Z525E, Z535M, Z540M, Z535R, Z540R ZTrak Residentia Mower Diagnostic and Repair

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TECHNICAL MANUAL

Ztrak Mowers models Z525E, Z535M, Z540M, Z535R, Z540R (SN. 010001-)

TM140419 11 JAN 16 (ENGLISH)

John Deere Commercial and Consumer Equipment Lawn and Garden
Pinted by Belgreen

TM140419

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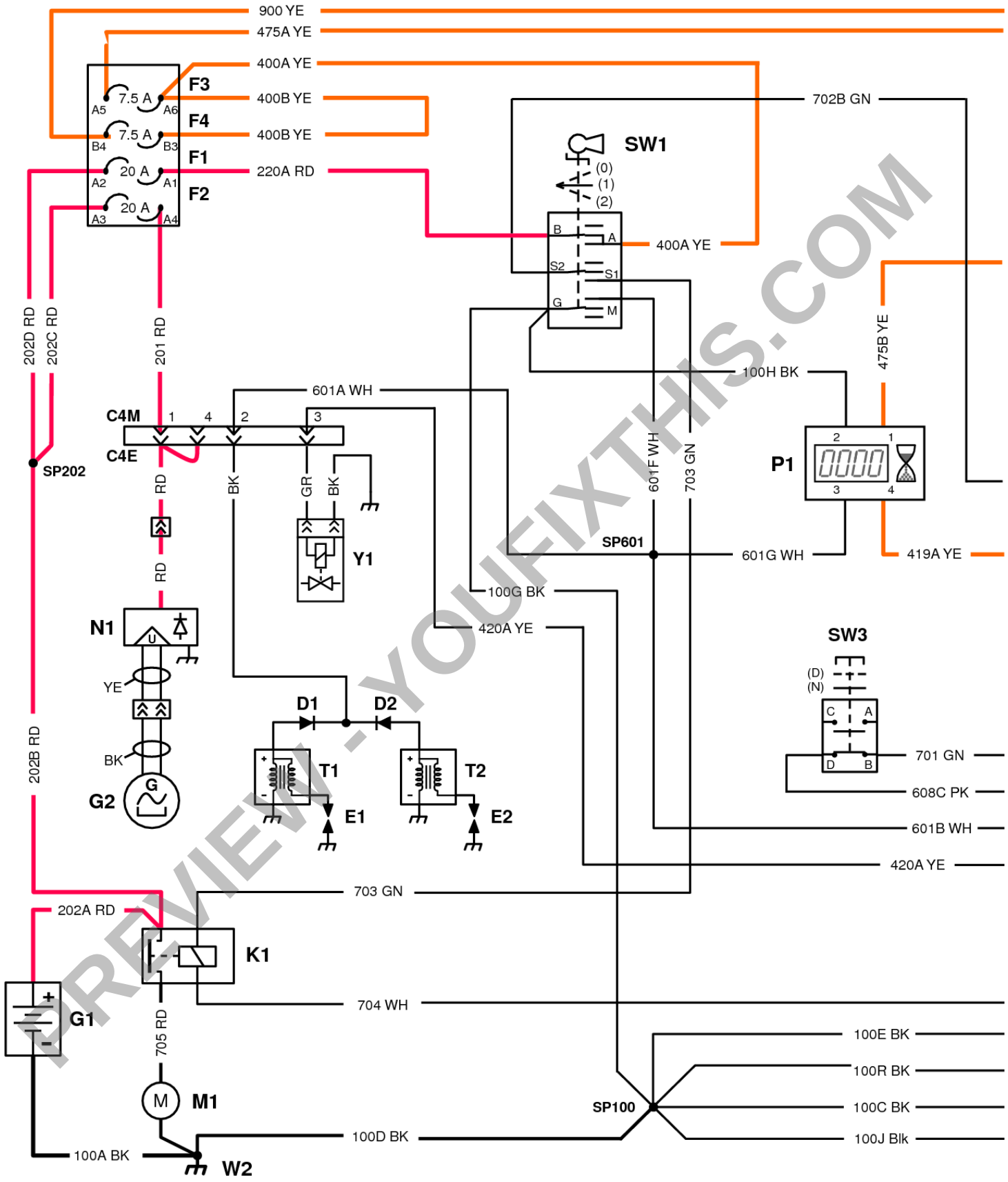
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Group 40 - Wiring Schematics

Main Electrical Schematic (Z525E, Z535M, Z535R)



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Main Schematic (1 of 2)

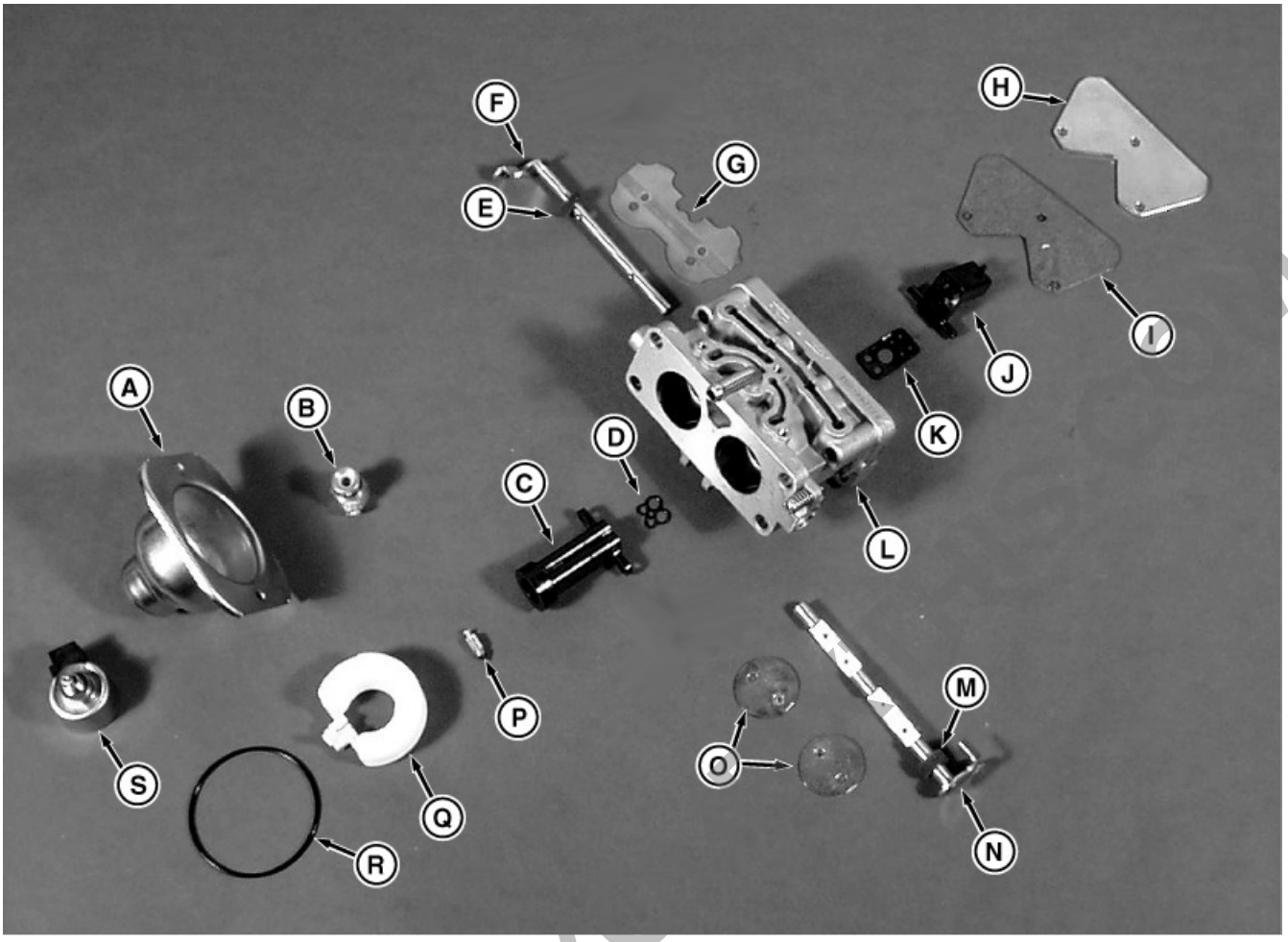
LEGEND:

