JOHN DEERE
WORLDWIDE COMMERCIAL & CONSUMER EQUIPMENT DIVISION

Lawn Tractors
LTR155, LTR166 and LTR180

ITM1768 FEBRUARY 2002

TECHNICAL MANUAL



JOHN DEERE

Litho in U.S.A.

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CONTENTS

Page

SPECIFICATIONS

GENERAL VEHICLE SPECIFICATIONS 3
KOHLER ENGINE—LTR155. 3
BRIGGS & STRATTON ENGINE—LTR166 3
KAWASAKI ENGINE—LTR180. 3
ELECTRICAL 4
HYDROSTATIC TRANSAXLE. 4
PTO DRIVE 4
STEERING 4
IMPLEMENT LIFT 4
TIRES 4
DIMENSIONS 4
REAR DISCHARGE MOWER DECK 4
DRAWBAR LOAD 4
GRASS COLLECTION SYSTEM 4
TORQUE SPECIFICATIONS. 5
METRIC FASTENER TORQUE VALUES 5
INCH FASTENER TORQUE VALUES. 6
FUEL AND OIL SPECIFICATIONS. 7
GASOLINE 7
GASOLINE STORAGE— NORTH AMERICA. 7
ENGINE OIL 8
ENGINE BREAK–IN OIL. 8
LUBRICANT SPECIFICATIONS. 9
ANTI-CORROSION GREASE 9
ALTERNATIVE LUBRICANTS 10
SYNTHETIC LUBRICANTS. 10
LUBRICANT STORAGE 10
MIXING OF LUBRICANTS 10
CHASSIS GREASE. 10
HYDROSTATIC TRANSMISSION OIL. 11
PRODUCT IDENTIFICATION LOCATIONS 11
PRODUCT IDENTIFICATION NUMBER (PIN) 11
ENGINE IDENTIFICATION NUMBER—KOHLER. 12
ENGINE IDENTIFICATION NUMBER—BRIGGS & STRATTON 12
ENGINE IDENTIFICATION NUMBER—KAWASAKI 12
HYDROSTATIC TRANSAXLE IDENTIFICATION NUMBER 12

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GENERAL VEHICLE SPECIFICATIONS

KOHLER ENGINE—LTR155

Make	Kohler
Model / Model Number	Command 15 QT / CV15S-41562
Power	11.2 kW (15.0 hp)
Displacement	426 cm^3 (26.0 cu-in.)
Cylinders	1
Stroke/Cycle	4
Valves	Overhead Valves
Lubrication	Pressurized Gerotor Pump 0 – 413 kPa (0 – 60 psi)
Oil Filter	Single Element, Full Flow, Spin-On Filter
Crankcase Capacity (With Filter)	1.8 L (1.9 U.S. qt; 60 U.S. oz)
Without Filter	1.4 L (1.5 U.S. qt; 48 U.S. oz)
Cooling System	Air Cooled
Air Cleaner	Paper with outer foam element
Muffler	Horizontal discharge below frame

BRIGGS & STRATTON ENGINE—LTR166

Make	Briggs & Stratton
Series	Vanguard V-Twin
Type	916928 Gasoline
Model	303777
Horsepower	11.94 kW (16.0 hp)
Displacement	480 cm^3 (29.3 cu. in.)
Cylinders	2
Stroke/Cycle	4
Valves	Overhead Valves
Lubrication	Pressurized 0 – 344 kPa (10 – 50 psi)
Oil Filter	Full Flow Filter (w/o By-Pass Valve)
Crankcase Capacity (With Filter)	1.5 L (1.6 U.S. qt; 52 U.S. oz)
Without Filter	1.4 L (1.5 U.S. qt; 48 U.S. oz)
Cooling System	Air Cooled
Air Cleaner	Paper with outer foam element
Muffler	Horizontal discharge below frame

KAWASAKI ENGINE—LTR180

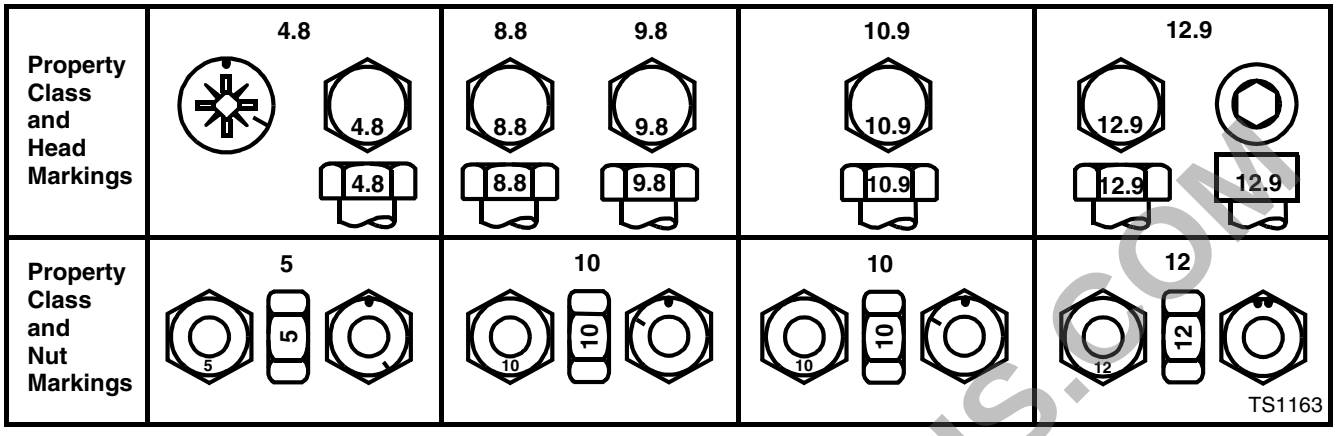
Make	Kawasaki
Model	FH500V-AS32 V-Twin
Horsepower	12.7 kW (17.0 hp)
Displacement	494 cm^3 (30.0 cu. in.)
Cylinders	2
Stroke/Cycle	4
Valves	Overhead Valves
Lubrication	Pressurized
Oil Filter	Single Element, Full Flow, Spin-On Filter
Crankcase Capacity (With Filter)	1.7 L (1.8 U.S. qt; 58 U.S. oz)
Without Filter	1.5 L (1.6 U.S. qt; 52 U.S. oz)
Cooling System	Air Cooled
Air Cleaner	Paper with outer foam element
Muffler	Horizontal discharge below frame

