V-ENGINE SERVICE MANUAL

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TORO®

Toro V Engine

SERVICE MANUAL

ABOUT THIS MANUAL

This manual was written expressly for the Toro V Engine. The Toro Company has made every effort to make the information in this manual complete and correct.

This manual was written with the service technician in mind. The book is divided into two sections, Quick Reference information (specifications, troubleshooting, etc.) and servicing information (servicing procedures).

We hope you find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company
Consumer Service Department
8111 Lyndale Avenue South
Bloomington, MN 55420-1196

The Toro Company reserves the right to change product specifications or this manual without notice.

Safety Information

This safety symbol means WARNING or PERSONAL SAFETY INSTRUCTION - read the instruction because it has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service and repair of the engine only. The Operator's Manual will contain safety information on the complete product powered by the Toro 2- Cycle V engine. Operator's Manuals with complete instructions are available through:

The Toro Company
Publications Department
811 Lyndale Avenue South
Bloomington, MN 55420-1196 U.S.A.

Think Safety First

Avoid unexpected starting of the engine....
Always turn off the powered product and disconnect the spark plug before attempting cleaning, adjustment or repair.

Avoid lacerations and amputations...
Stay clear of all moving parts when the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...
Do not touch the engine while it is running or shortly after it has been running.

Avoid falls...
Do not operate the powered product on slippery surfaces or if footing is questionable.

Avoid fires...
Wipe up any spilled fuel or oil immediately.

Avoid asphyxiation...
Never operate an engine in a confined area without proper ventilation.

Avoid fires and explosions...
Use a container designed for gasoline.

Avoid spilling fuel and never smoke while working with any type of fuel.

Avoid accidental misuse of fuel...
Always store fuel in a properly labeled container designed for gasoline.

Avoid injury due to inferior parts...
Use only TORO original parts to ensure that important safety criteria are met.

Avoid injury to bystanders...
Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...
Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the powered equipment. Keep all safety shields in place

Avoid modifications...
Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...
Always test the safety systems after making adjustments or repairs on the machine.

QUICK REFERENCE SECTION

SERVICE SECTION

SPECIFICATIONS

1

Engine Specifications

Item	Specification
Type	Air cooled, 2-cycle
Bore	2.3810 - 2.3800" (60.477 - 85.852 mm)
Stroke	1.7520 - 1.7497" (44.501 - 44.442 mm)
Connecting rod length	3.00" (76.2 mm)
Wrist pin diameter	.5000" (12.7mm)
Wrist pin offset	.070" (1.78mm) toward major thrust side
Crankpin diameter	.742" (18.85 mm)
Top and bottom bearings	Dia: Top: .875" (22.3mm) Bottom: 1.125" (28.58 mm)
Displacement	7.78 cu in (127.51 cc)
Horsepower	4.5 hp (3.35 kws)
Compression ratio	5.91:1 (Range of 5.151 - 6.668:1)
Compression	Approximately 90-115 ps i(6.43 - 8.21 kg/cm^2)
Engine rotation	Counter clockwise as viewed from the PTO
Carburetor	Single-circuit, with fixed main jet, float type,with primer, Minlon®
Fuel required Fuel/Oil Ratio	Unleaded regular (87 octane) premixed with 2-cycle oil at 32:1 ratio
Recommended oil	Toro 2-cycle or premium ashless NMMA certified oil
Fuel tank capacity	1.3 qts (1.23 ltr)
Ignition type	Solid state CD Pack, magneto type
CD Pack air gap	.010" (.25 mm)
Spark timing	2º - 8º BTDC (cranking); 22º - 28º (running)
Spark plug / air gap	Champion RJ12C / .035" (.889 mm)
Starting system	Rope rewind
Governor	Air vane
Governed engine speed	3050 +/- 100 RPM
Idle speed	2200 - 2800 RPM
Air cleaner	Oiled, foam type
Choke	Primer bulb
Fuel Filter	In-tank and in-carburetor
Piston	Permanent mold, high silicon aluminum
Piston rings	Cast iron, semi-keystone top ring, square cut second ring
Ring end gap	Normal range: .006" - .016" (.152 - .506mm) Wear limit: .030" (.762mm)
Reed valve air gap	.004" (.101mm) max.

Engine Fastener Torque Requirements

Item	Torque
Bolt, Blade	45 - 60 ft lbs (60 - 81.6 N•m)
Nut, Flywheel	375 - 425 in lbs (42-47 N•m)
Screw, Air vane	5 - 7 in lbs (.5 -.8 N•m)
Screw, Brake plate assembly	60 - 70 in lbs (6.7 - 7.8 N•m)
Screw, Carburetor mounting	45 -55 in lbs (5.0 - 6.1 N•m)
Screw, CD ignition pack	90 - 110 in lbs (10 -12 N•m)
Screw, Cylinder to crankcase	105 - 115 in lbs (12 - 13 N•m)
Screws, Engine mounting	350-400 in lbs (39 - 45 N•m)
Screw, Ground strap stop	15 - 25 in lbs (1.7 - 2.8 N•m)
Screw, Muffler cover	150 - 190 in lbs (17 - 22 N•m)
Screw, Muffler plate	140 - 200 in lbs (16 - 22 N•m)
Screw, Reed*	10 - 13 in lbs (1.1 - 1.5 N•m)
Screw, Rod cap to rod#	65 - 75 in lbs (7.3 - 8.4 N•m)
Screw, Shroud	20 - 25 in lbs (2.3 - 2.8 N•m)
Screw, shroud base	60 - 70 in lbs (6.7 -7.8 N•m)
Spark plug	150 - 200 in lbs (17 - 23 N•m)
Rewind starter*	65 - 75 in lbs (7.3 - 8.4 N•m)

*Use thread-locking compound

See page 2.2

Carburetor Specifications

Item	Specification
Type	Toro, float type, single circuit, with primer
Body material	Minlon®
Seat material	Bronze
Needle	Stainless steel with viton tip
Inlet needle "pop-off" pressure	5 psi (.7 Kg/cm^2)
Main jet	67.5
High altitude main jet	65
Float height	15/32" to 17/32" (11.9 -13.5 mm) bowl flange (no gasket) to top of float

SPECIAL TOOL REQUIREMENTS

QUICK REFERENCE SECTION

SERVICE SECTION

SPECIAL TOOL REQUIREMENTS

REQUIRED SERVICE SUPPLIES

Item	Supply Used
Tool kit	See "engine tool requirements" below
Crankcase cover sealant	Loctite® Gasket Maker
Connecting rod cap bolts	Clean threads, use Loctite® 271
Reed valve retaining screws	Clean threads, use Loctite® 271
Cylinder core plugs	Screw lock (p/n 682301)

TORO 2-CYCLE V ENGINE TOOL REQUIREMENTS

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Description	Part Number	Comments/use
V Engine tool kit (p/n 612490) Includes the following tools to service V Engine		
Air gap gauge	604659	Sets .010" (.254 mm) gap between flywheel and coil
Piston stop	612103	Prevents piston from traveling over TDC. Use when servicing flywheel or installing piston.
Crankshaft gauge	609968	Sets correct gap on crankshaft support
Piston ring compressor	609967	Compresses rings into piston grooves during installation of piston
Seal puller	681867	Use to remove upper and lower crankshaft seals
Seal installe	608976	Use to properly position upper and lower crankshaft seals
E-12 Torx socket	Purchase locally	Use to remove crankshaft fasteners

QUICK REFERENCE SECTION

SERVICE SECTION

TROUBLESHOOTING

ENGINE WILL NOT START WHEN "COLD"

Possible Causes	Remedies
Fuel tank is empty	Fill with clean, fresh, properly mixed, unleaded fuel
Bad fuel	Drain and flush tank and float bowl, fill tank with clean, fresh, unleaded, properly mixed fuel
Fuel filter plugged	Clean and backflush fuel tank. Replace fuel tank if neccessary.
Air Cleaner plugged	Wash and re-oil air cleaner element
Fouled spark plug	Replace the spark plug
No spark at spark plug	See "ENGINE WILL NOT PRODUCE SPARK" table
Insufficient momentum	Check for loose blade
Incorrect ignition timing	Check for sheared flywheel key
Low compression	See "ENGINE HAS LOW COMPRESSION" table
Engine flooded with fuel	See "ENGINE FLOODED WITH FUEL" table
Reed Valves not closed	Replace reed valves

ENGINE WILL START WHEN "COLD", BUT NOT WHEN "HOT"

Possible Causes	Remedies
Engine is flooded	See "ENGINE FLOODED WITH FUEL" table
Excessive alcohol in fuel	Use no more than 10% ethanol blend
Engine is overheated	See "ENGINE OVERHEATS" table
Clogged bowl vent	Clean bowl vent

ENGINE WILL NOT PRODUCE SPARK

Possible Causes	Remedies
Spark plug wire disconnected	Reconnect spark plug
Spark plug fouled or damaged	Replace spark plug
Spark plug wire damaged	Replace CD Pack
Coil kill wire grounded	Locate and eliminate the unwanted ground
Ignition coil failed	Replace CD Pack
Flywheel magnets failed	Replace flywheel

ENGINE FLOODED WITH FUEL

Possible Causes	Remedies
Over use of primer	Let unit sit, retry, or, remove spark plug, pull rope several times. Reinstall plug. Try again.
Throttle misadjusted	Adjust throttle cable
Air cleaner plugged	Wash and re-oil cleaner element
Fouled spark plug	Replace spark plug
Carburetor needle stuck open	Clean carburetor, replace failed parts
Carburetor air vent plugged	Clean
Gas cap vent plugged	Clean

ENGINE HAS LOW COMPRESSION

Possible Causes	Remedies
Worn piston rings	Replace piston rings or short block
Piston ring(s) stuck in groove	Replace piston rings, or decarbon
Cylinder worn	Remove and replace short block

ENGINE LACKS POWER

Possible Causes	Remedies
Dull blade	Sharpen or replace blade
Housing choked with grass and debris	Clean housing thoroughly
Plugged exhaust system	Clean exhaust ports
Muffler plugged	Clean or replace muffler
Flywheel key sheared	Replace flywheel key
Carburetor dirty	Clean carburetor
Air filter dirty	Wash and re-oil, or replace, air filter element
Intake air leak	Repair or replace failed component(s)
Low compression	See "ENGINE HAS LOW COMPRESSION" table

ENGINE SURGES

Possible Causes	Remedies
Dirty / plugged main fuel and/or air bleed circuits	Clean main fuel circuit and all air bleed circuits
Air leak	Check sealing surfaces, oil seals, gaskets, and port plugs
Restricted air flow	Check filters and fuel line

ENGINE BACKFIRES

Possible Causes	Remedies
Flywheel key sheared	Replace key
Muffler filled with carbon	Clean muffler
Exhaust ports plugged	Clean ports

ENGINE OVERHEATS

Possible Causes	Remedies
Cylinder head cooling fins clogged	Clean fins thoroughly
Restricted main carburetor jet	Clean carburetor and jet
Improper gas to oil mixture and/or improper oil used	Ensure mixture is 32:1
Cooling air intake plugged	Remove foreign material and clean

ENGINE VIBRATES EXCESSIVELY

Possible Causes	Remedies
Blade out of balance	Balance blade or replace if damaged or worn out
Bent blade	Replace blade
Loose engine mounting screws	Tighten engine mounting screws
Bent crankshaft	Replace crankshaft
Flywheel out of balance	Replace flywheel

ENGINE CRANKSHAFT WILL NOT TURN

Possible Causes	Remedies
Engine brake incorrectly engaged	Disengage brake and inspect and repair as necessary
Blade jammed in housing	Inspect and repair or replace
Piston seized in its cylinder	Inspect, determine cause, and repair or replace
Starter jammed	Repair starter

ENGINE PRODUCES MECHANICAL KNOCKING SOUND

Possible Causes	Remedies
Loose blade	Inspect and tighten blade bolt to correct torque
Loose flywheel	Inspect and tighten flywheel nut to correct torque
Pre-ignition is occurring	See "ENGINE PRE-IGNITES" table
Loose rod cap	Inspect and repair and tighten nuts to correct torque
Loose engine mounting bolts	Tighten bolts

ENGINE PRE-IGNITES

Possible Causes	Remedies
Wrong spark plug - too hot	Install the correct type of spark plug
Low quality fuel	Replace with fresh unleaded regular fuel
Carbon buildup in engine	Decarbon engine and muffler
Excessive alcohol in fuel	Replace with fresh unleaded fuel having no more than 10% ethanol or 15% MTBE
Sheared flywheel key	Inspect and repair
Overheating	See "ENGINE OVERHEATS"

ENGINE SMOKES EXCESSIVELY

Possible Causes	Remedies
Slight oil accumulation in crankcase	None; normal on startup
Air cleaner element clogged	Clean and re-oil or replace air cleaner element
Fuel/oil mixture too rich	Drain fuel tank and fill with fuel of correct mixture
Carburetor running too rich	Clean and check carburetor

ENGINE STALLS

Possible Causes	Remedies
Engine out of fuel	Refill with fresh fuel of the correct mixture
Engine overloaded	Unload engine and restart
Spark plug fouled	See "SPARK PLUG FOULED" table
Fuel cap vent plugged	Replace fuel cap
Ignition inadvertently grounded	Inspect and repair to remove unwanted ground
Carburetor vent plugged	Clear vent of obstruction
Engine overheated	Clear debris from fins or cause of overheating
Incorrect or no oil in gasoline	Refill with fresh,and properly mixed, fuel

SPARK PLUG FOULED

Possible Causes	Remedies
Incorrect spark plug	Use correct spark plug
Carburetor running too rich	Clean / rebuild carburetor
Clogged air cleaner element	Clean and re-oil element or replace
Weak ignition system	Replace CD ignition pack
Worn rings and/or cylinder	Rebuild engine or short block
Use of leaded fuel	Drain fuel tank and replace with fresh, unleaded regular fuel, having the correct oil mixture
Fuel/oil mixture too rich	Drain fuel tank and fill with fuel of correct mixture (32:1)
Wrong oil	Use Toro 2-Cycle, or NMMA certified ashless oil

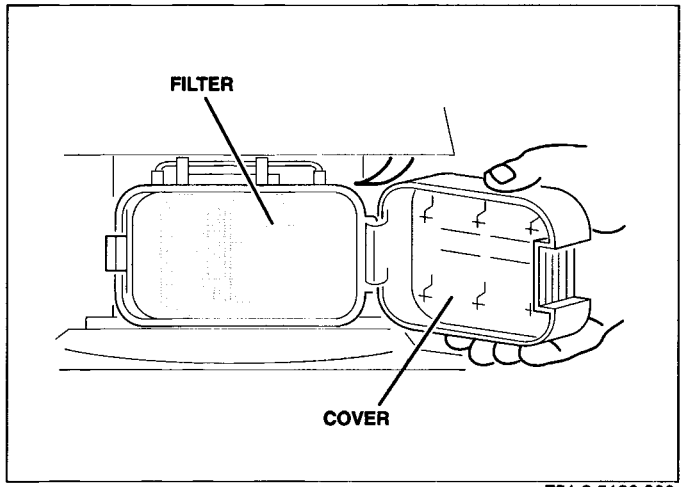
QUICK REFERENCE SECTION

SERVICE SECTION

RECOMMENDED MAINTENANCE SCHEDULE

Frequency	Item	Comments
5 Hours	Fasteners	Check blade and engine mounting fasteners frequently. Keep all nuts, bolts tight
25 Hours	Air filter	Remove and clean each mowing season or every 25 hours: **more frequently if operating conditions are dusty.**
	Spark plug	Clean, inspect and regap: replace if necessary
	Housing	Remove buildup of grass clippings and dirt
	Self-propelled Mechanism	Clean grass clippings and debris under drive belt and drive belt cover
50 Hours	Blade	Sharpen or replace; maintain more frequently if edge is dulled quickly in rough or sandy conditions
	Blade brake	Check stopping time every 50 hours or at the start of each mowing season. The blade must stop within 3 seconds of releasing the bail; if not, repair or replace.
	Lubrication	Grease rear height adjuster brackets (self-propelled models only)
	Exhaust ports	Clean every 50 hours or at least once each mowing season
	Fuel system	Check for leakage and/or detrioration of fuel hose; replace if necessary.
100 Hours	Cooling system	Clean grass clippings, debris or dirt that clog the engine air cooling fins; **do more often under dirty or high chaff conditions.**

AIR FILTER



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Cleaning

Once every season, or every 25 hours, clean the air filter housing and element. **Do so more frequently under dusty conditions.**

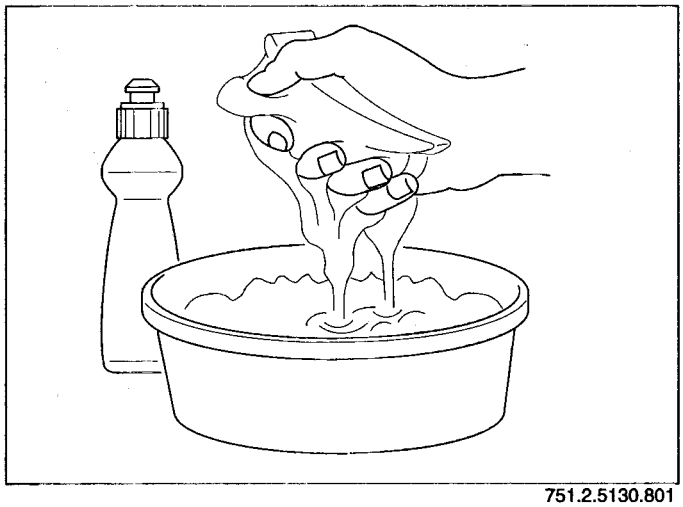
NOTES: Do not operate the engine without the air filter in place. Doing so may damage the engine or cause excessive engine wear.

To remove the air filter, snap the cover latch open, swing the cover to the side and unhook. Remove the cover and air filter.

AIR FILTER (cont'd

Cleaning (cont'd)

2. Wash the air filter in dish or laundry detergent. Squeeze the filter to remove excess liquid and blot dry with a clean paper towel or rag. **NOTE: Do not wring out the element or damage may occur.**



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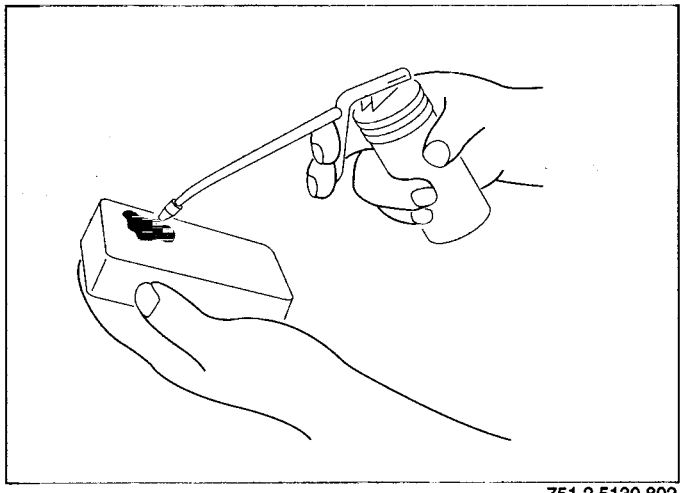
3. Apply one tablespoon of SAE 10W30, or similar, oil to the air filter. Lightly squeeze the filter until the oil is distributed evenly throughout the filter. Blot lightly with a clean paper towel or rag to remove excess oil.

   Reinstall the filter with the cleanest side facing the carburetor.

   NOTE: Be sure the filter is properly seated in the air box and is not puckered (allowing direct passage of air and dirt to carburetor).



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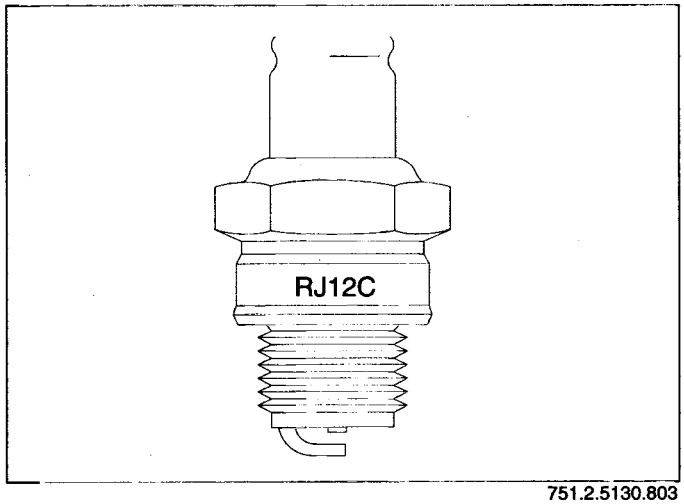
Spark Plug

A spark plug that is dirty, pitted, carbon covered, or has worn electrodes, may cause hard starting and poor operation.

Clean or replace the spark plug once a season or every 25 hours, whichever occurs first.

PLUG TYPE: Champion RJ12C

Remove the spark plug and clean it with a wire brush, removing carbon build up. **DO NOT SANDBLAST**. Check the plug for cracks, damaged or worn electrodes. Replace if necessary.



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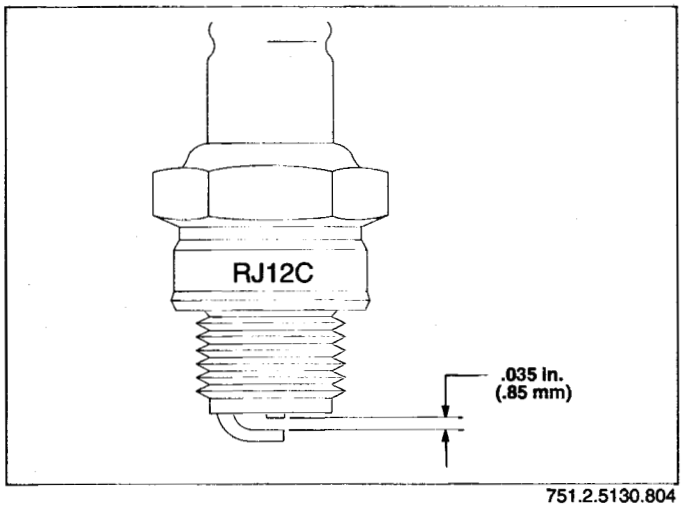

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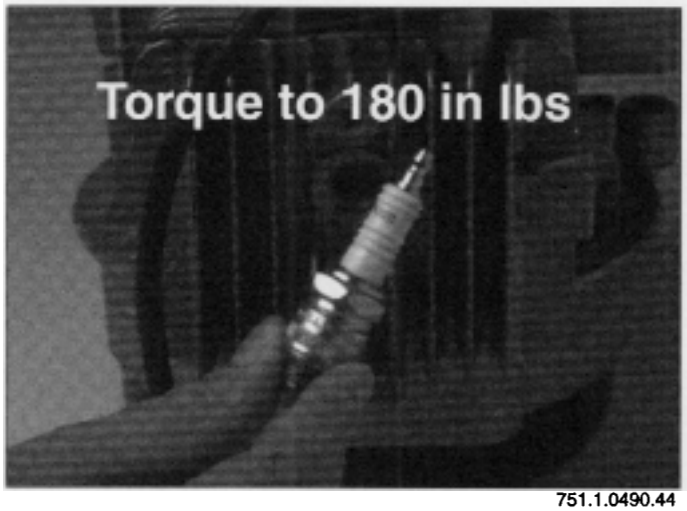
Spark Plug Gap

Set the spark plug gap to .035" (.85mm).



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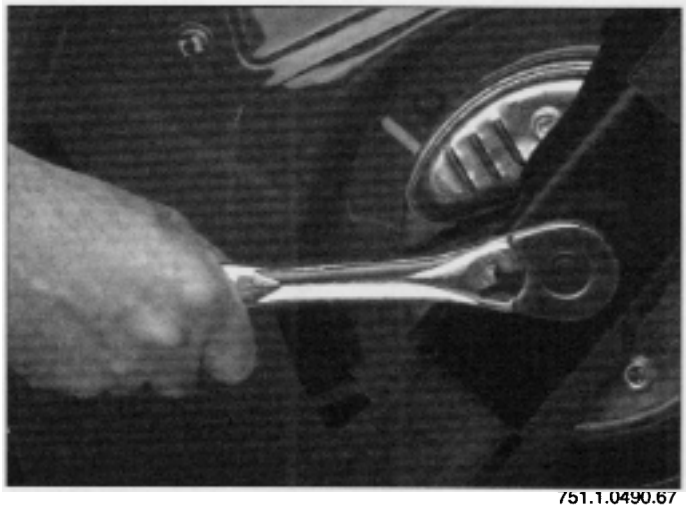
Spark Plug Torque

Install the spark plug finger tight, then torque to 180 in lbs (15 ft. lbs.) (20 Nm), or 1/4 turn after plug and gasket are seated.

