## 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.

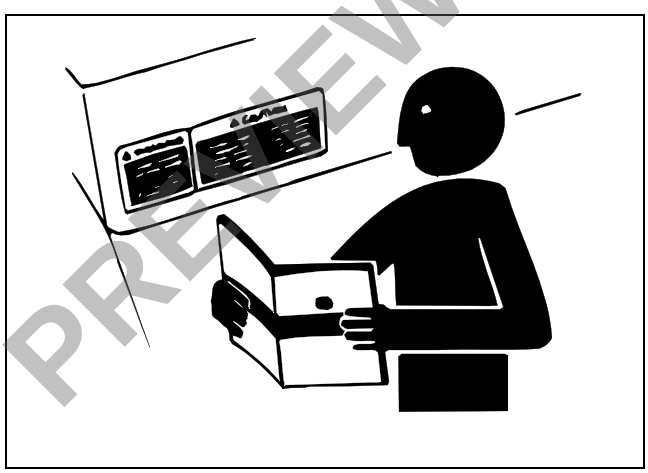
Follow recommended precautions and safe servicing practices.

## 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

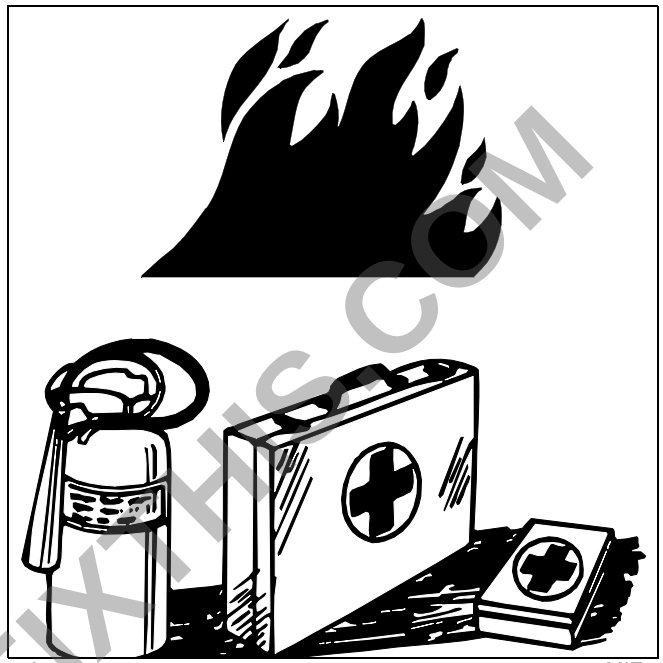


MIF

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

## Handle Fluids Safely - Avoid Fires

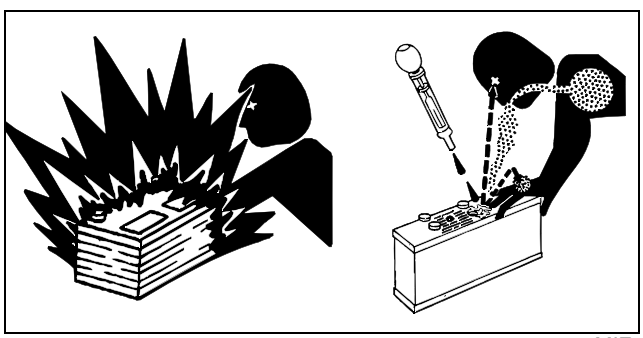
### Be Prepared For Emergencies



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.

## Use Care In Handling and Servicing Batteries



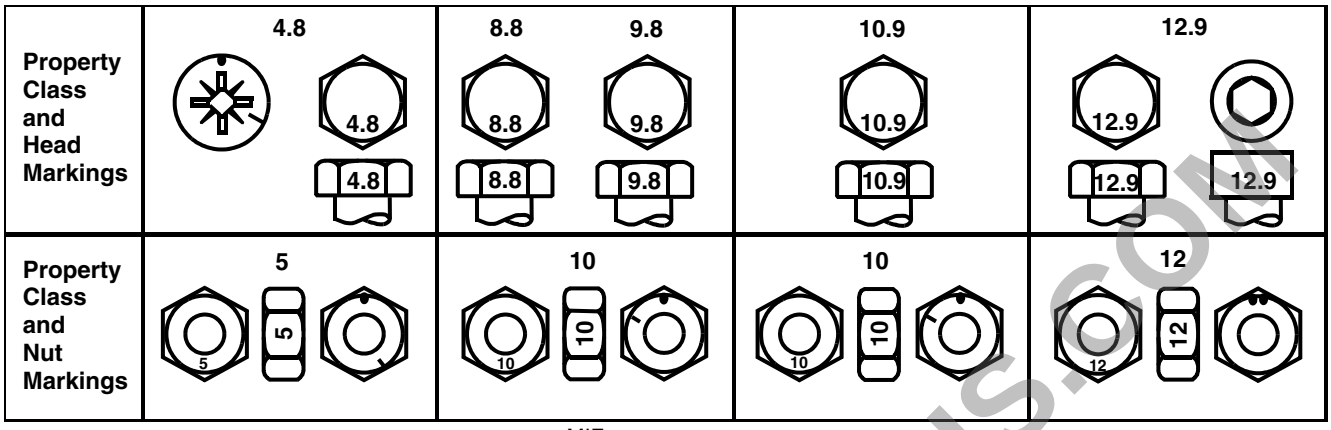
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## Fastener Torques

### Metric Fastener Torque Values




MIF

| | 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 | 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.*

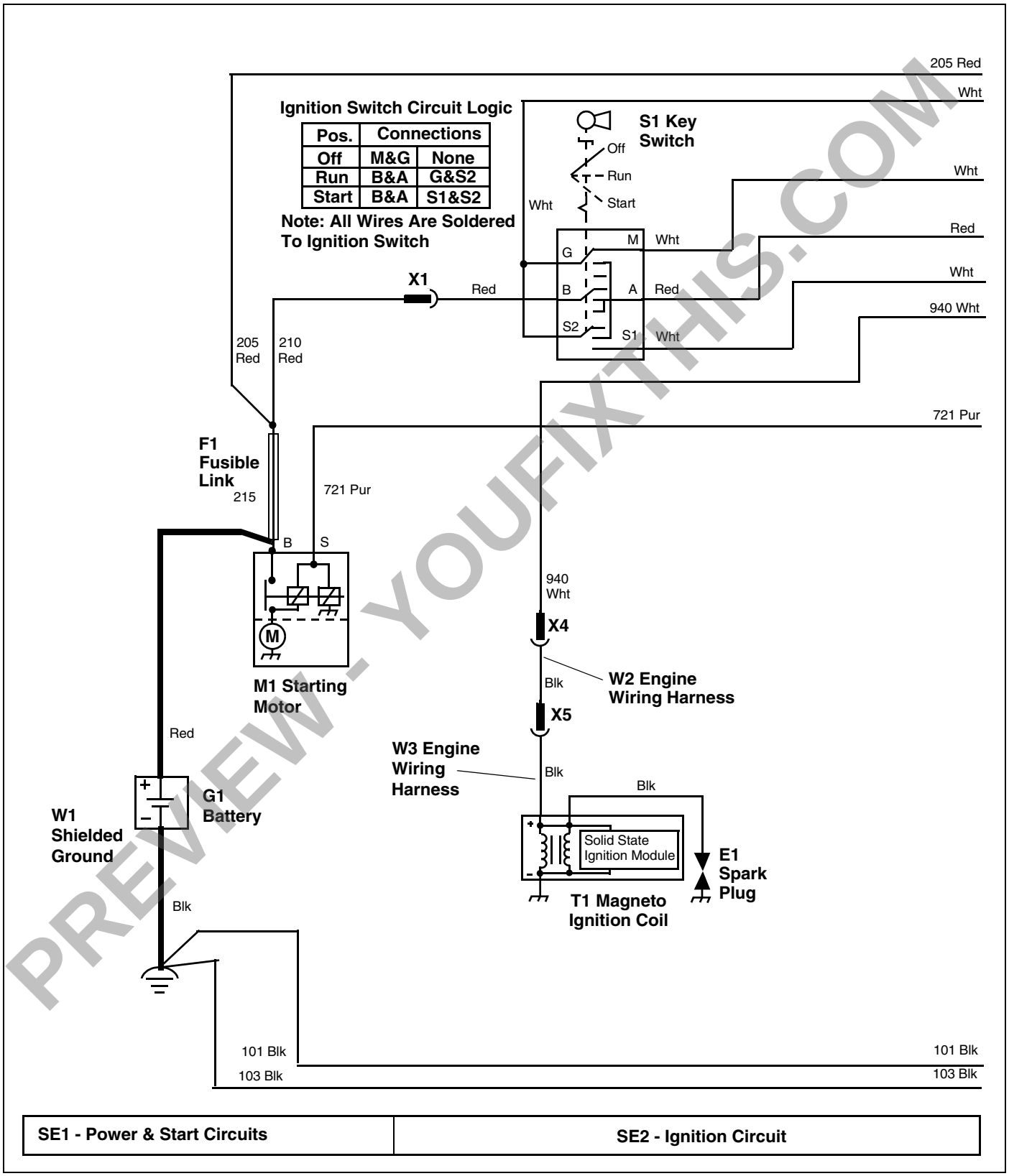
Reference: JDS - G200.



