TC3, 4, 5000 GAS TRIMMER, MODELS 51643, 51644, 51645

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TORO®

TC3000, TC4000 & TC5000 gas trimmer

SERVICE MANUAL

ABOUT THIS MANUAL

This Service Manual was written expressly for the Toro TC3000, TC4000 and TC5000 Gas Powered Trimmers. The Toro Company had made every effort to make the information in this manual complete and correct.

This manual was written with the service technician in mind. It is organized so that information used most often is up front. As a result, you will find reference information on safety, maintenance, specifications, special tools and troubleshooting all in the front third of the manual.

Disassembly, inspection and reassembly procedures are covered in the last two-thirds of the manual and are grouped by component. We tried to cover each common repair with its own section or sub-section. For example, you will find that air gap adjustment and ignition coil replacement are called out separately.

And, because certain components are often difficult to troubleshoot without a good understanding of how they work, we have included some component theory. This information can be found of the beginning of most service procedure sections.

We are hopeful that you will find this manual a valuable addition to your shop. If you should come across any errors or if you have any questions regarding this manual, please contact us at the following address:

The Toro Company
8111 Lyndale Avenue South
Bloomington, MN, USA 55420

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

The Toro Company gratefully acknowledges the assistance of Mitsubishi Heavy Industries, Ltd. in the production of this manual.

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SAFETY INFORMATION

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

This manual is intended as a service and repair manual only. The safety instructions provided in this manual are for the troubleshooting and service of the product only. The individual Operator's Manual will contain safety information on the operation of the TC3000, TC4000, or TC5000.

Operator's Manuals with complete operational safety instructions are available through:

The Toro Company
Publications Department
8111 Lyndale Avenue South
Minneapolis, MN 55430 U.S.A.

FOR YOUR SAFETY...

Avoid possible explosions...
Store fuel in a container designed for gasoline and never smoke while working around gasoline.

Avoid fires...
Never allow the trimmer engine closer than one meter (three feet) to any combustible material.

Avoid accidental misuse of fuel...
Always store fuel in an approved container that is properly labeled.

Avoid falls...
Always wipe up spilled fuel or oil.

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

Avoid unexpected starting of the engine...
Always disconnect the spark plug wire before attempting any cleaning, adjustment or repair.

Avoid contact with a moving cutter head...
Always stay clear of the cutter head when the engine is running. The clutch is a mechanical device which could fail. Do not rely on it to keep the cutter head from turning.

Avoid blindness...
Always wear eye protection when repairing or running a gas trimmer.

Avoid hearing loss...
Wear ear protection when running a gas trimmer.

SPECIFICATIONS

Engine Specifications

	TC3000	TC4000	TC5000
Type	2-cycle	2-cycle	2-cycle
Bore mm (in)	32 (1.25)	32 (1.25)	36 (1.41)
Stroke mm (in)	30 (1.18)	30 (1.18)	32 (1.25)
Displacement cm3 (mm3)	24 (1.44)	24 (1.44)	33 (1.98)
Compression Ratio	8.0:1	8.0:1	8.6:1
Continuous Rated Output HP	0.8 at 6000 rpm	0.8 at 6000 rpm	1.1 at 6000 rpm
Maximum Output HP	1.3 at 7500 rpm	1.3 at 7500 rpm	1.7 at 7500 rpm
Maximum Torque kg m (in lbs)	0.14 (12.2) at 5250 rpm	0.14 (12.2) at 5250 rpm	0.18 (15.6) at 5000 rpm
Direction of Rotation (from PTO end)	counterclockwise	counterclockwise	counterclockwise
Carburetor	diaphragm	diaphragm	diaphragm
Idle Speed (rpm)	3000 ± 200	3000 ± 200	2500 ± 200
Clutch Type	centrifugal	centrifugal	centrifugal
Clutch Diameter mm (in)	56 (2.2)	56 (2.2)	78 (3.1)
Clutch Engagement Speed rpm	3900 ± 200	3900 ± 200	3300 ± 200
Fuel, Gas:Oil	32:1	32:1	32:1
Fuel Tank Capacity, l (oz)	0.6 (20.3)	0.6 (20.3)	1.0 (33.8)
Ignition	electronic	electronic	electronic
Spark Plug	NGK BM-6A	NGK BM-6A	NGK BM-6A
Starting System	recoil	recoil	recoil
Lubrication	oil mixed with gas	oil mixed with gas	oil mixed with gas
Air Cleaner	oiled foam	oiled foam	oiled foam

TC3000 and TC4000 Service Specifications

Item	Allowable Limit	Standard Dimension
Spark Plug Gap	0.6 to 0.7 mm (0.024 to 0.027")	N/A
Ignition Coil Air Gap	0.4 to 0.5 mm (0.016 to 0.020")	N/A
Crankshaft Runout	0.05 mm (0.0020")	0.06 mm (0.0024")

SPECIFICATIONS (cont'd)

TC3000 and TC4000 Service Specifications (Cont'd)

Item	Standard Dimension	Allowable Limit
Crankshaft Axial (End) Play	0.020 to 0.300 mm (0.0008 to 0.0118")	0.500 mm (0.0197")
Cylinder Diameter	32.00 to 32.02 mm (1.2598 to 1.2606")	Until plating exfolliates
Piston Diameter	31.940 to 31.995 mm (1.2575 to 1.2596")	See piston to cylinder clearance specification
Piston to Cylinder Clearance	0.025 to 0.060 mm (0.0010" to 0.0024")	0.100 mm (0.003")
Piston Ring End Gap	0.100 to 0.300 mm (0.0039 to 0.0118")	0.700 mm (0.0276")
Piston Ring Side Clearance	0.020 to 0.060 mm (0.0008 to 0.0024")	0.150 mm (0.0059")

TC5000 Service Specifications

Item	Standard Dimension	Allowable Limit
Spark Plug Gap	0.6 to 0.7 mm (0.024 to 0.027")	N/A
Ignition Coil Air Gap	0.4 to 0.5 mm (0.016 to 0.020")	N/A
Crankshaft Runout	0.05 mm (0.0020")	0.06 mm (0.0024")
Crankshaft Axial (End) Play	0.020 to 0.300 mm (0.0008 to 0.0118")	0.500 mm (0.0197")
Cylinder Diameter	36.00 to 36.02 mm (1.4173 to 1.4181")	Until plating exfolliates
Piston Diameter	35.930 to 35.985 mm (1.4146 to 1.4167")	See piston to cylinder clearance specification
Piston to Cylinder Clearance	0.035 to 0.070 mm (0.0014 to 0.0028")	0.100 mm (0.0039")
Piston Ring End Gap	0.100 to 0.300 mm (0.0039 to 0.0118")	0.700 mm (0.0276")
Piston Ring Side Clearance	0.040 to 0.080 mm (0.0016 to 0.0031")	0.150 mm (0.0059")

SPECIFICATIONS (cont'd)

Carburetor Specifications

Item	Standard
Throttle Valve Needle Jet	Clip positioned in middle groove
Inlet Valve Arm Height (from body surface)	1.4 to 1.6mm (0.055 to 0.063")
Free Length of Inlet Valve Spring	8mm (0.315")
Valve Opening Pressure	0.9 0.2 kg/cm^2 (13.5 3psi)
Valve Closing Pressure	0 to 0.5 kg/cm^2 (0 to 7 psi)
High Speed Mixture Screw	3 turns out ± 1/2 turn
Idle Speed Adjusting Screw	Adjust so idle is (3000 ± 200 rpm on TC3000 and TC4000 (2500 ± 200 rpm on TC5000)