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TORQUE SPECIFICATIONS

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	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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TROUBLESHOOTING

Problem or Symptom / Check or Solution	Engine cranks but will not start or starts hard	Engine will not stay running or runs rough	Engine stalls frequently	Engine backfires	Engine surges, uneven or uncontrolled rpm	Engine misses	Low power under load	Engine has no spark	Engine will not crank	Exhaust black, engine floods or burns rich	Exhaust smoke blue or high oil consumption	Engine has low oil pressure	Fuel in oil	Engine overheats	Excessive engine noise or vibration
Spark plug fouled or incorrect gap. Incorrect spark plug.	●	●	●		●	●	●	●		●			●	●	
Defective ignition components.	●	●	●	●	●	●	●	●	●	●			●		
Starter worn. Cranking rpm too slow, cables corroded, battery weak. Engine overloaded.	●	●	●				●		●			●		●	●
Fuel tank outlet restricted, shut-off valve not fully open, fuel filter or line restricted. Fuel stale, contains water, or wrong type.	●	●	●		●	●	●			●	●				
Air filter element plugged or oil soaked.	●	●	●		●	●	●			●			●		
Choke, throttle, or governor linkage worn / out of adjustment. Carburetor set too rich.	●	●	●	●	●	●	●		●	●			●	●	
Carburetor worn, contaminated with debris or varnish. Passages plugged. Wrong jets or adjusted too lean.	●	●	●	●	●	●	●						●		
Carburetor, intake manifold, or cylinder head gaskets leaking.	●	●	●	●	●	●	●							●	●
Low compression: worn piston, rings, cylinder, valves. Warped head.	●	●	●		●	●	●				●	●	●	●	●
Valve clearance incorrect. Burned or warped valves and seats. Defective springs.	●	●	●	●	●	●	●							●	●
Engine oil viscosity or level incorrect. Engine oil filter restricted. Oil pump worn or passages obstructed.	●	●					●		●			●		●	●
Engine gaskets or seals leaking.	●	●	●	●	●	●	●				●	●	●	●	●
Crankcase breather restricted, reed valve damaged, clearance incorrect, or drain hole plugged.	●	●	●		●		●		●		●	●		●	
Valve guides or seals worn or leaking. Valve stems worn.	●	●	●	●	●	●	●				●			●	●
Worn, stuck, or broken piston rings. Cylinder bore worn. Check compression and vacuum.	●	●	●	●	●	●	●				●	●	●	●	●
Connecting rod or crankshaft bearings worn. Internal wear limits out of specification.	●	●	●		●		●					●		●	●
Engine mounting hardware loose or broken.					●		●								●

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TESTS AND ADJUSTMENTS

THROTTLE CABLE ADJUSTMENT

Reason:

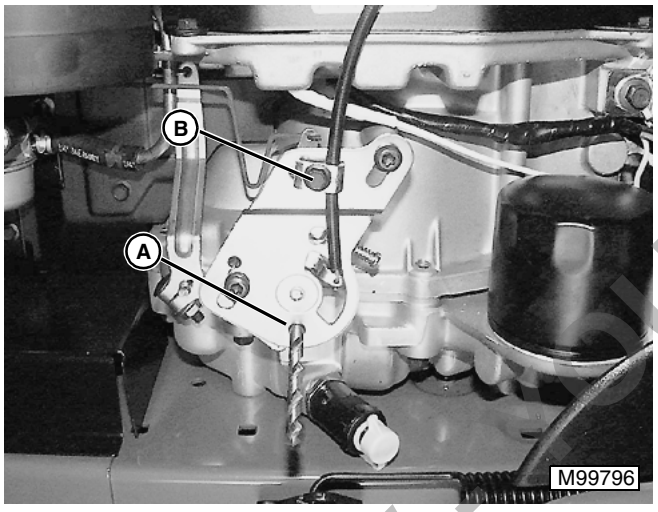
To make sure the throttle cable moves the throttle and choke control lever through its full range of movement.

Equipment:

- 6.4 mm (0.25 in.) Drill Bit

Procedure:

1. Move throttle lever to FAST idle position.



2. Align hole in throttle control lever with hole (A) in throttle control plate. Put a **6.4 mm (0.25 in.)** drill bit through holes to keep the throttle control lever from moving. Be sure drill bit is perpendicular to the throttle control plate.
3. Loosen cap screw (B) and pull throttle cable housing tight. Tighten cap screw.
4. Remove drill bit.
5. Move throttle lever to the full choke position. Make sure throttle lever is held up against throttle plate. Choke should be fully closed.
6. Move throttle lever through full range to be sure linkage is not binding.

CHOKE ADJUSTMENT

Reason:

To make sure the choke plate is fully closed when the throttle lever is in the full choke position. Correct adjustment also makes sure choke is completely open in the fast idle position.

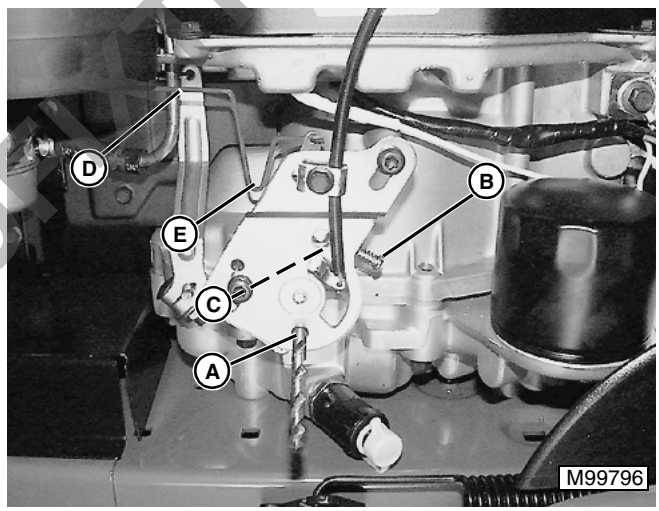
Equipment:

- 6.4 mm (0.25 in.) Drill Bit

Procedure:

NOTE: Adjust throttle cable before adjusting choke.

