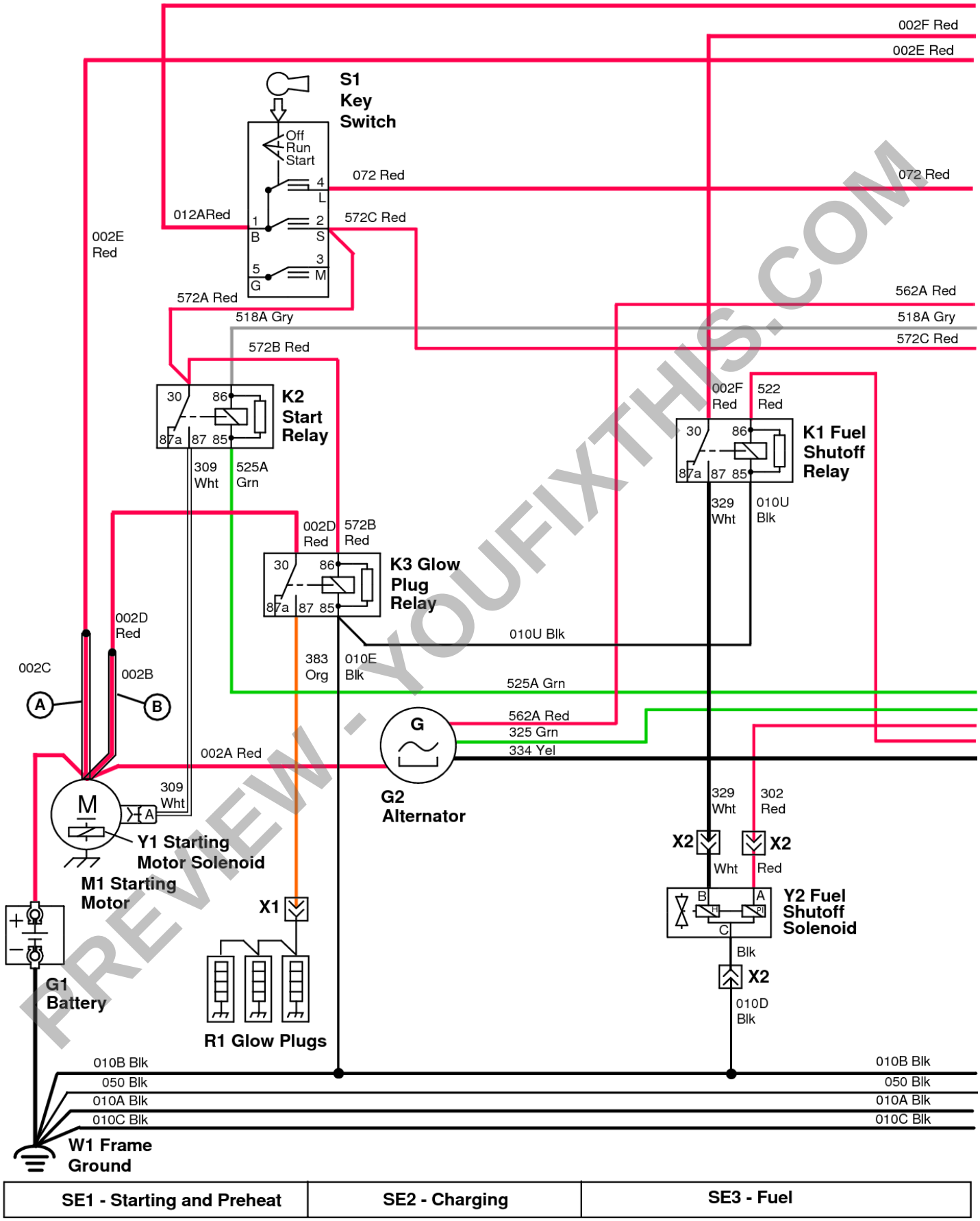
Main Schematic

Main Schematic (1 of 4)



Main Schematic (1 of 4)

LEGEND:

A	002C Fuse Link

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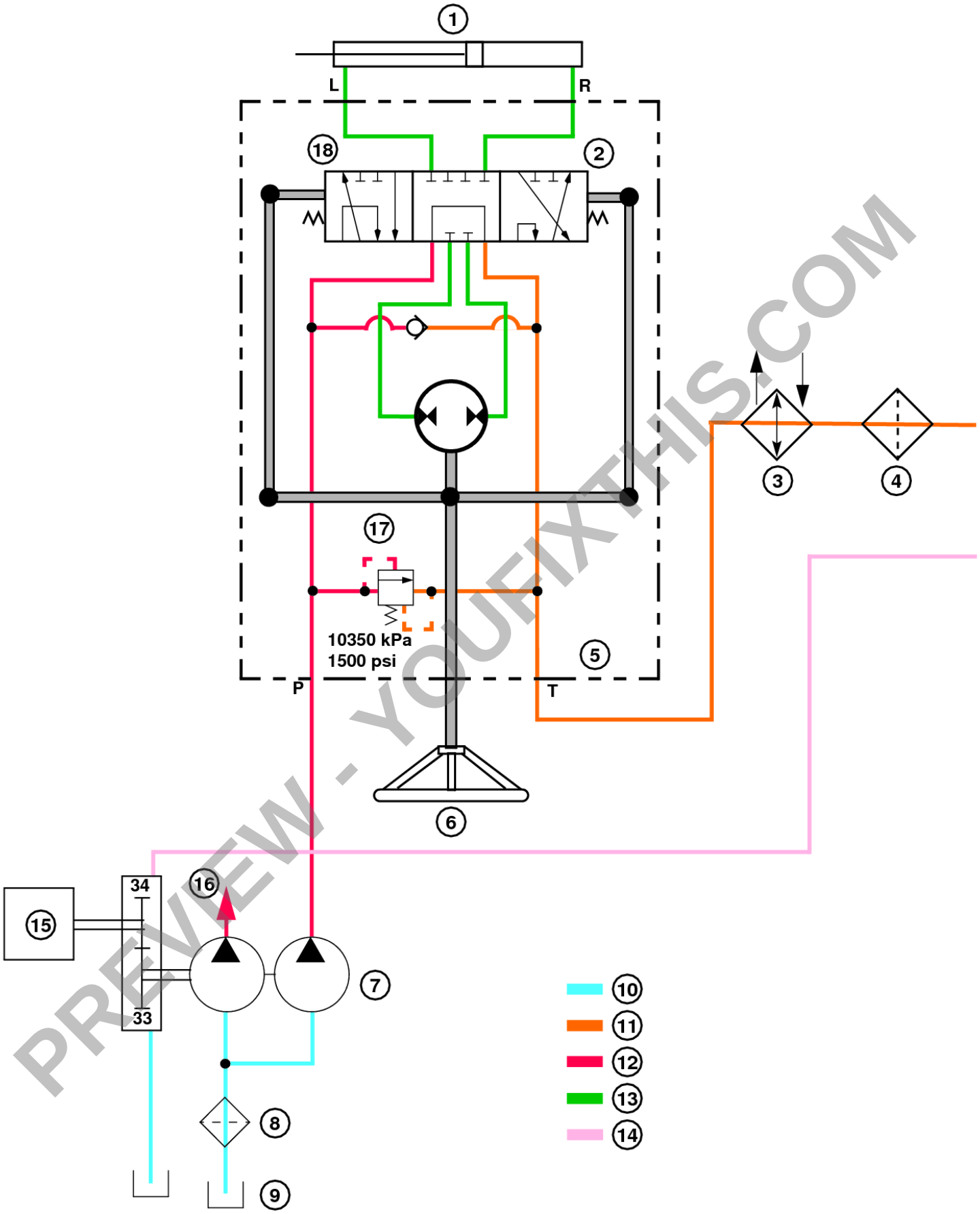
Steering System Schematic



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Steering System Schematics

LEGEND:

