GS25, GS30, GS45, GS75 HD45, HD75, Commercial Walk–Behind Mowers

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TECHNICAL MANUAL

John Deere
Worldwide Commercial and
Consumer Equipment Division

TM1598 (01Nov97)
Replaces TM1598 (01Mar97)
And TM1598 (01Jul96)

Litho in U.S.A

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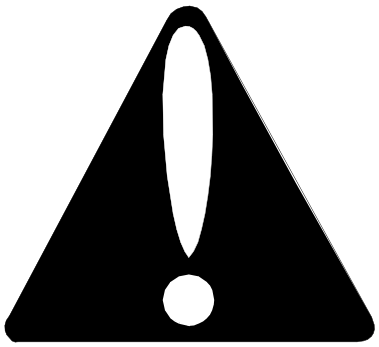
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RECOGNIZE SAFETY INFORMATION



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.

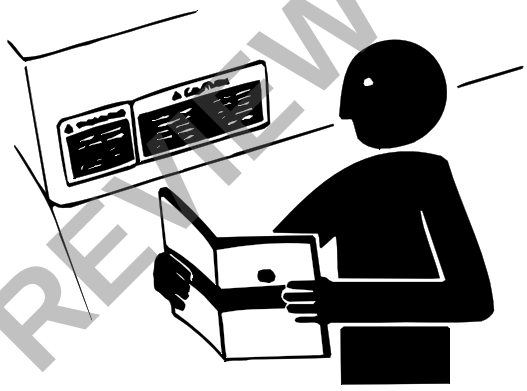
Follow recommended precautions and safe servicing practices.

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

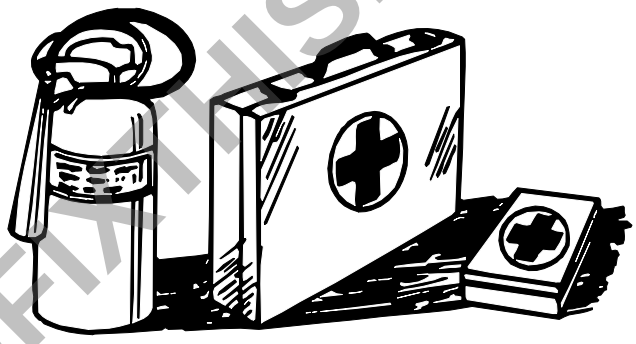


Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

HANDLE FLUIDS SAFELY-AVOID FIRES

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.

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SPECIFICATIONS

ENGINE

	GS25	GS30	GS45, HD45	GS75, HD75
Horsepower	9.3 Kw (12.5 hp)	9.7 Kw (13 hp)	10.5 Kw (14 hp)	12.7 Kw (17 hp)
Model number	FC401V-BS05	CV13S	FC420V-AS19	FC540V-AS17
Manufacturer	Kawasaki	Kohler	Kawasaki	Kawasaki
Displacement	423 cc (25.8 cu. in.)	398 cc (24.3 cu. in.)	423 cc (25.8 cu. in.)	535 cc (32.6 cu. in.)
No. of cylinders	One	One	One	One
Fast idle speed	3350 ± 100 rpm	3350 ± 100 rpm	3350 ± 100 rpm	3350 ± 100 rpm
Slow idle speed	1450 ± 75 rpm	1550 ± 75 rpm	1450 ± 75 rpm	1450 ± 75 rpm
Ignition	Solid state electronic	Solid state electronic	Solid state electronic	Solid state electronic
Crankcase capacity without oil filter	1.3 L (2.8 U.S. pt.)	1.9 L (4 U.S. pt.)	1.3 L (2.8 U.S. pt.)	1.6 L (3.4 U.S. pt.)
Crankcase capacity with oil filter	1.5 L (3.17 U.S. pt.)		1.6 L (3.4 U.S. pt.)	1.9 L (4.0 U.S pt.)
Oil filter	Standard	Standard	Standard	Standard
Type of fuel	Regular grade leaded or lead-free	Regular grade leaded or lead-free	Regular grade leaded or lead-free	Regular grade leaded or lead-free
Air cleaner	Dual stage	Dual stage	Dual stage	Dual stage
Governor	Mechanical	Mechanical	Mechanical	Mechanical
Fuel tank capacity	19 L (5.0 U.S. gal.)	19 L (5.0 U.S. gal.)	19 L (5.0 U.S. gal.)	19 L (5.0 U.S. gal.)

