System Schematics

Schematic and Wiring Harness Legend—L1742/L17.542/L2048

E1—RH Headlight (SE2, W1)

E2—LH Headlight (SE2, W1)

E3—Spark Plug (SE4, W6)

E4—Spark Plug (SE4, W6)(L2048 only)

F1—Fuse 20 Amp (SE1, W1)

G1—Battery (SE1, W1)

G2—Alternator (SE4, W6)

K1—Starting Motor Solenoid (SE1, W1)

K2—RIO Latch Relay (SE3, W1)

M1—Starting Motor (SE1, W1)

N1—Voltage Regulator/Rectifier (SE4, W6)

P1—Hourmeter/Service Light (SE1, W1)

S1—Key Switch (SE1, W1)

S2—PTO Switch (SE3, W1)

S3—Brake Switch (SE3, W1)

S4—RIS Switch (SE3, W1)

S5—Seat Switch (SE3, W1)

S6—RIO Switch (SE3, W1)

T1—Magneto Ignition (SE4, W6)

T2—Magneto Ignition (SE4, W6)(L2048 only)

V1—Diode (SE4, W6)(B&S engines only)

V2—Diode (SE4, W6)(L2048 only)

W1—Shielded Ground (SE1, W1)

Y1—Fuel Shutoff Solenoid (SE4, W6)

CONNECTORS:

X1—W1 Front Main Wiring Harness to W3 Positive Jumper Wiring Harness (SE1, W1)

X2—W1 Front Main Wiring Harness to W4 Negative Jumper Wiring Harness (SE1, W1)

X3—W1 Front Main Wiring Harness to ACC Power port (SE1, W1)

X4—W1 Front Main Wiring Harness to W5 Headlight Wiring Harness (SE2, W1)

X5—W1 Front Main Wiring Harness to W2 Rear Main Wiring Harness (SE3, W1)

X6—W1 Front Main Wiring Harness to W6 Engine Wiring Harness (SE3, W1)

X7—W6 Engine Wiring Harness to Y1 Fuel Shutoff Solenoid (SE4, W6)

X8—W6 Engine Wiring Harness to T1 and T2 Magneto Ignition (SE4, W6)

X9—W6 Engine Wiring Harness to N1 Voltage Regulator/Rectifier (SE4, W6)(B&S engines only)

WIRING HARNESSES:

W1—Front Main Wiring Harness

W2—Rear Main Wiring Harness

W3—Positive Jumper Wiring Harness

W4—Negative Jumper Wiring Harness

W5—Headlight Wiring Harness

W6—Engine Wiring Harness

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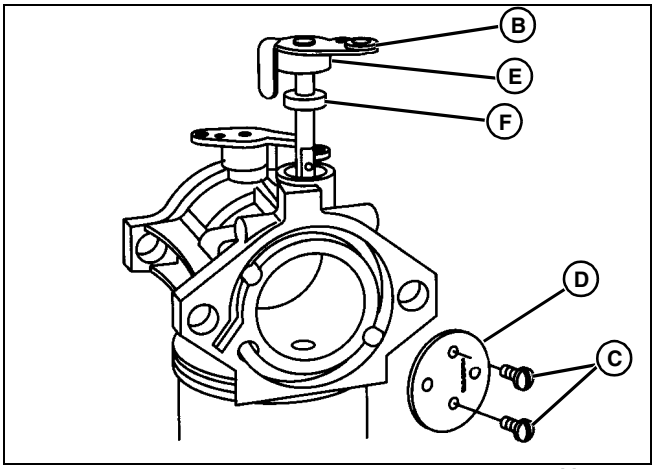
Carburetor Disassembly

Procedure:

