GENERAL VEHICLE SPECIFICATIONS[1]

	4100 Gear Drive	4100 Hydrostatic Drive	4100 Narrow Gear Drive
ENGINE			
Make	John Deere/Yanmar	John Deere/Yanmar	John Deere/Yanmar
Model	3TNE74	3TNE74	3TNE74
Type	4-cycle Diesel	4-cycle Diesel	4-cycle Diesel
Bore and Stroke	74 x 78 mm (2.91 x 3.07 in)	74 x 78 mm (2.91 x 3.07 in)	74 x 78 mm (2.91 x 3.07 in)
Cylinders	3	3	3
Valves	Overhead Valves	Overhead Valves	Overhead Valves
Displacement	1006 cc (61.4 cu in.)	1006 cc (61.4 cu in.)	1006 cc (61.4 cu in.)
Gross Output Power	14.9 kW (20 hp)	14.9 kW (20 hp)	14.9 kW (20 hp)
Maximum Torque	39.7 lb-ft@2650 rpm	39.7 lb-ft@2650 rpm	39.7 lb-ft@2650 rpm
Lubrication	Full pressure	Full pressure	Full pressure
Oil filter	Spin On (Standard)	Spin On (Standard)	Spin On (Standard)
Engine Rated Speed	2650 rpm	2650 rpm	2650 rpm
Engine Slow Idle Speed	1000 rpm	1000 rpm	1000 rpm
Engine Fast Idle Speed	2850 rpm	2850 rpm	2850 rpm
Cooling system	Liquid w/Pump & Radiator	Liquid w/Pump & Radiator	Liquid w/Pump & Radiator
Air cleaner	Dry Replaceable Dual Element w/Safety Element	Dry Replaceable Dual Element w/Safety Element	Dry Replaceable Dual Element w/Safety Element
Muffler	Spark Arresting	Spark Arresting	Spark Arresting
ELECTRICAL			
Volts	12 VDC	12 VDC	12 VDC
Battery Rating	45 amp-hr	45 amp-hr	45 amp-hr
Alternator (Standard)	20 amp	20 amp	20 amp
Alternator (Optional)	35 or 40 amp	35 or 40 amp	35 or 40 amp
Regulator	External, Current Limiting	External, Current Limiting	External, Current Limiting
Starting Motor	1.1 kW (1.5 hp)	1.1 kW (1.5 hp)	1.1 kW (1.5 hp)
Headlights	37.5 W Halogen Bulb	37.5 W Halogen Bulb	37.5 W Halogen Bulb
Tail Lights	5 W Bayonet Base	5 W Bayonet Base	5 W Bayonet Base
Hazard Lights	32 Cd/m^2, Single Element, Type 1156	32 Cd/m^2, Single Element, Type 1156	32 Cd/m^2, Single Element, Type 1156
Instrument Panel Lamps	1.7 W Bayonet Base	1.7 W Bayonet Base	1.7 W Bayonet Base

1. Specifications and design subject to change without notice.

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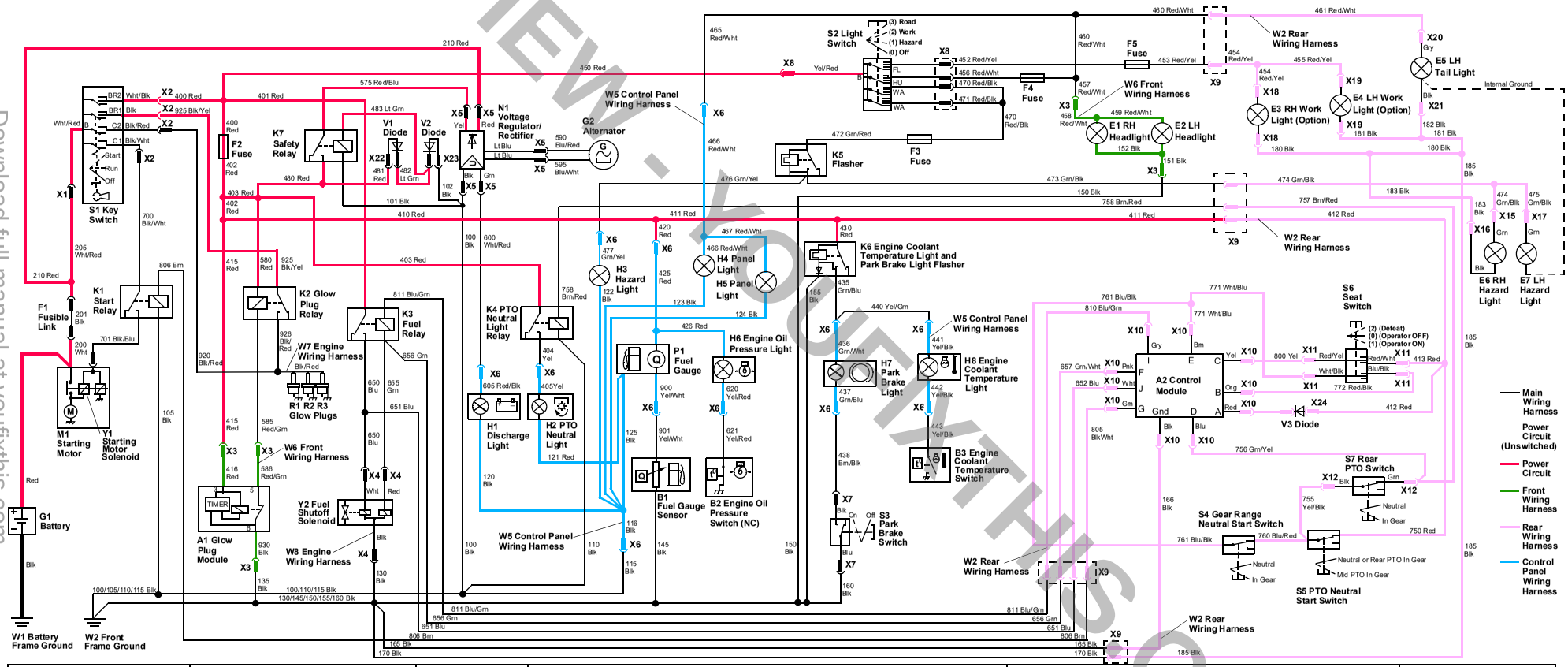
TROUBLESHOOTING CHART

Cause \ Problem or Symtom	Engine will not start	Engine starts but does not continue to run: Exhaust smoke: No smoke	Engine starts but does not continue to run: Exhaust smoke: Excess smoke	Low engine output: Exhaust Color: Normal	Low engine output: Exhaust Color: White	Low engine output: Exhaust Color: Black	Poor exhaust color: Under load: White	Poor exhaust color: Under load: Black	Loud knocking noise during combustion	Misfiring	Uneven combustion sound	Engine surges: During Idling	Engine surges: Under Load	Excessive engine vribration	Poor return to low speed	Excessive fuel comsumption	Lubricating Oil: Excessive oil consumption	Lubricating Oil: Fuel oil in crankcase	Lubricating Oil: Water in crankcase	Lubricating Oil: Low oil pressure	Low compression	Coolant: Overheating	Coolant: Low water temperature	Intake manifold pressure: Low pressure	Intake manifold pressure: High pressure	Exhaust temperature too high	Problem or Symptom \ Solution
Engine System	Improper intake or exhaust valve clearance	●	●		●					●														●		●	Adjust valve clearance
	Compression leakage from valve seat				●		●		●	●						●					●			●		●	Grind valve seat, regrind valves
	Seized intake/exhaust valve	●		●	●		●		●	●			●	●				●			●			●			Replace valve and check valve guide
	Leaking cylinder head gasket				●														●			●					Replace head gasket
	Broken or seized piston ring	●		●		●		●			●		●	●			●	●			●	●				●	Replace rings and check cylinder
	Piston ring, piston or cylinder worn	●		●		●		●									●	●			●						Bore or hone cylinder & replace piston
	Crankshaft pin or bearing seized	●	●							●		●	●	●							●						Regrind crank and replace bearings
	Piston ring end gaps not correct		●			●											●				●						Stagger piston ring gaps
	Piston rings installed incorrectly					●		●									●				●						Install piston rings correctly
	Crankshaft pin or bearing worn				●					●		●	●	●						●							Regrind crank and replace bearings
	Connecting rod bolt loose									●				●						●							Check for damage and re-torque bolts
	Foreign matter in combustion chamber	●								●							●				●						Remove head and inspect for damage
	Excessive timing gear backlash									●																	Measure timing gear backlash
	Intake/exhaust valve guides worn					●											●				●						Check valve guides and stems
	Governor not functioning properly		●									●	●	●	●												Repair or replace governor
	Improper timing between injection pump, intake & exhaust valves	●				●	●	●	●	●																	Adjust valve clearance. Check vlave timimg
Cooling System	Engine running too cool							●								●							●				Check thermostat
	Engine running too hot						●															●				●	Check thermostat, fan belt tension
	Coolant level low						●															●				●	Check cooling system for level/leaks
	Cracked water jacket																		●	●		●					Repair or replace water jacket
	Malfunctioning thermostat						●															●	●				Check or replace thermostat
	Water pump/alternator belt loose						●															●				●	Adjust fan belt tension

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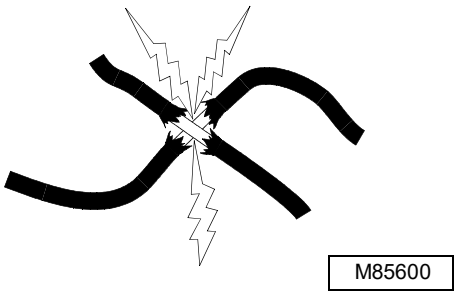
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COMMON CIRCUIT TESTS

Shorted Circuit:

A shorted circuit may result in the wrong component operating (i.e. improper wire-to-wire contact). To test for a shorted or improperly wired circuit:

1. Turn component switch ON.
2. Start at the controlling switch of the component that should not be operating.
3. Follow the circuit and disconnect wires at connectors until component stops operating.
4. Shorted or improper connections will be the last two wires disconnected.