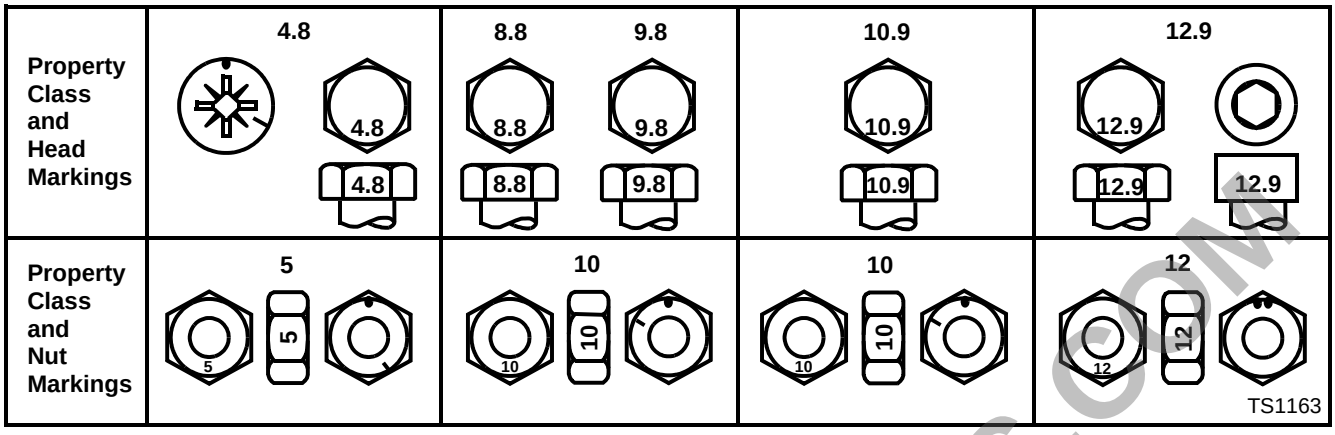
POWER TRAIN—GEAR

	GS25	GS30	GS45	GS75
Transmission	Dana, 5-speed with reverse	Dana, 5-speed with reverse	Dana, 5-speed with reverse	Dana, 5-speed with reverse
Shift mechanism	Enclosed gear with keys	Enclosed gear with keys	Enclosed gear with keys	Enclosed gear with keys
Brakes	Band	Band	Band	Band
Axle	Solid axle, 25 mm (1 in.) diameter, with grease lubricated roller bearings in wheels			
Drive wheels	330 x 165 mm (13 x 6.5 in.)	330 x 165 mm (13 x 6.5 in.)	330 x 165 mm (13 x 6.5 in.)	330 x 165 mm (13 x 6.5 in.)
Ground speeds:				
Forward speeds	5	5	5	5
Reverse Speeds	1	1	1	1
Forward Speed range	2.9 to 9.6 km/h (1.8 to 5.9 mph)	2.9 to 9.6 km/h (1.8 to 5.9 mph)	2.9 to 9.6 km/h (1.8 to 5.9 mph)	2.9 to 9.6 km/h (1.8 to 5.9 mph)
Reverse Speed Range	1.2 km/h (0.75 mph)	1.2 km/h (0.75 mph)	1.2 km/h (0.75 mph)	1.2 km/h (0.75 mph)

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METRIC FASTENER TORQUE VALUES



	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	48	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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TROUBLESHOOTING

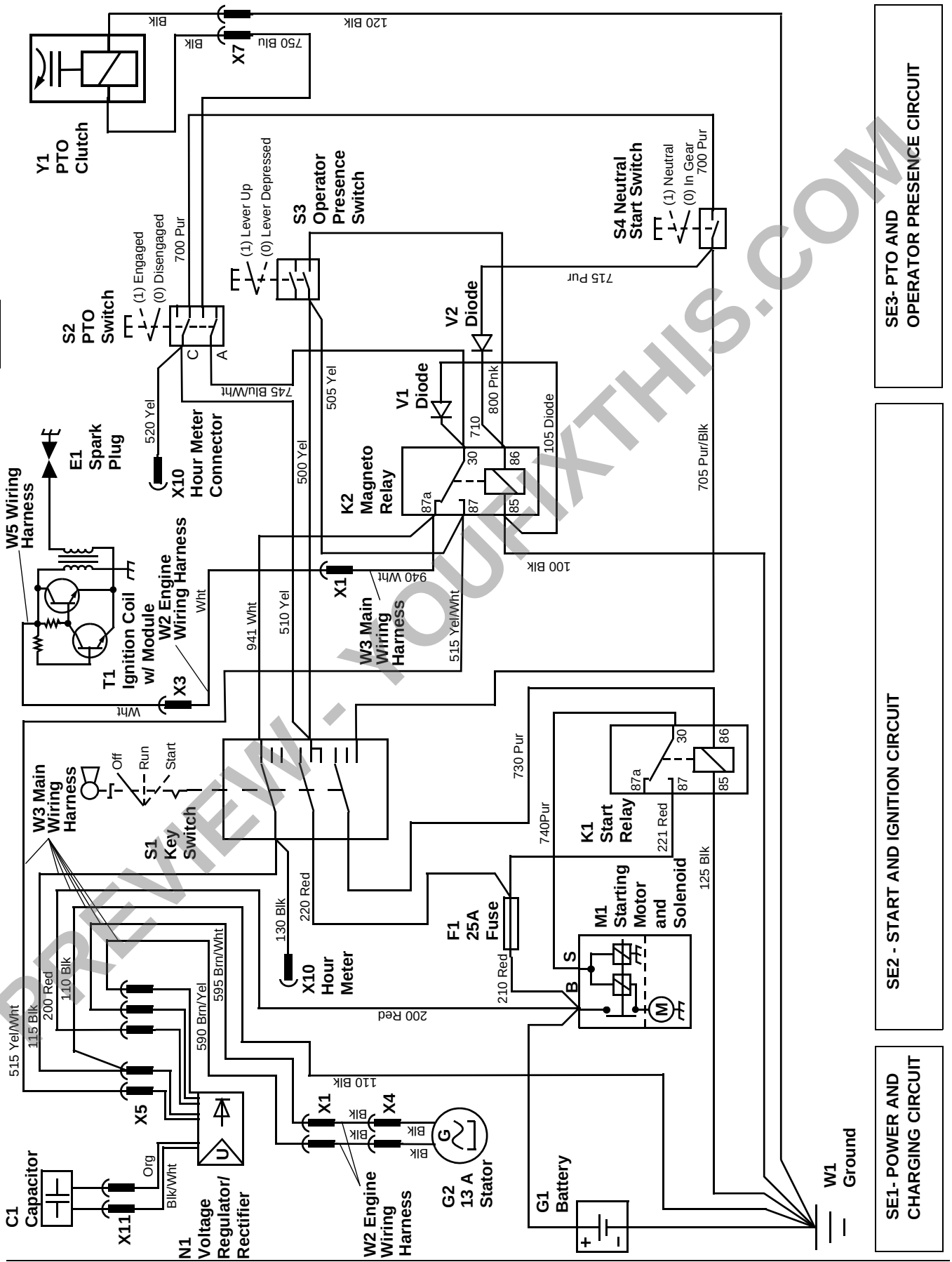
CARBURETION TROUBLESHOOTING

Problem or Symptom / Check or Solution	Hard Starting	Fuel Leak at Carburetor	Engine Floods	Will Not Idle	Rich Idle	Idles with Needle Closed	Hunts / Erratic Idle	Idles Fast-Lean	Will Not Accelerate	Over Rich Acceleration	Hesitates	Will Not Run At High Speed	Low Power	Hunts at High Speed	Runs With Needle Closed	Engine Overspeeds
Plugged Air Filter	●			●	●				●	●		●	●			
Leaky Carb Gasket				●			●	●			●					●
Throttle Or Choke Shafts Worn	●			●			●	●					●	●		●
Choke Not Functioning Properly	●															
Plugged Atmospheric Vent		●	●													
Air Bleed Restricted	●			●	●		●		●		●			●		
Damaged Or Leaky O-Ring		●					●	●						●		●
Plugged Tank Filter Or Vent	●								●		●	●	●			
Fuel Pick-up Restricted	●			●			●		●		●	●		●		
Idle Port Restricted				●			●									
Damaged Adjustment Needles	●			●	●	●	●		●			●	●	●	●	●
Incorrect Float Height			●				●		●	●			●	●		
Main Nozzle Restricted	●								●		●	●	●	●		
Dirty, Stuck Needle and Seat	●	●	●										●			
Fuel Inlet Plugged	●			●			●						●	●		