D1, D2	Diodes
E1, E2	Spark Plugs
G1	Battery

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Repair Two Barrel Carburetor

Component Location:



Carburetor Component Location

LEGEND:

A	Fuel Bowl
B	Main Jet
C	Emulsion Tube Body
D	Rubber Gasket
E	Foam Seal
F	Choke Shaft
G	Choke Valve
H	Top Plate
I	Top Plate Gasket
J	Discharge Nozzle
K	Rubber Gasket
L	Carburetor Body
M	Foam Seal
N	Throttle Shaft
O	Throttle Valve Plates
P	Inlet Valve
Q	Float
R	O-ring
S	Fuel Shutoff Solenoid

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Group 10 - General Specifications

Metric Cap Screw Torque Values—Grade 7

→NOTE:

When bolting aluminum parts, tighten to 80% of torque specified in table.

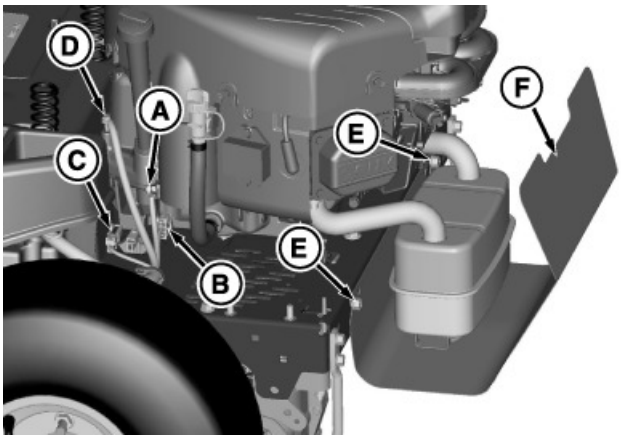
Metric Cap Screw Torque Values—Grade 7

Size	N˙m	(lb-ft)
M6	9.5—12.2	(7—9)
M8	20.3—27.1	(15—20)
M10	47.5—54.2	(35—40)
M12	81.4—94.9	(60—70)
M14	128.8—146.4	(95—108)
M16	210.2—240	(155—177)

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Remove Engine



LEGEND:

A	Starter Terminal
B	Engine Wire Harness Connector
C	Clutch Wire Harness Connector
D	Screw
E	Screws
F	Muffler Shield

Engine and Clutch Wire Harness Connector

[1] - Park machine safely. See the “Safety Section”.

[2] - Raise seat.

[3] - Remove battery access cover and disconnect negative (—) battery cable.

[4] - Drain engine oil into a suitable container. (Oil capacity with filter is approximately **1.9 L (2.0 US qt)** .

[5] - Remove engine guards. (See Remove and Install Engine Guard .)

[6] - Disconnect wire from starter terminal (A).

[7] - Unplug main wire harness to engine wire harness connector (B).

[8] - Unplug main wire harness to clutch wire harness connector (C).

[9] - Remove the cap screw (D) securing ground wires to engine block. Remove ground wires.

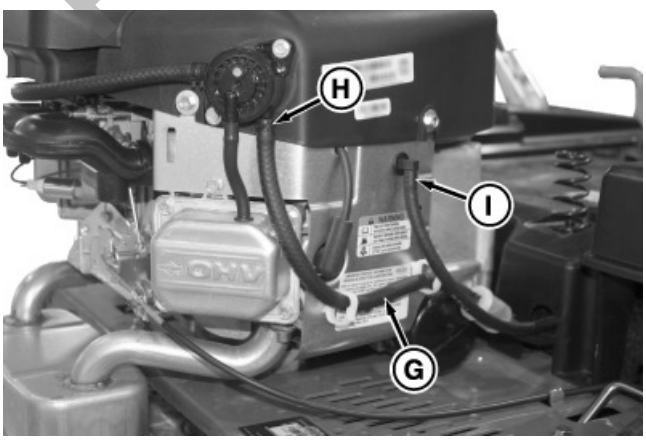
[10] - Loosen two screws (E) and remove muffler shield (F).

[11] -

CAUTION:

Avoid Injury! Fuel vapors are explosive and flammable:

- ***Do not smoke while handling fuel.***
- ***Keep fuel away from flames or sparks.***
- ***Shut off engine before servicing.***
- ***Cool engine before servicing.***
- ***Work in a well-ventilated area.***
- ***Clean up spilled fuel immediately.***



LEGEND:

G	Fuel Line
H	Clamp
I	Vent Line

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restricts air flow to the carburetor, the low pressure in the venturi drops even further, resulting in a higher pressure differential between the fuel bowl and the venturi. Therefore, a dirty air filter can enrich the air/fuel mixture to the point that performance will drop.

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

Vent Tube Location

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

Engine Will Not Crank, V-Twin

66

Engine Will Not Crank (V-Twin)

Symptom	Problem	Solution
Engine Will Not Crank	Battery	a. Charge and test battery. (See Charge Battery , and Battery Load Test .)
		b. Replace the battery if it will not take or hold a charge.
	Starting motor does not rotate when ignition switch is turned to start position.	a. Cranking circuit problem. (See Interlock Circuit Operation .)
		b. Key switch malfunction. (See Key Switch Test .)
		c. Starting relay malfunction. (See Relay Test .)

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Group 20 - Machine Specifications

Machine Specifications Z525E, Z535M, Z540M

→NOTE:

Specifications and design subject to change without notice.