Fastener Torques

Fastener	kg m	in lbs
Crankcase Screws	0.4 to 0.5	35 to 43
Cylinder Bolts	0.4 to 0.5	35 to 43
Fan Case Screws	0.4 to 0.5	35 to 43
Flywheel Nut	1.0 to 1.3	87 to 113
Starter Pulley Nut	1.0 to 1.3	87 to 113
Carburetor Insulator Screws	0.3 to 0.45	26 to 39
Carburetor Screws	0.3 to 0.45	26 to 39
Air Cleaner Screws	0.15 to 0.20	13 to 17
Muffler Nuts	0.6 to 0.7	52 to 61
Recoil Starter Screws	0.2 to 0.3	17 to 26
Fuel Tank Screws	0.2 to 0.25	17 to 22
Spark Plug	1.2	104
Ignition Coil Bolts	0.4 to 0.5	35 to 43
Clutch Bolts	0.6 to 0.8	52 to 69
Trigger Module Screw	0.2 to 0.3	17 to 26

TOOL REQUIREMENTS:

Flywheel Puller	Toro part number 41-7650
Spark Tester	Toro part number 41-7890
Tachometer	Toro part number 42-2730
Feeler Gauge	
Compression Gauge	
Metric Socket Set 3/8" Drive	
Spark Plug Socket	
#2 Phillips Screwdriver	
12 oz. Ball Peen Hammer	

Dial Indicator	
Magnetic V Blocks & Dial Indicator Stand	
Spark Plug Gapping Tool	
Torque Wrench	
Threebond #1104	Toro part number 505-80
Loctite #242	Toro part number 505-76
Micrometer	
Snap Ring Plier (inside & outside type)	
Hex. Key Set	

TROUBLESHOOTING

Engine Does Not Produce Spark

Possible Causes	Remedy
stop switch in "off" position	move switch to "on" position
stop switch in backwards	disassemble control and turn switch around
spark plug damaged or fouled	replace spark plug
spark plug wire damaged	replace coil
coil primary wire grounding out	repair damaged wire with electrical tape
ignition coil has failed	replace ignition coil
trigger module has failed	replace trigger module

Engine Floods During Starting

Possible Causes	Remedy
operator not depressing tickler valve when priming	review proper starting procedure
stale gasoline	mix fresh fuel
choke not opening	replace damaged or broken parts
incorrect gas:oil ratio	use fuel with 32:1 gas:oil ratio
tank not venting properly	repair or replace gas cap
debris in carburetor	clean carburetor
air filter plugged	clean air filter

Engine Not Getting Fuel

Possible Causes	Remedy
fuel tank empty	fill fuel tank
fuel filter clogged	replace fuel filter
leak in fuel line	replace defective fuel line
gas cap not venting properly	repair or replace gas cap
diaphragm pump not functioning	rebuild carburetor
crankcase leak	repair leak

TROUBLESHOOTING (cont'd)

Engine Lacks Power

Possible Causes	Remedy
grass wound around trimmer head	clean trimmer head
muffler plugged	clean muffler and spark arrestor screen
improper gas:oil ratio	use 32:1 gas:oil ratio
stale fuel	mix fresh fuel
adjust carburetor	carburetor improperly adjusted
flywheel key sheared or missing	replace flywheel key
low compression	see "Low Compression" troubleshooting section

Engine Has Low Compression

Possible Causes	Remedy
insufficient oil in fuel	use fuel with 32:1 gas:oil ratio
piston rings excessively worn	rebuild engine
air leak in lower crankcase	replace lower crankcase seals
air leak in cylinder mounting area	replace gasket and tighten mounting bolts
air leak at spark plug	replace defective plug or cylinder

Engine Backfires (indicated by burnt air cleaner element)

Possible Causes	Remedy
muffler and exhaust port plugged	decarbonize muffler and exhaust ports
sheared or missing flywheel key	replace flywheel key

Trimmer Vibrates Excessively

Possible Causes	Remedy
missing eyelet in cutter head	replace eyelet
trimmer implement damaged	replace cutter head
bushings in drive tube worn	replace drive tube
bent crankshaft	check runout and replace if necessary

MAINTENANCE

Maintenance - Air Cleaner

Servicing of the air cleaner is recommended after every 25 hours of operation or more often in very dusty conditions.

See Figure 1.

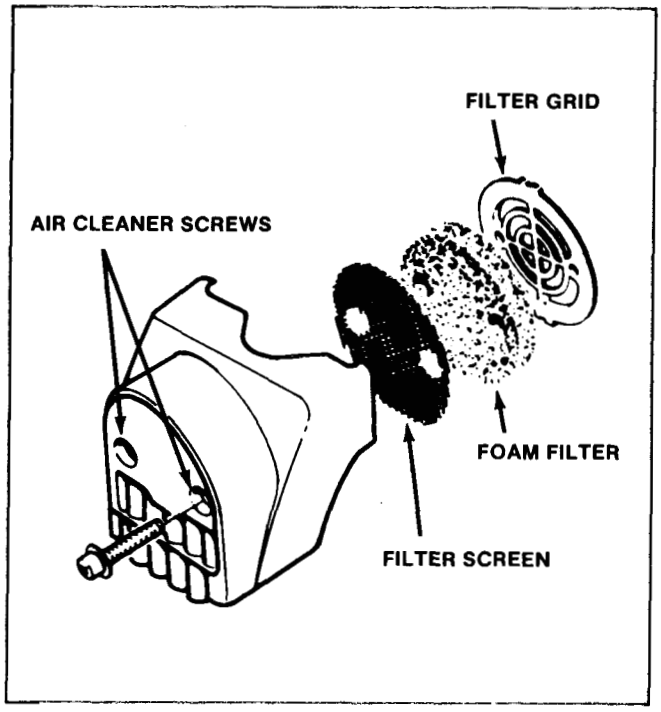

Figure 1

1. Remove the two screws securing the air cleaner cover to the trimmer
2. Carefully remove the filter grid, foam filter and filter screen.
3. Wash the foam filter in a soap and water solution and dry thoroughly. If the filter shows any sign of damage replace it.
4. Saturate the foam filter with 5 ml (one teaspoon) of SAE 30 oil, then squeeze to distribute the oil evenly and to remove excess oil. The element should be damp but not wet.
5. Wash the filter screen in a clean solvent and air dry. If the filter screen shows any signs of damage, replace it.
6. Reinstall the air cleaner components as shown in Figure 1. Note that the flat side of the filter grid faces the foam filter.
7. Tighten the air cleaner screws to 0.15 to 0.20 kg m (13 to 17.5 in lbs)

Maintenance - Muffler

Decarbonizing the muffler is recommended after every 50 hours of operation or if engine speed decreases drastically. See Figure 2.

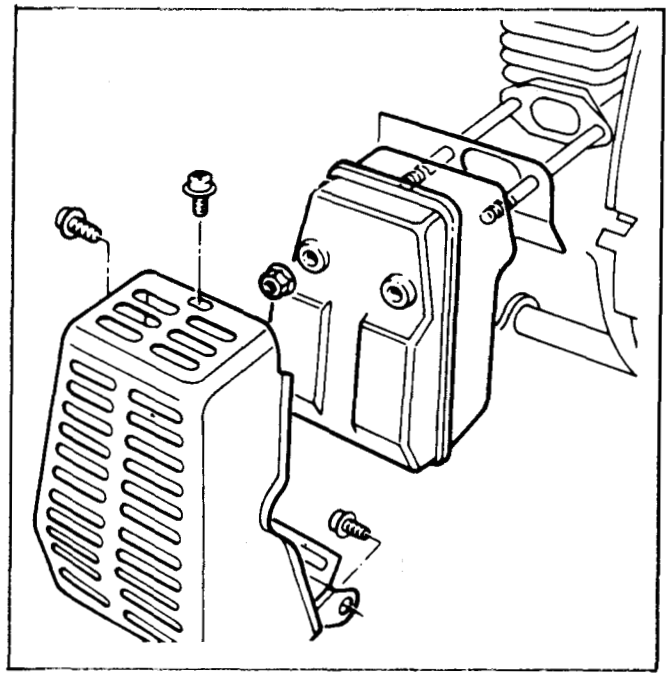

Figure 2

1. Remove the three screws securing the muffler cover to the trimmer.
2. Remove the two nuts securing the muffler to the engine.
3. Rotate the engine crankshaft until the piston totally covers the exhaust port. Clean the exhaust port area by using a clean flat piece of hard wood. Remove all loose particles.