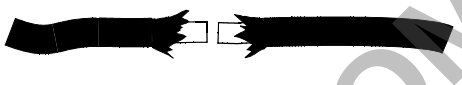


M85600

High Resistance or Open Circuit:

High resistance or open circuits usually result in slow, dim or no component operation (i.e. poor, corroded, or disconnected connections). Voltage at the component will be low when the component is in operation. To test for high resistance and open circuits:

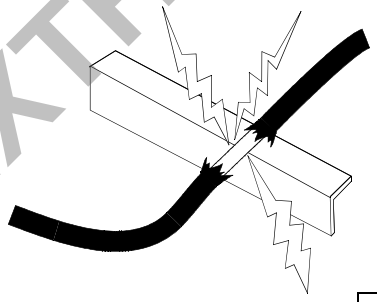
1. Check all terminals and grounds of the circuit for corrosion.
2. If terminals are not corroded or loose, the problem is in the component or wiring.



M85601

Grounded Circuit:

Grounded circuits usually result in no component operation or a blown fuse.



M85602

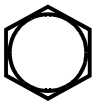
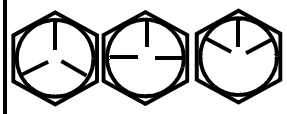
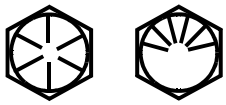
CONDUCTORS FOR 12 VOLT CIRCUITS

STRANDED CONDUCTORS FOR 12 VOLT CIRCUITS						
SAE WIRE SIZE (GAUGE)	20	18	16	14	12	10
METRIC WIRE SIZE (MM)	0.5	0.8	1.0	2.0	3.0	5.0
TYPICAL STRANDING	7 X 28	16 X 30	19 X 29	19 X 27	19 X 25	19 X 23
MINIMUM CONDUCTOR AREA IN CIRCULAR MILS	1072	1537	2336	3702	5833	9343

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INCH FASTENER TORQUE VALUES

SAE Grade and Head Markings	No Marks 			
SAE Grade and Nut Markings	No Marks 			TS1162

	Grade 1				Grade 2[b]				Grade 5, 5.1 or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
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
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.

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.*

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

Reference: JDS—G200.

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TESTS AND ADJUSTMENTS

CYLINDER COMPRESSION TEST

Reason:

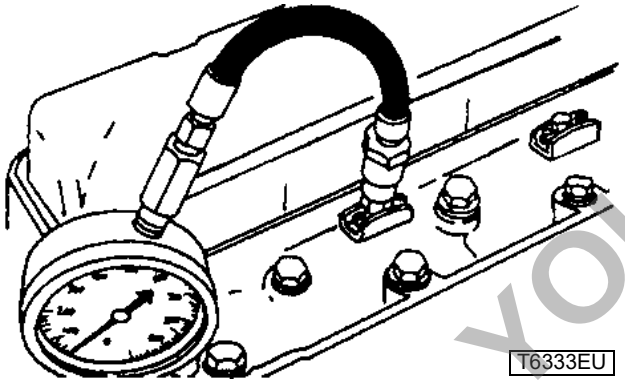
To determine the condition of the pistons, rings, cylinder walls and valves.

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: 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:

Standard . . . . . 3432 ± 98 kPa (498 ± 14 psi)
Minimum Pressure . . . . 2746 ± 98 kPa (398 ± 14 psi)
Maximum Difference Between Cylinders . . . 197 – 294 kPa (29 – 43 psi)
Minimum cranking speed . . . . . 250 rpm

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 ADJUSTMENT

Reason:

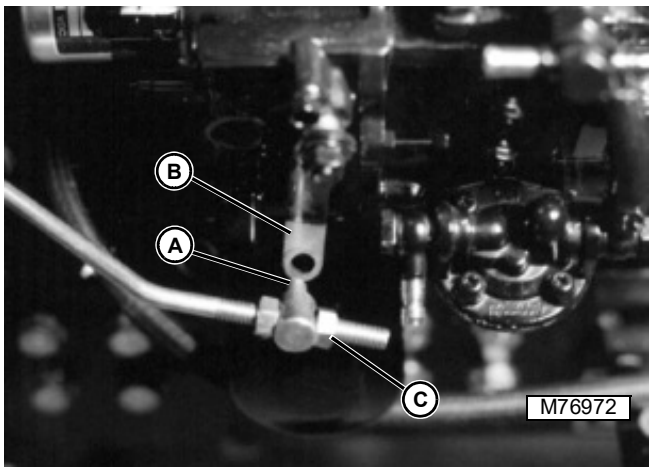
To ensure that throttle hand lever linkage, and foot pedal linkage (Gear Drive model only), is adjusted correctly, and to allow to full high idle and slow idle position of governor throttle lever.

Equipment:

- (2) 12 mm Open End Wrenches

Procedure:

1. Park machine on level surface, turn key switch OFF, shift transmission to NEUTRAL, and LOCK park brake.
2. Open hood and remove right side engine cover.
3. On gear drive tractor only: loosen lock nut and back-off throttle pedal stop screw under right side foot rest panel.
4. Pull throttle hand control lever fully back to slow idle position.

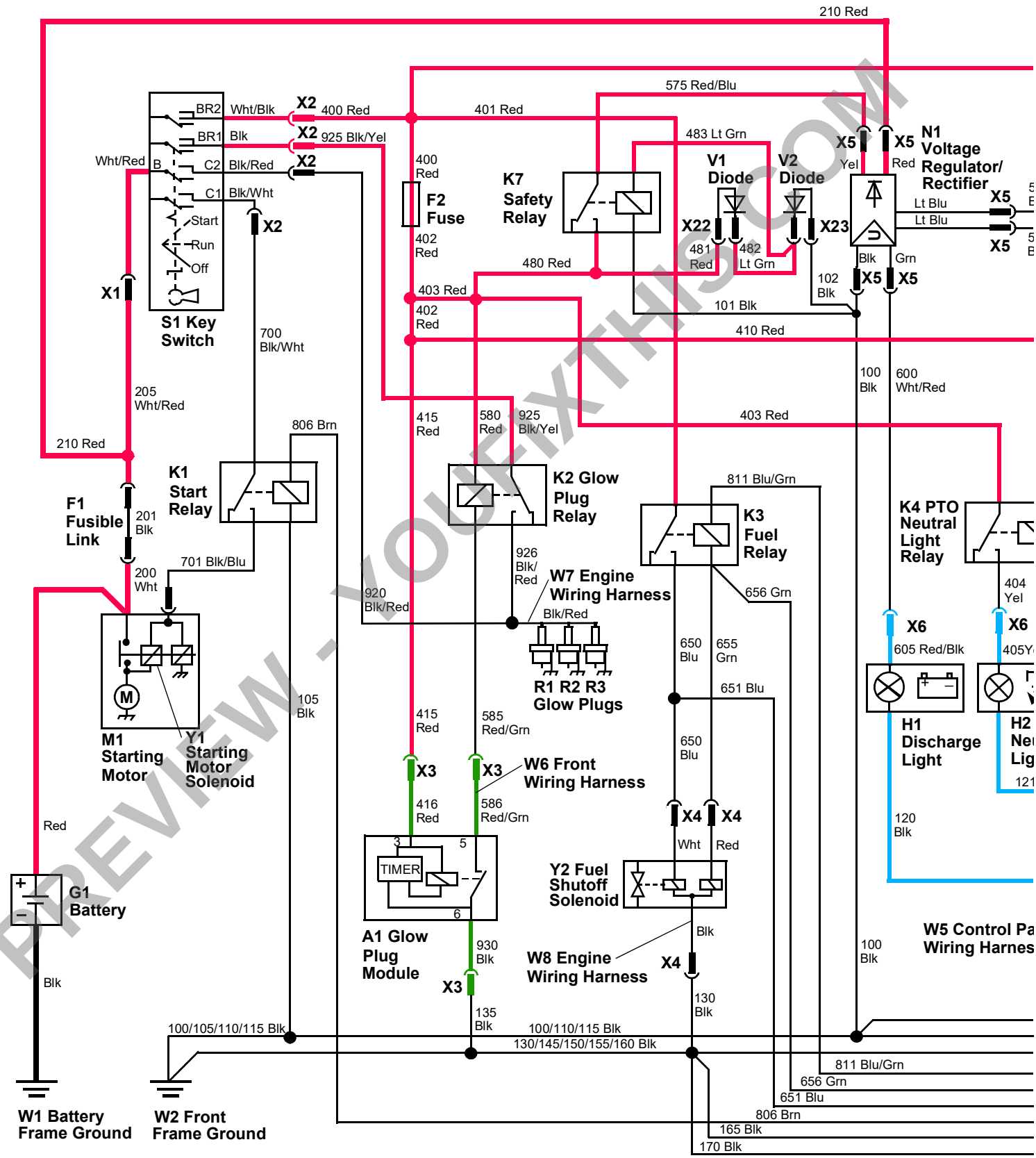


5. Remove spring pin and washer from back of throttle adjustment pin (A), and pull pin from governor lever (B).
6. Check alignment of adjustment pin to hole in

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MAIN ELECTRICAL SCHEMATIC – GEAR DRIVE



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SE1 - STARTING	SE2 - IGNITION	SE3 - CHARGING

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SPECIFICATIONS

Battery:

Voltage 12
Rating . . . . . 45 amp-hr
BCI group U-1
CCA rating (Amps at –18° C) 433
Reserve capacity (minutes). 38
Specific gravity . . . . . .1.280 or above
Electrolyte required fill (Approx.) . . . . . 1.9 L (2.0 qt)
Load test (minimum) . . . . . 340 amp for 15 seconds

Starting Motor:

Type. . . . . Solenoid Shift
Size . . . . . 1.1 KW (1.5 hp)
Amp draw (on vehicle). . . . . 200 amps (max.)
No-load amp draw (free running) . . . . . .60 amps (max.) at 4440 rpm

