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.

All information, illustrations and specifications in this manual are based on the latest information at the time of publication. The right is reserved to make changes at any time without notice.

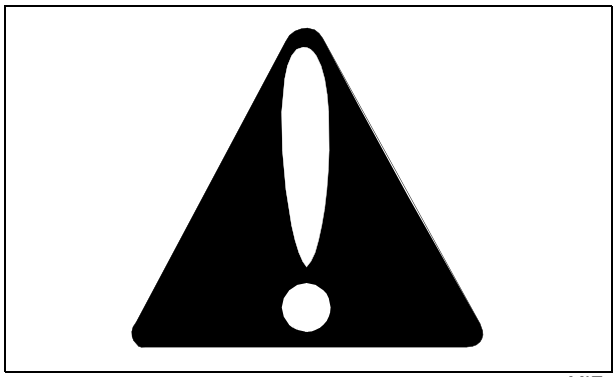
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Safety
Specifications and Information
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Engine (Kohler - Single Cylinder)
Engine (B&S - V-Twin)
Engine (Kohler - V-Twin)
Electrical
Power Train (Gear)
Power Train (Hydrostatic)
Steering
Brakes
Attachments
Miscellaneous

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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.

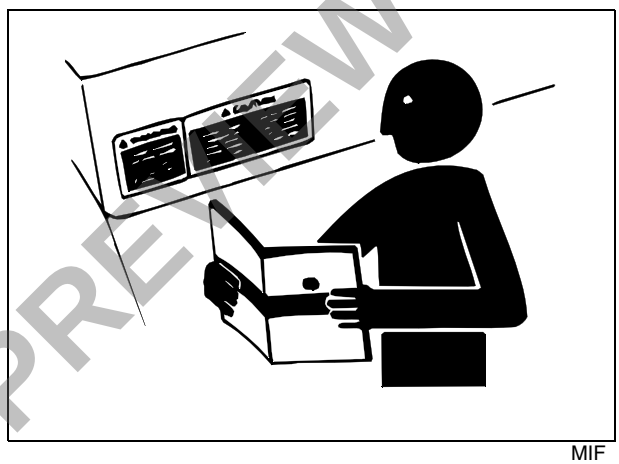
Follow recommended precautions and safe servicing practices.

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

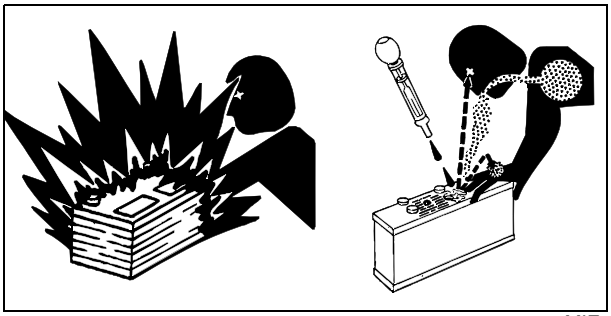
Be Prepared For Emergencies



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



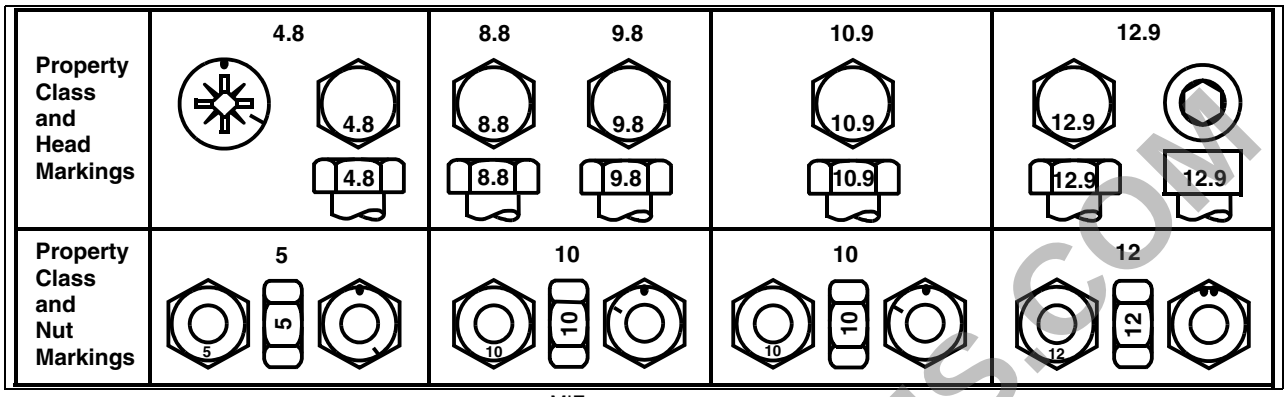
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Fastener Torques

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 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 - G200

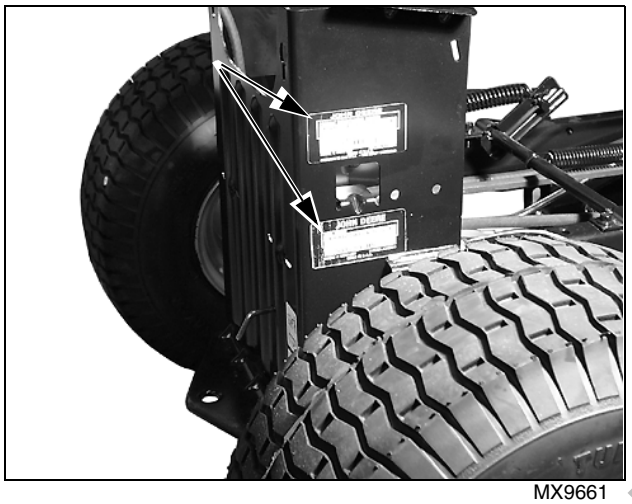
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Serial Number Locations

Machine Product Identification Number

When ordering parts or submitting a warranty claim, it is IMPORTANT that the machine product identification number (PIN) and component serial numbers are included. The location of the PIN and component serial numbers are shown.



MX9661

Located on right side of frame.

Engine Serial Number



MX9662

Located on right side of engine.

Transaxle Serial Number



MX9663

Located on back-right side of transaxle.

