JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

John Deere Select Series™ Tractors
X300 Series

TM2308 JANUARY 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 (FH491)
Engine (FH661 and FH721)
Engine - (FS541V)
Electrical
Power Train
Hydraulics
Steering
Attachments
Miscellaneous

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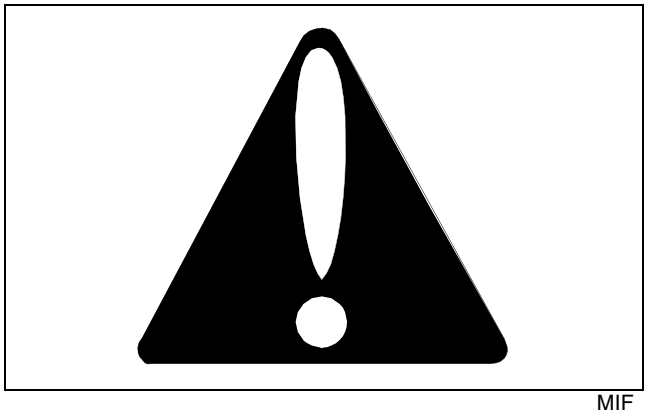
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Safety

Recognize Safety Information



MIF

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.

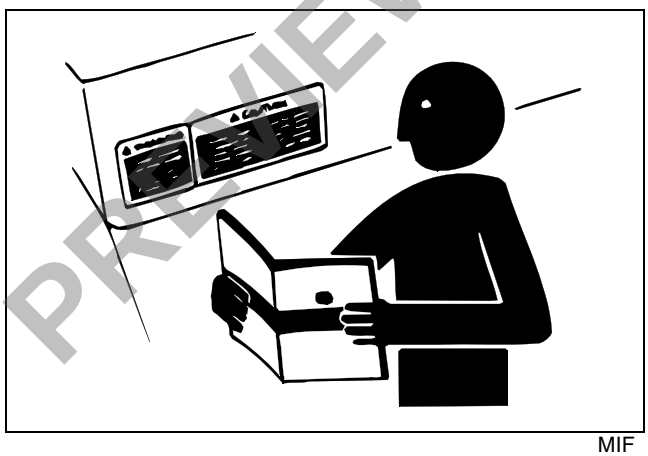
Follow recommended precautions and safe servicing practices.

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

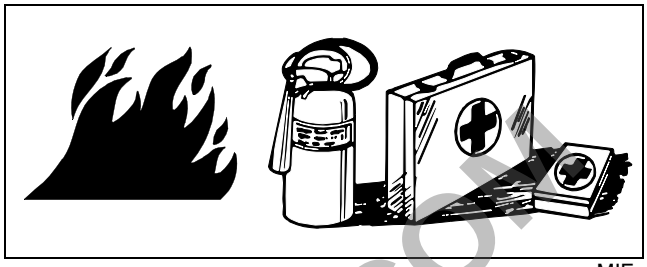


MIF

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

Handle Fluids Safely - Avoid Fires

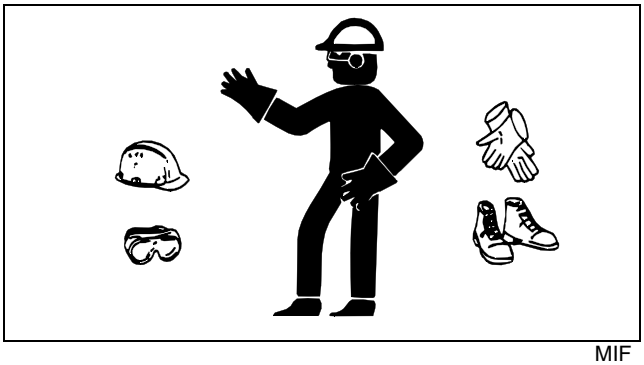
Be Prepared For Emergencies



MIF

- 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.

Wear Protective Clothing



MIF

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

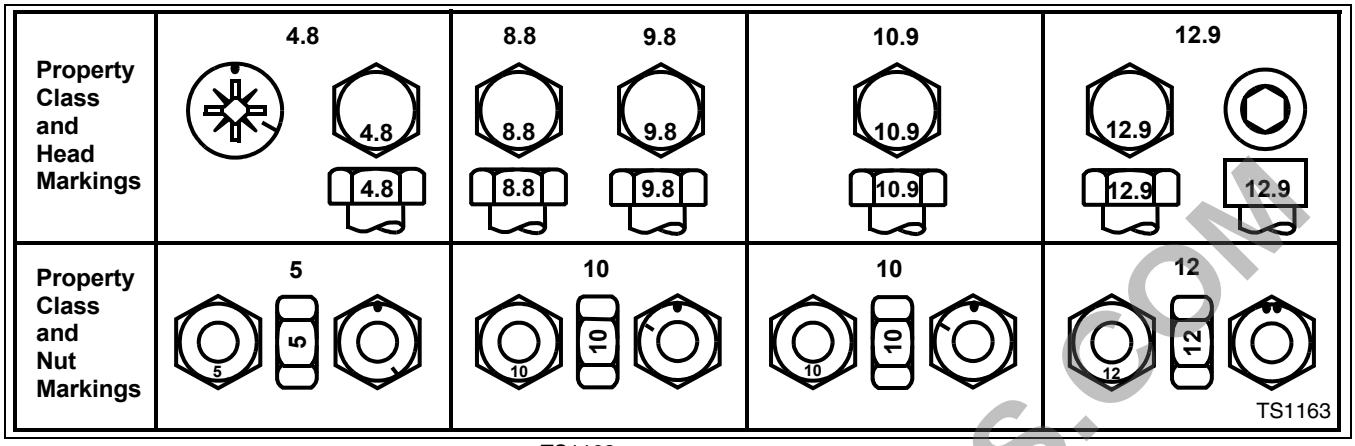
Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.

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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.**

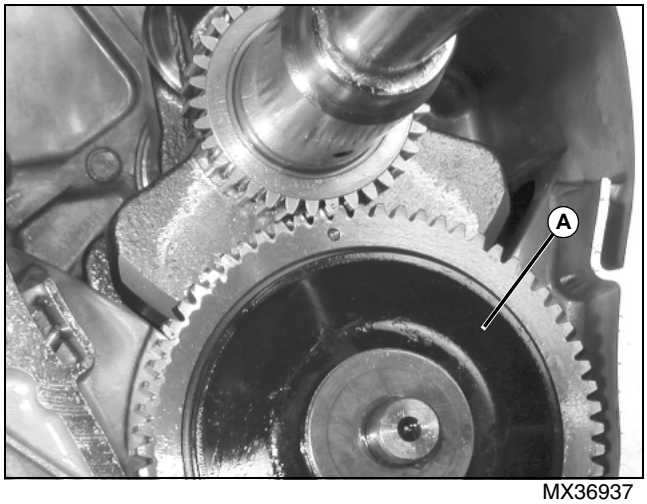
Reference: JDS-200

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Governor Removal, Inspection, and Replacement

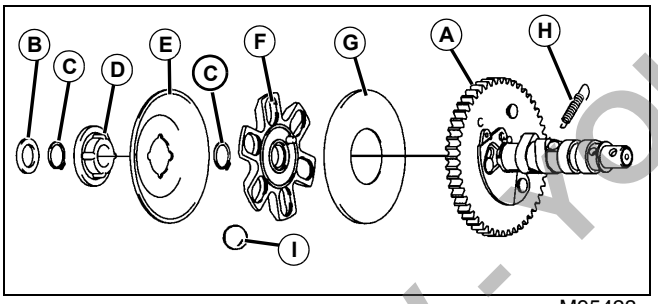
1. Remove crankcase cover. See “Crankcase Cover Removal and Installation” on page 64.