1. Move throttle lever to CHOKE position then back to FAST idle position.

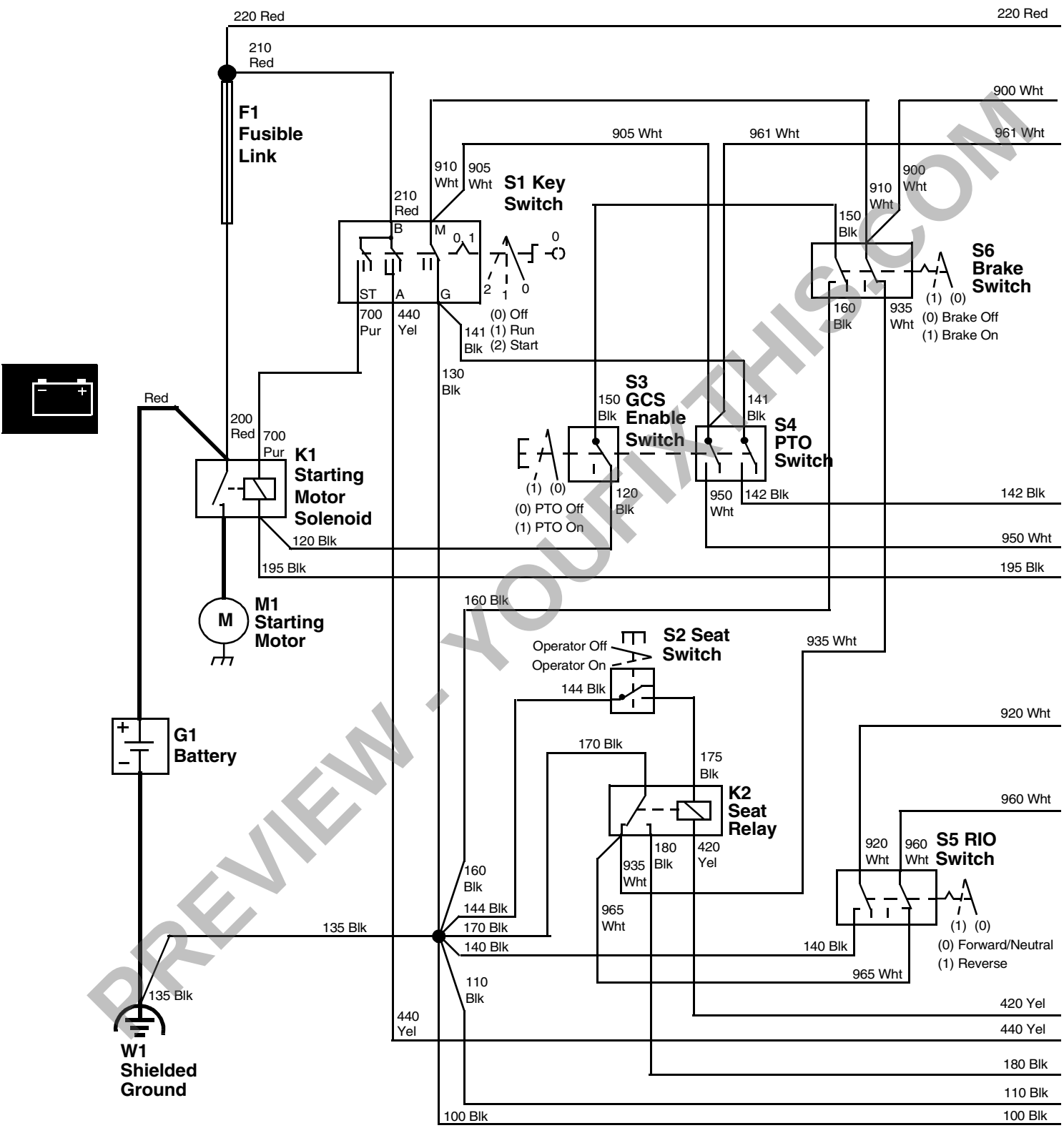


2. Align hole in throttle control lever with hole in throttle control plate. Put a **6.4 mm (0.25 in.)** drill bit (A) through holes to keep the throttle control lever from moving. Be sure drill bit is perpendicular to the throttle control plate.
3. Turn screw (B) counterclockwise until screw does not contact the choke control lever (C).
4. Turn screw clockwise until screw just touches the choke control lever.
5. Remove drill bit.
6. Move throttle lever to full choke position.
7. Try to move choke rod (D) forward (choke rod should not move). If the choke rod moves forward, the choke plate is not fully closed. Carefully bend the choke rod at Vee bend (E) until the choke plate is fully closed.
8. Move throttle lever to be sure choke linkage is not binding.

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ELECTRICAL SCHEMATIC—LTR155 w/3 AMP CHARGER