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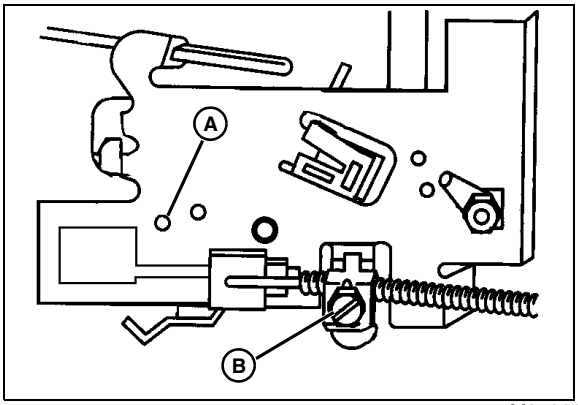
Tests and Adjustments

Throttle Cable Adjustment

Reason:

To make sure the throttle cable moves the throttle through its full range of movement.

Procedure:



M95232

1. Move throttle lever to FAST idle position (detent).
2. Hole in governor control lever must align with hole (A) in governor control plate.
3. Loosen throttle cable clamp (B).
4. Slide the throttle cable left or right to align holes.
5. Tighten throttle cable clamp (B).

Fuel Shutoff Solenoid Test

Reason:

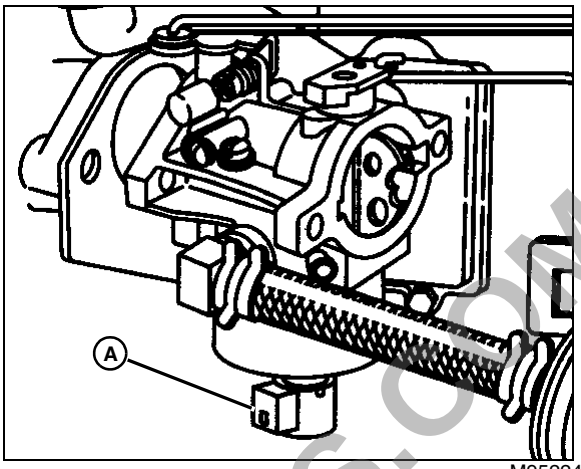
To test proper operation of fuel shutoff solenoid.

Required Tools:

- Jumper wire

Procedure:

1. Listen for an audible click when ignition switch is turned from OFF to ON.
2. If solenoid does not click, problem could be in equipment wiring.



M95224

3. Disconnect wire from solenoid (A).
4. Momentarily place a jumper wire from solenoid terminal to battery positive terminal.

NOTE: If battery voltage drops below 9 volts when cranking engine or while engine is running, the solenoid will not function.

5. If solenoid now clicks, the solenoid is working properly.

Results:

- Solenoid is operating properly if a click is heard when ignition switched from OFF to ON.

Governor Adjustment - Static

(Engine OFF)

CAUTION: Avoid Injury! Before starting or running engine, static adjustment of the governor must be made. Failure to make static adjustments first, could result in engine overspeeding, and may result in engine or equipment damage causing personal injury and/or property damage.

NOTE: All linkage must be installed to make adjustment.

Reason:

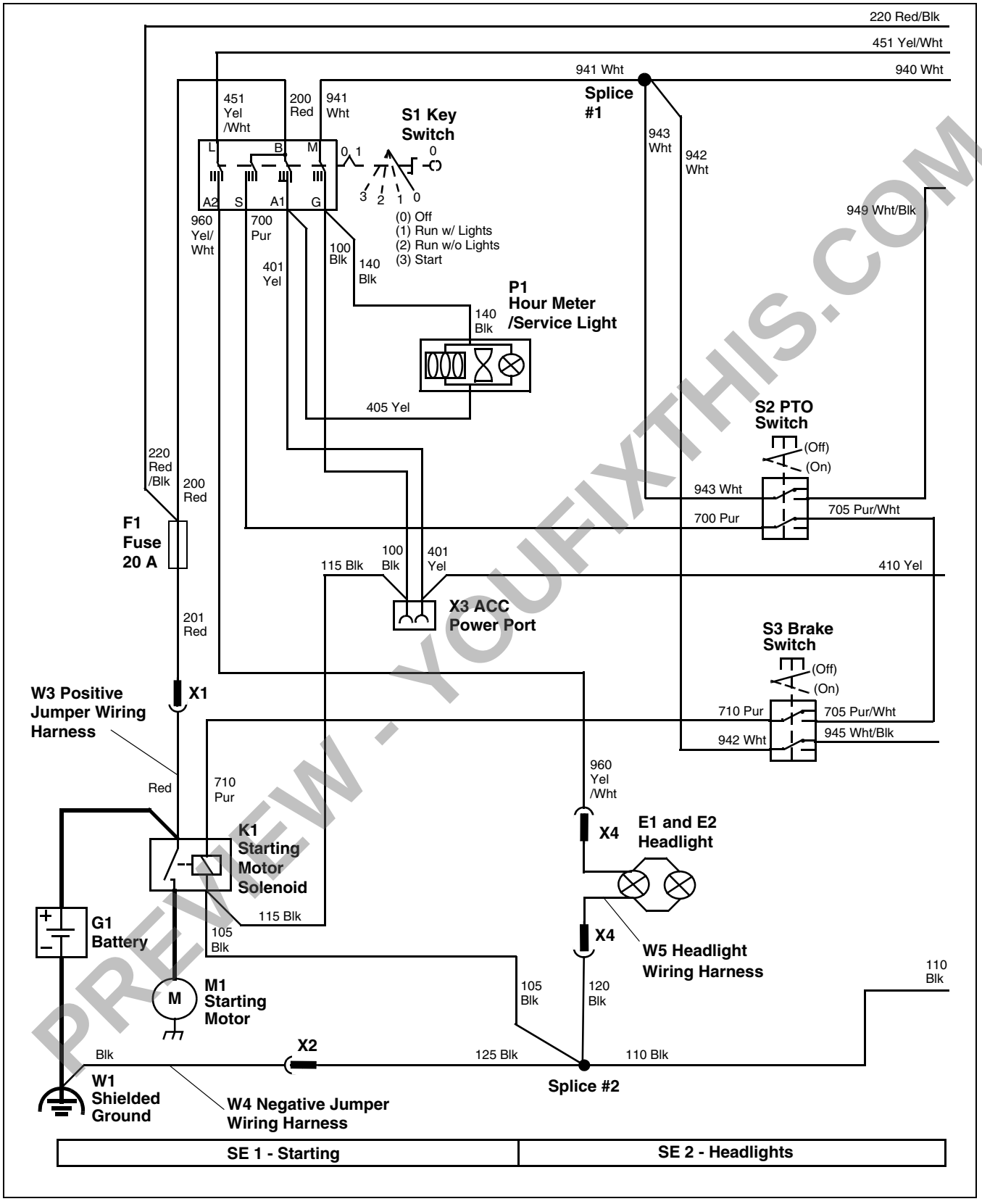
To set the initial engine speed limits.