Exhaust System



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Cleaning

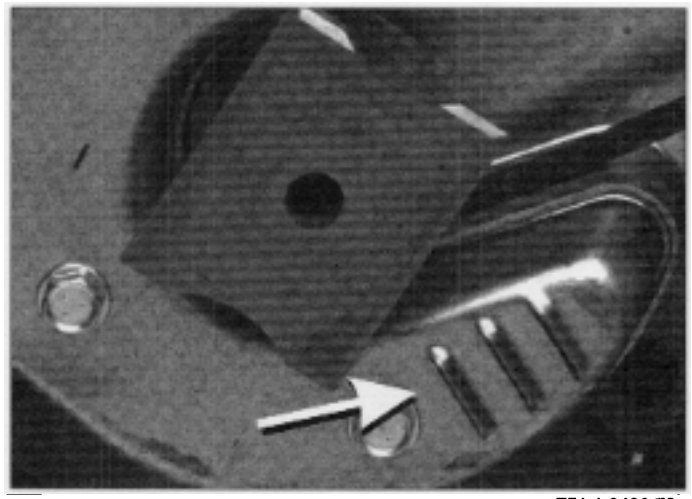
WARNING: Disconnect the spark plug wire to prevent accidentally starting the engine.
TOOLS REQUIRED:
- 1/2" drive
- 5/8" socket
- 3/8" (9mm) wooden dowel

1. Wearing heavy duty gloves hold the blade while removing the bolt. Using the 1/2" drive and 5/8" socket, remove the blade bolt that secures the accelerator, blade and blade retainer. Remove the accelerator, blade and blade retainer.

Exhaust System (cont'd)

Cleaning (cont'd)

2. The small louvers in the muffler cover must be open and free of debris. Clean if necessary.



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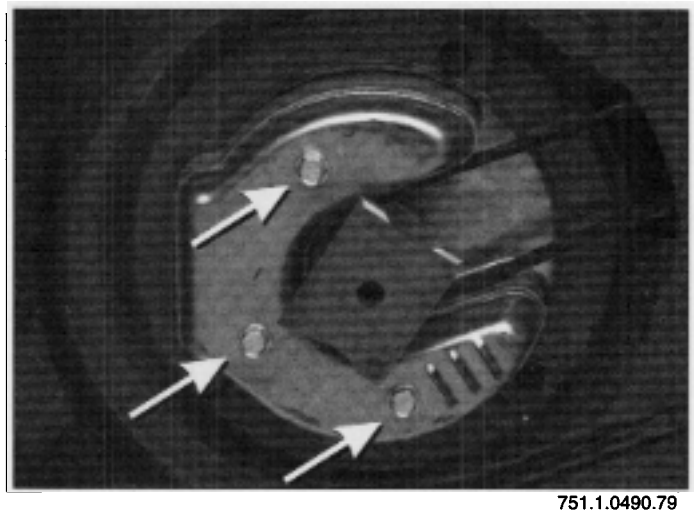
3. To remove the muffler cover, remove the three bolts. Drop the cover down to inspect the condition of the exhaust ports, etc.



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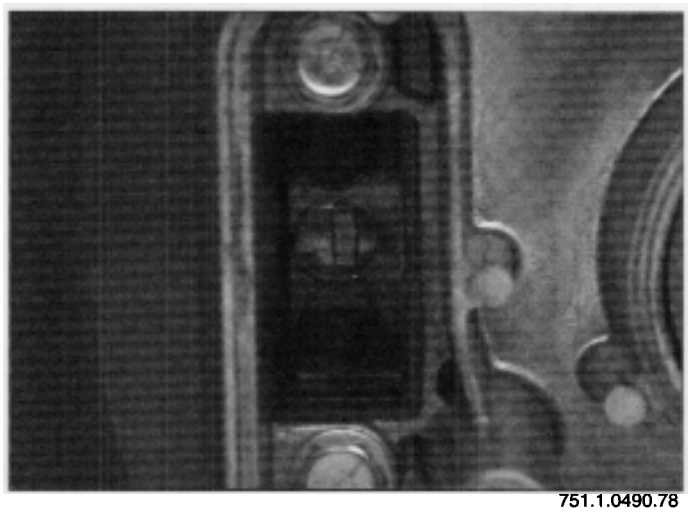
4. Pull the starter rope until the piston covers the exhaust ports, this prevents carbon from falling into the cylinder. Clean exhaust port area with the 3/8" (9mm) wooden dowel.
NOTE: Do not scratch the piston or allow carbon to fall into the cylinder.



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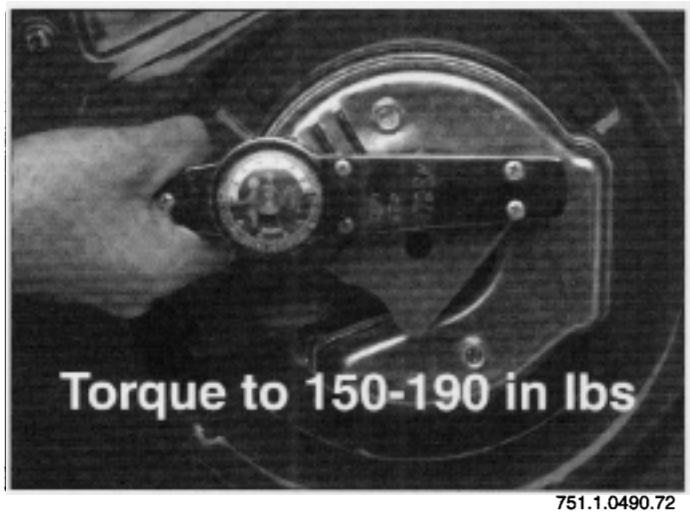

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Reassembling

1. Insert the three bolts into the muffler cover and torque to 150-190 in lbs (17-22 Nm).

2. Check the condition of the key and keyway. If OK, re-install the blade retainer.

3. Re-install the blade and accelerator with the 7/16 - 20 blade bolt. Torque the bolt to 50 ft lbs (68 Nm)

QUICK REFERENCE SECTION

SERVICE SECTION

PRIMER START CARBURETOR

5

Engine Starts Hard

Possible Causes	Remedies
Primer malfunction	Repair or replace as necessary
No fuel in carburetor	Clean tank, air cleaner element and carburetor
Carburetor bolts loose	Tighten bolts to 45 - 55 in lbs (5.1 - 6.2 N•m)
Mislocated gaskets	Loosen bolts, realign gaskets and tighten

Engine Runs Rich

Possible Causes	Remedies
Dirty air cleaner	Clean or replace, and re-oil air filter element
High altitude operation	Install high altitude jet
Dirt in carburetor	Clean carburetor
Primer line pinched	Inspect and correct problem
Dirt in primer vent	Clean and/or replace as necessary

Engine Runs Lean

Possible Causes	Remedies
Carburetor bolts not tight	Tighten bolts to 45 -55 in lbs (5.1 - 6.2 N•m)
Air leak	Locate leak and repair
Dirt in carburetor	Clean carburetor
Loose or warped float bowl	Replace float bowl

Fuel Leaks From Carburetor

Possible Causes	Remedies
Dirt under inlet needle	Remove inlet needle and clean or replace
Bowl vent plugged	Remove bowl and clean with compressed air
Float leaking (heavy)	Replace float
Float stuck (gummed carburetor)	Remove bowl and clean carburetor
Damaged/warped float bowl	Replace float bowl

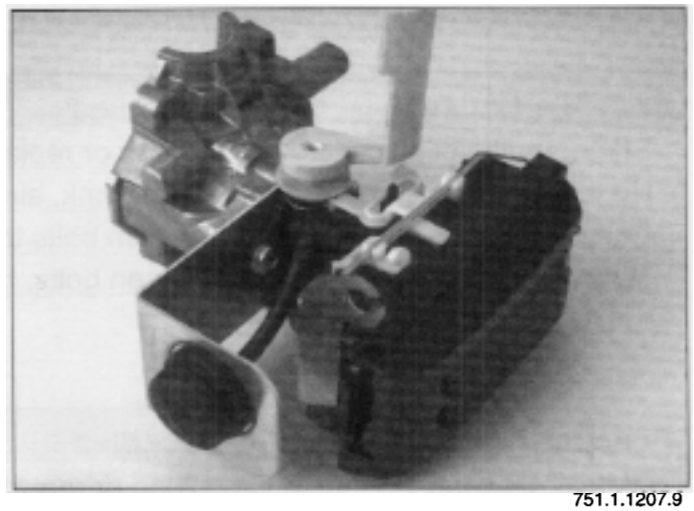
PRIMER START CARBURETOR

INTRODUCTION

Identification

The primer start carburetor is easily identified by the primer bulb mounted to the aluminum heat shield/ primer bracket and the black Minlon carburetor body.

This is a single circuit, fixed jet, non-adjustable carburetor manufactured by The Toro Company.



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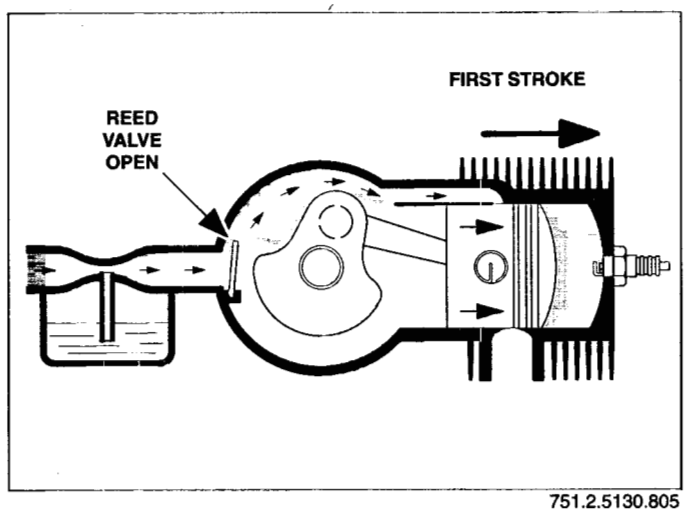
5

Operation

As the crankshaft rotates, the piston moves up and down in the cylinder. alternately creating pressure or a partial vacuum in the crankcase.

When a vacuum is created by upward pressure movement, the reed valve opens and air rushes through the carburetor throat.



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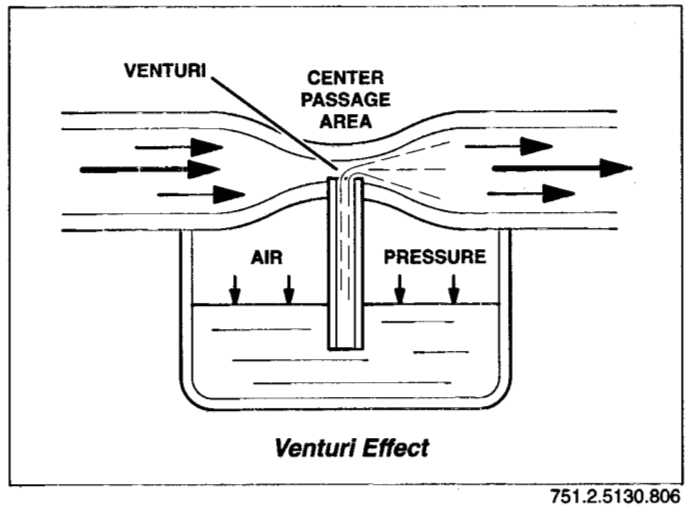
The carburetor is a venturi tube (large at each end, with a smaller center passage). When air rushes through this tube air pressure at the center of the passage is lowered. By inserting a tube from the carburetor float bowl into the venturi, lower air pressure at the venturi draws fuel up through the tube. The fuel\oil mix is then picked up by, and mixed with, the incoming air. The fuel\oil\air mixture enters the crankcase through the reed valves, thereby sustaining operation of the engine as long as fuel is supplied to it.



Venturi Effect

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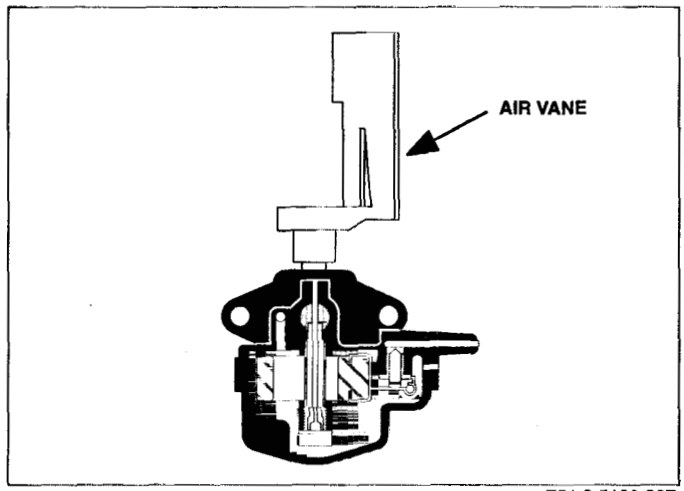

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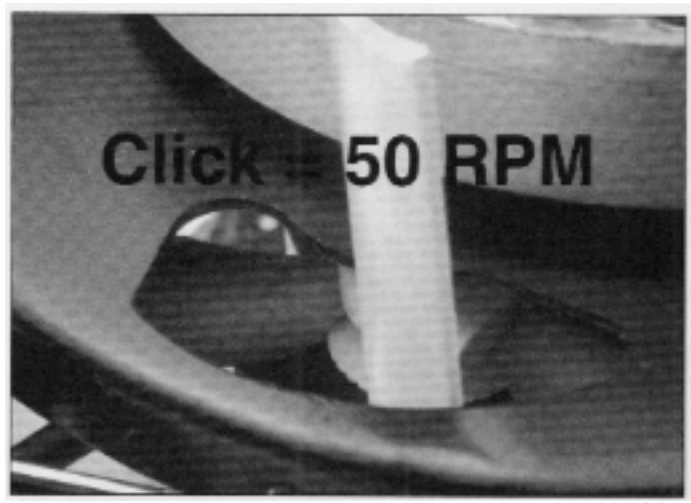
Governor

The sail of the air vane governor is attached to the throttle valve of the carburetor. Air flow created by the rotating flywheel attempts to close the throttle. The governor spring resists this force and attempts to open the throttle. The balance between these two forces is the governed engine speed.



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Governor Adjustment

To change the RPMs of the engine you change the tension of the governor spring. Spring tension is changed via an adjustable collar. When the collar is turned each "click" produces approximately a 50 RPM change in engine speed.

5

SERVICING

751.1.0490.44A

Preliminary Check

The primer start carburetor used in V Engine has an all Minlon housing with a fixed high speed jet and an adjustable float.

Perform the following preliminary checks to eliminate some of the other possibilities that may contribute to hard starting:

Ignition system- ensure that all components are adjusted to specs and are the correct components.

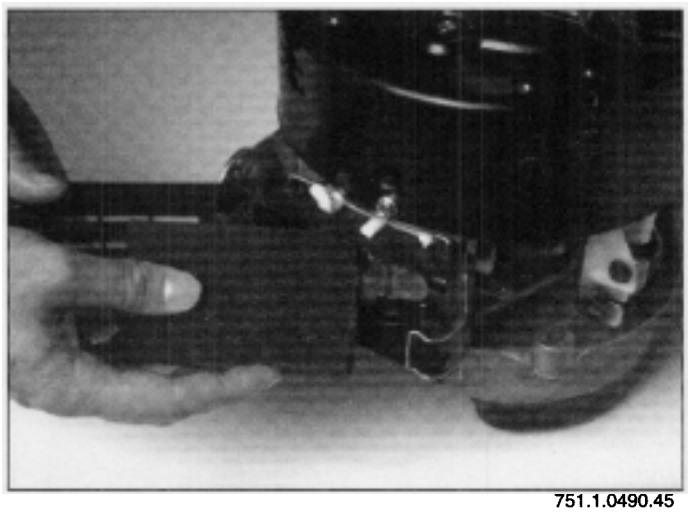
Fuel tank filter- must not be plugged.

SERVICING (cont'd)

Preliminary Check (cont'd

Fuel cap vent- hole must not be plugged.

Air filter- must be cleaned and oiled.



751.1.0490.45

5

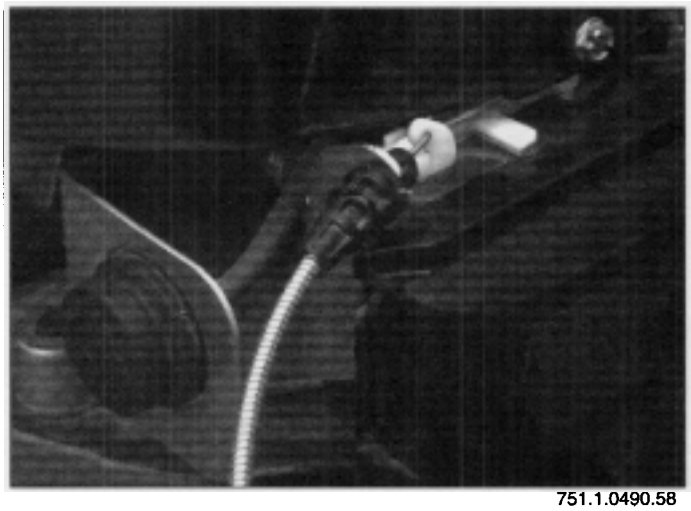
Crankcase seal- Crankcase seals must be installed properly and in good condition; torque value on the sump cover bolts must be correct.

Carburetor flange gaskets and heat shield- must be installed correctly

Exhaust ports- must not be restricted.

Fuel- mixture must be fresh, not unknown, etc. If unknown, flush out.

Governor air vane- must move freely.



751.1.0490.58

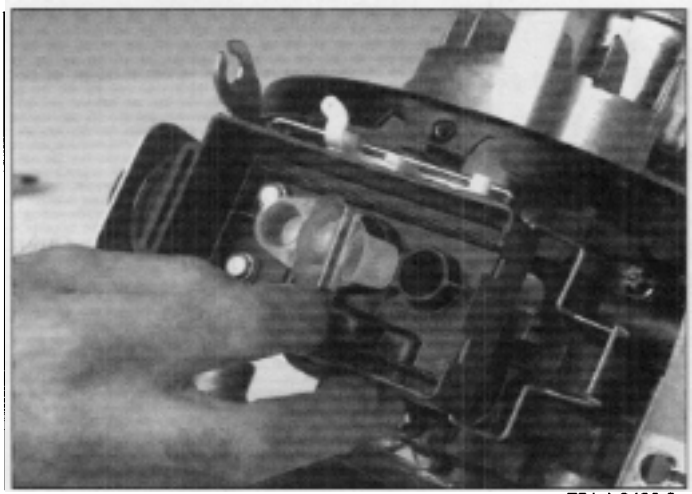
Removal

Tools Required:

Flat Blade Screwdriver

Needle nose pliers

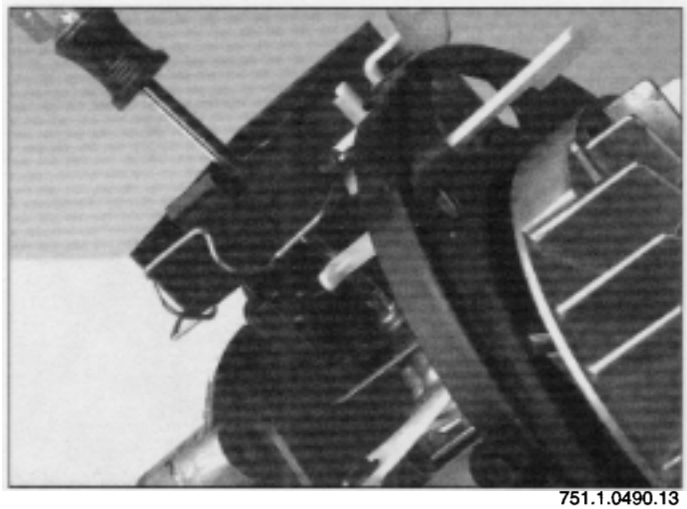
1. Disconnect the spark plug wire.
2. Remove the fuel line and drain; remove the fuel tank (see page 6-4)
3. Open and remove the air cleaner cover and air filter element. Remove the Spit Cup, if present, by gently prying the ends of the spit cup mounting plugs out of the air filter housing covering the carburetor mounting screws.



751.1.0490.9

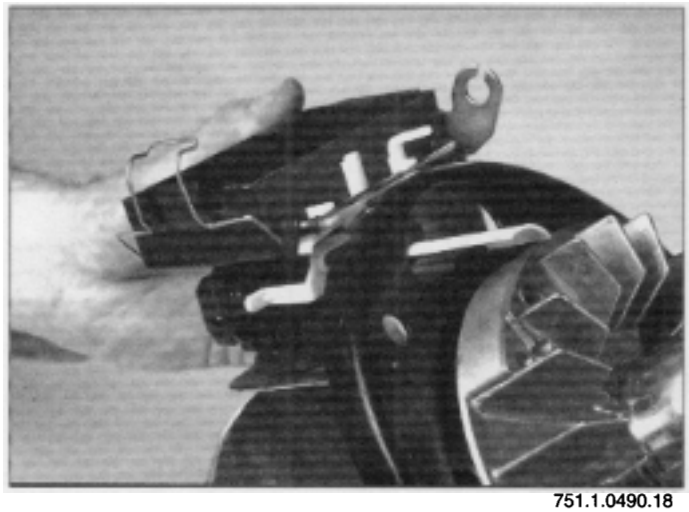
751.1.0490.53

4. Remove the throttle cable screw and nut from the throttle cable mounting bracket.



751.1.0490.13

5. Detach the carburetor from the engine by removing the two mounting screws. Discard the two smaller carburetor gaskets on either side of the carburetor shield. Keep the heat shield/primer bulb bracket for later installation.
6. Disconnect the fuel line and the primer tube from the carburetor fittings.



751.1.0490.18

7. Pull the carburetor assembly down and away from the engine so the air vane governor clears the hole in the shroud mounting base.

SERVICING (cont'd)

Removal (cont'd)

8. **CAUTION:** Avoid damaging the delicate governor spring during this step.

   Slide the white plastic control lever to either end of its adjustment and snap it to the locked position. This will help restrict its movement while you disconnect the throttle cable from the control lever.

751.1.0490.4

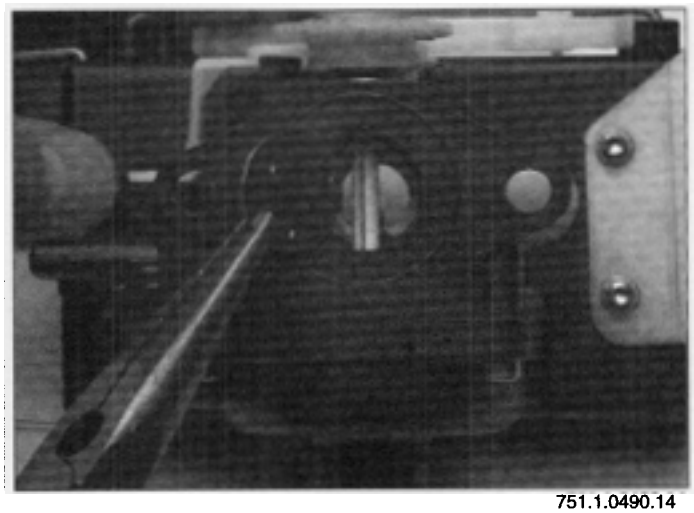
5

Disassembly

Tools Required:

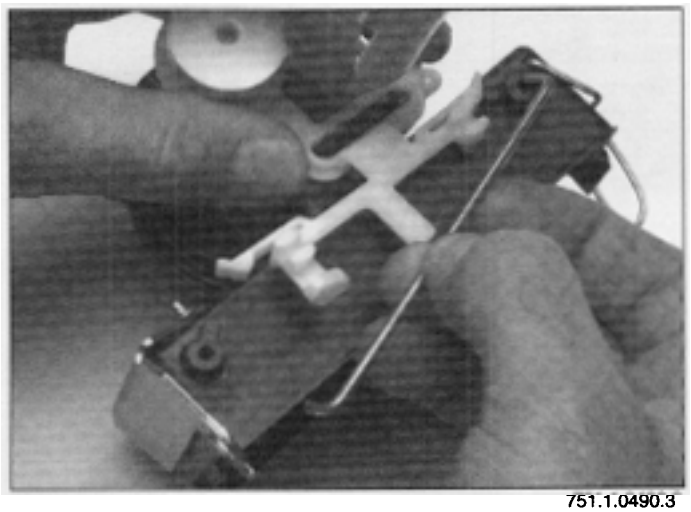
Needle Nose Pliers
Flat blade screwdriver

1. At the throat of the carburetor, use the needle nose pliers to gently pull the throttle plate out of the air vane governor assembly shaft. Notice the orientation of the small protrusions on the throttle plate as you pull it out. The single protrusion should be on your left (next to the hole at the 9 o'clock position).