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## Schematics and Harnesses

### LX255 and LX266 Kohler Main Electrical Schematic (1 of 4)

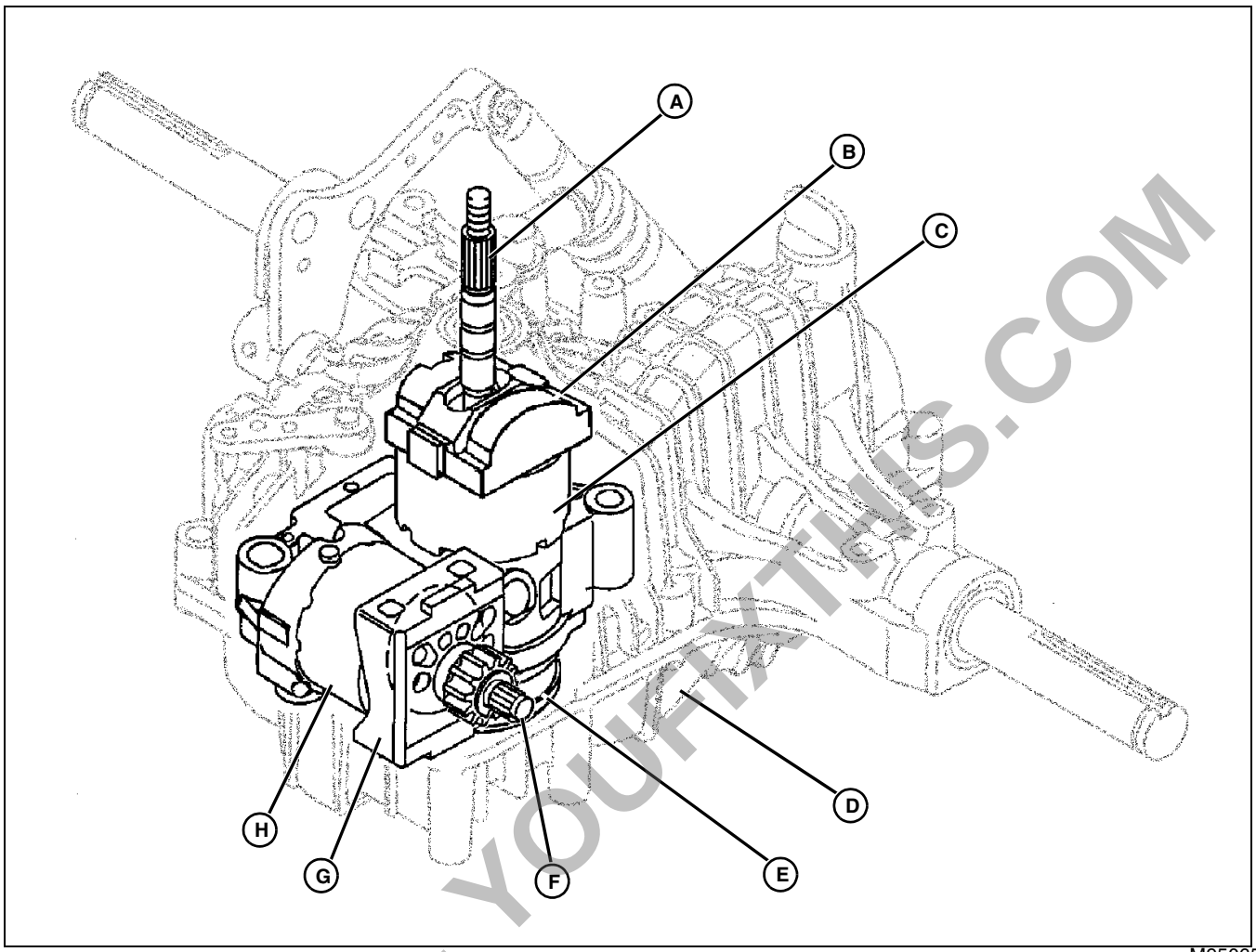



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## Hydrostatic System Operation




M95065

**Function:**

The hydrostatic transaxle provides a means of transferring power from the input sheave to the axle shafts of the transaxle. It also provides infinitely variable speed control and the capability of forward or reverse directional travel of the machine.

**Theory of Operation:**

As the input sheave is rotated by the traction drive belt it rotates the pump input shaft (A). The pump input shaft is splined to the pump rotating group (H) and the charge pump. The pump rotating group is composed of an axial piston pump and a variable displacement swash plate (B). The charge pump is composed of a Gerotor pump that draws pressure-free oil from the reservoir (D) through the filter (E) and supplies oil to the pump rotating group. The pump rotating group provides oil under pressure to the motor rotating group (C). The motor rotating group is composed of an axial piston motor with a fixed position swash plate (G), and converts hydraulic energy into rotary motion, which is output through the motor output shaft (F).

This rotary motion of the motor output shaft is the beginning of the gear power flow.

**Neutral:**

With the transmission in the neutral position, the swash plate is held perpendicular to the piston. Springs in the pump cylinder block force the pump pistons against the swash plate. Since the variable displacement swash plate is perpendicular to the axis of the pistons, there is no reciprocating motion of the pistons in the cylinders, and no oil is displaced. Because there is no demand for oil in the pump, both directional check valves are closed, and the machine remains stationary.

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Control Pedals and Linkage .....447
Intermediate Shaft .....447
Neutral Return Arm .....448
Cruise Control Lever (2WS Model) .....449
Cruise Control Lever (AWS Model) .....450
Hand Control Lever
(Optional) (2WS Model) .....452
Hand Control Lever
(Optional) (AWS Model) .....452
Brake Pedal and Linkage .....454
Brake Rod
Removal and Installation .....455

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## Tests and Adjustments

### Throttle Cable Adjustment

**Reason:**

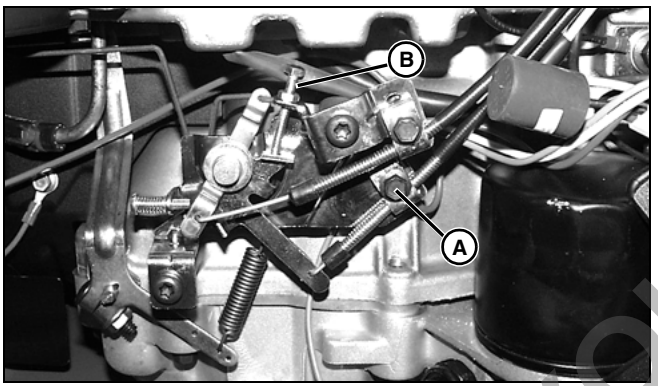
To make sure the throttle cable moves the throttle and choke control lever through its full range of movement.

**Equipment:**

- JT05719 Photo Tachometer; or,
- JT07270 Digital Pulse Tachometer

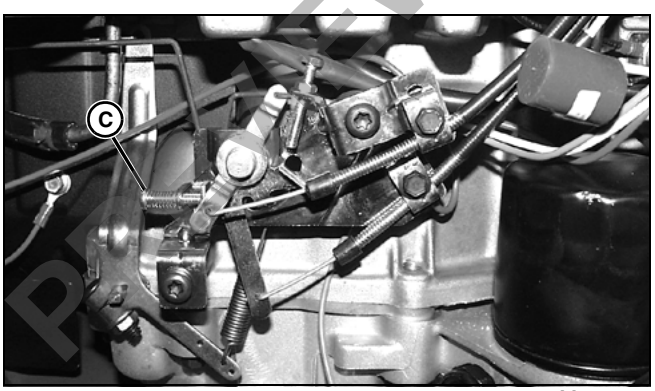
**Procedure:**

1. Start and run engine at MEDIUM idle for 5 minutes.
2. Loosen cable clamp (A) securing throttle cable.



M99723

3. Place throttle lever in fast idle position.
4. Adjust fast idle screw (B) until fast idle is 3350 ± 50 rpm. Pull throttle cable housing rearward to remove any slack in throttle cable.
5. Tighten throttle cable clamp.



M99722

6. Move throttle lever to the slow position.
7. Adjust slow idle screw (C) to set low idle at 1550 ± 100 rpm.
8. Move throttle lever through full range to be sure linkage is not binding.

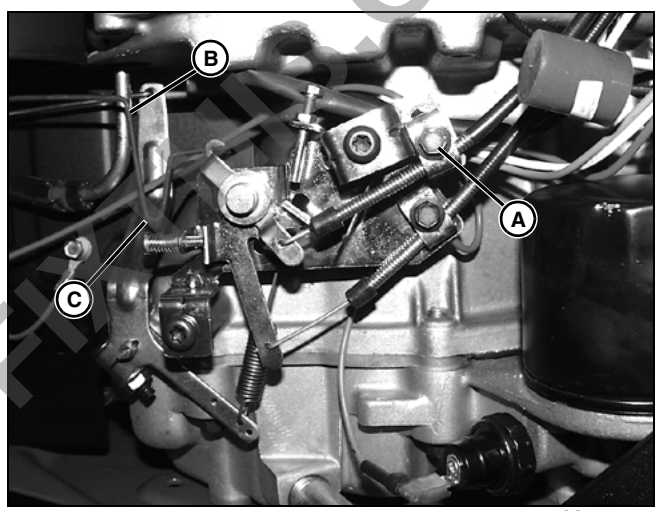
### Choke Cable Adjustment

**Reason:**

To make sure the choke plate is fully closed when the choke lever is in the full choke position. Correct adjustment also ensures choke is completely open when the choke lever is in the OFF (choke open) position.

**Procedure:**

1. Stop engine and set parking brake.
2. Remove air cleaner assembly from carburetor.
3. Move choke lever to full CHOKE position.



M99724

4. Loosen choke cable clamp (A) and pull cable housing rearward to remove any slack in choke cable.
5. Tighten choke cable clamp.
6. Move throttle lever to full choke position.
7. Try to move choke rod (B) forward (choke rod should not move). If the choke rod moves forward, the choke plate is not fully closed. Carefully bend the choke rod at Vee bend (C) until the choke plate is fully closed.
8. Move choke lever to be sure choke linkage is not binding and choke plate fully opens when choke lever is in the OFF position.

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## Diagnostics

## Engine Will Start

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

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

### Symptom: Engine Will Not Crank

**(1) Is battery voltage 12.4 volts or higher?**

**Yes -** Go to next step 3.

**No -** Charge battery and perform no-load test. Go to next step.

**(2) Is battery voltage 12.4 volts or higher?**

**Yes -** Go to next step.

**No -** Replace battery.

**(3) Does starter solenoid click when ignition switch is turned to START position?**

**Yes -** Check starter motor.

**No -** Check electrical system.

**CAUTION: Avoid Injury! DO NOT rotate engine with starter if the spark plugs are removed. Gasoline spray from the open cylinders may be ignited by ignition spark and cause an explosion or fire.**

***NOTE: Perform a visual inspection first to determine if battery cables are tight and not corroded and if battery is of sufficient size to turn the engine over at minimum cranking speed of 350 rpm.***

### Symptom: Engine Cranks But Will Not Start

**(1) Is battery voltage 12.4 volts or higher?**

**Yes -** Go to next step 3.

**No -** Charge battery and perform no-load test. Go to next step.

**(2) Is battery voltage 12.4 volts or higher?**

**Yes -** Go to next step.

**No -** Replace battery.

### Symptom: Engine Cranks But Will Not Start

**(3) Does fuel shutoff solenoid click when ignition switch is turned to START/RUN?**

**Yes -** Go to next step.

**No -** Defective fuel shutoff solenoid, switch or wiring. See Electrical section.

**(4) Does engine crank slow?**

**Yes -** Remove spark plugs and turn the engine over by hand. Go to next step.

**No -** Go to step 6.

**(5) Is the engine hard to turn over by hand?**

**Yes -** Pistons or other internal components binding.

**No -** Starter motor defective. Repair or replace as needed.

**(6) Is the choke operating properly?**

**Yes -** Go to next step.

**No -** Adjust choke cable. See “Choke Cable Adjustment” on page 30.

**(7) Do spark plugs have strong blue spark?**

**Yes -** Go to next step.

**No -** Possible defective spark plugs, magneto shorted to ground, flywheel magnet weak, or ignition coil air gap not adjusted. See Electrical section.