1. Remove fuel shutoff solenoid and fuel bowl washer.

2. Remove float bowl and float bowl gasket from carburetor.

3. With a small punch, drive the float hinge pin out of float hinge. Remove float and fuel inlet valve assembly.

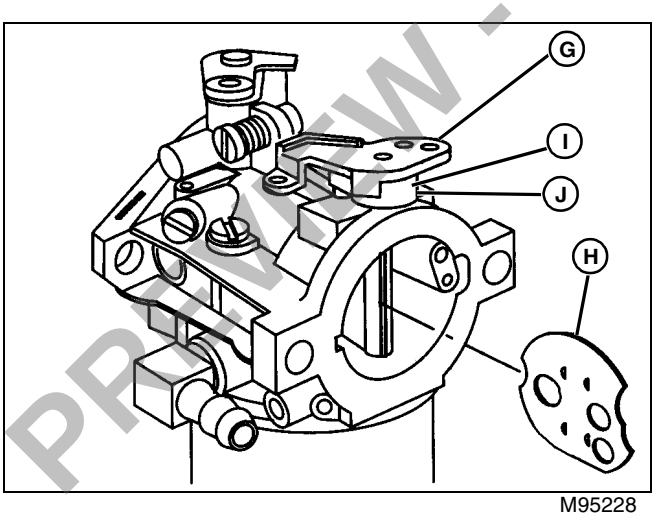


M95229

4. Rotate throttle shaft and lever (B) to closed position and remove two throttle valve screws (C).

5. Remove throttle valve (D), throttle shaft with lever (B), and foam seal (E).

6. Remove throttle shaft seal or bushing from carburetor (F).

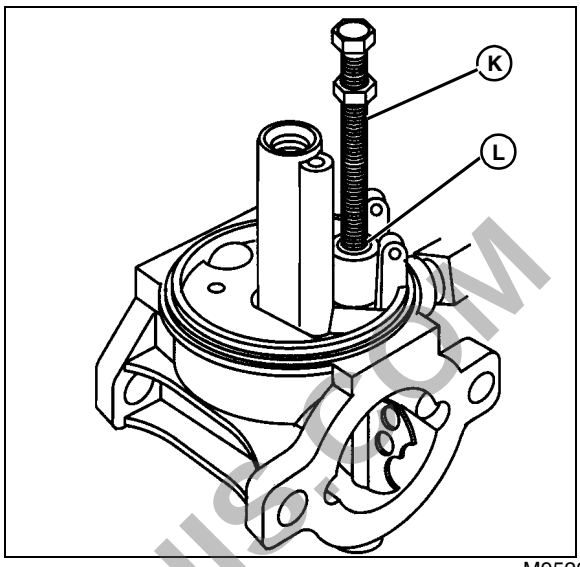


M95228

7. Rotate choke shaft (G) to wide open position.

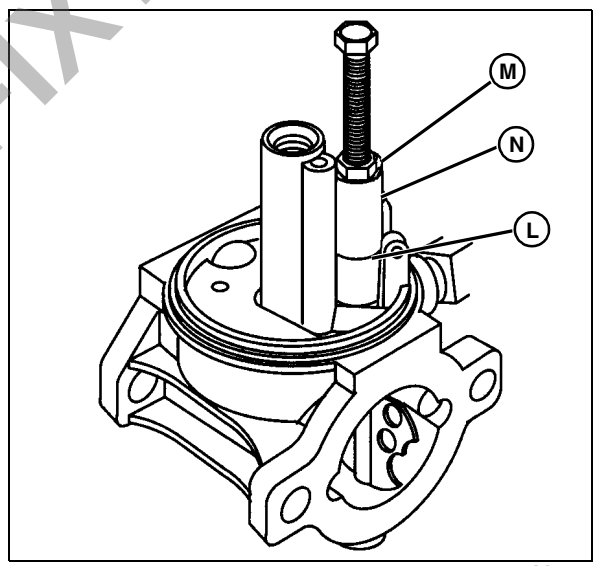
8. Pull choke valve (H) out of choke shaft and lever.

9. Remove choke shaft and lever, return spring (I), and foam washer (J).



M95225

10. Using 1/4-20 self-threading screw or tap (K), threaded into fuel inlet seat (L) 3-4 turns and remove screw or tap.



M95226

11. Place 1/4-20 nut and washer (M) on a 1/4-20x1in. screw to use as a puller.

12. Place the hex end of a 1/4 in. drive 3/8 in. socket (N) over fuel inlet seat (L).

13. Place the puller screw through the socket and thread it into the tapped inlet seat until the screw bottoms.

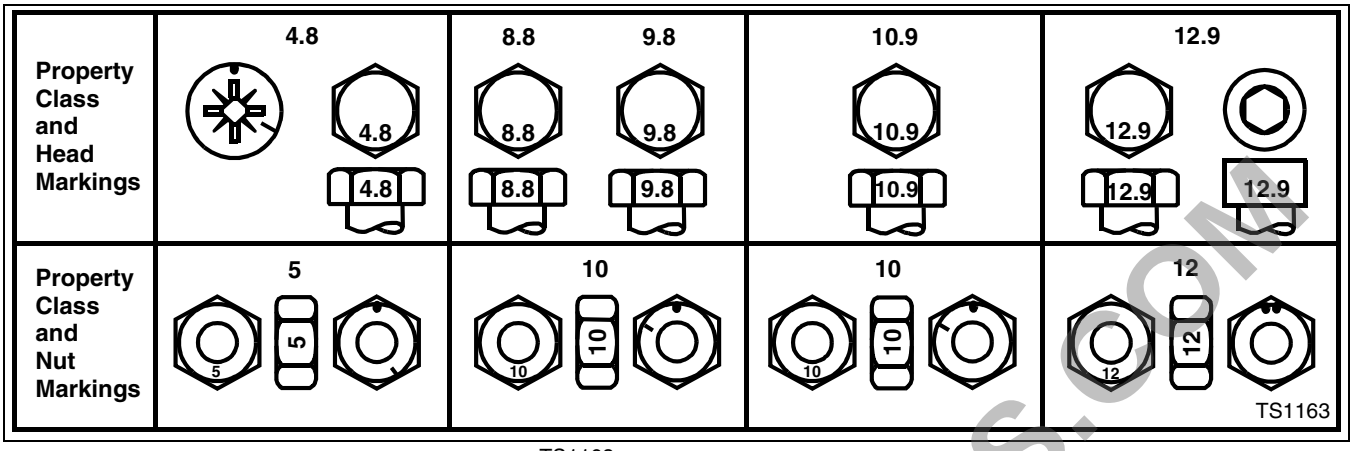
14. Thread nut down onto the washer and socket and continue turning nut until inlet seat is free from carburetor body.

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Fastener Torques

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	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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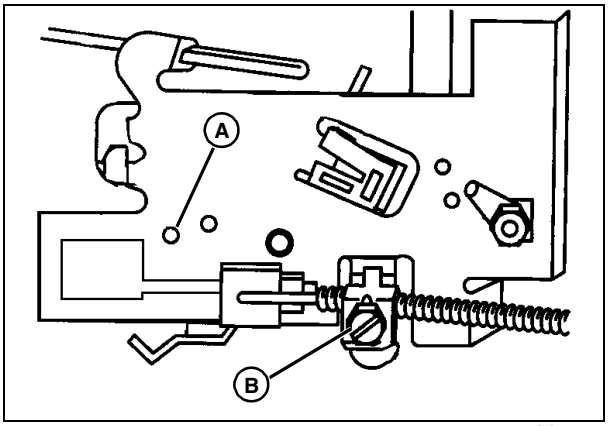
Tests and Adjustments

Throttle Cable Adjustment

Reason:

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

Procedure:



M95232

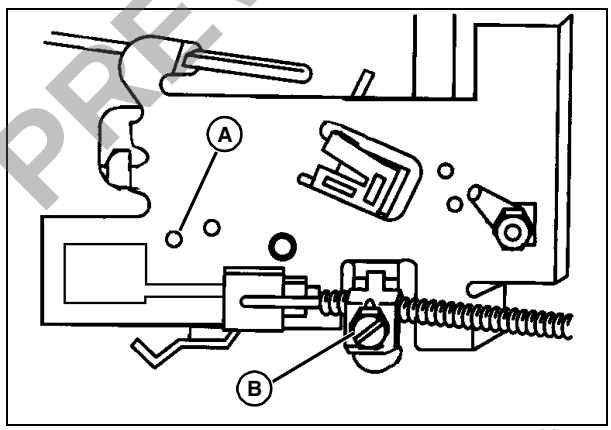
1. Move throttle lever to FAST idle position (detent).
2. Hole in governor control lever must align with hole (A) in governor control plate.
3. Loosen throttle cable clamp (B).
4. Slide the throttle cable left or right to align holes.
5. Tighten throttle cable clamp (B).