Alternator:

Rating (Standard) . . . . . .20 amps
Unregulated amperage . . . . . 20 amps (min.)
Regulated voltage . . . . . 12.2 – 14.8 volts DC
Unregulated voltage . . . . . .50.0 volts AC
Rating (High Capacity Optional Alternator). . . . . .35 amps

Alternator – European Tractor:

Rating (Standard) . . . . . .40 amps
Unregulated amperage . . . . . 40 amps (min.)
Regulated voltage . . . . . 12.2 – 14.8 VDC
Unregulated voltage . . . . . .50.0 volts AC

Fuel Shutoff Solenoid (Dual Coil):

Voltage . . . . . 12 VDC
Pull-in voltage . . . . . .6.8 VDC
Hold voltage . . . . . 3.0 VDC

PTO Solenoid (Hydrostatic Transmission Only):

Voltage . . . . . 12 VDC
Amperage . . . . . 1.5 amps

Fuel Gauge Sensor:

Resistance (variable). . . . . 3.0 – 115 ohms

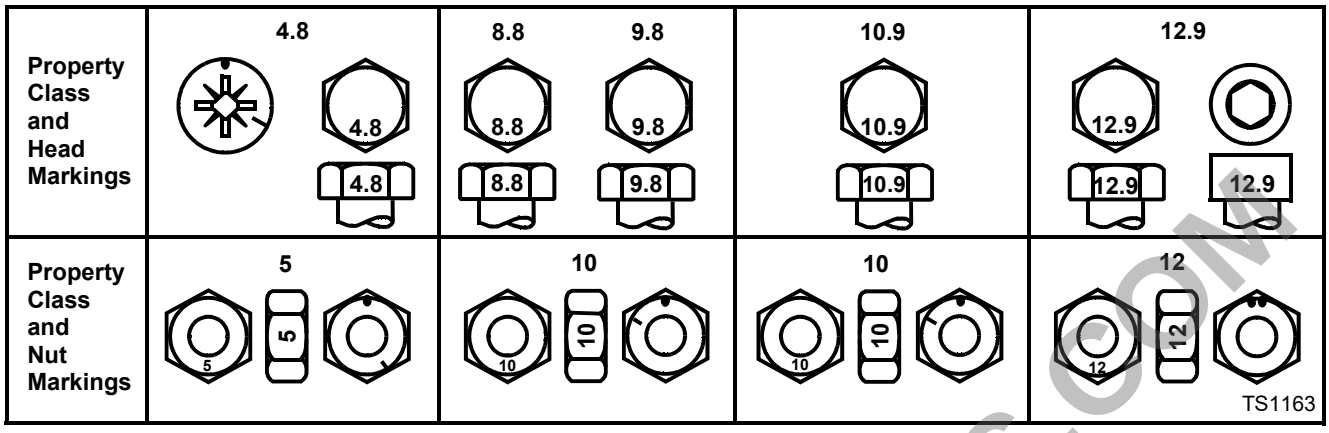
Voltage Regulator/Rectifier (North American Only):

No load voltage . . . . . 14.5 ± 0.5 VDC
Battery voltage . . . . . 12 VDC

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METRIC FASTENER TORQUE VALUES



	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	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.

[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—G200.

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governor lever. Pin should slide into hole easily. If not, loosen locking nuts (C) on throttle rod, and thread adjustment pin forward or back until aligned with hole in governor throttle lever.

7. Tighten locking nuts on throttle shaft.
8. Push throttle hand control lever forward to fast idle position. Move governor throttle lever rearward by hand to full throttle stop position.
9. Check alignment of throttle adjustment pin with hole in governor throttle lever. Readjust pin if necessary to achieve full fast idle position.
10. Install washer and spring clip onto throttle rod adjusting pin shaft.
11. Move throttle hand control lever to full forward (fast idle) position.
12. Gear Drive Tractor Only: Turn stop bolt on throttle pedal in until it contacts frame. Tighten lock nut. Throttle foot pedal should reach stop at same time as governor throttle lever reaches fast idle stop, with no strain on governor internal components.

    Hydrostatic Drive Tractor Only: Turn stop bolt on throttle hand control lever until it contacts lever. Tighten lock nut. Throttle hand control should reach stop at same time as governor throttle lever reaches fast idle stop, with no strain on governor internal components.
13. Install engine side cover and close hood.

SLOW IDLE ADJUSTMENT

Reason:

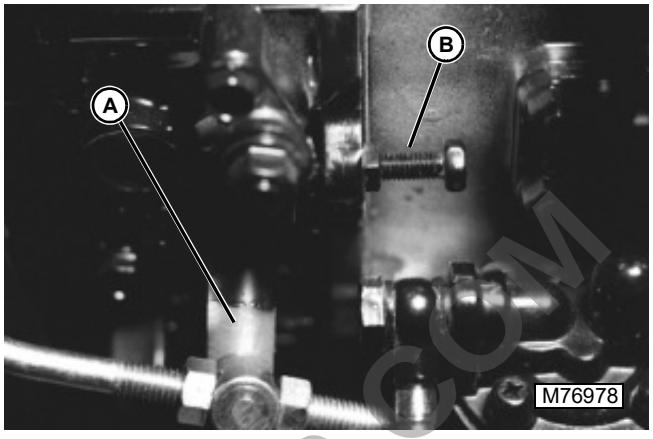
To achieve proper slow idle rpm setting. Provides adequate rpm to keep engine running smoothly without stalling.

Equipment:

- JT05719 Digital Strobe Tachometer
- (2) 10 mm Box End Wrenches

Procedure:

1. Place a small piece of reflective tape on outside edge of crankshaft pulley.
2. Start engine and run for five minutes until thermostat opens.



3. Move throttle hand lever fully back to low idle position. Check that governor throttle lever (A) is against slow idle stop screw (B). If not, adjust throttle linkage (see *Throttle Adjustment* in this section).
4. Use JT05719 Hand Held Digital Tachometer to check engine speed at front crankshaft pulley.

Specifications:

Slow Idle Speed. . . . . .1000 rpm

- If slow idle rpm is not according to specifications, loosen lock nut and adjust slow idle stop screw. After adjustment, tighten lock nut, and recheck engine slow idle speed.

FAST IDLE ADJUSTMENT (NON EPA ENGINES)

ATTENTION!

Do not attempt to adjust the fast idle stop screw unless you are a factory trained technician with authorization to service CARB/EPA Certified engines.

Reason:

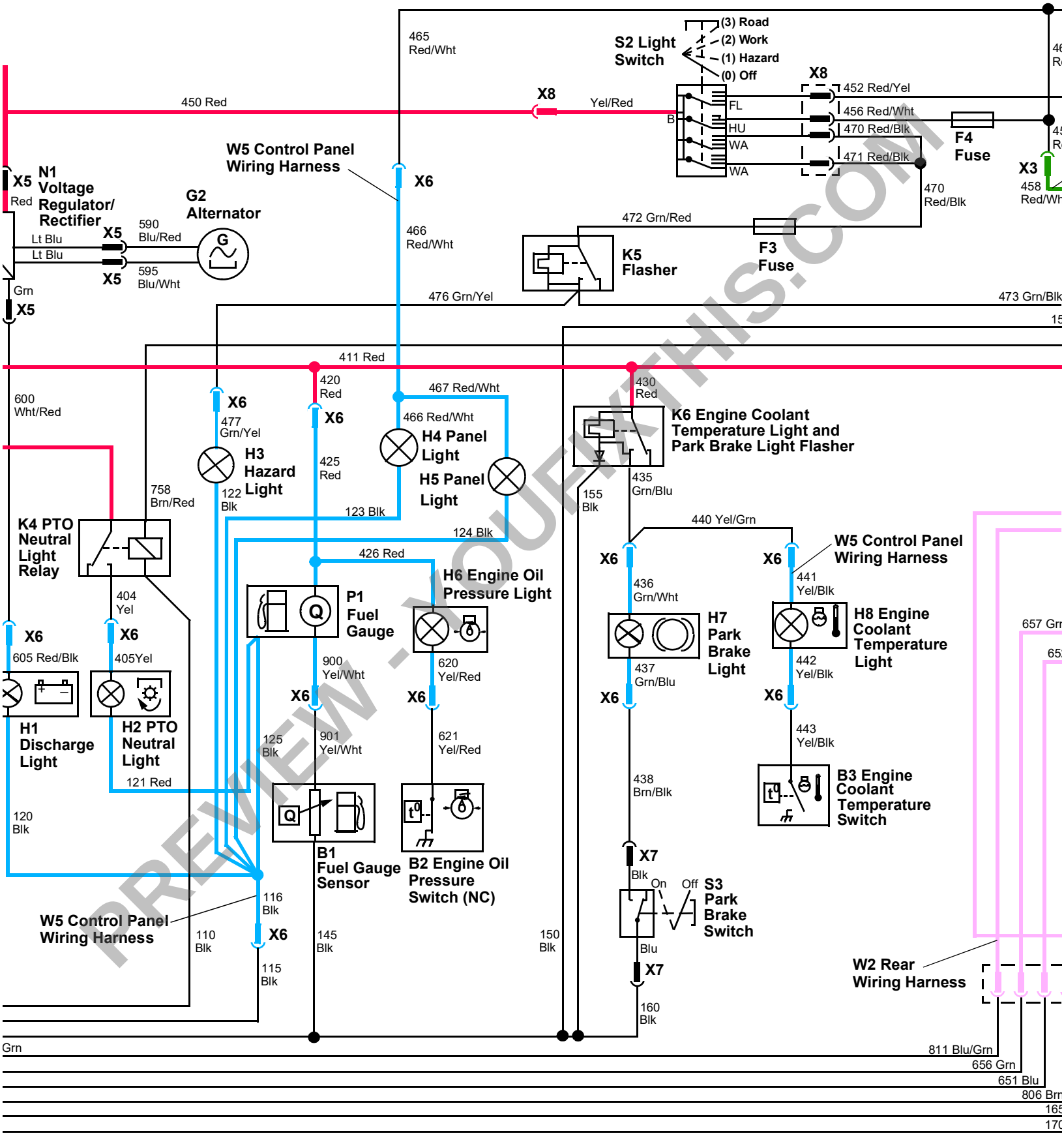
To achieve proper fast idle speed setting. This insures that the engine is running at proper rpm's for peak performance and meets the CARB/EPA emissions requirements.