Procedure:

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Main Wiring Schematic L100/L110/L120

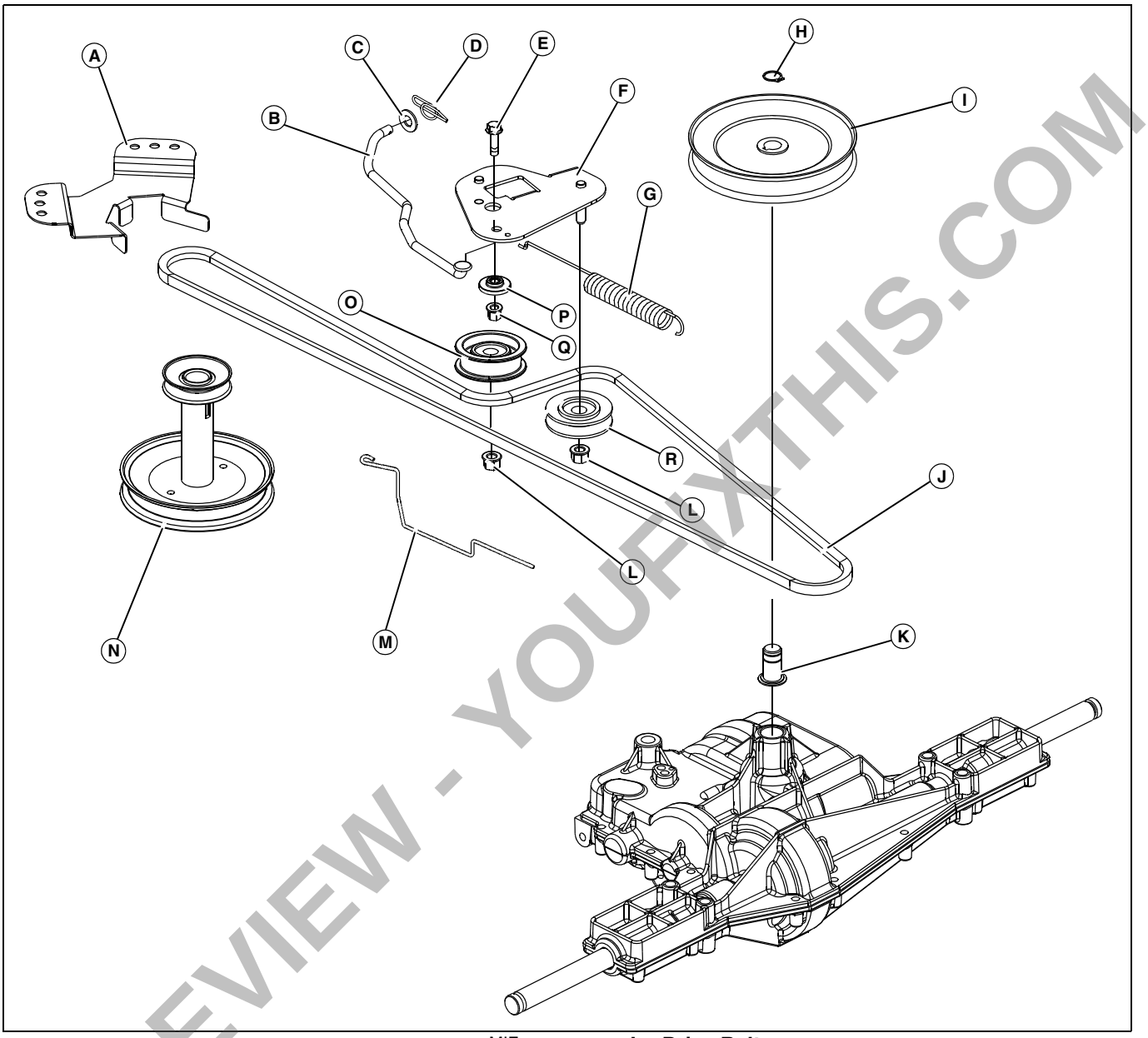


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Component Location

Drive Components



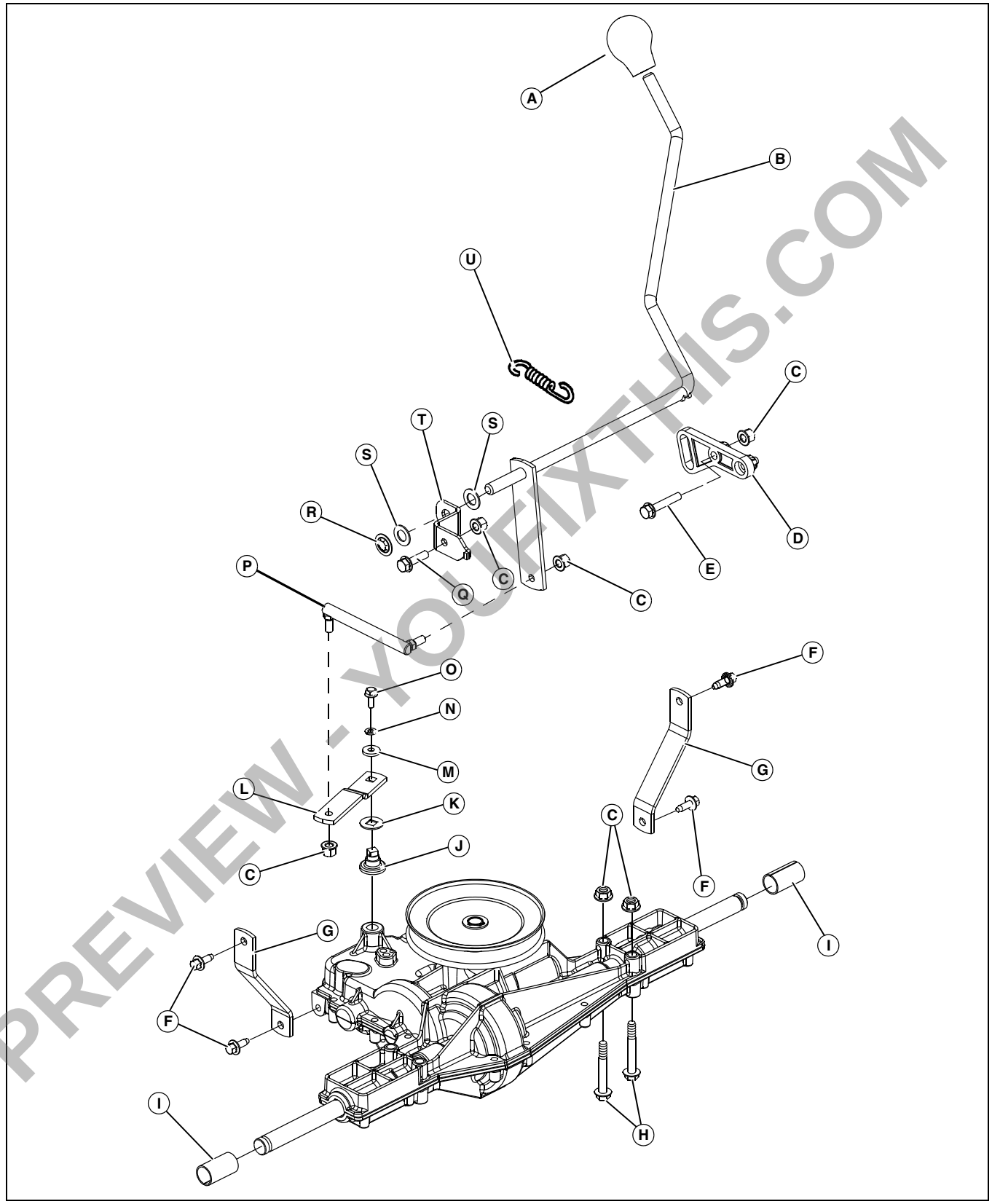
MIF

A - Belt Guide
B - Clutch Rod
C - Washer
D - Spring Clip
E - Bolt
F - Idler Arm
G - Extension Spring
H - E-Ring
I - Transaxle Spindle
J - Drive Belt
K - Shaft
L - Lock Nut
M - Belt Guide
N - Jacksheave
O - Flat Idler
P - Bushing
Q - Lock Nut
R - V-Idler)

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Forward and Reverse Drive and Linkage



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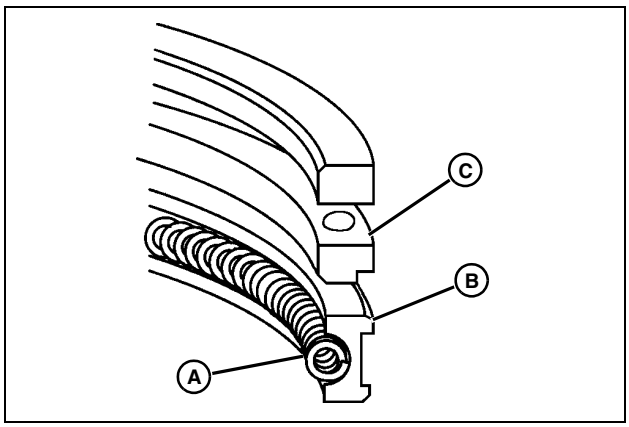
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7. Insert piston pin from opposite side of piston until pin stops against piston pin lock. Then install other piston pin lock. Be sure both locks are seated in grooves.