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:

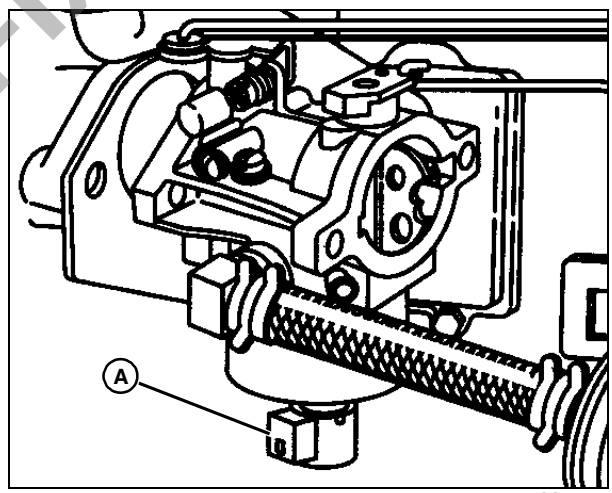
To test proper operation of fuel shutoff solenoid.

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:

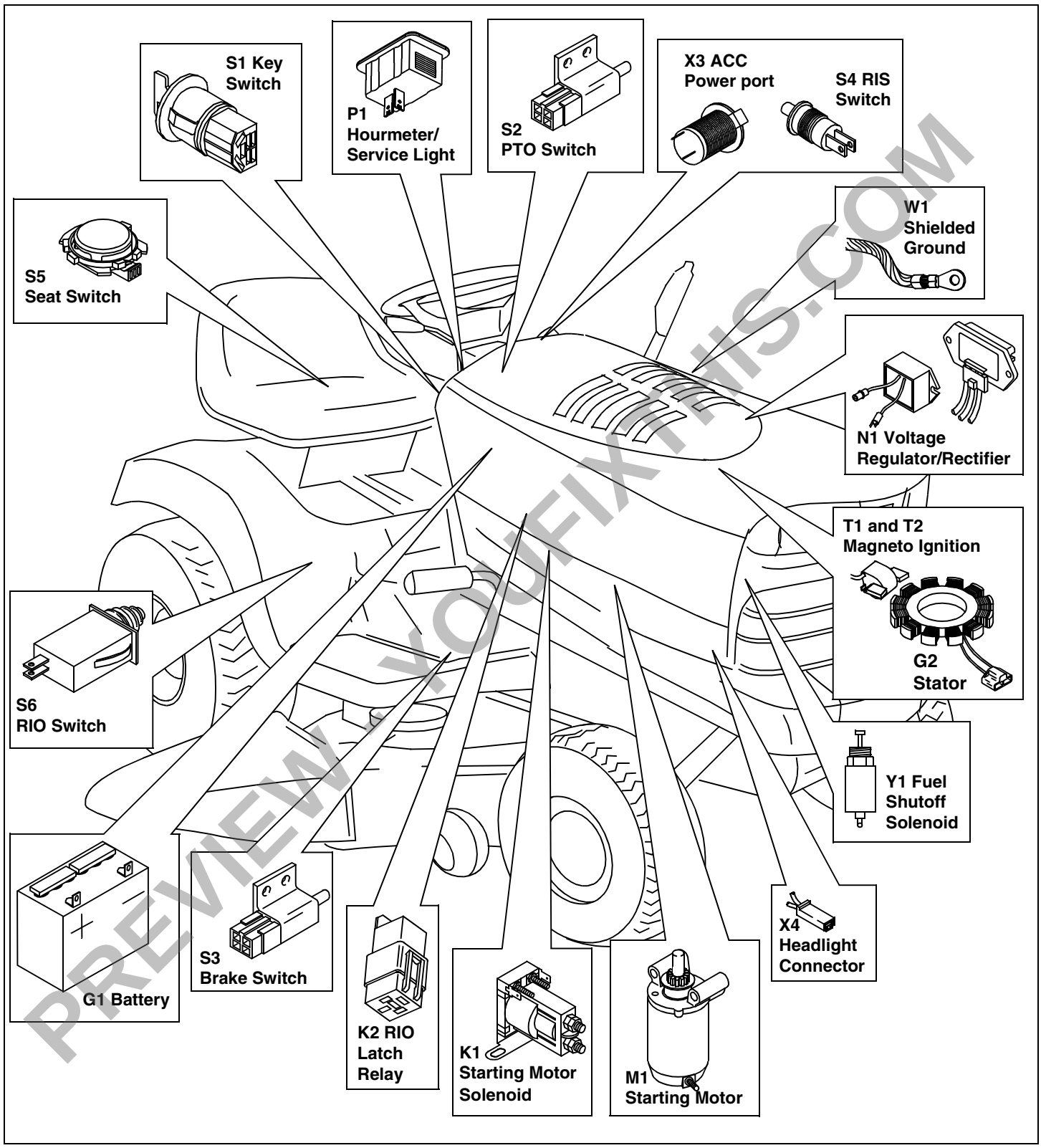
- Solenoid is operating properly if a click is heard when ignition switched from OFF to ON.

Governor Adjustment - Static

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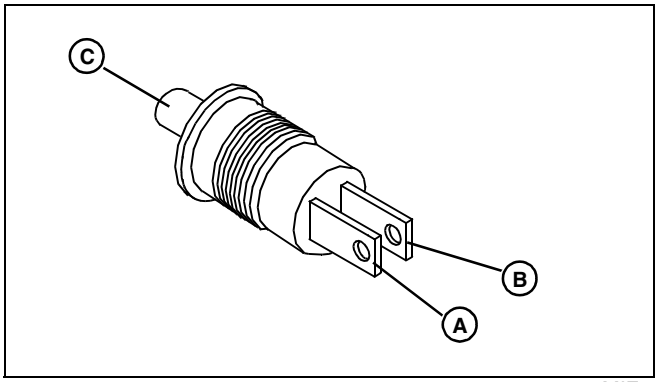
Component Location—L1742/L17.542/L2048



MIF

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MIF

2. Connect meter leads to pairs of switch posts and compare to specifications.

3. Press and release plunger (C) of switch.

Results:

- If RIS switch does not pass all tests, replace switch.