Equipment:

- JT05719 Digital Photo Tachometer
- Flat Blade Screwdriver
- 10 mm End Wrench
- 12 mm End Wrench

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Procedure:

1. Place a small piece of reflective tape on outside edge of crankshaft pulley.

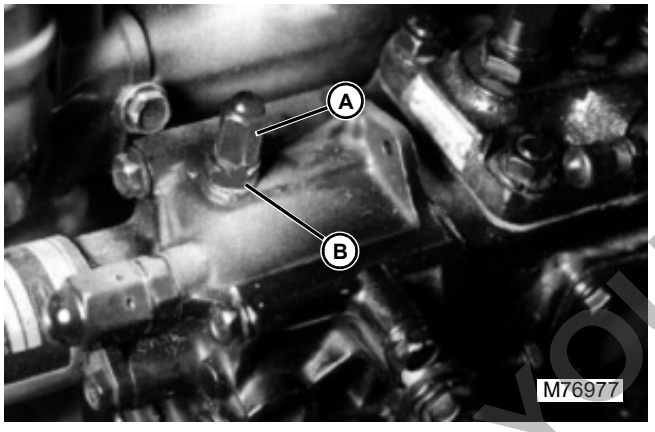
NOTE: Make sure air cleaner is clean and not restricted. Replace air cleaner element as necessary.

2. Start engine and run for five minutes until thermostat opens.
3. Move throttle hand lever fully forward to fast idle position.
4. Use JT05719 Digital Photo Tachometer to check engine speed at crankshaft pulley.

Specifications:

Fast Idle Speed. . . . . .2850 rpm

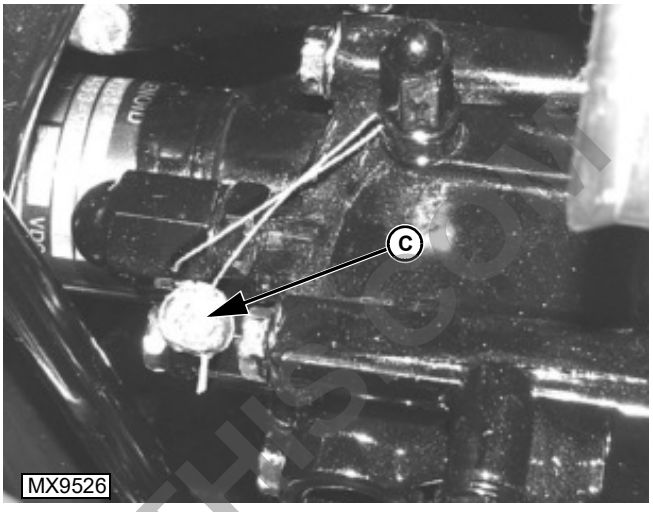
:



Results:

- If fast idle speed does not meet specifications, remove the cap nut (A) from the fast idle stop screw.
- Loosen lock nut (B) at base of fast idle screw.
- Turn fast idle stop screw with screwdriver until fast idle speed is **2850 rpm**.
- While holding fast idle screw with screwdriver, tighten lock nut to **4 N•m (35 lb-in.)**.
- Recheck fast idle speed (steps 2–4).
- If engine still does not meet fast idle speed specifications, have injection pump inspected by an authorized diesel service (ADS) center.
- Install cap nut.

FAST IDLE ADJUSTMENT (EPA ENGINES)



IMPORTANT: Fast idle and torque capsule caps are wired and sealed (C) and cannot be adjusted.

ATTENTION!

The FAST idle adjustment is pre-set by the engine manufacturer to comply with strict California Air Resources Board/Environmental Protection Agency (CARB/EPA) emissions requirements and is NOT adjustable. Tampering with the FAST idle adjustment may result in severe fines or penalties.

Because the FAST idle speed is NOT adjustable, the throttle rod adjustment becomes very critical to proper engine operation. Therefore, first MAKE SURE that the throttle lever and rod obtains its full range of motion, stop-to-stop, (See THROTTLE ADJUSTMENT, previously in this section) before performing any diagnostic procedures.

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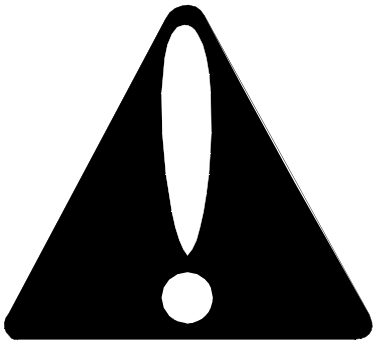
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RECOGNIZE SAFETY INFORMATION



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

Follow recommended precautions and safe 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

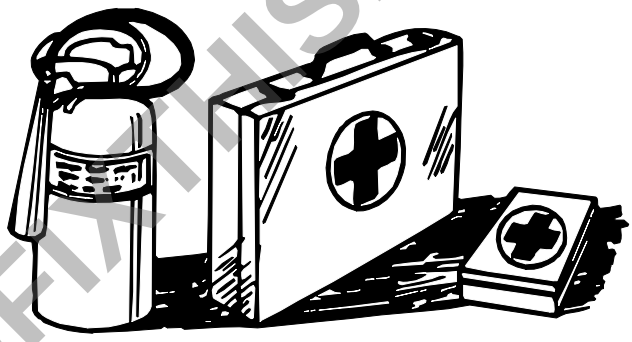


Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

HANDLE FLUIDS SAFELY-AVOID FIRES

Be Prepared For Emergencies





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.

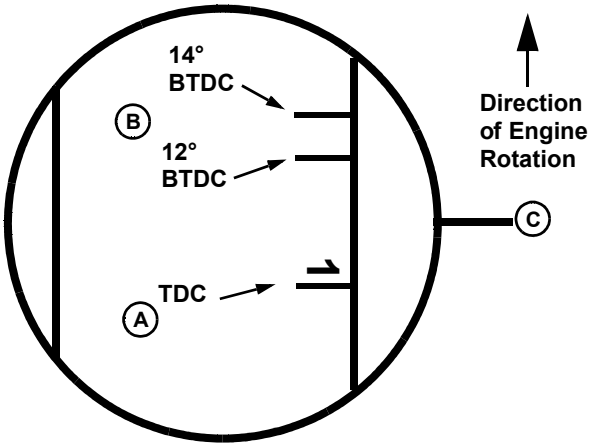
Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

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

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7. Turn crankshaft and flywheel (using a 17 mm wrench on crankshaft pulley) until flywheel timing marks for cylinder No. 1 are visible through timing inspection hole. There are three marks side-by-side. One is stamped with the number 1 (A) and is top-dead-center (TDC) for cylinder No.1. The other marks (B) are 12 and 14 degrees before top-dead-center (BTDC). The 14 degree mark is the one to be used to set the timing of the injection pump.

Timing Fuel Injection Pump:

CAUTION

Fuel injection pump is capable of extremely high pressure. Do not place hands near high pressure outlet ports. Wear eye protection. Cover pump outlets with a cloth. Do not crank engine when high pressure lines are removed.

8. Open fuel shutoff valve on fuel filter.
9. The timing procedure must be performed with the fuel shutoff solenoid pulled in and holding open so a steady supply of fuel may be available to the injection pump. The key switch must be left ON during test to hold-in fuel solenoid.To pull the fuel solenoid in, the operator's seat is tilted forward, and the seat switch is pulled UP to the defeat position. When fuel shutoff solenoid pulls in, an audible click is heard from the governor housing.
10. Turn the flywheel counterclockwise (as viewed from the flywheel end) until the timing tool straw has fuel showing.
11. Snap the straw with your finger until the level of the fuel, or a bubble, is set part way up the straw. This will be the point to watch for fuel movement.
12. Turn the crankshaft pulley clockwise (back) until the No. 1 cylinder top dead center (TDC) mark (A) and pump timing marks (B) have gone past the center mark of the timing hole (C) by at least 50 mm (2 in.).

NOTE: When running, the crankshaft turns counter-clockwise (as viewed from operator's seat). Number 1 cylinder is in the rear, closest to the flywheel.

13. Slowly turn the flywheel counterclockwise (as viewed from the flywheel end) until the fuel in the straw just starts to move. Stop rotating the flywheel the instant the fuel begins to move.

NOTE: If the fuel level does not change, the No. 1 piston may be on TDC of the exhaust stroke instead of the compression stroke. Turn flywheel one revolution and repeat Steps 12 & 13. Check that fuel shutoff solenoid is pulled in and battery is up to full charge.

14. Turn key switch OFF.

Specifications:

Injection Pump Timing. . . . . 14° BTDC

Results:

- **If Timing Is Not According To Specifications:**
  - Remove injection pump and shims. (See *Injection Pump Repair* in this section.)
  - Increase shim pack thickness to retard injector timing, decrease thickness to advance timing.
  - Install injection pump and tighten nuts to **20 N•m (177 lb-in.)**
  - Recheck timing.
- **If Engine Performance Remains Poor:**
  - Check air cleaners, fuel filter, fuel supply pump pressure, injector opening pressure, and cylinder compression before removing pump for service. Check all timing gears for wear. Retest performance.
- **If Performance Did Not Change:**
  - Have pump tested by an Authorized Diesel Service (ADS) Center. When reinstalling an injection pump sent out for service, use the same thickness of shim pack removed. If shim pack thickness is unknown or new pump is installed, replace with **0.8 mm (0.031 in.)** shim pack thickness.

