

GAS TRIMMER GUIDE, MODELS 51630, 51603, 51604

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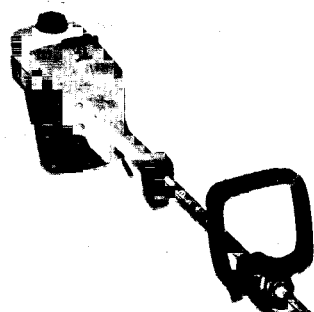


GASOLINE POWERED TRIMMER MAINTENANCE & REPAIR GUIDE

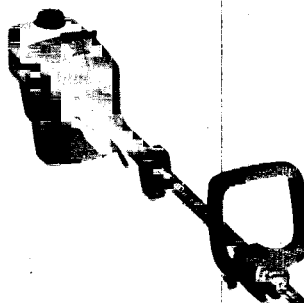
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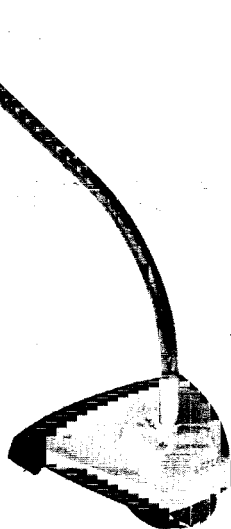
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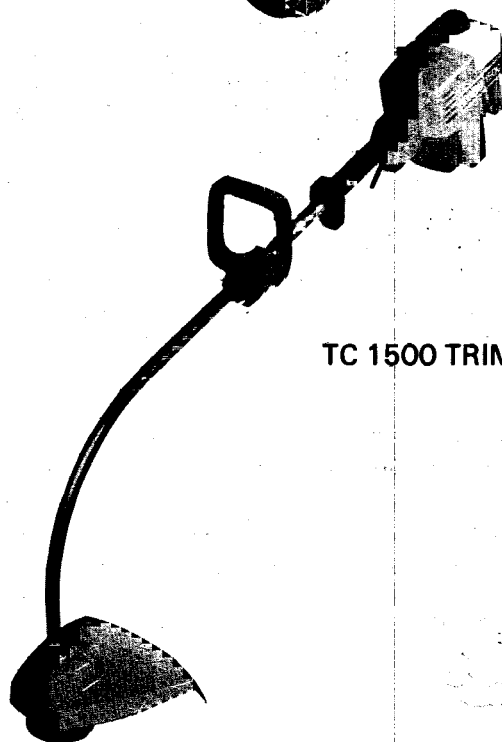
TC 300 TRIMMER



TC 400 TRIMMER



TC 1500 TRIMMER



FOREWORD

This Maintenance and Repair Guide will provide you with complete information necessary to accomplish the maintenance and repair of gasoline-powered flexible line trimmers powered by the new line of the lightweight two-cycle engines manufactured by The Toro Company.

The number of repair procedures for this line of engines has been limited for simplicity and economy. The repairs are easy to accomplish, even for operators or mechanics who have limited experience in the repair of small two-cycle engines.

Should you require additional information concerning these trimmers, we urge you to write to us. Address inquiries to:

The Toro Company
8111 Lyndale Avenue South
Minneapolis, MN 55420
Attn: Service Department

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GENERAL INFORMATION

Two-Cycle Engine — Theory of Operation

Two-cycle engines are used on TORO Trimmers because of their:

1. Light weight
2. Excellent power-to-weight ratio
3. Ability to operate in any position
4. Easy maintenance
5. Simple construction

The TORO Two-Cycle Engine used on the TC-1500, TC-300 and TC-400 Trimmers is a third-port, loop-scavenged design. This design name describes the path of the fuel/air mixture into the crankcase and combustion chamber, and the exhausting of spent gases (Fig. 1).

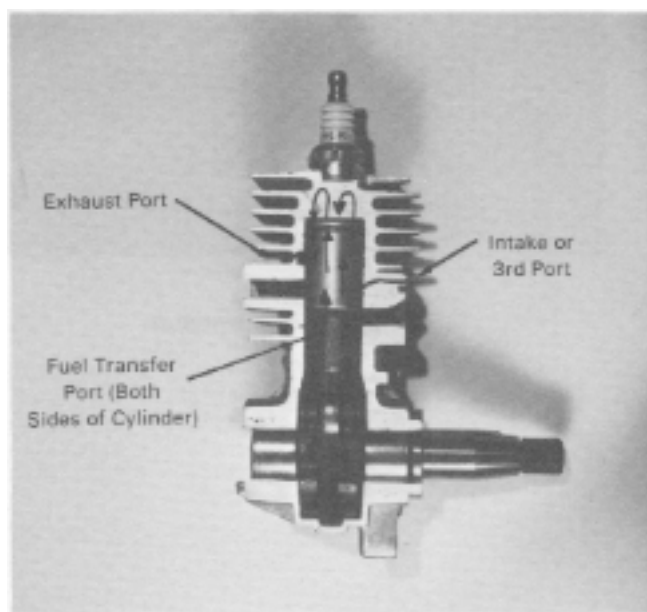


Figure 1

In a loop-scavenged engine with a third-port, the flow of the fuel/air mixture can be described as follows: (See Fig. 1).

1. The fresh fuel/air mixture enters the crankcase through the third-port on the side of the cylinder. The oil in the fuel/air mixture lubricates the moving parts within the crankcase.
2. The fuel/air mixture is transported through the fuel transfer ports to the combustion chamber where it is compressed, ignited, and then expelled from the engine through the exhaust port.

Engine Operation

The piston closes all engine ports as it moves toward the combustion chamber (Fig. 2). The moving piston creates high pressure in the combustion chamber and partial vacuum in the crankcase.

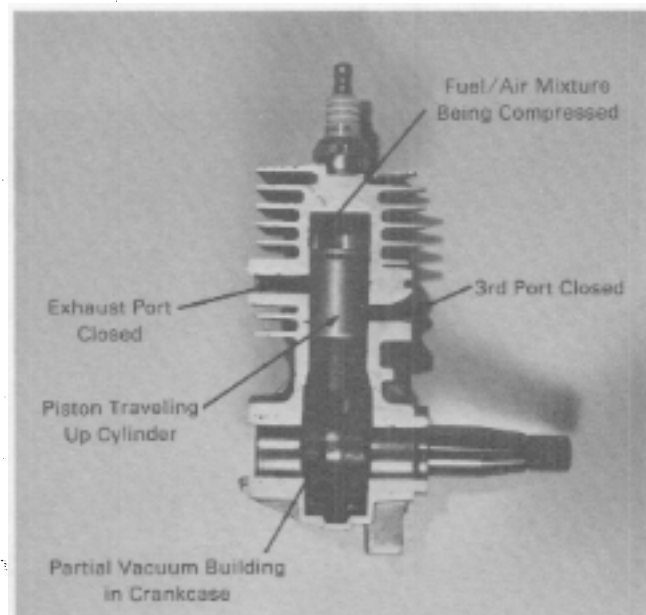


Figure 2
Compression Stroke

At a point slightly before top dead center (BTDC) of the piston travel, the spark from the plug ignites the fuel air mixture (Fig. 3). Also, at this time, the third-port opens allowing the fresh fuel/air mixture to rush into the crankcase to equalize the partial vacuum.

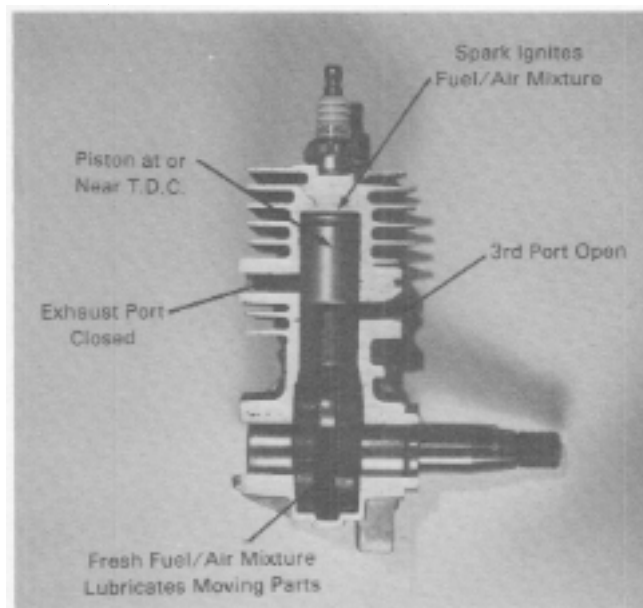


Figure 3
Ignition

GENERAL INFORMATION

The expanding gases from the burning fuel in the combustion chamber force the piston down the cylinder, closing the third-port and increasing the pressure in the crankcase. At a point approaching the bottom of the stroke, the exhaust port opens and the burnt gases begin to be expelled from the combustion chamber (Fig. 4).