1	Steering Cylinder
2	Right
3	Oil Cooler
4	Spin-On Charge Pressure Filter

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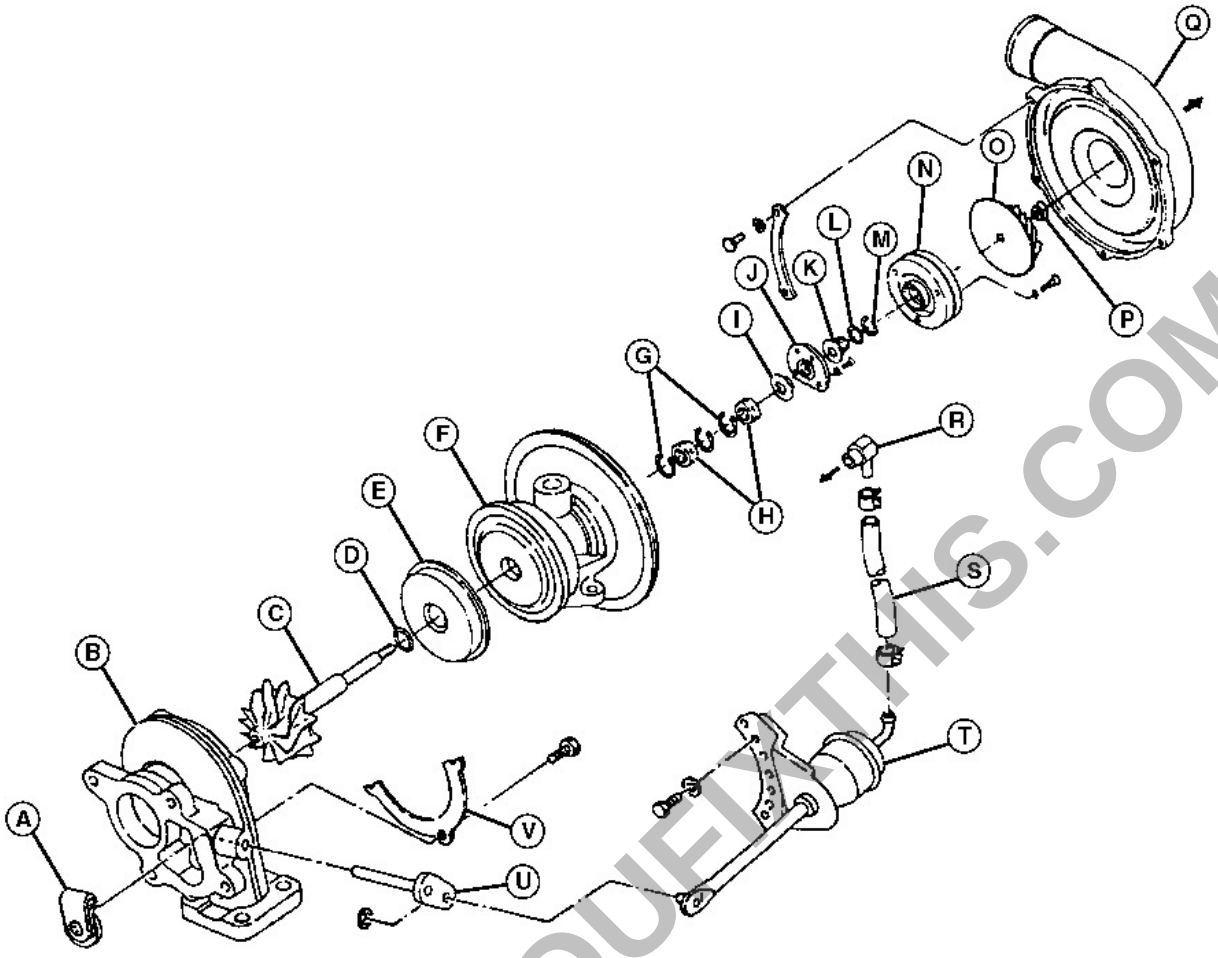
Turbocharger Components



Turbocharger Components

LEGEND:

A	Waste Gate Valve
B	Turbine Housing
C	Turbine Shaft
D	Seal Ring (Turbine Side)
E	Heat Shield
F	Bearing (Center) Housing
G	Retaining Ring
H	Journal Bearing
I	Thrust Bushing
J	Thrust Bearing
K	Oil Thrower
L	Seal Ring
M	Seal Ring
N	Seal Plate
O	Impeller
P	Lock Nut (LH Thread)
Q	Compressor Housing
R	Fitting (To Intake Manifold)
S	Hose
T	Waste Gate Actuator
U	Waste Gate Link Plate
V	Lock Plate

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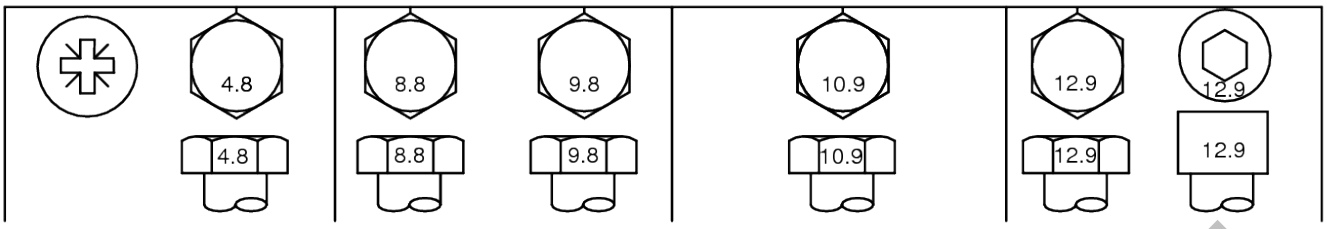
Group 05 - General Specifications

Metric Bolt and Screw Torque Values



Metric Bolt and Screw

Metric Torque Values

Bolt or Screw Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated ["Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.]		**Dry** ["Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B, F13E or F13H zinc flake coating.]		**Lubricated** ["Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.]		**Dry** ["Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B, F13E or F13H zinc flake coating.]		**Lubricated** ["Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.]		**Dry** ["Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B, F13E or F13H zinc flake coating.]		**Lubricated** ["Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.]		**Dry** ["Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B, F13E or F13H zinc flake coating.]	
	N˙m	**lb.-in.**	**N˙m**	**lb.-in.**	**N˙m**	**lb.-in.**	**N˙m**	**lb.-in.**	**N˙m**	**lb.-in.**	**N˙m**	**lb.-in.**	**N˙m**	**lb.-in.**	**N˙m**	**lb.-in.**
M6	4.7	42	6	53	8.9	79	11.3	100	13	115	16.5	146	15.5	137	19.5	172
									N˙m	**lb.-ft.**	**N˙m**	**lb.-ft.**	**N˙m**	**lb.-ft.**	**N˙m**	**lb.-ft.**
M8	11.5	102	14.5	128	22	194	27.5	243	32	23.5	40	29.5	37	27.5	47	35
			N˙m	**lb.-ft.**	**N˙m**	**lb.-ft.**	**N˙m**	**lb.-ft.**								
M10	23	204	29	21	43	32	55	40	63	46	80	59	75	55	95	70
	N˙m	**lb.-ft.**														
M12	40	29.5	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	46	80	59	120	88	150	110	175	130	220	165	205	150	260	190
M16	100	74	125	92	190	140	240	175	275	200	350	255	320	235	400	300
M18	135	100	170	125	265	195	330	245	375	275	475	350	440	325	560	410
M20	190	140	245	180	375	275	475	350	530	390	675	500	625	460	790	580
M22	265	195	330	245	510	375	650	480	725	535	920	680	850	625	1080	800
M24	330	245	425	315	650	480	820	600	920	680	1150	850	1080	800	1350	1000
M27	490	360	625	460	950	700	1200	885	1350	1000	1700	1250	1580	1160	2000	1475
M30	660	490	850	625	1290	950	1630	1200	1850	1350	2300	1700	2140	1580	2700	2000
M33	900	665	1150	850	1750	1300	2200	1625	2500	1850	3150	2325	2900	2150	3700	2730
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2770	4750	3500

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For stainless steel fasteners or for nuts on U-bolts, see the tightening instructions for the specific application. Tighten plastic insert or crimped steel type lock nuts by turning the nut to the dry torque shown in the chart, unless different instructions are given for the specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class. Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

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Display Panel Theory of Operation

→NOTE:

For all display panel inputs or outputs not covered here, see associated circuit description elsewhere in this manual.

Function:

To inform the operator of various machine operating conditions as well as controlling certain lighting operations. The display panel has limited diagnostic functions as well. In addition, the display panel provides the logic to operate the various safety interlocks on the machine.

Operating Conditions:

The key switch must be in run or start position.

Theory of Operation - Display Panel:

There are be two modes of operation, normal and hazard mode. Normal mode is the normal operation of the module (hour meter, icons, turn signals, etc.). Hazard mode can be used to check the hour meter of the machine and flash hazard lights without the need of a key.

A POST (Power On Self Test) will occur every time the key switch is turned from OFF to RUN, and only once per power cycle. This is when the module first powers up. During the POST, the module will test all LCD segments, test the non-volatile memory, and check for the desired mode. The POST will take no longer than 1 second. The module will enter normal operation upon completion of the POST. If the NV (Non-Volatile) memory (hour meter) test fails, the module will revert back to the latest stored value and “disable” the bad location in the NV memory. The POST will also capture the state of engine oil pressure input to a memory variable, “EOP Initial State”.

The A1 display panel receives unswitched power over the 012B Red wire (J1-C). If the key switch is in the off position, but the S2 light switch is on, power will flow to the display panel J2-A pin over the 103 Org wire.

The A1 display panel receives switched power over the 562E Red wire (J1-A).

A single point ground is provided by the 050 Blk wire (J1-B).

Engine Oil Pressure Light:

The H4 engine oil pressure light is driven by the B4 oil pressure switch. When the oil pressure falls below an unsafe level, the switch will close to ground and illuminate the warning light. The oil pressure switch also controls hour meter logic.

Engine Coolant Temperature Light:

The H2 engine coolant temperature light is driven by the B2 coolant temperature switch. When the coolant temperature exceeds an unsafe level, the switch will close to ground and cause the warning light to illuminate.

Diagnostic Trouble Codes:

The error codes are displayed on the LCD portion of the A1 display panel to indicate a problem on certain outputs and the reasons for not being able to turn on the fuel solenoid. The error codes will be displayed as long as the fault persists, except Fuel Solenoid OFF codes.