   IMPORTANT: Use extreme care when cleaning the exhaust port. Stay clear of the piston so it will not be damaged.
4. Inspect the inside of the muffler for excessive carbon buildup. If carbon buildup appears to be restricting the exhaust flow, replace the muffler. Otherwise, clean the muffler by holding it with a vice grips and heating with a propane torch. Once hot, break the carbon loose by hitting the muffler on a hard surface. Ensure that the muffler is completely free of all carbon particles before reinstalling.
5. Reinstall muffler using a new muffler gasket and tighten all fasteners securely.
6. Reinstall the muffler cover as shown in Figure 1.

Maintenance - Spark Plug

The TC3000, TC4000 and the TC5000 each use an NGK BM6A spark plug or the equivalent. Correct gap is 0.6-0.7 mm (0.024-0.028"). The recommended servicing interval for the spark plug is 25 hours of operation.

1. Stop the engine and pull off the spark plug wire.
2. Clean around the spark plug and remove the spark plug from the engine using a 19mm (3/4") socket.

   IMPORTANT: Replace a cracked, fouled or dirty spark plug. Do not sand blast, scrape or clean electrodes because engine damage could result from grit entering the cylinder.
3. Set the plug gap to 0.6-0.7mm (.024-.028"). See Figure 3.

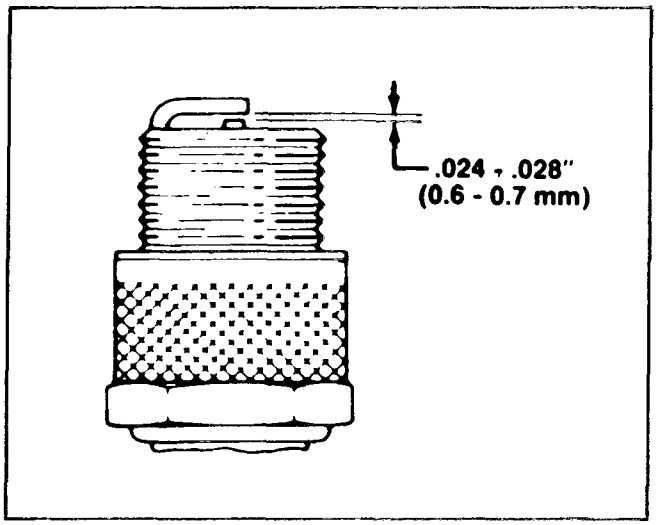

Figure 3

4. Reinstall the plug and gasket in the engine. Tighten to 1.2 kg m (104 in lbs)

Maintenance - Fuel Filter

Fuel filter replacement is recommended after every 25 hours of operation.

1. Drain the fuel from the fuel tank into a container designed for gasoline. Start the engine and let it run at idle speed until it stops and all fuel is expended.
2. Remove the fuel tank cap. Insert a clean wire with a hooked end into the tank and hook the pickup tube above the filter. Pull the filter and hose out the fuel tank opening. See Figure 4.
3. Remove the filter by holding the black tubing and pulling the filter straight off.
4. Replace the filter assembly.
5. Push the pickup assembly back into the tank and install the gas cap.

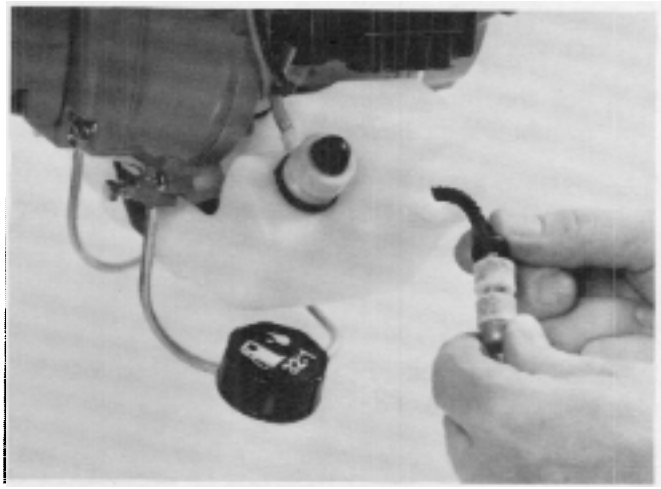

Figure 4

Maintenance - Cooling System

Before each use, visually inspect the cooling air inlet, the cooling fins, and the openings around the muffler for debris. Obstruction of these areas could lead to overheating and possible engine damage.

Be careful not to damage the cooling fins during cleaning.

Maintenance - Trimmer Implement

The trimmer implements require no lubrication. However, cleaning of the implement and the drive shaft area is recommended after every 25 hours of operation. More frequent cleaning may be required if trimming in very tall grass or if the implement area gets excessively hot.

Refer to the **Table of Contents** for the location of information on removal and cleaning of your particular implement.

Maintenance - Preparation for Storage

The following procedure is recommended to ensure proper operation of the trimmer before storage of more than a month.

1. Drain the fuel from the tank into a container designed for gasoline. Start the engine and let it run at idle speed until it stops and all fuel is expended.
2. Remove dirt and grime from external parts of the trimmer. Ensure that the cooling fins are clean.
3. Pull the spark plug wire off the spark plug. Clean around the plug so that debris will not fall into the spark plug hole when the plug is removed. Remove the spark plug.

Maintenance - Preparation for Storage (cont'd)

4. Pour 5ml (one teaspoon) of two-cycle oil into the spark plug hole. This will prevent corrosion from damaging internal engine components.
5. Pull the recoil starter handle several times to distribute the oil throughout the engine.
6. Reinstall the spark plug. Tighten it to 1.2 kg m (104 in lbs). DO NOT CONNECT PLUG WIRE TO THE SPARK PLUG.

Maintenance - Gearbox Lubrication

Lubrication of the cutter head gearbox is recommended after every 40 hours of operation.

1. Remove the cutter implement from the trimmer. Refer to the **Table of Contents** for the location of information on removal of your particular implement.
2. Remove the gear case cap and the spacer sleeve from the drive shaft. See Figure 5.

Figure 5

3. Clean any debris from under the gear case cap.
4. Clean the grease fitting, then fill the gear case with a general purpose number 2 lithium base grease until grease is forced out from around the drive shaft.
5. Reinstall the spacer sleeve and the gear case cap on the drive shaft.
6. Reinstall the trimmer impement. See the **Table of Contents** for the location of information on installation of your particular implement.

SECTION 1 CARBURETOR

Carburetor Operation

The carburetor used on the TC3000, TC4000 and the TC5000 is a diaphragm style carburetor. It uses alternating pulses from the crankcase to pump fuel from the fuel tank to the carburetor.

To adequately describe the function of the carburetor, it is necessary to break its operation down into three systems:

- The Diaphragm Pump
- Fuel Metering and Mixing System
- The Primer System

Carburetor Operation - The Diaphragm Pump

The diaphragm pump requires alternating positive and negative air pressures working upon it in order to fluctuate and perform a pumping function. The source of the positive and negative pressures is the lower crankcase where these pressures are alternately being created by the up and down movement of the piston.