2. Remove rocker covers and push rods.



MX36937

3. Turn engine upside down and remove camshaft (A).



M95423

A- Camshaft
B- Washer
C- Snap Ring
D- Sleeve
E- Governor Plate
F- Ball Guide
G- Ball Plate
H- Automatic Compression Release Spring
I- Steel Balls (6 used)

4. Disassemble the governor assembly from the camshaft.

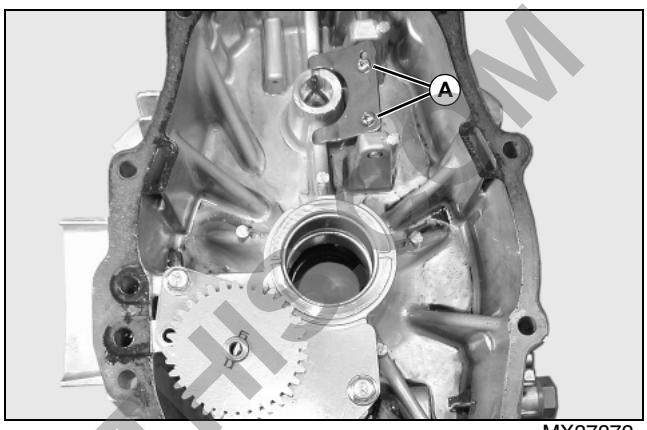
5. Inspect governor for wear or damage. Replace if necessary.

6. When assembling, be sure the steel balls are seated in slots on the ball guide and that the snap rings are fully seated in their grooves.

Governor Shaft Inspection and Replacement

Note: It is not necessary to remove governor shaft unless damaged.

1. Remove crankcase cover. See “Crankcase Cover Removal and Installation” on page 64.



MX37372

2. Unscrew the governor shaft plate screws (A) and pull the governor shaft out of the crankcase cover.

3. Replace the oil seal if the lip shows signs of leakage or it has been damaged.

4. Inspect governor shaft for wear or damage. Replace if necessary.

Installation:

- Apply clean engine oil to the governor shaft.
- Insert the governor shaft into the crankcase.
- Install the governor shaft plate to the shaft and tighten the screws to **2 N•m (17 lb-in.)**.
- Check that governor shaft turns freely within its operating range.
- If oil seal has been removed, press a new seal into crankcase with the seal lip to the inside.
- Press the seal in to flush to **1.0 mm (0.04 in.)** below crankcase surface.

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Specifications

Tests and Adjustments Specifications

Mower Deck Lift Time (Oil Flow and Pressure Check) . . . . . 2 seconds at 2700 - 3000 engine rpm

Repair Specifications

Torque Specifications:

Draft Arm Retaining Cap Screw . . . . . 110 N•m (80 lb-ft)
Hose Retainer Plate Cap Screws . . . . . 31 N•m (23 lb-ft)
Hydraulic Line Connector Torque . . . . . 24.4 N•m (18 lb-ft)
Hydraulic Hose Connector Torque . . . . . 24.4 N•m (18 lb-ft)
Hydraulic Hose Fittings . . . . . 24.4 N•m (18 lb-ft)
Lift Cylinder Lock Nut . . . . . 40 N•m (30 lb-ft)
Steering Valve to Pedestal Cap Screws . . . . . 65 N•m (48 lb-ft)

Special Tools

Special or Required Tools

Tool Name	Tool No.	Tool Use
	19 kg (42 lb) Weights	Use to check mower hydraulic lift oil flow and pressure

Note: Order tools according to information given in the US SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

Special Materials

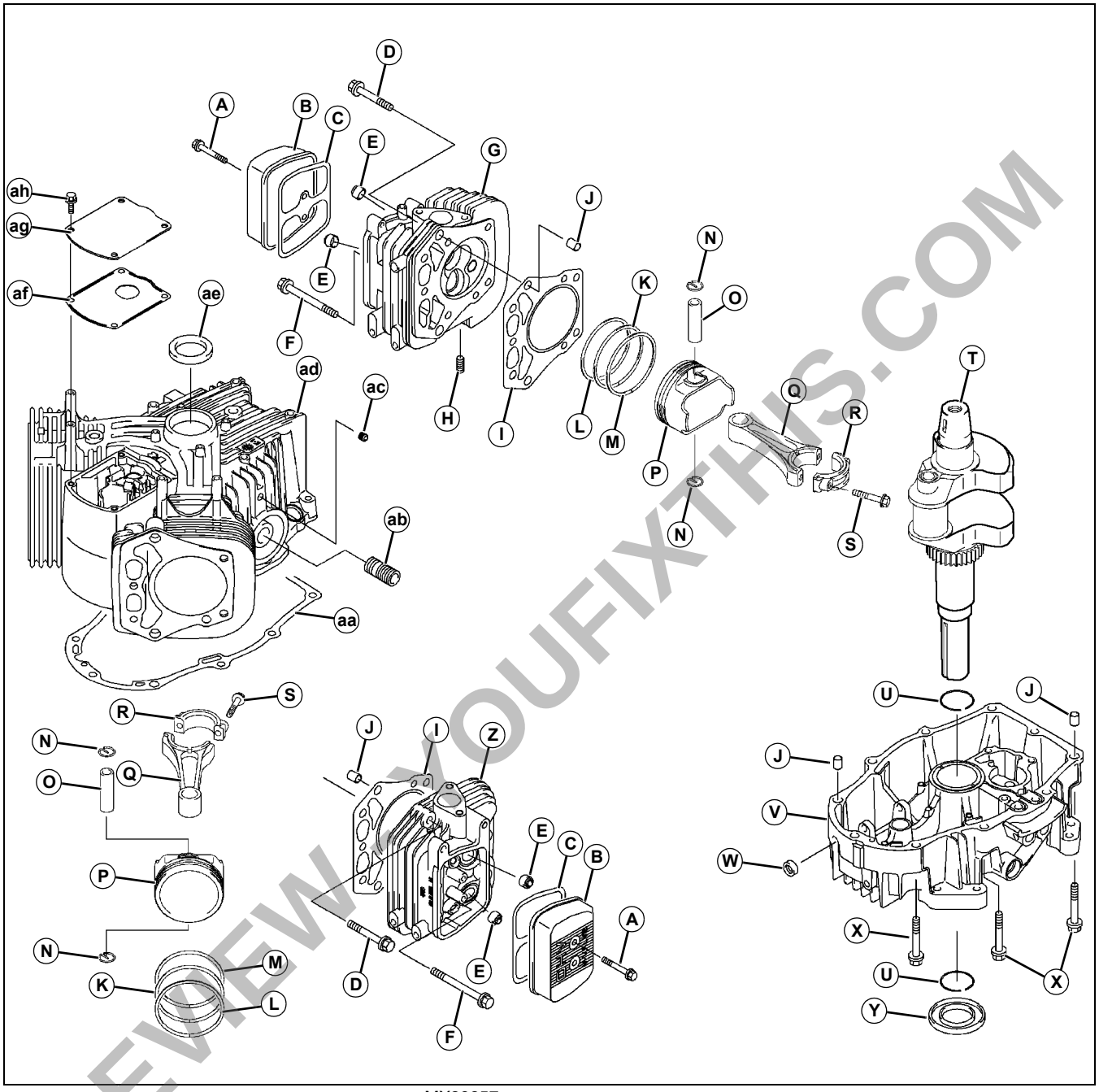
Other Material

Part No.	Part Name	Part Use
J20D	John Deere Low Viscosity HY-GARD™	Hydraulic fluid

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Engine Block



MX39857

A- Cap Screw M6x12 (4 used)
B- Valve Cover
C- Gasket
D- Bolt (17 used)
E- Seal
F- Bolt (2 used)
G- Cylinder Head No. 1
H- Stud (4 used)
I- Head Gasket
J- Pin (6 used)
K- Piston Ring, Compression
L- Piston Ring, Chrome Compression
M- Piston Ring, Oil Ring Assembly
N- Snap Ring
O- Piston Pin
P- Piston
Q- Connecting Rod
R- Connecting Rod Cap
S- Cap Screw M6x30
T- Crankshaft
U- Clip