The display panel will display turn/hazard light faults if there are no Fuel Solenoid OFF codes. These codes will be displayed for 2 seconds every 10 seconds until the fault is corrected.

→NOTE:

Fault will have to be active for at least 0.5 seconds before the error is displayed to avoid nuisance errors.

Error Codes

Description	Code	Notes
Fuel Solenoid OFF	NeutOF PTOON	These error codes will scroll through one at a time, when Hold-in coil output is OFF.
Left Turn Output Fault	LTFT	Open circuit or shorted to ground.

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Fan and Alternator Drive Belt Adjustment

Reason:

To keep correct tension on the drive belt to the water pump and alternator. To prevent shortened belt and bearing life.

Equipment:

Belt Tension Gauge

JDG529 or JDST28

Determine Belt Tension

Straight Edge

To Adjust Drive Belt

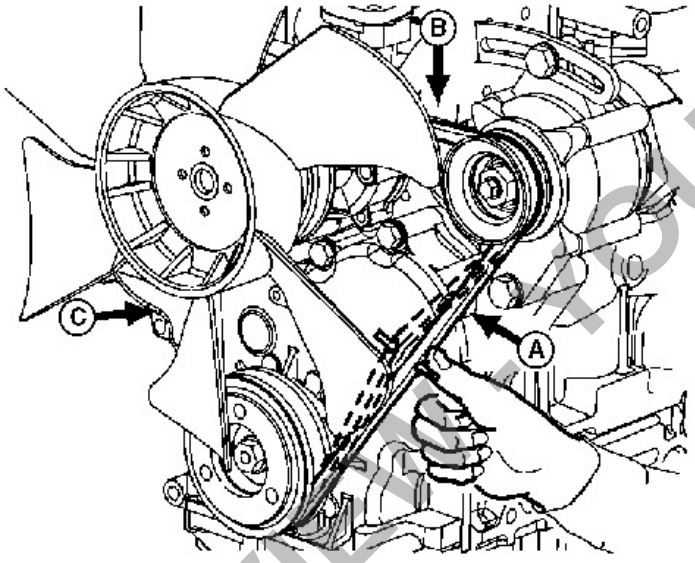
Procedure:

[1] - Park machine safely. (See Park Machine Safely in Section 10, Group 05.)

[2] - Allow engine to cool.

[3] - Raise hood.

[4] -



LEGEND:
A Belt Midway Between Crankshaft Pulley and Alternator
B Belt Midway Between Alternator and Water Pump
C Belt Midway Between Water Pump and Crankshaft Pulley

Fan and Alternator Drive Belt Deflection Points

Apply a force of 98 N (22 lb.-force) to the belt midway between water pump, crankshaft pulley, or alternator (A), (B), or (C) using a belt tension gauge and a straight edge.

[5] - The deflection should be to specification.

Item	Measurement	Specification
Belt Deflection	Force	98 N (22 lb.-force)
Point (A)		
Used Belt	Deflection	10—14 mm (0.40—0.55 in.)
New Belt	Deflection	8—12 mm (0.32—0.47 in.)
Point (B)		
Used Belt	Deflection	7—10 mm (0.28—0.40 in.)
New Belt	Deflection	5—8 mm (0.20—0.32 in.)
Point (C)		
Used Belt	Deflection	9—13 mm (0.35—0.51 in.)
New Belt	Deflection	7—11 mm (0.28—0.43 in.)

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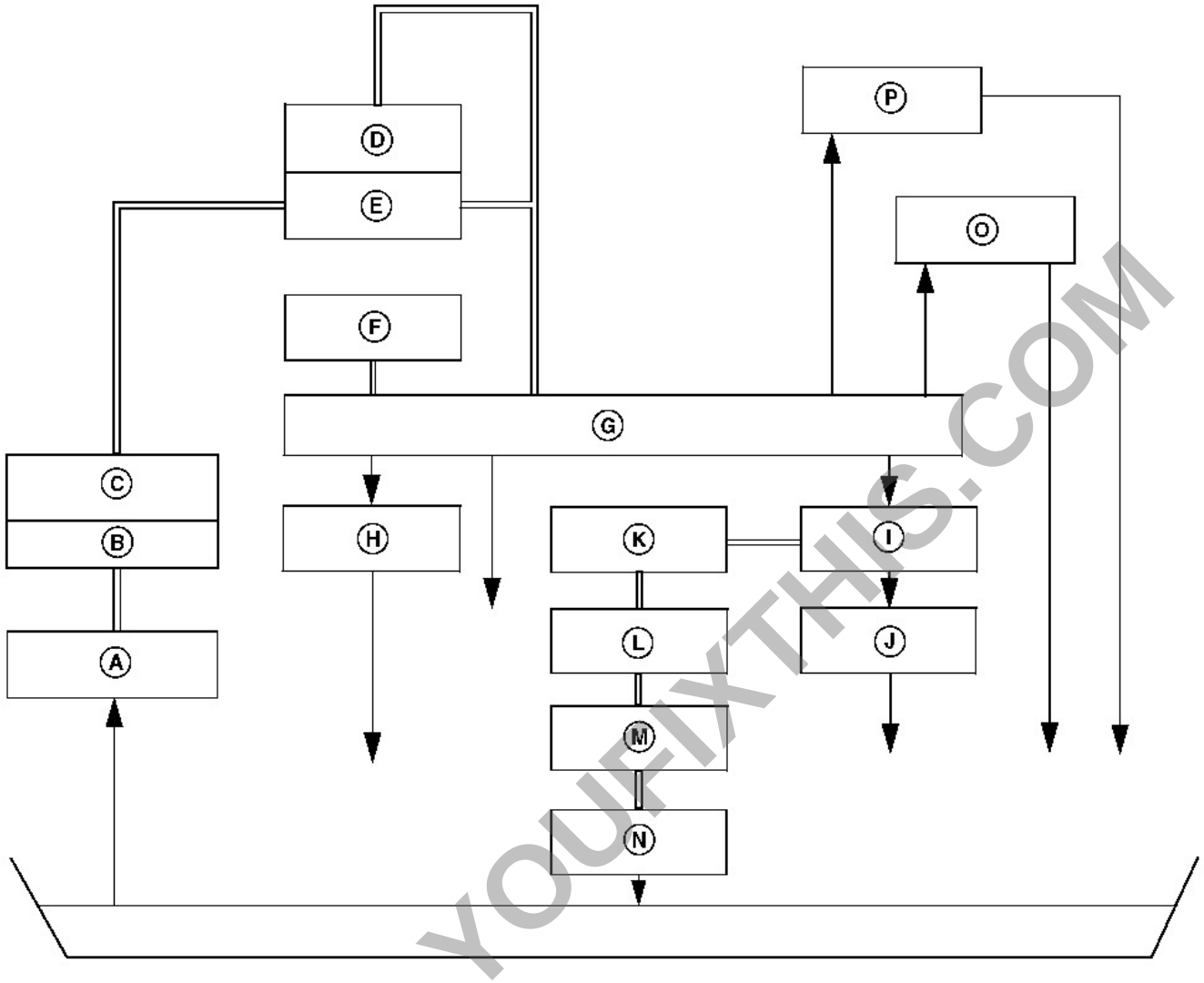
Lubrication System Operation



Lubrication System Operation

LEGEND:

A	Oil Strainer
B	Positive Displacement Oil Pump
C	Oil Pressure Regulating Valve
D	Full Flow Oil Filter
E	Oil Filter Bypass Valve
F	Electrical Pressure Warning Switch
G	Engine Block Main Oil Galley
H	Intermediate Gear Shaft
I	Crankshaft Main Bearing Journals
J	Connecting Rod Bearings
K	Camshaft Bearings
L	Rocker Arm Bearings
M	Rocker Arms
N	Cam Followers and Valves
O	Fuel Injection Pump
P	Turbocharger Bearing Housing

Function:

A full pressure system lubricates engine parts with filtered oil.

Theory of Operation:

The pressure lubrication system consists of an oil strainer (A), positive displacement oil pump (B), oil pressure regulating valve (C), full flow oil filter (D), oil pressure bypass valve (E) and an electrical pressure warning switch (F).

The pump draws lubrication oil from the oil pan through a strainer and a suction tube. The oil is then pumped through an oil

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Engine Oil Diagnostics

Symptom	Problem	Solution
Crankcase Contamination	Fuel in crankcase.	Broken or seized piston ring - replace rings and check cylinder.
		Seized intake and exhaust valve - replace valve and check valve guide.
		Piston ring, piston, or cylinder worn - bore or hone cylinder and replace piston.
	Water in crankcase.	Leaking cylinder head gasket - replace head gasket.
		Cracked water jacket - repair or replace water jacket.