General Specifications

Model:	Z525E	Z535M	Z540M
Ground Speed:			
Forward	0—13.7 km/h (0—8.5 mph)		
Reverse	0—5.6 km/h (0—3.5 mph)		

— **Engine:**			
Make	Briggs & Stratton		Kawasaki
Engine Power Information	http://www.briggsandstratton.com		http://www.kawasaki-criticalpower.com/
Type	Gas		
Model	44 ELS	44 Cyclonic	FS730V
Cylinders	V-twin		
Low Idle Speed	1300 ± 100 rpm		—
Low Idle Speed (Governed)	2250 ± 450 rpm		1900 ± 150 rpm
High Idle Speed	3350 ± 100 rpm		
Displacement	0.724 L (44.18 in^3)		0.726 L (44.3 in^3)
Bore	79.25 mm (3.12 in)		78.0 mm (3.07 in)
Stroke	73.40 mm (2.89 in)		76.0 mm (2.99 in)

Lubrication	Pressurized	
Crankcase Capacity	1.8 L (1.9 qt)	2.0 L (2.1 qt)
Crankcase (with Filter)	1.9 L (2.0 qt)	2.1 L (2.2 qt)
Cooling	Air Cooled	
Air Cleaner	Paper with Foam Element	Dual stage element
Engine Shut Off	Key Switch	

Fuel System:	
Type	Pulse Pump
Tank Capacity	13.2 L (4.5 gal)

Electrical System:		
Type	12 V DC Negative Ground	
Stator Output	6—16.6 A regulated at 12.2—13.8 V DC	20 A regulated at 12.2—13.8 V DC
Battery	12 V	
Battery Type	BCI Group U1	
Spark Plug Torque	20 N·m (180 lb·in)	22 N·m (195 lb·in)
Spark Plug Gap	0.76 mm (0.030 in)	
Ignition Coil Air Gap	0.20—0.30 mm (0.008—0.012 in)	0.20—0.40 mm (0.008—0.016 in)

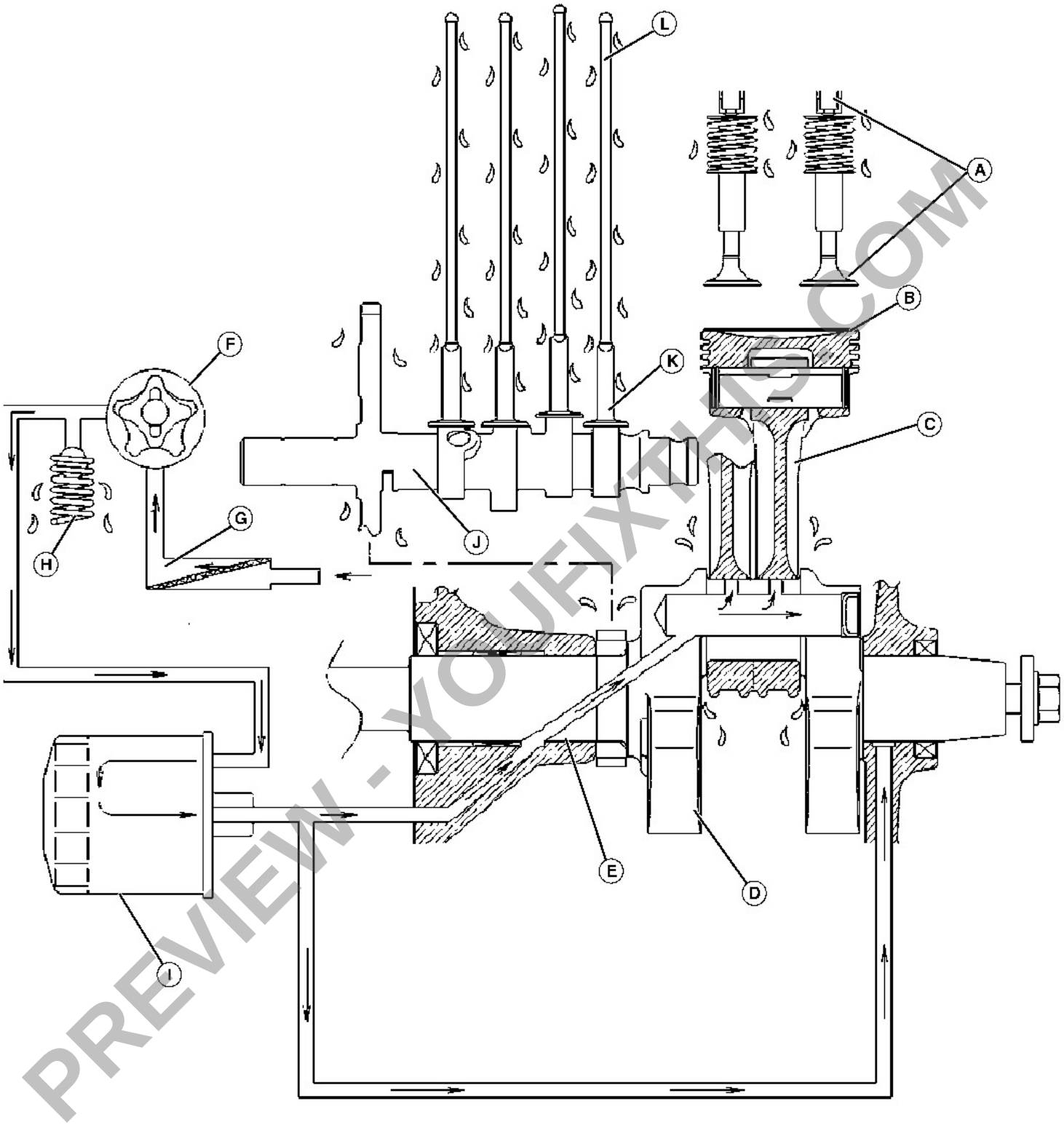
Power Train:	
Transaxle	Tuff Torq TZT7D
Transaxle Type	Hydraulic Infinite Variable Speed
Drive	2 Transaxles (Mirror Image of Each Other)
Brake Type	Internal Disc
Transaxle Oil Capacity (approximate)	1550—1650 mL (53.4—55.8 oz)

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Group 30 - Theory of Operation

Engine Oil Flow Chart



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Engine Oil Flow Chart

LEGEND:

A	Rocker Arm and Valve
B	Piston
C	Connecting Rod
D	Crankshaft
E	Crankshaft Main Journal
F	Oil Pump
G	Pickup Screen
H	Oil Pressure Relief Valve
I	Oil Filter
J	Camshaft

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Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.



CAUTION:

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

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

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Group 10 - Engine Repair

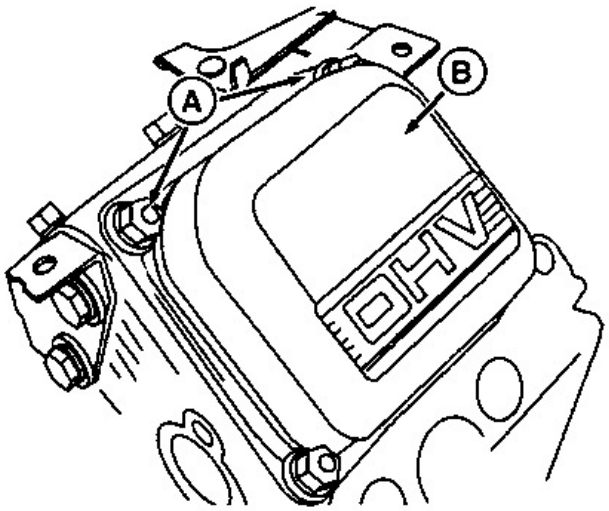
Summary of References

- Remove Engine
- Install Engine
- Remove Upper Blower Housing
- Install Upper Blower Housing
- Changing Engine Oil and Filter
- Cleaning Air Intake Screen and Engine Fins
- Cleaning Engine Shroud
- Replace Fuel Filter
- Cleaning Engine Screen Guard
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- Install Cylinder Air Guides
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- Install Cylinder Head
- Inspect and Repair Cylinder Head
- Remove Valve
- Inspect and Repair Valve
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- Assemble Piston and Rod
- Install Piston and Rod
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- Hone Cylinder Bore
- Clean Cylinder Bore
- Resize Cylinder Bore
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- Inspect Magneto Bearing
- Inspect PTO and Cam Bearing
- Service Breather Valve
- Remove Oil Pump
- Install Oil Pump
- Inertia Starting Motor Components
- Remove and Install Starting Motor
- Disassemble Inertia Starting Motor
- Assemble Inertia Starting Motor
- Replace Inertia Pinion Gear

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Remove Cylinder Head



LEGEND:

A	Cap Screw
B	Valve Cover

Valve Cover

[1] -

IMPORTANT:

Avoid Damage! Mark all parts when disassembling cylinder heads to prevent interchanging.