751.1.0490.14

2. Remove the retainer holding the speed control lever.



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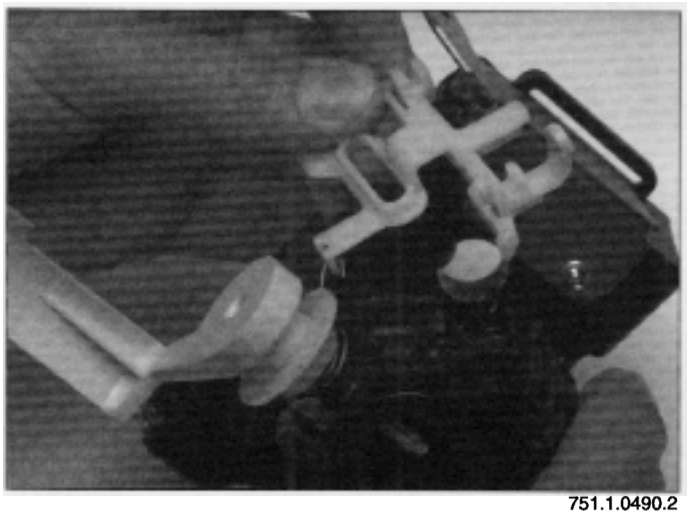
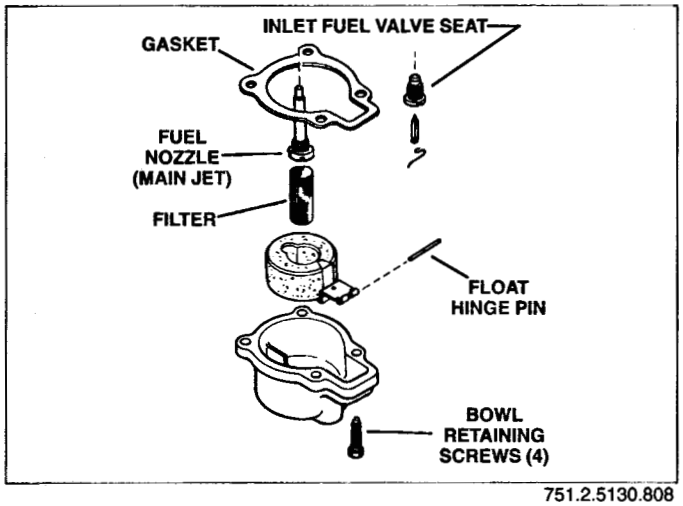


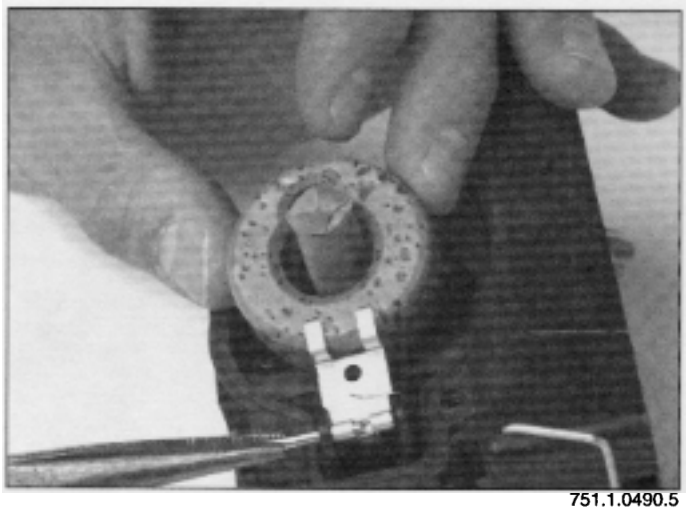
751.1.0490.2

3. Hold the governor collar on the carburetor and lift the air vane/throttle shaft out of the carburetor. Lift the collar and spring up, detaching the spring from the speed control lever.



751.2.5130.808

4. Turn the carburetor over and remove the four bowl retaining screws, the bowl gasket and the bowl. Discard the bowl gasket.
5. Remove the fuel filter from the fuel nozzle.



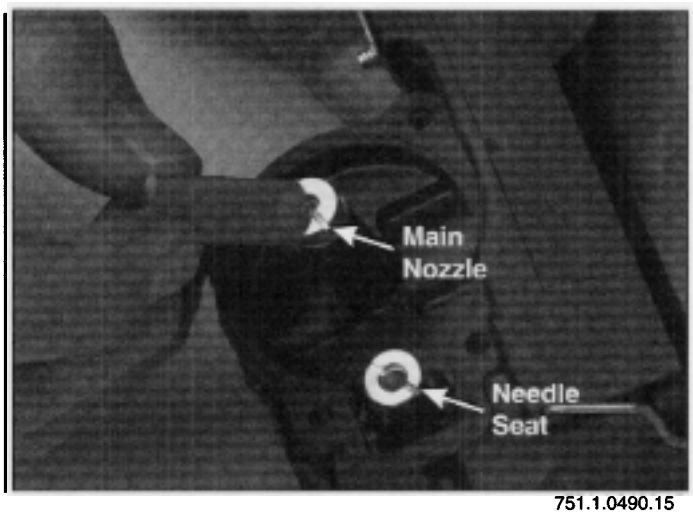
751.1.0490.5

6. Remove the float hinge pin, the inlet valve needle assembly (with its clip) and the float. Discard the needle and clip.
7. Inspect the float for cracks or deterioration of the cork.

SERVICING (cont'd)

Disassembly (cont'd)

8. Remove the brass inlet fuel valve seat and discard.
9. Remove the nozzle and the high speed jet from the nozzle.



751.1.0490.15

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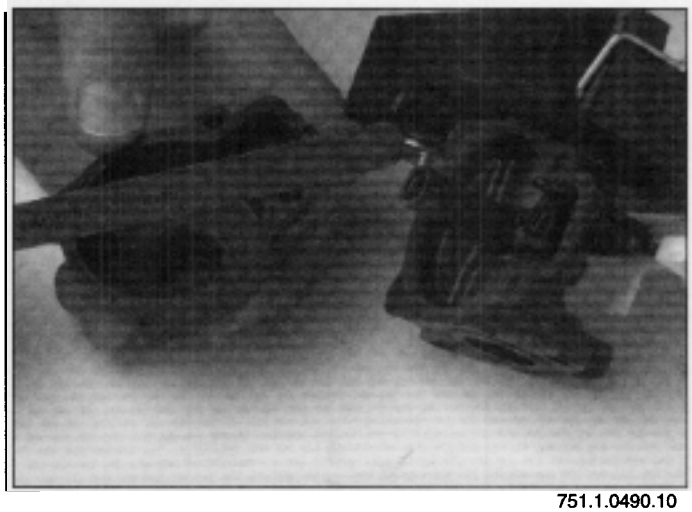
Cleaning and Inspection

1. With the carburetor completely disassembled, thoroughly clean all parts; do not soak the parts, use an aerosol carburetor cleaner. Inspect for wear or deterioration. Blow dry all carburetor passages with compressed air.

   CAUTION: If a tag wire is used, never enlarge or restrict any passageway in the carburetor.
2. Always check the carburetor mounting flange and fuel bowl mounting flange surfaces to be sure they are flush.



751.1.0490.10

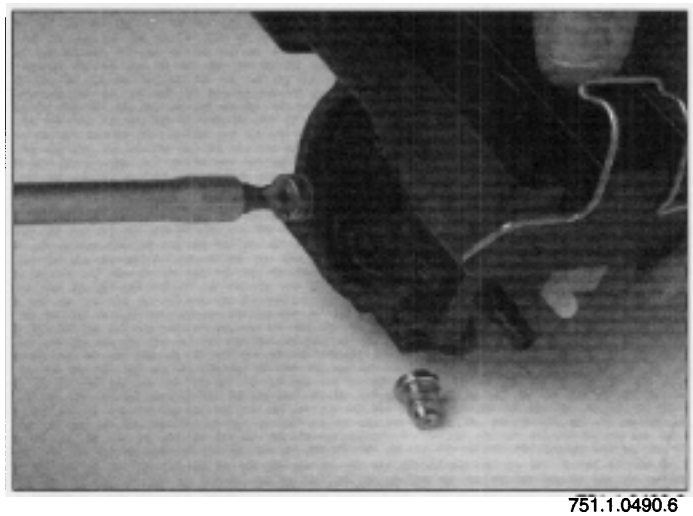
Assembly

Tools Required

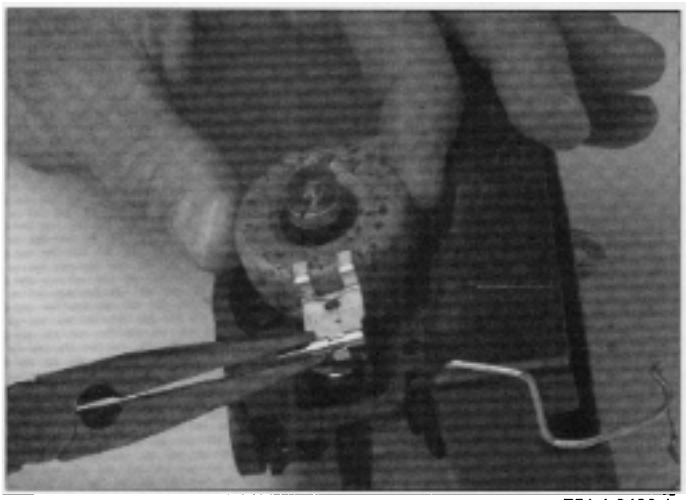
Flat blade screwdriver

Needle nose pliers

1. Install the high speed jet into the fuel nozzle.
2. Turn the carburetor over and install the nozzle assembly into the carburetor body.
3. Install a new brass inlet fuel valve seat.

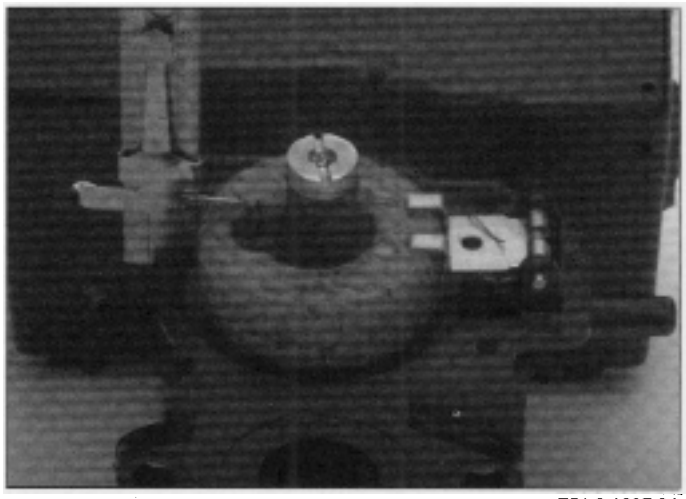


751.1.0490.6



751.1.0490.1

4. Install a new inlet valve needle and clip on the float.
5. Install the float assembly with a new float hinge pin in the bottom of the carburetor. Ensure the hinge pin is positioned properly to keep the float level. The float should be free to move up and down easily in the carburetor body.



751.2.1207.34

6. Adjust the float so the height is 15/32" to 17/32" (11.9 - 13.5 mm) from the bowl flange (without the gasket in place) to the top of the float.

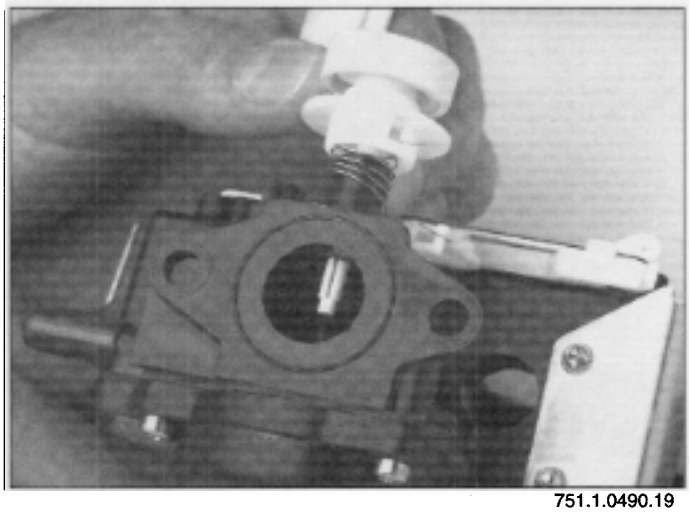
751.1.0490.12

7. Install the fuel filter over the nozzle.
8. Install a new fuel bowl gasket and the fuel bowl with the four bowl retaining screws.

SERVICING (cont'd)

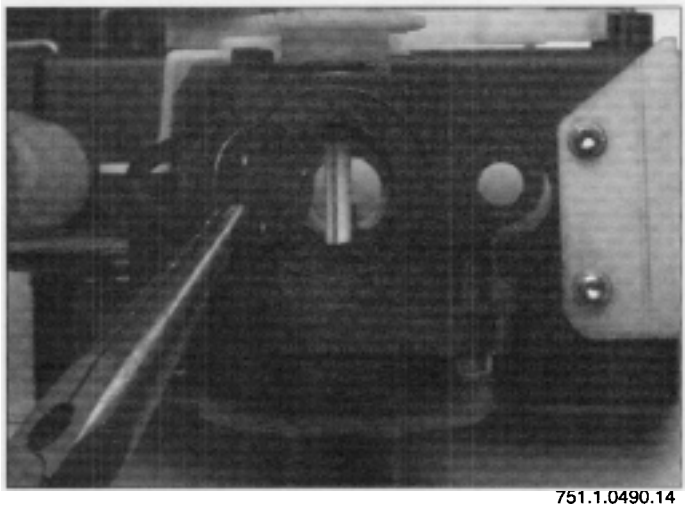
9. Hook the governor spring into the bottom of the governor collar.

10. Install the air vane and throttle shaft into the carburetor body by very carefully pushing the shaft through the collar into the carburetor body.



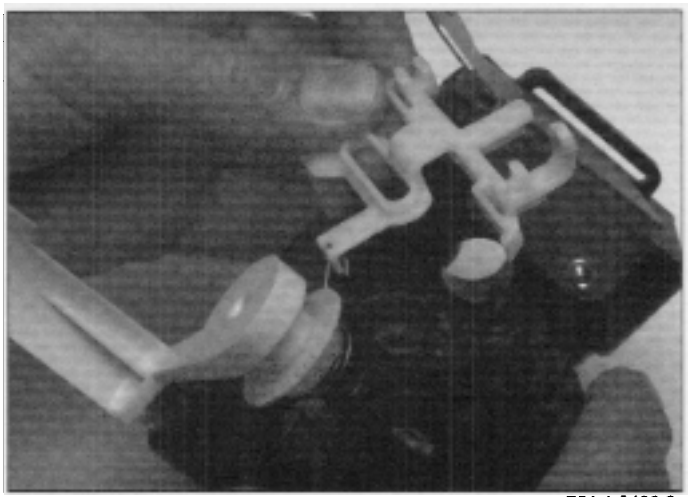
751.1.0490.19

11. Push the throttle plate into the throttle shaft (the plate only inserts one way).

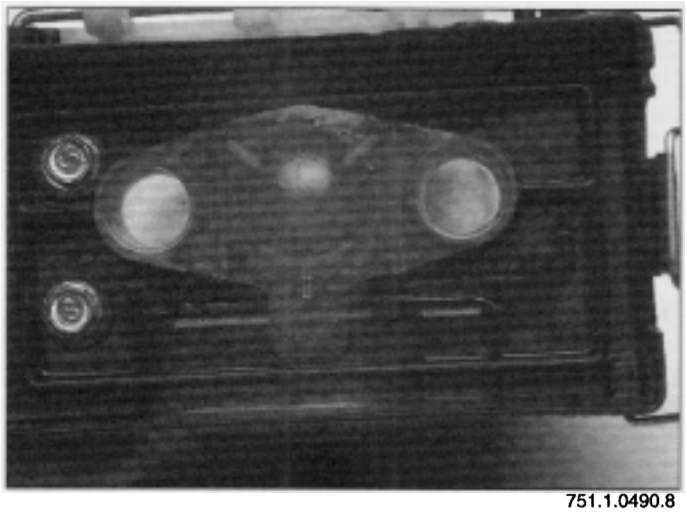


751.1.0490.14

12. Holding the spring collar, hook the other end of the spring into the speed control arm.
13. Re-install the speed control lever and retainer.



751.1.0490.2



751.1.0490.8

Installation

Tools Required: See "REMOVAL"

Install new gaskets and the heat shield (removed in previous procedure) on the carburetor. The air cleaner element and its cover should not be in place at this time.

Guide the air vane through the opening in the shroud base and attach the carburetor to the engine with the two mounting screws. Torque to 45-55 in lbs (5.1 -6.2 N•m). Replace the spit cup, if used. To prevent any air leaks make sure the spitcup (or two plugs) is(are) seated properly.

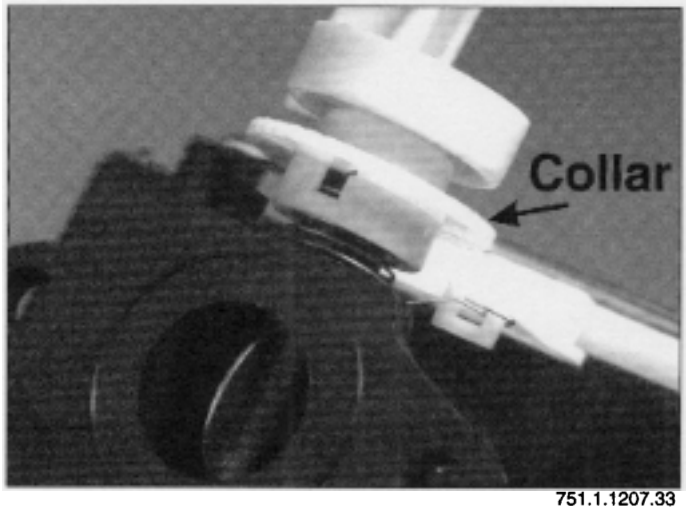
751.1.0490.53

Insert the Z bend of the throttle cable into the vertical tab of the speed control lever. Set the throttle to fast and the speed control lever so the throttle plate is sprung open to the full open position.

Install the fuel line and primer tube on the appropriate carburetor fittings.

Check that the choke/air vane assembly moves freely.

Install the air filter and cover.



751.1.1207.33

Presetting the Governor

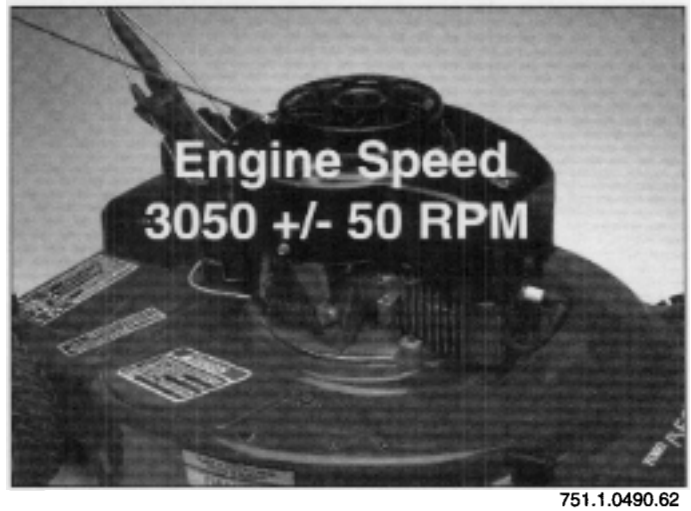
TOOLS REQUIRED:
Tachometer

NOTE: Each "click" of the governor collar represents approximately 50 RPMs.

1. Turn the collar clockwise to increase spring tension, and engine RPMs, or counter clockwise to decrease them. Preset the governor collar 3 or 4 clicks clockwise.

SERVICING (cont'd)

2. Use the tachometer to check engine speed; the normal high speed setting is 3050 +/- 150 RPM.



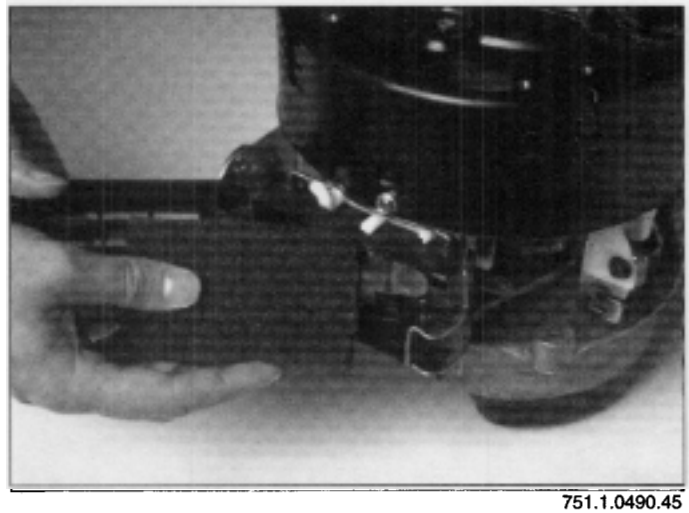
751.1.0490.62

5

Servicing the Air Filter

1. To remove the air filter, unsnap the wire holder, on the left side, from the cover. Then unsnap the cover from the clear plastic shell. Remove the cover and air filter element.
2. Clean and re-oil the air filter element according to the maintenance procedure, pages 4-3 and 4-4.

CAUTION: Do not operate the engine without a filter element, with a dry filter element, or without the spit cup (or carb access hole plugs) in position (unfiltered air could enter the carburetor) or engine life will be shortened.



751.1.0490.45

QUICK REFERENCE SECTION

SERVICE SECTION

FUEL SYSTEM

6

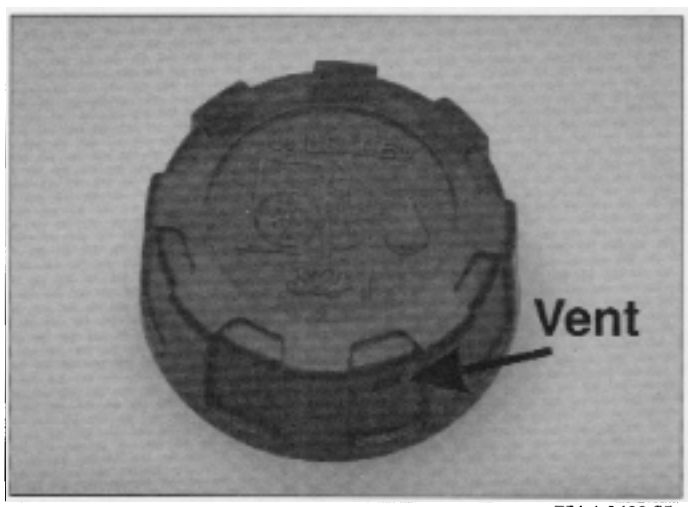
751.1.1207.16

Fuel Tank

The Toro V Engine uses a 1.3 quart plastic fuel tank with a non replaceable 75 micron, intank, filter screen. The filter is welded in the bottom of the tank over the outlet fitting. The tank is mounted above the level of the carburetor and uses gravity to supply fuel through a .25" I.D. (6.35 mm) rubber hose to the carburetor. The fuel hose is friction fitted to the tank outlet at one end and to the carburetor at the other end.

751.1.1207.15A

The fuel tank is vented through an opening in the fuel cap. The fuel opening on the tank is 1.75" (45 mm) in diameter and is opposite the fuel outlet. This helps prevent damage to the filter screen by funnels and gasoline filler spouts that may be inserted into the fuel tank during refilling. The placement of the cap also prevents interference with the starting rope in zone start applications.



751.1.0490.55

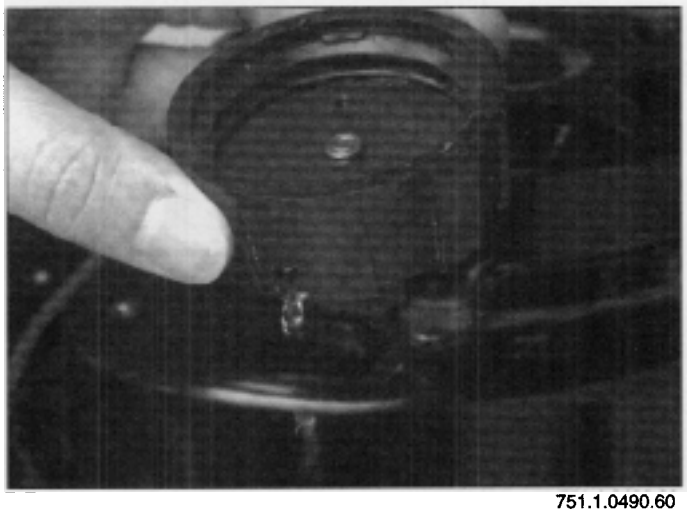
Fuel Cap

The fuel cap is a four piece design with an inner sealing disc that is vented to a baffle assembly in the body of the cap. The baffle assembly allows expansion in the tank without the loss of fuel. Atmospheric pressure is allowed into the tank from an opening in the cap to allow gravity to feed fuel to the carburetor. NOTE: If an individual part of the cap fails, the entire assembly must be replaced.