Specifications:

Switch plunger not pressed)

. . . . . no continuity between A and B

Switch plunger pressed)

. . . . . continuity between A and B

Seat Switch Test

Reason:

To determine proper operation of seat switch.

Equipment:

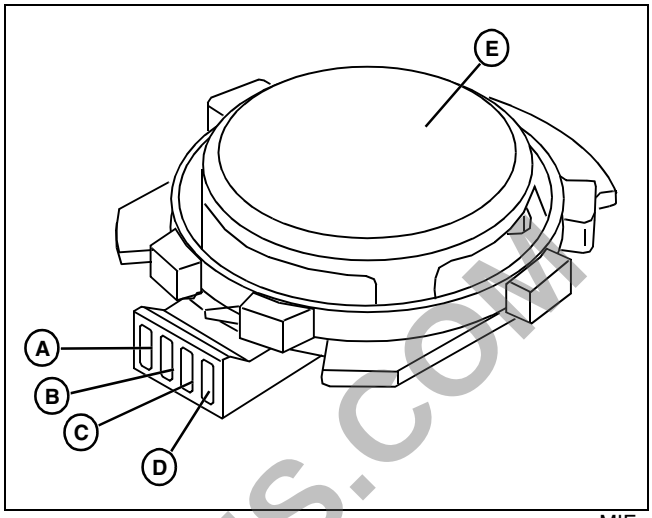
- Ohmmeter

Test Connections:

- Set ohmmeter for 1X ohms scale

Procedure:

1. Remove connector from seat switch.



MIF

2. Connect meter leads to pairs of switch posts and compare to specifications.

3. Press and release seat switch plunger (E).

Results:

- If the seat switch does not pass tests, replace switch

Specifications:

Seat switch plunger not pressed

. . . . . continuity between B and C

. . . . . no continuity between any other terminals

Seat switch plunger pressed

. . . . . continuity between A and D

. . . . . no continuity between any other terminals

Diode Test—Ignition Coil

Reason:

To verify correct function of diodes in engine stop circuit. If a diode fails "open", the cylinder with the open diode will continue to run when the engine is shut off. If a diode fails "short", the cylinder with the shorted diode will not run (no spark).

Equipment:

- Ohmmeter

Procedure:

1. Park machine on level surface.
2. Turn key switch to OFF position.
3. Move Forward/Reverse pedals to NEUTRAL position.
4. Engage park brake.

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Specifications

Engine

L1742

Make	Briggs & Stratton
Model	Intek / 31E707
Horsepower	12.7 kW (17.0 hp)
Displacement	508 cm3 (31 cu in.)
Cylinders	1
Stroke/Cycle	4
Valves	Overhead
Lubrication	Pressurized
Oil Filter	None
Crankcase Capacity (Without Filter)	1.4 L (1.5 qt)
Cooling System	Air Cooled
Air Cleaner	Paper with outer foam element
Muffler	Horizontal discharge below frame
Spark Plug Gap	1 mm (0.040 in.)
Spark Plug Torque	26 N•m (240 lb-in.)

L17.542

Make	Kohler
Model	Command / CV490S
Horsepower	13.1 kW (17.5 hp)
Displacement	490 cm3 (29.9 cu in.)
Cylinders	1
Stroke/Cycle	4
Valves	Overhead
Lubrication	Pressurized
Oil Filter	Single Element, Full Flow, Spin-On Filter
Crankcase Capacity (With Filter)	1.9 L (2.0 qt)
Crankcase Capacity (Without Filter)	1.8 L (1.75 qt)
Cooling System	Air Cooled
Air Cleaner	Paper with outer foam element
Muffler	Horizontal discharge below frame
Spark Plug Gap	1 mm (0.040 in.)
Spark Plug Torque	26 N•m (240 lb-in.)

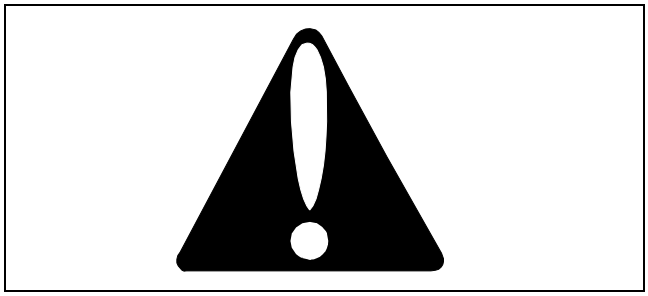
L2048

Make	Briggs & Stratton
Model	Intek V-Twin / 406777
Horsepower	14.9 kW (20 HP)
Displacement	656 cm3 (40.0 cu in.)

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Recognize Safety Information



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

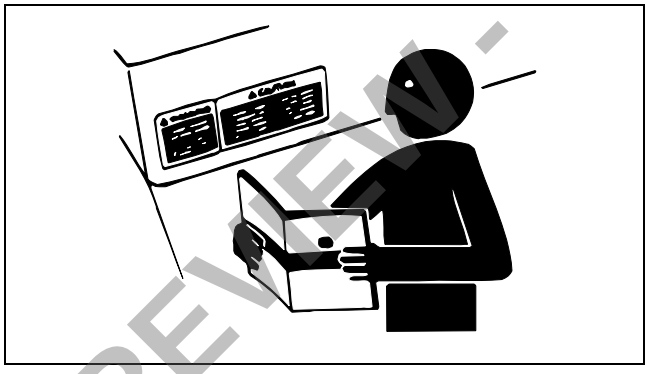
Follow recommended precautions and safe servicing practices.