**(8) Are tappets adjusted properly.**

**Yes -** Go to next step.

**No -** Adjust. See “Cylinder Leak Test” on page 32.

**(9) Is engine getting fuel?**

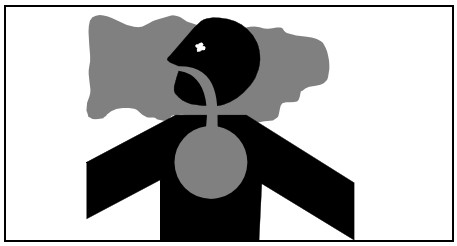
**Yes -** Check air leaner, fuel mixture, contaminated fuel, or possible stuck float needle.

**No -** Check fuel shutoff valve, fuel lines, fuel pump, and engine vacuum. See “Fuel Flow Tests” on page 36, or “Crankcase Vacuum Test” on page 35.

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**IMPORTANT: Avoid damage! California Proposition 65 Warning: Gasoline engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.**

## Gasoline Storage

**IMPORTANT: Avoid damage! Keep all dirt, scale, water or other foreign material out of gasoline.**

Keep gasoline stored in a safe, protected area. Storage of gasoline in a clean, properly marked ("UNLEADED GASOLINE") POLYETHYLENE PLASTIC container WITHOUT any metal screen or filter is recommended. DO NOT use de-icers to attempt to remove water from gasoline or depend on fuel filters to remove water from gasoline. Use a water separator installed in the storage tank outlet. BE SURE to properly discard unstable or contaminated gasoline. When storing the machine or gasoline, it is recommended that you add **John Deere Gasoline Conditioner and Stabilizer (TY15977)** or an equivalent to the gasoline. BE SURE to follow directions on container and to properly discard empty container.

## 4 - Cycle Gasoline Engine Oil

Use the appropriate oil viscosity based on the expected air temperature range during the period between recommended oil changes. Operating outside of these recommended oil air temperature ranges may cause premature engine failure.

The following John Deere oils are PREFERRED:

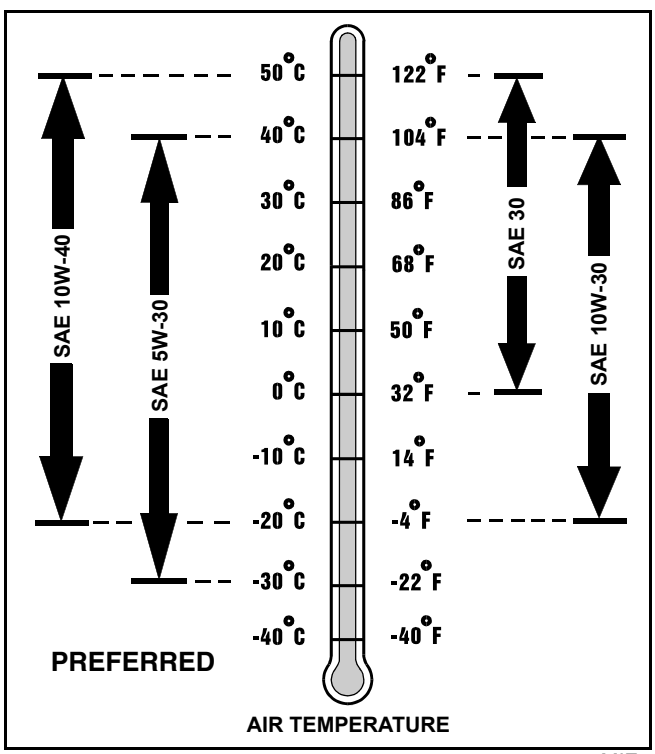
- **PLUS - 4® - SAE 10W-40**;
- **TORQ - GARD SUPREME® - SAE 5W-30**.

The following John Deere oils are **also recommended**, based on their specified temperature range:

- **TURF - GARD® - SAE 10W-30;**
- **PLUS - 4® - SAE 10W-30;**
- **TORQ - GARD SUPREME® - SAE 30.**

Other oils may be used if above John Deere oils are not available, provided they meet one of the following specifications:

- SAE 10W-40 - API Service Classifications SG or higher;
- SAE 5W-30 - API Service Classification SG or higher;
- SAE 10W-30 - API Service Classifications SG or higher;
- SAE 30 - API Service Classification SC or higher.




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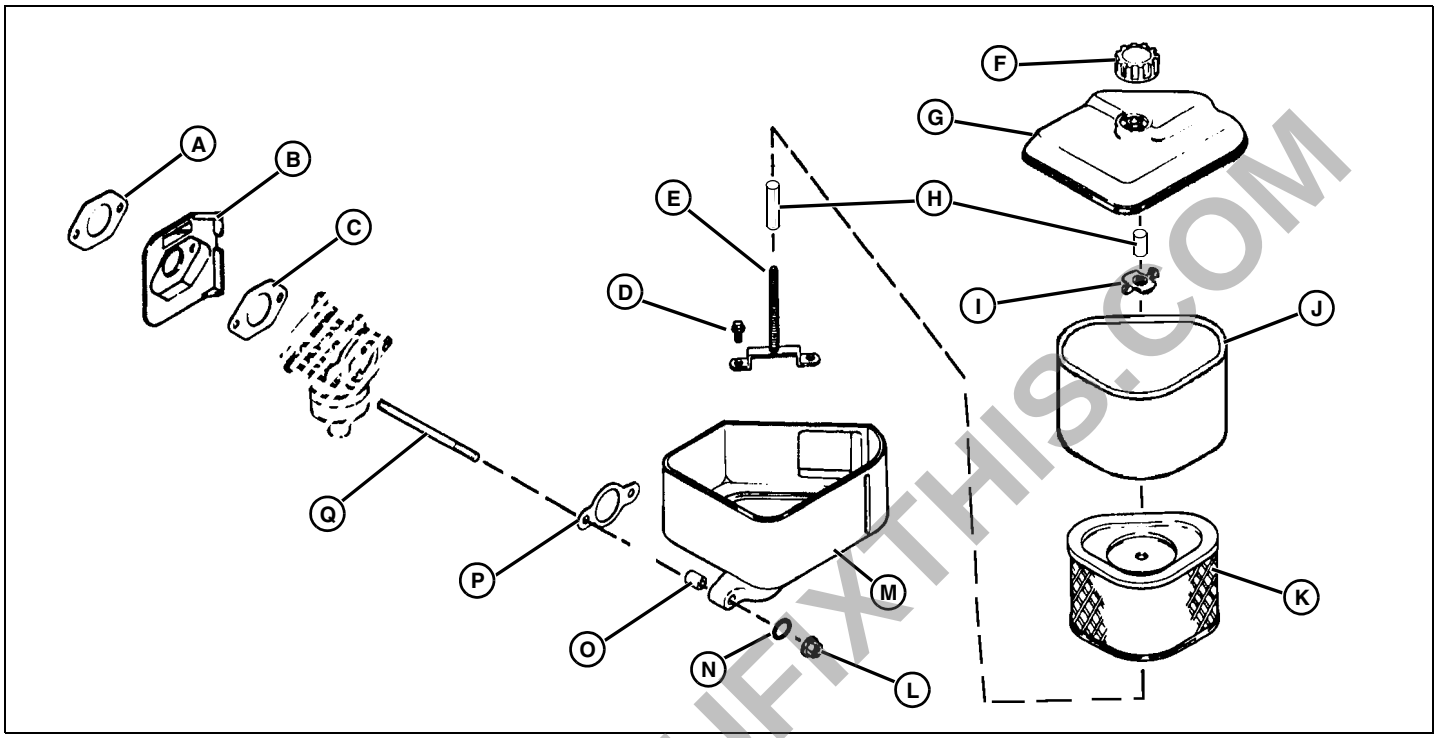
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## Fuel and Air Repair

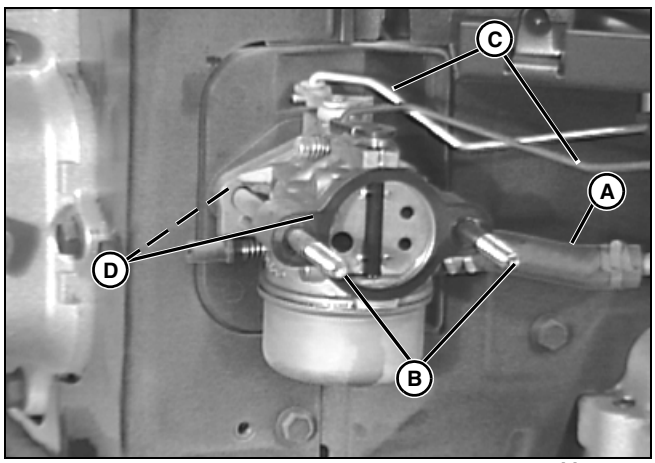
### Air Intake System Components




M55326

- **A - Gasket**
- **B - Shield**
- **C - Gasket**
- **D - Stud Retaining Screw (Use Thread-Lock & Sealer)**
- **E - Stud (Remove studs to remove carburetor)**
- **F - Knob**
- **G - Cover**
- **H - Rubber Seal**
- **I - Wing Nut**
- **J - Foam Element**
- **K - Paper Element**
- **L - Nut (Tighten to 9.9 N•m (88 lb-in.))**
- **M - Air Cleaner Housing**
- **N - Washer (Used on stud w/o electrical eyelet of grounding lead)**
- **O - Sleeve**
- **P - Gasket**
- **Q - Stud**