Transfer of these pressure pulses is accomplished by a passage which leads from the lower crankcase to a point just below the intake port. See Figure 6.

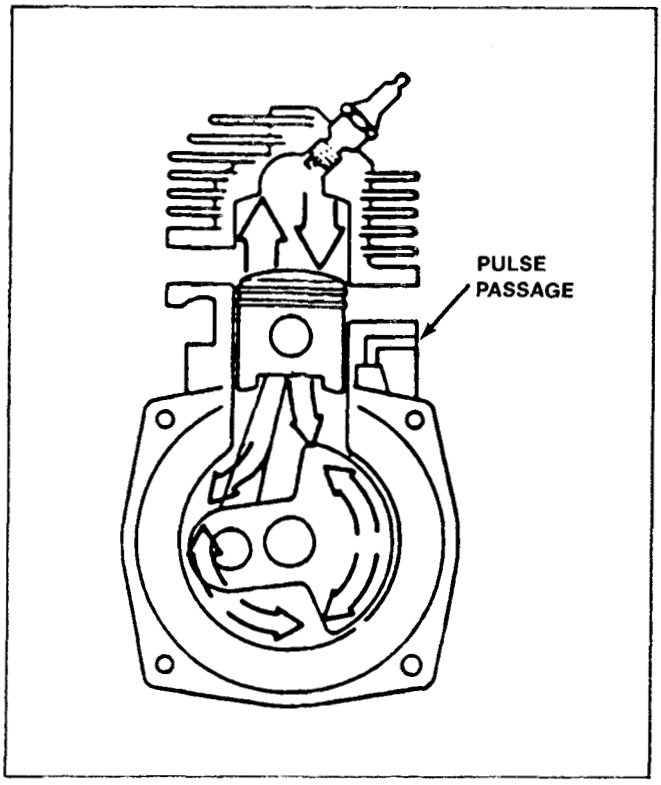

Figure 6

From there, the passage leads through the intake flange and into the carburetor. It terminates in the diaphragm chamber at a point called the pulse hole. See Figure 7.

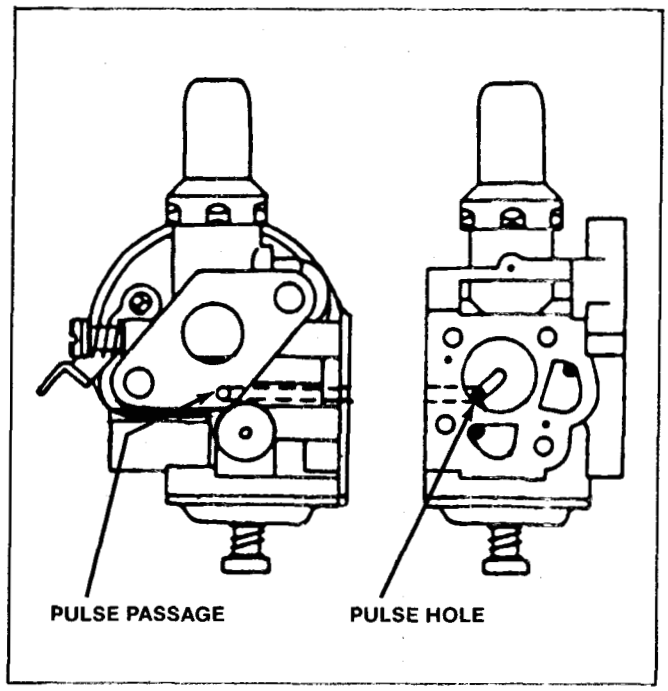

Figure 7

The pulses vary with the movement of the piston. As the piston moves upward, vacuum is created which pulls the diaphragm toward the pulse hole. This movement results in three things happening on the pump cover side of the diaphragm. See Figure 8.

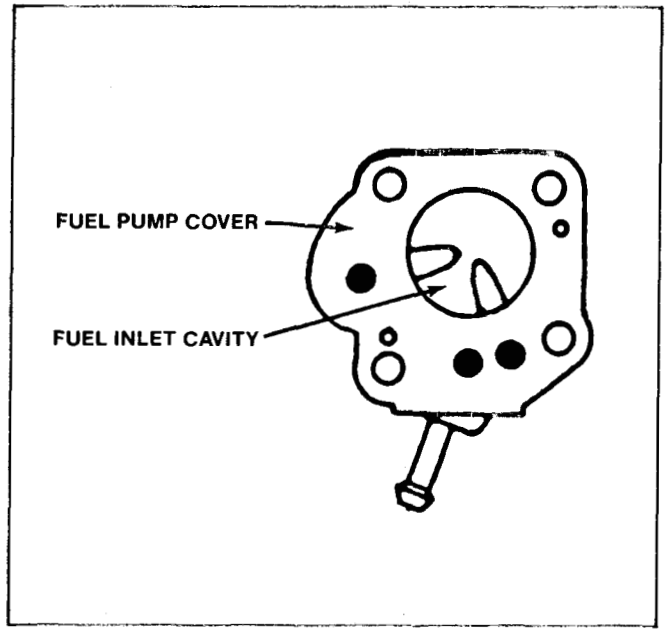

Figure 8

1. The oulet flapper valve is drawn toward the pump cover. This seals the outlet passage to ensure that fuel is drawn only through the fuel inlet.

Carbuertor Operation - The Diaphragm Pump (cont'd)

2. The inlet flapper valve is pulled open to allow fuel to flow from the fuel line and into the fuel inlet cavity.

3. Fuel is drawn into the fuel pump cavity.

   As the piston moves downward, another sequence occurs which pumps the fuel from the pump cavity into the the main diaphragm cavity. See Figure 9.

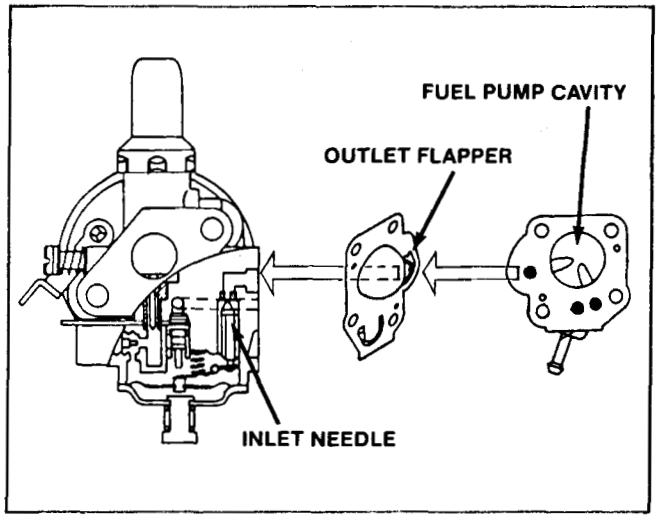

Figure 9

1. The exhaust stroke sends a positive pressure pulse to the pump diaphragm which pushes the diaphragm toward the pump cover.

2. The positive pressure in the fuel pump cavity seals the inlet flapper valve to prevent fuel from being forced back into the fuel line.

3. The outlet flapper valve is pushed open.

4. Fuel is forced out of the pump cavity and past the inlet needle.

   NOTE: The inlet needle is spring loaded in the closed position. The spring pressure is very slight and is easily overcome by the force of the fuel coming through the passage.

5. The fuel enters the main diaphragm cavity. See Figure 10.

   NOTE: The main diaphragm serves only as a reservoir so that fuel can be properly metered before entering the venturi. It does not do any pumping of fuel during normal operation.