Remove carburetor and associated components. (See Remove Two Barrel Carburetor .)

[2] - Disconnect spark plug leads. Remove spark plugs.

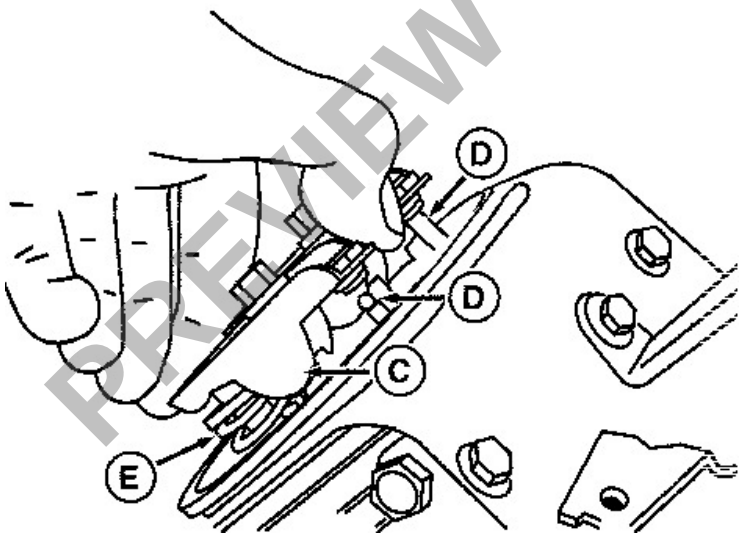
[3] - Loosen governor lever nut.

[4] - Remove governor control bracket and governor lever.

[5] - Remove cylinder air guides. (See Remove Cylinder Air Guides .)

[6] - Remove cap screws (A), and valve cover (B). Repeat for second cylinder, if being removed.

[7] -



LEGEND:

C	Rocker Arms
D	Push Rod
E	Valve Spring

Valve Spring

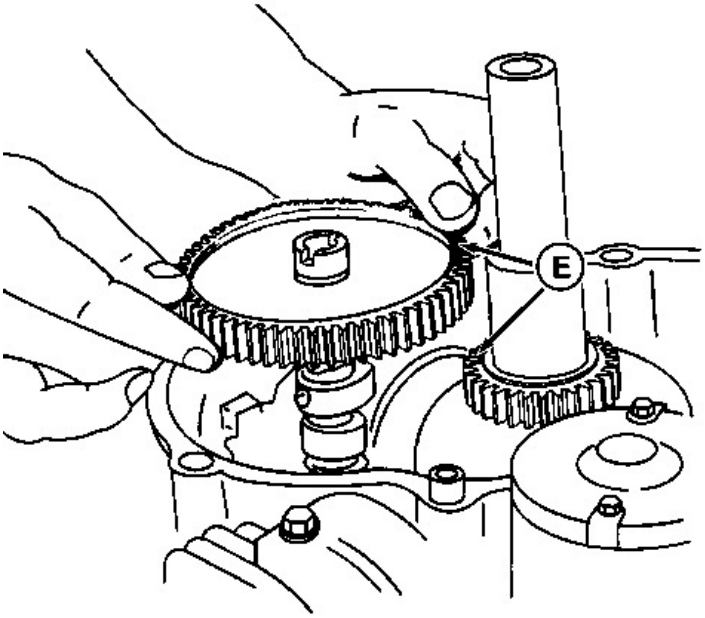
Release valve spring pressure from rocker arms (C) by rocking the arm against spring pressure and allowing push rod (D) to drop out of the rocker arm socket. Push rod will move out of position, releasing valve spring (E) pressure.

[8] -

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LEGEND:
E Timing Marks



Crankshaft Timing Marks

[1] - Remove any old gasket material from mating surfaces. Place new crankcase cover gasket on crankcase.

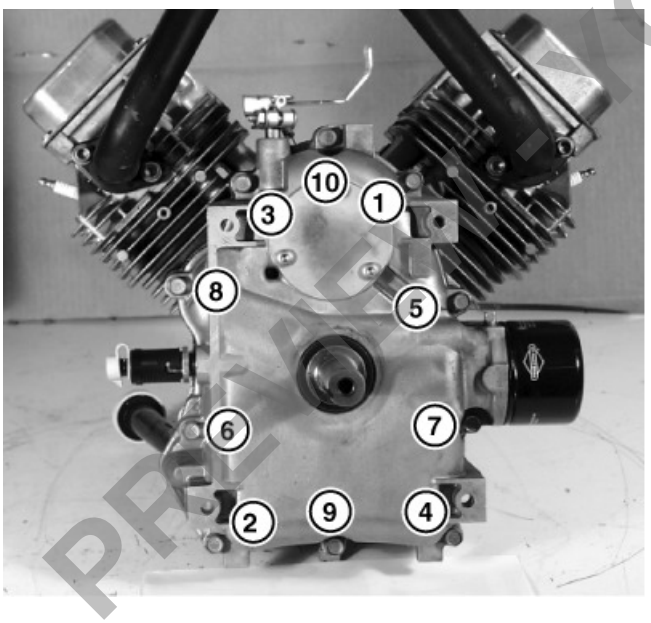
[2] - Install crankshaft and camshaft, aligning timing marks (E) accordingly.

[3] - Lubricate thrust washer, governor gear and governor cup and install.

[4] - Install oil pump. (See Install Oil Pump .)

[5] - Take care to protect the oil seal while assembling crankcase cover. No force should be used.

[6] -



Cover Bolts

Tighten cover bolts to specification in the sequence shown.

[7] - Install cylinder heads. (See Install Cylinder Head .)

[8] - Install flywheel. (See Install Flywheel .)

[9] - Install intake manifold and carburetor assembly. (See Install Two Barrel Carburetor .)

[10] - Install governor lever and governor springs.

[11] - Install oil fill tube and dipstick assembly.

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Item	Measurement	Specification
Connecting Rod Big End (Maximum)	ID	40.04 mm (1.58 in.)
Bearing Journal-to-Connecting Rod Journal	Centerline-to-Centerline	37.95—38.05 mm (1.4941—1.4980 in.)
Cylinder Hone	Over Final Bore	0.006—0.008 mm (0.0002—0.0003 in.)