### Carburetor Removal and Installation




M89099

**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; including equipment that utilizes pilot lights.**

**Procedure:**

1. Turn ignition switch OFF and disconnect battery negative (-) ground cable.

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## Tools and Materials

### Tools

***NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).***

**Special or Required Tools**

| Tool Name | Tool No. | Tool Use |
|---|---|---|
| Hand-Held Digital Tachometer | JT05719 | Used to check idle speed and starter performance. |
| Digital Pulse Tachometer | JT07270 | Used to check idle speed and starter performance. |
| Compression Gauge | JDM59 | Used to check engine compression. |
| U-Tube Manometer Test Kit | JT05698 | Used to check engine crankcase vacuum. |
| Vacuum Gauge | JT03503 | Used to check engine crankcase vacuum. |
| Drill Bit | 6.4 mm (0.25 in.) | Throttle and choke adjustment. |
| Reaming Tool (7.05 m) | D20020WI | Used to clean or size valve guides. |
| Reaming Tool (7.25 mm) | JDG705 | Used to bore oversize valve guide. |
| Lapping Tool | - - - | Valve lapping |
| Dial Indicator | - - - | Automatic compression relief test, valve inspection, crankshaft end play. |
| Spark Plug Ground | JDM74A5 | Used to prevent accidental engine starting during tests. |
| 90° Elbow Fitting | JT03338 | Used to connect pressure gauge to engine when performing Engine Oil Pressure Test. |
| Connector | JT03349 | Used to connect pressure gauge to engine when performing Engine Oil Pressure Test. |
| Hose Assembly | JT03017 | Used to connect pressure gauge to engine when performing Engine Oil Pressure Test. |
| Pressure Gauge Assembly | JT03344 | Used to read engine oil pressure when performing Engine Oil Pressure Test. |
| Pressure Gauge | JDG356 | Used to check fuel pump performance. |
| Spark Tester | D-05351ST | Used to check overall condition of ignition system. |
| Valve Spring Compressor | JDM70 | Used to remove and install valve springs. |
| Current Gun | JT05712 | Used to check starter performance. |
| Cylinder Leak Tester | JT035029 | Cylinder Leak Test |
| Oil Pressure Test Adapter w/ O-ring (required ONLY on engines without test ports) | JT07262 | Oil Pressure Test |
| Connector | JT05487 | Oil Pressure Test |
| Hose Assembly | JT03017 | Oil Pressure Test |
| Coupler | JT03262 | Oil Pressure Test |
| Gauge 0 - 700 kPa (0 - 100 psi) | JT07034 | Oil Pressure Test |

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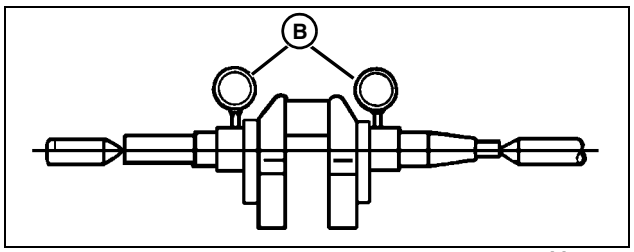


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**Inspection:**

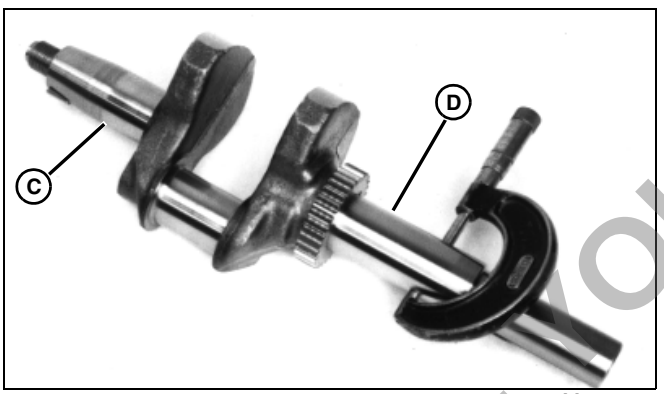
**IMPORTANT: Avoid damage! A bent crankshaft must be replaced; it cannot be straightened.**

1. Clean and inspect crankshaft. Replace if scratched or damaged.




M80432

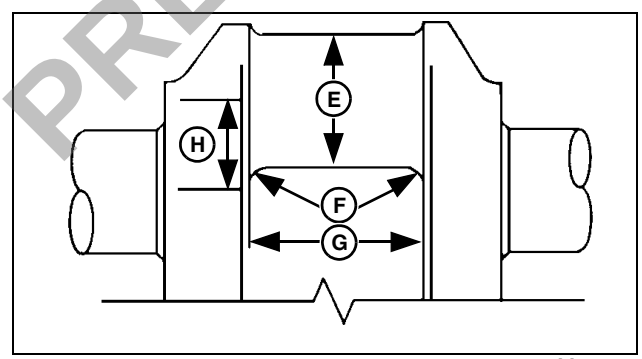
2. Place crankshaft into an alignment jig and slowly rotate crankshaft. Use dial indicators (B) to measure maximum Total Indicated Runout (TIR). If runout exceeds 0.05 mm (0.002 in.), replace crankshaft.




M51729

3. Measure main bearing journal diameters. If PTO side journal (D) OD is less than 34.90 mm (1.374 in.) replace crankshaft. If flywheel side journal (C) OD is less than 34.93 mm (1.375 in.) replace crankshaft.

***NOTE: If the engine has had a previous overhaul, connecting rod journal may have been resized for undersized rod. A 0.50 mm (0.020 in.) undersized rod is available.***




M57348

4. Measure connecting rod journal diameter (E) and inspect journal radii (F) for cracks. Connecting rod journal can be resized to accept undersized rod. Have grinding done by a reliable repair shop.

If undersized journal diameter is less than specifications, replace crankshaft.

**Connecting Rod Journal ID (LX288 - FH580V) (Wear Limit):**

**Standard . . . . . 38.055 mm (1.498 in.)**

**Connecting Rod Journal OD (LX277 - FH500V) (Wear Limit):**

**Standard . . . . . 35.055 mm (1.380 in.)**

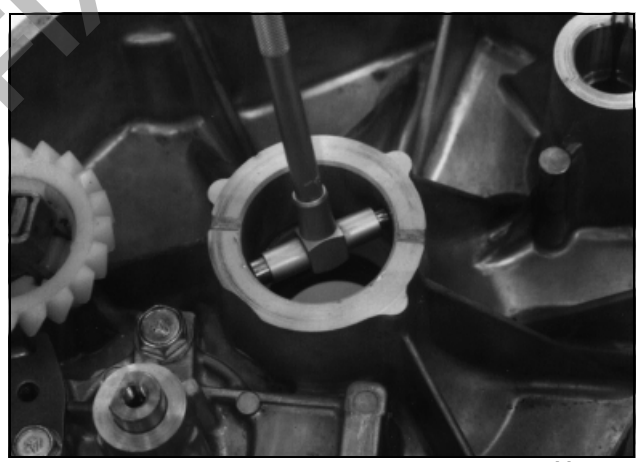
**Resizing Specifications:**

**E. . . . . 37.457 - 37.470 mm (1.474 - 1.475 in.)**

**F. . . . . 2.0 - 2.4 mm (0.0787 - 0.0945 in.)**

**G (Maximum) . . . . . 39.50 mm (1.555 in.)**

**H. . . . . 33.95 - 34.05 mm (1.337 - 1.340 in.)**



M50072

5. Measure crankshaft main bearing diameter in crankcase and crankcase cover. Replace crankcase cover or crankcase if diameter is greater than 35.15 mm (1.384 in.).

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10.Connect JT03017 Hose Assembly (C) and JT03344 Pressure Gauge Assembly (B).

11.Monitor oil pressure while cranking engine. If no oil pressure is present, discontinue cranking engine. Determine and correct cause before running engine.

**IMPORTANT: Avoid damage! If pressure reading is below 69 kPa (10 psi), STOP ENGINE IMMEDIATELY and determine cause.**

12.Start and run engine at Medium idle for five minutes to heat engine oil to normal operating temperature.

**CAUTION: Avoid injury! Engine components are HOT. Be careful not to touch, especially the exhaust pipe or muffler while making adjustments. Wear protective eye glasses and clothing.**

13.Run engine at FAST idle (3550 ± 50 rpm) and check oil pressure. Gauge should read a minimum oil pressure of 276 kPa (40 psi).

**Results:**

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

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

## Fuel Pump Tests

**Reason:**

To check condition of fuel pump.

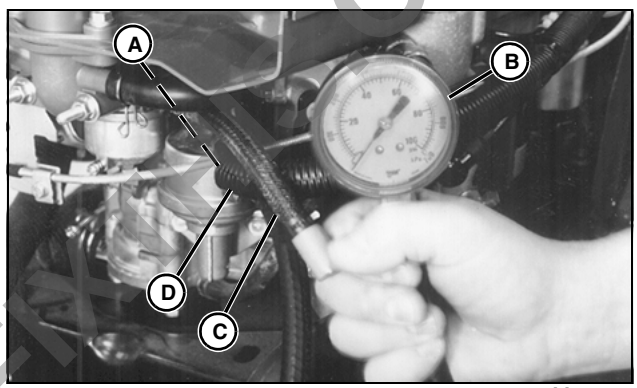
**Test Equipment:**

- JDG356 Pressure Gauge
- Graduated Container

**Procedure:**

1. Park machine on level surface.
2. Move forward/reverse pedals to NEUTRAL position.
3. Lock park brake.
4. Remove engine hood. See “Hood Removal and Installation” on page 593 in the Miscellaneous section.
5. Remove muffler heat shield.
6. Start engine and run at SLOW idle (1550 ± 150 rpm) for one minute to fill carburetor with fuel.
7. Stop the engine.

**CAUTION: Avoid injury! Gasoline is extremely flammable. Do not smoke. Always work in a ventilated area away from open flame or spark producing equipment; including equipment that utilizes pilot lights. Wipe-up any spills IMMEDIATELY.**

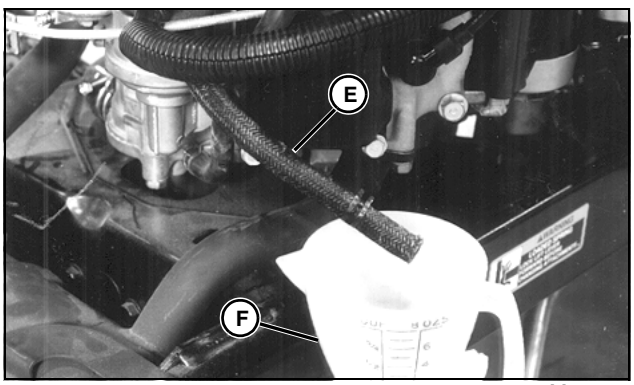


M83431

8. Disconnect fuel pump outlet hose (C) from fuel pump.
9. Connect JDG356 Pressure Gauge (B) hose (D) to fuel pump outlet (A).