*** NOTE: GCS is Grass Collection system**

SE 1 - STARTING	SE 2 - MAGNETO KILL & START INTERLOCK

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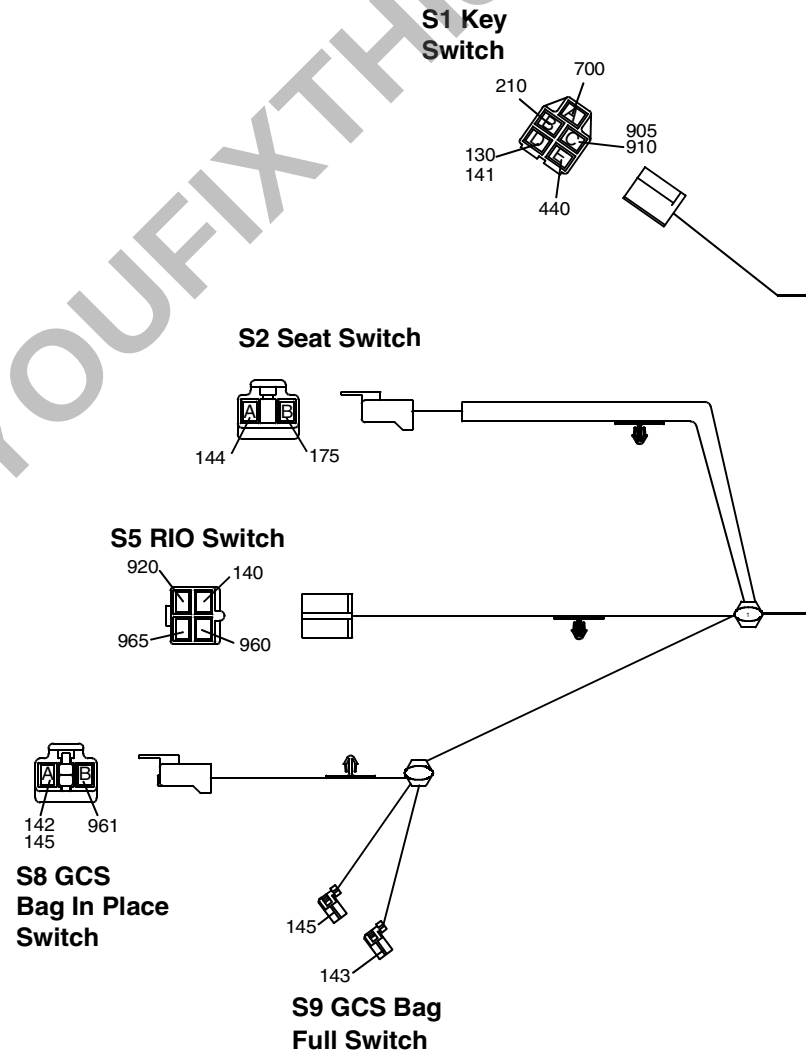
W1 MAIN WIRING HARNESS—LTR155 w/3 AMP CHARGER

S/N –020000

Circuit No.	Wire Size	Color	Connection Point
100	0.8	Blk	X4, Splice
110	0.8	Blk	K4, Splice
120	0.8	Blk	K1, S3
130	0.8	Blk	S1, Splice
135	2.0	Blk	W1, Splice
140	0.8	Blk	S5, Splice
141	0.8	Blk	S4, S1
142	0.8	Blk	S8, S4
143	0.8	Blk	H1, S9
144	0.8	Blk	S2, Splice
145	0.8	Blk	S8, S9
150	0.8	Blk	S6, S3
160	0.8	Blk	S6, Splice
170	0.8	Blk	K2, Splice
175	0.8	Blk	K2, S2
180	0.8	Blk	K4, K2
190	0.8	Blk	V1, K4
195	0.8	Blk	V1, K1
200	0.5	Fuse Link	K1, F1
210	1.0	Red	F1, S1
220	2.0	Red	F1, X1
400	0.8	Yel	Y1, Splice
410	0.8	Yel	K4, Splice
420	0.8	Yel	K2, Splice
430	0.8	Yel	K3, Splice
440	0.8	Yel	S1, Splice
445	0.8	Yel	H1, Splice
510	0.8	Blu	X1, X4
595	2.0	Brn	X1, K4
700	0.8	Pur	S1, K1
900	0.8	Wht	X1, S6
905	0.8	Wht	S4, S1
910	0.8	Wht	S6, S1
920	0.8	Wht	S5, S7
935	0.8	Wht	S6, K2
950	0.8	Wht	K3, S4

Circuit No.	Wire Size	Color	Connection Point
960	0.8	Wht	K3, S5
961	0.8	Wht	S8, S4
965	0.8	Wht	S5, K2
971	0.8	Wht	K3, S7
972	0.8	Wht	K3, K3
973	0.8	Wht	K3, S7

*** NOTE: GCS is Grass Collection system**



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SAFETY

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 identifies the most serious hazards. Danger or Warning safety signs are located near specific hazards.
- CAUTION safety signs are used where general precautions should be used. 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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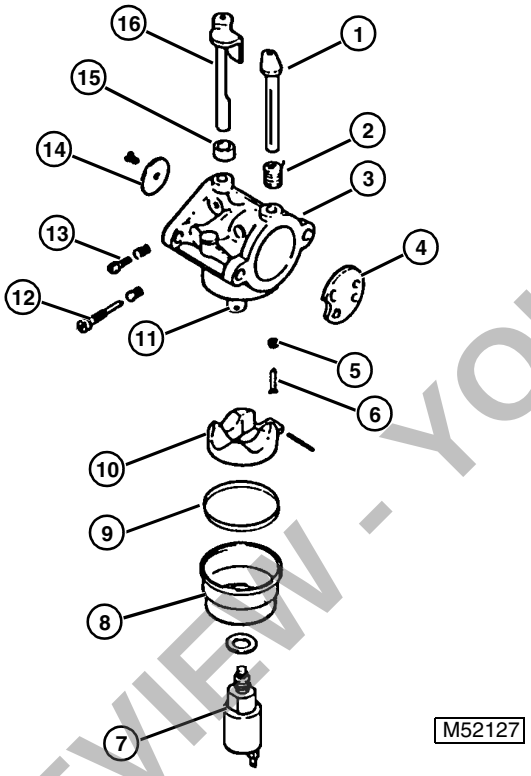
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4. Disconnect linkage rods (A) from carburetor levers.
5. Remove and discard gaskets (D), install new ones.
6. Connect linkage rods (A) and install carburetor, studs (C), and air filter assembly.
7. Connect solenoid wire (if installed), and fuel line (B)—open fuel line or turn fuel shut-off valve (if installed) to ON position.
8. Adjust carburetor, see Test and Adjustments earlier in this section.

Specification:

Air Filter Assembly Nuts . . . . . 9.9 N•m (88 lb-in.)

CARBURETOR INSPECTION



1. Choke Shaft
2. Choke Spring
3. Body
4. Choke Plate
5. Inlet Seal
6. Needle
7. Fuel Solenoid (Opt.)
8. Float Bowl
9. Seal
10. Float
11. Main Jet
12. Fuel Screw
13. Idle Screw
14. Throttle Plate
15. Seal
16. Throttle Shaft

Procedure:

⚠ CAUTION

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

1. Disassemble bowl, float, inlet needle, low idle mixture screw and spring.

IMPORTANT: Further disassembly of carburetor is not required for general cleaning. Further disassembly will require replacing parts with new parts. DO NOT soak carburetor in carburetor cleaner when fiber, rubber or foam gaskets are still installed. Cleaner may damage these components.