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ELECTRICAL SCHEMATIC—ELECTRIC START, KAWASAKI ENGINE



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THEORY OF OPERATION

TRANSMISSION OPERATION

Function:

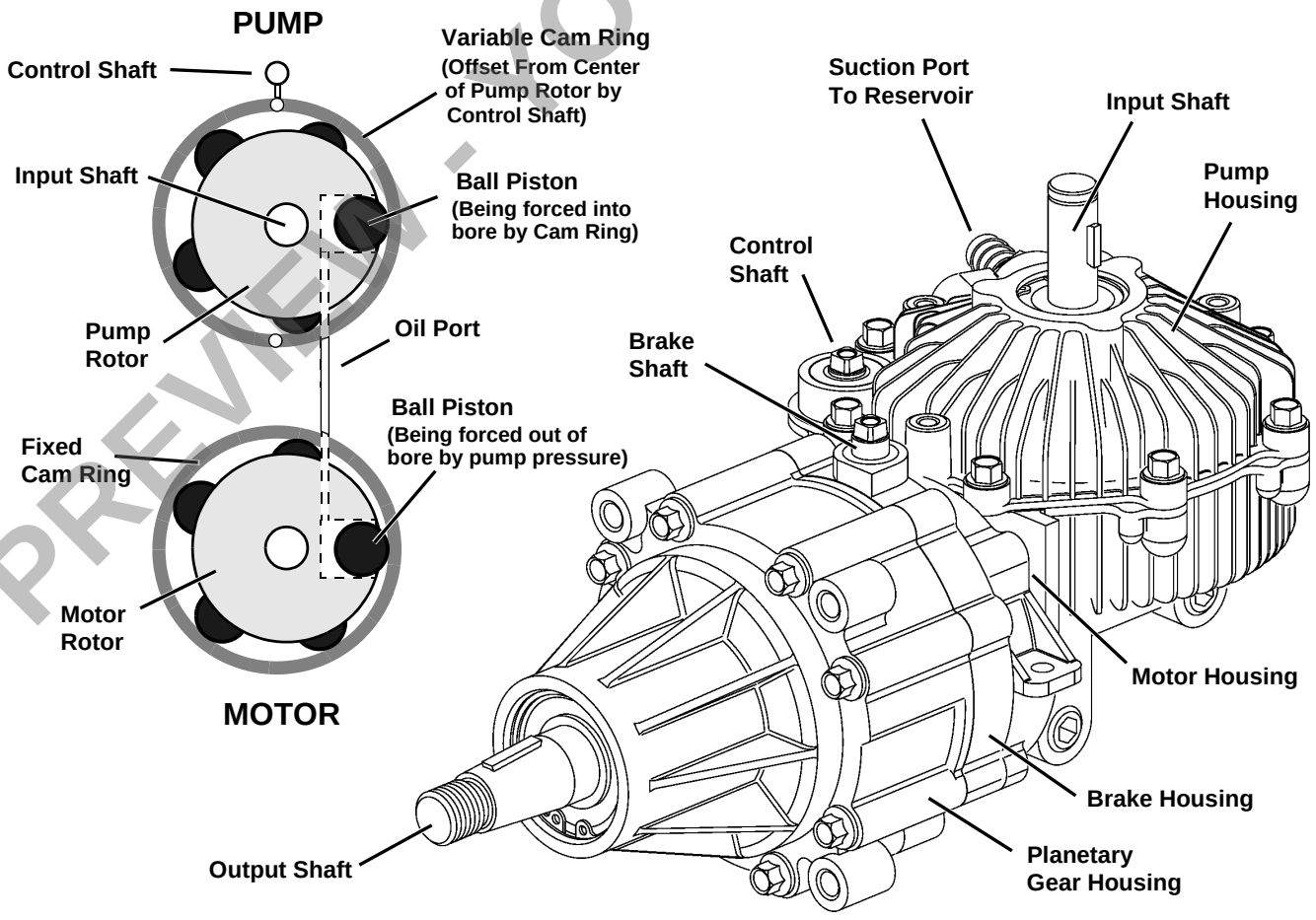
Eaton Model 778 Right Angle Transaxles are used to transmit forward and reverse power to the drive wheels. Two separate transaxles are used, one for each drive wheel. The transaxles are sealed and contain no internal serviceable parts, so disassembly is not recommended. External case seals are available through service parts, and it is recommended to check the Parts Catalog before attempting transaxle service.

Power from the engine is transmitted through the engine drive sheave, to the transmission drive belt, and into both the left and right transaxle input sheaves. The input sheaves turn the input shafts of the transaxles, driving the internal hydrostatic pumps.

The hydrostatic pump is a ball piston type, with a variable cam ring. When in neutral, the cam ring is centered on the rotation of pump rotor. As the input shaft turns the pump rotor, the ball pistons follow the race of the cam ring, and remain centered in the bore of the piston. When the control shaft is turned, the cam ring is moved off center from the pump rotor. The ball pistons continue to follow the race of the cam ring, and are now forced into and out of the pump rotor bores. This action forces oil to be pumped to one port to the motor, and suction created in the other port, providing power to drive the hydrostatic motor. If the cam ring is moved off center of the pump rotor in the opposite direction, the motor will be driven in reverse.

The hydrostatic motor is also a ball piston type, but its center axle is off center from the cam ring race. As pressure is directed to the motor, the ball pistons are forced outward in the motor bore, causing the rotor to spin. The cam race is fixed into the transmission housing, so the rotation of the motor rotor is directed to the planetary drive, turning the drive wheel axle.

The brake housing is located between planetary gear housing and the motor housing. The brakes are wet disk style and controlled by the brake shaft. The brake is only used for parking when the speed control lever is returned to neutral. The brake pads and disks are not serviceable, and no attempt should be made to open the transaxle.