10.Start and run engine at SLOW idle (1550 ± 150 rpm) for 15 seconds. Minimum pressure should be 2.45 kPa (0.36 psi).

11.Stop engine and remove pressure gauge and connect fuel pump outlet hose to fuel pump outlet.



M83433

12.Disconnect fuel pump outlet hose (E) from carburetor and place it in graduated container (F).

13.Start and run engine at SLOW idle (1550 ± 150 rpm) for 60 seconds, then stop engine and record container measurement. Minimum Flow should be 800 mL/60 seconds (0.8 qt/60 seconds).



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## Specifications

### General Specifications

| | |
|---|---|
| Make | Briggs & Stratton Vanguard V-Twin |
| Model Number (LX288, SN -090000) | 350777-1154 |
| Horsepower | 13.4 kW (18 hp) |
| Bore | 72 mm (2.83 in.) |
| Stroke | 70 mm (2.76 in.) |
| Displacement | 570 $cm^3$ (34.7 cu in.) |
| Cylinders | 2 (V-twin) |
| Stroke/Cycle | 4 |
| Valves | Overhead Valves |
| Lubrication | Fully Pressurized |
| Crankcase Oil Capacity | |
| w/o Oil Filter | 1.42 L (1.5 qt ) |
| w/ Oil Filter | 1.65 L (1.75 qt) |
| Oil Filter | Replaceable Full Flow, Spin-On Filter |
| Cooling System | Air Cooled with Oil Cooler |
| Air Cleaner | Paper Element with Foam Pre-cleaner |
| Muffler | Horizontal Discharge Below Frame |

### Tests and Adjustments Specifications

| | |
|---|---|
| Valve Clearance | 0.10 - 0.16 mm (0.004 - 0.006 in.) |
| Valve Guide Depth | 0.7 mm (0.276 in.) |
| Slow Idle | 1550 ± 100 rpm |
| Fast Idle | 3350 ± 50 rpm |
| Oil Pump Operating Pressure | 103 - 345 kPa (10 - 50 psi |
| Spark Plug Type | RC12YC |
| Spark Plug Gap | 0.76 mm (0.030 in.) |
| Ignition Coil Air Gap | 0.20 - 0.30 mm (0.008 - 0.012 in.) |

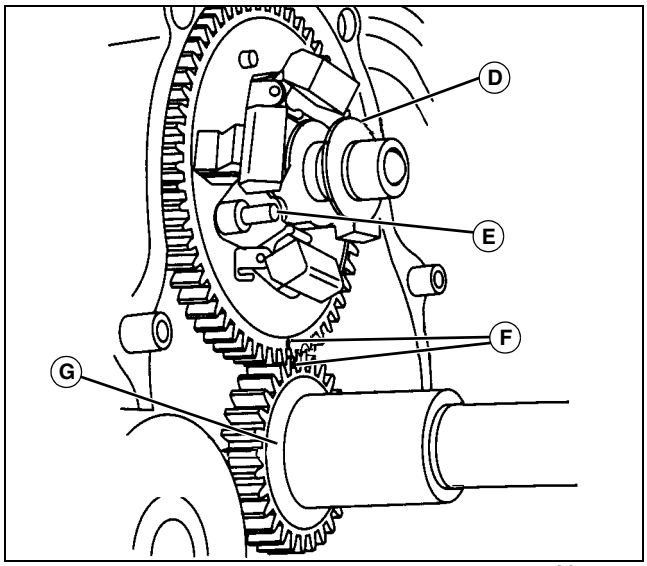
### Repair Specifications

| | |
|---|---|
| Valves: | |
| Valve Guide Standard Dimension | 6.01 - 6.02 mm (0.236 - 0.237 in.) |
| Valve Stem Standard Dimension | |
| Intake | 5.94 - 5.96 mm (0.234 - 0.235 in.) |
| Exhaust | 5.94 - 5.95 mm (0.234 - 0.235 in.) |
| Valve Stem Wear Limit | |
| Intake | 5.92 mm (0.233 in.) |
| Exhaust | 5.91 mm (0.233 in.) |
| Valve Seat Width | 1.2 - 1.6 mm (0.047 - 0.063 in.) |
| Valve Margin (Minimum) | 0.4 mm (0.016 in.) |
| Valve Face Angle | 45° |

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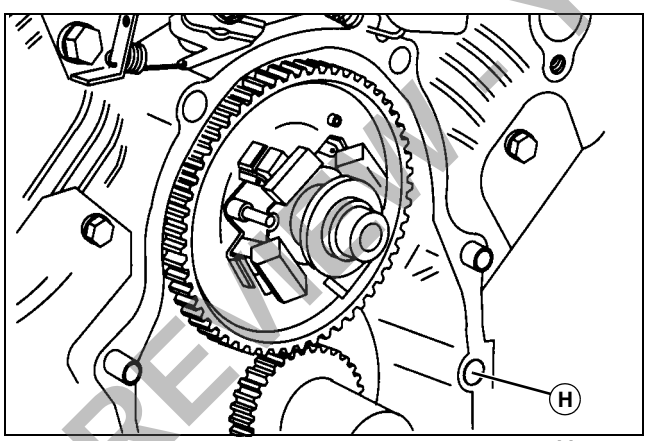


M88938

15.Governor slider (D) must move freely on PTO journal of cam gear. Flywheel must pivot freely. Make sure flyweight spring is not stretched. Governor weights must move freely on hinge pins. Make sure hinge pins are not loose.

16.Assemble governor slider onto PTO journal on cam gear making sure that slot on slider fits over locating pin (E) on cam gear. Be sure the weights are in the proper location so that they will be able to move freely without binding.

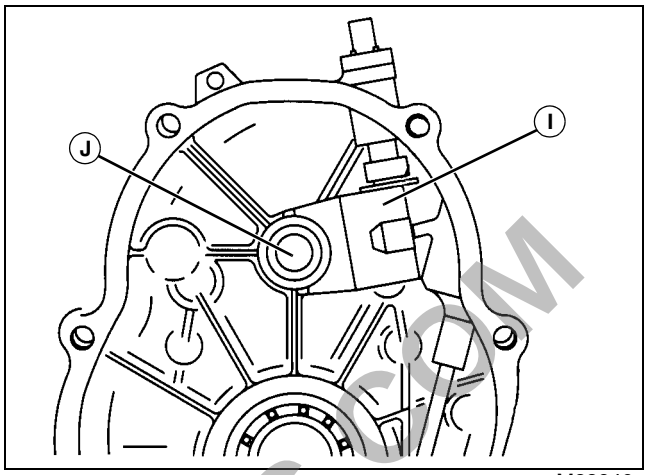
17.Install crankshaft and camshaft, aligning timing marks (F) accordingly. Install thrust washer (G), if required. Tip engine to position crankshaft horizontally.



M88939

18.Place new crankcase cover gasket on crankcase.

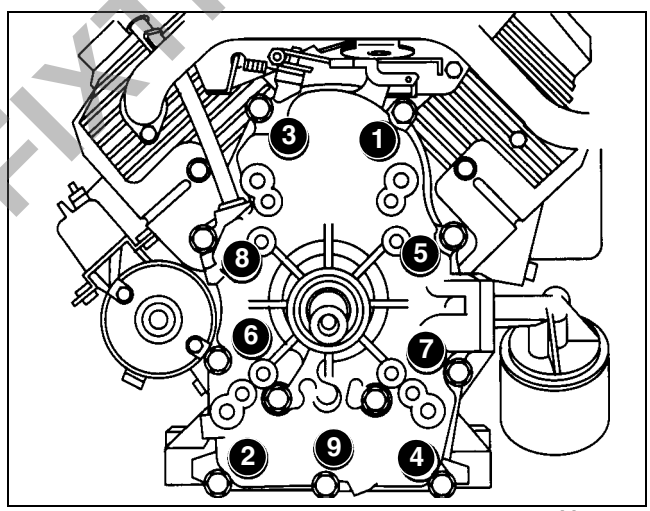
***NOTE: Be sure O-ring (H) is installed in crankcase.***



M88940

19.Rotate governor shaft (I) against boss (J).

20.Take care to protect the oil seal while assembling crankcase cover. No force should be used.



M88941

21.Tighten cover bolts to 17 N•m (150 lb-in.) in the sequence shown above.

22.Install cylinder heads.

23.Install flywheel.

24.Install intake manifold and carburetor assembly.

25.Install governor lever and governor springs.

26.Install oil fill tube and dipstick assembly. Perform static governor adjustment.

27.Install engine shrouding.