MX9650

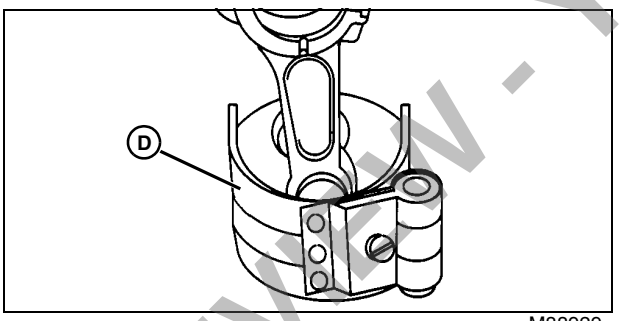
8. Install oil ring expander coil spring (A) first. Spiral oil control ring (B) into top ring groove, then into second ring groove and into position over expander coil spring.

9. Position gap of oil ring expander coil spring approximately 180° from oil control ring.

10.The correct piston ring positions are shown above. The second (C) compression ring is installed with “ID” mark toward top of piston.

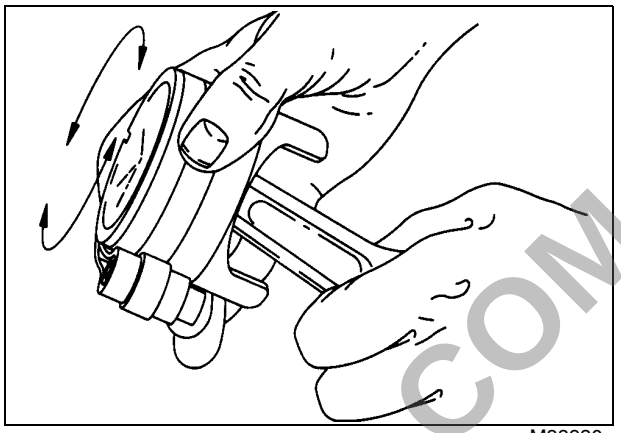
11.Using ring expander, install center compression ring then, top compression ring as shown above.

12.Apply oil to piston rings, piston skirt.



M88929

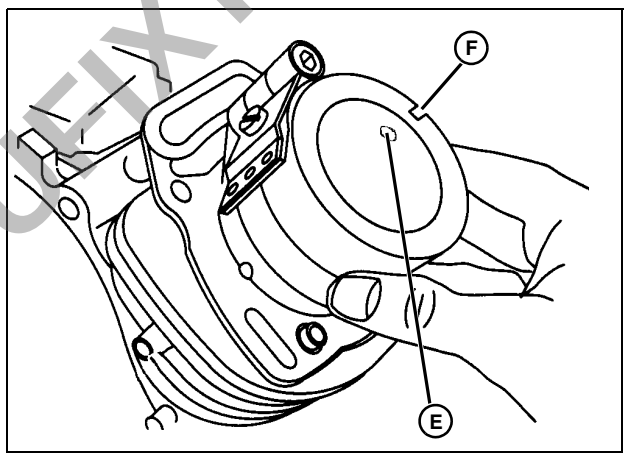
13.Place piston and ring compressor (D) upside down on bench and push down until head of piston and edge of ring compressor are even.