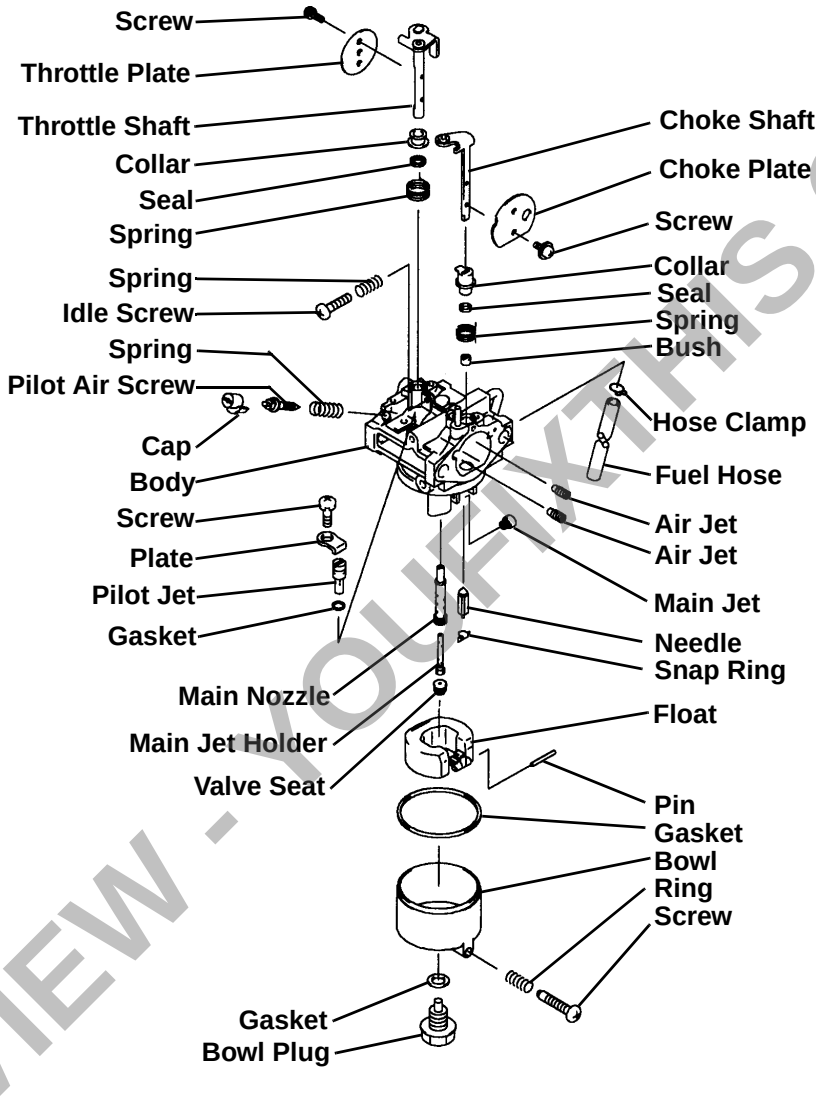


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COMPONENT LOCATION

CARBURETOR COMPONENT LOCATION–FC401V-BS05, FC420V-AS19 & 21



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TESTS AND ADJUSTMENTS

FLYWHEEL SCREEN ADJUSTMENT

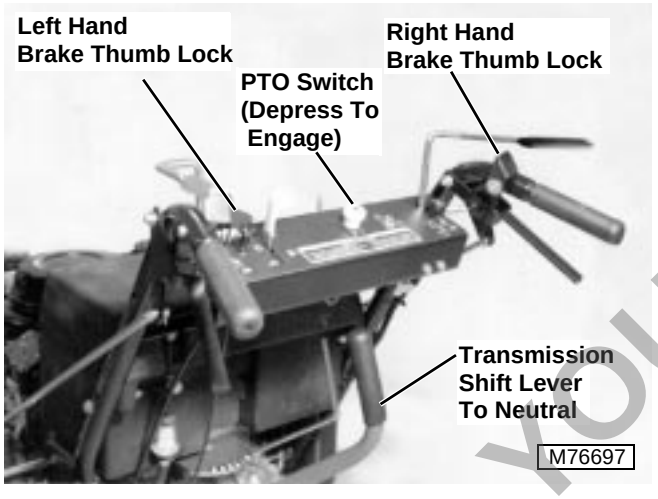
Reason:

To insure that there is sufficient gap between the flywheel screen and the blower housing.

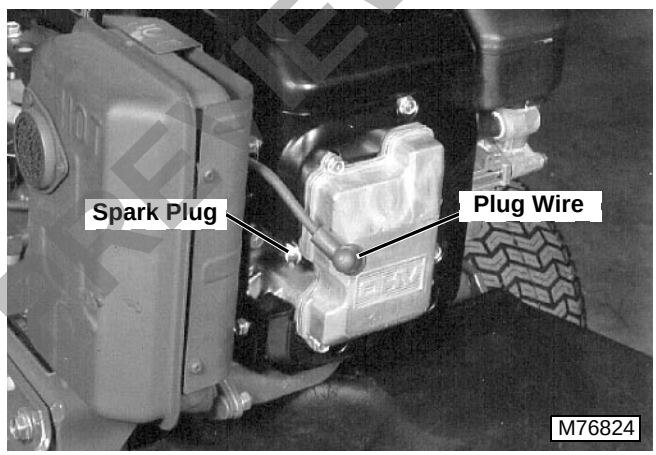
Equipment:

- Feeler Gage 1.5 mm (0.059in.)