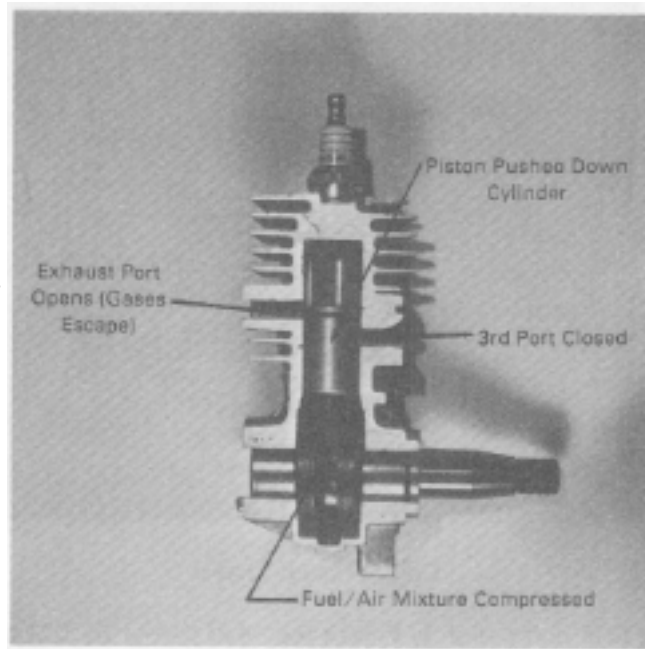


Figure 4
Power/Exhaust

At a point of piston travel slightly before bottom dead center (BDC) the fuel transfer ports, on the sides of the cylinder walls, are uncovered and the compressed fuel/air mixture in the crankcase is allowed to enter the combustion chamber where they help expel the burnt gases and charge the chamber for the following piston stroke (Fig. 5).

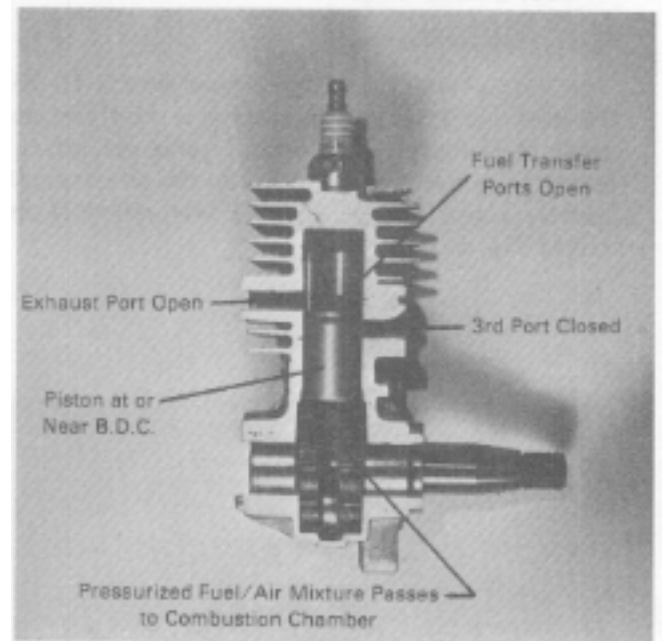


Figure 5
Exhaust/Fuel transfer

ENGINE SPECIFICATIONS

	TC 1500 (Model 51630)	TC 300 (Model 51603)	TC 400 (Model 51604)
ENGINE:			
Type	TORO-built, air-cooled, two-cycle, single cylinder gasoline engine		
Rotation	viewed from output end	Counter-clockwise	
Displacement	cc (cu. in.)	13.8 cc (.84 cu. in.)	20.9 cc (1.28 cu. in.)
Bore	mm (in.)	26.0mm (1.02 in.)	32mm (1.26 in.)
Stroke	mm (in.)	26.0mm (1.02 in.)	26mm (1.02 in.)
Compression ratio		7:1	
Operating speed	full line extension	7400-9000 RPM	6500-7500 RPM
Idling speed	full line extension	3000-4500 RPM	3500 RPM Max.
Cranking pressure		689 kPa (100 lbs.) psi minimum	
FUEL:			
Fuel to oil Mixture	gasoline:oil	32:1	
Gasoline		leaded or unleaded regular	
Oil		Genuine TORO Two-Cycle Oil or other high quality two-cycle oil, BIA approved	
Fuel tank capacity liters (U.S. fl. oz.)		.40 L (13.5 oz.)	
CARBURETOR:			
Type	Tillotson Model SP-1A with self contained fuel pump, accelerator pump, and filter screen	Walbro Wa-120 series with self contained fuel pump and filter screen	
Adjustment	initial	Factory adjusted and test run. Adjusting Procedures pp. 5-6	Factory adjusted and test run. Adjusting Procedures pp. 6-7
IGNITION SYSTEM:			
Ignition timing	BTDC	Solid state, capacitive discharge ignition (CDI) 22 degrees BTDC	
Ignition timing	piston position, mm (in.)	1.29-1.67mm (.051-.066 in.) BTDC	
Magneto air gap	mm (in.)	.20-.30 mm (.008-.012 in.)	
Spark plug	recommended (alternates)	NGK-BM6A (Champion CJ-8, AC CS-45)	
Spark plug gap	mm (in.)	.5-.6mm (.020-.024 in.)	
AIR CLEANER:		Foam & felt filter elements	
SPARK ARRESTING MUFFLER:	optional	Standard on certain models	
STARTER:			
Type		Spring rewind, recoil starter	
Starter rope diameter x length mm (in.)		#4 Diamond Braid 3.18mm (.125 in.) x 1.02m (40 in.)	
Starter pre-wind		Refer to recoil start repair instructions, p. 12.	
DRIVE SYSTEM:			
		Direct drive—¼ inch diameter flexible shaft to cutting head	¼ in. flexible shaft; centrifugal clutch at the cutting head.

ENGINE TORQUE SPECIFICATIONS

FASTENER LOCATION	QTY.	TORQUE Kg-cm/Kg-m	TORQUE in.-lbs./ft.-lbs.
Lower Backing Plate Screws	3	35-41 Kg-cm	30-45 in.-lbs.
Upper Backing Plate Screws	2	23-35 Kg-cm	20-30 in.-lbs.
Ignition Coil Screws	2	29-40 Kg-cm	25-35 in.-lbs.
Cooling Shroud Screws	3	12-23 Kg-cm	10-20 in.-lbs.
Carburetor Mounting Screws	2	17-29 Kg-cm (plastic), 40-46 Kg-cm (metal)	15-20 in.-lbs. (plastic), 35-40 in.-lbs. (metal)
Heat Shield Tab to Cylinder Screw	1	35-46 Kg-cm	30-40 in.-lbs.
Heat Shield Tab Screw	1	17-29 Kg-cm	15-25 in.-lbs.
Muffler Mounting Screws	2	29-40 Kg-cm	25-35 in.-lbs.
Muffler Outlet Plate Screws	2	23-35 Kg-cm	20-30 in.-lbs.
Flywheel Nut	1	2.8-3.2 Kg-m	20-23 ft.-lbs.
Sparkplug	1	1.9-2.4 Kg-m	14-17 ft.-lbs.

NOTE: Metric Torque Conversions:

inch-pounds X 1.152 = kilogram-centimeters
foot-pounds X .1383 = kilogram-meters

MAINTENANCE PROCEDURES

AIR CLEANER MAINTENANCE

Check and clean the foam air cleaner element every eight operating hours, and the felt air cleaner once a season.

1. Remove the air cleaner cover by pressing up on the bottom of the cover to release the lower mounting tab and pressing in on front of the cover to release the upper tab. **DO NOT FORCE.**
2. Carefully remove the filter clip or filter retainer. Remove the foam filter and felt filter (Figures 6 and 7).