SERVICE

Fuel Cap

1. The fuel cap may not be disassembled; however, the vent opening on the cap and inner sealing disc should be kept free of debris.
2. The ventilating ability of the cap may be tested by filling the cap with water and observing the flow of water out of the vent opening in the top of the cap. If water does not drain, the vent opening may be plugged or restricted (this may be indicated by a stalling or erratically operating engine).
3. If the fuel cap will not vent properly replace the entire cap assembly.



751.1.0490.60

Tank Removal

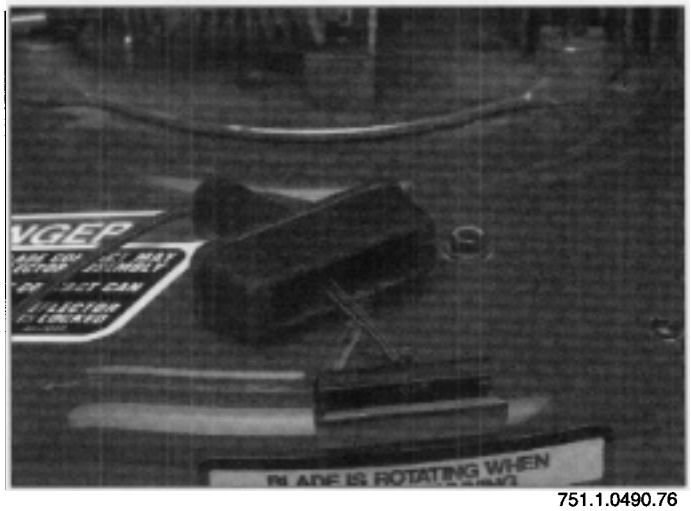
Tools Required

Clamping Pliers

Minimum 1.5 Qt (1.41 ltr)Container

#T25 Torx

1. Disassemble the starter rope "T" handle sufficiently to untie (or cut) the starter rope knot and release the rope from the handle (the plastic rope-stop prevents the rope from rewinding completely into the starter).

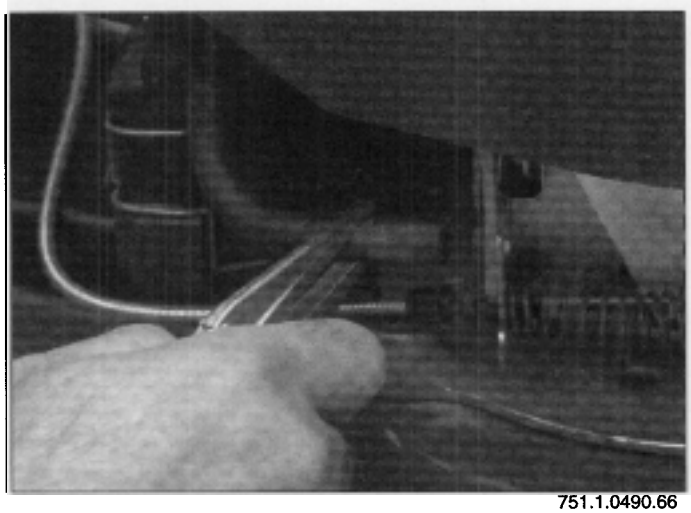


751.1.0490.76

NOTE: To remove the fuel tank, you may either crimp the fuel hose and use the clamping pliers to remove the fuel hose from the carburetor. Release the clamping pliers and drain the fuel into a container designed to receive gasoline.

OR

You may reach under the edge of the fuel tank to pull the hose off the tank outlet, but you must be ready to catch the fuel that will drain out of the tank. If you use this method, you must have a container large enough to hold the amount of fuel in the tank.

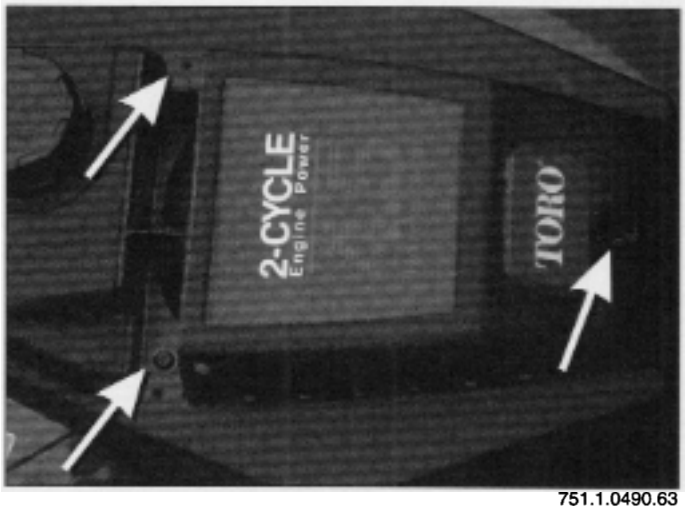


751.1.0490.66

751.1.0490.71

CAUTION: Avoid fire and explosion. Store fuel in a container designed for gasoline and never smoke while working around gasoline.

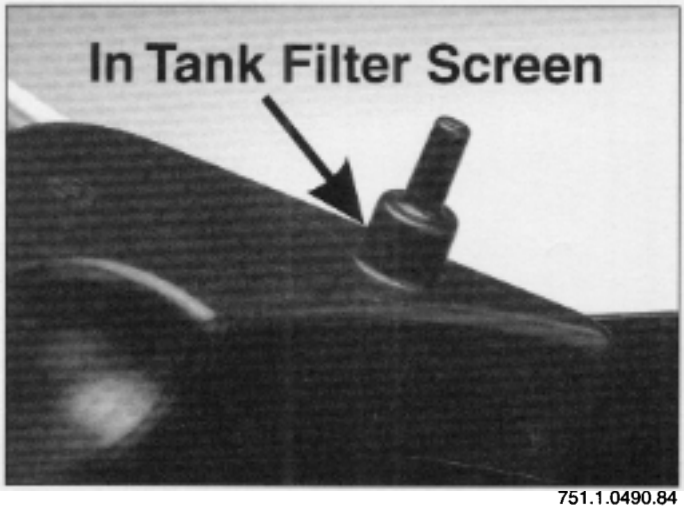
If you remove the fuel line from the tank outlet catch the fuel as it drains. Properly dispose of the fuel.
Note: Always use a fresh supply of fuel when refilling the tank.



751.1.0490.63

Using a #T25 TORX driver, remove the three screws, with captive washers, that secure the fuel tank to the shroud assembly.

6



751.1.0490.84

Cleaning

Take the fuel tank to an appropriate area and wash the tank with a clean, mild cleaning solvent intended for engine parts.
NOTE: Do not use soap and water or carburetor cleaner.

Back flush the filter screen by directing the cleaning solvent, under moderate pressure, through the sediment reservoir and screen, opposite the direction of fuel flow.

As a final rinse, wash the tank again with cleaning solvent or a small amount of fresh fuel..

Clean or replace the fuel hose.

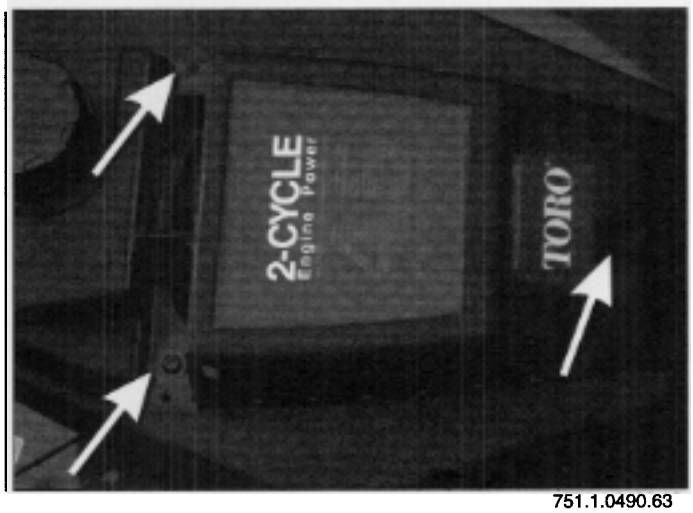
SERVICE (cont'd)

Tank Installation

Tools required:

#T25 Torx

1. Fasten the tank to the engine with the three screws, with captive washers.
2. Connect the fuel line.
3. Refill the tank with a fresh gas/oil mixture and check the system for leaks.



751.1.0490.63

Fuel Storage

Use clean, fresh, lead-free gasoline, including *oxygenated* or *reformulated* gasoline, with an octane rating of 85 or higher. To assure freshness, purchase only the quantity of gasoline that can be used in 30 days. Use of lead-free gasoline results in fewer combustion chamber deposits and longer spark plug life. Use of premium grade fuel is not necessary or recommended.

Important:: Never use Methanol gasoline containing Methanol, gasoline containing more than 10% ethanol or gasoline containing more than 15% MTBE. Use of these fuels can cause engine/fuel system damage.

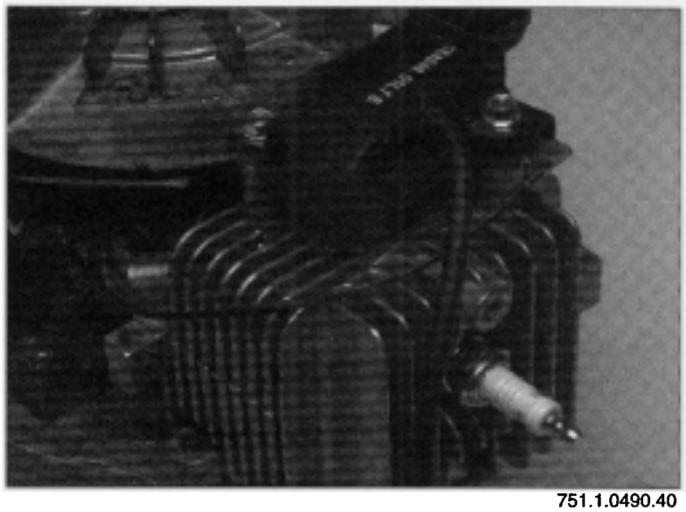
Follow Proper Procedure For Fuel Storage

QUICK REFERENCE SECTION

SERVICE SECTION

IGNITION SYSTEM

7



751.1.0490.40

Process

Check the ignition system in the following order:

Spark plug (connection and wire condition)

CD Pack (air gap, connections or spark)

Flywheel (key and magnets)

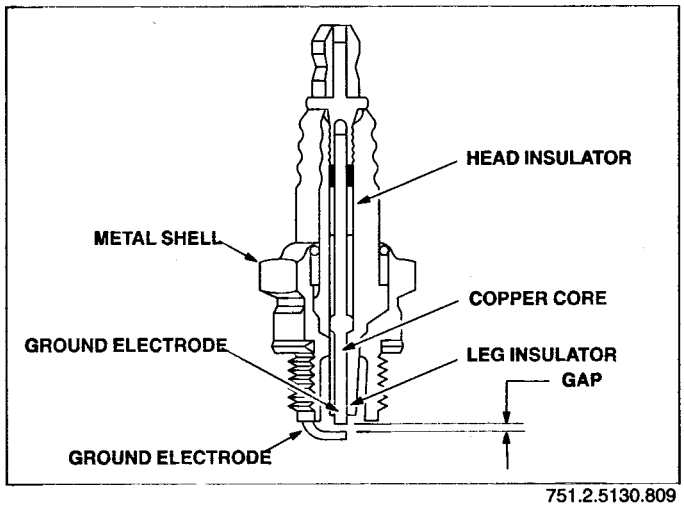
Use the following table to aid in diagnosing the problem

Problem	Possible Cause	Suggested Remedy
Misfiring, no firing, engine surges, engine dies. (NOTE: These symptoms may also be caused by fuel symptom problems).	Spark plug wire loose Spark plug in poor condition	Tighten plug to specifications
	CD Pack air gap wrong	Adjust (see CD Pack Service section)
	CD Pack high tension lead loose	Secure with GE silicon sealant
	CD Pack leads loose or dry	Clean and tighten leads
	CD Pack defective	Replace CD Pack
	Flywheel key damaged or sheared	Replace key and check keyway (see Flywheel - Servicing, in this chapter)
	Flywheel magnets demagnetized or weak	Replace flywheel

SPARK PLUG

Operation

The spark plug ignites the fuel-oil mixture by producing a spark just before the piston reaches top dead center (TDC). A spark plug is typically constructed as shown.



751.2.5130.809

Service

1. Check the spark plug with the chart and replace, if necessary using the specifications shown.

CAUTION: Do not clean the plug with a sand blaster.

2. Remove carbon build up by cleaning the plug with a wire brush. Check the condition of the plug for cracking or damage. Replace if necessary.

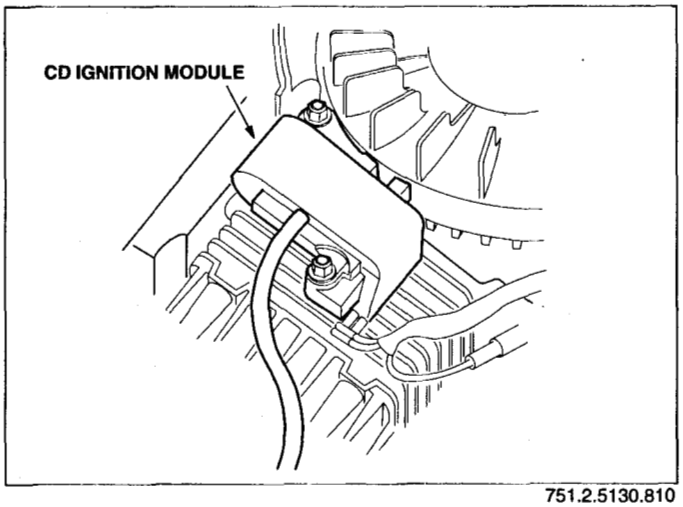
Item	Specification/Action
Plug type	Champion RJ12C or equivalent
Frequency of change	As needed (See Troubleshooting above)
Check, Clean, and gap	Every 25 hours Gap at .035" (.89 mm)
Torque value	144-180 in lbs (18.3 N•m)

CD PACK

Advantages

The Toro V Engine uses a solid state ignition module to generate an electrical pulse for the spark plug. The term "solid state" is a broad term applied to any electrical system which uses electronic components such as diodes, transistors, silicon controlled rectifiers (SCR), etc., that take the place of one or more of the older standard mechanical ignition components.

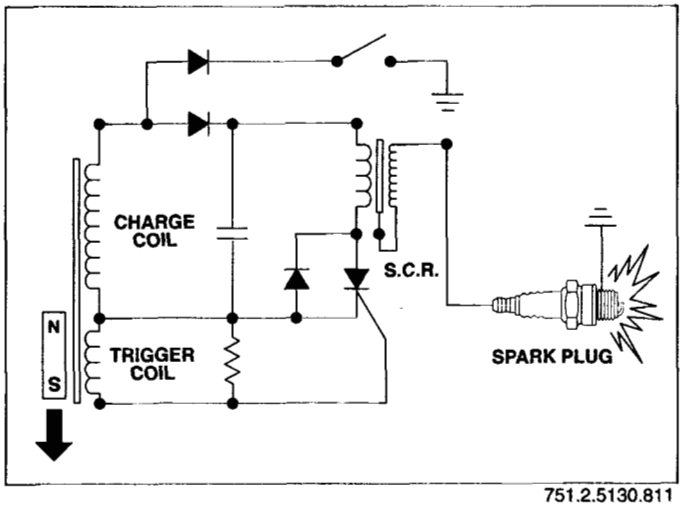
Solid State Ignition uses Electronic Components In Place Of Mechanical Devices



751.2.5130.810

Electronic components are very small, have no moving parts, require no mechanical adjustments, and are not affected by wear as are mechanical devices. They deliver uniform performance throughout component life under adverse operating conditions. They can be hermetically sealed so that they are unaffected by dust, dirt, oil or moisture.

The Capacitive Discharge (CD) system is breakerless, and contains electronic components that replace mechanical points and related accessories (such as a breaker cam, spark advance assembly, etc.).

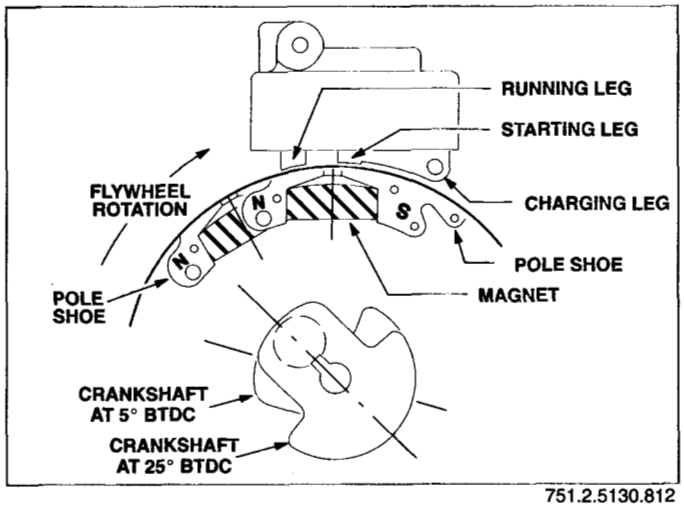


751.2.5130.811

Operation

As the flywheel magnet passes the CD pack, an AC voltage is induced into the charge coil. This AC voltage is converted by a rectifier into a DC signal which is then stored in a capacitor.

When the SCR is triggered or "fires", up to 200 volts DC, stored in the capacitor, travels to the spark coil. Here it is stepped up to as much as 25,000 volts and is discharged across the electrodes of the spark plug.



751.2.5130.812

At slower speeds, the flywheel magnet induces a smaller charge in the trigger coil. This action triggers the SCR, enabling easier starting in a "retarded firing position" about 5 degrees before top dead center (BTDC).

At faster speeds (about 800 RPM), the flywheel magnets induce a large enough charge in the trigger coil to trigger the SCR in the "advanced firing position" (about 25 degrees BTDC).

CD PACK (cont'd)

Air Gap Adjustment

Tools required:

Air Gap Gauge (p/n 604659)

10 mm Socket

1. Rotate the flywheel until the magnets are directly adjacent to the CD Pack as shown.
2. Adjust the air gap by loosening the screws, inserting the gauge , or a piece of .010" (.254 mm) shim stock, and tightening the screws.

751.1.1207.31

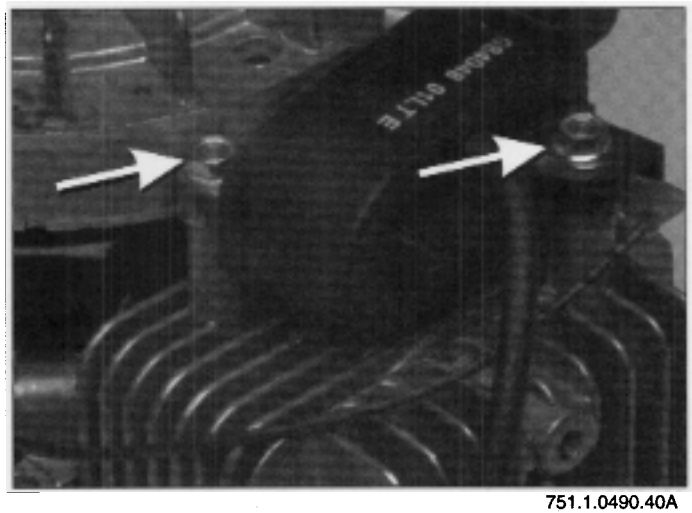
Removal/Installation

Tools Required

10mm Socket

Flat blade screwdriver

1. Disconnect leads and remove the mounting screws.
2. Remove the screws, replace the CD Pack and set the gap as outlined in the previous topic. Torque the screws to 100 in. lbs (11 Nm).



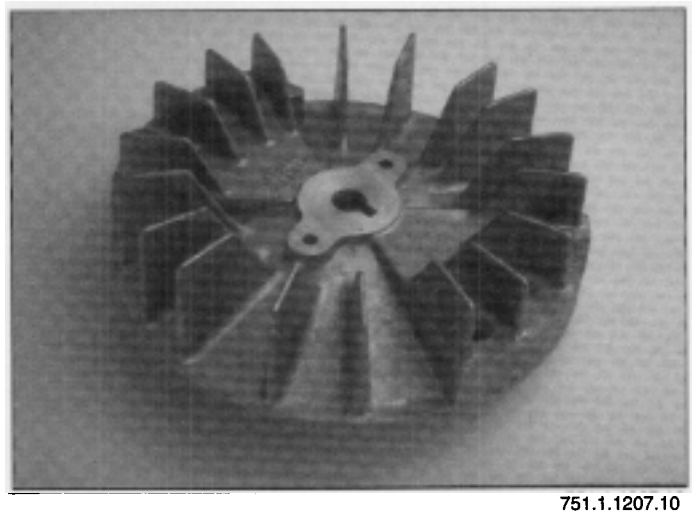
751.1.0490.40A

FLYWHEEL

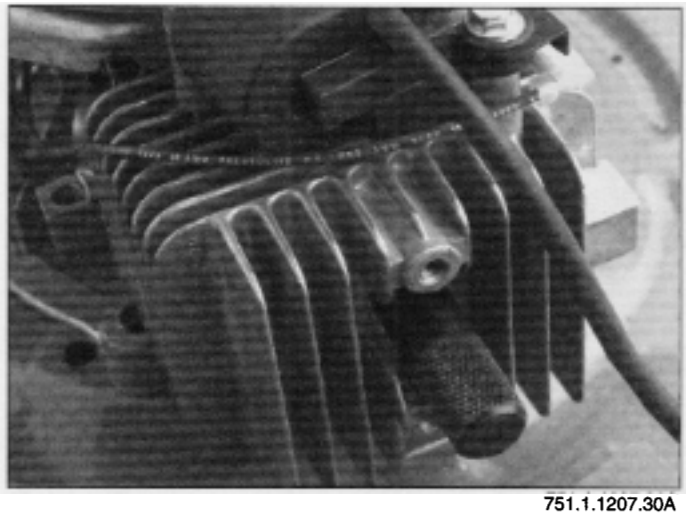
Operation

The flywheel is connected directly to the crankshaft (secured by a key and nut) and turns at the same speed as the crankshaft. Two permanent magnets, imbedded in the flywheel, rotate past the coil in the CD Pack to begin the generation of electricity.

Imbedded in the opposite side of the flywheel are steel counter weights which offset the weight of the magnets. These counter weights are not magnetic.



751.1.1207.10

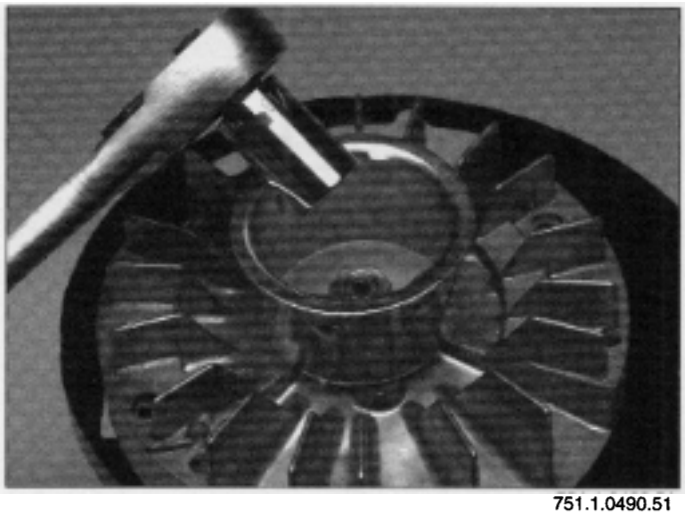


751.1.1207.30A

Removal

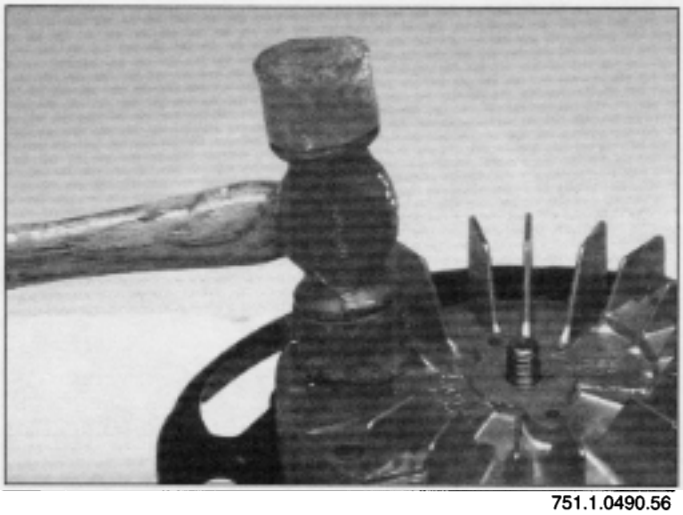
Tools Required
Piston Stop (p/n 677389)
Puller (B&S #19165) or similar puller
Soft Hammer
1/2" Socket

1. Remove the spark plug and install the piston stop.



751.1.0490.51

2. Remove the shroud and fuel hoses.
3. Remove the flywheel nut.



751.1.0490.56

4. There are two methods used to remove the flywheel.
   Remove the flywheel by pulling on the edge of the flywheel while striking the wide fin of the flywheel with a soft hammer.