6. Once the positive pressure is gone, the needle valve is reseated. This allows fuel to be drawn from the sealed main diaphragm cavity and into the carburetor throat on the intake stroke.

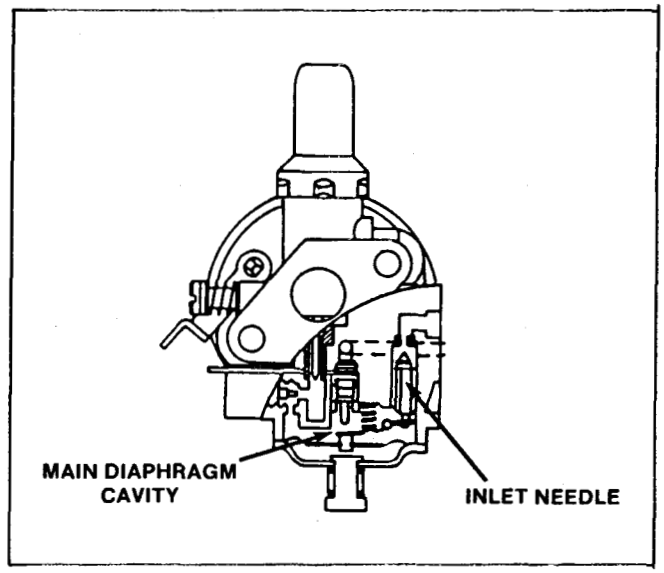

Figure 10

Carburetor Operation - Fuel Metering & Mixing

With the main diaphragm filled with fuel, the carburetor meters the amount going into the engine by using the high speed mixture screw and the needle jet. Before entering the intake port of the engine, the fuel is mixed with air to further atomize it and increase its combustibility.

The metering and mixing operation is described below: See Figure 11.

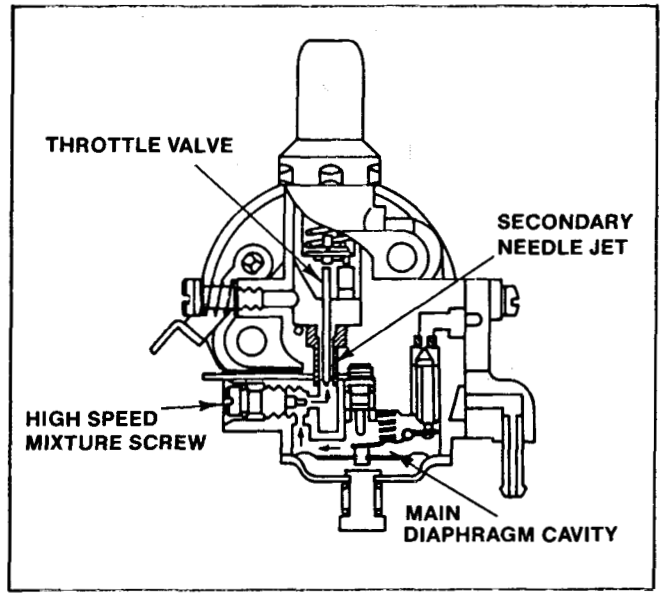

Figure 11

1. On the intake stroke, vacuum in the carburetor throat draws fuel from the main diaphragm cavity. Note that as the intake stroke begins, the main diaphragm cavity is filled with fuel and that the diaphragm is bowed toward the cover.

Carburetor Operation - Fuel Metering & Mixing (cont'd)

2. The fuel is drawn through the hole in the top of the main diaphragm chamber and past the high speed mixture screw. The high speed mixture screw regulates the maximum amount of fuel that can enter the carburetor throat.

3. The fuel is then drawn past the secondary needle which is attached to the throttle valve. It moves with the throttle valve and regulates the amount of fuel allowed into the carburetor throat in proportion with the throttle setting.

4. The venturi is the portion of a carburetor throat that is narrowed in order to increase air velocity. On the TC1000 carburetor, the venturi size is variable and is controlled by the postion of the throttle valve. See Figure 12.

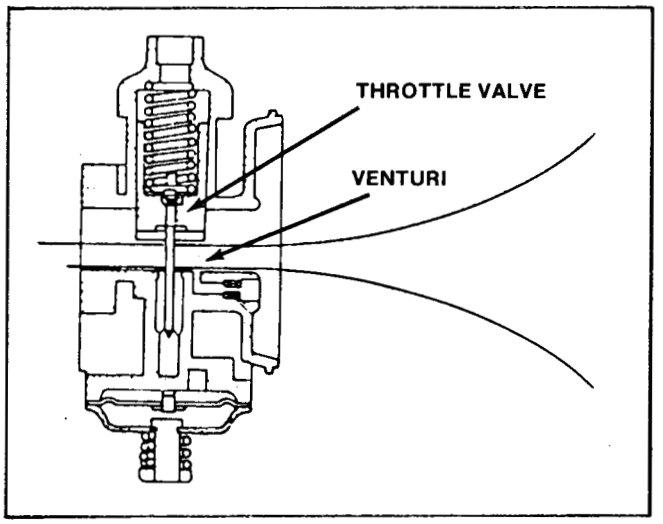

Figure 12

5. The vacuum in the venturi area draws the fuel past the secondary needle jet and into the carburetor throat.

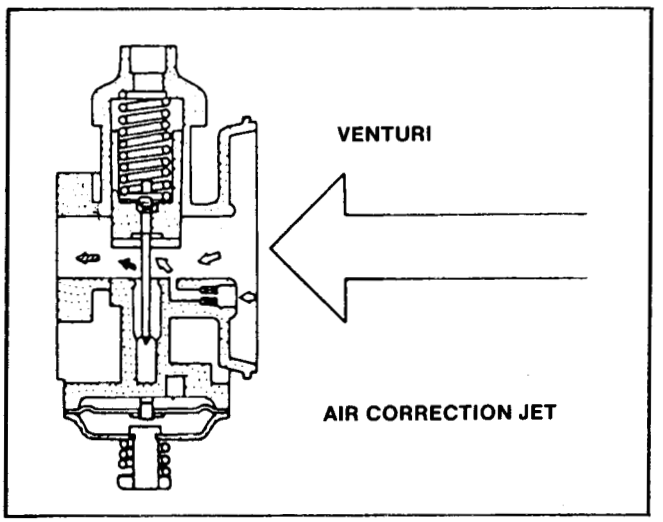

Figure 13

6. To better atomize the fuel, an air correction jet was added. The air correction jet allows filtered air to enter the carburetor throat perpendicular to the normal air flow. This action creates turbulence in the venturi area and helps mix the fuel with air as it enters the carburetor throat. See Figure 13.

7. The air/fuel mixture enters the engine.

Carburetor Operation - The Primer System

The TC3000, TC4000 and TC5000 trimmers use a primer system that ensures fuel is present throughout the fuel system. When properly used, this primer system should not induce flooding.