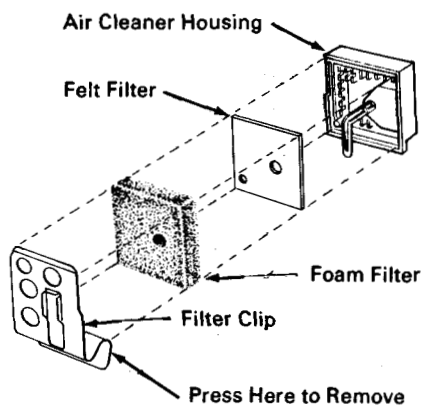


Figure 6

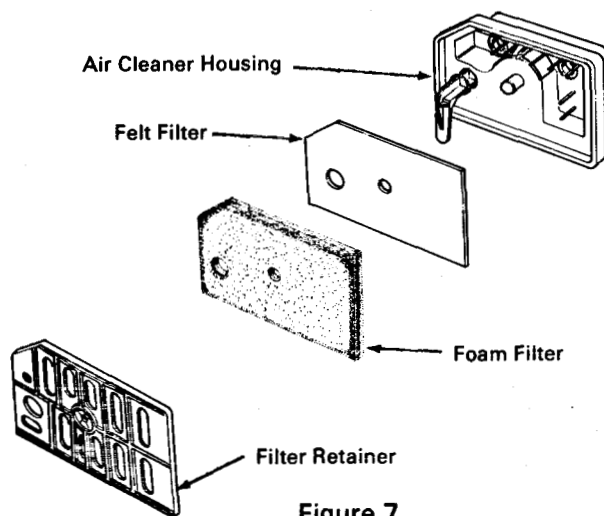


Figure 7

3. Wash the foam filter in a soap and water solution and dry thoroughly. If the filter shows any sign of damage or deterioration, replace it.
4. Saturate the foam filter with one teaspoon (5 ml) SAE 30 oil. Squeeze the filter to distribute the oil evenly and to remove excess oil. A damp element is necessary to ensure proper functioning of the air cleaner.

5. Inspect the felt filter. If it is dirty, wash it in clean solvent and air dry it. If the filter shows any sign of damage it must be replaced.

6. Reinstall the felt filter, foam filter, and filter clip or retainer in the air cleaner housing (Figures 6 and 7).

IMPORTANT: Make sure the peg in the air cleaner housing fits through the small hole in the felt filter. Both filters must cover the opening in the air cleaner housing.

7. Reinstall the air cleaner cover by pressing the cover in, and up, behind the choke lever and then press the lower mounting tab into the hole in the engine housing. **DO NOT FORCE.**

EXHAUST SYSTEM MAINTENANCE

NOTE: Some states require that a spark arrester be attached to the muffler if the trimmer is to be used in forested areas, or on other public lands. Be sure to check your local state laws before using your gasoline powered trimmer.

An important part of the maintenance procedure for all two-cycle engines is the cleaning or decarboning of the exhaust system. This is done to assure the unobstructed flow of exhaust gases and particles from the combustion chamber. A severely carboned muffler, spark arrester screen, and/or exhaust port will cause poor starting and low power output of the trimmer engine.

1. Remove the muffler shield, screen, muffler and exhaust gasket.
2. Soak the screen in solvent and remove the carbon build-up with a wire brush, or replace the screen.
3. Clean the muffler baffle holes inside the muffler with a screwdriver.
4. Check the cylinder exhaust port. If necessary, remove the carbon deposits from the port using a wooden stick (Fig. 8).

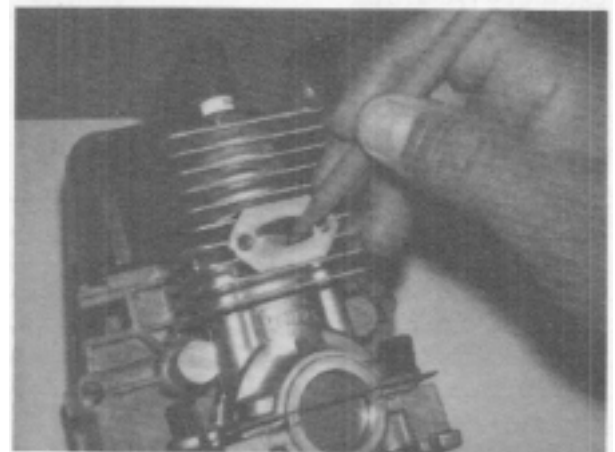


Figure 8

MAINTENANCE PROCEDURES

IMPORTANT: WHEN REMOVING CARBON DEPOSITS, CLOSE THE PORT WITH THE PISTON TO PREVENT LOOSE CARBON DEPOSITS FROM FALLING INTO THE CYLINDER. TAKE CARE NOT TO SCRATCH THE PISTON. DO NOT USE A METAL TOOL SUCH AS A SCREWDRIVER.

5. Reassemble the muffler components. Use a fresh exhaust gasket.

FLEXIBLE DRIVE SHAFT MAINTENANCE

The flexible drive shaft has been lubricated at the factory. After approximately every 40 hours of operation, the shaft should be removed from its housing and its entire surface coated with a No. 2 general purpose, lithium-base grease. To remove the shaft, loosen the lower handle and slide it toward the engine assembly to expose the clamp. Loosen the clamp and separate the upper and lower tube assemblies. The shaft will then be able to be pulled from the lower tube (Fig. 9).

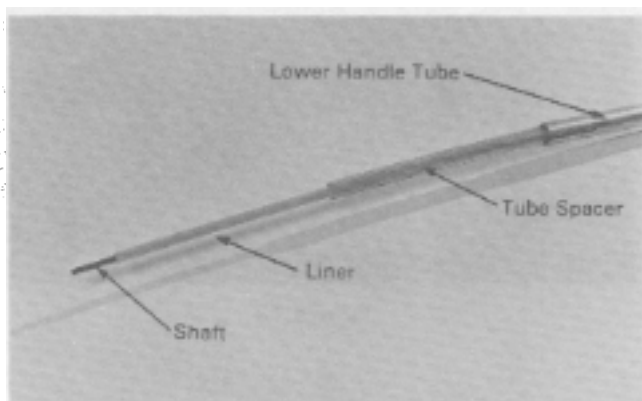


Figure 9

CARBURETOR ADJUSTMENTS — MODEL TC-1500 WITH TILLOTSON CARBURETOR

The carburetor has been adjusted at the factory, but an adjustment may be required to compensate for differences in fuel, temperature and altitude. The Tillotson carburetor used on the TC-1500 is not serviceable. If carburetion difficulties cannot be corrected by adjustment, the carburetor must be replaced.

IMPORTANT: The correct amount of line must be fed from the trimmer spool before adjusting the carburetor to ensure that the engine is adjusted for operation while under load.

1. Remove air cleaner cover by pressing up on bottom of cover to release lower mounting tab and pressing in on front of cover to release upper tab. DO NOT FORCE (Fig. 10).

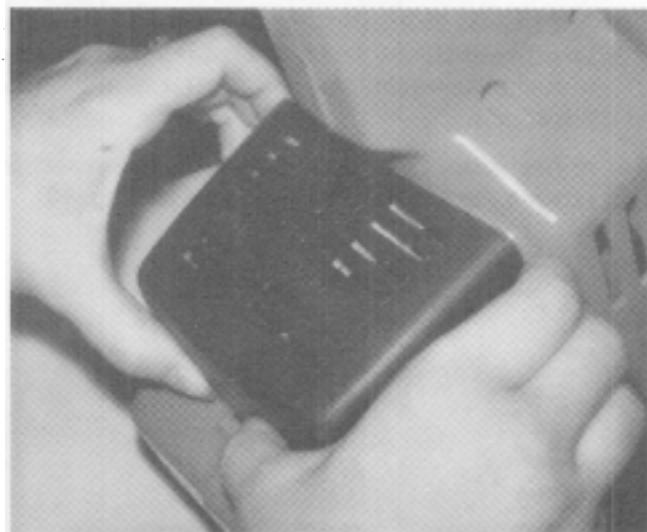


Figure 10

CAUTION: THE ENGINE MUST BE RUNNING SO FINAL ADJUSTMENTS OF THE CARBURETOR CAN BE PERFORMED. TO GUARD AGAINST POSSIBLE PERSONAL INJURY, KEEP HANDS, FEET AND FACE AWAY FROM MOVING PARTS.

2. Start the engine and let it warm up for approximately 3-5 minutes. Do not adjust the carburetor when the engine is cold. Be sure to perform the carburetor adjustments while in an area that is close to the average outdoor temperature at which the trimmer will be used.

CAUTION: DO NOT RUN THE TRIMMER INDOORS WITHOUT ADEQUATE VENTILATION. EXHAUST FUMES ARE POISONOUS AND COULD BE DEADLY IF INHALED.