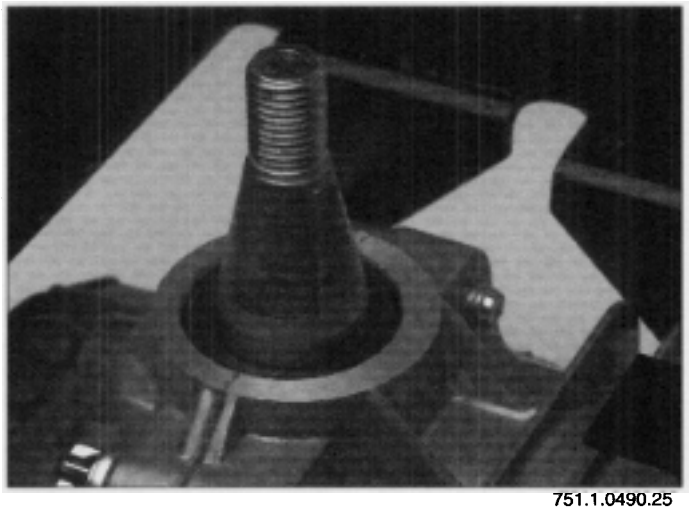
   OR

   Using a flywheel puller to remove the flywheel.

FLYWHEEL (cont'd)

Removal (cont'd)

5. Remove the key and check its condition.
6. Replace the crankshaft and/or flywheel if the keyway is distorted or cracked. Replace the key if damaged.
7. Check the flywheel for wear and flywheel magnets for strength. Check the magnets by holding the flywheel up against a metal object. The magnets shouldhave a strong pulling force.



751.1.0490.25

Installation

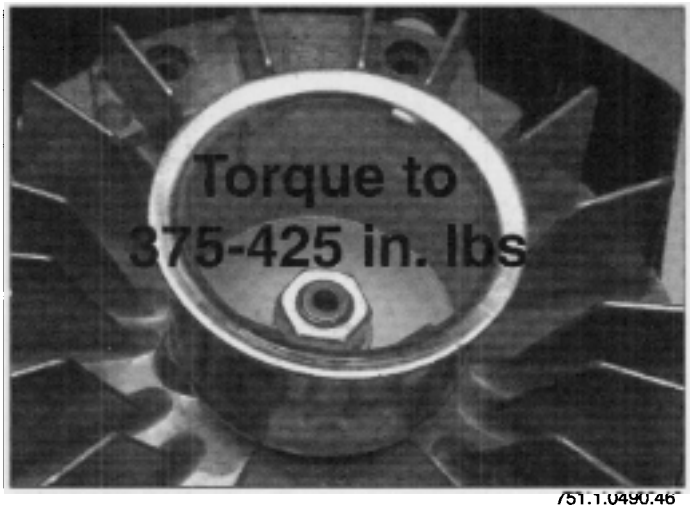
Tools Required:

1/2" Socket

1. Make sure the flywheel keyway is absolutely clean.
2. Make sure the key is installed parallel with the centerline of the crankshaft.

751.1.0490.30

3. Locate the keyway cutout in the flywheel over the key and shaft.
4. Torque the flywheel nut to 375-425 in. lbs (43-47 Nm).



751.1.0490.46

QUICK REFERENCE SECTION

SERVICE SECTION

REWIND STARTER

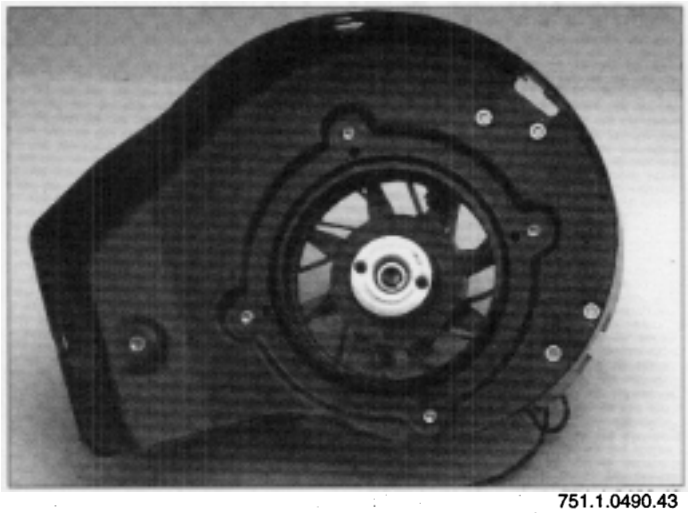
Operation

The rewind starter operates through a retainer/friction disc that causes two, spring-loaded, engagement dogs to extend from the rewind starter and engage the inside of the starter hub on the flywheel. The engagement dogs extend outward to make contact with the starter hub when the rope is pulled. When the engine starts, and the rope is released the starter dogs are retracted back into the center of the rewind mechanism, disengaging them from the starter hub.

751.1.0490.42A

Recoil Assembly Replacement

If the starter should wear out, or fail, the complete recoil and blower housing assembly must be replaced (the exception to this is the starter rope). You should not attempt to replace individual parts.

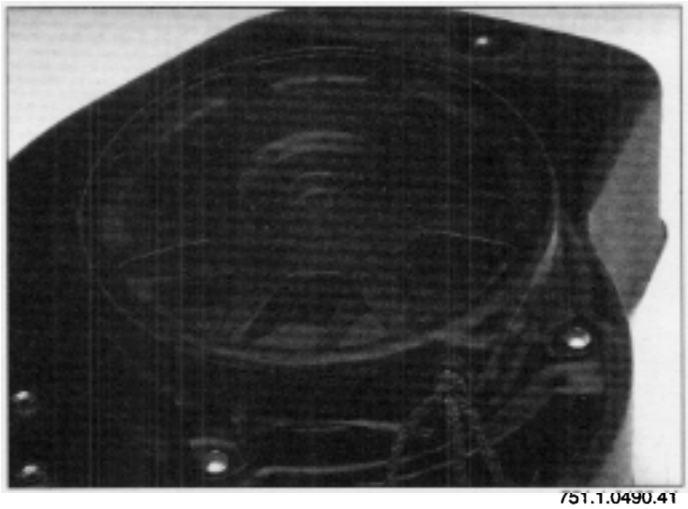


751.1.0490.43

Starter Rope Replacement

Rope length: 88 5/8"

When installing the replacement rope use 1/2 to 1 1/2 turns of prewind to pretension the spring (enough to pull the rope back into the recoil).

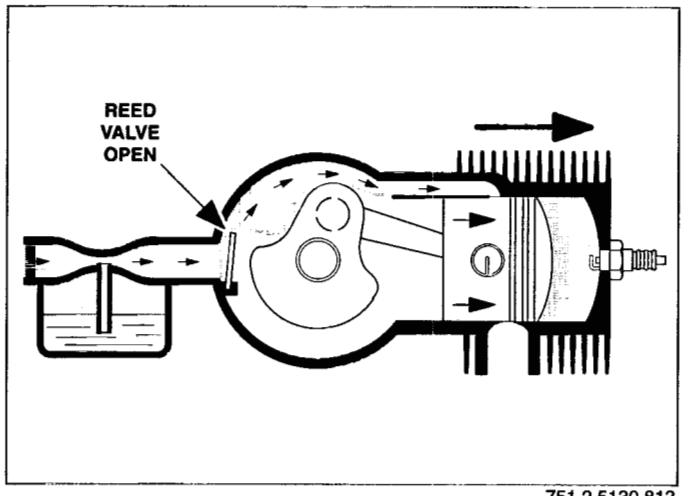


751.1.0490.41

QUICK REFERENCE SECTION

SERVICE SECTION

ADVANTAGES / DESCRIPTION

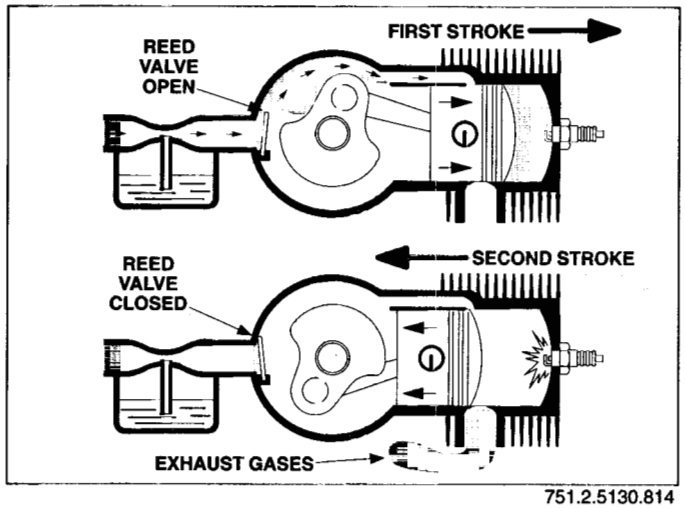


751.2.5130.813

Two-cycle engines have special advantages which make their use more practical in certain applications. Two-cycle engines are lightweight with an excellent power-to-weight ratio and can be operated in any position. They are also notably easy to maintain and service because of their uncomplicated design.

The Toro Two-Cycle V Engine used on Toro rotary mowers is a reed valve design. This design name describes the method used to control the admission of the fuel/air mixture into the cylinder/crankcase and combustion chamber, and the exhausting of gases.

OPERATION

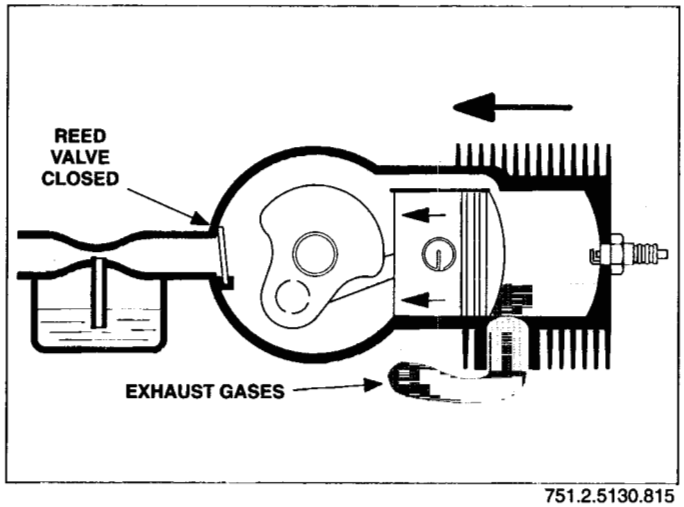


751.2.5130.814

The two-cycle engine is one of the simplest and most efficient power systems ever developed.

The illustration show at the left shows what happens inside the engine during one full crankshaft revolution. Fuel intake, fuel ignition and the exhaust of burned gases all take place during a single 360-degree rotation of the crankshaft.

9



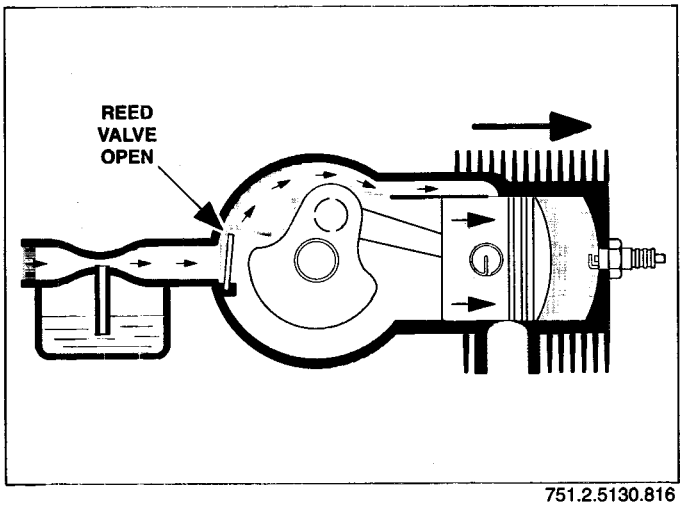
751.2.5130.815

Beginning at a point where the top of the piston is just below the exhaust port, the piston moves down toward the crankcase. As the transfer port is uncovered, the fuel/air mixture stored in the pressurized crankcase is forced into the combustion chamber.

OPERATION (cont'd)

The crankshaft continues its rotation and the piston begins its travel toward the spark plug. As it moves, the piston seals off the transfer port first, then the exhaust port. When both ports are sealed, the remaining travel compresses the air/fuel mixture to prepare it for ignition. The travel of the piston towards the spark plug is called the compression stroke.

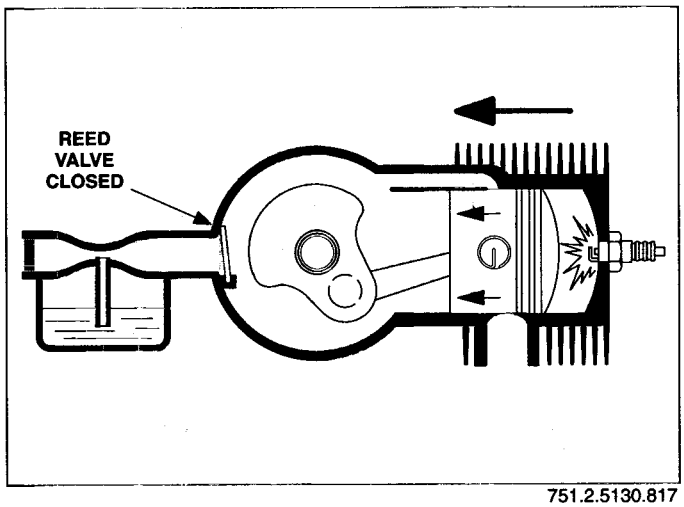
The movement of the piston towards the spark plug also has an important effect in the crankcase. Once the transfer port is sealed, a vacuum is created in the crankcase. This action pulls the reed valve open and draws in a fresh charge of the fuel/air mixture.



751.2.5130.816

Just before the piston reaches top dead center (TDC), the spark plug fires. When the engine is functioning properly, the fuel/air mixture ignites, causing a burn that occurs evenly through the power stroke. The piston changes direction and begins its travel towards the crankcase.

NOTE: If the compression ratio is too high, the fuel/air mixture actually explodes before it is ignitied by the sparkplug. This can be heard and is identified as detonation (also called "knock").



751.2.5130.817

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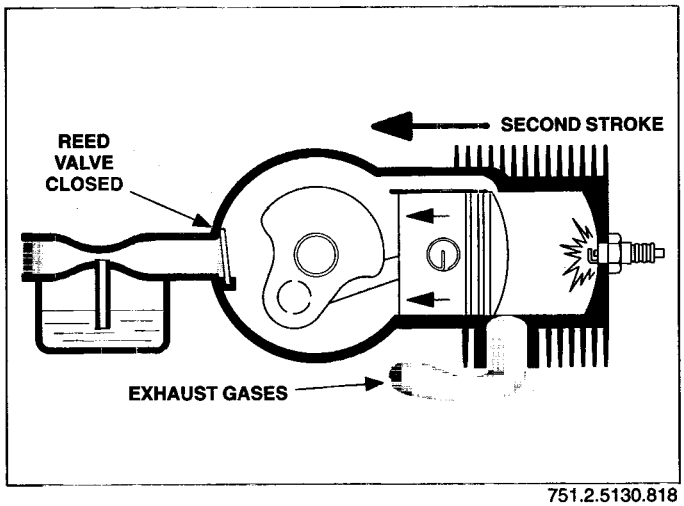
When the piston opens the exhaust port, high-pressure exhaust gases exit the exhaust port. Further movement of the piston towards the crankcase uncovers the transfer port which allows a fresh charge of air/fuel mixture to enter the combustion chamber. As the exhaust gases continue to exit the exhaust port the engine is readied for another cycle.

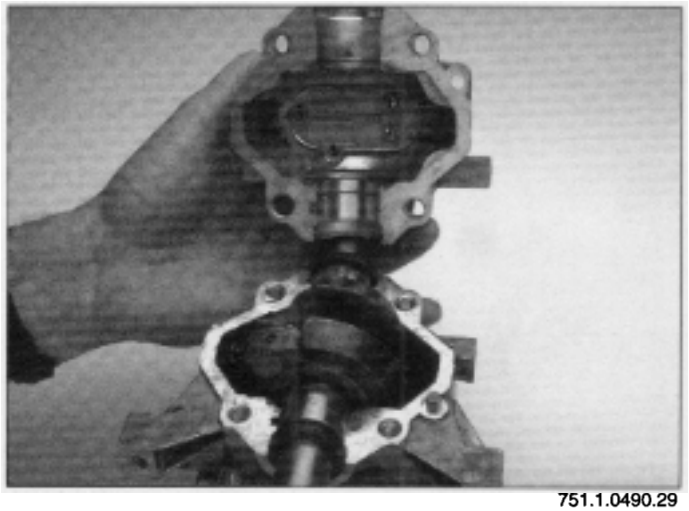


751.2.5130.818

751.1.0490.86

The two-cycle engine is always well lubricated as long as the correct gas/oill mixture(using proper 2 cycle oil) is maintained in the fuel tank. Oil suspended in the fuel vapor adheres to all moving parts, keeping them continually coated, regardless of operating angle.

SERVICE TIPS

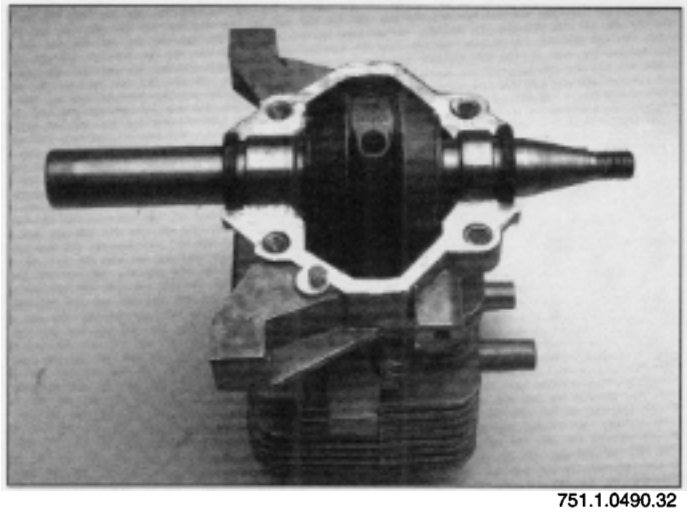


751.1.0490.29

Cylinder/Crankcase Halves

The two halves are a matched pair and cannot be mixed. Check the cleaning and assembly procedures under Engine -Disassembly (pg 9-11) in this section.

Be sure to use Loctite 515 gasket maker on the cover only. Do not apply gasket maker to either crankshaft seal. Torque the 4 washer-head screws that secure the two halves to 105-115 in. lbs (12 - 13 Nm).



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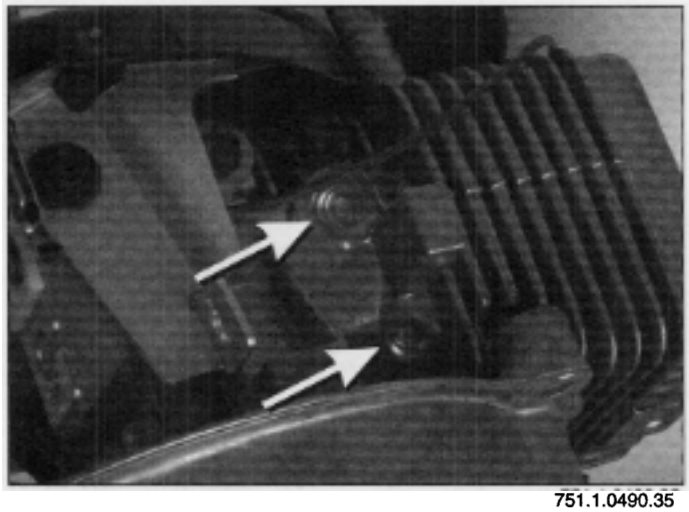
Oil Seals

Visually inspect for leaking or damaged oil seals (two locations).

SERVICE TIPS (con'd)

Core Plugs

Visually inspect for damaged or leaking plugs



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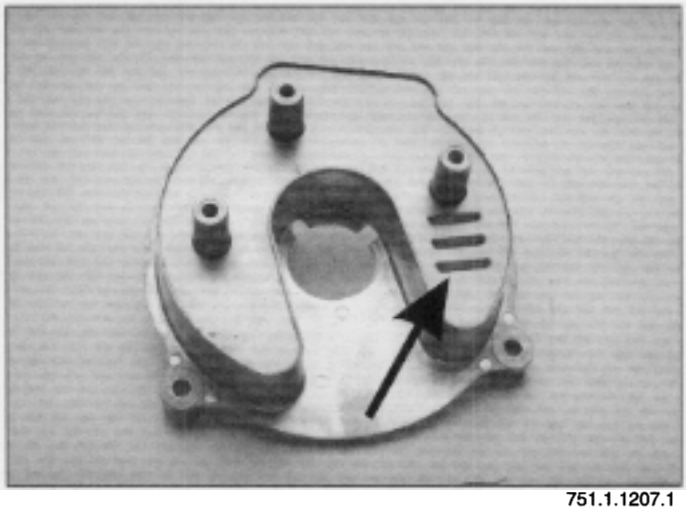
Muffler Baffle

This item should be cleaned every 50 hours (maximum) to keep carbon from clogging the exhaust system (power loss) and from entering the engine (piston scoring).



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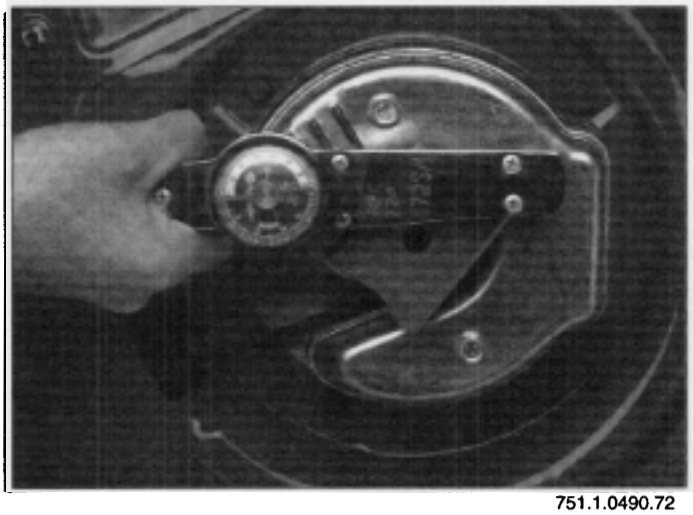
9

Muffler Plate Screws

Screws may have loosened due to vibration. They should be torqued to 140 - 200 in. lbs (16 - 22Nm).



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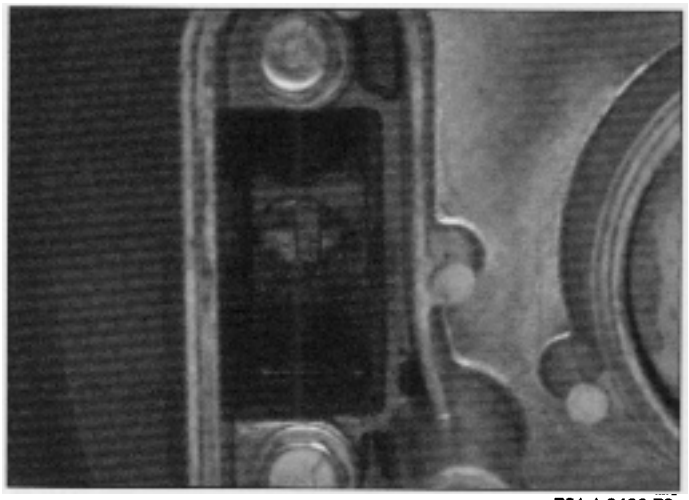
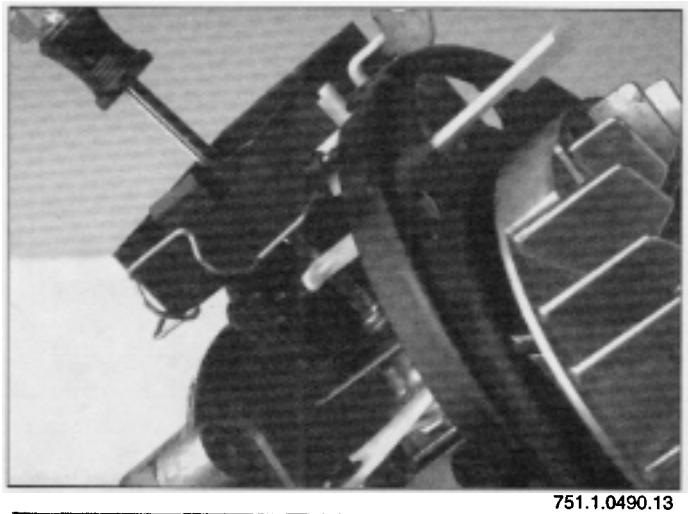


751.1.0490.78

Exhaust Ports

Exhaust ports should be inspected every 50 hours and cleaned as necessary.