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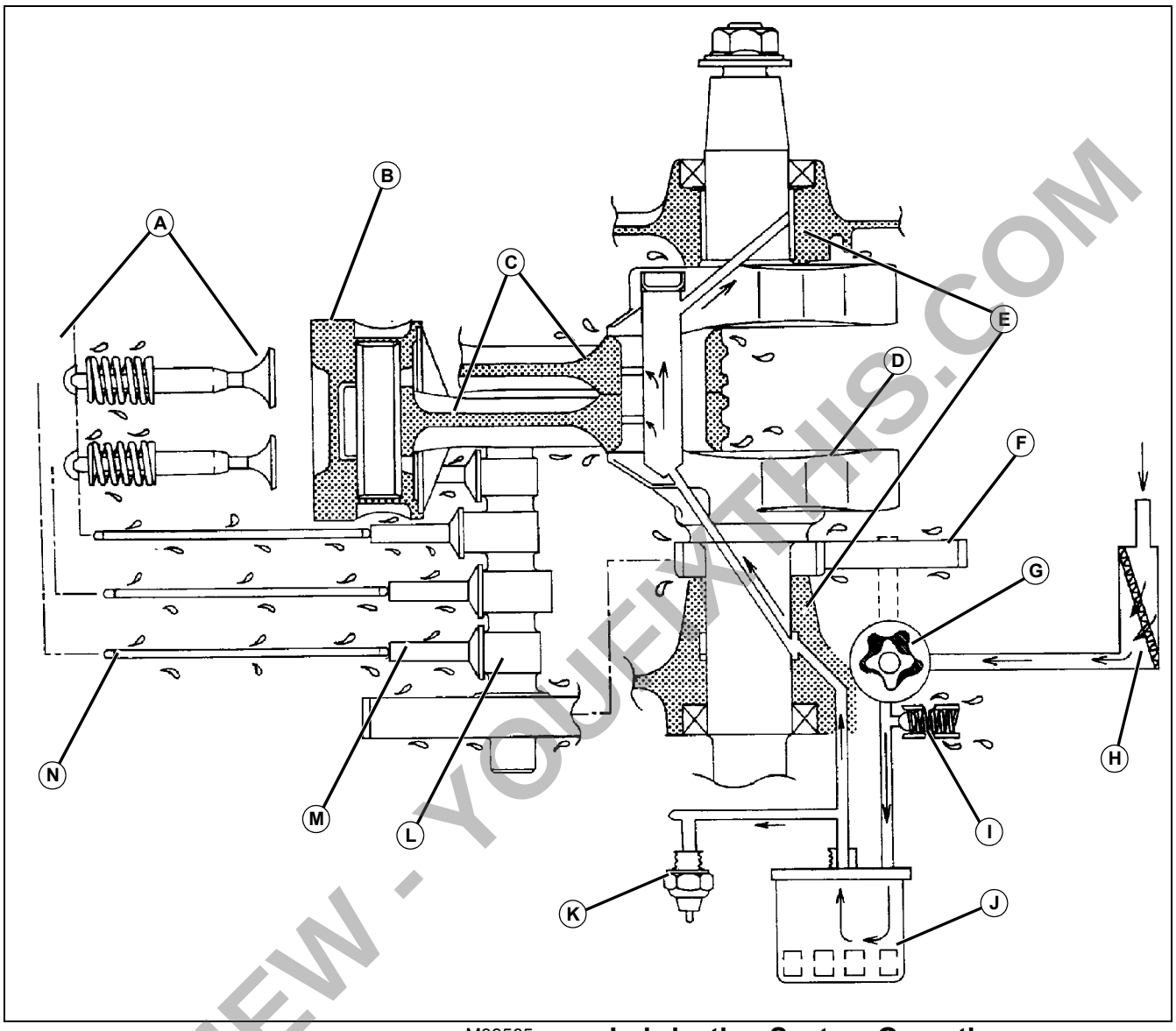
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Theory of Operation

Engine Oil Flow Chart



M99565

A- Rocker Arms and Valves
B- Piston
C- Connecting Rods
D- Crankshaft
E- Crankshaft Main Bearings
F- Oil Pump Gear
G- Oil Pump
H- Pick-up Screen
I- Oil Pressure Relief Valve
J- Oil Filter
K- Oil Pressure Sensor
L- Camshaft
M- Tappets
N- Push Rods

Lubrication System Operation

Function:

To provide pressurized oil to lubricate internal engine components.

Theory of Operation:

A positive displacement gerotor pump is used to pressurize the lubrication system. The lubrication system is protected by an oil pressure relief valve, low oil pressure switch, and an oil filter with bypass valve.

The oil pump draws oil from the sump through the pick-up screen. Pressure oil from the pump flows through the pump outlet passage past the oil pressure relief valve. The oil pressure relief valve limits the oil pressure to approximately **296 kPa (43 psi)** and protects the oil pump from damage if

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Note: Other engine failures such as plugged exhaust or improper valve clearance can cause symptoms similar to faulty fuel supply. Verify the quality of the engines mechanical and electrical systems.

Engine Surge

An engine that surges may have an improper air/fuel mixture or a misadjusted or worn governor.

Attempt to manually control the throttle at low and high idle to determine which system is causing the surge. If the engine speed can be held constant check the governor system. If the engine surge cannot be controlled manually, check the fuel system.

Fuel system issues may consist of:

- Improper air/fuel mixture caused by air leaks around the throttle shaft, intake and/or insulator gaskets.
- Minor restrictions inside the carburetor passages from varnish and debris buildup in the idle circuit. Properly cleaning the carburetor will likely fix the problem.

Rich Air/Fuel Mixture

There are several possible causes of a rich running condition such as: improper or stale fuel, short-tripping, air filter, choke adjustment and/or vent tube location.

Note: Verify the ignition system. A rich running condition can have the same symptoms as an improperly operating ignition system.

Float Valve



MX47331

Float Valve with Worn Tip Shown

Fuel level in the float bowl is regulated by the float and the float valve. A worn float valve tip provides too much fuel and will cause a rich condition.

Improper or Stale Fuel

Poor fuel quality can cause an engine to appear to be running rich. Improper or stale fuel can cause engine components to stick or deteriorate.

Short-Tripping

A common misdiagnosis comes from short-tripping machines (engines that are started for short periods of time). Short-tripping causes the engine to develop black, sooty spark plugs and contamination in the oil. Over time, short-tripping can lead to glazed cylinder walls. To prevent this, every time the engine is started, allow the engine to reach operating temperature and load the machine.

Air Filters

Note: Late model carburetors are internally vented to meet emissions standards.

Engines with externally vented carburetors with a dirty air filter will exhibit rich running conditions. When a dirty air filter restricts air flow to the carburetor, the low pressure in the venturi drops even further, resulting in a higher pressure differential between the fuel bowl and the venturi. Therefore, a dirty air filter can enrich the air/fuel mixture to the point that performance will drop.

Engines with internally vented carburetors will not exhibit rich running conditions with a dirty air filter. When a dirty air filter restricts air flow to the throat of the carburetor, an equal reduction will be applied to the bowl vent. Internally vented carburetors maintain the pressure differential between the bowl and the venturi resulting in a consistent air/fuel mixture over the life of the air filter.

Vent Tube Location

With an externally vented carburetor, a rich or lean run condition could also be caused by the location of the float bowl vent tube. The purpose of the vent tube is to allow atmospheric pressure into and out of the float bowl. Air from the cooling fan at the vent tube opening can cause a pressure increase or decrease on the fuel in the float bowl and cause the engine to run rich or lean. Check for bulletins and relocate the float bowl vent tube to a location away from any source of turbulence.