NOTE: If the engine will not start or if the reference setting is lost, set both screws so the arrows point to "5½". Low number settings are lean. High number settings are rich. (Fig. 11).

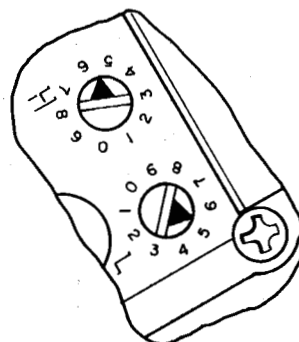


Figure 11

MAINTENANCE PROCEDURES

3. **Adjust Idle First:** With engine idling, rotate the Low Speed Screw (L) for the leanest fuel mixture that allows stable idle, and acceleration without hesitation.
4. If necessary, idle speed can be increased by turning the idle stop screw clockwise (Fig. 12).

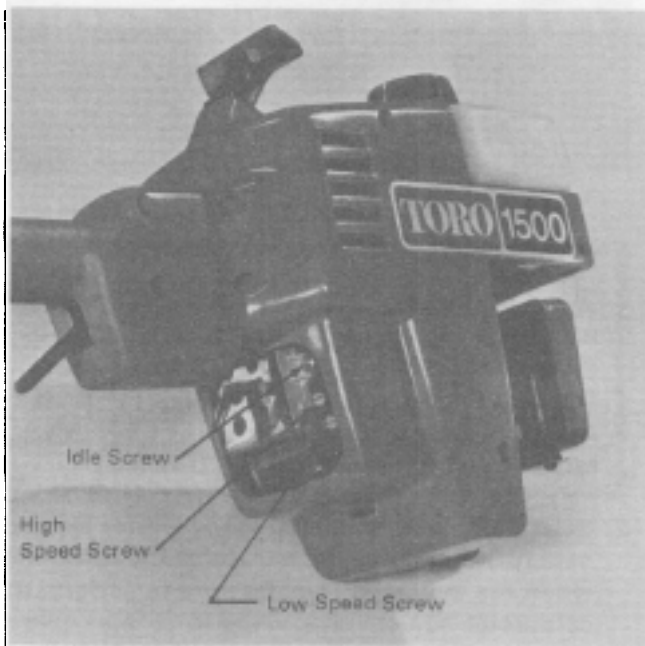


Figure 12

2. **Low Speed Screw (L)** (Fig. 13) — Close the screw by gently rotating it clockwise until a light seating resistance is felt. Next, rotate the screw $1\frac{1}{4}$ - $1\frac{1}{2}$ turns counterclockwise.
3. **Idle Screw** (Fig. 13) — Close the screw by rotating it clockwise until the screw contacts the throttle lever. After contact is made, continue turning screw $1\frac{1}{2}$ - $2\frac{1}{2}$ additional turns.



Figure 13

5. Hold the throttle trigger at the maximum speed position and adjust the High Speed Screw (H) for maximum engine speed.
6. Recheck the idle adjustment.

CARBURETOR ADJUSTMENT — MODELS TC-300, TC-400 WITH WALBRO CARBURETOR

IMPORTANT: Do not close the carburetor adjusting screws too tightly as damage to the screws and seats may result. Also, the correct amount of line must be fed from the trimmer spool before adjusting the carburetor to ensure that the engine is adjusted for operation while under load.

1. **High Speed Screw (H)** (Fig. 13) — Close the screw by gently rotating it clockwise until a light seating resistance is felt. Next, rotate the screw one turn counterclockwise.

NOTE: Although these settings are approximate, the engine should be able to be started. Further adjustments of the carburetor may be necessary to obtain the best performance for your area. Steps 4-6 should be followed to fine tune the carburetor. When making these adjustments, turn the screws $\frac{1}{8}$ of a turn at a time and wait for the engine to respond to the change.

CAUTION: THE ENGINE MUST BE RUNNING SO FINAL ADJUSTMENTS OF THE CARBURETOR CAN BE PERFORMED. TO GUARD AGAINST POSSIBLE PERSONAL INJURY, KEEP HANDS, FEET, AND FACE AWAY FROM CONCEALED, MOVING, OR ROTATING PARTS.

MAINTENANCE PROCEDURES

4. Start the engine and let it warm up for approximately 3-5 minutes. Do not adjust the carburetor when the engine is cold. The adjustments should be made at the temperatures that the trimmer will be used. Allow the engine to idle. If necessary, re-adjust the idle speed to keep the engine from stalling (3000-3500 RPM on the TC400, 3000-4500 on the TC300)

CAUTION: DO NOT RUN THE TRIMMER INDOORS WITHOUT ADEQUATE VENTILATION. EXHAUST FUMES ARE POISONOUS AND COULD BE DEADLY IF INHALED.

5. With the engine idling, slowly turn the low speed screw clockwise and note the position at which the engine begins to slow down. Now turn the screw counterclockwise and again note the position when the engine speed is reduced. Set the screw at a point midway between these two positions.
6. Hold the throttle wide open and follow the same procedure to set the high speed screw.
7. Re-check the idle adjustment.
8. Install the air cleaner cover.

TROUBLESHOOTING AND TEST PROCEDURES

Generally, all gasoline-powered products require some form of service or repair during their lifetime. The amount of time and expense involved in repairing a product can be greatly impacted by the amount of time required to initially determine the cause of the difficulty. Therefore, it is recommended to make these preliminary checks before proceeding to secondary troubleshooting procedures.

Preliminary Checks

1. Check for ignition:
 - a. Check the start/stop switch position
2. Check the spark plug: (refer to specifications, page 3)
 - a. To ensure the correct type
 - b. For damage to the insulator
 - c. For excessive carbon or burnt electrodes
 - d. For the correct gap
 - e. Check for spark (refer to page 8)
3. Check the fuel supply:
 - a. Check the choke position
 - b. Check the condition of the fuel, for freshness, cleanliness, and proper mixture
4. Check the air cleaner: (refer to page 4)
 - a. For loose or damaged mounting screws
 - b. For dirty filter elements
 - c. For excessive oil in the foam element
5. Check cylinder compression (refer to page 7)

Testing Cylinder Compression

A compression test of the engine can provide vital information on the general condition of the working

parts within the engine. This test will indicate a worn cylinder, piston, or ring and generally determine whether the engine is sound or if it should be replaced.

Compression Test Procedure

1. Install the compression gauge into the spark plug hole. **IMPORTANT:** Be certain that no more than a 1/2" of the gauge is threaded into the cylinder as damage to the piston may result (Fig. 14).



Figure 14:
Compression testing

2. Pull the starter rope several times to obtain the highest possible compression reading.
3. If the compression reading is below 100 psi (689 kPa), cylinder, piston, or ring damage should be suspected. If so damaged, a new engine short-block should be installed.

TROUBLESHOOTING AND TEST PROCEDURES

Checking for Spark

1. Pull off the spark plug cap and remove the spark plug.
2. Inspect the spark plug for wear, carbon deposits and damage. Replace the plug if damaged, burnt or fouled.
3. Check for the correct spark plug gap and adjust if necessary to .020-.024 in (.5-.6 mm) by bending outer electrode.

NOTE: Do not pry against inner electrode. This could crack the insulator.

4. Attach a spark or ignition tester as shown in Figures 15 or 16.
5. While maintaining the plug in this position, pull the starter rope and observe for spark.

CAUTION: DO NOT TEST FOR SPARK WHERE GASOLINE HAS BEEN SPILLED OR INFLAMMABLE VAPORS MAY EXIST. A FIRE COULD RESULT.

NOTE: The spark may be difficult to see in daylight or other brightly illuminated areas.

6. If no spark is seen, refer to the troubleshooting chart on page 9.

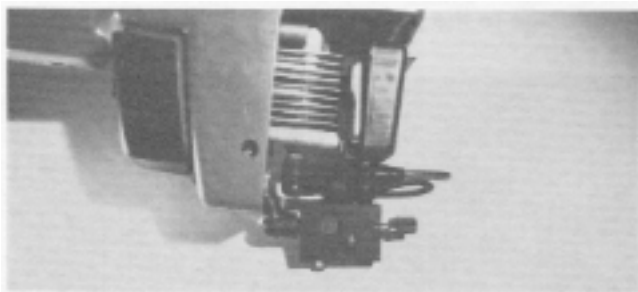


Figure 15
Spark tester
Toro P/N 41-7890



Figure 16
Alternate type spark tester

Checking Fuel Tank Venting

The fuel tank cap vent allows air into the tank as fuel is consumed. If this vent is blocked with dust or dirt, the engine will eventually stall.