751.1.0490.13

Carburetor Gaskets

Ensure that the air cleaner/carburetor mounting screws are tightened to a torque of 45-55 in. lbs (5.0 - 6.1Nm). Check for damaged or leaking gasket surfaces. Replace the gaskets if damaged. Carburetor gaskets on either side of the carburetor shield may be leaking or damaged causing air leaks into the engine (may cause power fluctuations).

Removal

751.1.0490.76

Tools Required:

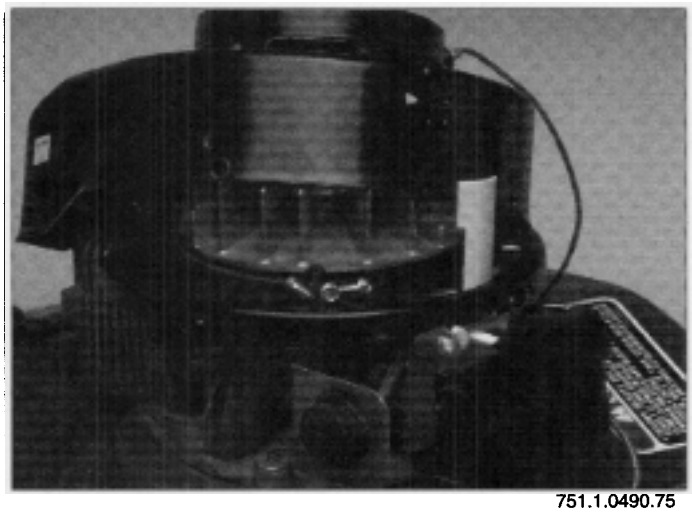
Sockets - 3/8", 5/16'", 7/16"', 1/2"Flat blade screwdriver
#T25 Torx
Flywheel puller

Prior to disassembling the engine and prior to further troubleshooting a malfunction, separate it from the mower as follows:

1. Disconnect the spark plug wire
2. Disassemble the "T" starter handle to untie the knot in the starter rope. The plastic rope-stop will keep the rope from rewinding completely into the starter.

REMOVAL (cont'd)

3. Remove the fuel tank (See Fuel Tank Removal, page 6-4).
4. Remove the shroud ; the starter comes off with the shroud.



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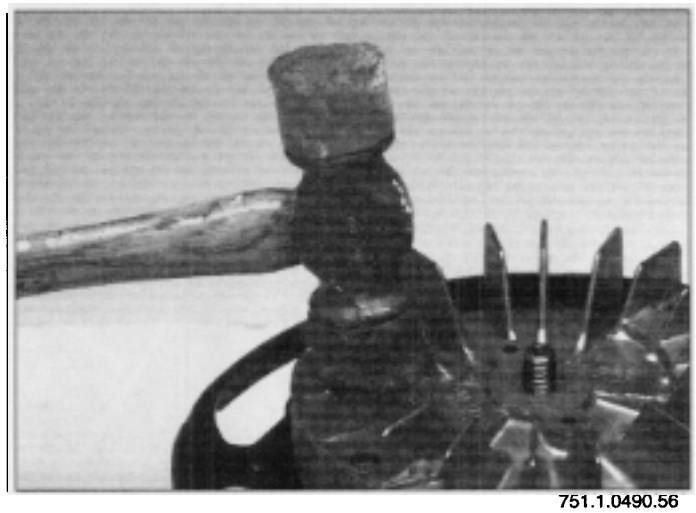
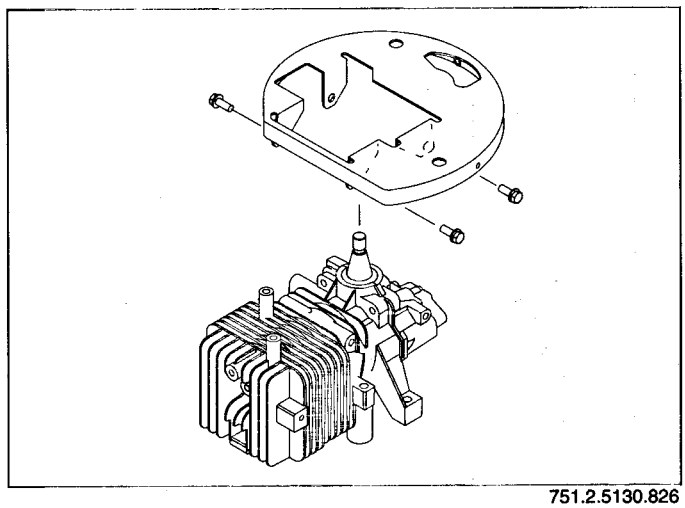
5. Remove the flywheel (See Flywheel Removal, page 7-7).



751.1.0490.56

6. Remove the remaining bolts securing the shroud base to the crankcase halves.



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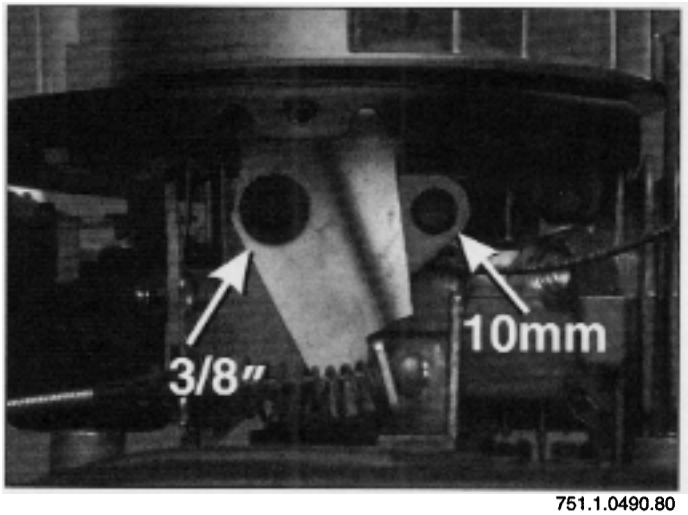
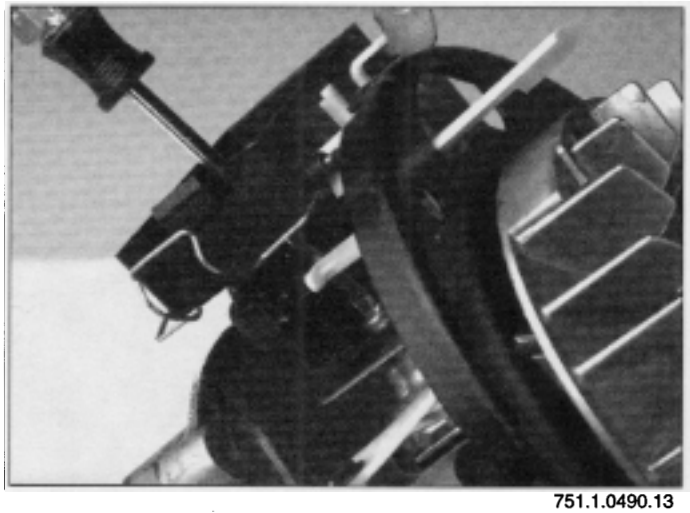


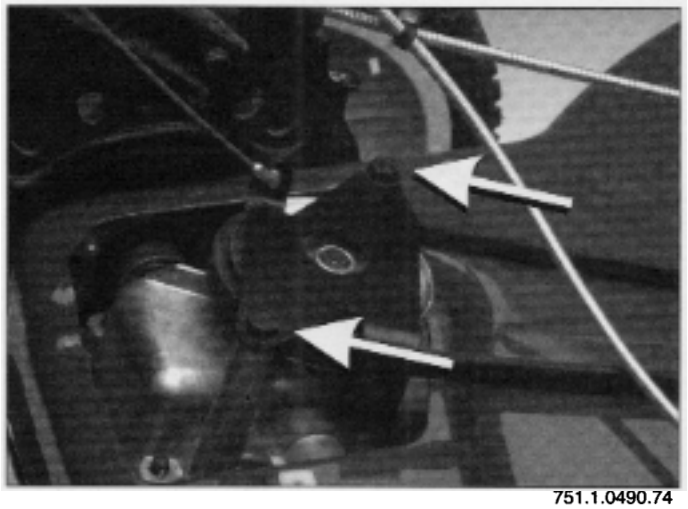
751.1.0490.80

7. Remove the brake plate assembly by removing one 10 mm shoulder screw and one 3/8" washer-head screw. Place the assembly on the mower deck and disconnect the ground wire that goes to the CD Pack.
8. Remove the CD Pack (See CD Removal, page 7-6).



751.1.0490.13

9. Snap open the air cleaner cover (catch on left, hinge on right) and remove the air filter element. Pop out, and retain, the 2 plastic plugs(or spit cup) covering the carburetor screws. Remove the two screws securing the carburetor to the engine . **NOTE:** Later production '95 carbuertors use a spit cup in place of the 2 plugs. Remove the carburetor spitcup by pulling the ends out of the carburetor access holes molded into the air filter base. Disconnect the fuel line from the carburetor. Separate the carburetor from the engine with controls attached and set it on the mower deck. (See Carburetor Removal, page 5-5)



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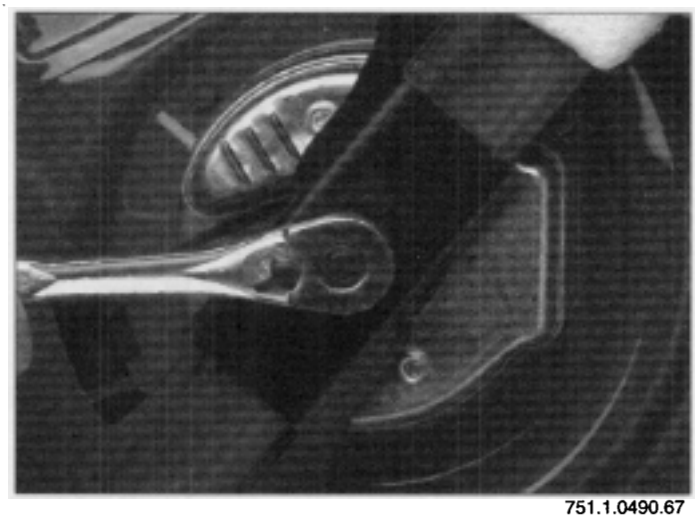
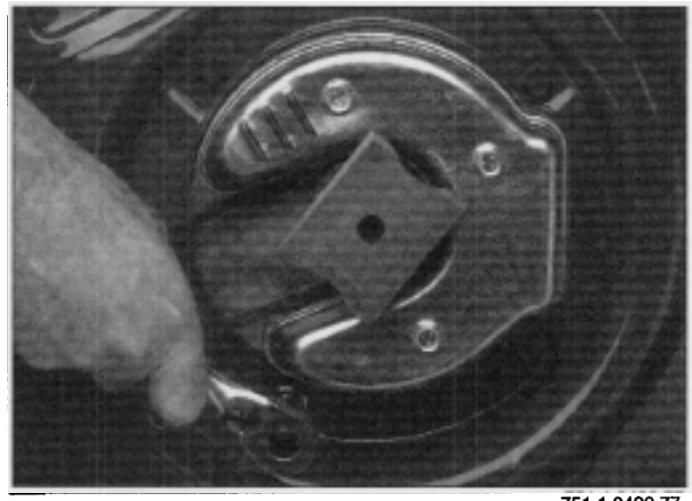
10. **On self propelled models only**, remove the 5/16" screw to remove the belt drive cover. Remove two 3/8" screws with spacers that secure the belt drive guide bracket to the transmission. Remove the drive belt from the pulley. The belt will stay with the engine as the cover is removed.

11. Remove the 7/16-20 blade bolt that secures the blade, blade retainer and accelerator to the engine shaft. Use heavy duty gloves to hold the blade while removing the nut. Set the parts aside



751.1.0490.67

12. Under the mower deck, remove the three 1/2" bolts that secure the engine to the mower deck. Lift the engine (with the drive belt) up and out of the deck.



751.1.0490.77

9 DISASSEMBLY

Tools Required

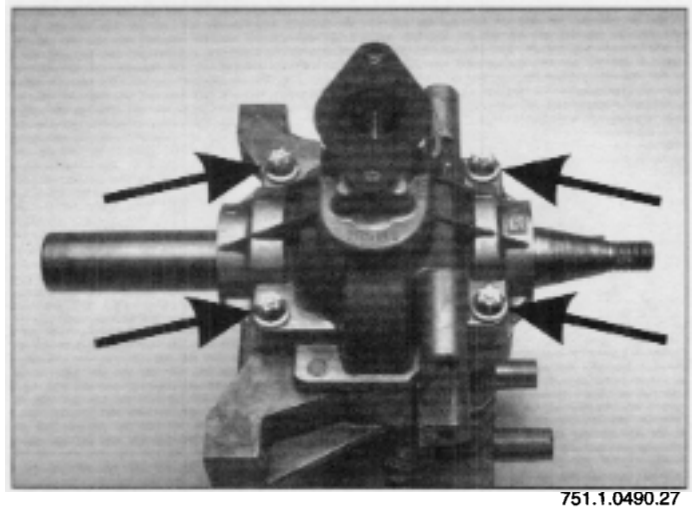
Compression Pliers (p/n 303857)

Wrist Pin Knockout Tool (602884)

Torx # E-12

Flat blade screwdriver

1. Remove the four crankcase cap screws with a Torx # E-12 socket and separate the halves using a screwdriver.



751.1.0490.27

751.1.0490.36

2. Remove the entire crankshaft assembly and discard the oil seals.

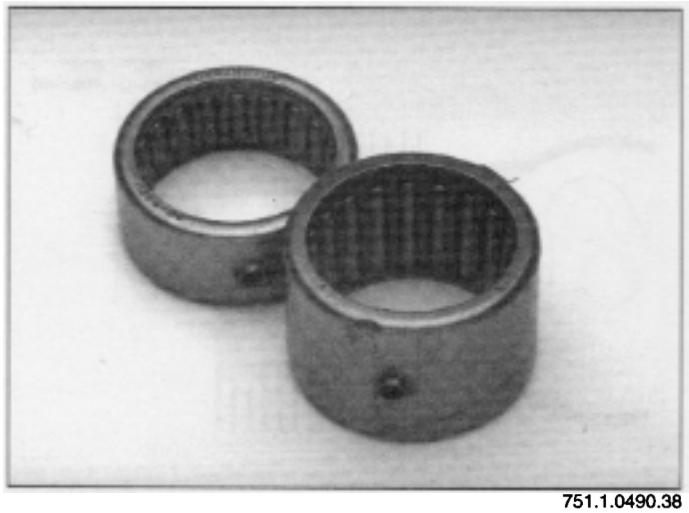
   Carefully remove the HSH (hex socket head) cap screws to remove the connecting rod cap and the split bearing liner. The 32 needle roller bearings are under the split bearing liner and will be loose. Carefull account for all of them.

751.1.1207.29

3. Remove the piston and rod assembly; separate the assembly, if necessary, using a compression pliers on the retaining ring. Use the wrist pin knockout tool to punch out the wrist pin.

INSPECTION AND REPAIR

9



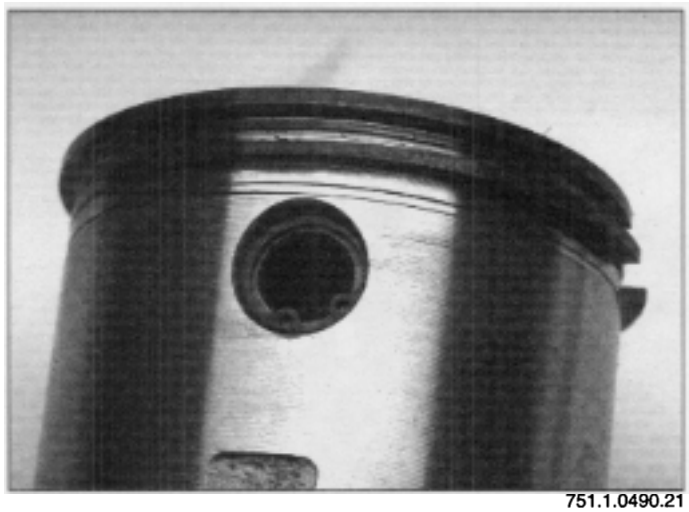
751.1.0490.38

Tools Required:
Gel Seal and Gasket Remover
Screw Lock (p/n 682301)

1. Check bearings for wear and freedom of movement; replace if questionable.

INSPECTION AND REPAIR (CONT'D)

2. Check rings for sticking. Remove and check rings for wear (e.g. ring end gap) or damage; replace the rings if questionable.
3. Clean and inspect the piston, including the ring land and wrist pin snap ring grooves. Check all parts for wear or damage and replace if questionable.



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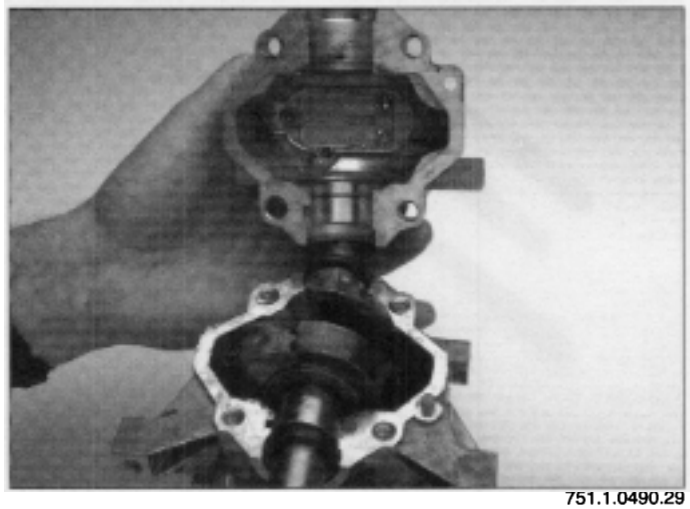
4. Clean the crankcase surfaces with Gel Seal and Gasket Remover.



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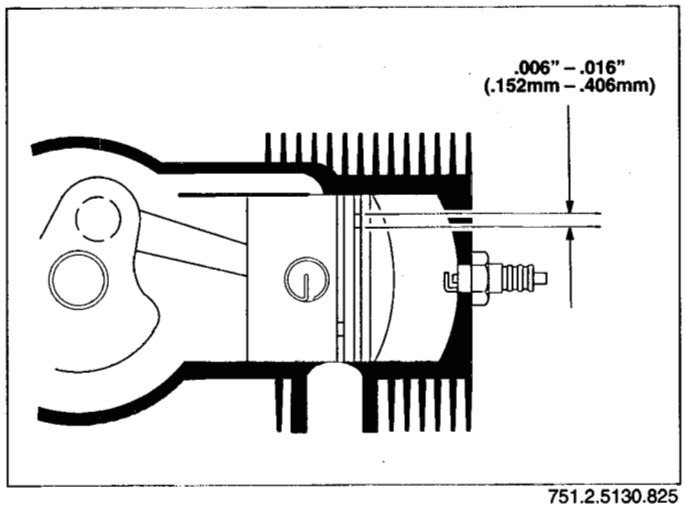
5. Check that the ring end gap is between .006" and .016"(.152 - .406mm) with .030" (.762mm) as the wear limit.



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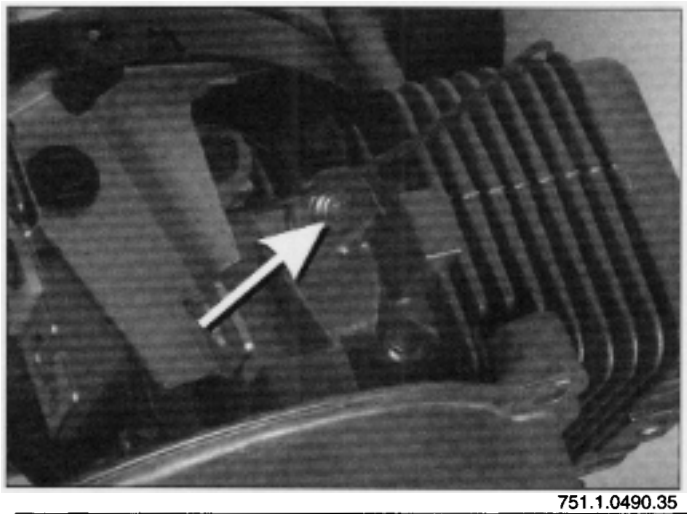
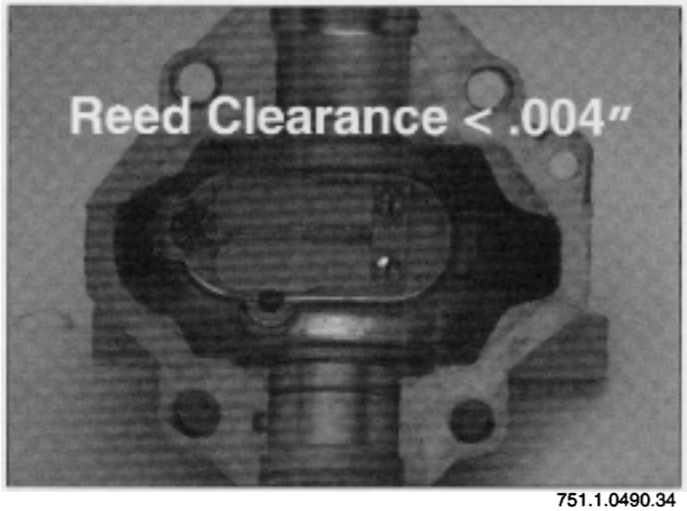


751.1.0490.35

6. Replace the core plugs if leaking, using Screw Lock on the outside surfaces.

   CAUTION: Do not attempt to clean any hole with a drill bit.

REED VALVE SERVICE

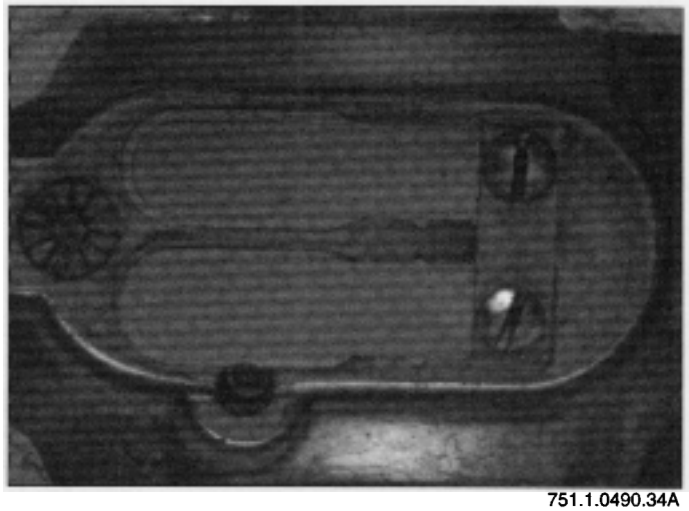


751.1.0490.34

Tools & SuppliesRequired:
- Loctite 271
- Carburetor Solvent
- Feeler Gauge

These assemblies permit fuel mixtures to enter the crankcase on the compression stroke and to trap fuel mixture in the crankcase on power strokes.

Check the clearance between the tip of the reed and the plate; replace the reeds if the clearance is more than .004" (.1 mm).



751.1.0490.34A

Clean the reeds carefully, by hand, using carburetor solvent

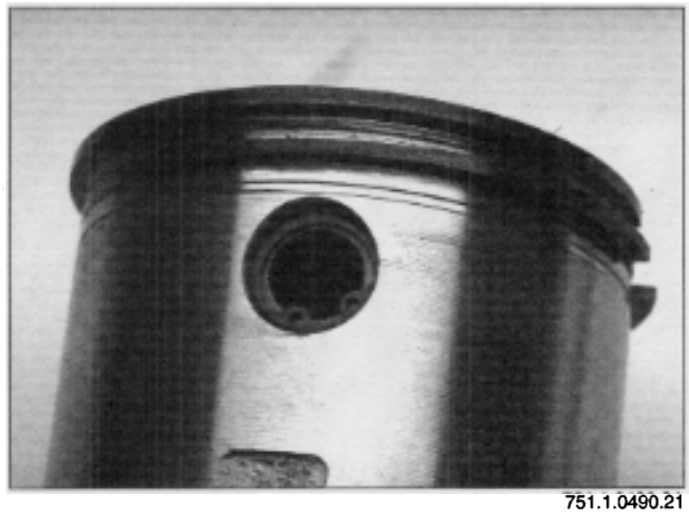
CAUTION: Do not use compressed air to clean the reeds. High pressure will cause distortion.

When replacing the reeds, install with the smooth edge down and use Loctite 271 on the thread of the screws.