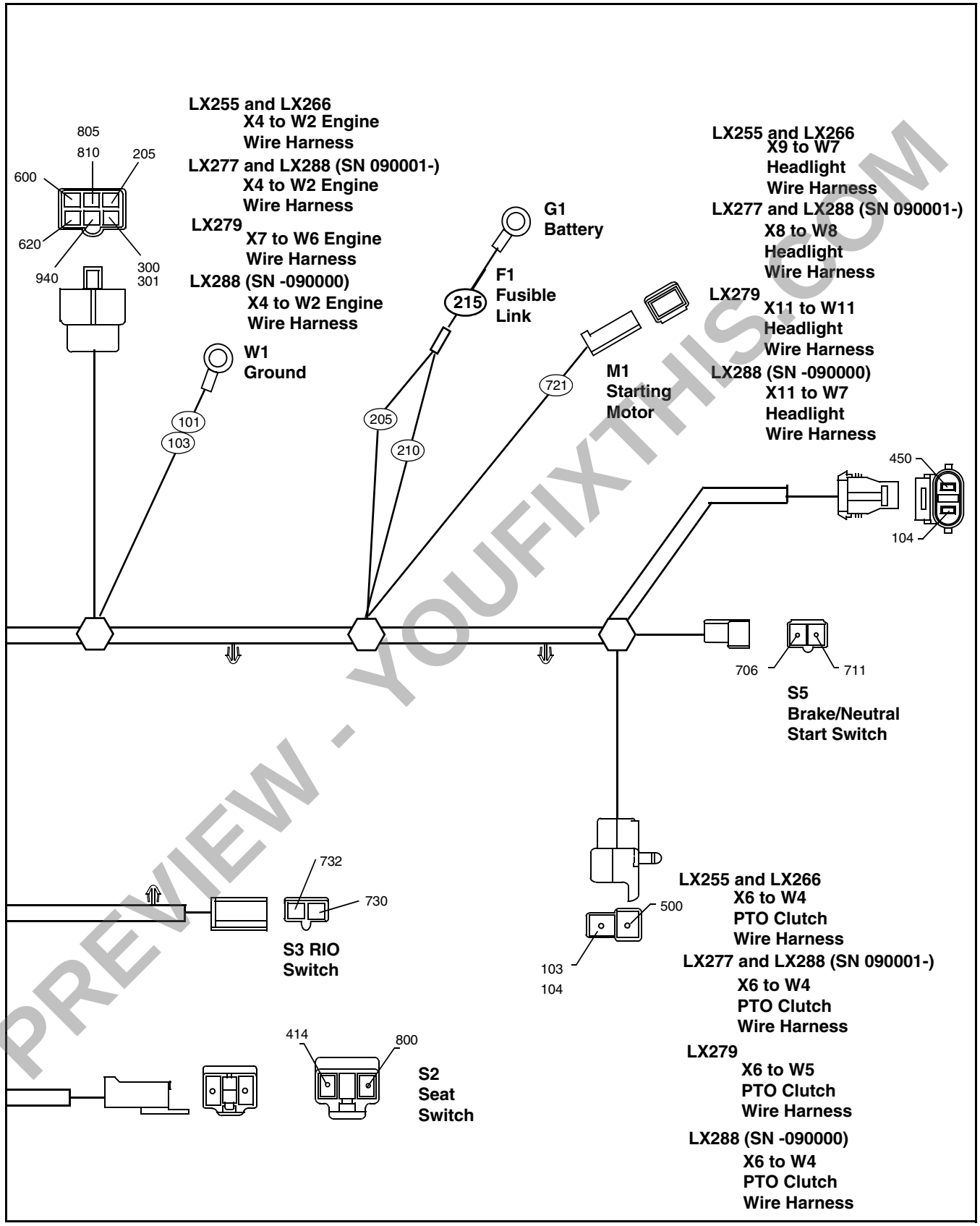
28.Install air filter assembly.

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## Main Wiring Harness - All Machines (2 of 2)




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## PTO Circuit Operation - PTO On

**Function:**

To provide power to energize or de-energize the PTO clutch when desired by the operator.

**Operating Conditions:**

- Key Switch in RUN position.
- PTO/RIP switch in ON position
- Operator on seat. (Seat switch in CLOSED position.)

**System Operation:**

***NOTE: The key switch is connected to the printed circuit board (A1 Interlock Module) by soldered wire connections. Components are solid state and are not serviced separately except for the 15 amp fuses. Lines within dashed border of the Interlock Module (A1) except for key switch connections are circuit paths on the circuit board are not wires in the harness.***

The PTO/RIP switch is used in the PTO safety circuit to prevent the PTO relay from energizing if the PTO/RIP switch is in the ON position when the key switch is turned on. With the PTO/RIP switch OFF (PTO disengaged), current flows from the 810 Pnk wire, across the PTO/RIP switch contact to the 710 Pur and 730 Org wires, RIO switch (S3) N.C. contacts (neutral/forward position), 732 Grn wire into the interlock module to energize the PTO relay coil. The PTO relay contacts close suppling power to the 750 Pur wire. The 750 Pur wire connects back at the PTO/RIP switch to the 710 Pur wire. This then creates a loop to energize the PTO relay. Power is now available at the PTO/RIP switch to energize the RIO circuit and the PTO clutch when the PTO/RIP switch is moved to the ON position.

With the PTO in the ON position power is supplied from the 750 Pur wire across the PTO/RIP switch contacts to the 500 and 731 Blu wires. The 500 Blu wire supplies power to the PTO clutch and is grounded through the 103 Blk wire. At the same time the 500 Blu wire supplies power to the PTO clutch the 731 Blu wire supplies power to the momentary contacts of the PTO/RIP switch. This circuit is part of the RIO circuit to allow for operation of the machine in reverse with the PTO engaged. See “Reverse Implement Option (RIO) Circuit Operation” on page 312.

If the machine is operated in reverse without pulling the PTO/RIP switch into the Reverse Implement Position (RIP) the PTO will be disengaged. The PTO/RIP switch will then need to be placed back to the OFF position to energize the PTO relay and then pulled back to the ON position if desired.

With the PTO/RIP switch ON, current flow to the brake/neutral start switch is stopped, so the seat circuit must keep the ignition relay energized. If the operator gets off the seat with the PTO/RIP switch ON, the seat switch (S2) de-energizes the ignition and PTO relays, which stops current flow to the PTO clutch and allows the magneto relay to deenergize closing its contacts grounding the ignition system.

The ground circuit, 105 and 101 Blk wires, provides a path to ground for the magneto, ignition and PTO relay coils.

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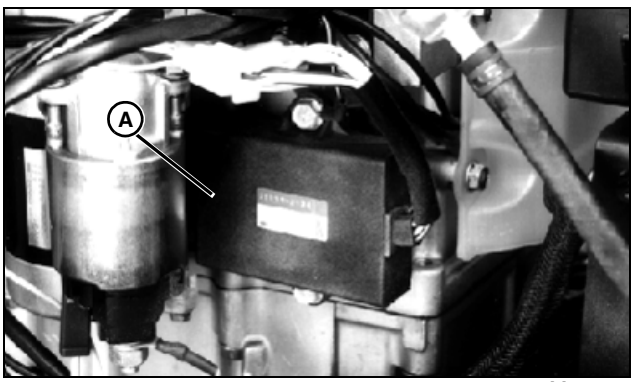
## Ignition Module Test - LX279

**Reason:**

To determine if the ignition module is defective.

**Procedure:**

1. Park machine on a level surface.
2. Move forward/reverse pedals to NEUTRAL position.
3. Lock parking brake.
4. Turn key switch OFF.
5. Raise hood.




M83232

6. The ignition module (A) is very sensitive to the type of ohmmeter used to check resistance. Due to variations in ohmmeters, the best way to determine if the ignition module is good is to replace the questionable ignition module with a known good module.

**Results:**

- If the new ignition module does not solve the problem, check other ignition components.

## Ignition Coil Test - LX279

**Reason:**

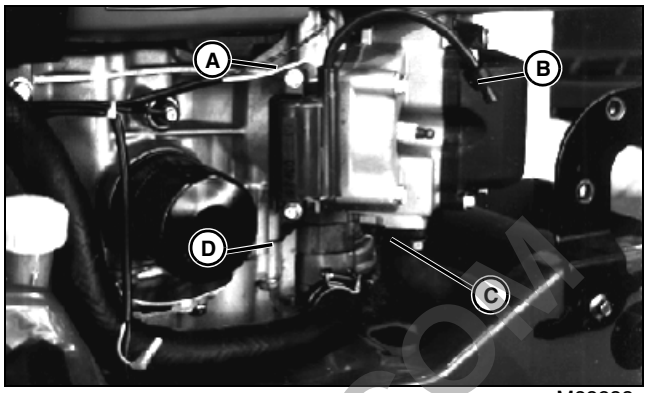
Check primary and secondary windings of ignition coil.

**Test Equipment:**

- Ohmmeter

**Procedure:**

1. Park machine on a level surface.
2. Move forward/reverse pedals to NEUTRAL position.
3. Lock parking brake.
4. Turn key switch OFF.
5. Raise hood.
6. Disconnect wires from ignition coil terminals.




M83233

7. Unscrew spark plug cap from high tension lead (B).
8. Set ohmmeter to 1x ohms scale.

Primary Windings:

***NOTE: Resistance may vary between ohmmeters.***

9. Connect one ohmmeter lead to coil positive (+) (wide) terminal (D).

10.Connect other ohmmeter lead to coil negative (-) terminal (C).

11.Measure resistance across primary windings.

Resistance should measure 3.4 - 4.6 ohms.

Secondary Windings:

12.Set ohmmeter to 10kx (10,000) ohms scale.

13.Connect one ohmmeter lead to coil positive (+) terminal (D).

***NOTE: Test spark plug cap resistance before installing on high tension lead. See “Spark Plug Cap Test - LX279” on page 345.***

14.Connect other ohmmeter lead to high tension lead (B).

15.Measure resistance across secondary winding.

Resistance should measure 10,400 - 15,000 ohms.

Open Circuit Check:

16.Connect one ohmmeter lead to coil positive (+) terminal (D) or coil negative (-) terminal (C).

***NOTE: Do not connect ohmmeter lead to ignition coil mounting screws as this will result in an inaccurate reading.***

17.Connect other ohmmeter lead to coil core (A).

18.Measure resistance from primary leads to coil core. There should be no continuity (open circuit) between coil primary terminals and coil core.

19.Connect one ohmmeter lead to high tension lead (B).

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## Theory of Operation

## Controls and Linkage Operation

**Function:**

The controls and linkage for the hydrostatic power train provide mechanical means of operating the forward/reverse control lever on the transaxle through the forward (6) and reverse (5) pedals, and a means of maintaining forward speed without holding the forward pedal down when using the cruise control lever. They also engage the transaxle brake, and ensure that the brake is released when the forward or reverse pedals are engaged, and that the forward/reverse controls on the transaxle will return to NEUTRAL when the brake pedal (7) is pressed.

**Foot Pedals:**

The internal transaxle engagement is controlled by the foot control pedals (forward - reverse - brake) through the control linkage.

The forward and reverse pedals pivot through the pedal shafts bracket and rotate the pedal control arm forward or rearward (reverse). The pedal control arm either pulls or pushes the forward/reverse control rod. In turn, the forward/reverse rod moves (pivots) the intermediate shaft plate (4) forward and rearward.

The transaxle control rod (10) connects the intermediate shaft plate to the transaxle control shaft (11). As the intermediate shaft plate rotates forward, the transaxle is shifted into forward. As the intermediate shaft plate rotates rearward, the transaxle is shifted into reverse.

**Cruise Control (Forward Only):**

The cruise control system holds the transaxle linkage in a forward position. The hand lever rod connects the cruise control lever to the intermediate shaft plate. When the cruise control is engaged, the hand lever rod is moved forward rotating the intermediate shaft forward. The friction device (1) holds the cruise control lever in the set position.