1. Remove the fuel tank cap and inspect the vent. If the cap is contaminated with dirt particles, the vent may need to be replaced.
2. The cap can be disassembled by prying up the insert with a flat screwdriver. Care should be used to prevent damage to the insert and the valve (Fig 17).

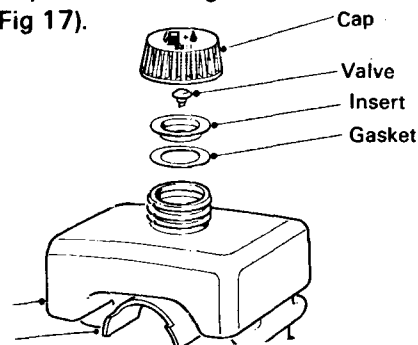


Figure 17

3. Remove the valve, squeeze the valve to close it, release it, and hold it up to a light. No light should be visible through the valve. If light can be seen, the valve should be cleaned or replaced.
4. With the insert removed, hold the cap up to a light. Light should be visible through a small hole at the center of the cap. If no light can be seen, the hole should be cleaned.

Checking fuel tank

1. Visually inspect the bottom of the fuel tank for dirt or other contaminants.
2. If dirt, water, or other contaminants are present, the tank should be flushed with a small amount of fuel, and refilled with fresh fuel.

Checking the Stop Switch

The "off" switch used on the Toro 1500, 300, and 400 Gas Trimmers has one set of contact points. When the switch is in the "off" position, the contacts are closed, grounding the coil current to the engine.

A continuity tester or ohmmeter is used to check for continuity. Note: If an ohmmeter is used the dial should be adjusted to a low setting. Attach the two tester leads to the two switch leads. Continuity should be evident with the switch in the "off" position. In the "on" position there should be no continuity. If continuity is intermittent or not evident, the switch is defective or a short has developed in the wiring and the switch and harness should be replaced.

ENGINE TROUBLESHOOTING

Description of Difficulty	Spark Plug	Stop Switch & Leads	CDI Module	Flywheel	Carburetor	Choke Position	Fuel-oil mix or condition	Fuel Cap Vent and tank	Recoil Starter	Muffler and exhaust Port	Air Cleaner	Internal Engine Damage or wear	Crankcase Leakage
Engine fails to crank	Extension too long		Interferes with flywheel	Cracked, magnets loose					Jammed or broken			Seizure. Binding or broken ring	
Engine fails to start	Fouled or damaged	Broken or disconnected	Defective-no spark	Broken magnets. Missing or sheared key	Improper adjustment	Closed, flooded	Fuel mixture incorrect; dirty, stale	Vent plugged or tank empty		Carboned		Worn, scored, broken ring	
Engine starts, runs erratically	Cracked insulator				Dirty, poor gasket seal, worn parts, out of adjustment			Restricted fuel line. Vent or filters plugged		Carboned			
Engine runs, quits, fails to restart	Fouled	Switch position or defect	Defective	Sheared or distorted key		Closed or partially closed, flooding		Vent plugged, fuel line kinked				Seized	
Engine smokes excessively					Adjusted to Rich	Partially closed, flooding	Excessive oil in fuel				Dirty or excess oil		
Engine runs, lacks power, poor acceleration					Improper adjustment	Partially closed, flooding	Dirty or too much oil			Muffler screen or exhaust port plugged	Dirty or excess oil	Cylinder wear or damage	Crankshaft or crankcase seal
Engine overheats				Sheared or mislocated key, timing	Adjusted to lean		Too little oil						

TROUBLESHOOTING AND TEST PROCEDURES

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

Trimmer Engine Removal, Disassembly, Replacement.

1. Drain the gas from the trimmer gas tank and remove the spark plug high tension wire.
2. Remove the air cleaner cover by pressing up on the bottom of the cover to release the lower mounting tab, and pressing in on the front of the cover to release the upper tab.
3. With the trimmer on its left side, remove the nine Phillips head screws which attach the case halves together. **NOTE:** A service fixture, plans for which are described in Gasoline Trimmer Service Bulletin No. 81-05, is very useful for supporting the trimmer for disassembly and reassembly.
4. Remove the right hand case half by lifting it from the left hand case half. The case half may appear to be stuck to the engine due to the fit of the rubber engine isolation mounts between the case and the engine backing plate. **NOTE:** When reassembling, install the rubber isolation mounts in the case halves rather than on the engine backing plate.
5. Remove the engine housing tube and recoil starter assembly by tipping the engine to the rear and lifting the tube and starter from the left hand case half.
6. **IMPORTANT:** Note how the fuel line, throttle lever, throttle link, spring, switch, and wiring harness are routed and attached (Fig. 18).

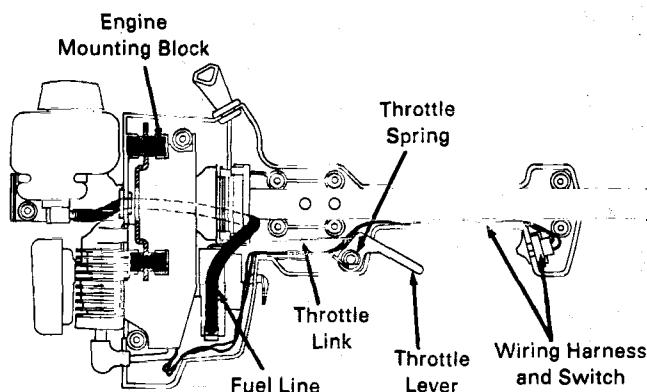


Figure 18

7. Remove the gas line from the carburetor inlet by compressing and sliding the fuel line clamp up onto the fuel line and twisting and pulling on the fuel line.

8. Remove the throttle and switch assemblies and lift the engine from the Left Hand Case.
9. Remove the air cleaner elements and retaining clip.
10. Remove the carburetor by removing the Phillips head screws which pass through the spit back/choke assembly and carburetor.
11. Remove the cooling shroud halves by removing the three screws which attach the shroud to the backing plate, and gently prying open the latch next to the spark plug wire. **NOTE:** The TC300 and TC400 have a single piece cooling shroud.
12. Remove the flywheel by retaining the starter cup with the starter cup wrench (P/N 45-1390) and removing the flywheel nut (Fig. 24, p. 17). Use the handle of the starter cup wrench to separate the flywheel from the crankshaft taper. The two holes cast into the flywheel should be tapped with a 1/4"-20 tap, and two 1/4"-20 x 3/4" long capscrews used to apply pressure against the crankshaft end until the seat between the flywheel and crankshaft is loosened.

CAUTION: DO NOT attempt to pry the flywheel from the crankshaft or tap on the crankshaft end to loosen the flywheel. The crankshaft is made up of three parts, with the crankshaft ends being pressed onto the crankpin. Prying or striking the crankshaft can result in damage that will require replacement of the short block.

13. Remove the CDI (Ignition) Module by removing the two screws which attach the laminations to the cylinder assembly.
14. Remove the backing plate assembly by removing the three bolts and two Phillips head screws which pass through the backing plate and backing plate stress plate into the cylinder assembly.
NOTE (TC1500 only): The intake gasket is sealed with a light coating of gasket sealant, and the backing plate may appear to be stuck to the cylinder assembly.
15. Remove the crankcase pad by squeezing the end of the crankcase pad clip so that it can be passed through the hole in the crankcase.
16. Remove the heat shield and muffler by removing the two hex socket capscrews and the Phillips head screw to the heat shield tab. The tab can then be removed by removing the Phillips head screw that fastens it to the cylinder assembly.