The recommended procedure for priming is as follows: See Figure 14

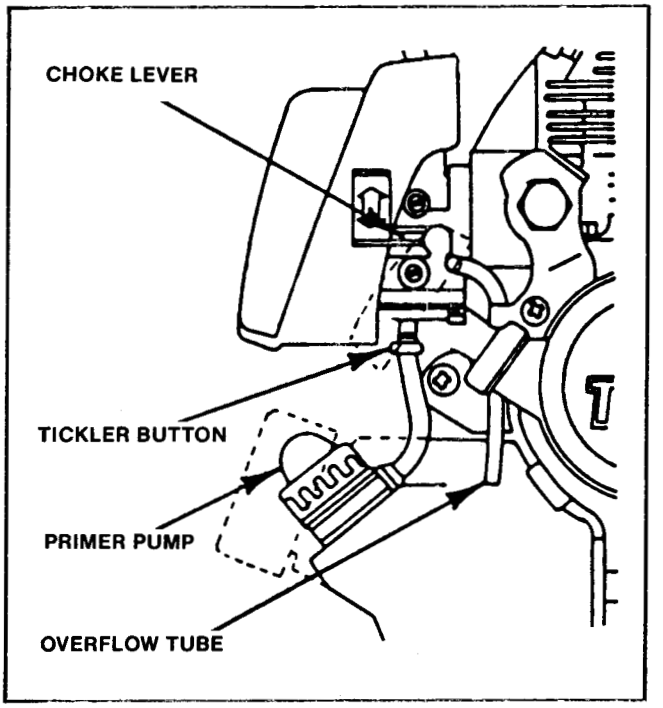

Figure 14

- Push the tickler button fully inward.
- Manually pump the primer pump until a small amount of fuel is emitted from the overflow tube.
- Stop pumping the primer pump and release the tickler valve. The engine is now ready to start.

The operation of the primer system is as follows: See Figure 15.

1. When the tickler valve is depressed slightly, the inlet needle is unseated.

2. Depressing the tickler valve fully keeps the inlet needle unseated and also opens the overflow needle.

Carburetor Operation - The Primer System (cont'd)

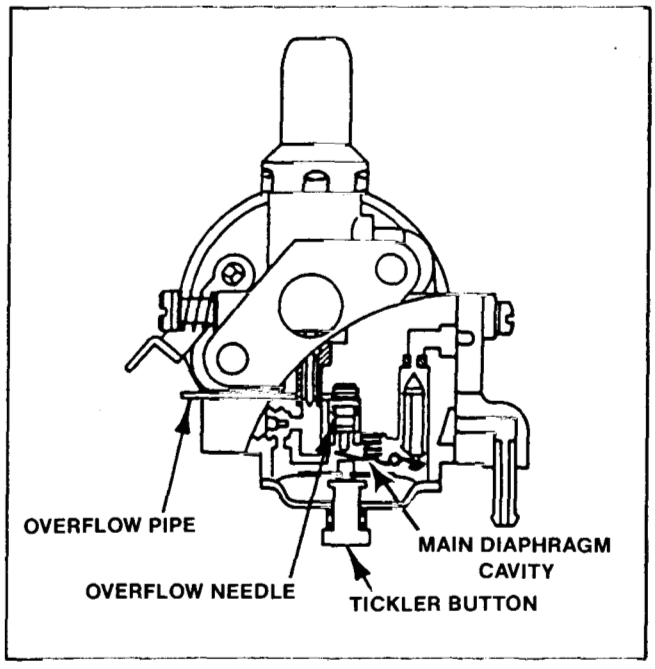

Figure 15

3. Pumping the primer pump forces fuel into the entire fuel system. This action ensures that the fuel line, diaphragm pump, and main diaphragm cavity are all filled with fuel.

   NOTE: If the tickler valve is not fully depressed during priming, the overflow valve will not open and fuel will be forced into the carburetor throat thereby flooding the engine.

4. Releasing the tickler valve seats the overflow valve and the inlet needle. At this point the engine is ready for starting.

Carburetor - Removal

1. Remove the two screws with flat washers and lock washers, securing the air cleaner assembly and remove the assembly. See Figure 16.

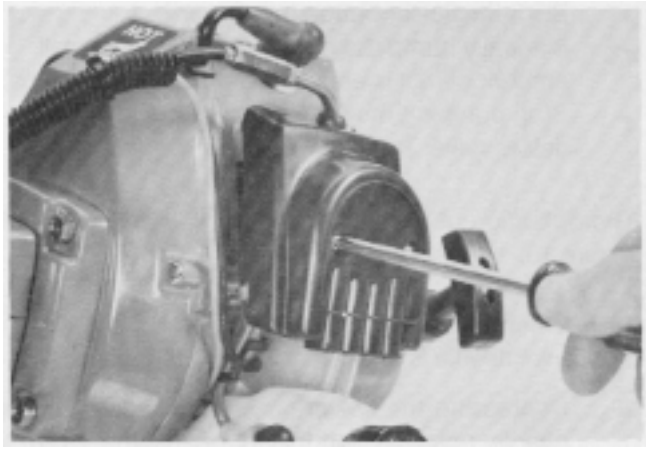

Figure 16

2. Pull from the carburetor the overflow line and the fuel feed line. Remove the carburetor with attached throttle wire. Next, remove the two screws with lock washers, that secure the carburetor onto the intake flange. See Figure 17.

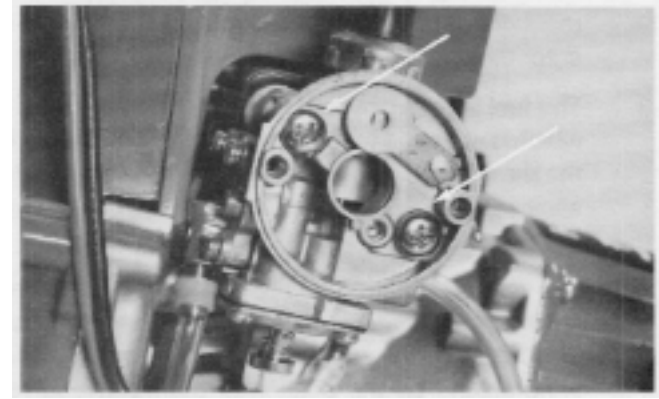

Figure 17

3. Remove the intake flange, gasket and insulators.

4. Remove the two screws securing the intake assembly to the cylinder and carefully remove the intake flange, insulator gasket, insulator and plate.

   IMPORTANT: Before removing the intake flange, note the position of the pulse orifice through the flange: this orifice should be positioned toward the fuel tank as it matches a corresponding orifice in the carburetor. The intake flange can be incorrectly positioned. This will result in fuel starvation.

   NOTE: The screws securing the intake flange may have become heat seized and difficult to remove. They can be loosened by firmly tapping the screwdriver into the screws. During reassembly, a sparse application of anti-seize compound to these threads can prevent future heat seizure.

Carburetor - Disassembly

1. Separate the carburetor from the throttle by unscrewing the mixing chamber cap and removing the throttle cable and the attached throttle valve, needle jet, throttle spring and spring retainer. See Figure 18.

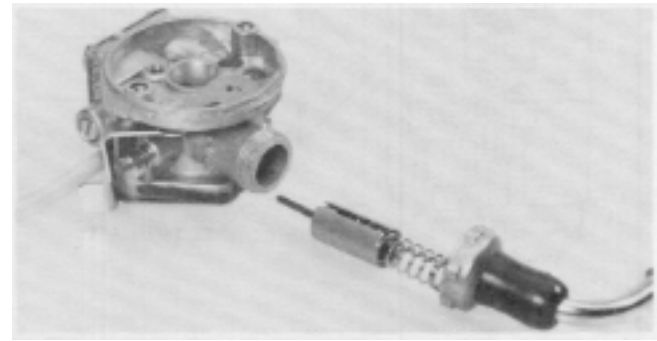

Figure 18

Carburetor - Disassembly (cont'd)

2. Remove the fuel pump by removing the 4 screws with lock washers securing the pump cover then lifting off the pump diaphragm and pump cover gasket.

   NOTE: The gasket and the diaphragm are extremely thin and may stick together giving the appearance of one piece. Remember that the pump diaphragm seals against the pump cover and that the gasket seals against the carburetor body. See Figure 19.