Procedure:

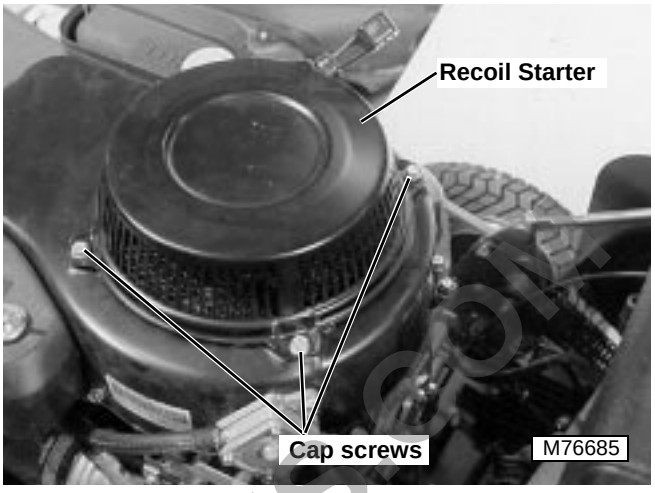


1. Move transmission shift lever to neutral position. Disengage PTO. Engage **both** brakes and thumb locks.

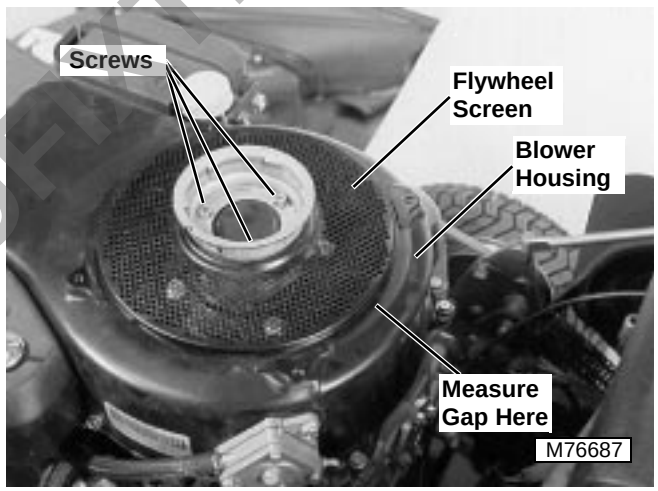


1. Disconnect spark plug wire and ground.

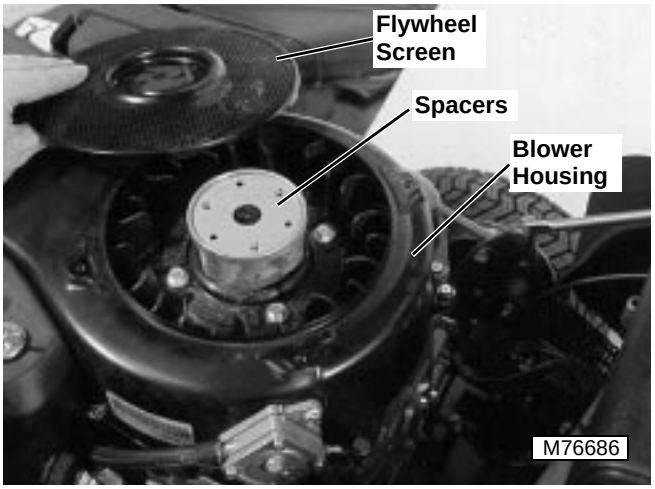
IMPORTANT: Spark plug wire must be grounded or electronic ignition could be damaged.



2. Remove four cap screws securing recoil starter to engine. Remove recoil starter.



3. Check gap between flywheel screen and blower housing. If gap is less than **1.5 mm (0.059 in.)** remove three screws securing starter pawl bracket to flywheel. Remove bracket and flywheel screen.



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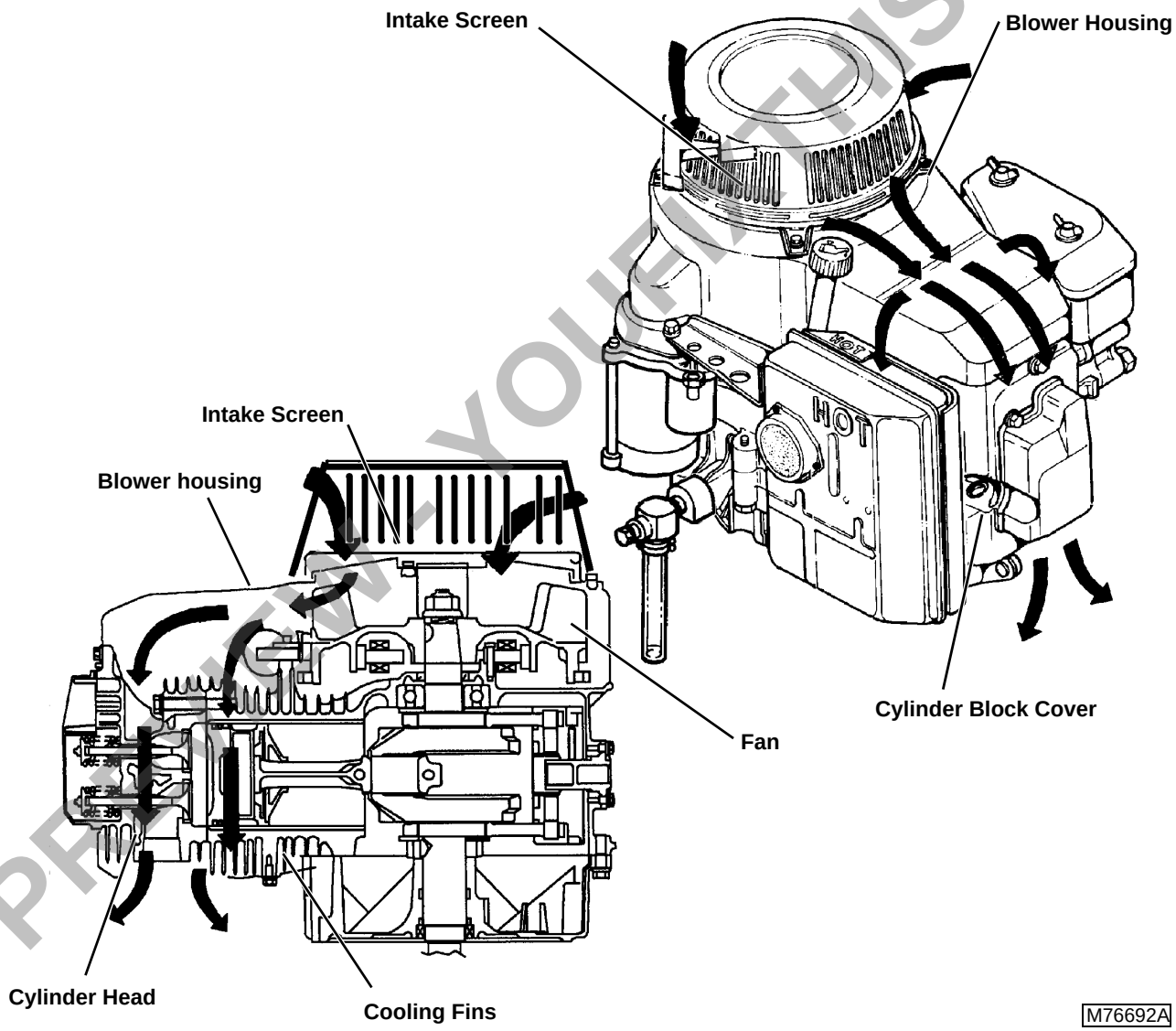
THEORY OF OPERATION

COOLING SYSTEM OPERATION

The engine is air cooled with air flow provided by a fan that is mounted on the flywheel. During operation the fan draws air in through the intake screen and delivers it, through the blower housing, to the cooling fins surrounding the cylinder and head.