M88930

14.Tighten ring compressor until rings are fully compressed. Then loosen ring compressor very slightly so that compressor can be rotated on piston skirt while holding connecting rod.

15.Thoroughly clean and then oil cylinder bore.



M88932

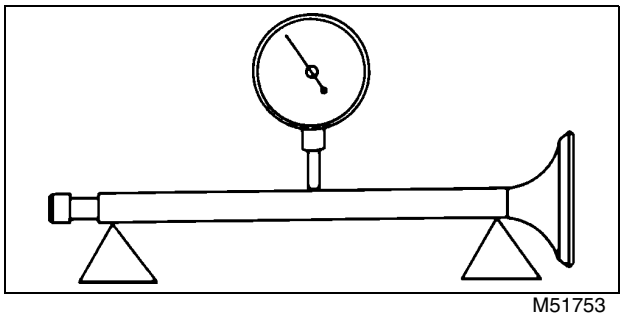
NOTE: The pistons have offset piston pin bores. Position the notch or arrow (E) on piston is facing toward the flywheel side (F) of engine.

16.Rotate crankshaft until crankpin journal is at bottom of stroke. This permits complete entry of compressed rings, piston and rod assembly, when pushed into cylinder.

17.Clean and oil crankshaft crankpin.

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M51753

4. Inspect valve stems for bends using V-blocks and dial indicator. Turn valve slowly and read variation. Replace if variation is greater than specification.

Specification:

Valve Stem Bend (maximum) . . . . 0.076 mm (0.003 in.)

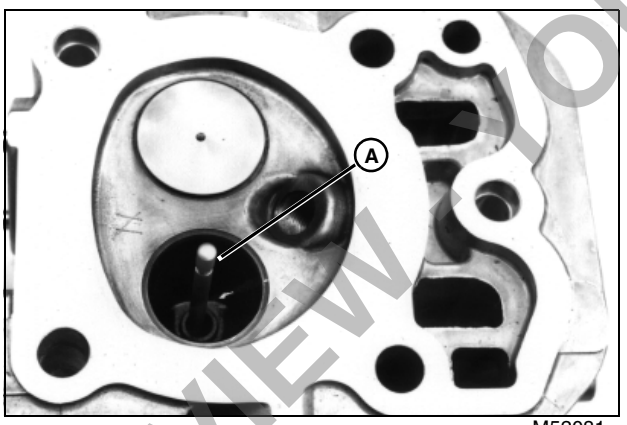
Valve Guides Inspection

Special or Required Tools:

- JDG705 Reaming Tool

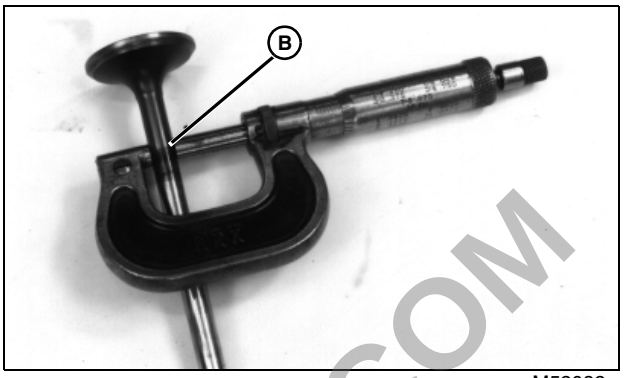
Procedure:

1. Clean inside of valve guide. Standard valve guide reamer can be used.



M52081

2. Measure inside diameter of guide with gauge (A).



M52082

3. Measure outside diameter of valve stem (B).

4. An oversize valve is available. Replace valve if stem-to-guide clearance is too great.

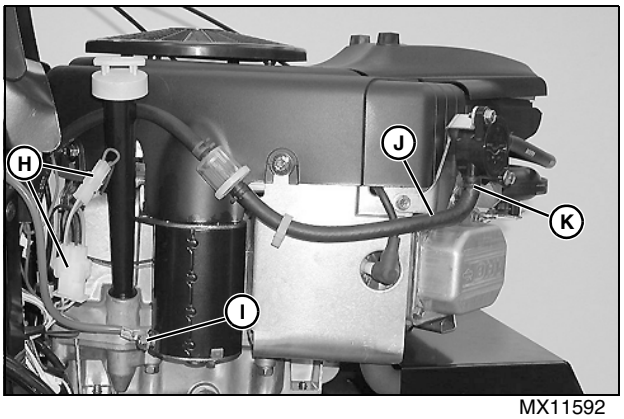
IMPORTANT: Avoid damage! If guide is reamed oversized, an oversize valve must be installed.

5. Use oversize reaming tool (JDG705) to ream guide, if necessary.

6. Replace cylinder head if inside diameter of guide is greater than oversize specification.

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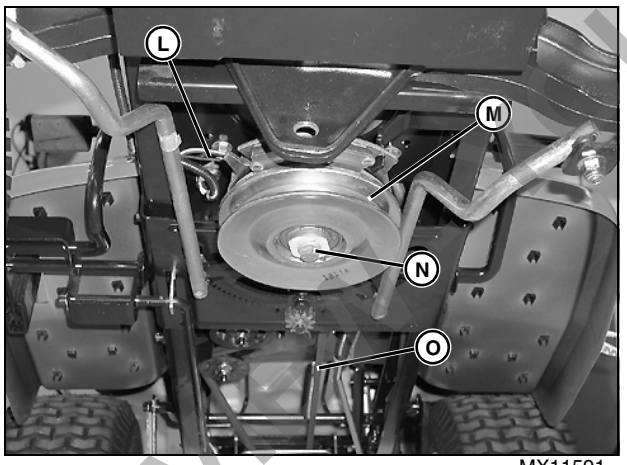
MX11592

CAUTION: Avoid injury! Gasoline is explosive.
Do not expose to spark or flame.
Store in a properly marked, safe container.
Wipe-up any spills IMMEDIATELY.

8. Disconnect hose clamp (K) and slide fuel line (J) off hose barb on fuel pump and plug fuel line.

9. Disconnect wires from starter terminal (I).

10.Unplug connectors (H) from stator and fuel shutoff solenoid.



