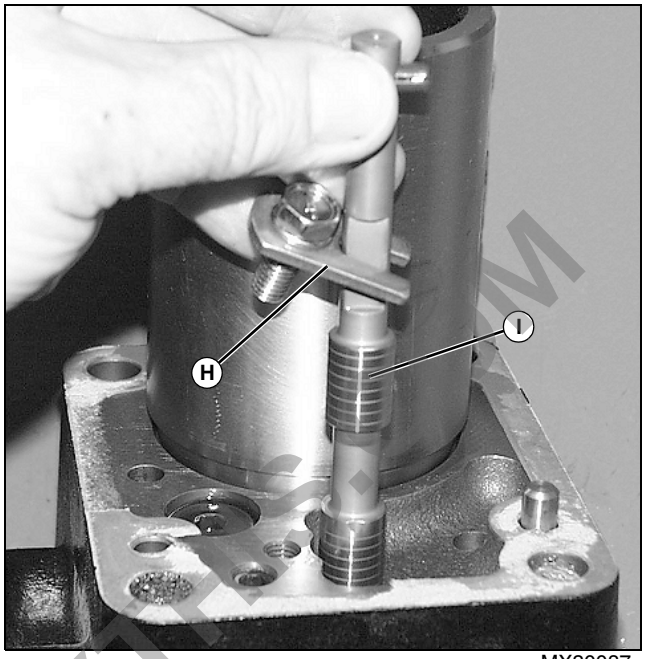
5. Remove the rate of drop check valve (F). Check parts for wear or damage. Replace any worn or damaged parts.

Note: Observe direction of flow divider valve when removing and make sure it is installed in the same direction during reassembly.



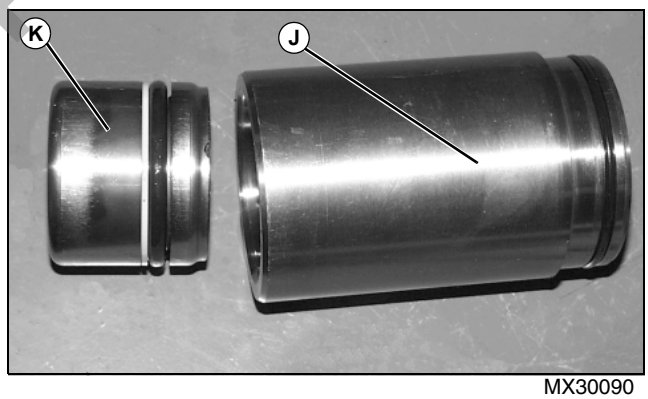
MX30086

6. Remove flow divider spool (G). Note direction of spool and mark it if necessary to aid in reassembling in the proper direction. Inspect spool and springs for wear or damage. Replace any worn or damaged parts.



MX30087

7. Remove clamp (H) and spool (I). Inspect spool and valve bore for wear or damage. If these parts are damaged, replace valve assembly.



MX30090

8. Remove the lift cylinder (J) and piston (K) from the valve assembly. Inspect parts for wear or damage. Replace any worn or damaged parts. Replace O-ring on cylinder and seal assembly on piston during reassembly.

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