Replace Fuel Filter, FS730V

CAUTION:

Fuel vapors are explosive and flammable:

- ***Do not smoke while handling fuel.***
- ***Keep fuel away from flames or sparks.***
- ***Shut off engine before servicing.***
- ***Cool engine before servicing.***
- ***Work in a well-ventilated area.***
- ***Clean up spilled fuel immediately.***

[1] -

IMPORTANT:

Incorrect installation of fuel filter may cause engine damage. Install the filter with the arrow pointing in the direction of fuel flow (toward the engine) for proper operation.

→NOTE:

Change fuel filter when fuel is low.

Park machine safely. (See “Park Machine Safely” in Safety Section.)

[2] - Allow machine to cool down.

[3] - Disconnect negative (—) battery terminal.

[4] - Place a drain pan under filter and hoses.

[5] - Disconnect fuel hose from the outlet side of the fuel filter, and drain gasoline into a properly marked container.

[6] - Remove the fuel filter from the inlet fuel hose. Discard filter.

[7] - Install new fuel filter making sure fuel filter is installed with arrow pointing in direction of fuel flow.

[8] - Install clamps and check for leaks.

[9] - Connect negative battery terminal.

Remove and Install Fuel Pump, FS730V

Removal:

[1] - Park machine safely. (See “Park Machine Safely” in Safety Section.)

[2] - Allow machine to cool down.

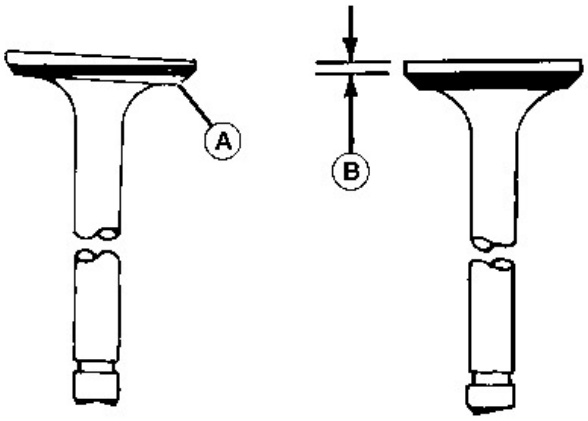
[3] -

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[2] - Inspect valve head, face, and stems for defects. Replace if necessary.

[3] -



LEGEND:

A	Warped Valves
B	Valve Margin

Warped Valves and Margin

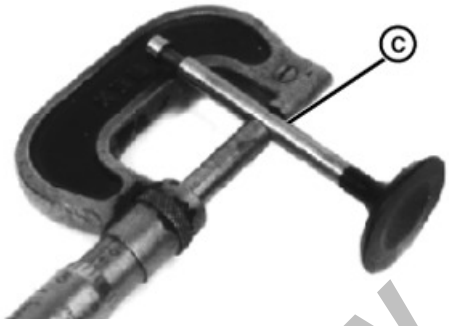
Replace warped valves (A) or valves with margin (B) less than specification.

Item	Measurement	Specification
Valve Margin (Minimum)	Width	0.35 mm (0.014 in.)

[4] -

LEGEND:

C	Valve Stem Diameter



Valve Stem

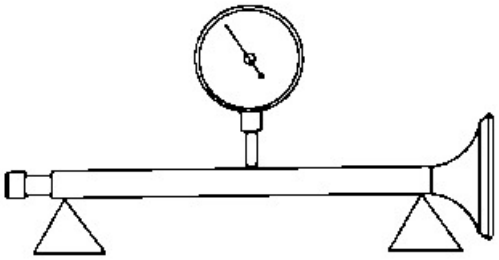
Measure the diameter of the valve stem (C) in two directions at right angles, at four different positions on the stem. Replace if diameter is less than specification.

Item	Measurement	Specification
Intake Valve Stem (Minimum)	OD	5.95 mm (0.234 in.)
Exhaust Valve Stem (Minimum)	OD	5.93 mm (0.233 in.)

[5] -

IMPORTANT:

Do not grind the exhaust valve or life will be shortened.



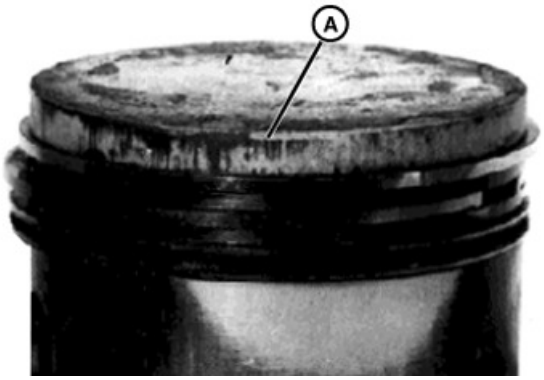
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Analyze Piston Ring Wear, FS730V

Rings of the wrong size or rings having improper end gaps will not conform to the shape of the cylinder. This results in high oil consumption and excessive blow-by.

Ring end gaps should be staggered on the piston during installation.



LEGEND:

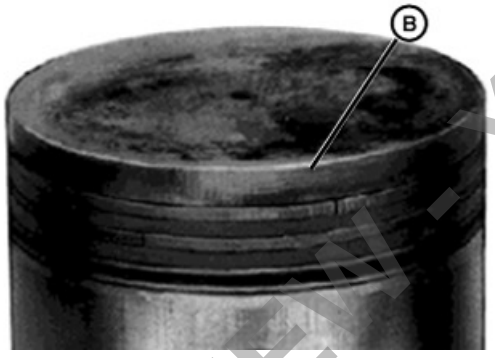
A	Scuffing or Scoring

Scuffing

Light scuffing or scoring (A) of both rings and piston occurs when unusually high friction and combustion temperatures approach the melting point of the piston.

When this condition exists, it is due to one or more of the following probable causes:

- Dirty cooling shroud and cylinder head.
- Lack of cylinder lubrication.
- Improper combustion.
- Wrong bearing or piston clearance.
- Too much oil in crankcase, causing fluid friction.



Deposits

The engine operating at abnormally high temperature may cause varnish, lacquer, or carbon deposits (B) to form in the piston ring grooves, making the piston rings stick. When this happens, excessive oil consumption and blow-by will occur.

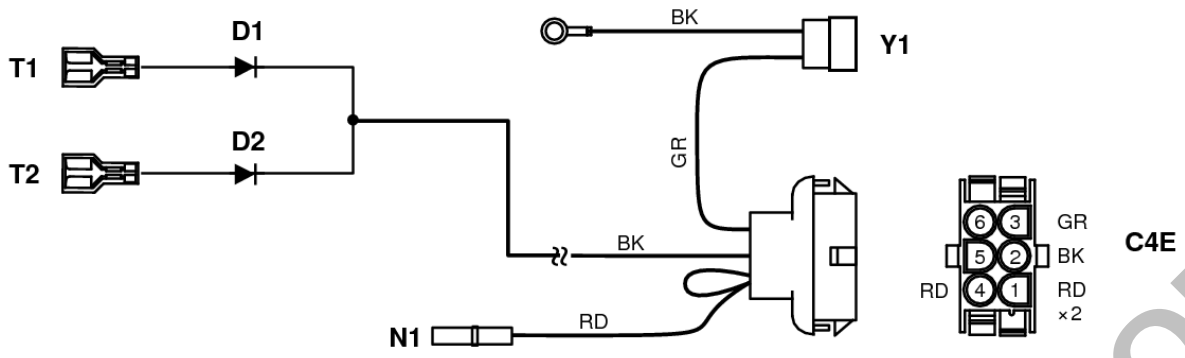
Engine overheating and ring sticking is usually caused by one or more of the following:

- Overloading.
- Incorrect ignition timing.
- Lean fuel mixture.
- Dirty cooling fins.
- Incorrect oil.
- Low oil supply.
- Stale fuel.