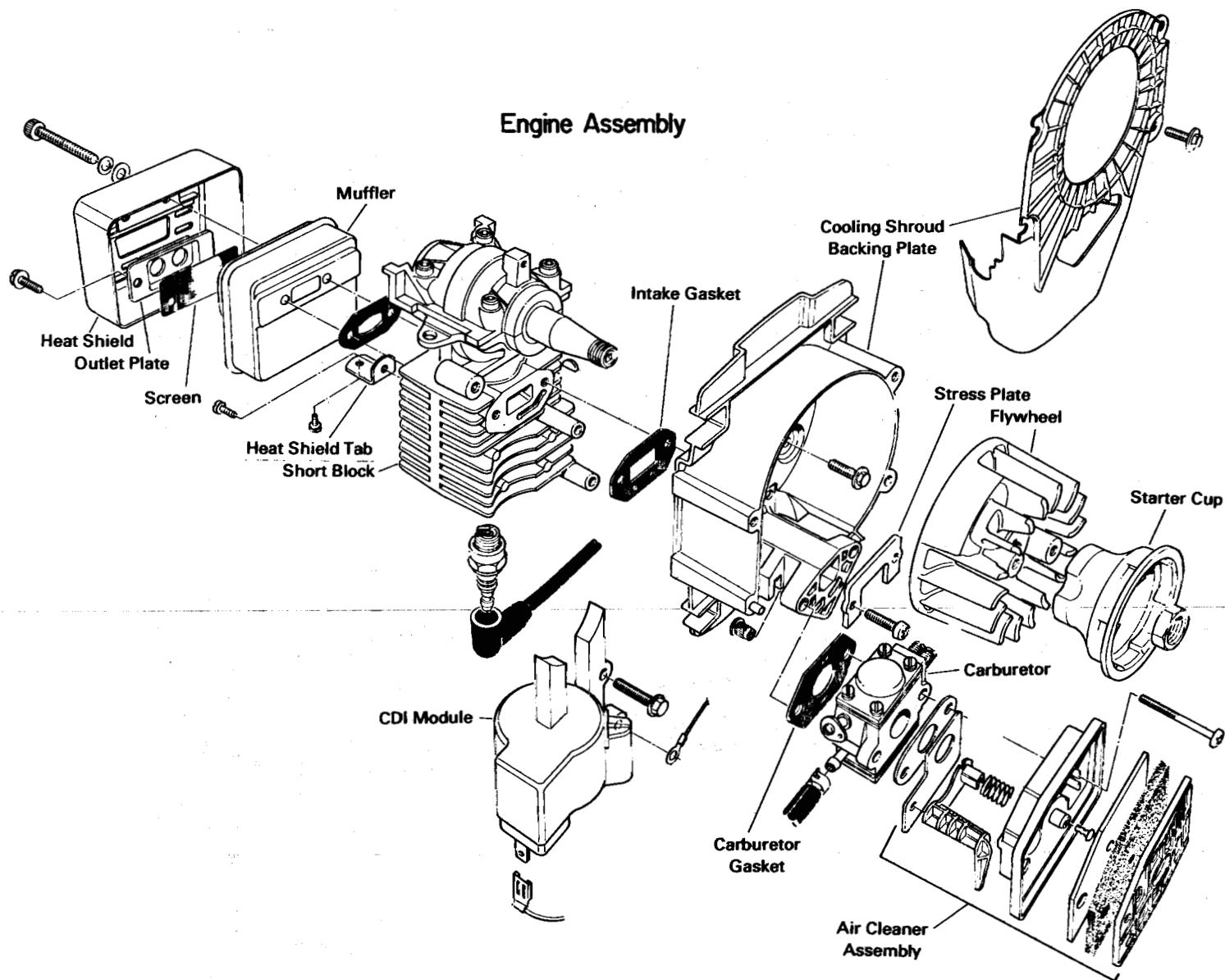


Figure 19

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

Starter Rope Replacement

1. Follow steps 1-5 of Trimmer & Engine Disassembly/Assembly Instructions. NOTE: Do not remove the Recoil Starter Assembly from the Upper Shaft Housing Tube.
2. Remove the damaged rope from the pulley.
3. Knot one end of the replacement rope. Align the cut-out sections of the Drum and the metal Ratchet Cover. Feed the un-knotted end of the rope through the clearance hole and into the rope groove in the Drum (Figure 20).

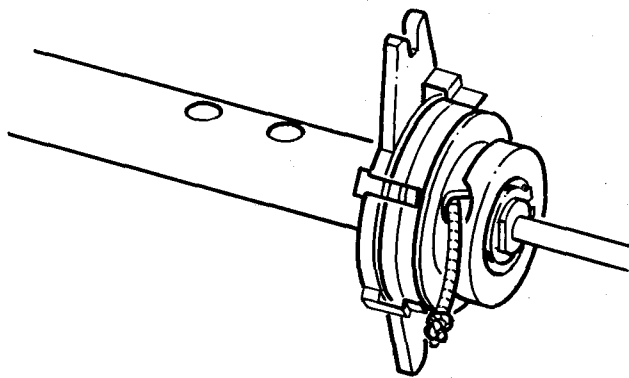


Figure 20

4. a. TC 1500, TC300, TC400

Wind the rope clockwise onto the drum, slipping the rope under the four retainer tabs (do not wind the drum) until the handle is within 2 inches from the Drum. Continue by rotating the Drum and sliding the rope under the retainer tabs until the rope extends through the widest gap between the rope retainer tabs. Install the rope bushing and handle.

b. TC400 (step 4a or 4b will apply depending upon the style of the starter drum)

Wind the rope clockwise onto the drum, slipping the rope between the retainer and the drum until 2 inches of rope remains. Thread

the end of the rope remaining through the guide slot in the retainer. Install the rope bushing and handle.

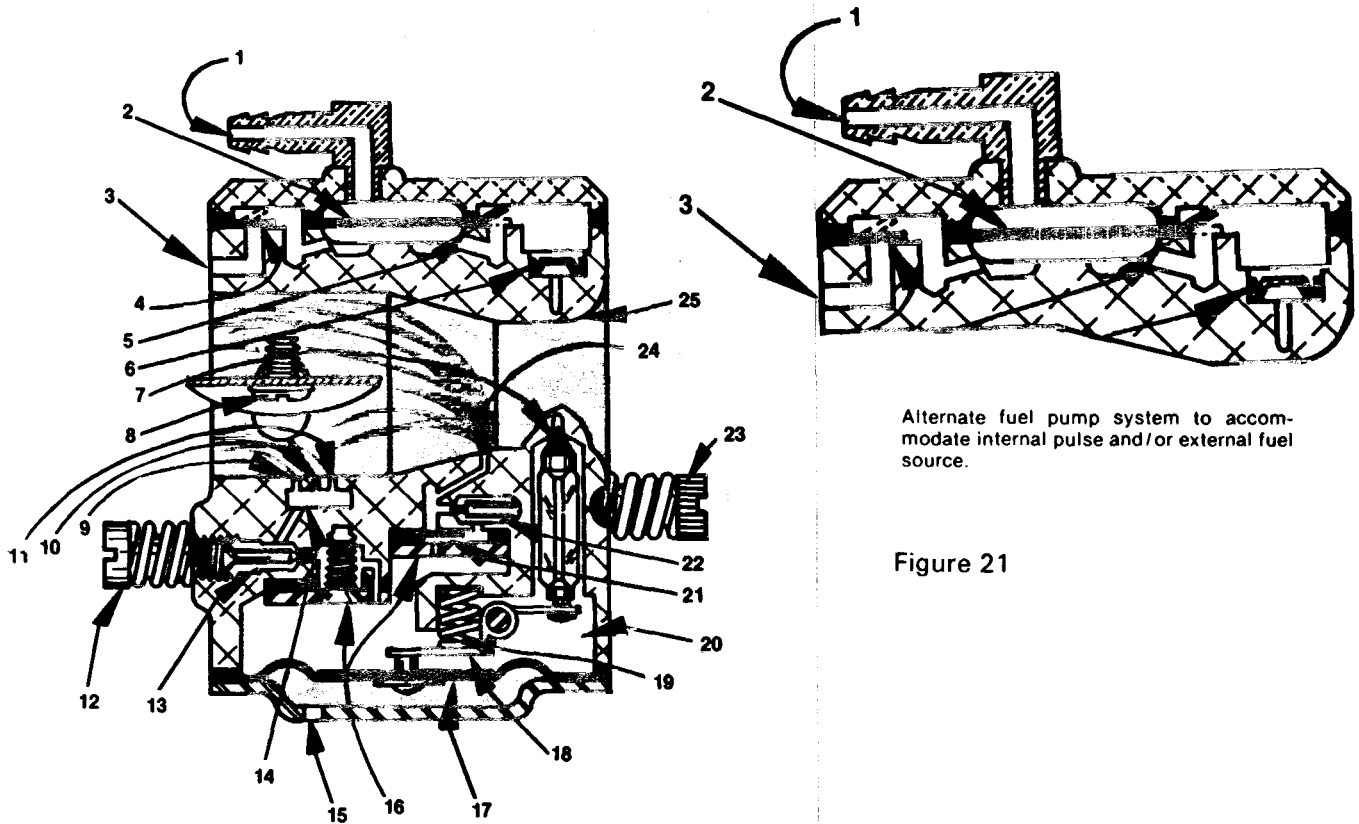
5. **IMPORTANT:** Check the starter for proper assembly by extending the starter rope full length. With the rope extended, the starter pulley must be able to be rotated an additional $\frac{1}{2}$ turn in a clockwise direction but not more than $1\frac{1}{2}$ turns.
6. To reassemble, reverse steps 1-5 in Disassembly Instructions (page 10).