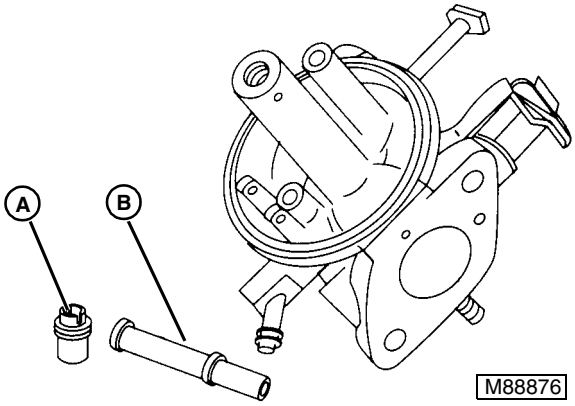
2. Clean carburetor using pressurized carburetor cleaner and compressed air. Clean out all passages.
3. DO NOT remove idle port welch plug unless absolutely necessary. To remove, pierce with sharp tool. Clean chamber. Install new plug using a flat tool about the same size as plug. Flatten plug but do not force below the surface of the cavity.
4. If inlet seat was leaking or damaged it can be replaced by pulling it out with a drill bit or screw. Always replace with new parts. Press in new seat until it bottoms in bore.
5. If throttle and choke plates were removed, use a high strength thread lock and sealer on the small retaining screws. Install screws slightly loose. Apply pressure on shafts to center plates in bore, then tighten screws.

NOTE: High altitude jet is available.

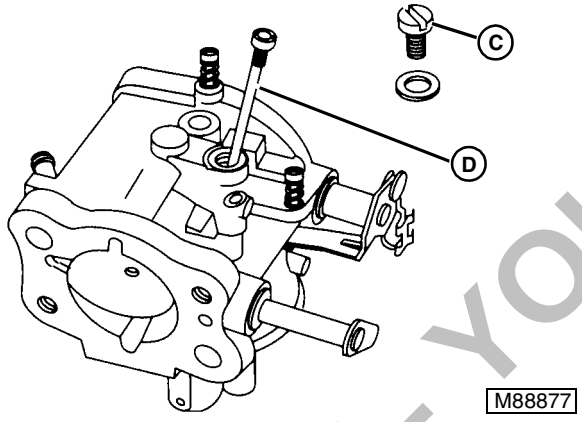
6. Main jet can be pressed out. Replace with new jet. Press new jet in until flush with surface.
7. Low idle mixture screw has a precision taper. If screw is grooved, bent or broken, this may indicate seat damage and carburetor may need to be replaced.
8. On standard carburetors, to set preliminary adjustment for idle mixture screw—**turn clockwise until LIGHTLY seated and back-out (counterclockwise) one full turn**.

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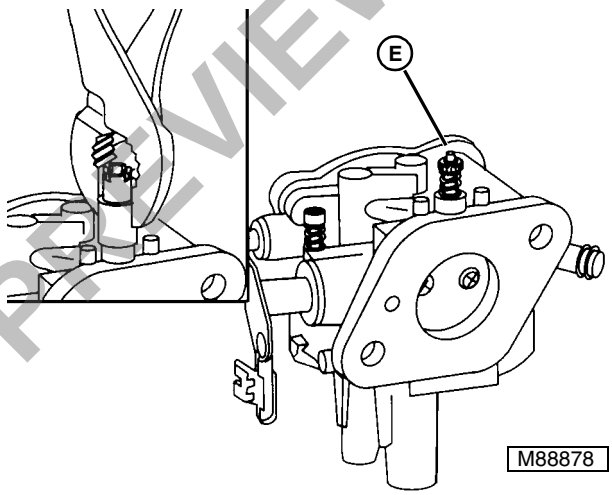
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6. When the fixed main jet (A) has been removed, the high speed nozzle (B) can be removed. Reach into carburetor throat with a flat blade screw driver and push the high speed nozzle up through fixed main jet tube.

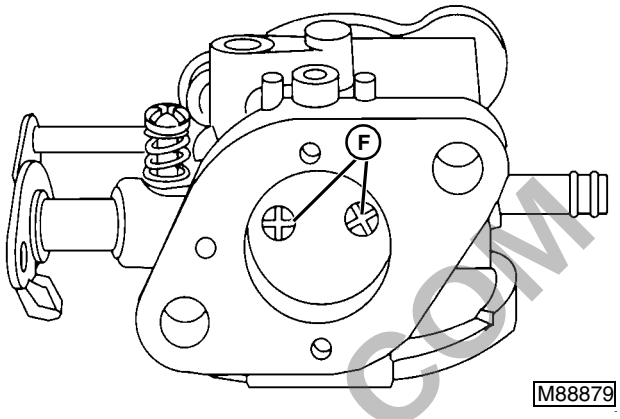


7. Remove idle jet plug (C) and idle jet (D).

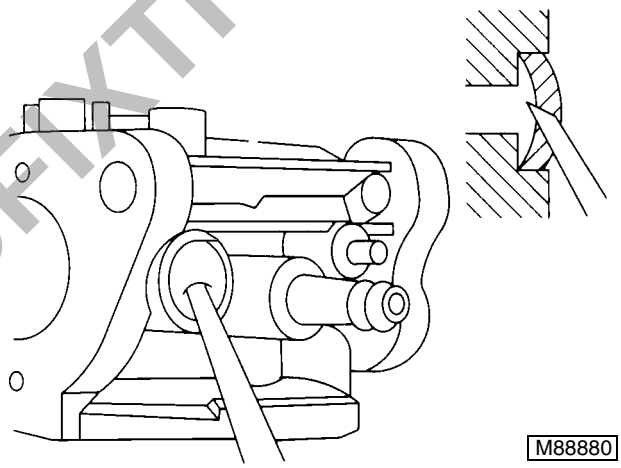


8. The idle mixture valve is equipped with a adjustment limiter cap. Use pliers to remove the cap.

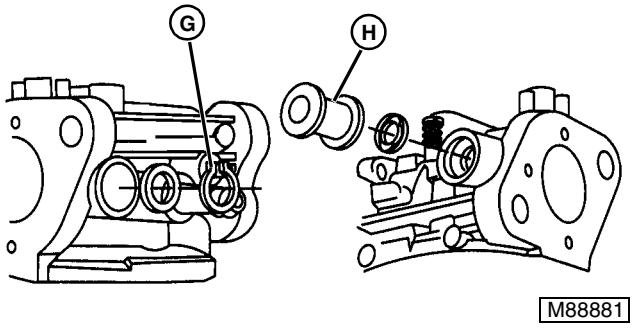
9. Remove the idle mixture valve (E).