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Engine Wiring Harness, Z525E, Z535M, Z535R



Engine Wiring Harness

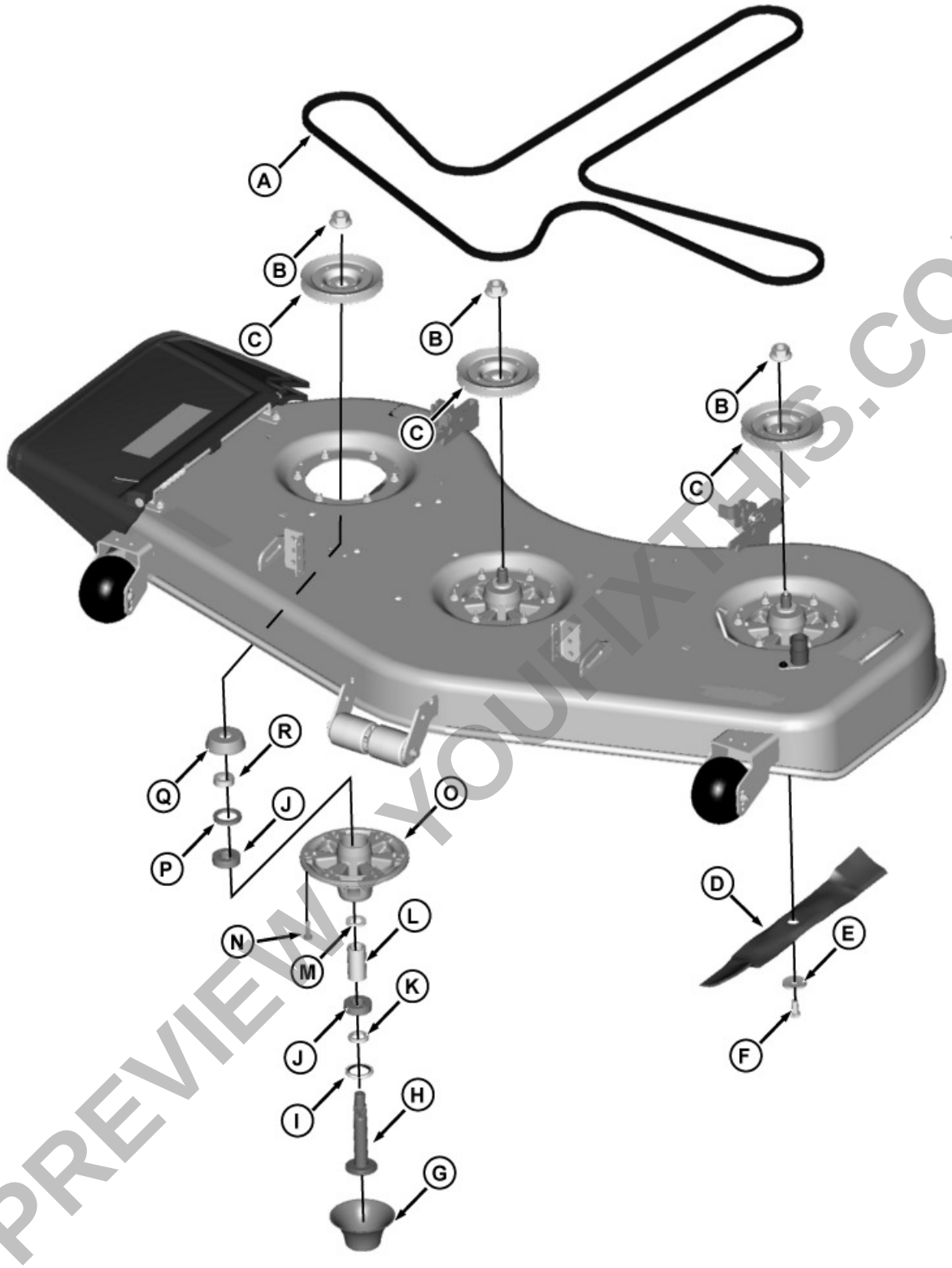
LEGEND:

C4E	Main Harness Connector
D1	Diode
D2	Diode
N1	Voltage Regulator/Rectifier
T1	Ignition Coil
T2	Ignition Coil
Y1	Fuel Shutoff Solenoid

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Spindles and Sheaves Components (60HC Deck)



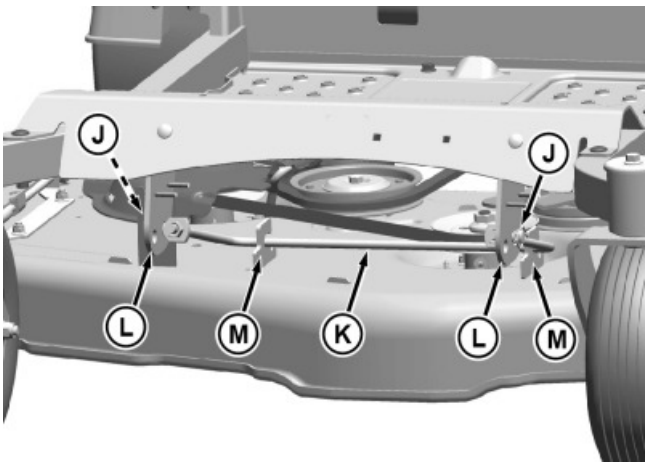
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Spindles and Sheaves Components

LEGEND:

A	Drive Belt
B	Locknut (3 used)
C	Sheave (3 used)
D	Blade (3 used)
E	Washer (3 Used)
F	Cap Screw (3 used)
G	Lower Deflector (3 used)
H	Spindle (3 used)
I	Oil Seal (3 used)

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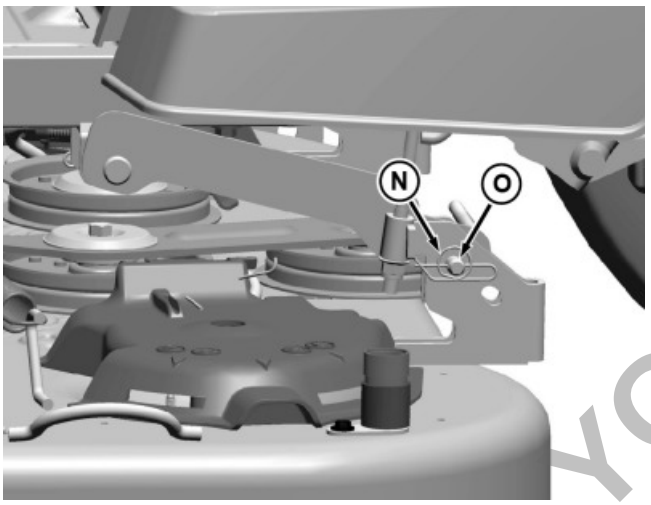
LEGEND:

J	Locking Clip
K	Front Draft Rod
L	Deck Bracket
M	Mower Hanger Bracket

Front draft rod.