Starter Assembly Replacement.

1. Follow steps 1-5 of Trimmer & Engine Disassembly/Assembly Instructions.
2. Remove the Recoil Starter Assembly from the Upper Shaft Housing Tube. Retain the tube by passing a bar through the holes in the tube. Twist the Recoil Starter Assembly to remove.
3. Press the replacement Recoil Starter Assembly into the Upper Shaft Housing Tube. The slots in the Recoil Starter Assembly which are retained by the Trimmer case halves must be in line with the locating holes in the tube, and the widest gap between rope retainer tabs on the Starter must be rotated 180° from the Pole Clamp slot cut in the tube. NOTE: Press only on the end of the Recoil Starter Assembly.
4. **IMPORTANT:** Check the starter for proper assembly by extending the starter rope full length. With the rope extended, the starter pulley must be able to be rotated and additional $\frac{1}{2}$ turn in a clockwise direction. If the Starter Drum stops rotating before the rope is extended full length, remove one wrap of the Starter Rope by sliding it from under the rope retainer tabs and repeat test procedure. If more than $1\frac{1}{2}$ turns are possible, wrap one more turn on the starter.
5. To reassemble reverse steps 1-5 in Disassembly Instructions (page 10).

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

WALBRO CARBURETOR OPERATION



Alternate fuel pump system to accommodate internal pulse and/or external fuel source.

Figure 21

1. Engine Impulse: Actuates Fuel Pump Diaphragm with alternating pressure-vacuum pulses.
2. Fuel Pump Diaphragm: Fluctuates in response to engine impulse. Transfers fuel through Fuel Pump Valves.
3. Fuel Inlet: Fuel drawn from tank.
4. Inlet Valve: Responds to Fuel Pump Diaphragm. Opens during vacuum pulse. Closes during pressure pulse.
5. Outlet Valve: Closes during vacuum pulse. Opens during pressure pulse.
6. Filter Screen: Filters fuel on route to Metering Chamber.
7. Inlet Needle Valve: Lifts off seat to allow fuel entry into Metering Chamber.
8. Throttle Valve: Regulates engine speed as it exposes Primary, Second, and Third Idle holes, then Nozzle for fuel delivery.
9. Primary Idle Hole: Only fuel source to engine at Idle position.
10. Second Idle Hole: Allows additional fuel flow on acceleration.
11. Third Idle Hole: Increases fuel flow at Part Throttle.
12. Idle Needle: Adjust for fuel richness to 3 Idle holes.
13. Idle Take-Off: Fuel entry for Idle holes.
14. Idle Port: Fuel reservoir for Idle holes.
15. Atmospheric Vent: Allows air pressure against Metering Diaphragm.
16. Circuit Plate: Meters fuel from Metering Chamber to Low Speed and High Speed Circuits.
17. Metering Diaphragm: Drawn up by vacuum to activate Metering Lever.
18. Metering Lever: Lifts Inlet Needle off seat.
19. Metering Lever Spring: Transmits force to Metering Lever. Closes Needle Valve as Metering Chamber fills.
20. Metering Chamber: Fuel reservoir, feeds to Idle and Nozzle circuits.
21. Nozzle Check Valve: Engine vacuum draws Valve open.
22. Nozzle Well: Fuel is drawn in from Metering Chamber at high speed.
23. Hi Speed Needle: Adjusts for fuel richness at high speeds.
24. Nozzle: Increases fuel discharge for high speeds.
25. Venturi: Increases air velocity at Nozzle, creating a suction to draw fuel into Throttle Bore.

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

WALBRO CARBURETOR SERVICING

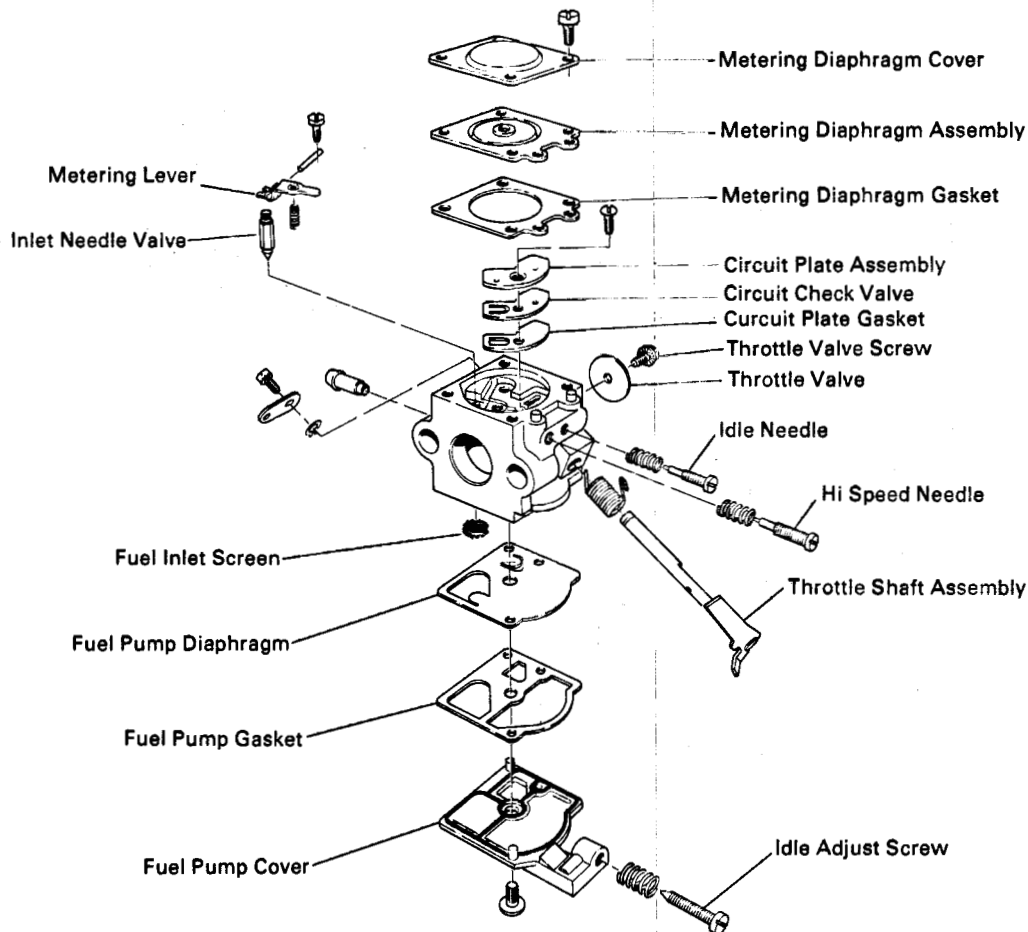


Figure 22

Carburetor Disassembly (Refer to Fig. 22):

1. Remove the fuel pump cover screw and pump cover.
2. Remove the fuel pump diaphragm and fuel pump gasket.
3. Inspect the diaphragm for flatness and continuity. The diaphragm should have no holes. The flapper valves should be flat and free from curling.
4. Blow through the external pulse hole on the body casting to insure that there are no obstructions.
5. Blow through the internal fuel hole on the body casting to insure that there are no obstructions.
6. Remove and discard the filter screen.
7. Remove the four screws and metering diaphragm plate.
8. Remove the metering diaphragm and gasket.
9. Inspect the metering diaphragm for holes, dirt and foreign matter.
10. Remove the metering lever screw and metering lever components including lever, pin, needle valve and spring.
11. Remove the circuit plate screw with the diaphragm and gasket.
12. Remove the high and low speed adjustment needles.
13. Thoroughly inspect and clean the carburetor, especially all small orifices and openings, using a solvent wash and an air gun.
14. Dry the carburetor with air and inspect the operation of the throttle valve and lever.