When the brake pedal is depressed, the cruise control interlock rod is pulled forward, and the cruise control lever (2) is pulled back to a neutral position (3).

**Brake Pedal:**

The brake functions, through a mechanical linkage, to return the intermediate shaft plate and transaxle, and the cruise control lever to neutral positions.

**Hand Control:**

An optional hand control may be installed that replaces the forward and reverse pedals.

## Foot Control - Neutral Position

**Function:**

The function of a properly adjusted linkage in a neutral position ensures that the transaxle control shaft is in the neutral position when the forward or reverse pedals are released, or the brake pedal is fully depressed.

***NOTE: With the cruise control lever in the OFF position, the hand lever rod moves freely in the cruise control lever slot. The foot pedal controls operate independently from the cruise control lever.***

A spring inside the transaxle returns the transaxle control shaft to the neutral position. As the transaxle control shaft rotates to the neutral position, the transaxle control rod moves the intermediate shaft plate to the neutral position, and the forward/reverse rod moves the pedal control arm and pedals to the neutral position.

Depressing the brake pedal pulls the neutral return rod (8) forward, rotating the neutral return arm (9). As the neutral return arm rotates, a bearing attached to the neutral return arm, and riding in the inner cam profile of the intermediate shaft plate moves the intermediate shaft plate to the neutral position. The intermediate shaft plate moves the transaxle control rod and places the transaxle control shaft in the neutral position. See “Brake Depressed - Maximum” on page 383

## Foot Control - Forward (Maximum)

**Function:**

When the forward pedal is depressed, the transaxle control shaft is moved to the forward position and the transaxle engages in forward drive. See “Function:” on page 381

The forward pedal pivots through the pedal shafts bracket and rotates the pedal control arm (13) forward. The pedal control arm pulls the forward/reverse control rod. In turn, the forward/reverse rod pivots the intermediate shaft plate forward.

The transaxle control rod connects the intermediate shaft plate to the transaxle control shaft. As the intermediate shaft plate rotates forward, the transaxle control shaft is shifted into forward.

***NOTE: With the cruise control lever in the NEUTRAL position, the hand lever rod moves freely in the cruise control lever slot (12). The forward pedal operates independently from the cruise control lever.***

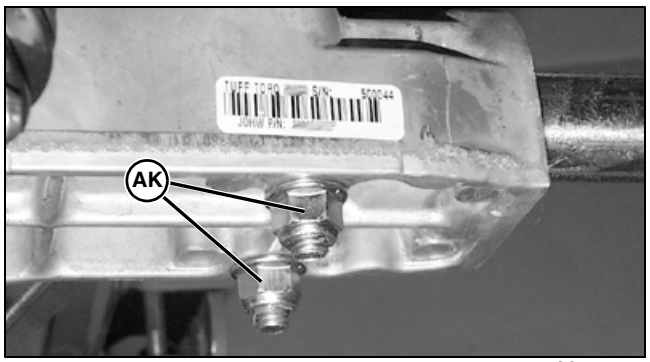
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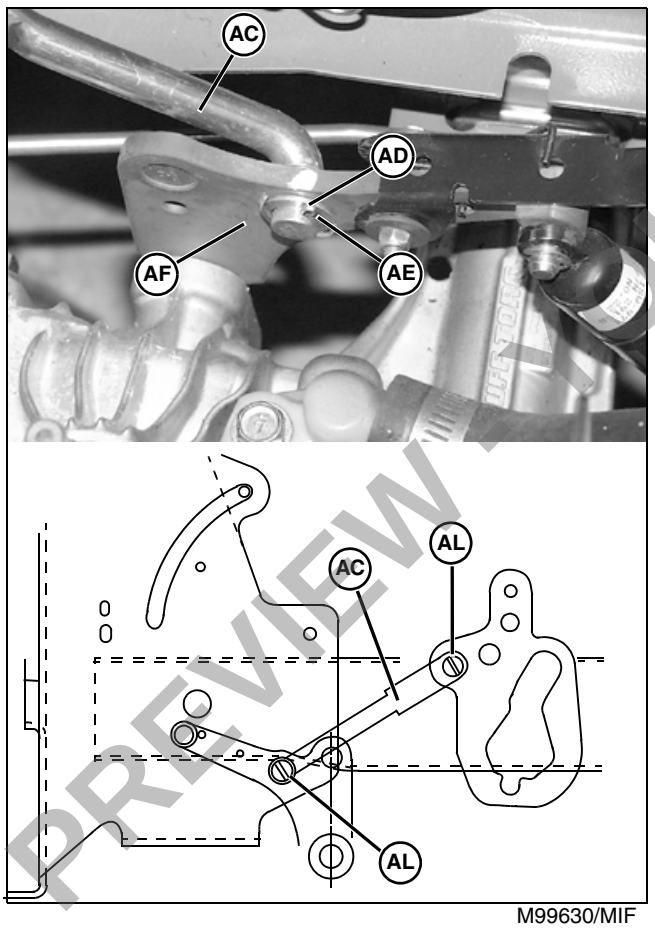
**Installation:**

1. Place transaxle on a transmission jack, and move into position beneath machine frame.




M99680

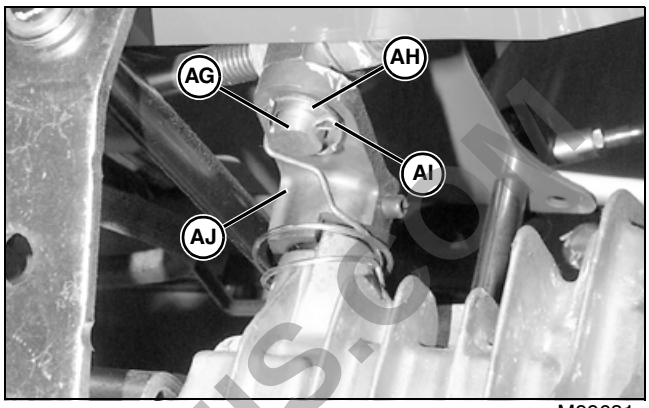
2. Raise transaxle into position and onto two U-bolts. Install four locknuts (AK) to retain transaxle to machine frame.




M99630/MIF

3. On right side of machine, connect transaxle control rod (AC) to control lever (AF). Retain with washer (AD) and cotter pin (AE).

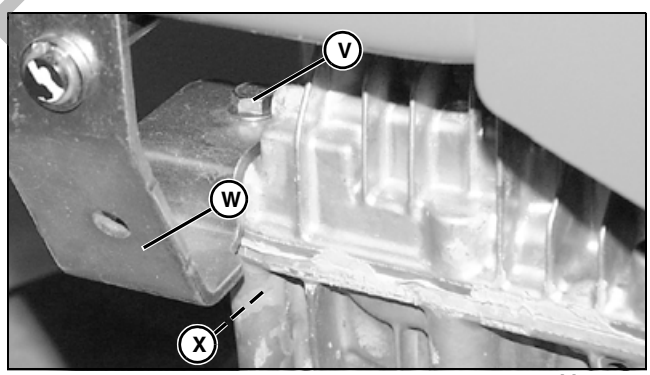
**IMPORTANT: Avoid damage! Pay particular attention to holes (AL) control rod (AC) is placed in. Damage may occur if wrong holes are used.**




M99631

4. On left side of machine, connect brake link (AG) to control lever (AJ), and retain with washer (AH) and cotter pin (AI).

5. Raise transaxle into position, and install four cap screws, washers, and locknuts to retain transaxle to machine frame.




M99628

6. On left side of machine, install cap screw (V) and locknut (X) to attach transaxle to angle bracket (W).

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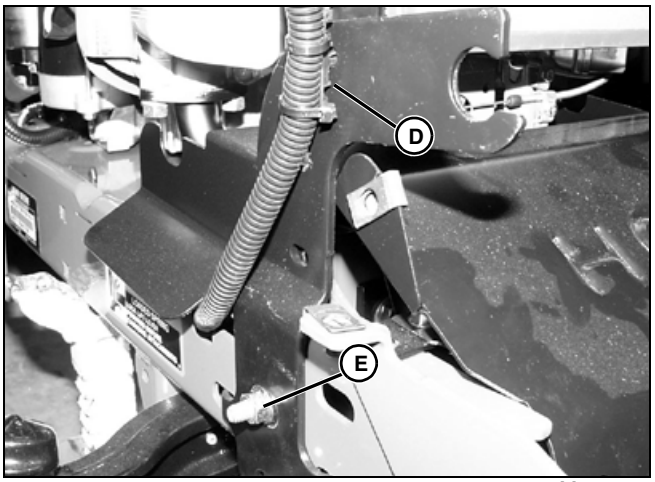
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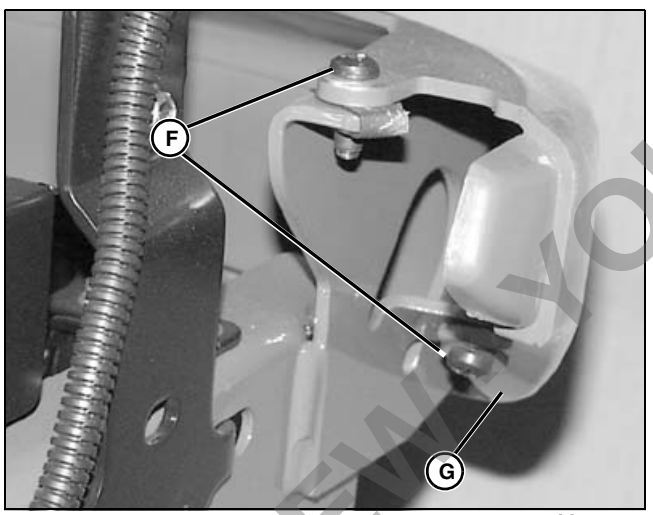


M99525

5. Install (if removed) hood brackets and secure with two flange nuts (E). Tighten flange nuts.

6. Connect headlight wiring harness clip (D) to frame.

**All Machines:**



M95518

1. Install bumper cover (G) to frame. Retain with four screws (F).

2. Raise front of machine, remove stands, and lower machine to the ground.

3. Install hood. See “Hood Removal and Installation” on page 593 in the Miscellaneous section.

4. Install mower deck. See Mower Deck Removal and Installation for the appropriate deck in Attachments section.

5. Lubricate spindles using John Deere Extreme Pressure Grease or an equivalent.

## Front Wheel Spindle Lubrication

1. Raise each wheel off of ground so grease can get around spindle.



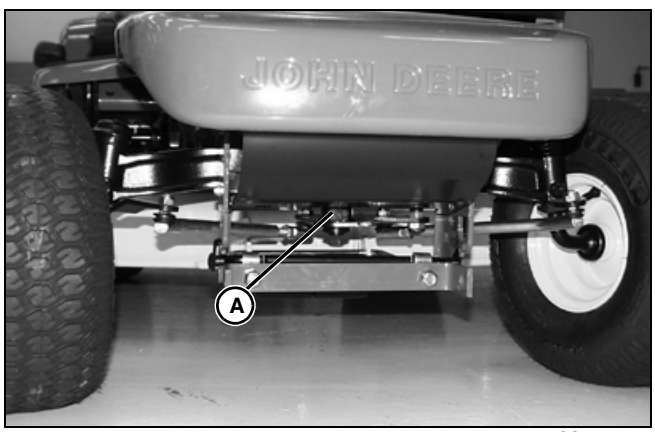
M96432

2. Lubricate front wheel spindle through lubrication fitting (A), on each side of machine, with one or two shots of John Deere Extreme Pressure Grease or an equivalent until grease comes out of spindle. Wipe off excess.