Symptom	Problem	Solution
Low Oil Pressure	Oil level low.	Add oil.
	Oil filter clogged.	Replace Oil Filter.
	Incorrect viscosity	Check oil for too low viscosity, or coolant-or-fuel-diluted engine oil.
		Change engine oil.
	External oil leaks	Repair as necessary
	Oil pressure relief valve worn.	Clean, adjust, or replace relief valve.
	Oil pump defective.	Remove and inspect oil pump. (See Oil Pump in Section 30, Group 30.)
	Coolant in oil.	(See Coolant in Oil or Oil in Coolant in Section 30, Group 20.)
	Fuel in oil.	Broken or seized piston ring. Replace rings and check cylinder.
		Seized intake or exhaust valve. Check valve guides and stems.
		Piston ring, piston or cylinder worn. Bore or hone cylinder and replace piston.
	Oil pump screen clogged or pick-up tube cracked.	Remove oil pan and clean screen. Replace pick-up tube. (See Oil Pan and Strainer in Section 30, Group 30.)
	Intake and Exhaust valves worn.	Check valve guides and stems.
	Crankshaft pin or bearing worn.	Regrind crank and replace bearings.
	Connecting rod cap screw loose.	Check for damage and re-torque cap screws.
	Excessive volume of fuel injected.	Check fuel injection pump and injectors.
	Broken or seized piston ring.	Replace rings and check cylinder.
	Excessive main or connecting rod bearing clearance.	Determine bearing clearance. (See Connecting Rod Bearing Clearance Check in Section 30, Group 25.)
	Piston ring, piston or cylinder worn.	Bore or hone cylinder and replace piston.
	Piston ring end gaps not correct.	Stagger piston ring gaps.
	Piston rings installed incorrectly.	Install piston rings correctly.
	Excessive fumes or dripping oil; appears to be caused by turbocharger boost pressure.	Check the turbocharger, repair or replace as needed. (See Turbocharger Failure Analysis in Section 30, Group 20.)
	Excessive fumes or dripping oil observed; does not appear to be caused by turbocharger boost pressure.	Excessive blow-by, not caused by boost pressure is most likely caused by faulty piston rings and cylinder bores not providing an adequate combustion seal. Perform a compression test to verify this is the case. (See Cylinder Compression Test in Section 30, Group 25.)
	Check for turbocharger oil seal leaks. Signs of oil leakage present.	Investigate problems associated with oil leakage as outlined in the test procedure, perform necessary repairs, and retest. (See Turbocharger Oil Seal Leak Check in Section 30, Group 25.)
High Oil Pressure	High oil pressure	Improper engine oil viscosity and type - replace engine oil and filter.
		Oil pressure relief valve failed. Inspect oil pressure relief valve. (See Oil Pump in Section 30, Group 30.)

Excessive Fuel Consumption

Symptom	Problem	Solution
Excessive Fuel Consumption	Compression leakage from valve seat.	Grind valve seat; regrind valves.
	Engine running too cool.	Check thermostat.
	Excessive volume of fuel injected.	Check fuel injection pump and injectors.
	Poor fuel injection pattern.	Clean or replace fuel injector nozzles.

Incorrect Manifold Pressure

Symptom	Problem	Solution
Low Manifold Pressure	Improper intake or exhaust valve clearance.	Adjust valve clearance.
	Compression leakage from valve seat	Grind valve seat; regrind valves.

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Group 05 - Specifications

General Specifications

Item	Measurement	Specification
General Specifications:		
Make		Yanmar
Type		4-Cycle Diesel
Model 3032M		3TNV88
Model 3036M		3TNV84T
Model 3038M		3TNV84T
Number of Cylinders (All)		3
Firing Order (No. 1 Cylinder on Flywheel Side)		1 - 3 - 2
Compression Ratio		19:1
Direction of Rotation		Counterclockwise (viewed from flywheel)
Combustion System		Direct Injection Type
Oil Capacity (with filter)	Capacity	Approximately 4.3 L (4.5 qt.)

Item	Measurement	Specification
Bore:		
3TNV84	Diameter	84 mm (3.31 in.)
3TNV88	Diameter	88 mm (3.46 in.)

Item	Measurement	Specification
Stroke:		
3TNV84	Distance	90 mm (3.54 in.)
3TNV88	Distance	90 mm (3.54 in.)

Item	Measurement	Specification
Displacement:		
3TNV84	Displacement	1.496 L (91.29 cu. in.)
3TNV88	Displacement	1.649 L (100.62 cu. in.)

Item	Measurement	Specification
Cooling:		
Type		Liquid
Cooling System	Capacity	Approximately 5.3 L (5.6 qt.)
Radiator Cap	Pressure	90 kPa (13 psi)

Item	Measurement	Specification
Engine Speed:		
Governor		Centrifugal
Slow Idle	Speed	950 ± 50 rpm
High Idle (No Load)	Speed	2675 ± 50 rpm
Rated Speed	Speed	2500 rpm
Operating Range	Speed	1200—2700 ± 25 rpm

Item	Measurement	Specification
Engine Torque (at rated speed):		
3TNV88 @ 2500 rpm	Torque	85.0 N·m (62.7 lb.-ft.)
3TNV84T @ 2500 rpm	Torque	99.1 N·m (73.1 lb.-ft.)
Engine Maximum Torque		
3TNV88 @ 1560 rpm	Torque	108.0 N·m (79.7 lb.-ft.)
3TNV84T @ 1560 rpm	Torque	120.0 N·m (88.5 lb.-ft.)

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Calibration Number Example A

Calibration Number Example A	
Replacement Injection Pump =	7.3
Original Injection Pump =	6.8
Difference =	+0.5

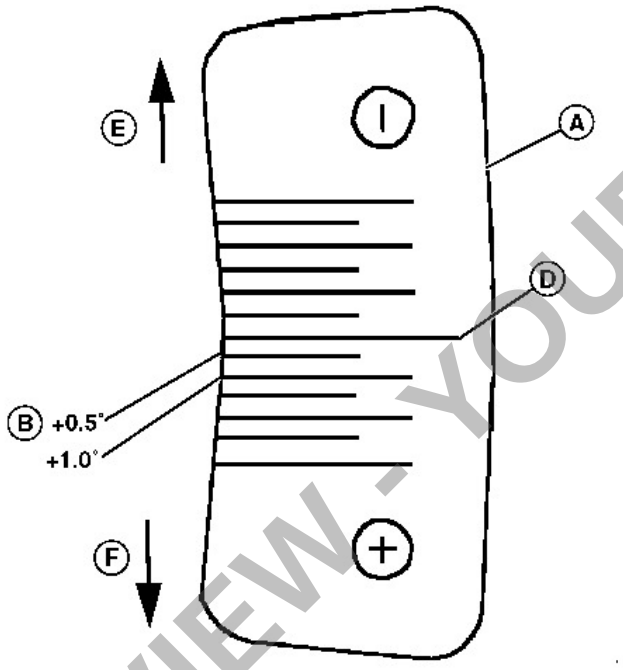
- If the difference between the calibration numbers is a positive number, (the replacement pump number is higher than the original pump number), the injection pump mounting position must be advanced.

Calibration Number Example B

Calibration Number Example B	
Replacement Injection Pump =	7.3
Original Injection Pump =	7.8
Difference =	-0.5

- If the difference between the calibration numbers is a negative number, (the replacement pump number is lower than the original pump number), the injection pump position must be retarded.
- The rest of the timing story will be using the calculation from example A.

LEGEND:
E Retard
F Advance



- ***Timing Sticker***

  Each mark on the timing sticker represents 0.5° timing change.
- Long mark (D) in center of sticker (A) represents 0°.
- The calibration number example A indicates that the replacement injection pump is to be installed at 0.5° advanced from the center mark on the timing sticker (A).

[7] - Align the mark on the injection pump with the appropriate mark on the timing sticker and tighten injection pump retaining nuts to specification.

[8] - Install and tighten the injection pump rear support bracket.

Item	**Measurement**	**Specification**
Injector Pump Mounting Nuts		23—28 N·m (17—21 lb.-ft.)

[9] - Place a thin bead of John Deere form in place gasket on the cover, and install the cover.

[10] - Connect fuel shutoff solenoid wire.

[11] - Connect hoses to and from fuel filter.

[12] - Install the lower radiator hose and connect the coolant hoses to the cold start device.

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Item	Measurement	Specification
Turbocharger:		
Turbocharger Model		RHB31
Turbine Shaft Journal	OD	6.257—6.263 mm (0.246—0.247 in.)
Turbine Shaft Journal (Wear Limit)	OD	6.25 mm (0.246 in.)
Turbine Shaft Seal Ring Groove	Width	1.038—1.062 mm (0.0408—0.0418 in.)
Turbine Shaft Seal Ring Groove (Wear Limit)	Width	1.07 mm (0.042 in.)
Compressor Side Seal Ring Groove (G1)	Distance	1.02—1.03 mm (0.040—0.041 in.)
Compressor Side Seal Ring Groove (G1) (Wear Limit)	Distance	1.04 mm (0.041 in.)
Compressor Side Seal Ring Groove (G2)	Distance	0.82—0.83 mm (0.246—0.247 in.)
Compressor Side Seal Ring Groove (G2) (Wear Limit)	Distance	0.84 mm (0.003 in.)
Turbine Shaft Run-Out	Distance	0.002 mm (0.001 in.)
Turbine Shaft Run-Out (Wear Limit)	Distance	0.005 mm (0.001 in.)
Journal Bearing	ID	6.257—6.285 mm (0.246—0.247 in.)
Journal Bearing (Wear Limit)	ID	6.29 mm (0.248 in.)
Journal Bearing	OD	9.940—9.946 mm (0.391—0.392 in.)
Journal Bearing (Wear Limit)	OD	9.93 mm (0.391 in.)
Journal Bearing Housing	ID	9.995—10.005 mm (0.394—0.394 in.)
Journal Bearing Housing (Wear Limit)	ID	10.01 mm (0.394 in.)
Thrust Bearing	Width	3.59—3.61 mm (0.141—0.142 in.)
Thrust Bearing (Wear Limit)	Width	3.58 mm (0.141 in.)
Thrust Bushing Groove	Distance	3.632 - 3.642 mm (0.143—0.143 in.)
Thrust Bushing Groove (Wear Limit)	Distance	3.65 mm (0.144 in.)
Seal Ring Fixing Area (Turbine Side)	Distance	11.00—11.018 mm (0.433—0.434 in.)
Seal Ring Fixing Area (Turbine Side) (Wear Limit)	Distance	11.03 mm (0.434 in.)
Seal Ring Fixing Area (Compressor Side—S1)	Distance	9.987—10.025 mm (0.394—0.395 in.)
Seal Ring Fixing Area (Compressor Side—S1) (Wear Limit)	Distance	10.04 mm (0.395 in.)
Seal Ring Fixing Area (Compressor Side—S2)	Distance	7.968—8.00 mm (0.314—0.315 in.)
Seal Ring Fixing Area (Compressor Side—S2) (Wear Limit)	Distance	8.01 mm (0.314—0.315 in.)