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

Carburetor Re-Assembly

1. Install a new filter screen with any appropriate hollow tube or tool of approximately .300 inch diameter. NOTE: The screen must be pushed in far enough to be below the fuel inlet hole.
2. Inspect the circuit plate for flatness and correct if necessary.
3. Inspect the new circuit plate diaphragm and gasket for flatness. Install the circuit plate, circuit diaphragm and circuit plate gasket with *diaphragm in contact with the plate* and *gasket in contact with body casting*. Use only moderate pressure on the circuit plate screw so as not to warp the circuit plate.
4. Install the metering lever components and adjust the metering lever to be flush with the surface of the circuit plate, Fig. 23.
5. Install the high and low speed needles and set at approximately *1 and 1/4* turns open. The high and low speed letters are indicated on the side of the carburetor casting. The high speed needle is the long needle and the low speed needle is the short needle.
6. Install the metering diaphragm and related components as follows: Install the gasket over the locator pins on the casting. Next, install the metering diaphragm over the locator pins on the casting. (The metering plate pin must be in contact with the metering lever.) Next, install the metering diaphragm cover with four screws. The vent hole in the cover should be located opposite the throttle valve.
7. With the large single screw, install the fuel pump cover with the *fuel pump diaphragm in contact with the body casting* and with the *fuel pump gasket in contact with the fuel pump cover*. The extension on the cover should be located on the same side as the throttle lever.
8. Visually inspect the carburetor and tighten all screws.

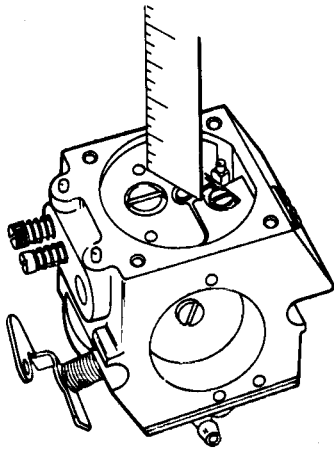


Figure 23

TROUBLESHOOTING AND TEST PROCEDURES

CUTTER HEAD TROUBLESHOOTING

Description of Difficulty	Engine Speed	Flexible Drive Shaft	Cutter Head Bearing Housing	Line Feed Assembly	Clutch Assembly	Handle Tube Assembly	Engine Housing
Reduced cutting ability	RPM too low	Binding	Bearing worn	Cutting line too short, won't index	Clutch slipping		
Cutting line fails to advance	RPM too low			Driver broken, line swelled from moisture, dirty, line tangled			
Cutting line pulls back into drum (or tangles)				Cutting line not indexed often enough or prior to engine shut off			
Line spool fails to turn		Not seated in engine or cutting unit	Bearing seized	Driver or drum broken	Bearing grease on clutch drum	Incorrect assembly	
Clutch fails to engage	RPM too low	Not seated in engine or cutting unit				Incorrect assembly	
Clutch fails to disengage at idle speed	RPM too high				Power shaft snap ring out of groove (some models), clutch spring broken		
Trimmer vibrates abnormally				Unbalanced cutting unit, bearings worn, dirt accumulation			

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

CLUTCH REPAIR

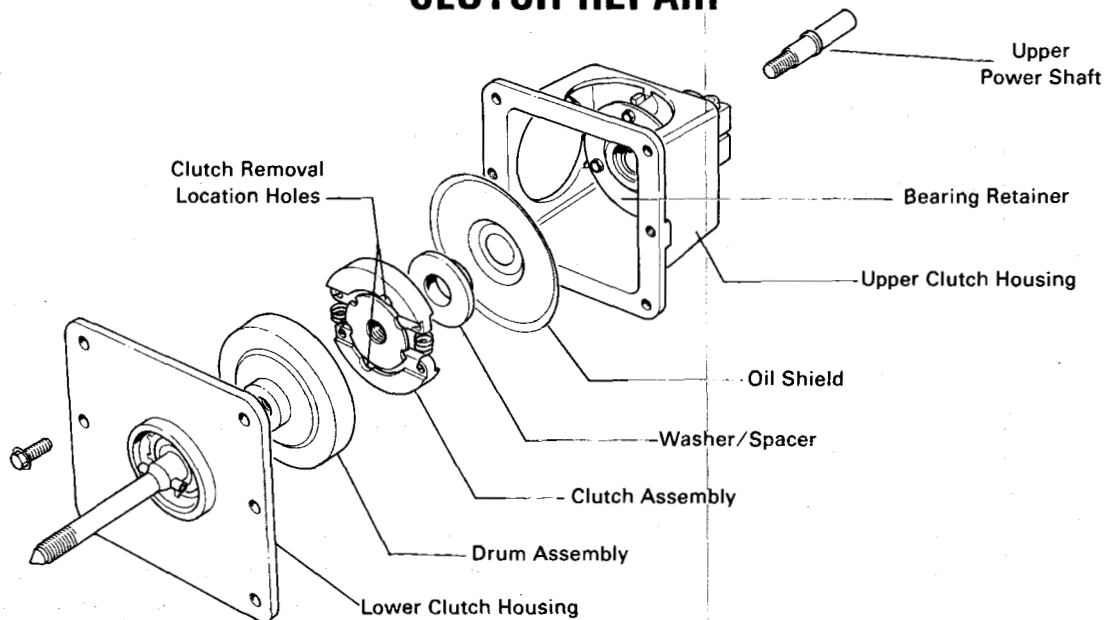


Figure 24

The clutch consists of two assemblies: (Fig. 24):

- A. The upper housing containing the upper power shaft, ball bearing, oil shield, clutch spacer, clutch assembly and ...
 - B. The lower bearing housing and clutch drum which is threaded to the lower housing shaft.
- NOTE: The oil shield was not used in early production of the TC-400 clutch assembly. Also, the upper power shaft with the snap ring was changed to a machined shaft with a shoulder. The two shafts are interchangeable. The oil shield may be added to existing clutch assemblies using the upper shaft with the machined ring.

Disassembly & Assembly Instructions

1. Remove the cutter head or line feed assembly.
2. Remove the clutch housing from the trimmer tube by loosening the housing clamp bolt.
3. Remove the six screws securing the upper and lower sections of the clutch housing. Separate the two sections by gently prying them apart.
4. The clutch assembly (shoes and springs) can be removed with the multipurpose tool P/N #45-1390 (Fig 25). Align the pins on the tool with the holes in the clutch assembly. While supporting the opposite end of the power shaft with a piece

of 3/16 inch square key stock, turn the clutch assembly counterclockwise. The spacer, oil shield and power shaft can now be removed.

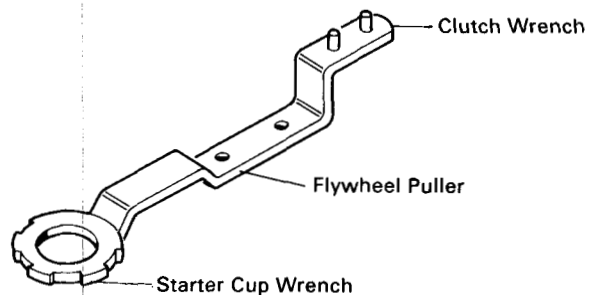


Figure 25
Multipurpose tool (P/N 45-1390)

NOTE: When reassembling the clutch shoe and spring assembly, be sure that the side marked "off" is toward you. The wide flange on the spacer must be against the clutch shoe and spring assembly.

5. Remove the three screws in the bearing retainer. The bearing fits loosely and can be pushed out by gently tapping the bearing from the top or clamp end of the housing.
6. The shaft and bearings in the lower clutch housing are not serviceable as individual components and must be replaced as an assembly.

DISASSEMBLY, REPAIR, REASSEMBLY INSTRUCTIONS

AUTOMATIC LINE FEED REPAIR

1. Drain the gasoline from the fuel tank and remove the high tension wire from the spark plug.
2. Insert a medium flat screw driver in one of the two window slots in the spool hub and twist. The spool will snap off. (Fig. 26). NOTE: Use as wide a screw driver as will fit in the slot so as not to damage the cap.

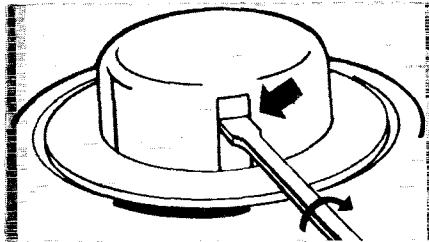


Figure 26

3. Hold the drum securely, and unscrew the spool core counterclockwise. The driver will turn off with it.
4. Remove the washer and compression spring and slide the drum off the power shaft.
5. Clean the debris from the inside and outside of the drum, and remove any debris wrapped around the power shaft.
6. Replace any worn or broken parts.
7. Reassemble the trimmer head in the reverse order. Be certain that the roll pin on the power shaft is seated in the slot in the drum.
8. The spool and spool core are keyed. They must be properly aligned when putting the spool back on. Thread the end of the line through the eyelet. Place the spool on the keyed core and push in place until you hear it click.

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