MX11591

11.Disconnect wiring harness (L) connected to electric PTO clutch (M).

12.With parking brake locked, removing tension from traction drive belt, remove cap screw (N) and lock washer securing electric clutch and engine sheave assemblies to engine output shaft. Remove electric clutch (M) and engine sheave assemblies, while simultaneously removing drive belt (O) from around engine sheave.

13.Remove four cap screws securing engine to frame.

14.Remove engine.

Engine Installation

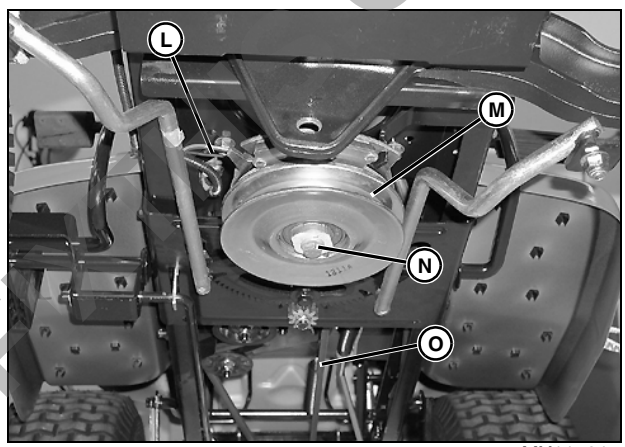
Procedure:

1. Set engine in machine frame with carburetor toward the front of the machine.

2. Install four engine mounting cap screws, washers, and nuts. Tighten all four cap screws to 32 N•m (24 lb-ft).

3. Inspect muffler flange for visual flatness. No obvious bends or kinks.

4. Install muffler with new gasket. Tighten muffler flange bolts to 24 N•m (18 lb-ft). Tighten muffler mounting bolts to 7 N•m (65 lb-in.).



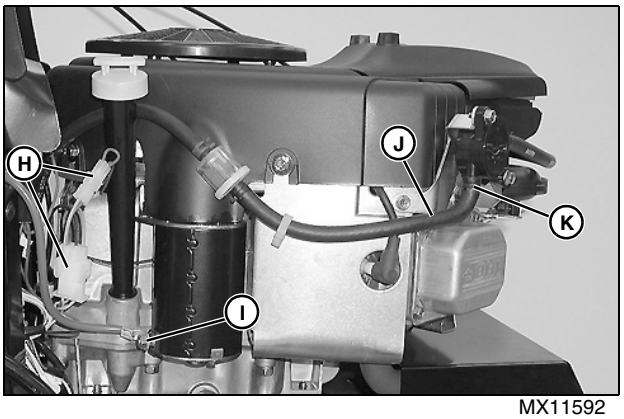
MX11591

5. Install engine output shaft key and engine sheave.

6. Install electric PTO clutch (M) and secure with lock washer and cap screw (N). Tighten cap screw to 75 N•m (55 lb-ft).

7. Install traction drive belt (O) around engine sheave.

8. Connect wiring harness (L) to electric PTO clutch.

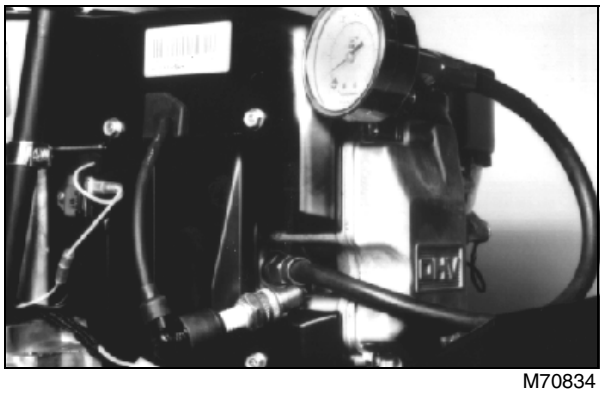


MX11592

9. Connect wires to starter terminal (I).

10.Connect plug connectors (H) from main wire harness to the stator and fuel shutoff solenoid.

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M70834

4. Install JDM59 Compression Gauge.

IMPORTANT: Avoid damage! Do not overheat starting motor during test. Starter duty cycle is 5 seconds on, 10 seconds off. Battery must be at a full state of charge to perform test. Charge battery first, if necessary.

5. Move throttle control lever to fast idle position - throttle and choke plates must be fully open to obtain an accurate reading.

6. Crank engine until gauge needle settles out at its highest position.

7. Record pressure reading. Minimum compression should be 1125 kPa (160 psi).

Results:

- If compression is below minimum specification, perform cylinder leak test to better determine the state of engines condition.

Cylinder Leak Test

Required Tools:

- JTO3502 Cylinder Leak Tester
- Breaker Bar & 30 mm Socket

Procedure:

NOTE: If the directions that come with the tester being used are different than the following, use the directions that came with the tester.

1. The engine should be run for at least 5 minutes to bring the engine to operating temperature.

CAUTION: Avoid injury! With spark plugs removed, the magnetos must be grounded to the engine to prevent a spark that could ignite anything combustible.

2. Remove both spark plugs and ground spark plug leads to engine using JDM-74A-5 Ignition Test Plug.

3. Remove valve covers.

IMPORTANT: Avoid damage! The piston must be positioned at Top Dead Center (TDC) to ensure that the intake valves are away from the compression relief balls. If not, the intake valve will be open and the leak test will be invalid.

4. Turn crankshaft until piston is at Top Dead Center (TDC), on the compression stroke (Both Valves Closed).



M88974

5. Screw the adaptor into the spark plug hole but do not attach it to the tester at this time.

IMPORTANT: Avoid damage! The air supply must have enough supply pressure to calibrate the tester (Usually 85 - 95 psi).