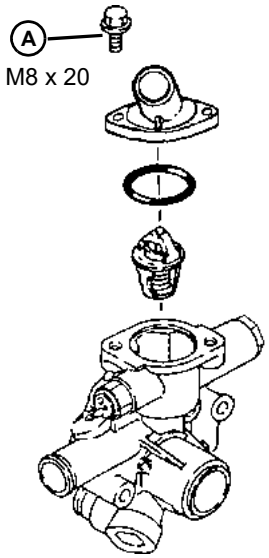
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THERMOSTAT

Removal:

1. Open engine drain valve to drain coolant level to below thermostat level.
2. Disconnect upper radiator hose from thermostat housing.



M82314B

3. Remove two cap screws (A) holding thermostat cover to water pump. Remove thermostat, Note position of notch in thermostat and casting in water pump.
4. Test thermostat. See “THERMOSTAT TEST” on page 31.

Installation:

1. Install thermostat with notch on raised tab of water pump casting.
2. Replace gasket. Install cover.
3. Tighten cap screws to specification.
4. Replace upper radiator hose and top off coolant in radiator.

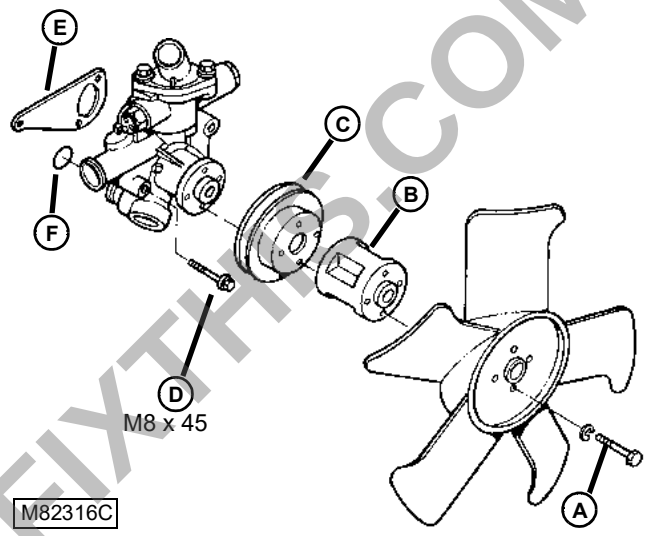
Torque Specification:

Cover Cap Screws . . . . . 9 N•m (80 lb-in.)

WATER PUMP

Removal:

1. Park tractor on level surface, park brake engaged.
2. Allow engine to cool and pressure in cooling system to drop before working on water pump.
3. Open hood and remove engine side covers and engine front cover.
4. Disconnect negative battery cable from battery.
5. Open engine drain valve to drain coolant from cylinder block and radiator.
6. Disconnect upper and lower radiator hoses from water pump.
7. Remove radiator. See “RADIATOR REMOVAL AND INSTALLATION” on page41.
8. Loosen alternator mounting bolts and remove water pump/alternator drive belt.



M82316C

9. Disconnect coolant temperature switch lead. Remove switch from water pump if pump is to be replaced.
10. Remove four radiator fan mounting cap screws (A). Remove fan, spacer (B), and pulley (C) from water pump flange.
11. Remove pump mounting cap screws (D), pump and gasket (E).
12. Inspect all parts for wear or damage.

Installation:

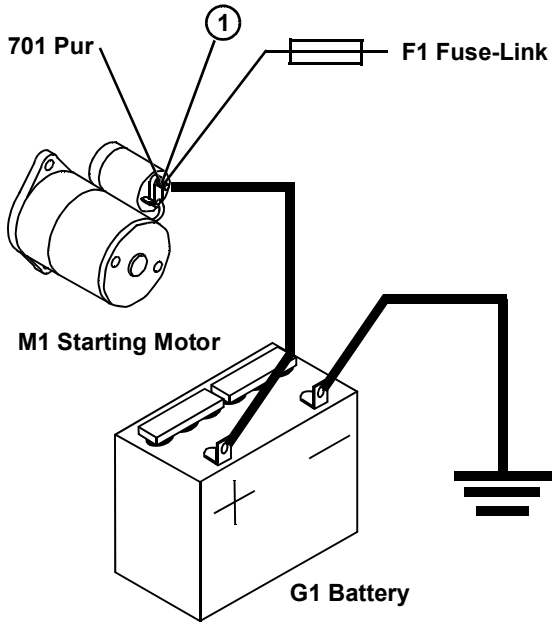
1. Clean cylinder block mating surfaces of all old gasket material.
2. Install new gasket (E) and O-ring (F).
3. Installation is done in the reverse order of removal. Tighten mounting bolts to specification.
4. Install coolant temperature switch. (See “COOLANT TEMPERATURE SWITCH” on page81.)
5. Install thermostat. (See “THERMOSTAT” on page 82.)
6. Adjust water pump/alternator drive belt tension. (See “WATER PUMP/ALTERNATOR DRIVE BELT ADJUSTMENT” on page31.)

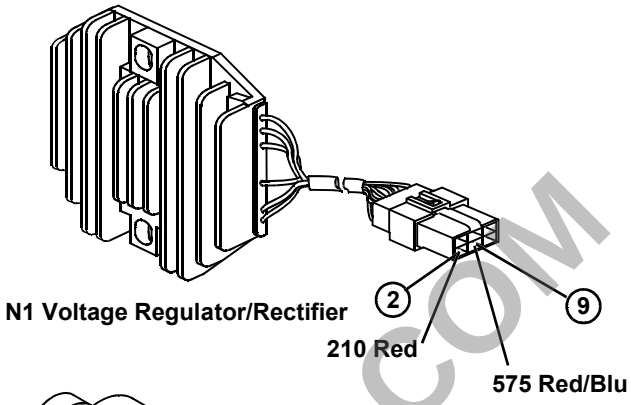
Torque Specification:

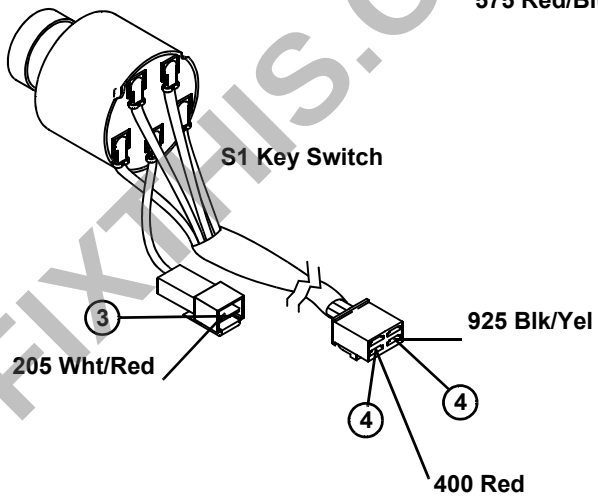
Pump Mounting Cap Screws. . . 25 N•m (221 (lb-in.)

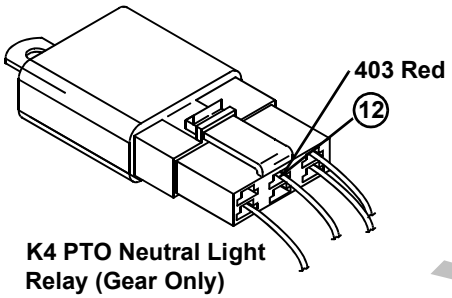
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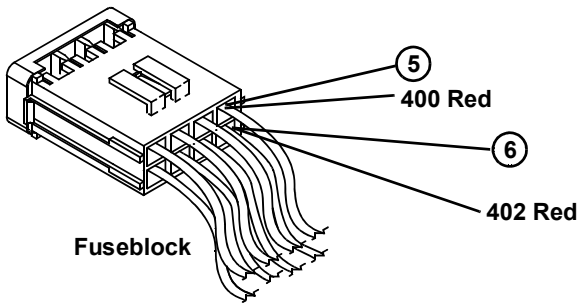
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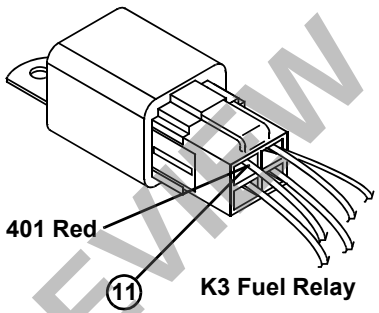


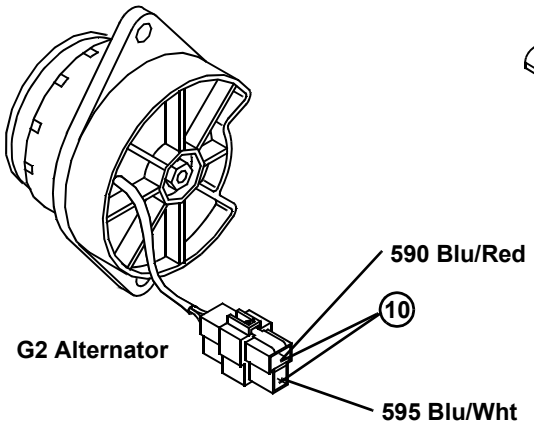


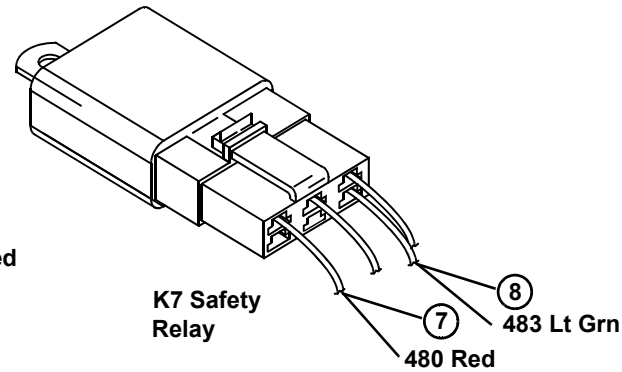












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ENGINE OIL PRESSURE SWITCH TEST

Reason:

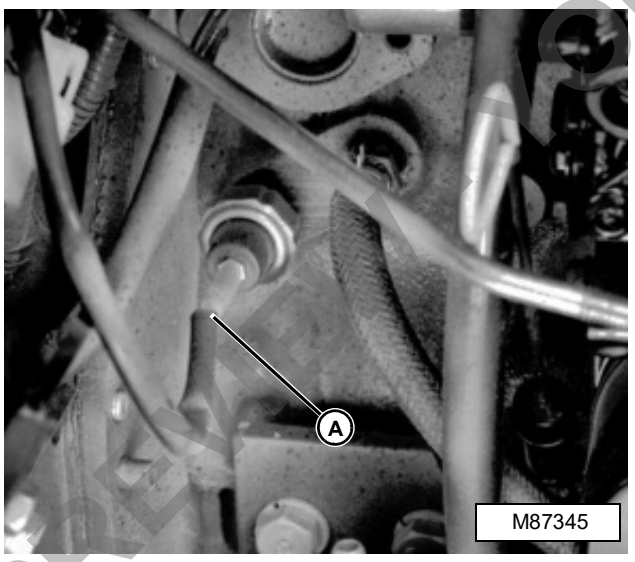
To determine if engine oil pressure switch is functioning properly, to warn operator that oil pressure has dropped below minimum operating pressure.