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Results:

- If starter motor solenoid proves defective in the final test, it must be replaced.

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Specifications

General Specifications

General Specifications:

Engine Use	X300 and X304
Make	Kawasaki V-Twin
Model Number	FH491V
Bore	68 mm (2.68 in.)
Stroke	65 mm (2.56 in.)
Displacement	472cm^3 (28.8 cu in.)
Cylinders	2 (V-Twin)
Stroke Cycle	4
Valves	Overhead
Lubrication	Fully Pressurized
Oil Capacity w/ Oil Filter	1.8 L (1.9 qt)
Oil Filter	Single Element, Full Flow, Spin-On
Cooling System	Air
Muffler	Horizontal Discharge Below Frame
Spark Plug Gap	0.76 mm (0.030 in.)
Spark Plug Torque	22 N•m (195 lb-in.)

Test and Adjustment Specifications

Test and Adjustment Specifications:

Governed Low Idle	1850 ± 100 rpm
Fast Idle	3350 ± 100 rpm
Low Speed Carb Idle Screw	1450 ± 100 rpm
Ignition Coil Air Gap	0.25 - 0.40 mm (0.010 - 0.016 in.)
Oil Pressure @ 3000 rpm	240 - 310 kPa (35 - 45 psi)
Crankcase Vacuum	1.3 - 25.4 cm (0.5 - 10.0 in.)
Cylinder Compression (Minimum)	390 kPa (57 psi)
Valve Clearance (Intake and Exhaust) (Cold)	0.075 - 0.125 mm (0.003 - 0.005 in.)
Fuel Pump Pressure (Slow Idle)	2.45 kPa (0.36 psi)
Minimum Fuel Flow	65 mL (2.2 oz)/15 seconds

Repair Specifications

Cylinder Head:

Cylinder Head Distortion (Maximum)	0.03 mm (0.001 in.)
Valve Guides ID	6.00 - 6.01 mm (0.0236 - 0.237 in.)
Valve Guides ID (Maximum)	6.08 mm (0.239 in.)
Valve Seat Width	0.6 - 0.9 mm (0.024 - 0.035 in.)
Valve Spring Free Length	31.0 mm (1.22 in.)

Intake and Exhaust Valves:

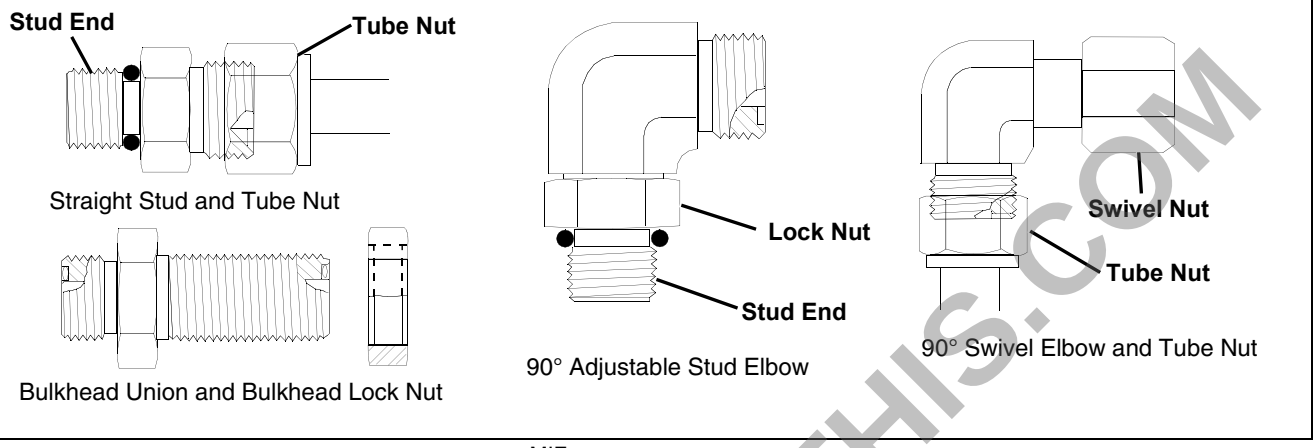
Valve Clearance (Intake and Exhaust) (Cold)	0.075 - 0.125 mm (0.003 - 0.005 in.)
Valve Stem OD (Intake) (Minimum)	5.93 mm (0.233 in.)

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O-Ring Seal Service Recommendations

Face Seal Fittings - Inch Stud Ends Torque



MIF

Nominal Tube OD/Hose ID				Face Seal Tube/Hose End					O-Ring Stud Ends		
Metric Tube OD	Inch Tube OD			Thread Size	Tube Nut/ Swivel Nut Torque		Bulkhead Lock Nut Torque		Thread Size	Straight Fitting or Lock Nut Torque	
mm	Dash Size	in.	mm	in.	N•m	lb-ft	N•m	lb-ft	in.	N•m	lb-ft
	-3	0.188	4.76						3/8-24	8	6
6	-4	0.250	6.35	9/16-18	16	12	12	9	7/16-20	12	9
8	-5	0.312	7.94						1/2-20	16	12
10	-6	0.375	9.52	11/16-16	24	18	24	18	9/16-18	24	18
12	-8	0.500	12.70	13/16-16	50	37	46	34	3/4-16	46	34
16	-10	0.625	15.88	1-14	69	51	62	46	7/8-14	62	46
	-12	0.750	19.05	1-3/16-12	102	75	102	75	1-1/16-12	102	75
22	-14	0.875	22.22	1-3/16-12	102	75	102	75	1-3/16-12	122	90
25	-16	1.000	25.40	1-7/16-12	142	105	142	105	1-5/16-12	142	105
32	-20	1.25	31.75	1-11/16-12	190	140	190	140	1-5/8-12	190	140
38	-24	1.50	38.10	2-12	217	160	217	160	1-7/8-12	217	160

Note: Torque tolerance is +15%, -20%

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V- Crankcase Cover
W- Seal
X- Bolt
Y- Seal
Z- Cylinder Head No. 2
AA- Gasket
AB- Fitting
AC- Plug
AD- Crankcase
AE- Seal
AF- Gasket
AG- Cover
AH- Screw M6x12

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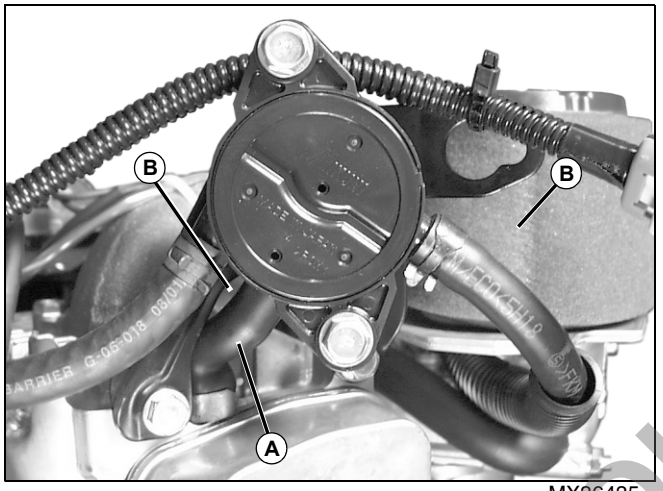
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Fuel Pump Removal and Installation

Procedure:

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

Caution: Avoid Injury! Gasoline is extremely flammable. Do not smoke. Always work in a ventilated area away from open flame or spark producing equipment, this includes equipment that utilizes pilot lights.



MX36435

2. Disconnect vacuum line (A) and fuel lines (B).
3. Remove two mounting screws.

Installation:

Installation is done in the reverse order of removal.