6. Pull back the locking ring and rotate the regulator knob fully counterclockwise. Connect an air line to the tester.



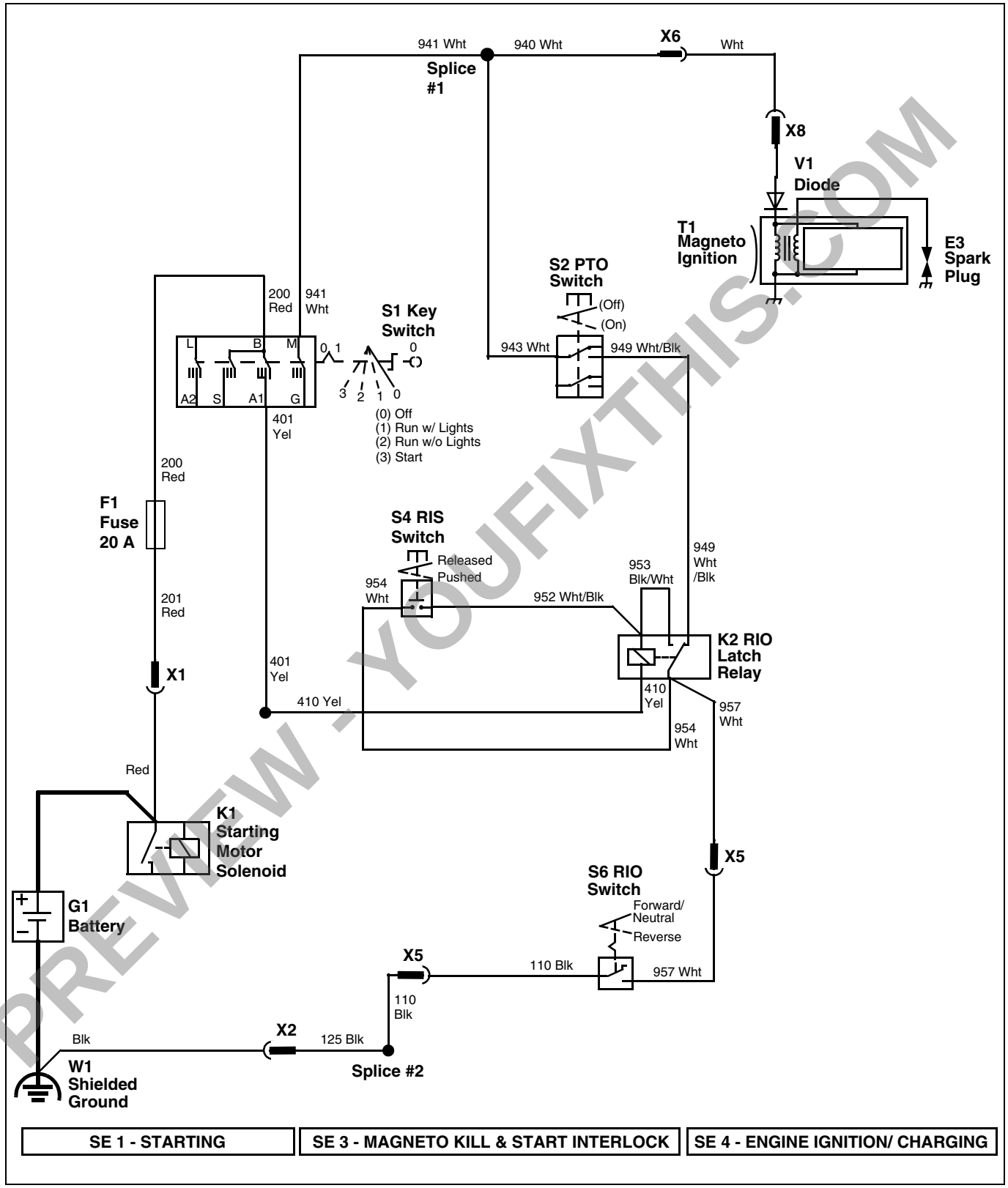
M88957

7. Pull back the locking ring and rotate the regulator knob clockwise until the gauge needle rests in the set range of the gauge. Push the locking ring towards the tester to lock it.

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PTO with RIO Circuit Schematic - L100/L110/L120



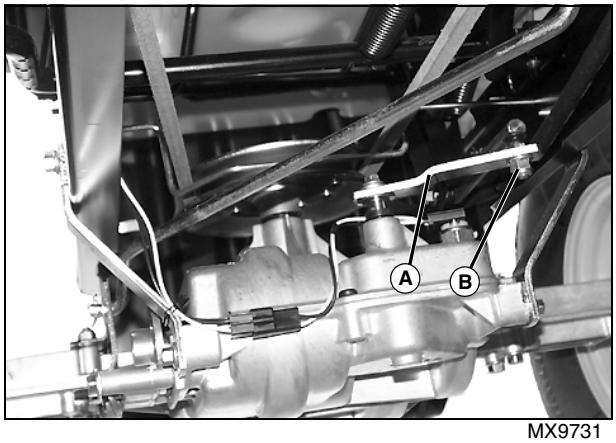
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Shift Linkage Removal and Installation

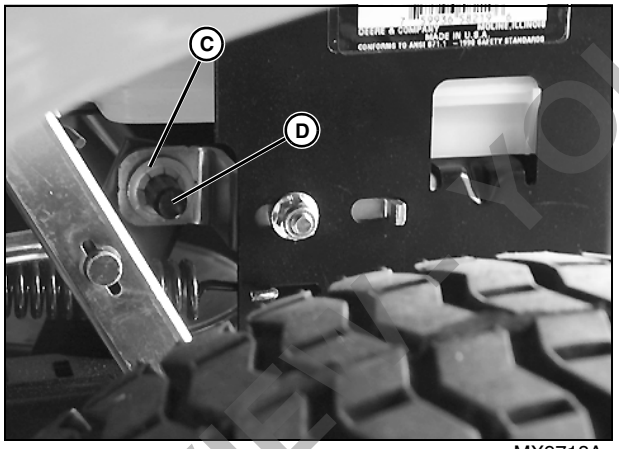
Removing:

1. Remove battery.
2. Block rear of machine off surface so you can remove right drive wheel.
3. Remove shift knob and nut.