REASSEMBLY

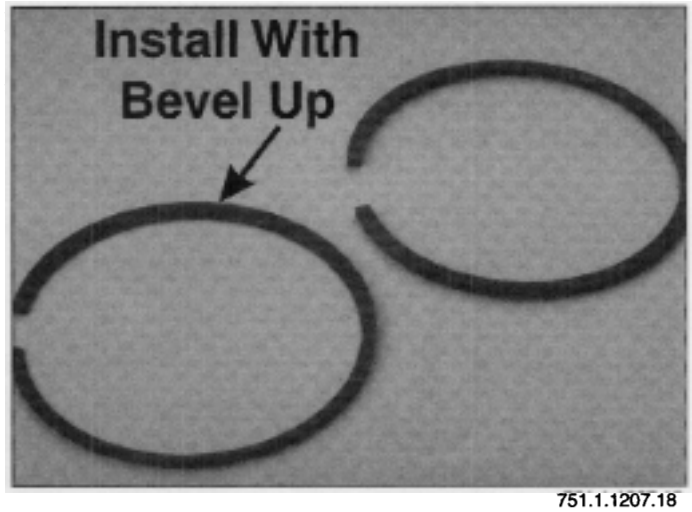
Tools & SuppliesRequired
Loctite 271
Loctite 515 Gasket Maker
Piston Stop (p/n 677389)
Ring Compressor (p/n 609967)
Seal Driver (p/n 608976)

1. Secure the wrist pin using the snap ring. Make sure the square edge of the snap ring faces out and the ring opening faces up (toward the top of the piston).


751.1.0490.21

2. Install the pressure back piston ring in the top groove with the bevel facing up; The square cut ring goes second and has no top or bottom orientation. Stagger the ring gaps.

CAUTION: Use the piston stop to prevent the piston from traveling too far up into the cylinder. If the piston goes to far into the cylinder the only way to remove it from the cylinder is to break the piston.

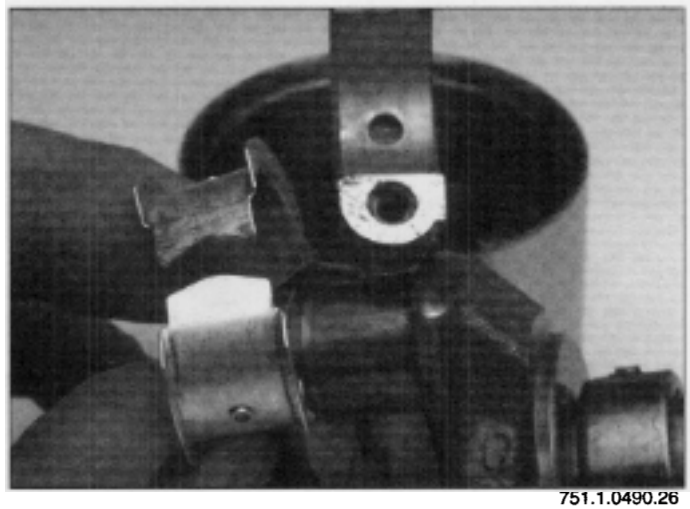


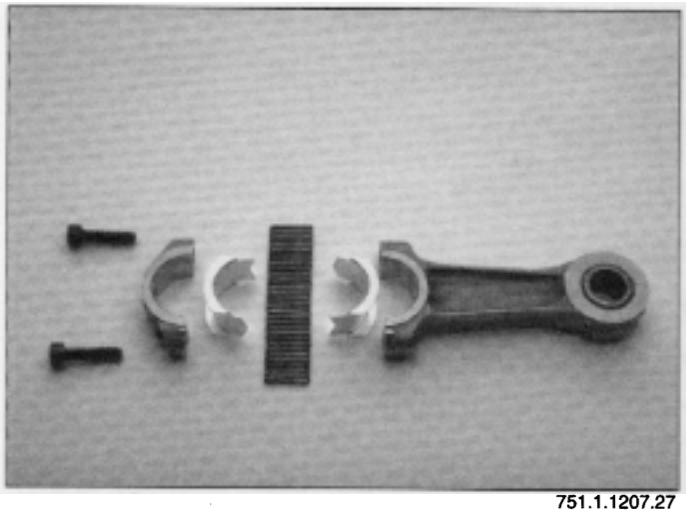
751.1.1207.18

9

3. Assemble the rod cap. Ensure that the dovetail ends of the liner are matched. Install new needles (p/n 683911).

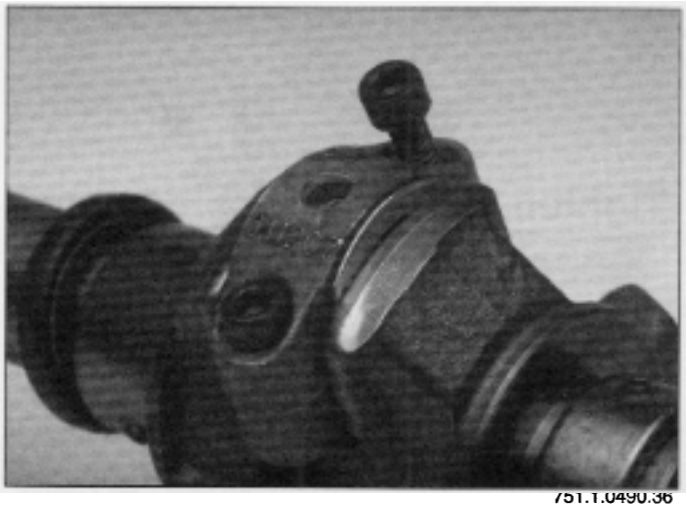
   NOTE: One side of the paper is sticky; remove the paper carefully while installing the needle bearings. There should be 32 needle bearings on the lower connecting rod.


751.1.0490.26



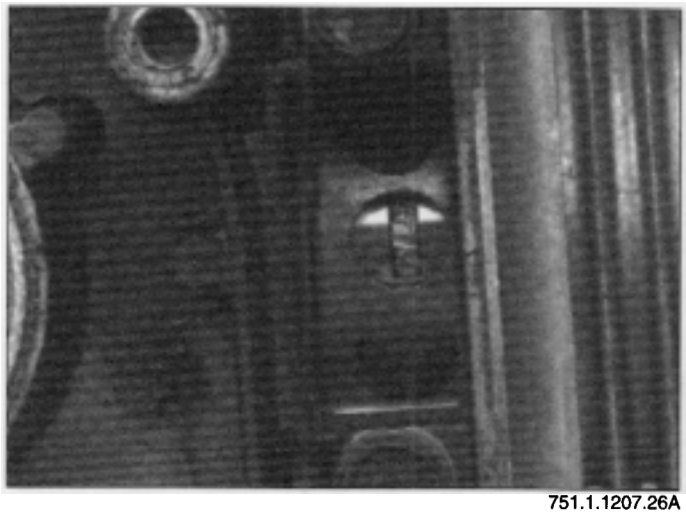
751.1.1207.27

4. Lubricate and assemble the needle bearings to the crankshaft and install the crankshaft.



751.1.0490.36

5. Install the rod cap; ensure that the mating marks are aligned. Clean old screws thoroughly and apply Loctite 271. Torque the screws to 70 in. lbs (7.8 Nm).

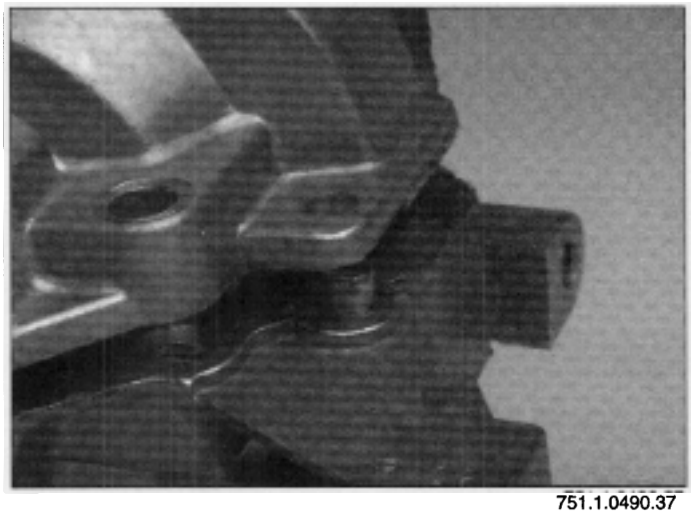


751.1.1207.26A

6. Oil the parts and use the piston stop and ring compressor to install the piston with the "BTM" mark facing toward the exhaust ports. **NOTE:** The letters "BTM" were omitted on some engines. However the small "rectangle" should still be visible through the ports.

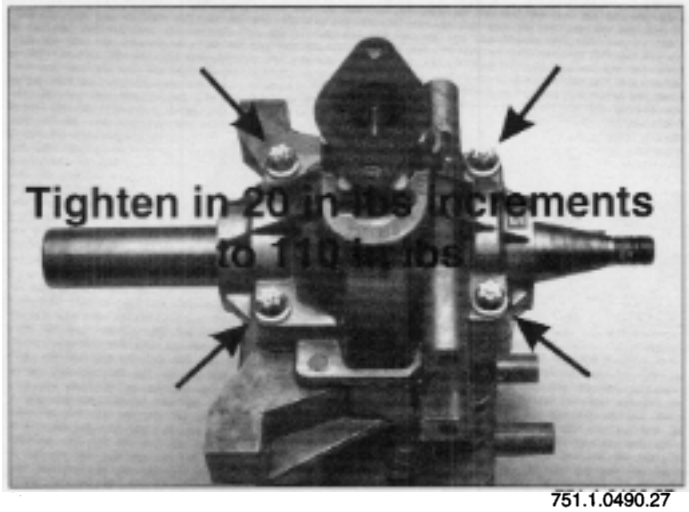
REASSEMBLY (cont'd)

7. Thinly apply Loctite 515 or Three Bond 1104 gasket maker to the crankcase cover sealing surface. Be careful not to get sealant on the bearings or seals.
8. Carefully align the two crankcase halves using the alignment pin and its matching hole; press the two halves together.



751.1.0490.37

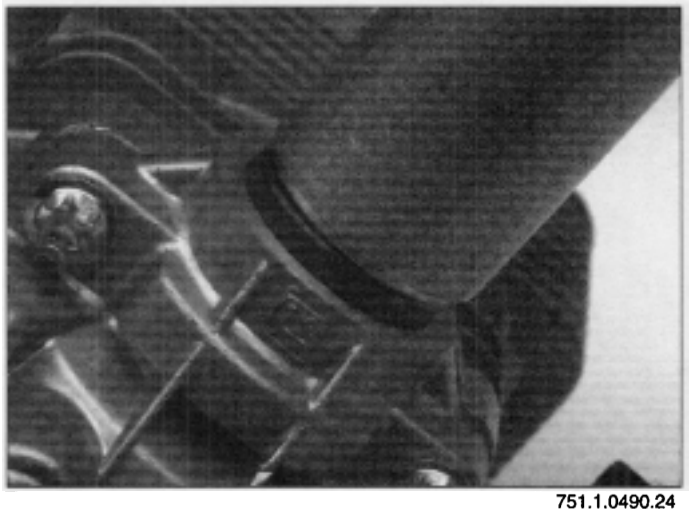
9. Torque the hex washer-head screws to a total of 110 in. lbs (12.5). NOTE: Tighten the screws in increments of 20 in lbs (2.26 Nm) while checking that the crankshaft turns freely.



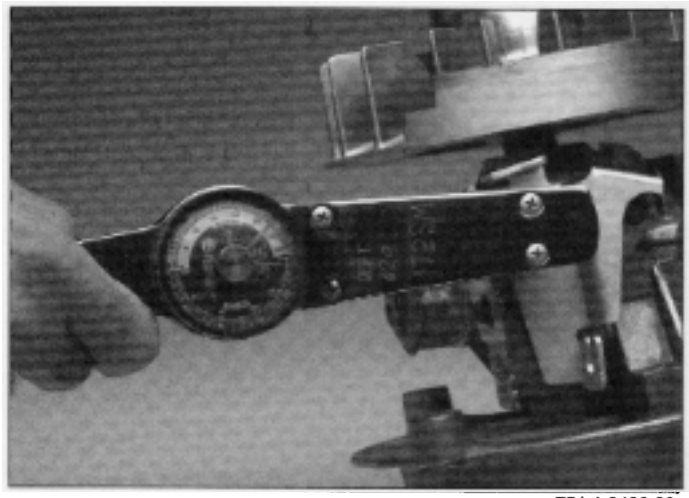
751.1.0490.27

9

10. Install new oil seals. Always use new seals and lubricate new seals, **on the ID only**, with oil before pressing them into place with the seal driver. Use the seal driver to do this. **CAUTION:** Do not assemble the crankcase cover with the seals in place.
11. Install the shroud base.



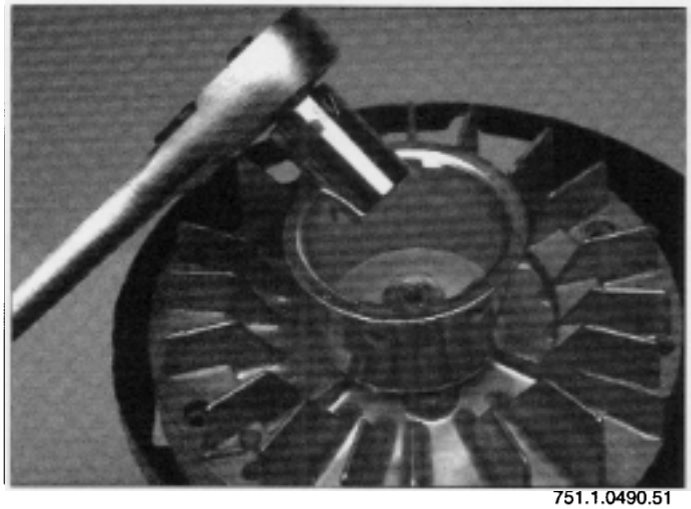
751.1.0490.24



751.1.0490.28

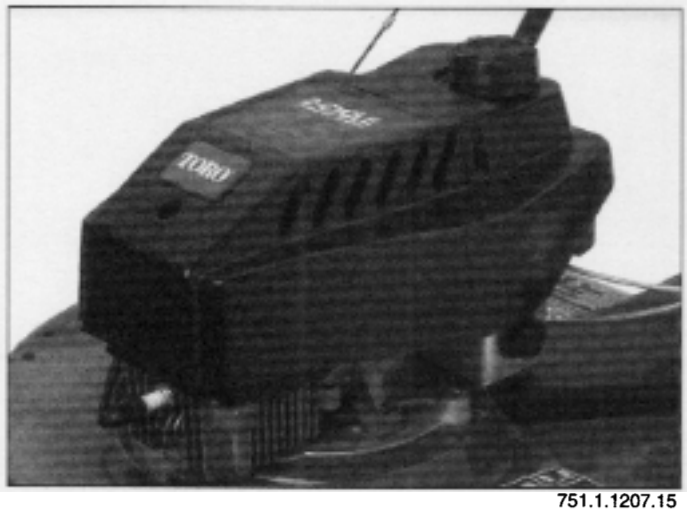
Reinstalling External Components

12. Reattach the flywheel brake system.



751.1.0490.51

13. Clean the crankshaft and flywheel hub and install the flywheel (see flywheel installation, page 7-8).
14. Install the carburetor and governor assembly (see page 5-11).



751.1.1207.15

15. Install the starter and shroud assembly and starter handle (see page 9-7).

    Reconnect the fuel lines and electrical system leads.

    Test run the engine.

PIVOTING ZONE START BRAKE

QUICK REFERENCE SECTION

SERVICE SECTION

PIVOTING ZONE START BRAKE

10

INTRODUCTION

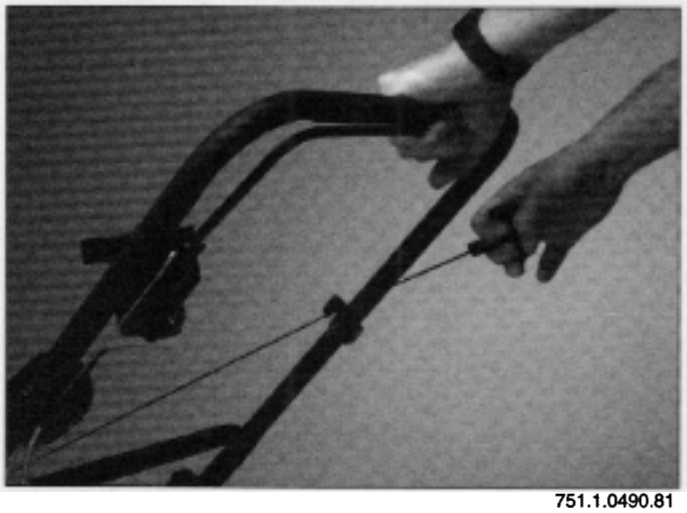
2 Primary Safety Criteria

1. Two-step Operation to start
2. Blade stops in three seconds

In 1982 the federal government mandated that all consumer walk behind mowers with a cut of 25" (63.5 cm) or less, be equipped with a safety blade stopping device. There are two primary criteria which these devices must meet:

A two-step operation must be performed in order to start the blade rotating.

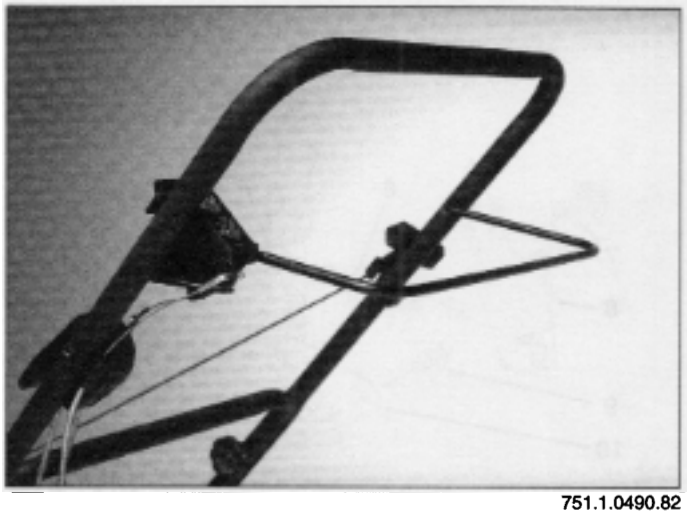
The blade must come to a stop within three seconds of the operator leaving the operator's position.



751.1.0490.81

One of the ways the Toro Company met these requirements was with the "zone start system." This system utilizes a kill switch and a brake which stops the engine when the operator releases the blade control bail. The two-step blade criteria is met by requiring the operator to pull the bail to the handle first, then pull the recoil rope from the operator's position.

OPERATION



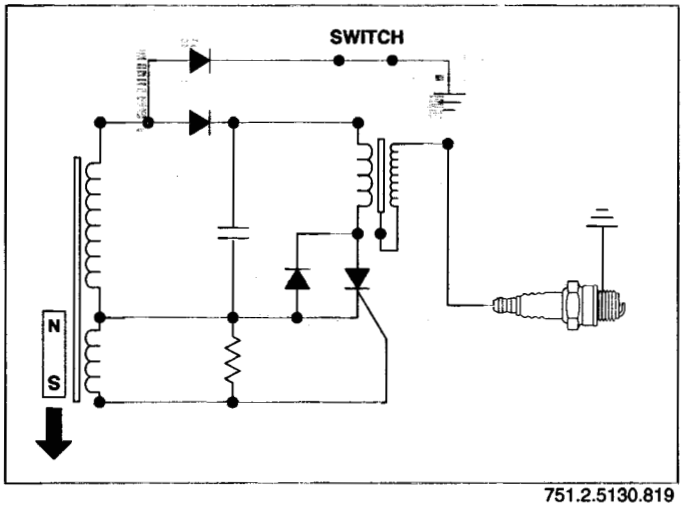
751.1.0490.82

The pivoting style zone start brake system has two main functions. The first function of the system is to stop the production of spark and the second is to stop the engine and blade.

Stopping spark production is controlled by a switch. The switch is closed when the blade control bail is in the "at rest" position. Raising the bail to the main mower handle opens the switch.

OPERATION (cont'd)

Switch leads are connected to the primary side of the coil and to the ground. When the switch is closed, coil is grounded. This action prevents the coil from producing the high voltage necessary to generate spark. When the switch is open, the ignition coil produces spark.



751.2.5130.819

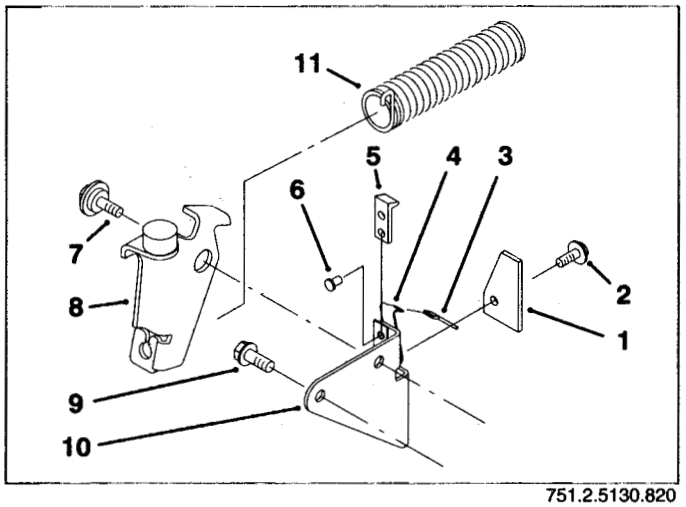
Stopping the engine and blade is accomplished by means of a brake that is applied to the bottom of the flywheel. The brake spring is in the "braked" position when the blade control bail is in the "at rest" position. When the blade control bail is raised to the mower handle, the brake is retracted from the underside of the flywheel to allow the engine to turn freely. The ignition system will produce a spark when the starter rope is pulled.

751.1.0490.23

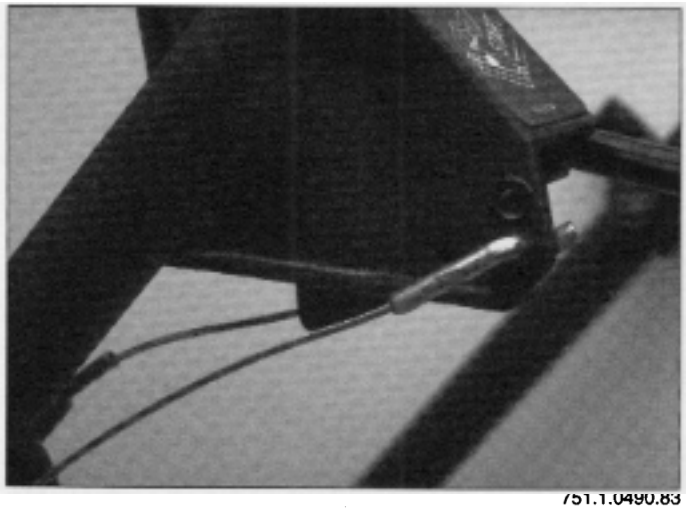
DISASSEMBLY

Tools Required:
10mm Socket
Needle nose pliers

1 Ground strap stop
2 Self-tapping screw
3 Brake switch leadwire
4 Ground strap
5 Insulation strap
6 Plastic rivet (self expanding) (2)
7 Shoulder screw (10 mm)
8 Brake assembly
9 Screw
10 Brake Mounting plate



751.2.5130.820



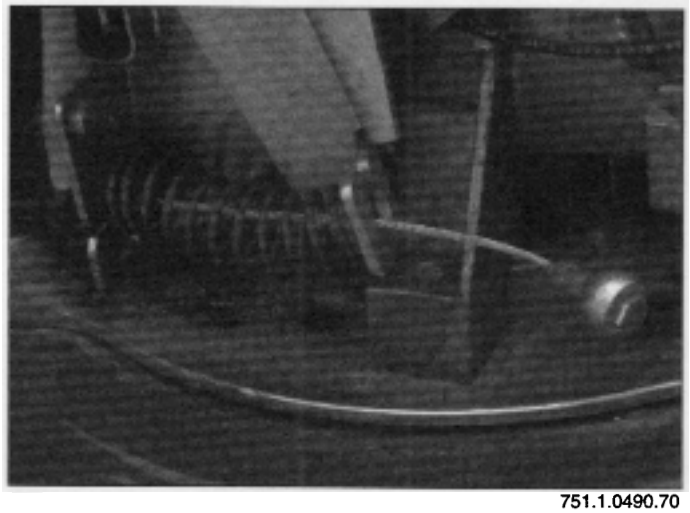
751.1.0490.83

1. If the engine and blade are taking more than 3 seconds to stop when the blade control bail is released, inspect the brake pad for excessive wear and replace if necessary. Note that the brake pad and the brake plate are replaceable only as an assembly.

   Disconnect the cable from the control bail on the handle

751.1.0490.65

2. To reduce the pressure of the spring between the brake mounting plate and brake plate, squeeze the tabs of the brake cable that hold it in place at the brake mounting plate. Push the cable through the hole in the brake mounting plate.