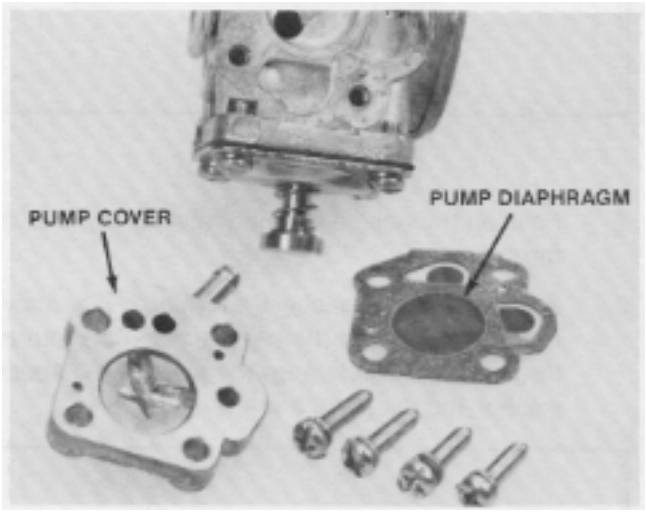

Figure 19

3. Remove the four screws with lock washers securing the main diaphragm cover assembly to the carburetor. Carefully lift off the main diaphragm cover assembly.

   NOTE: The main diaphragm assembly and the main diaphragm packing are thin and may stick together giving the appearance of one piece, not two. Remember that the main diaphragm gasket seals against the carburetor body. See Figure 20.

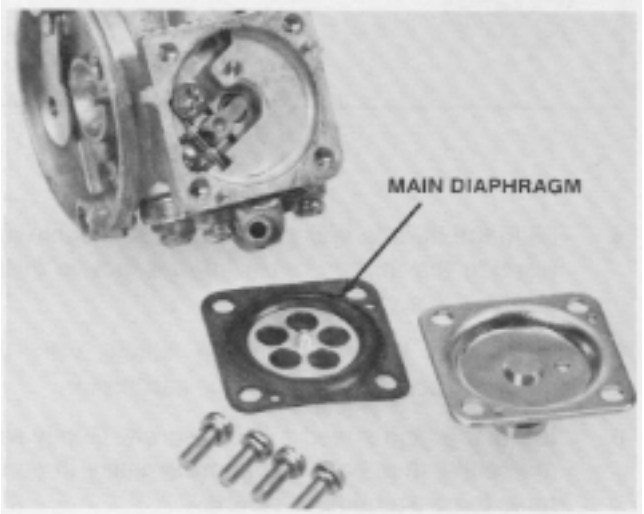

Figure 20

NOTE: Before removing inlet needle pieces, inspect inlet needle arm height using a depth micrometer. The correct height is 1.4 to 1.6 mm (.055 to .062"). See Figure 21.

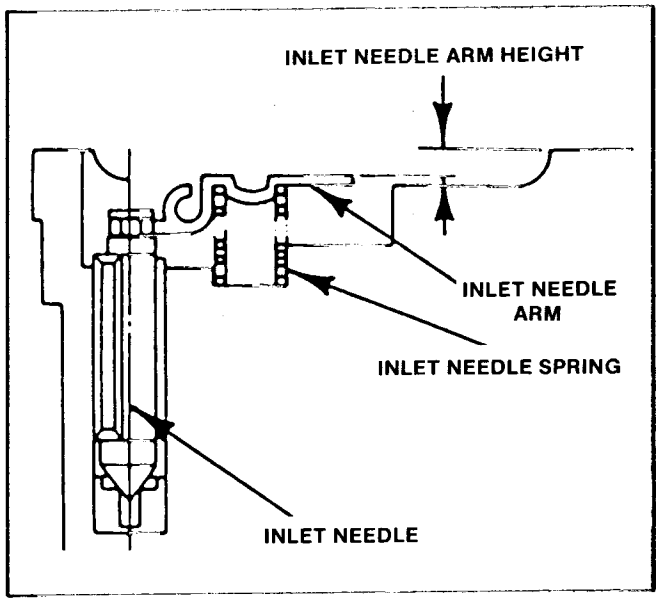

Figure 21

4. Remove the inlet needle pieces from the carburetor by removing the inlet needle pin set screw and carefully lifting out the inlet needle arm with inlet needle pin, the inlet valve spring and the inlet needle valve. See Figure 22.

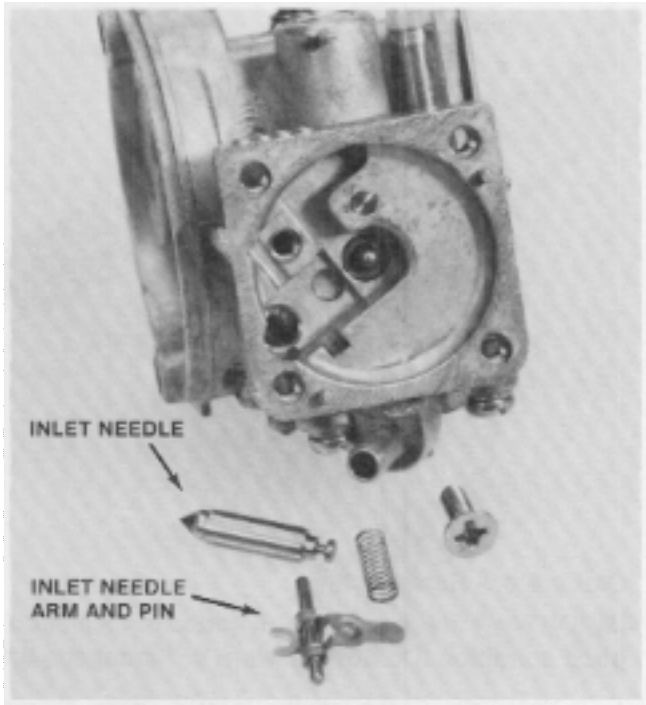

Figure 22

5. Remove the throttle adjusting screw, throttle adjusting screw spring and the high speed mixture screw. See Figure 23.

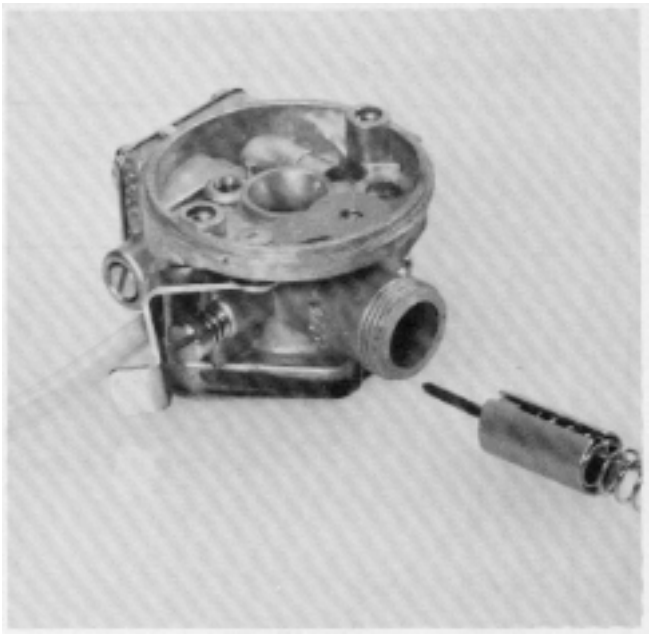

Figure 23

6. If it is necessary to remove the throttle parts from the throttle cable perform the following. Compress the throttle return spring and pull the lead lugged end of the cable from the slot in the throttle valve. Remove the throttle spring from throttle cable. From the throttle valve, push out the retainer and the needle jet assembly. See Figure 24.