Tests and Adjustment Specifications

Item	Measurement	Specification
Adjustment Specifications:		
Valve	Clearance	0.15—0.25 mm (0.006—0.010 in.)
Connecting Rod Side Play	Distance	0.2—0.4 mm (0.008—0.016 in.)
Connecting Rod Bearing	Clearance	0.04—0.07 mm (0.002—0.003 in.)
Crankshaft End Play	Distance	0.09—0.27 mm (0.004—0.011 in.)
Crankshaft Main Bearing	Clearance	0.04—0.07 mm (0.001—1.003 in.)
Camshaft End Play	Distance	0.05—0.25 mm (0.002—0.010 in.)
Timing Gear: All Except Hydraulic Pump Gear	Backlash	0.07—0.15 mm (0.003—0.005 in.)
Timing Gear: Hydraulic Pump Gear	Backlash	0.11—0.19 mm (0.004—0.008 in.)
Fuel Injection Nozzle: Opening Pressure	Pressure	19600 + 1000/-0 kPa (2843 + 145/-0 psi)
Fuel Injection Nozzle: Leakage at 11 032 kPa (1600 psi)	Pressure	None for a minimum of 10 seconds
Chatter and Spray Pattern at 19 600 ± 1000 kPa (2843 ± 145 psi): Slow Hand Lever Movement	Pattern	Fine Stream; Chatter Sound
Chatter and Spray Pattern at 19 600 ± 1000 kPa (2843 ± 145 psi): Fast Hand Lever Movement	Pattern	Fine Atomized Spray; 150° Spray Pattern
Alternator Drive Belt Deflection	Deflection	10—15 mm (0.4—0.6 in.)
Fuel Injection Pump	Timing	11° ± 1° BTDC
Turbocharger Rotor Play in Axial Direction	Play	0.022—0.053 mm (0.001—0.002 in.)
Turbocharger Rotor Play in Axial Direction (Wear Limit)	Play	0.07 mm (0.007 in.)
Turbocharger Rotor Play in Radial Direction	Play	0.061—0.093 mm (0.002—0.004 in.)
Turbocharger Rotor Play in Radial Direction (Wear Limit)	Play	0.12 mm (0.005 in.)

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Repair Specifications

Item	Measurement	Specification
Valve Train:		
Rocker Arm Shaft	OD	15.966—15.984 mm (0.6285—0.6295 in.)
Rocker Arm Shaft Wear Limit	Thickness	15.94 mm (0.6275 in.)
Rocker Arm and Shaft Support Bushing	ID	16.00—16.02 mm (0.630—0.631 in.)
Wear Limit	Thickness	16.09 mm (0.633 in.)
Oil Clearance	Clearance	0.02—0.05 mm (0.001—0.002 in)
Wear Limit	Thickness	0.15 mm (0.006 in.)
Push Rod Bend		0.0—0.03 mm (0.0—0.001 in.)

Item	Measurement	Specification
Cylinder Head and Valves:		
Cylinder Head	Distortion	0.0—0.05 mm (0.0—0.002 in.)
Wear Limit	Thickness	0.15 mm (0.006 in.)
Intake Valve Seat	Width	1.07—1.24 mm (0.042—0.049 in.)
Intake Valve Seat (Wear Limit)	Width	1.74 mm (0.069 in.)
Exhaust Valve Seat	Width	1.24—1.45 mm (0.042—0.049 in.)
Exhaust Valve Seat (Wear Limit)	Width	1.94 mm (0.076 in.)
Intake Valve Stem	OD	7.96—7.98 mm (0.313—0.314 in.)
Intake Valve Stem (Wear Limit)	OD	7.9 mm (0.311 in.)
Exhaust Valve Stem	OD	7.96—7.97 mm (0.313—0.314 in.)
Exhaust Valve Stem (Wear Limit)	OD	7.9 mm (0.311 in.)
Valve Head: Intake	Thickness	1.24—1.44 mm (0.049—0.057 in.)
Exhaust	Thickness	1.35—1.55 mm (0.053—0.061 in.)
Wear Limit	Thickness	0.50 mm (0.020 in.)
Intake Valve Recession	Thickness	0.31—0.51 mm (0.012—0.020 in.)
Intake Valve Recession Wear Limit	Thickness	1.00 mm (0.039 in.)
Exhaust Valve Recession	Thickness	0.3—0.5 mm (0.012—0.020 in.)
Wear Limit	Thickness	1.00 mm (0.039 in.)
Valve Guide Stem-To-Guide Oil Clearance: Intake	Clearance	0.04—0.07 mm (0.001—0.003 in.)
Exhaust	Clearance	0.05—0.08 mm (0.002—0.003 in.)
Exhaust (Wear Limit)	Thickness	0.20 mm (0.008 in.)
Valve Guide	ID	8.01—8.03 mm (0.315—0.316 in.)
Valve Guide (Wear Limit)	ID	8.10 mm (0.319 in.)
Valve Guide Projection	Length	15 mm (0.591 in.)
Valve Spring Free	Length	42.0 mm (1.654 in.)
Maximum Spring Inclination	Distance	1.40 mm (0.055 in.)
Valve Spring [Measured With Spring Compressed 1.0 mm (0.039 in.)]	Tension	2.36—3.10 kg (5.20—6.83 lb.)
Valve Seat Surface Angle: Exhaust Valve		45°
Intake Valve		30°
Valve Timing: Intake Valve Opens		10°—20° BTDC
Intake Valve Closes		40°—50° ABDC
Exhaust Valve Opens		51°—61° BBDC
Exhaust Valve Closes		13°—23° ATDC
Piston-to-Cylinder Head	Clearance	0.66—0.78 mm (0.026—0.031 in.)

Item	Measurement	Specification
Connecting Rod:		
Large End Bearing	ID	51—51.01 mm (2.008—2.008 in.)
Large End Bearing	Thickness	1.49—1.50 mm (0.059—0.059 in.)
Oversize	Thickness	1.625 mm (0.064 in.)
Oil Clearance	Clearance	0.02—0.05 mm (0.001—0.002 in.)
Oil Clearance (Wear Limit)	Clearance	0.13 mm (0.005 in.)

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Group 05 - Safety

Recognize Safety Information

Safety-alert symbol

This is a 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 operating practices.

Understand Signal Words

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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Table of contents

FOREWORD
Section 10 - SAFETY
Group 05 - Safety
Section 20 - SPECIFICATIONS AND INFORMATION
Group 05 - General Specifications
Group 10 - Fuel and Lubricants
Group 15 - Serial Number Locations
Section 30 - ENGINE—DIESEL
Group 05 - Specifications
Group 10 - Component Location
Group 15 - Theory of Operation
Group 20 - Diagnostics
Group 25 - Tests and Adjustments
Group 30 - Repair
Section 40 - ELECTRICAL
Group 05 - General Information
Group 10 - Specifications
Group 15 - Component Location
Group 20 - Schematics and Harnesses
Group 25 - Operation and Diagnostics
Group 30 - Tests and Adjustments
Group 35 - Repair
Section 45 - EXPORT ELECTRICAL
Group 05 - Component Location
Group 10 - Schematics and Harnesses
Group 15 - Operation and Diagnostics
Section 50 - POWER TRAIN
Group 05 - Specifications
Group 10 - Component Location
Group 15 - Theory of Operation
Group 20 - Diagnostics
Group 25 - Troubleshooting
Group 30 - Tests and Adjustments
Group 35 - Repair
Section 60 - HYDRAULICS
Group 05 - Specifications
Group 10 - Component Location and Schematics
Group 15 - Theory of Operation
Group 20 - Troubleshooting
Group 25 - Tests and Adjustments
Group 30 - Repair
Section 70 - STEERING
Group 05 - Specifications
Group 10 - Component Location
Group 15 - Theory of Operation
Group 20 - Diagnostics
Group 25 - Tests and Adjustments
Group 30 - Repair
Section 80 - BRAKES
Group 05 - Specifications
Group 10 - Component Location
Group 15 - Theory of Operation

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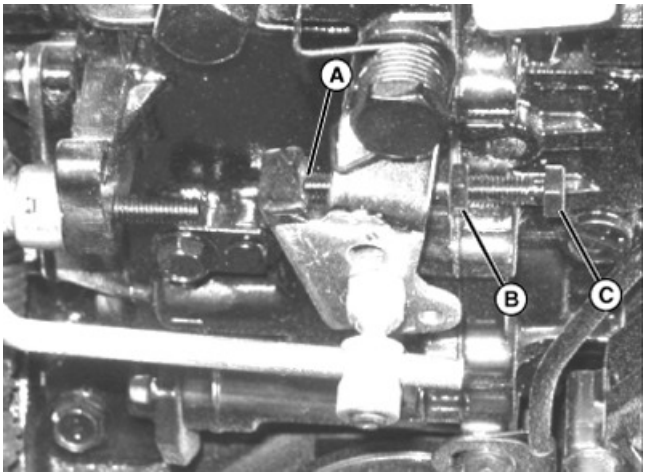

LEGEND:

A	Slow Idle Stop Screw
B	Nut
C	Slow Idle Stop Screw

Slow Idle Adjustment

Visually check that the injection pump throttle lever is against slow idle stop screw (A). Slow idle speed is set to specification.