10. Remove two screws (F) holding throttle valve to throttle shaft and remove throttle valve.



11. To remove throttle shaft it is necessary to first remove welch plug from side of carburetor. Use a punch to puncture and remove the plug.



12. Remove external snap ring (G) and throttle shaft washer.
13. Remove throttle shaft, throttle shaft collar (H) and throttle shaft seal.

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ENGINE & FUEL SYSTEM TROUBLESHOOTING CHART

Problem or Symptom / Check or Solution	Engine cranks but will not start or starts hard.	Engine will not stay running, runs rough, or irregularly.	Engine stalls frequently.	Engine backfires.	Engine surges, or has uneven	Engine misses.	Engine has low power.	Engine has no spark.	Engine will not crank.	Lack of fuel in carburetor.	Engine floods.	Exhaust smoke black or uses	Exhaust smoke blue or has excessive oil consumption.	Engine has low oil pressure.	Fuel in oil.	Engine overheats.	Excessive engine noise or vibration.
Low compression from worn piston, rings, cylinder, valves or warped head.	●	●	●		●	●	●						●				●
Valve clearance incorrect. Burned or warped valves and seats. Defective springs.	●	●	●	●	●	●	●		●								
Engine oil viscosity or level incorrect. Engine oil filter restricted.	●						●						●	●		●	●
Engine gaskets or seals leaking.		●	●	●	●	●	●										
Crankcase breather restricted, reed valve damaged, clearance incorrect, or drain hole plugged.	●	●	●		●		●		●				●			●	
Valve guides or seals worn or leaking. Valve stems worn.	●	●	●	●	●	●	●						●				
Worn, stuck, or broken piston rings. Cylinder bore worn. Check compression and vacuum.	●	●			●		●						●				
Connecting rod or crankshaft bearings worn. Internal wear limits out of specification.							●							●		●	●
Battery cables corroded, or battery weak.		●	●						●								

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CONTENTS

Page

THEORY OF OPERATION INFORMATION 5
DIAGNOSTIC INFORMATION 5
WIRE COLOR ABBREVIATION CHART 5
READING ELECTRICAL SCHEMATICS 6
COMMON CIRCUIT TESTS 7
CONDUCTORS FOR 12 VOLT CIRCUITS 7
SPECIFICATIONS 8
SCHEMATIC AND WIRING HARNESS LEGEND—LTR155 9
COMPONENT LOCATION—LTR155 10
SCHEMATIC AND WIRING HARNESS LEGEND—LTR166 11
COMPONENT LOCATION—LTR166 12
ELECTRICAL SCHEMATIC—LTR155 w/3 AMP CHARGER 13
W1 MAIN WIRING HARNESS—LTR155 w/3 AMP CHARGER 14
ELECTRICAL SCHEMATIC—LTR155 w/15 AMP CHARGER 15
W1 MAIN WIRING HARNESS—LTR155 w/15 AMP CHARGER 16
ELECTRICAL SCHEMATIC—LTR155 w/4 POSITION KEY SWITCH 17
W1 MAIN WIRING HARNESS—LTR155 w/4 POSITION KEY SWITCH 18
ELECTRICAL SCHEMATIC—LTR166 19
W1 MAIN WIRING HARNESS—LTR166 20
ELECTRICAL SCHEMATIC—LTR166 w/4 POSITION KEY SWITCH 21
W1 MAIN WIRING HARNESS—LTR166 w/4 POSITION KEY SWITCH 22
W2 ENGINE WIRING HARNESS—LTR155 w/3 AMP CHARGER 23
W2 ENGINE WIRING HARNESS—LTR155 w/15 AMP CHARGER 23
W3 HEADLIGHT WIRING HARNESS—LTR155 23
Y1 FUEL SHUTOFF SOLENOID—LTR155 (optional) 23
W2 & W3 ENGINE WIRING HARNESSES—LTR166 24
W4 HEADLIGHT WIRING HARNESS—LTR166 24
TROUBLESHOOTING 25
THEORY OF OPERATION AND DIAGNOSIS 26
POWER CIRCUIT OPERATION—LTR155 w/3 AMP CHARGER 26
POWER CIRCUIT SCHEMATIC—LTR155 w/3 AMP CHARGER 27
POWER CIRCUIT DIAGNOSIS—LTR155 w/3 AMP CHARGER 28
POWER CIRCUIT OPERATION—LTR155 w/15 AMP CHARGER 30
POWER CIRCUIT SCHEMATIC—LTR155 w/15 AMP CHARGER 31
POWER CIRCUIT DIAGNOSIS—LTR155 w/15 AMP CHARGER 32
POWER CIRCUIT OPERATION—LTR155 w/4 POSITION KEY SWITCH 34
POWER CIRCUIT SCHEMATIC—LTR155 w/4 POSITION KEY SWITCH 35
POWER CIRCUIT DIAGNOSIS—LTR155 w/4 POSITION KEY SWITCH 36
POWER CIRCUIT OPERATION—LTR166 38
POWER CIRCUIT SCHEMATIC—LTR166 w/3 POSITION KEY SWITCH 39
POWER CIRCUIT SCHEMATIC—LTR166 w/4 POSITION KEY SWITCH 39
POWER CIRCUIT DIAGNOSIS—LTR166 40
CRANKING CIRCUIT OPERATION—LTR155 w/3 AMP CHARGER 42
CRANKING CIRCUIT SCHEMATIC—LTR155 w/3 AMP CHARGER 43
CRANKING CIRCUIT DIAGNOSIS—LTR155 w/3 AMP CHARGER 44

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THEORY OF OPERATION AND DIAGNOSIS

POWER CIRCUIT OPERATION—LTR155 w/3 AMP CHARGER

Function:

Provides unswitched power to the primary components and switched power to secondary components whenever the battery is connected.

Operating Conditions, Unswitched Circuits:

Voltage must be present at the following components with the key switch in the OFF position:

- Battery Positive Terminal
- Starting Motor Solenoid Positive Contact Stud
- Key Switch
- Red Wire at Engine Wiring Harness Connector

The positive battery cable connects the battery to the starting motor solenoid bolt.