48A and 54A Mower Deck Only: Remove locking clips (J), and remove front draft rod (K) from deck brackets (L) and mower hanger brackets (M).

[8] -



LEGEND:

N	Spring Clip
O	Pin

Remove spring clip.

Remove spring clip (N) and pin (O) from each side of rear hanger bracket.

[9] - Raise draft arms to transport position:

a. Pull and raise mower lift lever fully upward.
b. Install pin just below lift lever to lock into raised position.

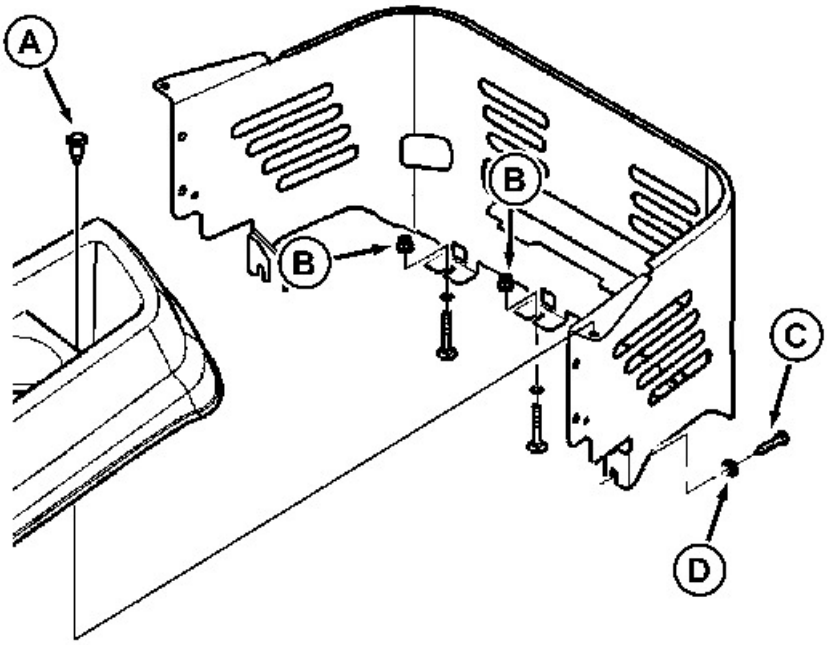
[10] - Rotate front caster wheels to maximize clearance.

[11] - Slide mower out from under the machine.

- Do not operate the machine without the mower deck: Machine may become unstable without the mower deck attached. Move machine only by hand.

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Engine Guard

LEGEND:

A	Push Pin
B	Nut
C	Screw
D	Washer

Remove Engine Guard

[1] - Remove push pins (A) from both sides.

[2] - Loosen two nuts (B).

[3] - Remove screw (C) and washer (D) from both sides.

[4] - Slide engine guard from frame.

Install Engine Guard

[1] - Slide engine guard onto frame and align with holes in frame.

[2] - Install two screws (C) and washers (D), tighten two nuts (B), and install two push pins (A).

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Test Engine Oil Pressure, V-Twin

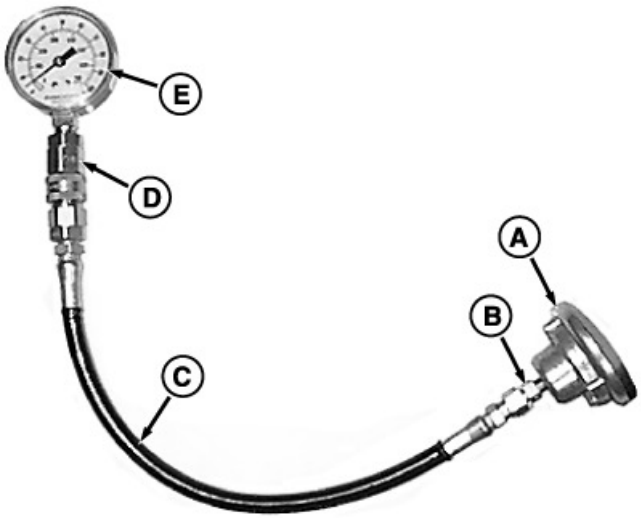
Reason:

To verify that the engine has enough oil pressure to lubricate the internal engine components.

Test Conditions

- Perform test procedure with engine level.
- Perform test procedure with engine level.
- Disconnect spark plug wires and allow engine to cool.

Procedure:



LEGEND:

A JT07262 Oil Pressure Adapter with O-ring (Only required on engines without test ports)
B JT05487 Connector
C JT03017 Hose Assembly
D JT03262 Coupler
E JT07034 Gauge

Oil Pressure Tester

[1] - Drain engine oil from oil filter.

[2] - Remove oil filter and wipe filter base clean.

[3] - Install pre-assembled JT07262 Adapter, JT05487 Connector, JT03017 Hose Assembly, JT03262 Coupler, and JT07034 Gauge on to oil filter base. ONLY hand-tighten adapter to oil filter base.

Oil Pressure Adapter with O-ring

JT07262

To measure oil pressure.

Connector

JT05487

To measure oil pressure.

Hose Assembly

JT03017

To measure oil pressure.

Coupler

JT03262

To measure oil pressure.

Gauge

JT07034

To measure oil pressure.

[4] - Check crankcase oil level and adjust to full mark.

[5] - Monitor oil pressure during cranking, if oil pressure is below 28 kPa (4 psi), STOP engine immediately and correct cause

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Check and Adjust Choke, FS730V

Reason

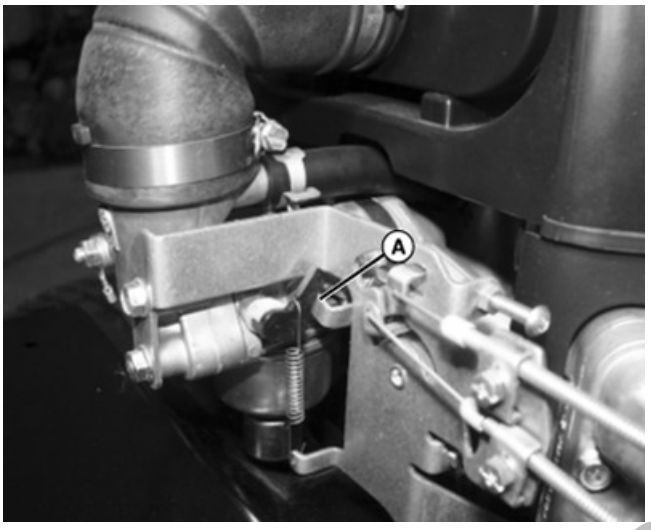
To make sure the choke plate is fully open when the choke lever is in the open position and fully closes when the choke lever is put in choke position.

Choke adjustment

Test Conditions:

- Park machine safely. (See “Park Machine Safely” in Safety Section.)
- Key switch in OFF position.