Results:

- If the slow idle rpm is not according to specification, loosen the nut (B). Turn the slow idle stop screw (C) clockwise to increase the engine speed, or counterclockwise to decrease the engine speed until the slow idle speed is correct. After adjustment, tighten the nut.

Item	Measurement	Specification
Low Idle	Speed	950 ± 50 rpm

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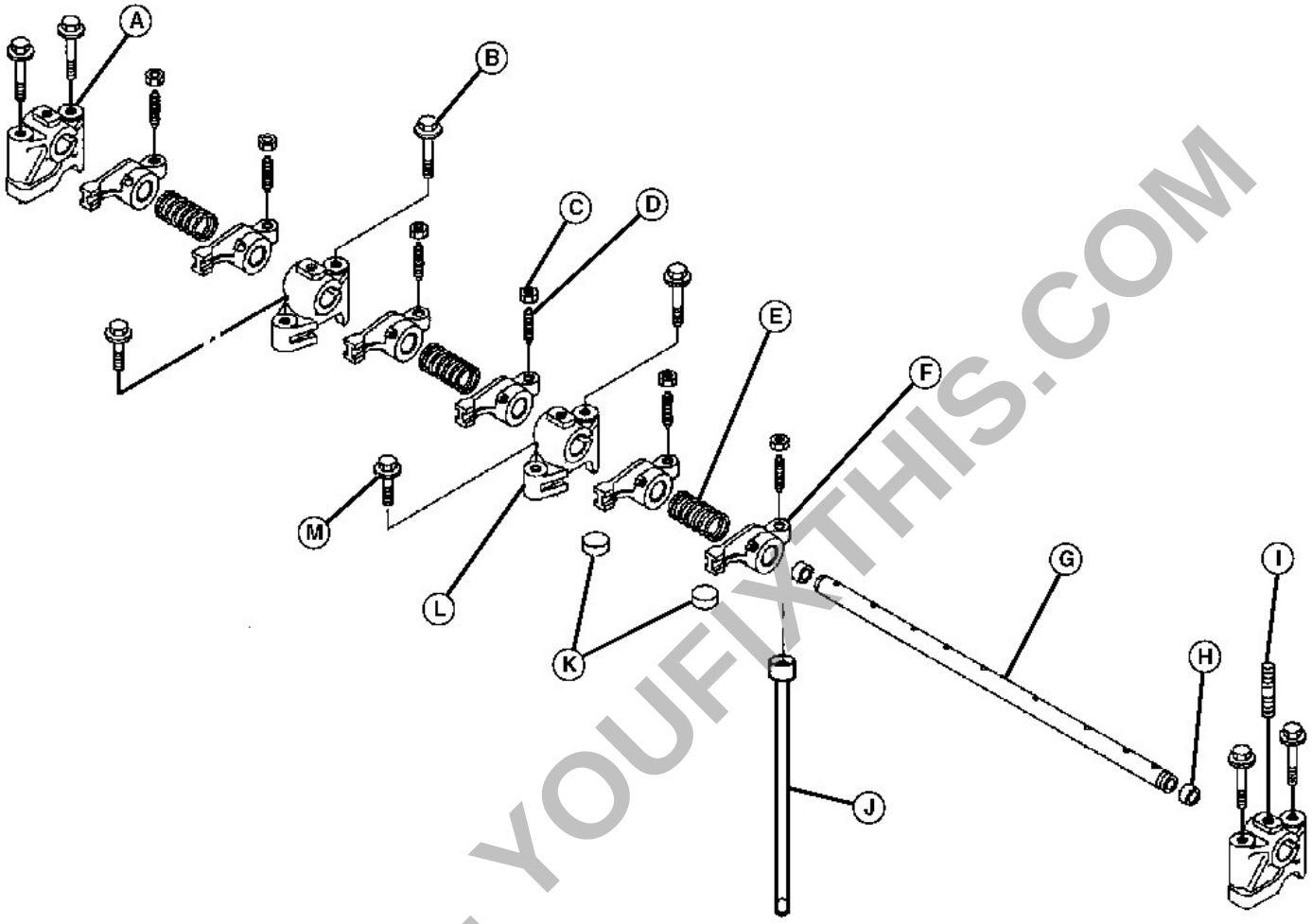
Rocker Arm Assembly

Removal, Installation, and Disassembly, Assembly:



Removal, Installation, and Disassembly, Assembly

LEGEND:

A	Shaft End Support (2 used)
B	Cap Screw, M8 x 50 (6 used)
C	Jam Nut (6 used)
D	Adjuster Screw (6 used)
E	Spring (3 used)
F	Rocker Arm
G	Rocker Arm Shaft
H	Plug (2 used)
I	Stud
J	Push Rod (6 used)
K	Valve Caps (6 used)
L	Center Support (2 used)
M	Cap Screw, M8 x 25

[1] - Remove the rocker cover. (See Rocker Cover Removal and Installation in Section 30, Group 30.)

[2] - Remove the rocker arm end support and rocker arm center support mounting cap screws.

[3] - Lift the rocker arm assembly from the cylinder head and set the assembly on a bench.

[4] -

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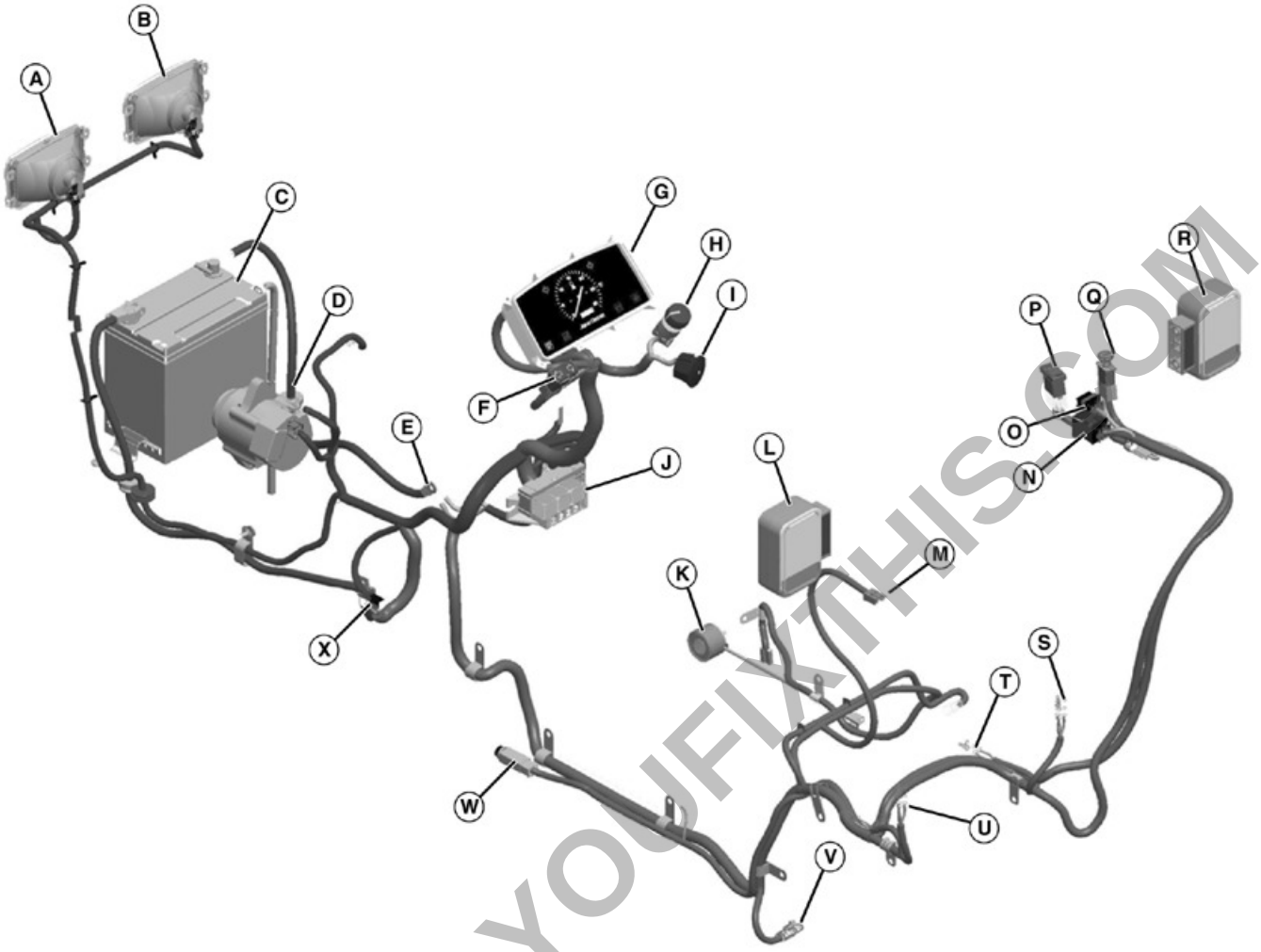
Group 15 - Component Location