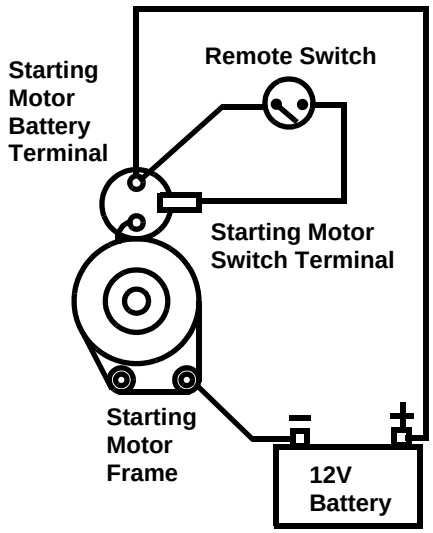
The intake screen rotates with the fan and cuts debris into fine pieces helping to keep the cooling fins clear.

It is important that the intake screen remains open for proper air flow. The engine shroud should never be altered or removed, as cooling capacity will be affected. Cylinder block and cylinder head cooling fins must remain clean and open to properly dissipate heat.



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2. Connect 12-volt battery to starting motor battery terminal and starting motor frame using heavy duty cables.
3. Connect remote start switch between switch terminal and battery terminal.

NOTE: A short piece of wire with a small clip on the end will allow a more positive connection at the switch terminal.

When switch is activated, starting motor should engage and run.

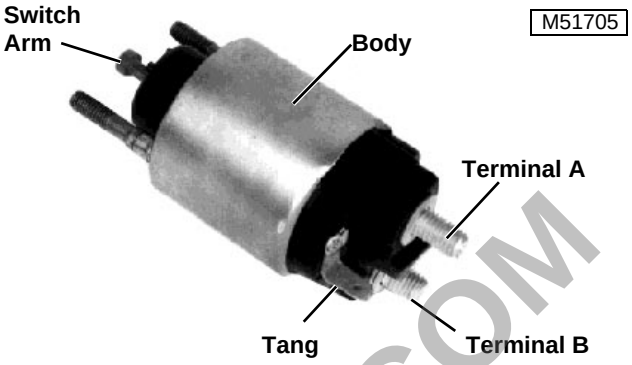
- IF SOLENOID CHATTERS: hold-in winding is open-circuited.
- IF NOTHING HAPPENS: either the solenoid pull-in winding is open-circuited or mechanical parts are sticking.
- IF SOLENOID ENGAGES - BUT MOTOR DOES NOT RUN: check solenoid switch continuity, brushes, armature and field windings.

Solenoid cannot be repaired, replace it.

SOLENOID TEST

NOTE: If bench test indicated solenoid problems, use an ohmmeter or test light to check solenoid.

Test is similar for all units.



1. Test solenoid terminals (A and B) for continuity. There should be no continuity.
2. Depress switch arm. There should be continuity when arm is fully depressed.
3. Test for open circuits between terminal (B) and tang. There should be continuity.
4. Test for open circuits between tang and body. There should be continuity.

If solenoid fails any test, it is defective and must be replaced.

STARTING MOTOR ROTATION TEST

1. Remove starting motor from engine.
2. Rotate armature.

If armature does not rotate freely, armature may be bent or bearings may be worn. Disassemble and inspect starting motor. (See this group.)

STARTING MOTOR DISASSEMBLY/ASSEMBLY

Mark body and covers for correct alignment during reassembly.

1. Separate pinion stopper halves to remove retaining clip.
2. Inspect starting motor parts for wear or damage.
3. Measure brushes. Test starting motor armature and brushes. (See this group.)
4. Apply multipurpose grease to:
   - sliding surfaces of armature and solenoid shift lever
   - armature shaft spline
   - points where shaft contacts cover
5. Assemble starting motor.

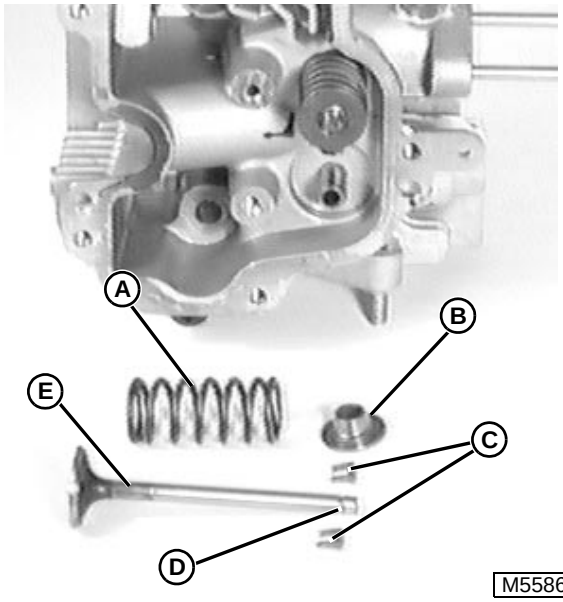
STARTING MOTOR INSPECTION

1. Mark body and covers for correct alignment during reassembly

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VALVES AND SPRINGS REMOVAL AND INSTALLATION



M55867

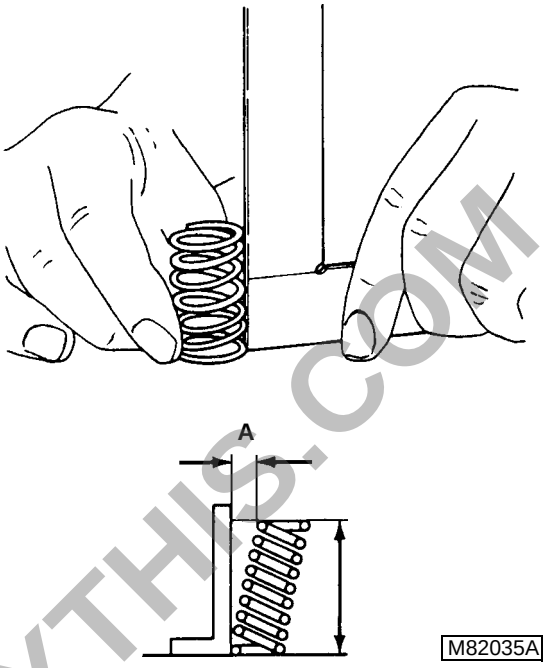
IMPORTANT: Make sure keepers are seated in valve stem groove (D).