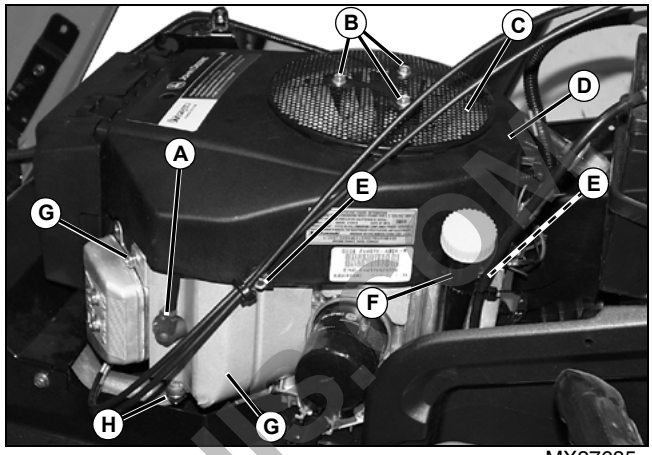
- Tighten mounting screws to specification.

Specification:

Torque . . . . . 5.9 N•m (52 lb-in.)

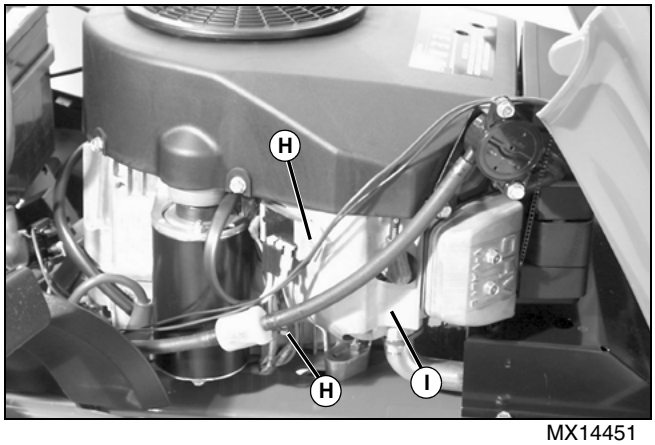
Blower Housing Removal and Installation

Removal:



MX37685

1. Disconnect spark plug caps (one on each side of engine) (A).
2. Remove three screws (B) securing the flywheel screen (C) to the flywheel. Remove flywheel screen.
3. Remove four screws (E) (two on each side) securing the upper blower housing (D) to the block and lower housings. Remove upper blower housing.
4. Remove two screws (H). Remove left side lower blower housing (G).
5. Remove dipstick tube (F).



MX14451

6. Remove two screws (J). Remove right side lower blower housing (I).

Installation:

Installation is done in the reverse order of removal.

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heat engine oil to normal operating temperature.

9. Run engine at fast idle and check oil pressure.

Note: Use silicon sealer on switch threads.

10.Remove test equipment and install oil pressure switch. Tighten switch to specification.

Results:

If oil pressure is BELOW specifications, inspect or replace the following:

- Oil filter plugged.
- Oil pressure relief valve for broken or worn spring.
- Oil pressure relief valve for stuck or damaged valve.
- Worn or damaged oil pump.
- Oil pump suction screen or oil passages plugged.
- Excessive wear of connecting rod and main bearing journals.

Specifications:

Oil Pressure Minimum . . . . . 69 kPa (10 psi)
Oil Pressure at Fast Idle. . . . 240 - 310 kPa (35 - 45 psi)
Switch Torque . . . . . 9.8 N•m (87 lb-in.)

Fuel Pump Test

Reason:

To check condition of fuel pump and determine fuel pressure.

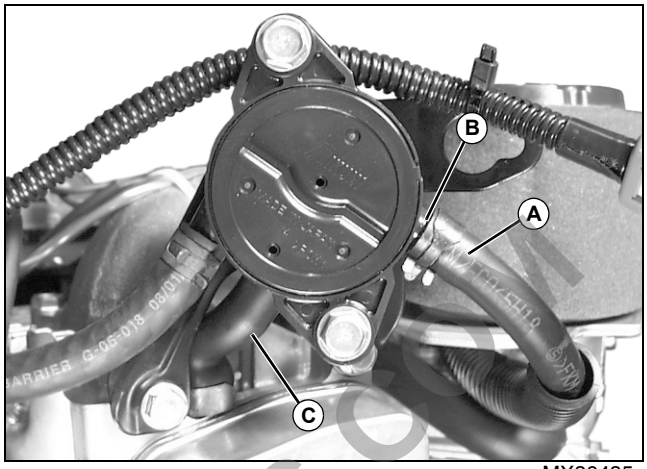
Test Equipment:

- JDG356 Pressure Gauge
- Graduated Container

Procedure:

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

Caution: Avoid Injury! Gasoline is extremely flammable. DO NOT SMOKE. Always work in a well ventilated area away from open flame or spark producing equipment; this includes equipment that utilizes pilot lights.



MX36435

2. Disconnect and plug fuel pump outlet hose (A).

3. Connect JDG356 pressure gauge to fuel pump outlet (B).

4. Start and run engine at fast idle for 15 seconds, then record pressure reading.

5. Stop engine.

6. Remove pressure gauge from fuel pump outlet and connect a length of hose long enough to reach into a graduated container.

7. Start and run engine at fast idle for 15 seconds, then stop the engine and record container measurement.

Results:

If fuel pump pressure or flow does not meet the specifications, check the following:

- Fuel lines, vacuum line (C), fuel filter and fuel tank cap for restrictions.
- Check fuel pump vent holes for obstruction.
- Check crankcase vacuum.
- Replace fuel pump.

Specifications:

Minimum Fuel Pressure. . . . . 6.12 kPa (0.90 psi)
Minimum Fuel Flow . . . . . 65 mL (2.2 oz)/15 seconds

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No: Replace oil pump.

7. Is there fuel in the oil?

Yes: Check for broken or seized piston rings or worn cylinder(s).

No: Go to next step.

8. Is oil pump screen clogged or pick up tube cracked?

Yes: Clean screen and repair or replace pick up tube.

No: Go to next step.

9. Is there excessive crankshaft or rod bearing clearance?

Yes: Regrind crank and replace bearings.

No: Go to next step.

10. Intake/exhaust valves or guides worn?

Yes: Replace valves and head(s).

No: Go to next step.

Contamination in Crankcase

1. Is there fuel in the crankcase?

Yes: Check for broken or seized piston rings or worn cylinder(s). Check for worn or seized exhaust valves.

No: Go to next step.

2. Is there water in the crankcase?

Yes: Check to make sure that crankcase breather is working correctly. See “Crankcase Vacuum Test” on page 185, and “Breather Inspection” on page 196

Starting Motor Troubleshooting Guide

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

Important: Avoid Damage! If starting motor does not stop rotating by turning ignition switch to Off position, disconnect negative (-) lead from battery as soon as possible.

Note: To test specific electrical components, see Electrical section and refer to either Diagnostics or Tests and Adjustments for further guidance.

Starting Motor Diagnostics

Starter Does Not Rotate

1. Is there a clicking sound from the starter solenoid?

Yes: Go to next step.

No: Test starting solenoid. See “Starting Solenoid Test” in the Electrical section.

2. Check that all starting conditions are met?

Yes: Go to next step.

No: Make sure all starting conditions are met.

3. Are battery cables loose or dirty?

Yes: Clean and tighten cables and connections.

No: Go to next step.

4. Is battery fully charged? See “Battery Test” in the Electrical section.

Yes: Go to next step.

No: Charge battery. See “Charge Battery” in the Electrical section.

5. Is key switch working correctly?

Yes: Go to next step.

No: Repair or replace key switch. See “Key Switch Test” in the Electrical section.

6. Is engine seized?

Yes: See engine repair section.

No: Go to next step.

Starter Rotates Slowly

1. Are battery cables loose or dirty?

Yes: Clean and tighten connections and cables.

No: Go to next step.