[1] -

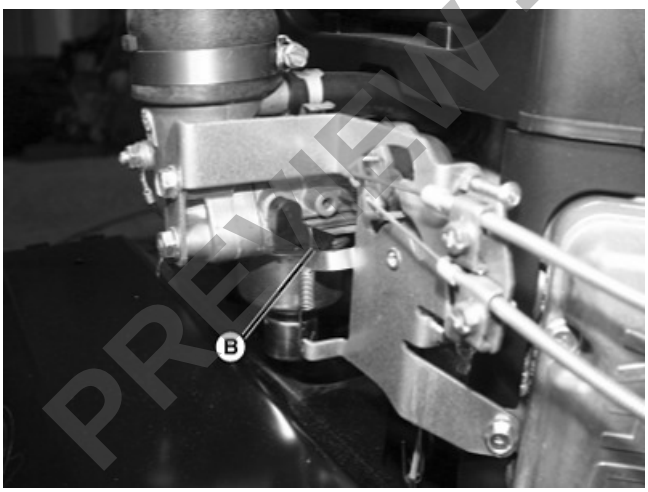


LEGEND:
A Choke Lever

Choke Lever

Put the choke knob or lever to the ON position. Apply upward finger pressure to choke lever (A) to see if it can be moved any further. If choke lever moves further choke is not closing completely.

[2] -



LEGEND:
B Gap

Gap

Push choke knob or lever to the OFF position. There should be a slight gap (B) between choke shaft and the choke actuator.

Results

If the choke valve plate does not move to either the full open or full closed position, perform Adjustment Procedure.

Adjustment Procedure

Test Conditions:

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Cranking Circuit Operation

Function:

To energize the starter motor to crank the engine.

Operating Conditions:

- Park brake locked
- PTO switch OFF
- Motion control handles in NEUTRAL position
- Key switch in START position

Theory of Operation:

Start relay K1 connects starter motor M1 to the battery. Energizing the relay requires both the power and ground circuits to the relay coil be complete.

Turning key switch SW1 to RUN or START provides switched power through fuse F3 and hour meter P1 to neutral switch SW2.

Power reaches SW6 PTO switch terminal 3 via neutral switches SW2 and SW3 (in neutral position) and park brake switch SW4 (brake engaged).

With the PTO switch OFF, power passes though to switch terminal 9 and onto key switch terminal S1.

Moving the key switch to START provides power to switch terminal S2 and the K1 start relay coil.

Interlock relay K2 controls the ground circuit for the start relay coil. Power from PTO switch terminal 9 flows through diode D3 and activates the interlock relay, creating the ground path for the start relay.

The D3 diode prevents the start relay from being energized when the SW6 PTO switch is ON and the operator is on the seat.

Energizing the start relay closes the relay main contacts, supplying battery power to the starter motor. The spinning motor engages the flywheel, cranking the engine.

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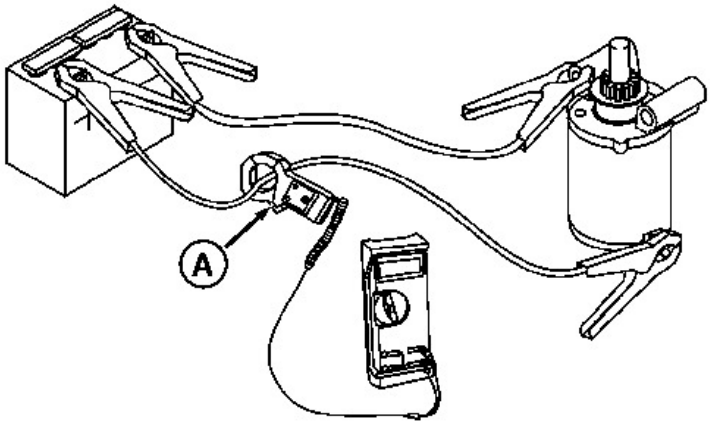
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Starting Motor Amperage Draw Test: No Load, B&S

Reason:

To determine starting motor condition under no load conditions.

Procedure:



LEGEND:
A Current Clamp

Starting Motor Amperage Draw Test, No Load

CAUTION:

Do not clamp starting motor housing in vise or strike with a hammer. Clamp only on the mounting bracket. Starting motors contain two ceramic magnets that can be broken or cracked if the motor housing is hit, deformed or dented.

[1] - Remove starting motor from machine and clamp the starting motor mounting bracket in a vise.

[2] - Connect JT02153 current clamp (A) RED lead to the VOLTS jack of the JT05791A multimeter and the BLACK lead of the current clamp to the COM jack on the multimeter.

Current Clamp

JT02153

To measure current.

Multimeter

JT05791A

To read current in millivolts.

[3] - Connect the negative jumper cable to the battery negative post and the frame of the starting motor.

[4] - Connect the positive jumper cable to the positive post of the battery.

[5] - Connect current clamp RED lead to the VOLTS jack of the multimeter and the BLACK lead of the current clamp to the COM jack on the multimeter.

[6] - Clamp jaws of current clamp around the positive jumper cable.

[7] -

→NOTE:

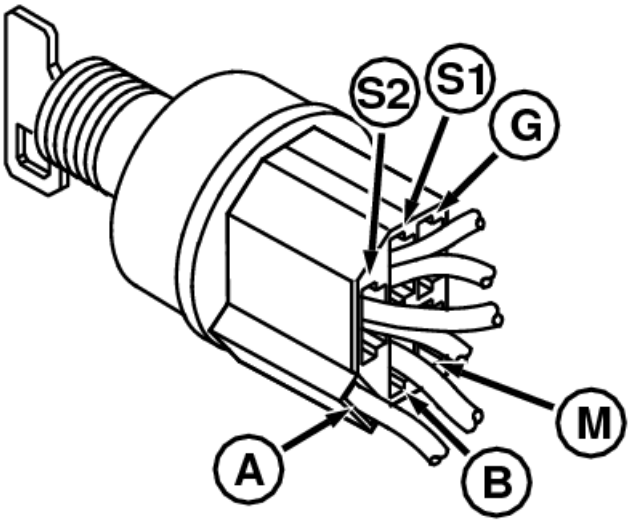
If using a multimeter other than JT05791A, use a meter that will read millivolts. Millivolts = current in amps; 1mV = 1 amp.

Set the current clamp to 2000A and the multimeter to 300mV.

[8] -

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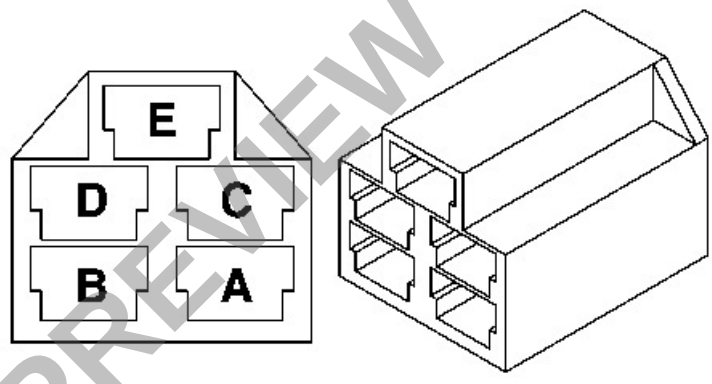


Key Switch Connector

Layout

Key Switch Connector	
Terminal	**Circuit Number**
A	400A
B	220A
G	100G, 100H
M	601F
S1	703
S2	702B

Left Handle Neutral Switch Connector



Left Handle Neutral Switch Connector

Left Handle Neutral Layout

Left Handle Neutral Switch Connector	
Terminal	**Circuit Number**
A	—
B	419A, 419B
C	—
D	701

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