1. Compress intake and exhaust springs using an appropriate size spring compressor.
2. Remove keepers (C), spring caps (B), springs (A), and valves (E).
3. Install valve components.
4. Compress spring and install keepers in grooves (D).
5. Install rocker arm assembly and cylinder head in reverse order.

IMPORTANT: Valves are equipped with a valve stem seals. Always use a new seals when valves are removed from cylinder head. The seals should also be replaced if deteriorated or damaged in any way. NEVER reuse an old seals.

VALVE SPRING INSPECTION

1. Clean and inspect valve springs. Replace if cracked or broken.



M82035A

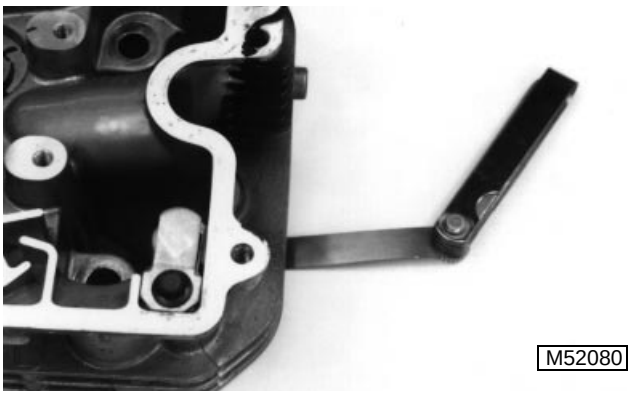
2. Inspect valve spring for squareness on a surface plate. Turn spring and measure space between top spring coil and square (A). Replace spring if not in within specifications.

Valve Spring Specifications:

Squareness Tolerance . . . . . 2.39 mm (0.090 in.)

CYLINDER HEAD INSPECTION

1. Remove carbon deposits and clean gasket surface with SCOTCH-BRITE® abrasive or equivalent.
2. Inspect head for cracks or damage. Make sure oil drain port is open.


M52080

3. Put head on a flat surface plate. Check for distortion at several points with a feeler gauge. Replace head if distorted beyond specification.

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CRANKING CIRCUIT DIAGNOSIS—ELECTRIC START

Test Conditions:

- Transmission in NEUTRAL
- PTO switch DISENGAGED
- Key switch in RUN position
- Meter positive (+) lead on numbered test point
- Meter negative (—) lead on battery negative (—) terminal

Test/Check Point	Normal	If Not Normal
1. Battery positive terminal	11.8-13.2 volts	Test battery.
2. Key switch 220 Red wire and starting motor solenoid terminal 210 Red wire	Battery voltage	Check battery cable connection, fuse (F1), and 220 Red wires. Replace as necessary.

Test Conditions:

- Key switch in START position

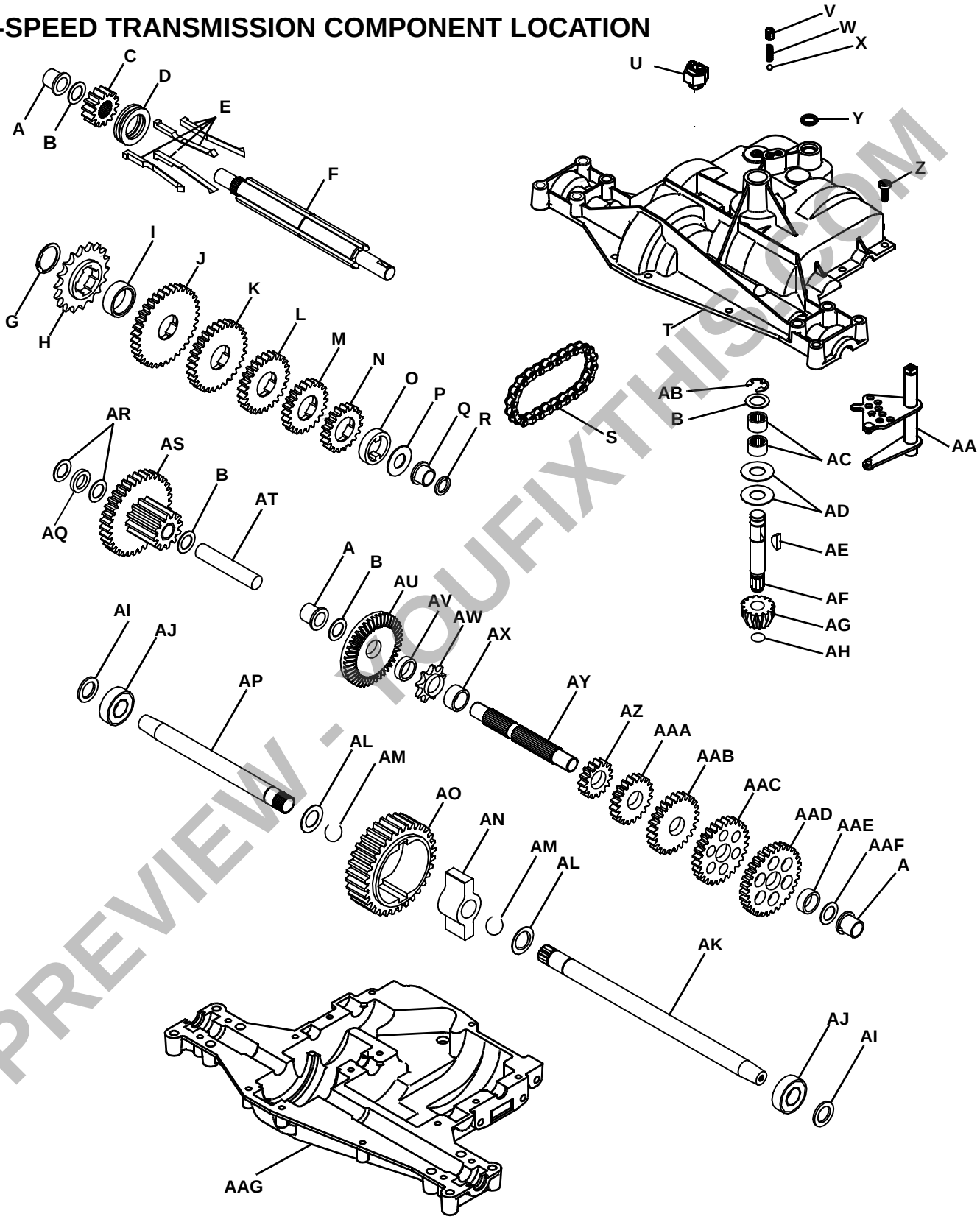
Test/Check Point	Normal	If Not Normal
3. Key switch 510 Yel wire	Battery voltage	Replace key switch.
4. PTO switch 510 Yel wire	Battery voltage	Replace 510 Yel wire.
5. PTO switch terminal E (700 Pur wire)	Battery voltage	Replace PTO switch.
6. Neutral start switch 700 Pur wire	Battery voltage	Replace 700 Pur wire.
7. Neutral start switch 705 Pur/Blk wire	Battery voltage	Replace neutral start switch
8. Key switch 705 Pur/Blk wire	Battery voltage	Replace 705 Pur/Blk wire.
9. Key switch 730 Pur wire	Battery voltage	Replace key switch.
10. Starter relay terminal 86 (730 Pur wire)	Battery voltage	Replace 730 Pur wire.
11. Starter relay ground terminal - 125 Blk wire	Greater than 0 - less than 0.2 volts	Greater than 0.2 volts: Check starting solenoid ground circuit 125 Blk wire. 0 volts: Replace solenoid.
12. Starter relay terminal 87 (221 Red wire)	Battery voltage	Check fuse F1. Clean battery terminals. Replace 221 Red wire.
13. Starter relay terminal 30 (740 Pur wire)	Battery voltage	Replace starter relay.
14. Starter solenoid terminal S (740 Pur wire)	Battery voltage	Replace 740 Pur wire. If solenoid still does not engage suspect solenoid ground. Check engine ground, replace solenoid.