2. Is battery fully charged? See “Battery Test” in the Electrical section.

Yes: Go to next step.

No: Charge battery. See “Charge Battery” in the Electrical section.

3. Is there a clicking sound from the starter solenoid?

Yes: Go to next step.

No: Test starter solenoid. See “Starting Solenoid Test” in the Electrical section.

4. Is engine seized?

Yes: See engine repair section.

No: Go to next step.

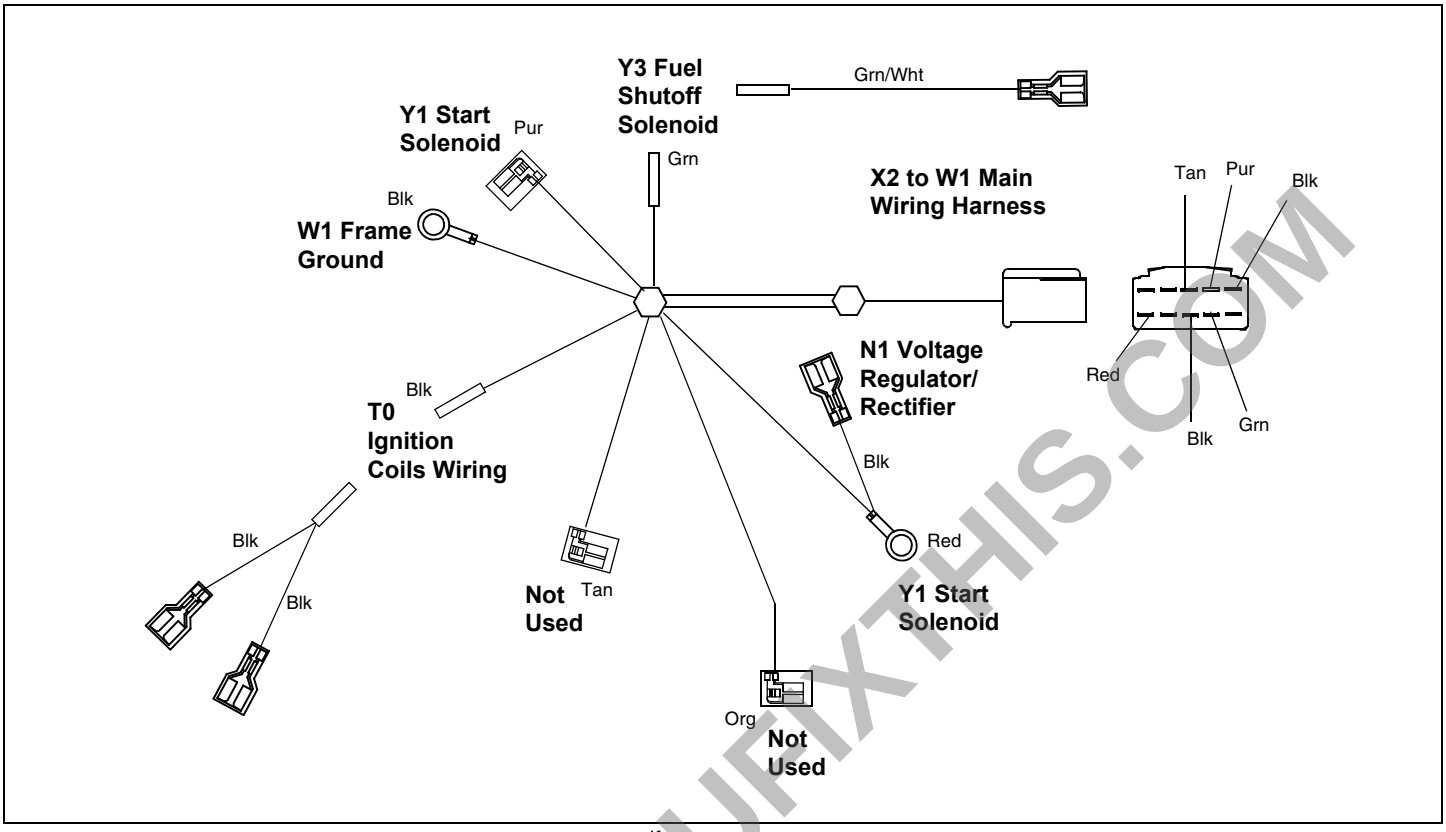
5. Is starting motor or solenoid defective?

Yes: Repair or replace. See related tests in the Electrical section.

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W2 Engine Wiring Harness (SN -040000)



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Ignition Circuit Operation

Function:

To control the ignition coils ability to create a spark.

Operating Conditions, Stopping Engine:

- Key switch in Off position

- or -

- Operator off seat
- Park braked unlocked.

Theory of Operation, Stopping Engine:

The engine is shut off by grounding the T1 and T2 ignition coils. With the ignition primary coils grounded, a spark cannot be produced.

Operating current for the interlock module is supplied by the switched power circuit. When the key switch is in the Off position, a module-created ground path shunts the 900-series Wht wires of the ignition coils and P1 hour meter.

If the interlock module senses that the logic inputs from both the seat switch (810B Pnk wire) and brake switch (705B Brn wire) are removed, the 900-series Wht wires are again grounded.

The seat switch and brake switch also provide inputs to the interlock module for the fuel shutoff solenoid circuit. If both the seat switch and brake switch are in the off position, the fuel shutoff solenoid is de-energized, stopping the flow of fuel within the carburetor.

Operating Conditions, Running Engine:

- Key switch in On or Start position
- Operator on seat

- or -

- Key switch in On or Start position
- Operator off seat
- Park braked locked.

Theory of Operation, Running Engine:

The ignition system is a transistor-controlled magneto design. Ignition timing is controlled by the transistor and is not adjustable. As the engine turns, the flywheel magnet induces a current pulse into the magneto ignition coil. The ignition coil steps up the pulse to produce a high voltage arc across the spark plug gap. This spark ignites the fuel/air mixture in the engine cylinder.

Operating current for the interlock module is supplied by the switched power circuit. With the key switch in the On position and the seat and/or brake switch activated, the module will open the ground shunt to the ignition primary coils. A high-voltage spark can now be generated.

Additionally, the interlock module energizes the fuel shutoff solenoid, allowing fuel to flow within the carburetor. See “Fuel Shutoff Solenoid Circuit Operation” on page 291.

The interlock module is a solid-state device with no field-serviceable components.

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Results:

- If MORE THAN 50 point variation between cells, replace battery;
- If LESS THAN 50 point variation between cells, go to next steps.

Note: If battery was discharged at slow or unknown rate, charge battery at 10 - 15 amps for 6 - 12 hours. (Maintenance-free battery: 4 - 8 hours).

a. Continue to charge battery until specific gravity is 1.250 - 1.265 points.

b. Load test battery.

c. Install battery.

Battery Load Test

Reason:

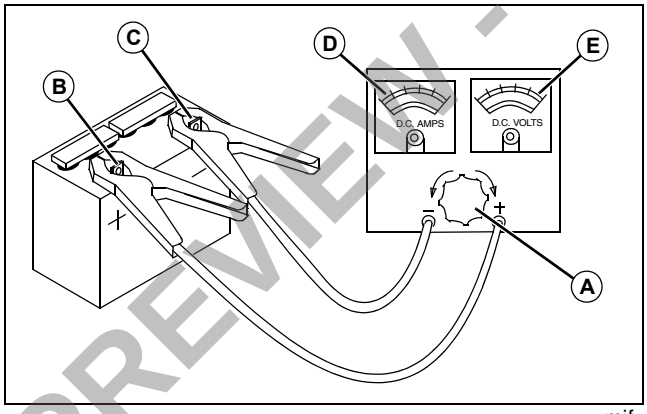
To check condition of battery under load.