Electrical Components



Electrical Components

LEGEND:

A	LH Headlight
B	RH Headlight
C	G1—Battery
D	G2—Alternator
E	W1—Frame Ground
F	Turn Signal Switch
G	Control Panel
H	Light Switch
I	Key Switch
J	Load Center
K	Cruise Control Magnet
L	LH ROPS Lights
M	Seat Switch Connector
N	Cruise Control Relay
O	Cruise Control Relay
P	Cruise Control Switch
Q	PTO Switch
R	RH ROPS Lights
S	RH ROPS Lights Connectors
T	Work Lights Connectors
U	LH ROPS Lights Connectors
V	Transmission Neutral Switch Connector
W	Brake Switch
X	Starting Motor Connectors

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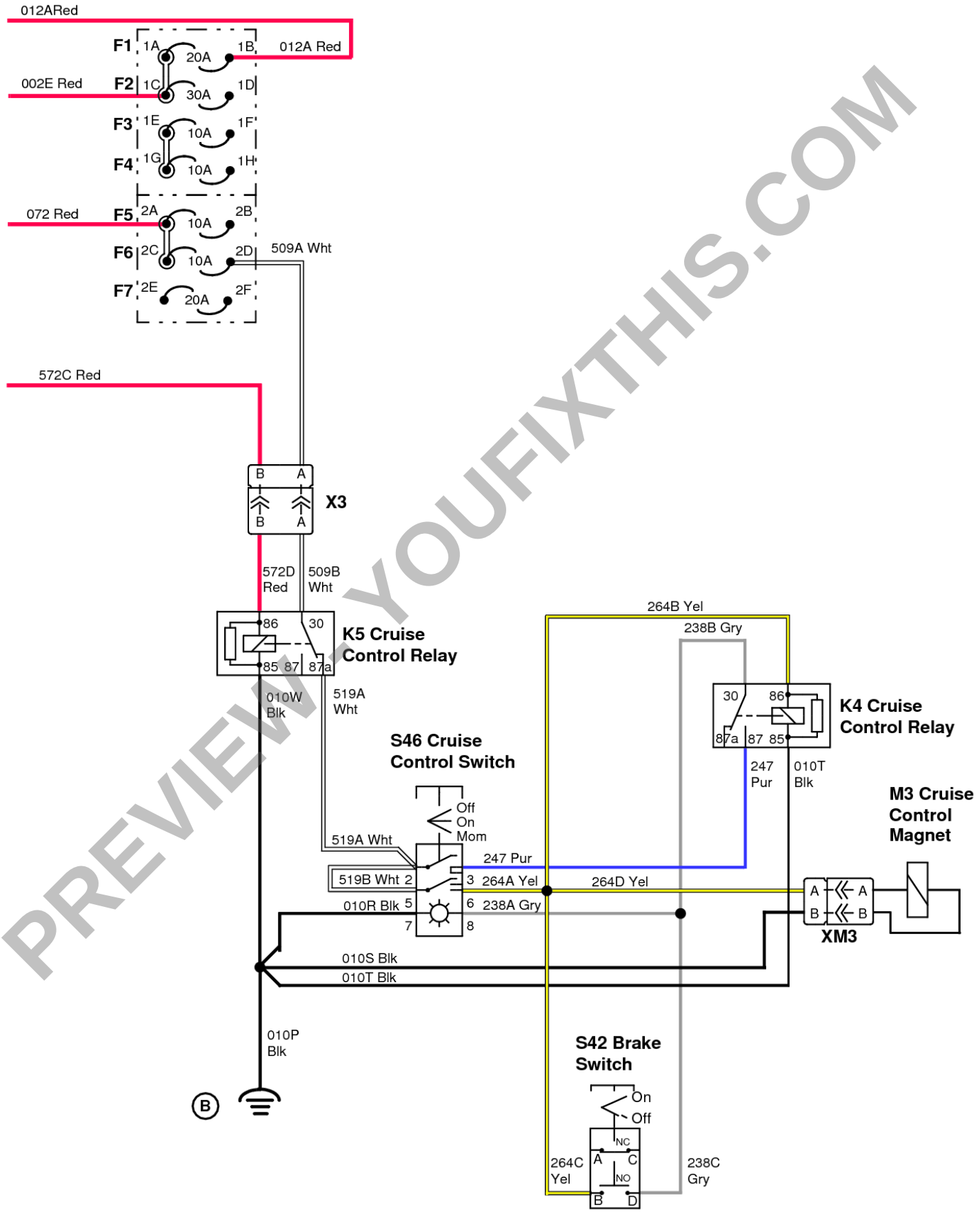
G1	Battery
M1	Starting Motor
S1	Key Switch
W1	Frame Ground
Y1	Starting Motor Solenoid

Cruise Control (2 of 2)



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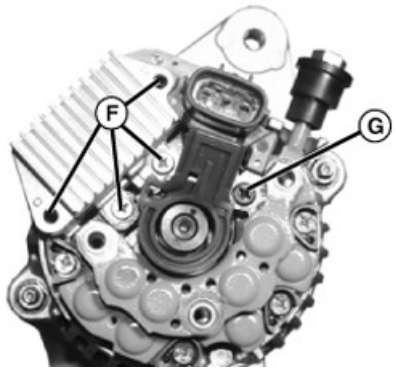
LEGEND:
F Voltage Regulator Screw (4 used)
G Black Brush Screw



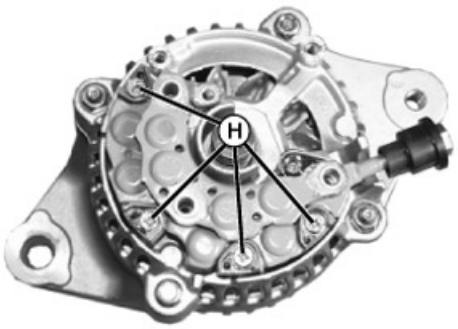
Alternator—Disassembly Step 5

Remove four voltage regulator screws (F) and black brush screw (G).

[6] - Remove regulator and brush assemblies.

[7] -

LEGEND:
H Screw (4 used)



Alternator—Disassembly Step 7

Remove four screws (H) retaining rectifier to alternator body.

[8] -

LEGEND:
I Wire Lead (4 used)

Alternator—Disassembly Step 8

Straighten the four wire leads (I) to allow removal of the rear half of alternator case.

[9] - Separate the two alternator case halves.

[10] -

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Cranking Circuit Schematic (2 of 2)

LEGEND:

A1	Display Panel
S4	Transmission Neutral Switch
S5	PTO Switch
S52	Front PTO Switch

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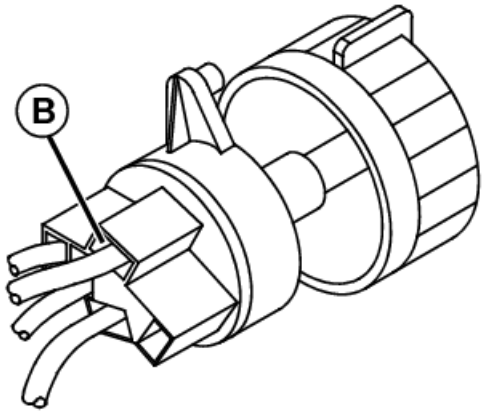


Left Headlight Circuit

LEGEND:

B	138 Gry Wire

Is battery voltage present at S2 light switch, 138 Gry wire (B)?

Result:

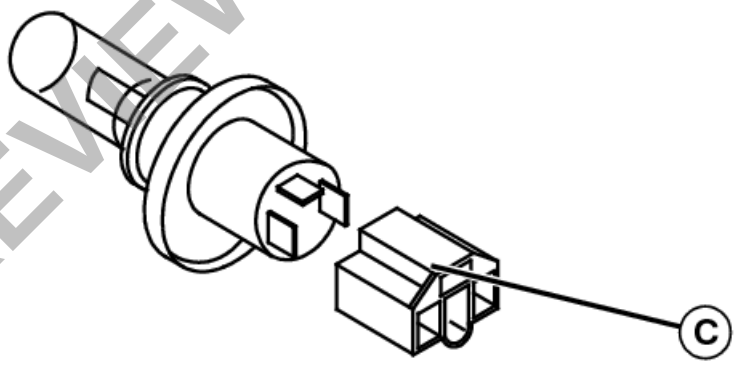
YES: Check 138 Gry wire, F9 10A fuse, 119E, 119A, and 119C Wht wires and connections.