The ground cable connection is equally important as the positive cable. Proper starting operation depends on these cables and connections to carry the high current for its operation.

The fusible link and 210 Red wire provide unswitched voltage to the key switch.

The fusible link and 220 Red wire provide unswitched voltage to the engine wiring harness connector.

Operating Conditions, Switched Circuits:

Placing the key switch in the RUN position provides voltage from 210 Red wire through the key switch to the 440, 400, 410, 420, 430, and 445 Yel wires. These wires supply input signal voltage to the three system interlock relays, the GCS full alarm and the fuel shutoff solenoid (if equipped). The relays will not energize until another switch(es) is actuated.

Placing the key switch in the START position (See “CRANKING CIRCUIT OPERATION—LTR155 w/3 AMP CHARGER” on page 60) provides voltage to the starting motor solenoid coil through the key switch contacts to the 700 Pur wire. The ground for this circuit is provided for the starting motor solenoid by the 120 Blk wire, GCS enable switch contacts (normally closed), 150 Blk wire, brake switch contacts (normally open), 160 and 135 Blk wires.

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IGNITION & SHUTOFF CIRCUIT DIAGNOSIS—LTR166/180, cont.

Test Conditions:

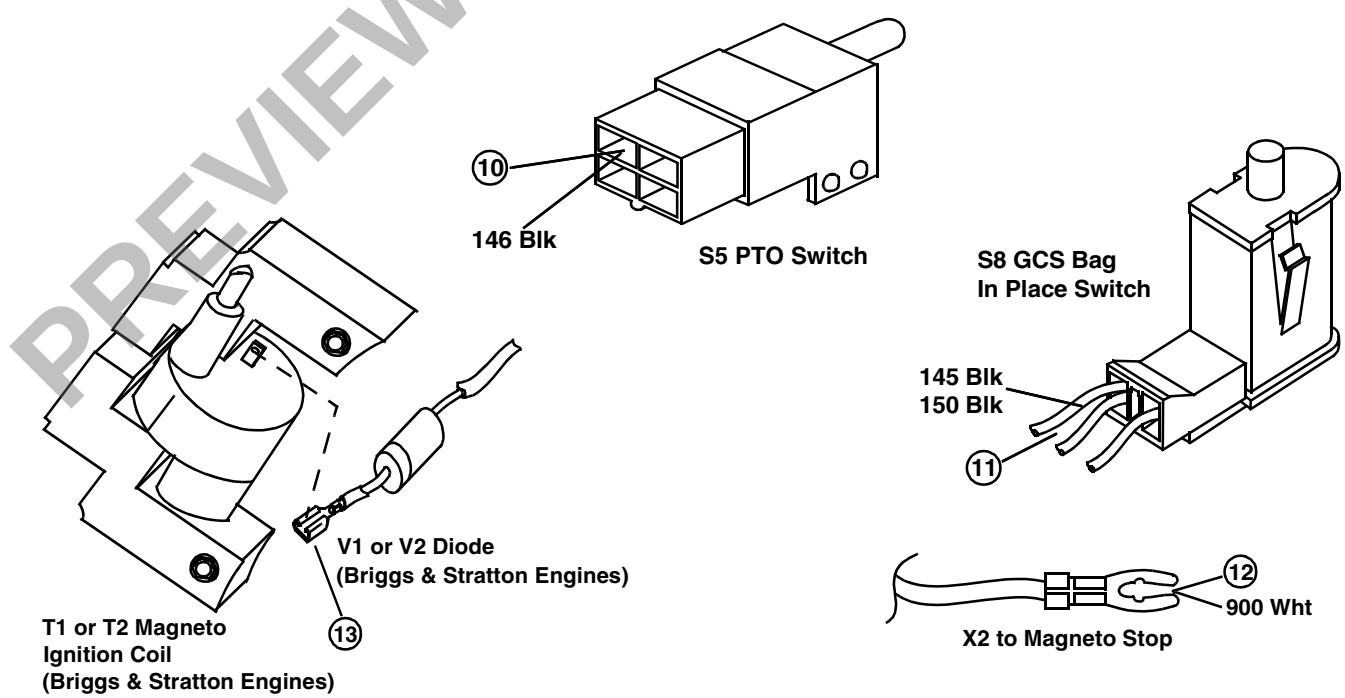
- Key switch in RUN position (Engine NOT running)
- Park brake ON
- Seat switch ON
- PTO ON (ENGAGED)
- GCS bag in place switch BAG OFF position
- Engine wiring harness disconnected from main wiring harness

Test/Check Point	Normal	If Not Normal
10. PTO switch	Continuity to ground	Check 146, 120 and 110 Blk wires and connections.
11. GCS bag in place switch	Continuity to ground	Check 145 Blk wire and connections. If OK, replace PTO switch.
12. X1 Engine harness connector	Continuity to ground	Check 970, 960, 910 and 900 Wht wires and connections. If OK, replace GCS bag in place switch.

Test Conditions: (Briggs & Stratton Engines ONLY – Test performed if engine will NOT shut off when operator leaves seat with EITHER PTO ENGAGED or brake switch OFF.)

- Key switch in OFF position (Closes fuel valve to stop engine)
- Allow engine to cool, and remove engine cover to access ignition coils
- Disconnect diode(s) from ignition coil(s)
- Operator OFF seat
- PTO ON (ENGAGED); or, Park brake OFF

Test/Check Point	Normal	If Not Normal
13. Ignition coil diode(s)	Continuity to ground with diode disconnected from ignition coil	Faulty diode(s) Replace diode(s)



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GRASS COLLECTION SYSTEM (GCS) CIRCUIT OPERATION— LTR166 & LTR180

Function:

To insure that the grass collection system is properly in place on the tractor, and to alert the operator when the grass collection container is full.

Operating Conditions:

With the engine running and the PTO engaged, the GCS circuit is activated. The GCS circuit has two functions. The first function is to shut off the engine when the PTO is engaged and the collection container is not properly in place on the tractor. The second function is to alert the operator when the grass collection container is full.