3. Turn steering wheel back and forth several times to distribute grease on spindles.

## Front Axle Pivot Lubrication

1. Lubricate front axle center pivot (A) with one or two shots of John Deere Extreme Pressure Grease or an equivalent.



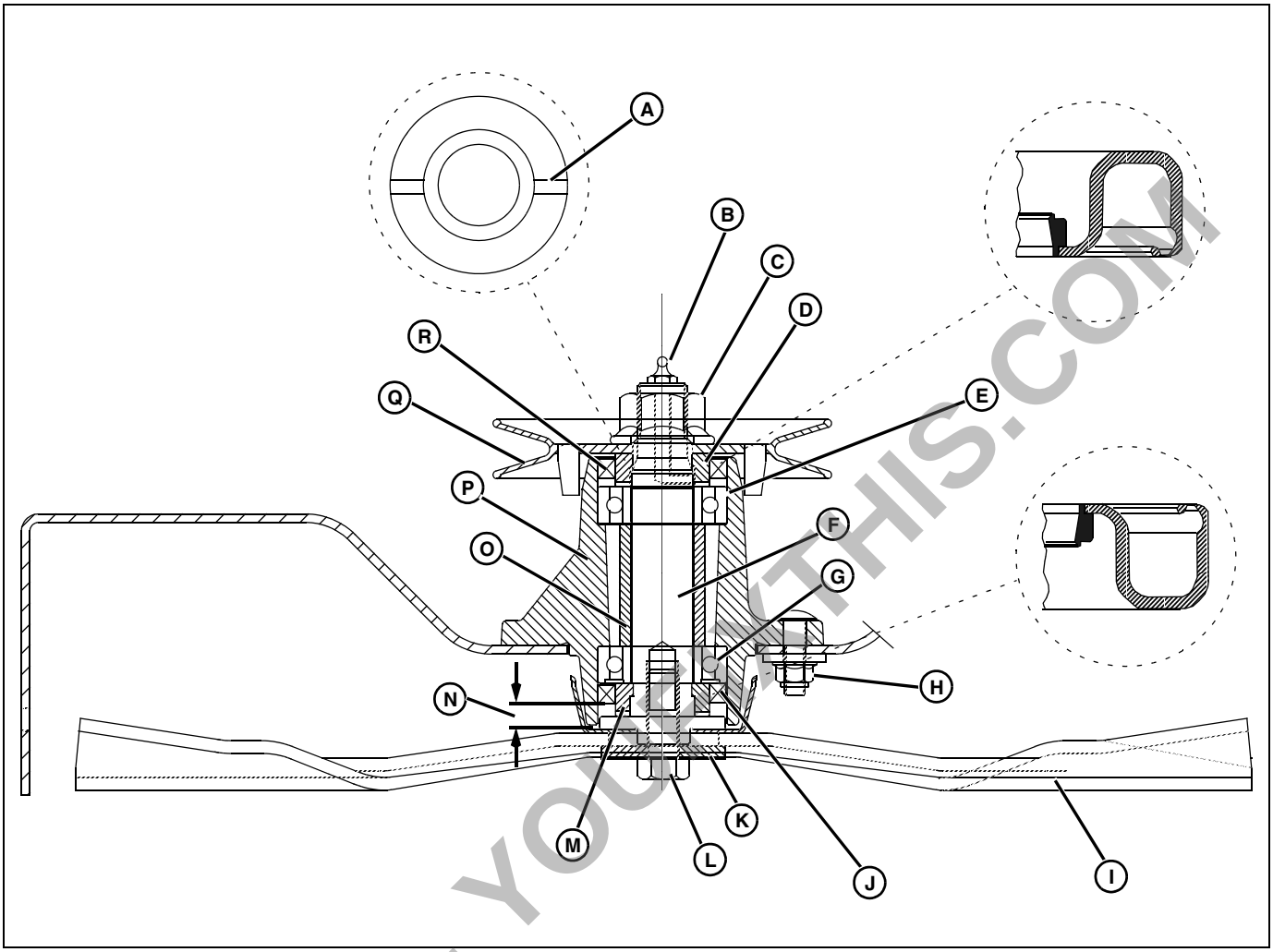
M97150

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**Spindle - Cross Section**



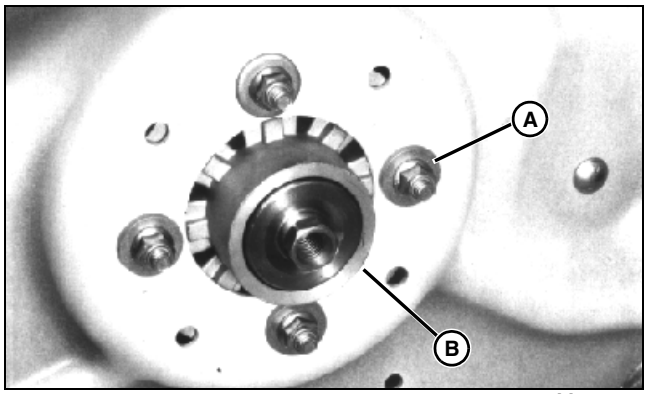

MIF

**A - Grease Notch (Upper-Face Towards Bearing and Lower-Face Away From Bearing)**
**B - Lubrication Fitting**
**C - Nut**
**D - Upper Seal Ring**
**E - Upper Bearing**
**F - Spindle Shaft**
**G - Lower Bearing**
**H - Nut (4 used)**
**I - Blade**
**J - Lower Seal**
**K - Washer**
**L - Cap Screw**
**M - Lower Seal Ring**
**N - Seal Depth - 7.3 mm (0.29 in.)**
**O - Spacer**
**P - Hub**
**Q - Spindle Sheave**
**R - Upper Seal**

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M54685

4. Remove four nuts and washers (A), and spindle (B).

5. Check spindle for smooth bearing operation, wear, or damage. Repair or replace components as needed.

**Installation:**

Installation is the reverse of removal.

- Tighten spindle retaining nuts to 26 N•m (230 lb-in.).
- When installing blade, make sure concave side of blade washer faces blade.
- Tighten blade cap screw to 73 N•m (54 lb-ft).

**Disassembly and Inspection:**

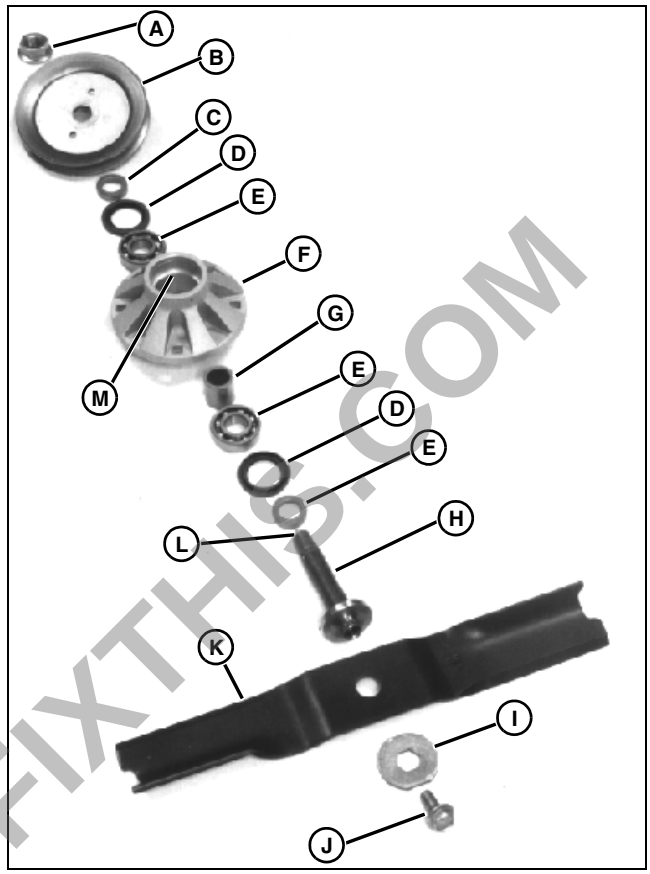
**IMPORTANT: Avoid damage! When removing spindle sheave nut, DO NOT hold end of spindle shaft in a vise. Spindle shaft will be damaged, resulting in improper blade operation.**

1. Remove spindle from deck. See “Removal:” on page 570.

**CAUTION: Avoid injury! SHARP EDGES. Wear gloves or wrap blade with a shop towel when removing/installing blades to minimize the risk of personal injury. DO NOT hold blade with bare hands.**

2. Install blade and washer to spindle. Secure with cap screw.

3. Secure the spindle assembly by the blade in a soft jaw vise.



M44948

**A - Nut**
**B - Sheave**
**C - Seal Ring**
**D - Seal**
**E - Bearing**
**F - Housing**
**G - Spacer**
**H - Spindle Shaft**
**I - Washer**
**J - Cap Screw**
**K - Blade**
**L - Lubrication Fitting**
**M - Shoulder in housing**

4. Remove nut, sheave, and lubrication fitting.

5. Remove cap screw, washer, and blade.

6. Using a suitable puller or press, remove spindle shaft from housing.

7. Note location of notched side, and remove two seal rings.

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