Equipment:

- JTO5685 Battery Tester

Procedure:

1. Park machine Safely with park brake locked. See “Park Machine Safely” in the Safety section.
2. Raise hood.
3. Clean cable ends, battery terminals and top of battery.
4. Remove battery.



mif

5. Turn load knob (A) counterclockwise to OFF position.
6. Connect tester positive (red) cable to battery positive (+) terminal (B).
7. Connect tester negative (black) cable to battery negative (–) terminal (C).
8. Turn load knob (A) of tester clockwise (in) until amperage reading (D) is equal to:
   - Cold cranking amperage rating of battery (use blue scale), or
   - Three times ampere hour rating (use black scale).
9. Hold for 15 seconds and turn load knob (A) of tester counterclockwise to OFF position.
10. Repeat Steps 8 and 9 above and read condition of battery at DC Volts scale (E).

Results:

- If battery DOES NOT pass test and has NOT been charged, charge battery and retest.
- If battery DOES NOT pass test and HAS BEEN charged, replace battery.

Regulated Voltage Test

Reason:

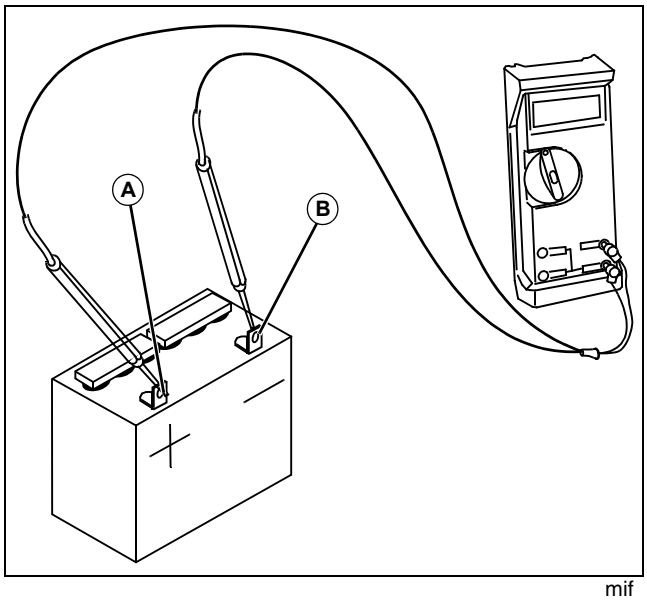
To determine regulated voltage output of the regulator/ rectifier.

Equipment:

- Multimeter

Procedure:

1. Park machine Safely with park brake locked. See “Park Machine Safely” in the Safety section.
2. Raise hood.
3. Remove surface charge from battery by placing a small load on the battery for 15 seconds.
4. Set voltmeter to 50 DC volt scale.



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5. Connect voltmeter positive (red) lead to battery positive (+) terminal (A).

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Note: Location of skip tooth spline (S) and matching recess (T) in shaft for assembly. Shafts and plate splines must line up correctly or damage to plates could occur.

- Tighten all fasteners to specifications
- Test drive system. See “Traction Drive System Test” on page 391.

Torque Specifications:

Cruise Control Pivot Cap Screw . . . . 32.5 N•m (24 lb-ft)
Pedal Pivot Rod Lock Nut . . . . . 45 N•m (33 lb-ft)
Cam Follower Cap Screw. . . . . 23 N•m (17 lb-ft)

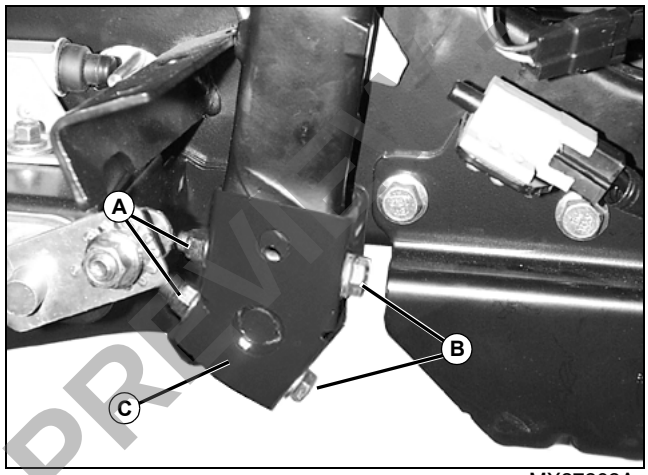
Brake Pedal and Cross Shaft Removal and Installation

Removal:

1. Remove mower deck. See “Mower Deck Removal and Installation” for the appropriate mower deck in the Attachments section.
2. Remove fender deck. See “Fenderdeck Removal and Installation” on page 566 in Miscellaneous section.
3. Disconnect negative (-) cable from battery.

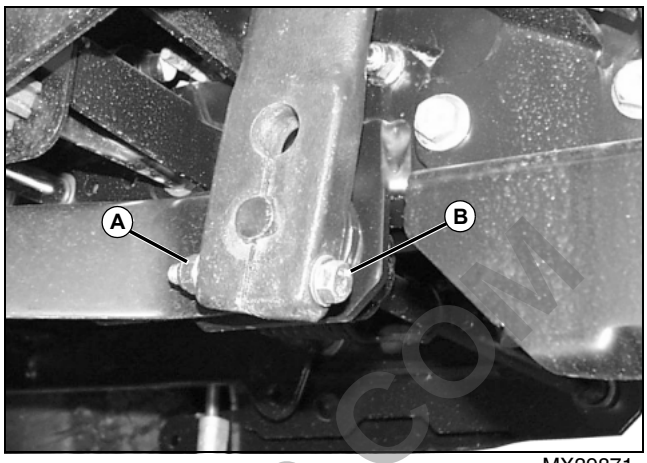
Caution: Avoid Injury! The machine may fall or slip from an unsafe lifting or holding devices!

4. Raise front of machine. Support on jack stands.



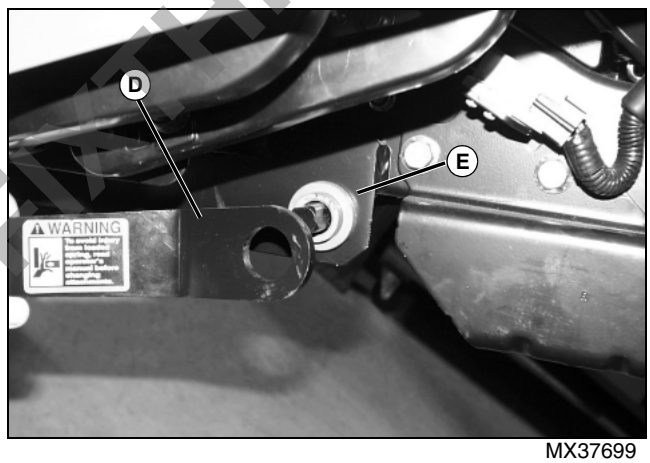
MX37262A

5. SN -85000: Remove nuts (A) and bolts (B) from pedal. Remove cover (C). Remove pedal from shaft.



MX39871

6. SN 85001-: Remove nut (A) and bolt (B) from pedal. Remove pedal from shaft.



MX37699

7. Remove right side lift arm (D) from pedal shaft bushing (E). Remove bushing.

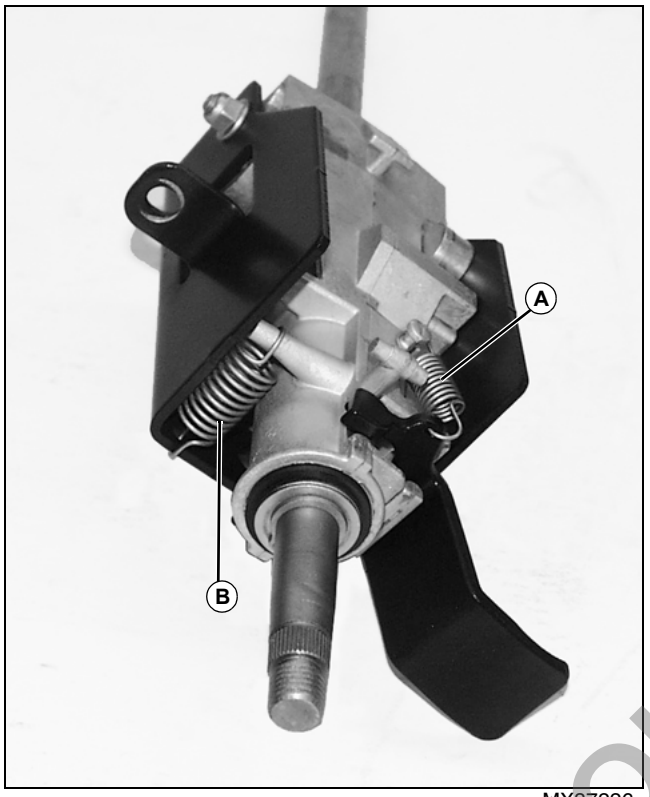
Caution: Avoid Injury! The brake spring is under high tension when installed. Wear approved eye protection and gloves when removing to minimize the risk of personal injury.