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

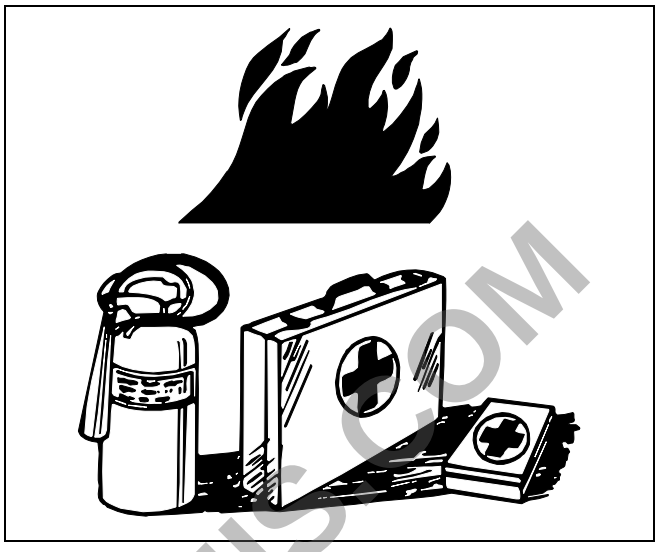
Replace Safety Signs



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

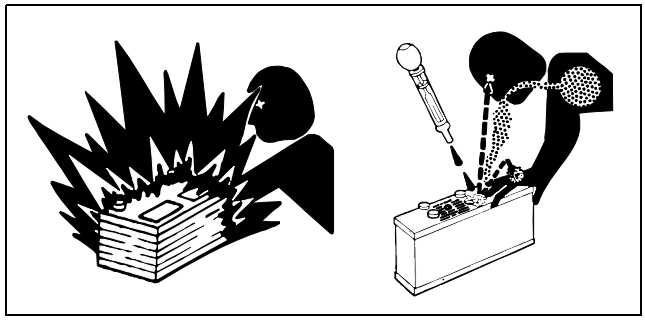
Be Prepared For Emergencies

- When you work around fuel, do not smoke or work near heaters or other fire hazards.
- Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.



- Make sure machine is clean of trash, grease, and debris.
- Do not store oily rags; they can ignite and burn spontaneously.
- Be prepared if a fire starts.
- Keep a first aid kit and fire extinguisher handy.
- Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

Use Care In Handling And Servicing Batteries



Prevent Battery Explosions

- Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.
- Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.
- Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).

Prevent Acid Burns

- Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

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INTRODUCTION

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

General Diagnostic Information

Specifications

Electrical Wiring Harness Legend

Component Location

System Schematic

Wiring Harness

Troubleshooting Chart

Theory of Operation

Diagnostics

Tests & Adjustments

Repair

Depending on the particular section or system being covered, not all of the above groups may be used.

Each section will be identified with a symbol rather than a number. The groups and pages within a section will be consecutively numbered.

We appreciate your input on this manual. To help, there are postage paid post cards included at the back. If you find any errors or want to comment on the layout of the manual please fill out one of the cards and mail it back to us.

Safety

Specifications and Information

Engine - Briggs & Stratton (Single)

Engine - Briggs & Stratton (Twin)

Engine - Kohler

Electrical

Power Train - Gear Transmission

Power Train - Hydro Transmission

Steering

Brakes

Attachments

Miscellaneous

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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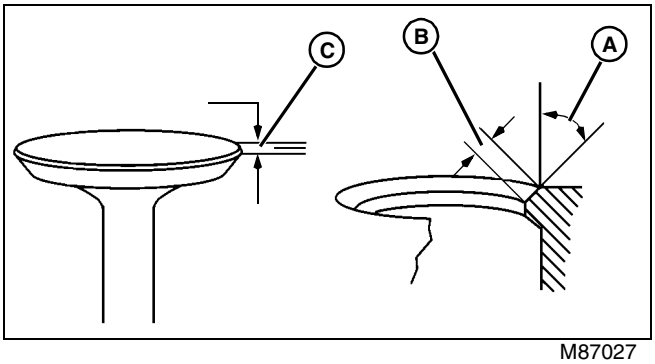
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IMPORTANT: Avoid damage! Always replace valve stem seals whenever valves are removed for servicing.

1. To remove valve stem seals, grasp seal with pliers and pull up on seal while turning.



M87027

2. Faces on valves may be resurfaced with a valve grinder to 45° (A). Valve seats can be reconditioned using Valve Seat Cutter. Valves and seats should then be lapped with Valve Lapping Tool and Valve Lapping Compound. Remove grinding marks and assure a good seal between valve and seat. Thoroughly clean lapping compound from valve seat and valve face.

3. Valve seat width (B) should be **0.79 – 1.98 mm (0.031 – 0.078 in.)**.

4. If seat is wider, it may be narrowed using Valve Seat Cutter. Use 30° side of cutter to narrow the seats.

5. If the valve is badly burned, it should be replaced. Normal valve margin (C) is **0.8 mm (0.030 in.)**. Replace valve if margin is **0.4 mm (0.0156 in.)** or less or is badly burned or damaged, replace cylinder head. Valve seats are not replaceable.

6. Inspect valve springs and replace if broken or worn.

7. Inspect valve guides by inserting plug gauge into valve guide. If plug gauge inserts **6.35 mm (0.250 in.)** or more, the guide must be replaced. If plug gauge is not available, the rejection dimension for both intake and exhaust valve guides is **6.09 mm (0.240 in.)**.

Specification:

Valve seat width
. . . . . 0.17 – 1.57 mm (0.046 – 0.062 in.)
Valve Margin (min) . . . . . 0.4 mm (0.0156 in.)
Valve Guide Reject Dimension (both)
. . . . . 6.09 mm (0.240 in.)
Valve Face Angle . . . . . 45°
Valve Narrowing Angle. . . . . 30°

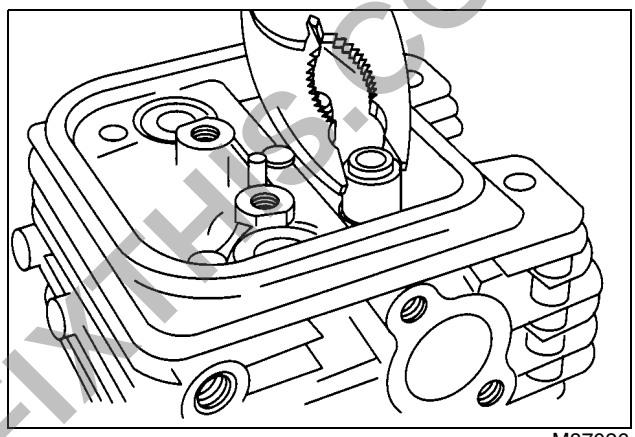
Valves Installation

Procedure:

1. If rocker arm studs were removed, coat with hardening sealant before installation.

2. Install rocker arm studs and tighten to **9.6 N•m (85 lb-in.)**.

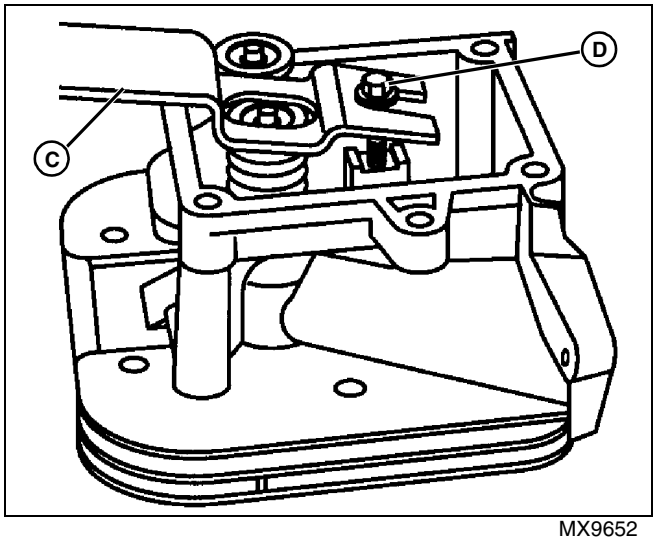
3. Valve stems and guides must be free of foreign material and burrs or valve sticking will occur and valve stem seals will be damaged.


M87026

4. Oil inside diameter of valve stem seal with engine oil and install on valve stem. Press seal down over intake valve guide.

NOTE: Be sure valve guide lubricant is not on valve face, valve seat, or exposed end of valve stem.

5. Lightly coat valve stems with a valve guide lubricant and install valve into valve guide.

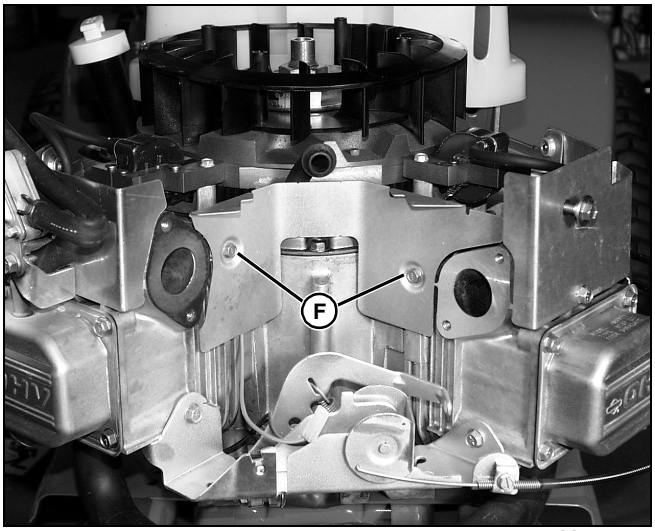


MX9652

6. Place valve spring over valve stem.

7. Place retainer on spring. Insert valve spring tool (C) to the rocker arm support screw (D) and depress the valve

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M95530

7. Remove the two screws (F) holding the front air guide in place.
8. Install air guides in reverse order.
9. Install carburetor.
10. Install carburetor linkage.
11. Install air filter assembly.
12. Install upper blower housing.

Specification:

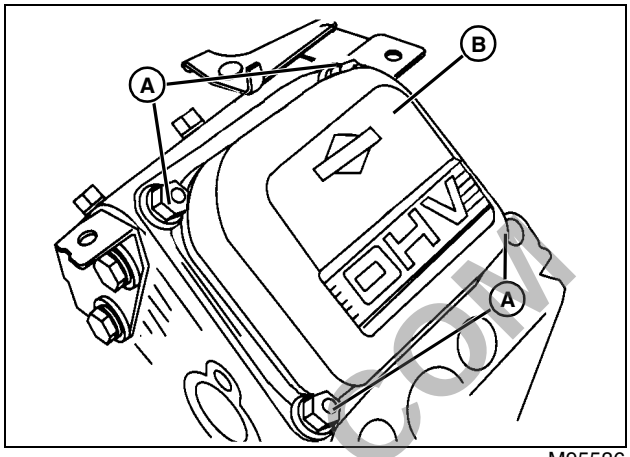
Air Guide Screws . . . . . 7 N•m (65 lb-in.)

Cylinder Head Removal and Installation

IMPORTANT: Avoid damage! Mark all parts when disassembling cylinder heads to prevent interchanging.

Removal:

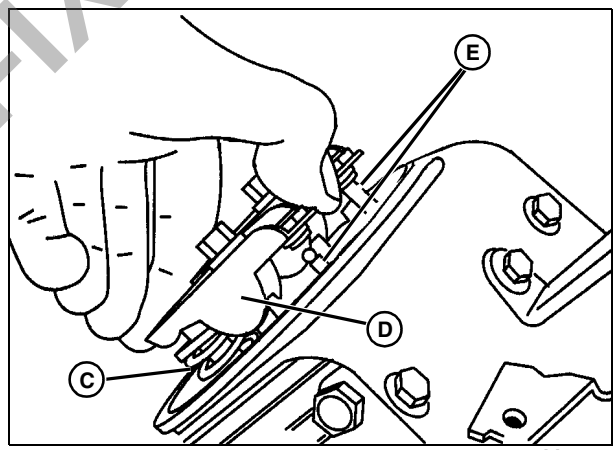
1. Disconnect spark plug leads and remove spark plugs.
2. Remove intake manifold.
3. Remove cylinder air guides.



M95536

4. Remove cap screws (A), and valve cover (B).

NOTE: To release spring (C) pressure from rocker arm (D), rock the arm against spring pressure and allow push rod (E) to drop out of the rocker arm socket. Push rod will move out of position, releasing valve spring pressure.