Equipment:

- Ohmmeter

Procedure:

1. Park machine on level surface.
2. Place PTO in NEUTRAL.
3. Turn key switch to OFF position.
4. Engage park brake.
5. Raise hood.
6. Remove right engine side cover.
7. Disconnect Yel/Red wire from oil pressure switch (A).
8. Connect black lead of ohmmeter to engine block and red lead of ohmmeter to terminal of switch.
9. Measure resistance between terminal and engine block.



Results:

- There should be continuity between terminal and ground.
- If there is NO continuity between terminal and ground: See Oil Pressure Test. Replace the switch.

NOTE: Be sure to apply Pipe Sealant with TEFLON® to threads of switch anytime it is installed.

® TEFLON is a registered trademark of the DuPont Company.

10. Start and run engine.
11. Measure resistance between terminal and engine block.

Results:

- There is NO continuity between terminal and ground, replace the switch.
- If the switch DOES have continuity to engine block (ground) with engine running, check oil pressure.
- If oil pressure is to specification, replace the oil pressure switch.

GLOW PLUG TEST

Reason:

To test operation of glow plugs.

Equipment:

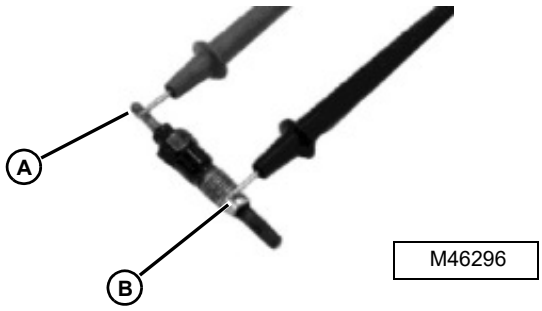
- Ohmmeter

Procedure:

1. Park machine on level surface.
2. Place PTO in NEUTRAL.
3. Turn key switch to OFF position.
4. Engage park brake.
5. Raise hood.
6. Remove right engine side cover.

NOTE: Cover glow plug hole to prevent debris from entering cylinder when glow plug is removed.

7. Remove glow plug lead. Remove glow plug.
8. Check continuity across terminal (A) and glow plug body (B). The reading should be between **0.3 – 0.5 ohms.**



Results:

- If glow plug does not have proper resistance, replace glow plug.

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POWER CIRCUIT DIAGNOSIS

Test Conditions:

- Park brake ENGAGED
- Key switch in RUN position
- Transmission in NEUTRAL
- PTO DISENGAGED
- Gear range lever in NEUTRAL

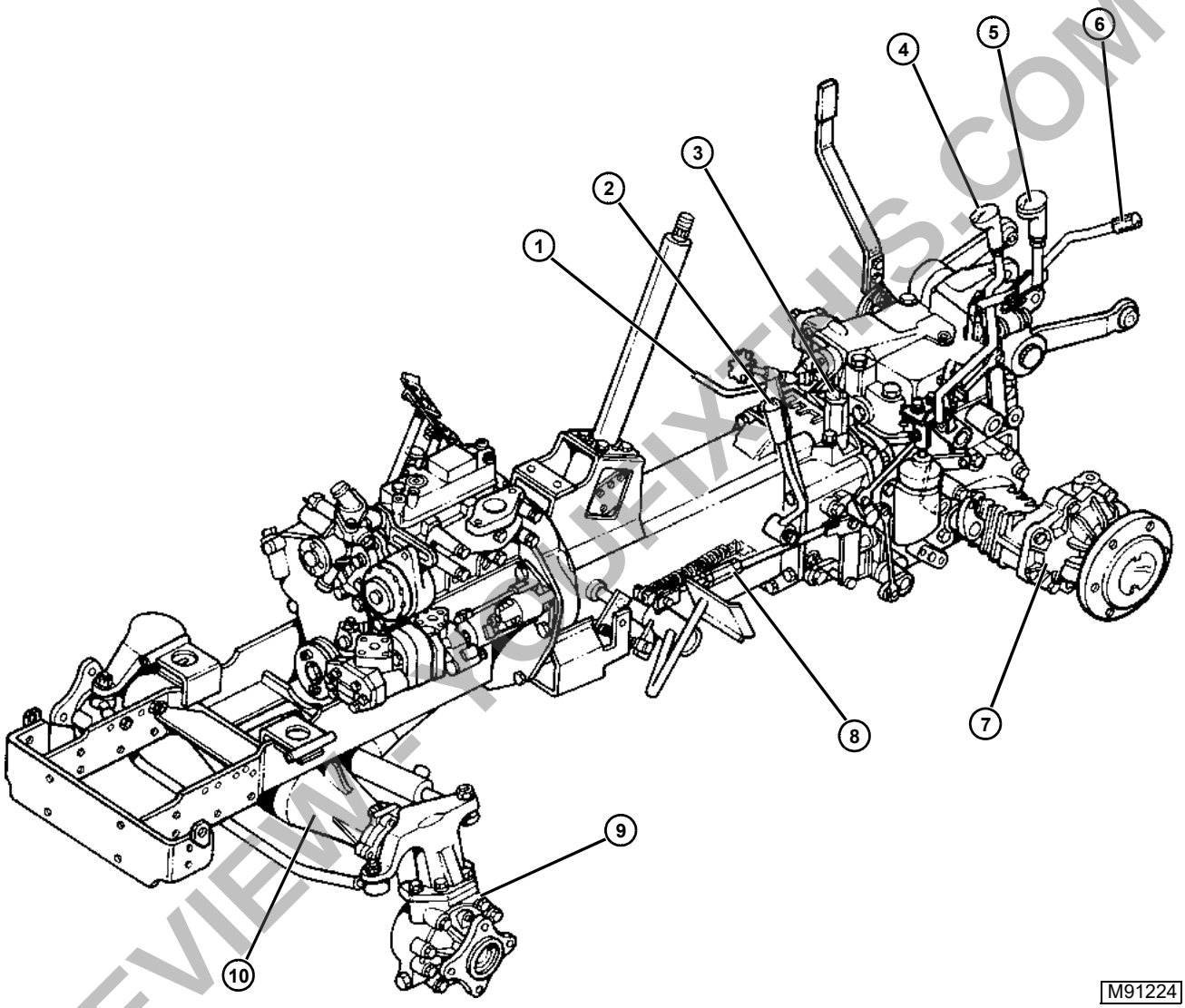
Test/Check Point	Normal	If Not Normal
28. Rear PTO switch (Hydro Only)	Battery voltage	Check 750 Red wire and connections.
29. Rear PTO switch (Hydro Only)	Battery voltage	Ensure PTO is in NEUTRAL. Test switch. (See “REAR PTO SWITCH TEST – HYDRO” on page 86.) Replace switch as necessary.
30. PTO Relay (Hydro)	Battery voltage	Check 757 Brn/Red, X9B connector, and 758 Brn/Red wire and connections.
31. Gear range neutral start switch (Hydro)	Battery voltage	Check 777 Brn/Red wire and connections
32. Gear range neutral start switch (Hydro)	Battery voltage	Ensure gear range shifter is in NEUTRAL. Test switch. (See “GEAR RANGE NEUTRAL START SWITCH TEST” on page 84.) Replace switch.
33. Seat switch (Hydro)	Battery voltage	Check 750 and 413 Red wires and connections, and X11 connector.
34. Seat switch (Hydro)	Battery voltage	Check 761 Yel/Blu wire and connections.
35. Gear range neutral start switch (Gear)	Battery voltage	Check 760 Blu/Red wire and connections.
36. Gear range neutral start switch (Gear)	Battery voltage	Ensure transmission is in NEUTRAL. Test switch. (See “GEAR RANGE NEUTRAL START SWITCH TEST” on page 84.) Replace switch as.
37. Control module	Battery voltage	Check 412 Red wire and connections.
38. Control module	Battery voltage	Gear: Check 762 Blu/Blk and 771 Wht/Blu wires and connections. Hydro: Check X11 connector and 765 Yel/Blu wire and connections.
39. Control module	Battery voltage	Gear: Check 756 Grn/Yel wire and connections. Hydro: Check 661 Brn/Wht wire, X9A connector and 662 Brn/Wht wire and connections.
40. Seat switch (Gear)	Battery voltage	Check 771 Wht/Blu wire and connections.