System Operation:

The first function of the GCS circuit is to shut off the engine when the PTO is engaged if the grass collection container is not properly in place on the tractor. Under this condition a ground path is created from the 110, 120 and 146 Blk wires to the PTO switch. With the PTO engaged the PTO switch contacts are closed connecting the 146 Blk wire to the 145 Blk wire and the GCS bag in place switch. If the grass collection container IS NOT in place, the GCS bag in place switch contacts will be closed and connect the 145 Blk wire to the 970, 960, 910, 900 Wht wire and the magneto ignition. This will then ground the ignition and shut off the engine.

The second function of the GCS circuit is to alert the operator when the grass collection container is full. With the key switch in the run position, power is supplied to the GCS full alarm via the 410 and 445 Yel wires. For this condition to function a ground path is created from the 110, 120 and 146 Blk wires to the PTO switch. With the PTO engaged the PTO switch contacts are closed connecting the 146 Blk wire to the 145 and 150 Blk wires and the GCS bag full switch. If the grass collection container IS full the GCS full switch contacts will be closed and connect the 150 Blk wire to the 151 Blk wire and the GCS full alarm. This will then complete the circuit allowing the alarm to sound, warning the operator that the grass collection container is full.

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SPECIFICATIONS

Transaxle

Type	Tuff Torq® K46 Transaxle
Travel Speed-Forward	0 – 8.0 km/h (0 – 5.0 mph)
Travel Speed-Reverse	0 – 4.7 km/h (0 – 2.9 mph)

Traction Drive Belt

Distance Between Plastic Caps of Compression Spring (Belt Tensioner Assembly)	32 – 34 mm (1.26 – 1.34 in.)

Brake

Brake Type	Wet Disk
Brake Capacity	351.5 N•m (259 lb-ft) with 11.3 N•m (100 lb-in.) on brake arm
Brake Lever Travel (Maximum)	30°

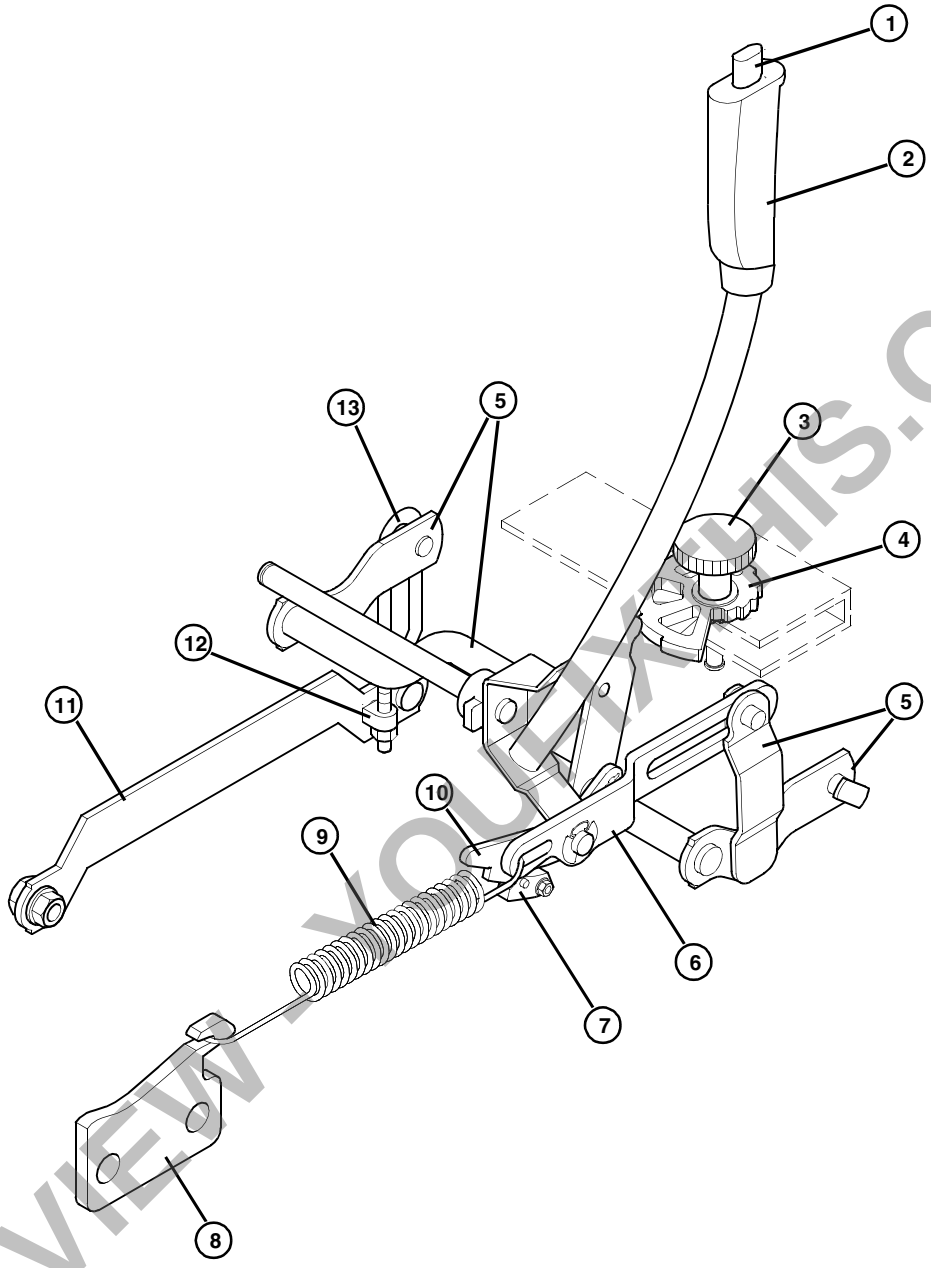
TORQUE SPECIFICATIONS

Flat Idler Nut On Idler Arm Assembly	26 N•m (228 lb-in.)
Transaxle Mounting Cap Screws	40 N•m (30 lb-ft)

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MOWER DECK LIFT LINKAGE—LTR155/166



MIF

1. Latch Release Button
2. Lift Handle
3. Depth Stop Knob
4. Depth Stop Cam
5. Lift Shaft Assembly
6. Lift Strap
7. Striker
8. Spring Anchor
9. Lift Assist Spring
10. Latch
11. Draft Arm (RH and LH)
12. Lift Link
13. Lift Rod

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