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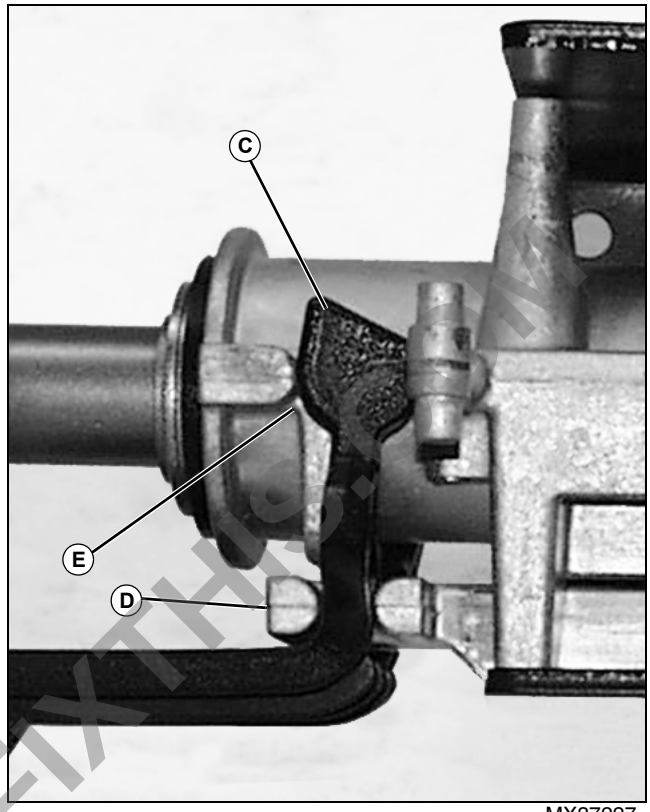
Steering Tilt Unit Disassembly and Assembly

1. Remove steering tilt unit from frame. See “Steering Tilt Unit Removal and Installation” on page 459.



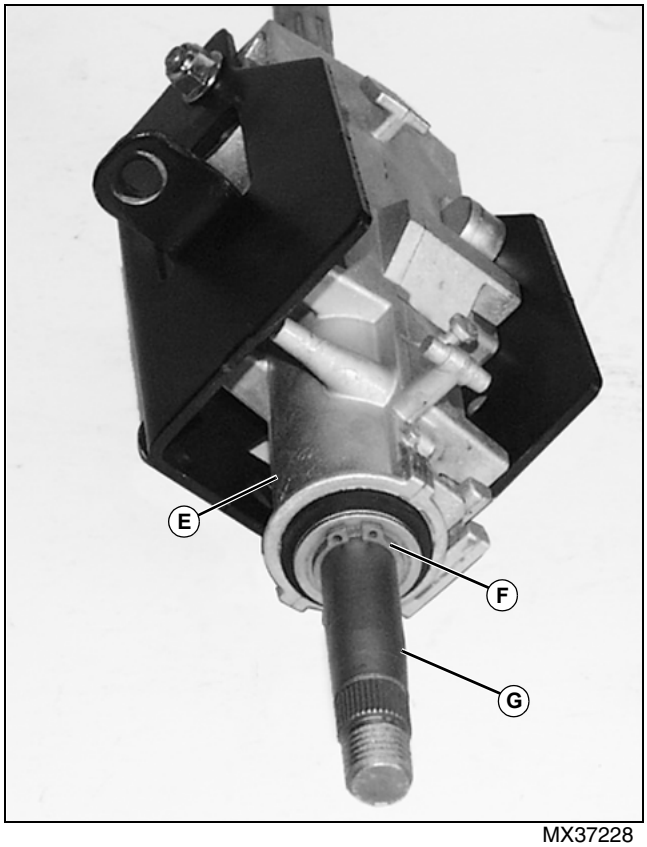
MX37226

2. Remove handle spring (A) and body spring (B). Note orientation of handle spring (A) for installation.



MX37227

3. Remove lock handle (C) from lock (D) and body (E).



MX37228

4. Remove snap ring (F) that retains steering shaft (G) in

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Diagnostics

Mower Drive Checks

Test Conditions

- Machine parked on level surface
- PTO disengaged
- Parking brake locked
- Key switch in Off position

Attachment Systems Checks

PTO Clutch and Drive Sheave

1. Is PTO clutch and drive shave tight on crankshaft? (Key not damaged or missing?)

Yes: Go to next step.

No: Tighten cap screw. Replace key if necessary.

2. Is air gap properly adjusted?

Yes: Go to next step.

No: Repair and adjust as needed.

3. Is belt on sheave?

Yes: Go to next step.

No: Install belt.

4. Is sheave binding, damaged or worn?

Yes: Replace sheave.

No: Go to next step.

5. Does sheave angle match belt angle?

Yes: Go to next check.

No: Check jack sheave and PTO sheave. Repair or replace components as necessary.

Primary Drive Belt: 48 and 54 Inch Decks

1. Is primary drive belt damaged, worn, broken or turned over?

Yes: Replace primary drive belt. See “Replacing Mower Drive Belt (Primary) (48 in. and 54 in. Mowers)” on page 544.

No: Go to next check.

Jack Sheave

1. Is sheave binding, damaged or worn?

Yes: Replace sheave.

No: Go to next step.

2. Does sheave angle match belt angle?

Yes: Go to next step.

No: Check jack sheave and PTO sheave. Repair or replace components as necessary.

3. Is jack sheave arm binding, damaged, or worn?

Yes: Replace arm.

No: Go to next step.

4. Is nut at correct torque?

Yes: Go to next check.

No: Tighten nut to specification.

Primary Belt Tension Spring and Rod

1. Is belt tensioning handle in tension position?

Yes: Go to next step.

No: Move to tension position.

2. Is primary belt tension spring or rod damaged, worn or weak?

Yes: Repair or replace components as necessary.

No: Go to next check.

Secondary Drive Belt

1. Is secondary drive belt damaged, worn, broken or turned over?

Yes: Replace belt.

No: Go to next check.

Secondary Drive Belt Tensioning Spring

1. Is secondary drive belt tensioning spring damaged, worn or weak?

Yes: Replace spring.

No: Go to next check.

Secondary Drive Belt Idler and Pivot Arm

1. Is secondary drive belt idler and pivot arm binding, damaged or worn?

Yes: Repair or replace components as necessary.

No: Go to next step.

2. Is pivot arm bent, keeping idler from being parallel to belt?

Yes: Repair or replace components as necessary.

No: Go to next check.

Fixed Idler

1. Is idler binding, damaged or worn?

Yes: Repair or replace components as necessary.

No: Go to next check.

Spindle Sheaves

1. Is spindle sheave tight on spindle with key in place?

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