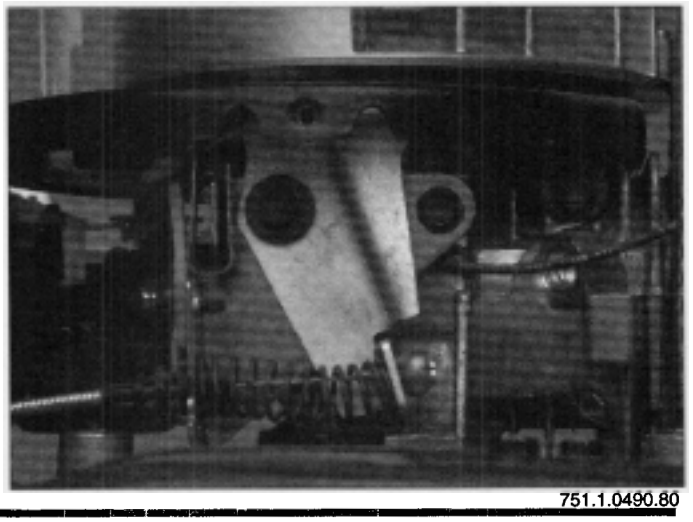


751.1.0490.70

3. Slide the cable out through the horizontal slot in the brake mounting plate. Also, slide the ball end of the cable up through the vertical slot in the brake plate.

DISASSEMBLY (cont'd)

4. Remove the 10 mm shoulder screw to remove the brake plate and brake pad attached to it.
5. If the ground strap or any part of this assembly requires replacement, remove the second screw to remove the brake mounting plate from the engine.



751.1.0490.80

ASSEMBLY

Tools Required
10mm Sockets

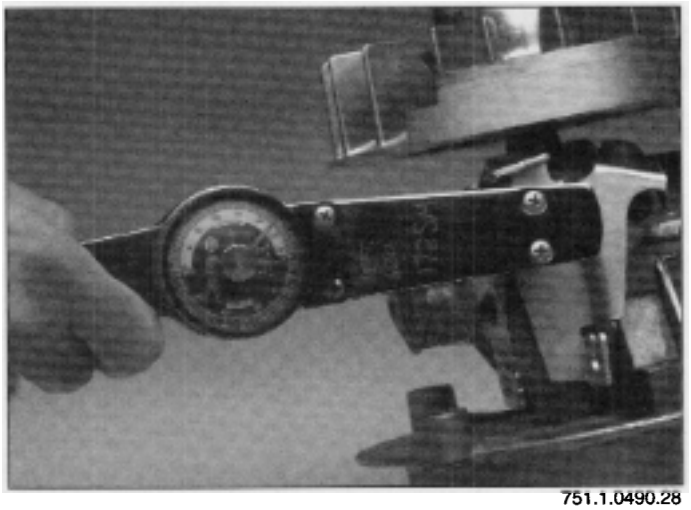
Needle nose Pliers

1. If the brake mounting plate was not removed from the engine, simply reconnect the grounding lead to the push-on terminal directly above the ground strap stop and continue with the reassembly process.

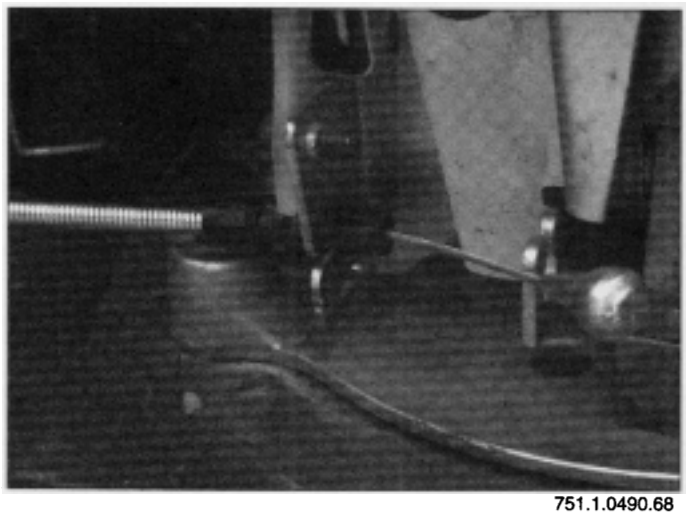
   NOTE: If the brake mounting plate was removed, torque the screw to 60 - 70 in. lbs (6.78 -7.91 Nm).

751.1.0490.22

2. Secure the replacement brake plate to the engine with the shoulder screw. Torque it to 90 in lbs (9.2 Nm). Ensure that the brake plate pivots freely. *(shroud removed for photo only)*

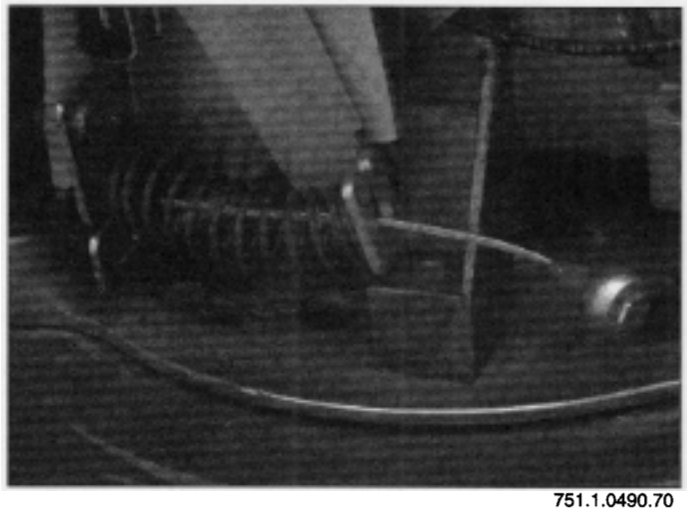


751.1.0490.28



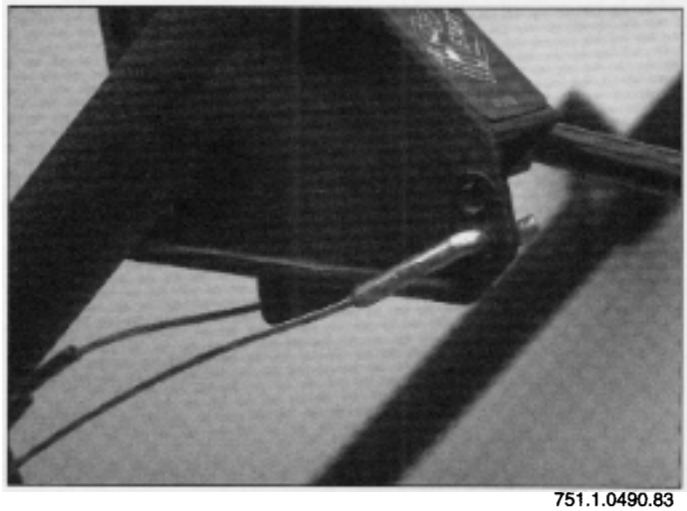
751.1.0490.68

3. Slide the cable into the narrow slot on the brake mounting plate and then push the cable into the hole making sure the tabs lock into the bracket.



751.1.0490.70

4. One end of the compression spring has a hook shape to it; that end hooks over an indentation in the brake plate. Squeeze the compression spring and slip it over the cable between the brake mounting plate and brake plate.



751.1.0490.83

5. Reattach the cable to the control bail on the handles

ASSEMBLY (cont'd)

6. Insert the ball end of the cable into the vertical slot of the brake plate.
7. Operate the blade control bail to verify that the brake mechanism stops the blade within three seconds. There is no adjustment needed after this assembly process is completed

751.1.0490.69

QUICK REFERENCE SECTION

SERVICE SECTION

APPENDIX

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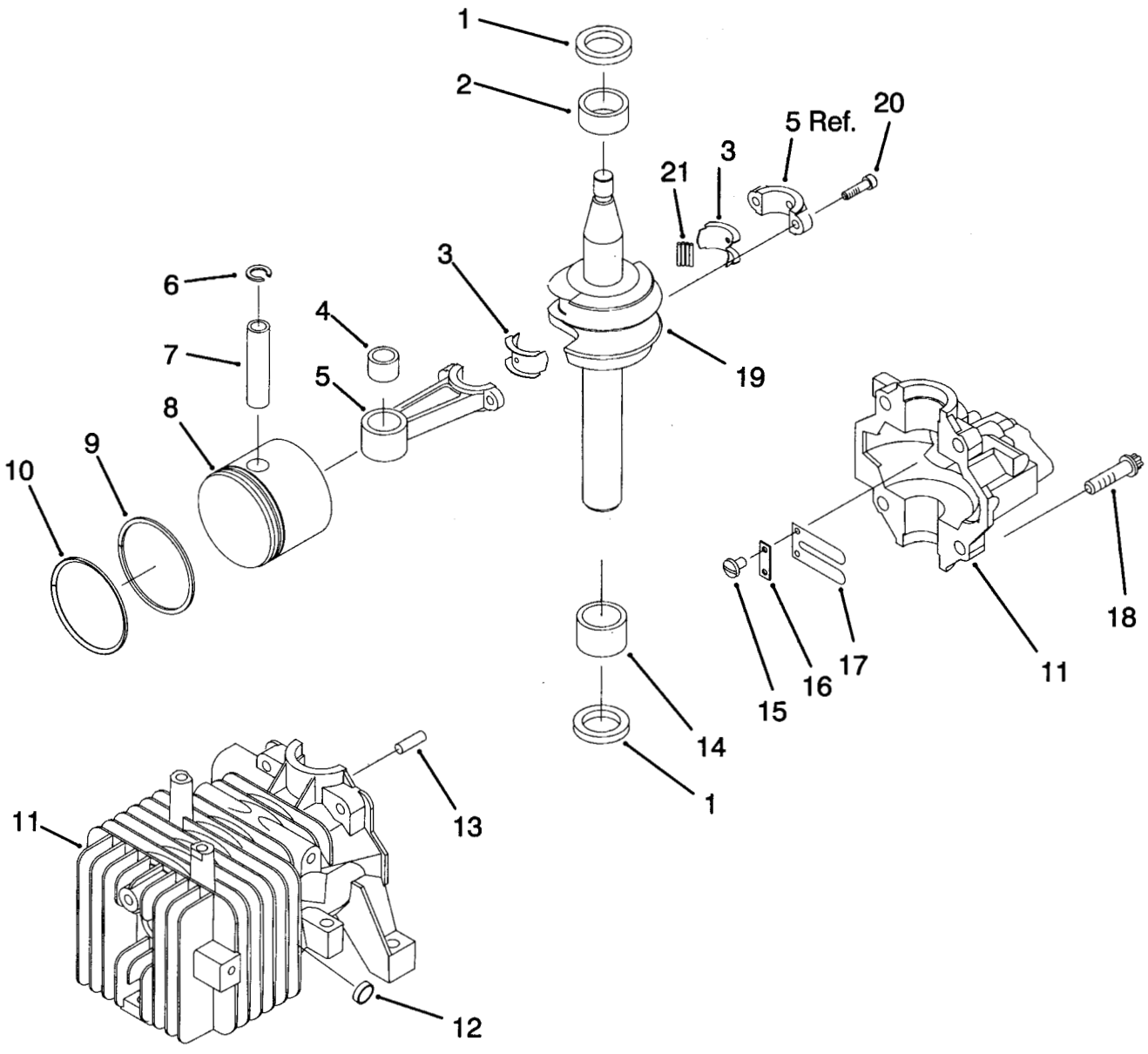
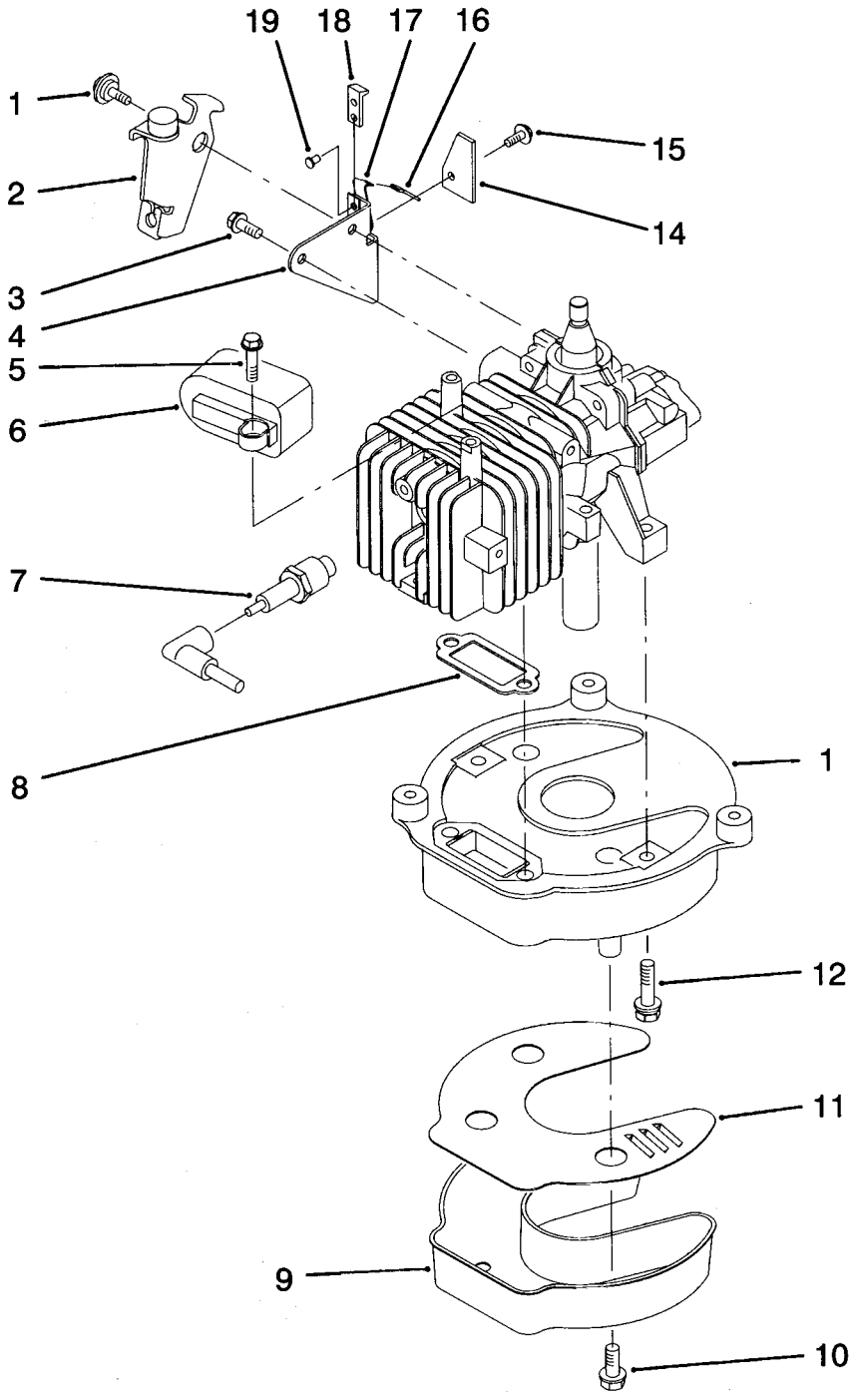
Power Head - Exploded View



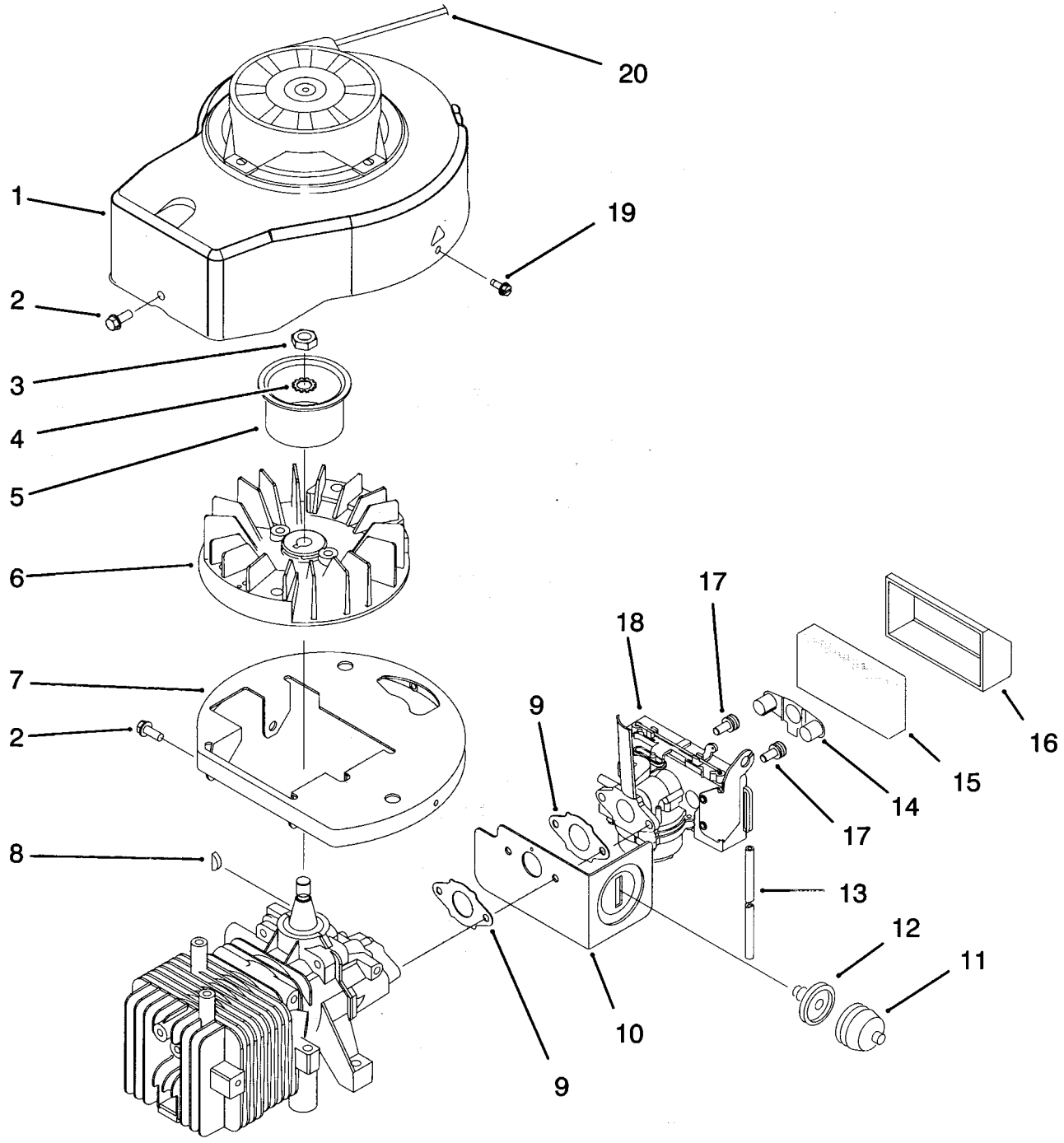
1 – Oil Seal (2)
2 – Upper Main Bearing (Narrow)
3 – Split Liner (2)
4 – Bearing
5 – Connecting Rod Assembly
6 – Retaining Ring
7 – Wrist Pin
8 – Piston
9 – Piston Ring
10 – Top Piston Ring
11 – Cylinder & Crankcase Assembly
12 – Core Plug (4)
13 – Dowel
14 – Needle Bearing (Wide)
15 – Slotted Head Screw (2)
16 – Reed Backup Plate
17 – Carburetor Reed
18 – Washer Head Hex. Screw (4)
19 – Crankshaft
20 – HSH Cap Screw (2)
21 – Needle Bearing (32)
22 – Sealant (Not Illustrated, See Required Service Supplies)

Ignition and Exhaust - Exploded View



1 – Shoulder Screw
2 – Brake Plate Assembly
3 – Screw
4 – Brake Mounting Plate
5 – Hex. Washer Head Screw (2)
6 – CD Ignition Pack
7 – Spark Plug (Champion RJ12C)
8 – Exhaust Gasket
9 – Muffler Cover
10 – Screw (3)
11 – Baffle
12 – Screw (4)
13 – Muffler Plate
14 – Ground Strap Stop
15 – Self–tapping Screw
16 – Brake Switch Leadwire
17 – Ground Strap
18 – Insulation Strap
19 – Self–expanding Plastic Rivet (2)

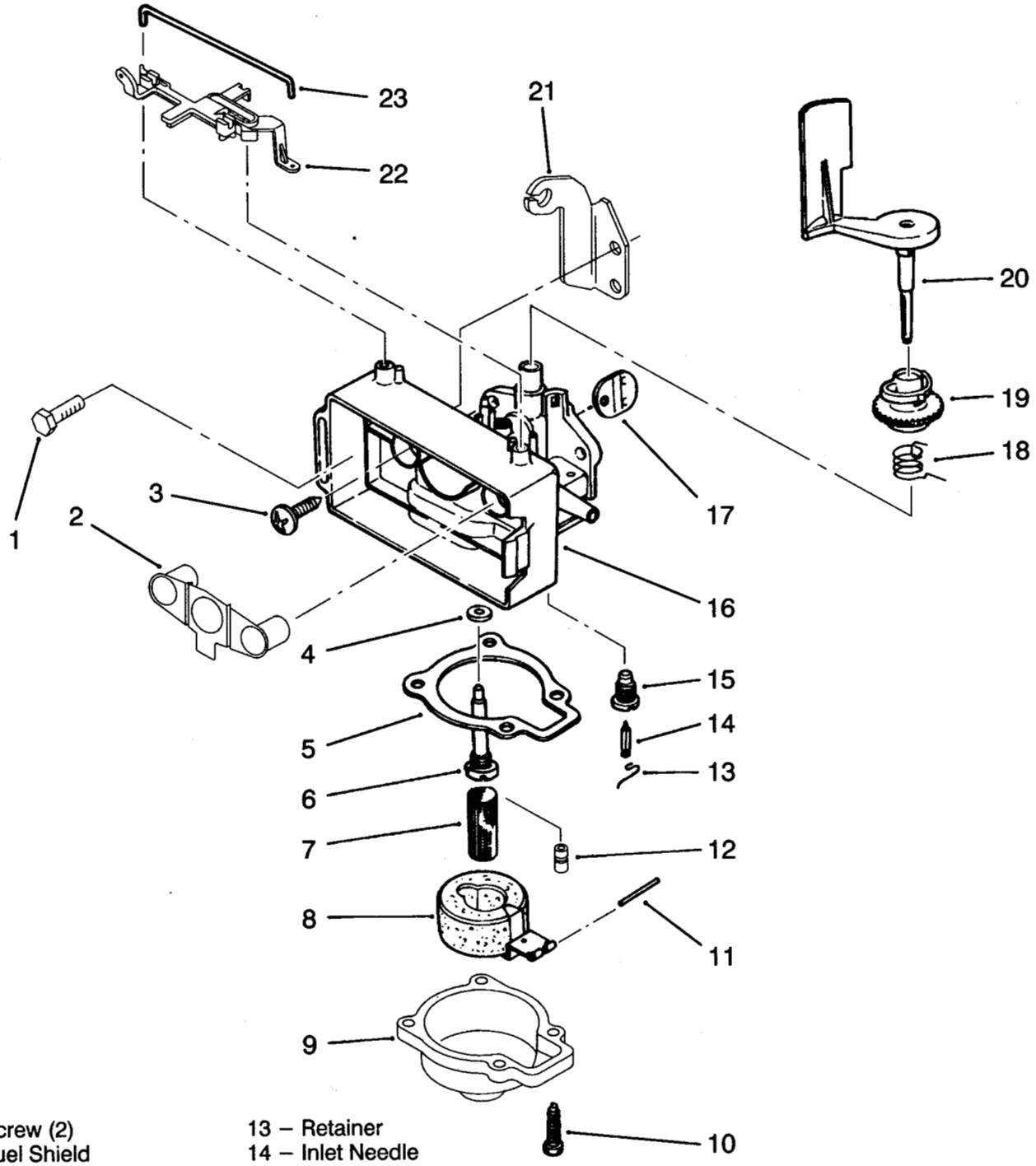
Starter and Primer Start Carburetor - Exploded View



1 – Shroud Assembly
2 – Screw (4)
3 – Nut
4 – Lockwasher
5 – Starter Hub
6 – Flywheel Assembly
7 – Shroud Base
8 – Key
9 – Carburetor Gasket (2)
10 – Carburetor Heat Shield & Primer Mount
11 – Primer Bulb
12 – Primer Body
13 – Primer Hose
14 – Fuel Shield
15 – Air Filter
16 – Air Filter Cover
17 – Screw (2)
18 – Carburetor Assembly
19 – Screw (3)
20 – Rope

11

Primer Start Carburetor Assembly - Exploded View



1 – Screw (2)
2 – Fuel Shield
3 – Screw (2)
4 – Washer
5 – Gasket
6 – Main Nozzle
7 – Filter Screen
8 – Float
9 – Carburetor Bowl
10 – Screw (4)
11 – Float Pin
12 – Main Jet
13 – Retainer
14 – Inlet Needle
15 – Inlet Seat
16 – Carburetor Body
17 – Throttle Plate
18 – Throttle Spring
19 – Air Vane Collar
20 – Air Vane
21 – Cable Bracket
22 – Lever
23 – Retainer

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