M95534

5. Release valve spring pressure.

IMPORTANT: Avoid damage! Exhaust valve push rods are aluminum. Intake valve push rods are steel. Mark push rods for identification with tape or tags to prevent interchange.

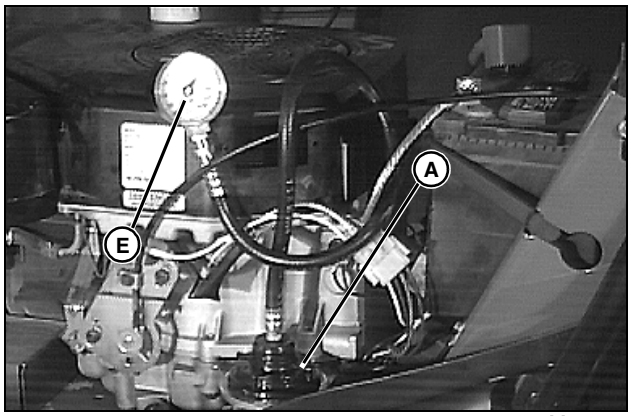
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- JT07034 Gauge, 0 – 700 kPa (0 – 100 psi)

NOTE: The connector, hose assembly, coupler, and gauge are found in other SERVICEGARD™ test kits. The connector pipe thread (NPT) also matches the oil pressure switch port on early Kohler engines.

Procedure:



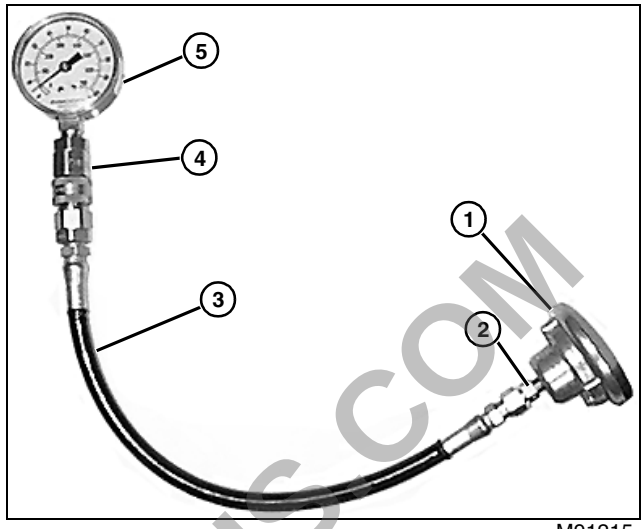
M89105

Test Procedure At Oil Filter Base:

1. Perform test procedure with engine level.
2. Stop engine.
3. Disconnect spark plug wire and allow engine to cool.

IMPORTANT: Avoid damage! When servicing engine (when the engine is running), it is important to remove hood to avoid damage from muffler exhaust heat source.

4. Remove hood assembly. (See “Hood Removal and Installation” on page 313 in the Miscellaneous section.)
5. Drain engine oil from oil filter.
6. Remove oil filter and wipe filter base clean.
7. Install pre-assembled adapter (A), connector (B), hose assembly (C), coupler (D), and gauge (E) on to oil filter base. ONLY hand-tighten adapter to oil filter base.
8. Check crankcase oil level and adjust to full mark.



M91215

1 - JTO7262 Oil Pressure Adapter
2 - JTO5487 Connector
3 - JTO3017 Hose Assembly
4 - JTO3262 Coupler
5 - JTO7034 Gauge

9. Monitor oil pressure during cranking, if oil pressure is below **28 kPa (4 psi)**—STOP engine immediately and correct cause before continuing.
10. Connect spark plug wire.
11. Warm-up engine by running at MEDIUM idle for five minutes.

CAUTION: Avoid Injury! Engine components are HOT. DO NOT touch with bare skin. Wear protective eye glasses and clothing.

12. Record oil pressure readings at SLOW and FAST idle.
13. Stop engine and allow to cool.
14. Remove adapter, connector, hose assembly, coupler, and gauge.
15. Install new oil filter.
16. Run engine for 30 seconds and stop engine.
17. Check crankcase oil level and adjust to full mark.

Results:

- If oil pressure readings are not within **69 kPa (10.0 psi) – 517 kPa (75.0 psi)** at FAST idle, inspect and/or replace the following:

–Oil pump assembly. (See “Oil Pump Disassembly and Inspection”.)

–Oil suction screen.

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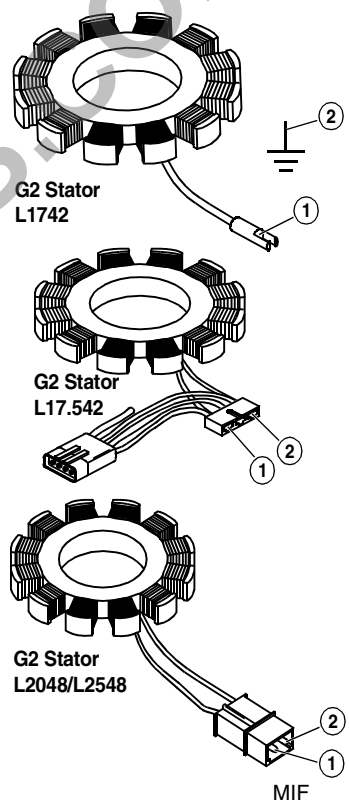
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Charging Circuit Diagnosis—L1742/L17.542/L2048/L2548

Test Procedure A

Test Conditions:

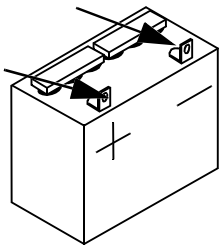
- Engine running full throttle.
- Park brake ON.
- PTO in Off position.
- Alternator stator connector unplugged.