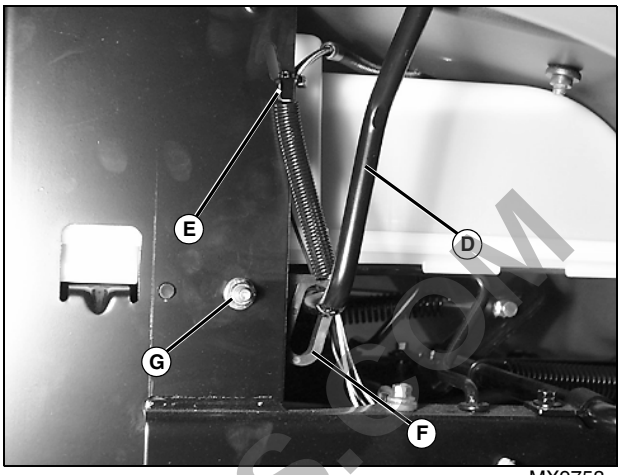
MX9731

4. Remove locknut (B) from transaxle shift arm (A).



MX9718A

5. Remove push nut (C) from shift lever shaft (D) on left-rear side of machine.



MX9753

6. Remove spring (E) from machine frame and shift lever shaft (D).
7. Remove shift bracket nut (G) and bolt and shift shaft arm holder (F).
8. Remove shift linkage from the right side of the frame. You will have to “snake” the shift rod from the machine.
9. Replace necessary components.

Installing:

1. Install shift linkage in reverse order of removal.
2. Adjust shift linkage. See “Shift Linkage Adjustment” on page 295.

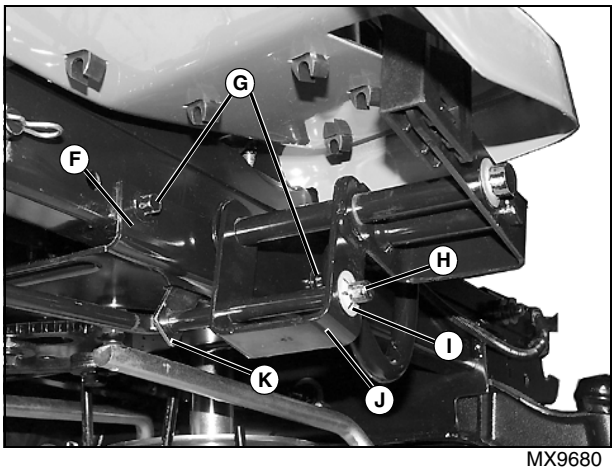
Transaxle Removal and Installation

Removing:

1. Disconnect battery.
2. Remove mower deck.
3. Raise and block machine off surface.
4. Remove rear wheels.

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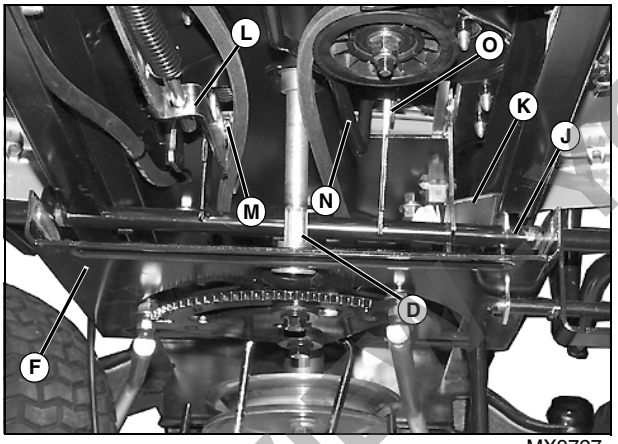


MX9680

7. Remove retainer (I) from forward/reverse rod (H), and remove rod from pedal assembly (J) and cruise control bracket (K).

8. Remove screws (G) from bracket (F) on both sides of machine.

NOTE: Be careful when lowering plate (F). Note location for hardware and linkage for forward/reverse pedal assembly during this procedure.



MX9727

9. Remove spring pin (O) and washer from clutch rod (N).

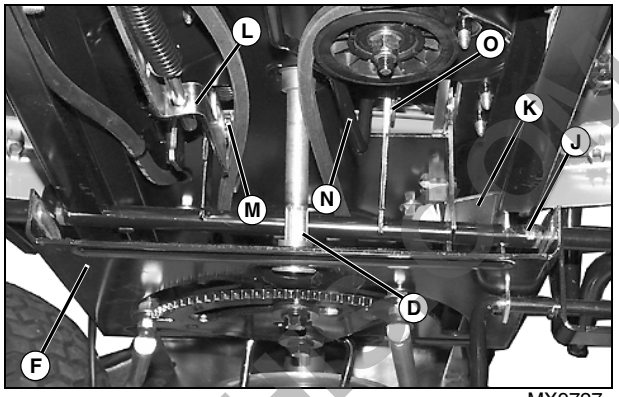
10.Remove washer and cotter pin (M) and pin, and remove brake rod bracket (L) from pedal assembly (J).

11.Lower bracket (F) and cruise control bracket (K) off of steering rod (D), and remove entire pedal assembly (J) from machine.

12.Inspect brake rod and pedals for damage, and replace as necessary.

Installation:

NOTE: Be careful when raising plate (F). Note location for hardware and linkage for brake pedal assembly during this procedure.



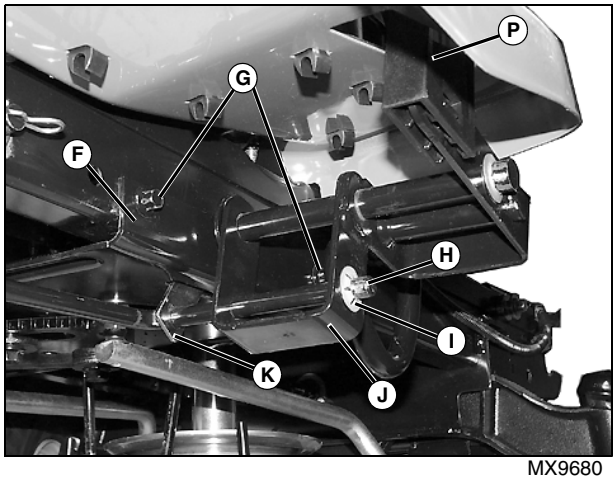
MX9727

1. Raise brake pedal assembly (J) and bracket (F) up to frame, being careful to also raise cruise control bracket (K) along with pedal assembly, onto steering shaft (D).

NOTE: Clutch rod (N) must be above belt.

2. Connect clutch rod (N) to ear on brake pedal assembly (J), and secure with washer and spring pin (O).

3. Connect brake rod bracket (L) onto brake pedal assembly and secure with pin, washer, and cotter pin (M).



MX9680

4. Raise reverse pedal (P) up through fenderdeck, when raising bracket (F) onto frame. Secure bracket on both sides of machine frame with screws (G).

5. Install forward/reverse rod (H) through cruise control bracket (K) and onto brake pedal assembly (J). Secure with retainer (I).

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