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COMPONENT LOCATION

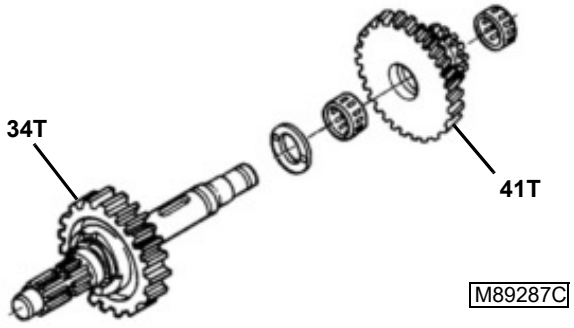
GENERAL



1. Differential Lock Lever
2. MFWD Engagement Lever
3. Dip Stick
4. Gear Shift Lever
5. Range Selector Lever
6. PTO Selector Lever
7. Rear Final Drive Housing
8. PTO Brake Rod
9. MFWD Final Drive
10. MFWD Differential Housing

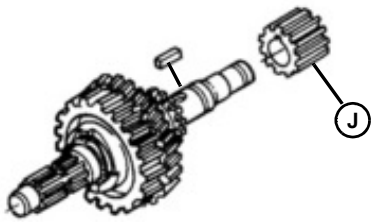
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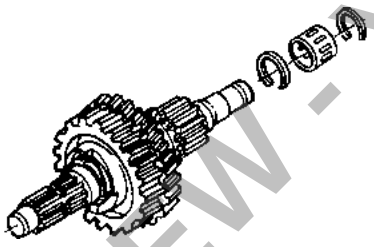
M89287C

30. Place washer on PTO transfer shaft next to 34T gear.
31. Install needle bearings in 41T gear and install gear assembly on PTO transfer shaft.

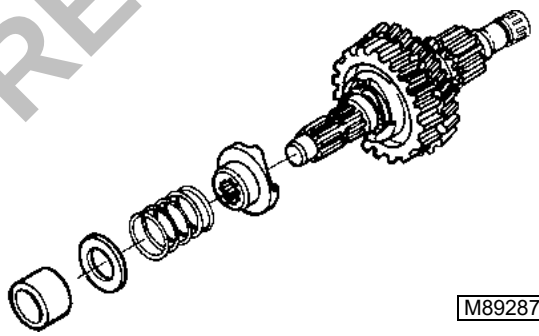


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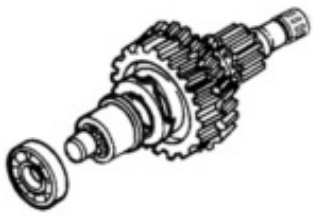
32. Place key in key way in PTO transfer shaft. Install slider (J) on PTO transfer shaft so that slot in slider lines up with key.


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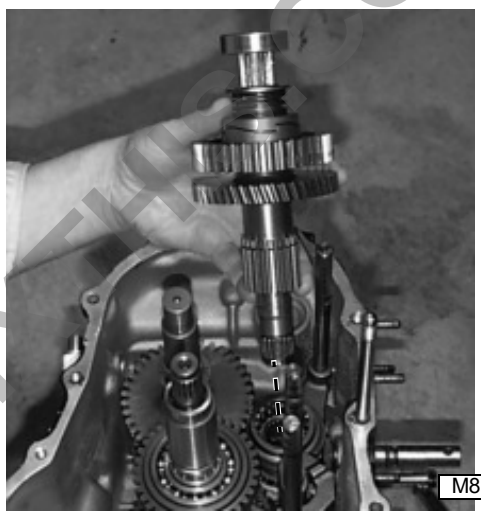
33. Install external C-clip and needle bearing on PTO transfer shaft. Secure with second C-clip.


M89287F

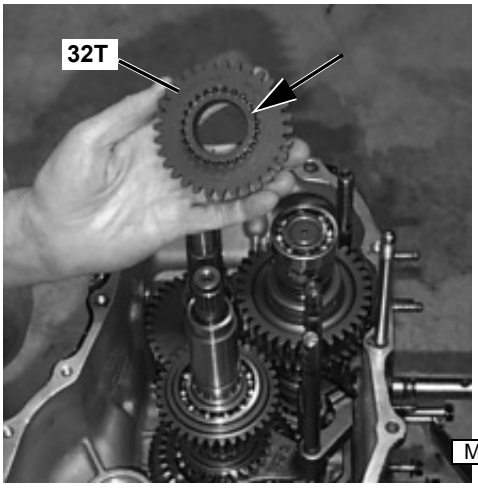
34. Install dog plate on PTO transfer shaft.
35. Install spring and washer on dog plate.


M89287G

36. Install spacer and bearing on end of PTO transfer shaft.


M89357

37. Install PTO transfer shaft assembly in stub shaft. Make sure that shaft seats all the way and that gears mesh correctly.



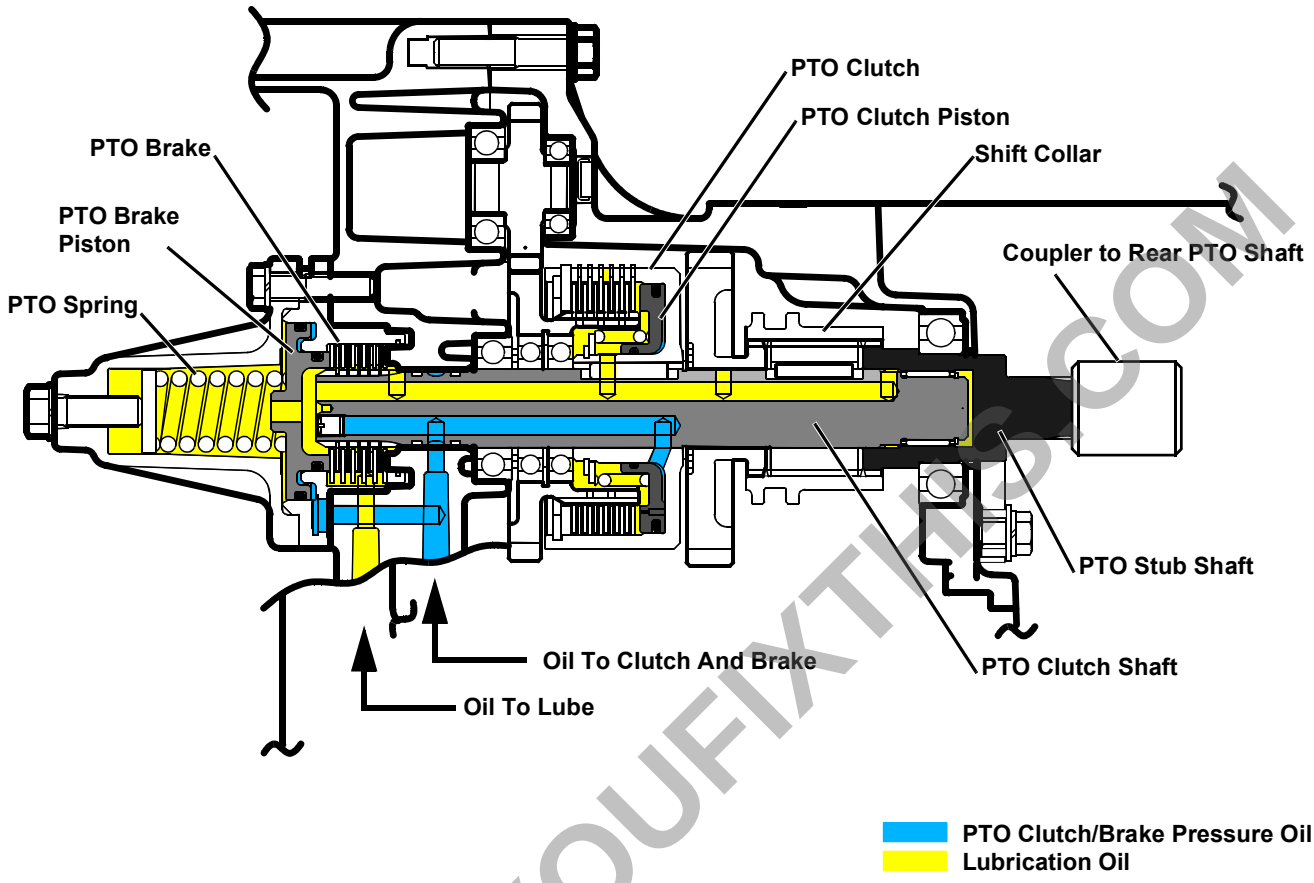
M89339

38. Place gear on 32T gear tube with small splined hub facing up.

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PTO CLUTCH AND BRAKE THEORY OF OPERATION



Function:

The PTO Clutch and PTO Brake consist of two interrelated hydraulically operated systems. The PTO clutch provides a means for disengaging the PTO output shaft from the engine. The PTO brake is provided to positively stop the rotation of the PTO system when the PTO clutch is disengaged. The PTO clutch and PTO brake work simultaneously. Both mid and rear PTOs are affected by the operation of the PTO clutch and PTO brake. See “POWER TRANSMISSION — MID AND REAR PTO” on page39.

Theory:

The PTO clutch and PTO brake are engaged, or disengaged, by the operator via the S8 switch on the control panel. This switch operates the Y3 PTO solenoid located in the valve plate mounted on the left side of the center case. See “PTO CLUTCH AND BRAKE CONTROL VALVES THEORY OF OPERATION” on page37.

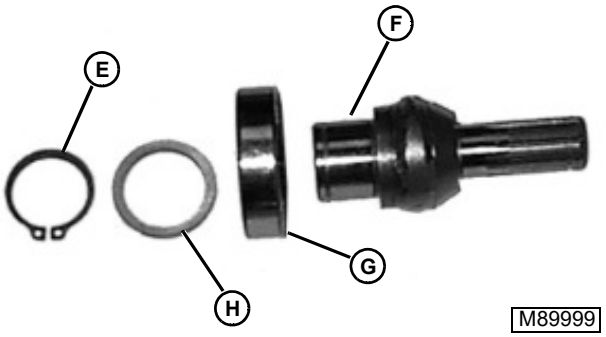
The PTO brake, mounted in the center case on the front end of the PTO clutch shaft, is a spring loaded, multi-plate, wet brake and is normally engaged, preventing the PTO clutch shaft from rotating. The PTO clutch is located on the same shaft as the PTO brake. The PTO clutch is a multi-plate, wet clutch and is normally disengaged.