Test Point/Procedure	Results	
Step (1) Alternator stator connector. Measure for AC volts between points 1 and 2 as shown.	**Above 40 volts AC (L1742), Above 28 volts AC (L17.542), Above 30 volts AC (L2048/L2548), Go To Step (1) of Test Procedure B.** • If below 40 volts AC (L1742), replace stator. • If below 28 volts AC (L17.542), replace stator. • If below 30 volts AC (L2048/L2548), replace stator.	 MIF

Test Procedure B

Test Conditions:

- Engine running full throttle.
- Park brake ON.
- PTO in OFF position.
- Alternator stator reconnected.

Test Point/Procedure	Results	
Step (1) Battery. Measure for voltage at battery terminals.	**13.0-13.5 DC volts, Test Complete.** • If less than 13 volts, check for bad connections between battery and K1 starting motor solenoid. **Go To Step (2).**	 MIF

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Diagnostics

Gear Transmission

Test Conditions:

- Park on level surface
- Park brake ENGAGED
- Engine OFF

Test/Check Point	Normal Condition	If Not Normal
Drive belt	Belt in good condition, not glazed, split, unraveled, or stretched	Replace drive belt
Sheaves, idlers, and belt guides	Sheaves, idlers and guides in good condition Guides installed, properly adjusted and tight	Replace any loose, worn, or damaged components Adjust and tighten
Clutch/brake pedal linkage	Clutch/brake pedal linkage adjusted properly Clutch spring measurement adjusted properly	Adjust clutch/brake pedal linkage. Repair or replace clutch/brake pedal components Adjust rear belt idler for correct clutch spring measurement
Shift linkage	Shift linkage adjusted properly, shifts smoothly, and obtains all gears	Adjust linkage Repair or replace as needed
Brake assembly	Disc and pads not worn or binding	Repair or replace as needed
Internal transaxle components	Shifts smoothly, and obtains all gears	Replace transaxle
Exterior of transaxle housing	No cracks, leaks, or loose hardware	Tighten hardware Repair or replace as needed
Tires, wheels and axles	Tire pressure equal Driving tires have same radii Wheels not bent or out of round Keys, keyways and E-rings in good shape and seated correctly	Adjust air pressure Match tires for same circumference Replace wheels Repair or replace as needed

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Tests and Adjustments

Park Brake Test

Reason:

To ensure park brake functions properly.

CAUTION: Avoid injury! OPERATE on ramp only in first or second gear (low speed for hydro units). Shift to neutral.

Procedure:

- Climb 17° ramp during running start in 1st or 2nd gear (or slow speed for hydro units)
- Check park brake holds tractor stationary

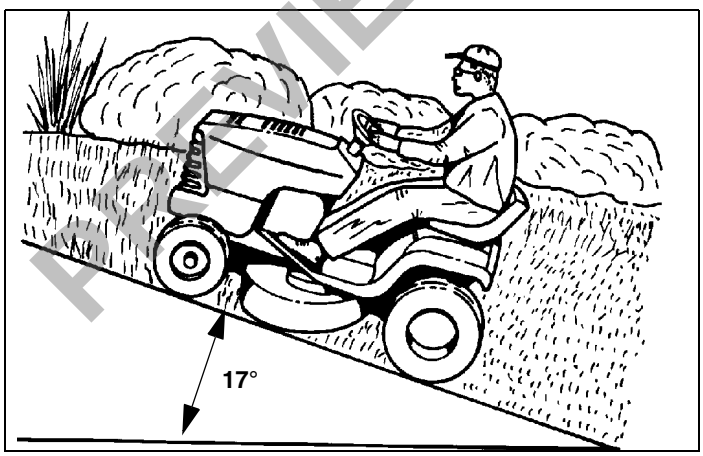
Test Drive:

CAUTION: Avoid injury! DO NOT engage clutch/brake pedal too aggressively or tractor may tip over backwards while performing the test drive on a 17° slope.

1. Drive tractor onto a 17° slope and lock clutch/brake pedal in PARK position. Check that park brake holds tractor stationary on slope and that tractor does not creep downward once park brake is set.

2. If park brake test fails, inspect brake assembly components, replace as necessary. Repeat all adjustment procedures and drive tests.

IMPORTANT: Avoid damage! Park brake must hold tractor stationary on slope and tractor must not creep downward once park brake is set.



M89154

3. If any test fails, the clutch and brake linkages must be adjusted or components replaced.

NOTE: For gear transaxle units, when the clutch/brake pedal is released and the traction drive system is engaged, there must be ample clearance between the friction pucks and the brake disc to prevent the disc brake from dragging.
If a dragging condition exists, the disc brake will over heat and will also experience premature wear.

Test Drive

CAUTION: Avoid injury! DO NOT engage clutch/brake pedal too aggressively when going in reverse or tractor may tip over backwards. It is recommended that you install the mower deck before performing the test drive on a 17° slope.

1. Attach mower deck to tractor, this will help stabilize the tractor.

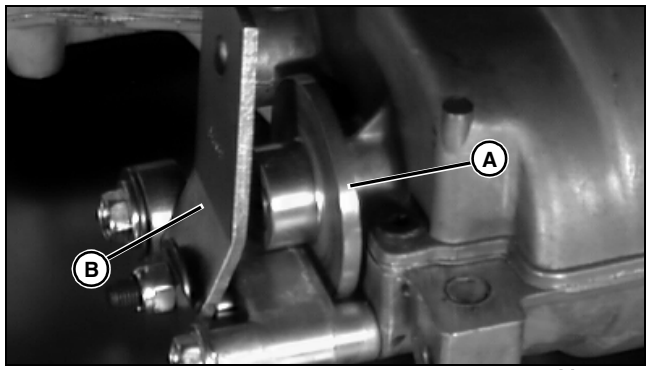
2. Drive tractor on dry pavement in a safe, open and level area at fast idle in high gear. Apply a “panic stop” force (no more than 50 pounds of force on gear models) to brake pedal—tractor must stop within **1.52 M (5 ft)** at full speed forward.

3. Repeat Steps 2—3 for reverse. Tractor must stop within **0.76 M (2.5 ft)** at full speed reverse.

4. If tractor fails test, inspect brake assembly components, replace as necessary. Repeat all adjustment procedures and drive tests.

Brake Adjustment – Gear

Procedure:



M89104

1. First check for brake disc (A) contacting the case and brake lever (B) contacting its mounting bracket, top or bottom.

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