NO: Test S2 light switch. (See Light Switch Test in Section 40, Group 30.)

(3) Step 3

Action:

Right Headlight Circuit



Left Headlight Circuit

LEGEND:

C	119B Wht Wire of E2 RH Headlight

Is battery voltage present at 119B Wht wire of E2 RH headlight (C)?

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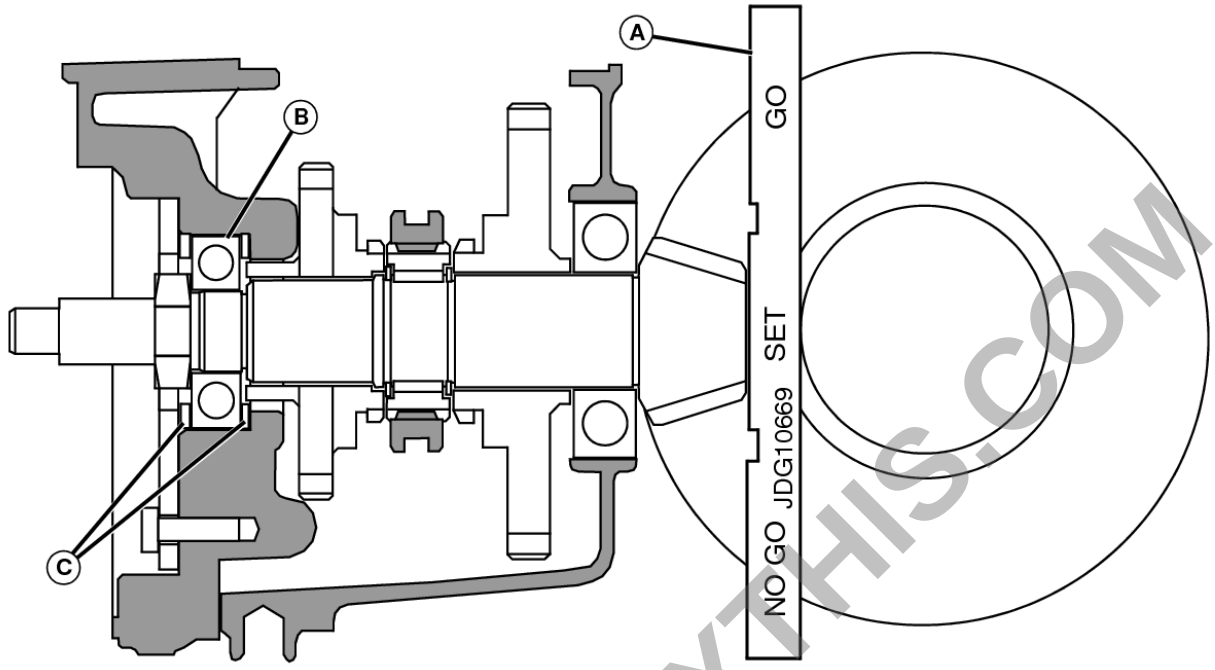
Group 30 - Tests and Adjustments

Differential Pinion Shaft Adjustment



Differential Pinion Shaft Adjustment

LEGEND:	
A	Transmission Pinion Depth Gauge
B	Bearing
C	Shim Washers

Reason:

To obtain proper gear engagement by setting pinion shaft cone point.

To set pinion shaft end play to 0.2—0.3 mm (0.008—0.012 in.)

Equipment:

Pinion Depth Gauge

JDG10669

Used to set pinion shaft cone distance from differential carrier housing

M10 x 25 Bolts

n/a

Four bolts required to hold bearing retainer plate

Adjustment Procedure:

[1] - Install pinion shaft assembly and range gears. (See Speed Range Gears in Section 50, Group 35.)

[2] - Install transmission front cover. Do not install outer bearing retainer plate.

[3] - If not already off, remove right axle housing. (See Differential Removal and Installation in Section 50, Group 35.)

[4] -

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PTO Drive Shaft and Gears

Equipment:

PTO Shaft Seal Driver

JDG10670

Used for installing rear PTO shaft seal.

Removal:

[1] - Park machine on a level surface, shut off engine, and set park brake.

[2] - Remove center lift link, draft arms, and adjustable draft links.

[3] -

→NOTE:

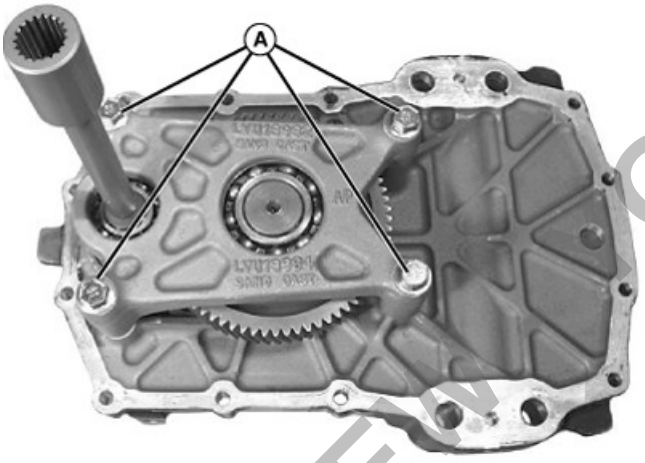
Capacity is approximately 21 liters (5.5 gal).

Drain hydraulic oil from reservoir.

[4] - Remove rear PTO shield assembly. Remove 4 M16 and 12 M8 bolts from rear cover.

[5] - Remove rear cover from transmission.

[6] -



LEGEND:

A	Bolt (4 used)

PTO Bearing Plate

Remove four bolts (A) securing PTO bearing plate to rear cover.

[7] - Remove bearing plate and gear assembly from rear cover.

Installation:

[1] - Lubricate bearings and bearing retainer with clean oil.

[2] -

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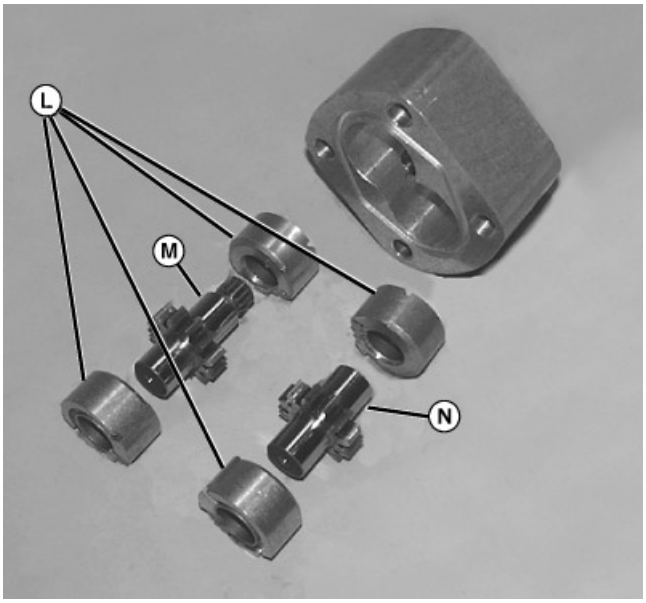


LEGEND:

L	Bushing (4 used)
M	Drive Gear
N	Driven Gear

Rear Pump Housing Disassembly

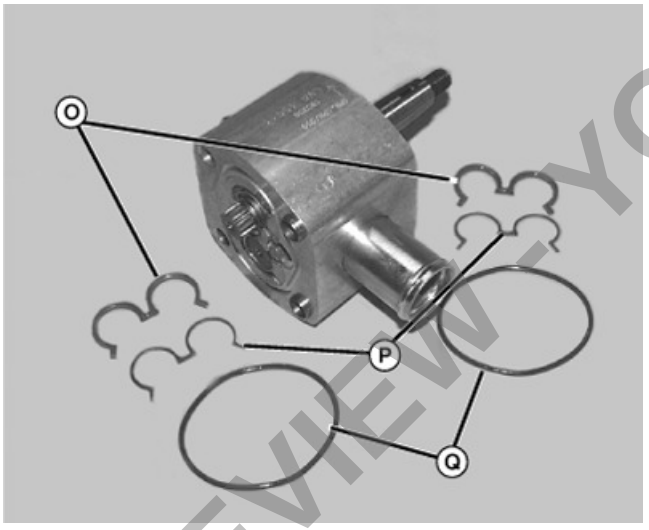
Remove the bushings (L), drive gear (M) and driven gear (N) from the rear pump housing.

[9] - Inspect gears, gear bearing surfaces, bushing faces and bearing surfaces for scoring, scratches or damage.

[10] - Inspect the drive gear shaft splines for wear or damage.

[11] - Inspect the rear pump housing internal surfaces for scoring or scratches. Replace pump if damaged.

[12] -



LEGEND:

O	Shaft Seal (2 used)
P	Backing Ring (2 used)
Q	Body Seal (2 used)

Front Pump Housing Seals

Remove the shaft seals (O), backing rings, (P) and body seals (Q) from both sides of the front pump housing.

[13] -

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