When the Y3 PTO solenoid is energized pressure oil flows to a piston in the PTO brake housing. When pressurized the piston compresses the PTO spring and releases the PTO brake. At the same time that the PTO brake is released oil flows through the PTO clutch shaft into the PTO clutch and pressurizes the piston in the PTO clutch. When the clutch piston is pressurized it applies pressure to the clutch pack locking the friction plates - which are splined to the 35T gear - and the stationary plates - which are keyed to the clutch housing - thus allowing power to be transferred from the 35T gear to the PTO shaft. See “POWER TRANSMISSION — MID AND REAR PTO” on page 39.

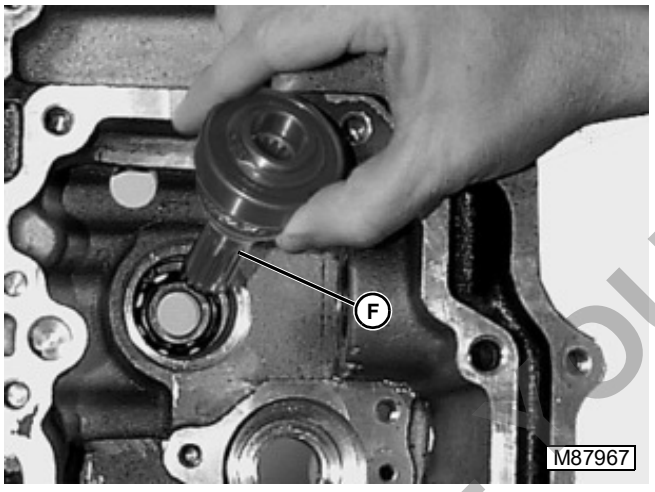
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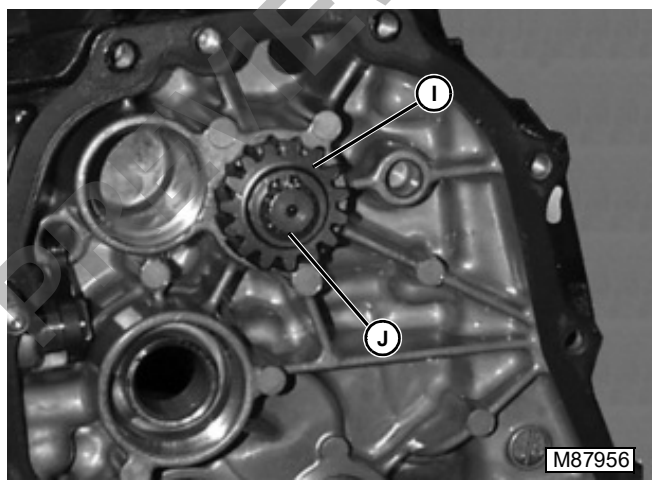
2. From back side of center case, install snap ring (C) in input stub shaft bore. Install bearing (D).



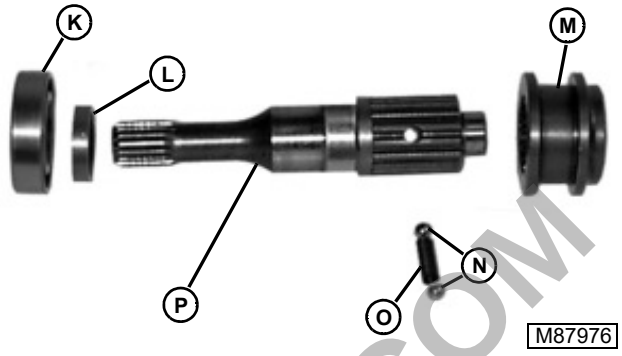
3. Assemble large end bearing (G) and washer (H) on stub shaft (F). Secure with external snap ring (E).



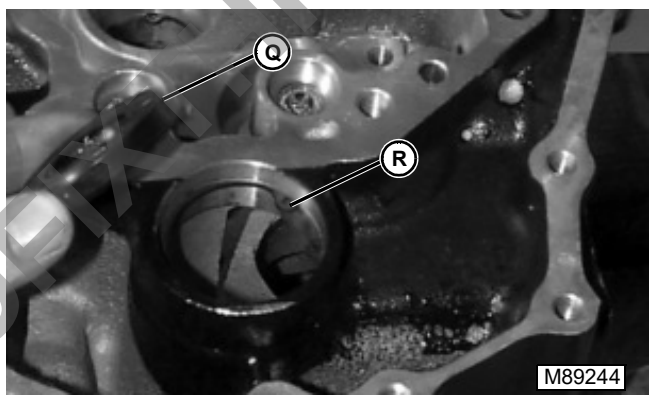
4. Install input stub shaft (F) from front side of center case.



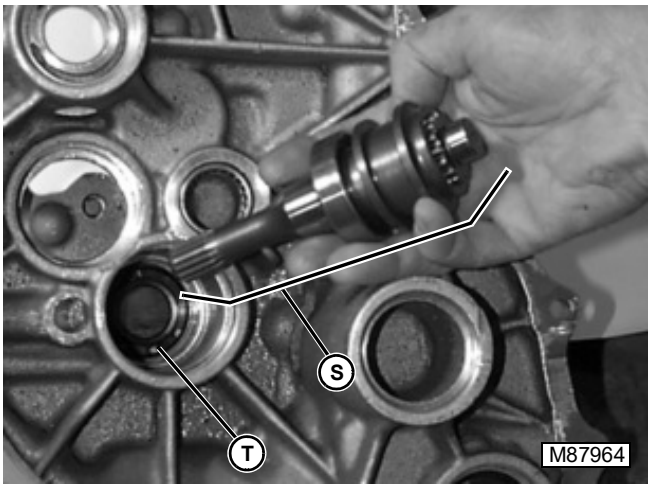
5. Place 15T gear (I) on input stub shaft with extended hub out. Secure with snap ring (J).



6. Assemble shift collar (M), detent balls (N), spring (O), spacer (L) and bearing (K) on front wheel drive output shaft (P).



7. If removed, replace snap ring (R) in front wheel drive output shaft bore.
8. Using correct size seal installation tool to drive new front wheel drive output shaft seal (Q) into center case bore until it seats on snap ring (R).

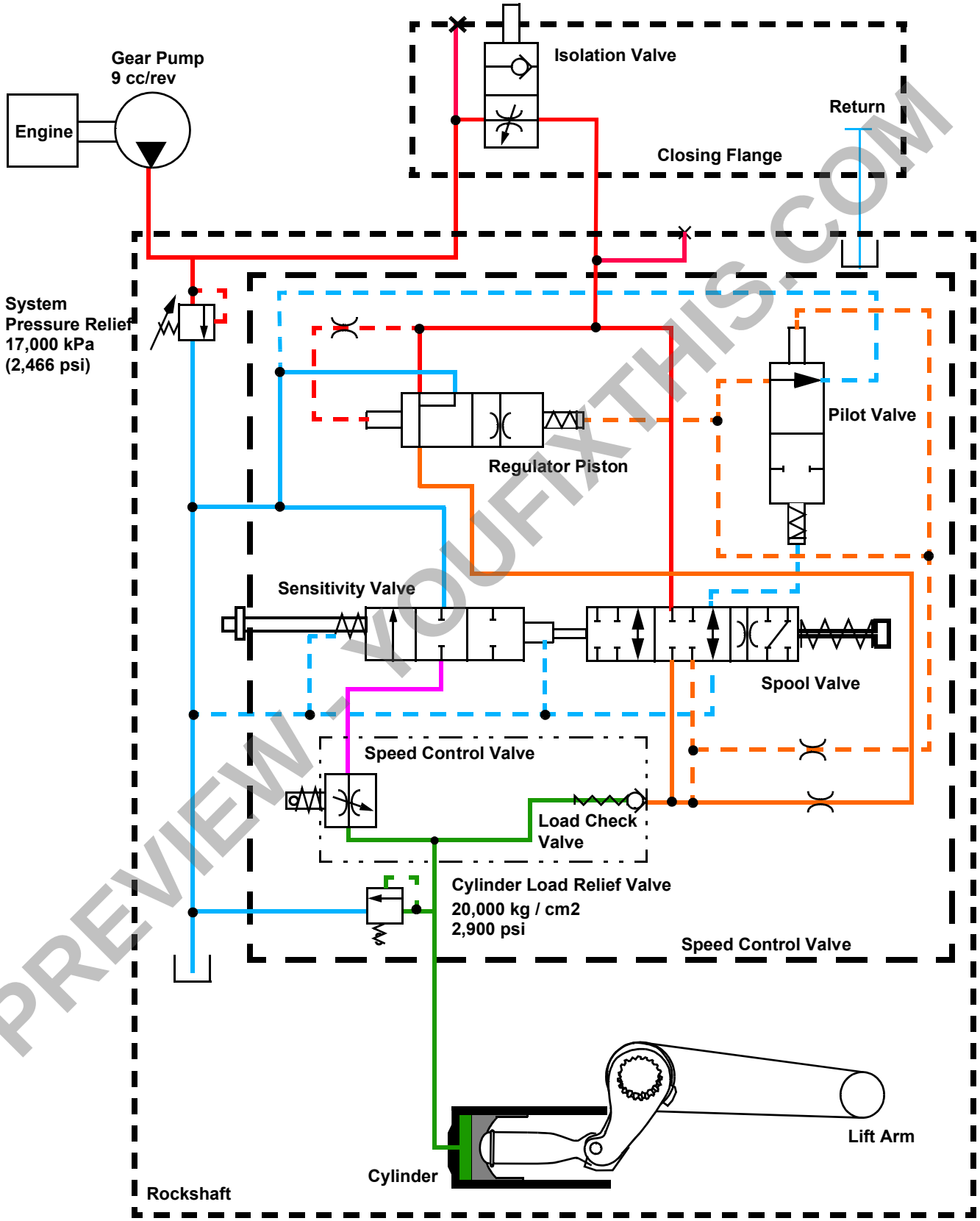


9. Taking care not to damage output shaft seal (T), install front wheel drive output shaft assembly (S) in stub shaft bore from back side of center case.

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