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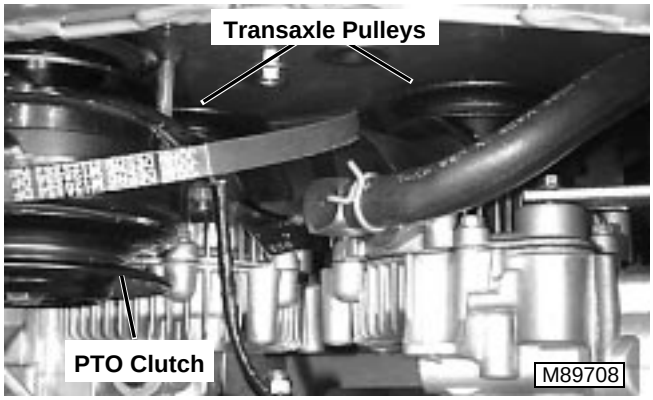
COMPONENT LOCATION

5-SPEED TRANSMISSION COMPONENT LOCATION



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2. Install belt up over PTO electric harness, and electric clutch.

NOTE: Be careful not to damage belt when pushing between transaxle pulleys and power deck frame.

3. Push belt between transaxle pulleys and power deck frame using pry bar or other suitable tool. Push belt into center of transaxle pulleys before installing belt into tensioner pulley.
4. Tighten tensioner mounting hardware. Install tensioner spring, washer, and adjusting nut. Adjust belt tension. (See "TRANSMISSION DRIVE BELT TENSION ADJUSTMENT" on page 11.)
5. Install PTO drive belt tensioner spring into hole in tensioner arm, and tab on front of right side transaxle housing.
6. Install mower deck.
7. Install PTO drive belt.

DRIVE WHEEL HUB REMOVAL & INSTALLATION

Removal:

NOTE: If transaxle or transmission guard will be removed after removing drive wheel hub, support power deck under green painted frame to allow access to transmission guard mounting screws.

1. Park mower on level surface. Support frame using blocks or stands. (See note above).
2. Remove lug nuts holding drive wheels to mounting studs on hub. Remove drive wheel from hub.
3. Remove cotter key holding axle nut to axle shaft. Remove axle nut and washer.

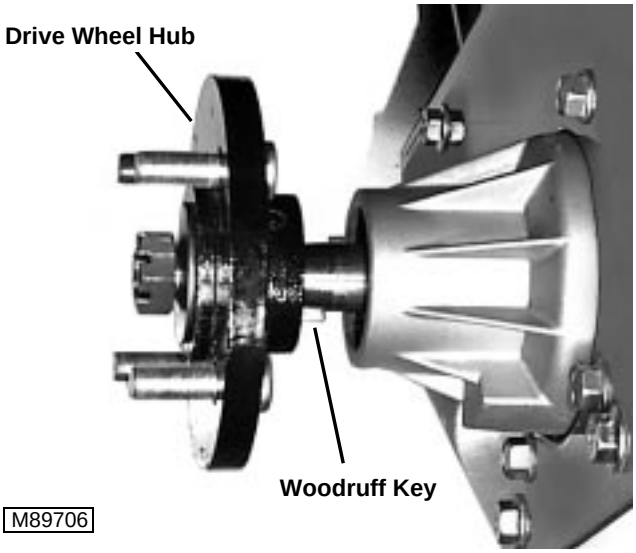


⚠ CAUTION

Axle hub can fly off of axle shaft suddenly and violently when puller is tightened. Always wear safety glasses and protect hands and body from flying parts before turning in screw on puller.

4. Install a puller onto hub and into center of axle shaft. Turn in puller screw until tight, then advance screw in small steps while tapping on side of hub with plastic dead-blow hammer.
5. Remove hub from axle shaft. Remove woodruff key from axle shaft.

Installation:



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