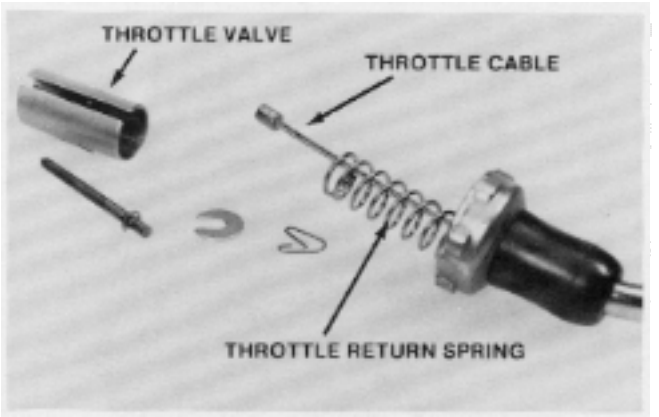

Figure 24

Carburetor - Reassembly

IMPORTANT: Make certain all parts are clean and in good condition. Do not use worn or damaged parts.

1. Install the E clip on the throttle valve. Nominal placement of the E clip is in the middle groove. The upper groove will yield a leaner mixture and the lower groove yields a richer mixture. See Figure 25.

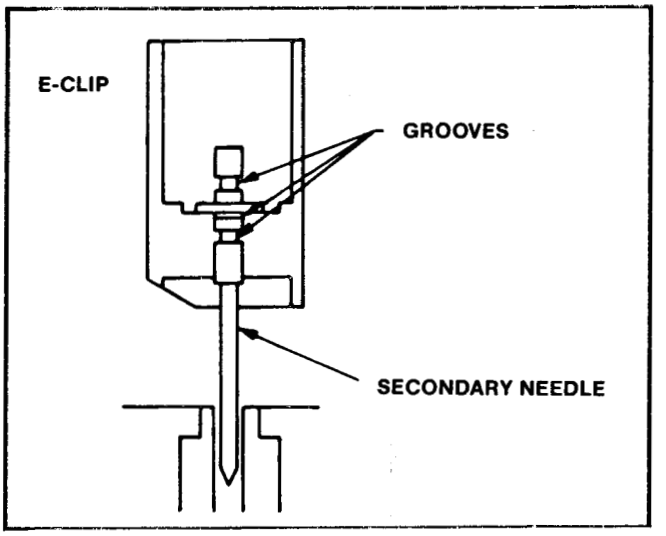

Figure 25

2. Position the needle with the retainer clip into the throttle valve.
3. Install the special washer and spring clip as shown in Figure 26. Push the needle assembly into the throttle valve and line up the slots in the special washer and the throttle valve.

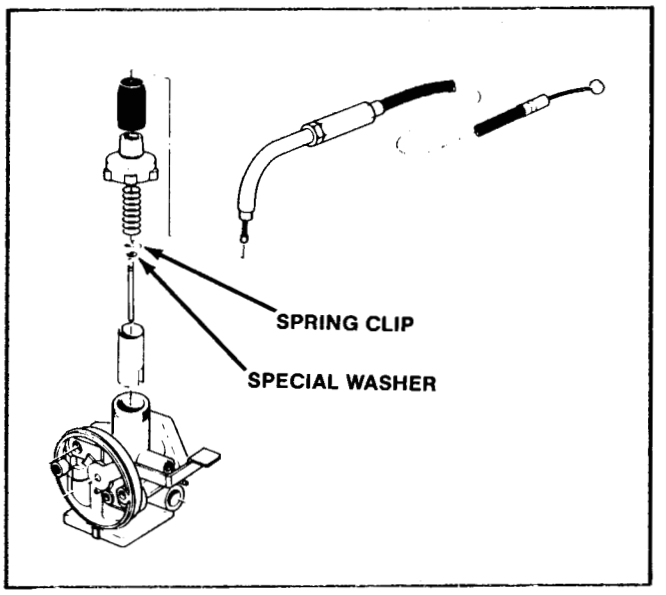

Figure 26

4. Slide the throttle spring on the throttle cable and position the throttle cable into its groove in the throttle valve.
5. Install the throttle adjusting screw with the adjusting screw spring into the carburetor.
6. Install the high speed mixture screw. Gently seat the screw, then back out approximately three full turns to give a nominal setting.

Carburetor - Reassembly (cont'd)

7. Replace the inlet needle pieces by installing the inlet needle, the inlet needle spring, the inlet needle arm and secure with the screw. See Figure 27.

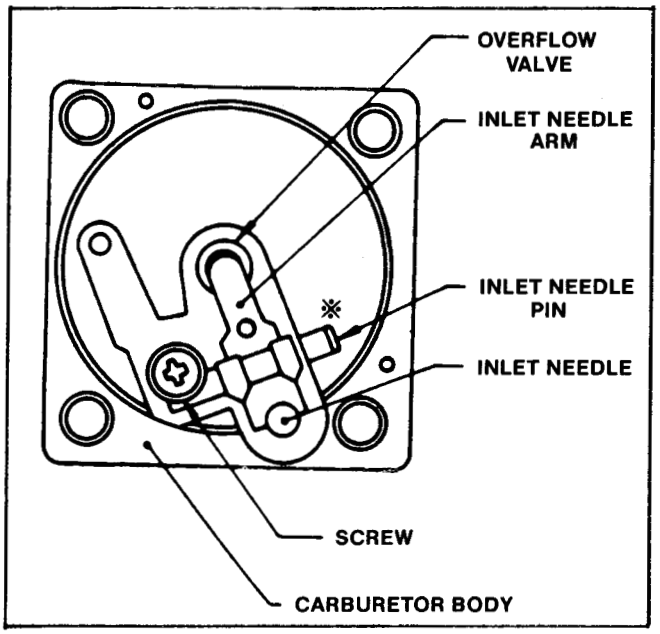

Figure 27

Make certain the spring is securely seated in the inlet needle arm and that the inlet arm positively engages the inlet valve.

8. Using the carburetor body surface as reference, check the inlet valve height. Inlet valve height can be checked with a height gauge or with an accurate depth gauge. See Figure 28.

Carburetor Inlet Needle Valve Height
1.4 to 1.6 mm (.055 to .063")

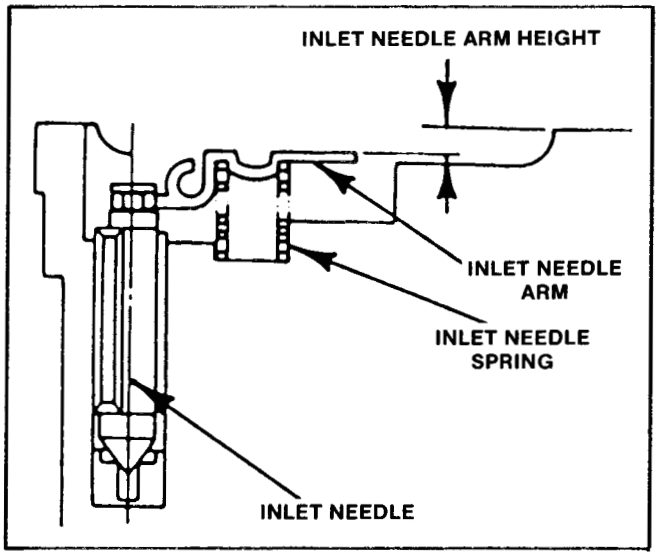

Figure 28

9. Replace the main diaphragm parts by installing the main diaphragm gasket against the carburetor, the main diaphragm assembly upon the main diaphragm gasket, the main diaphragm cover upon the main diaphragm assembly. When installing the main diaphragm assembly, position the shaft of the pin toward the inlet needle arm, not toward the tickler button.

NOTE: Sealant is not recommended on these gasket surfaces.

Secure these pieces with four screws with lock washers. See Figure 29.

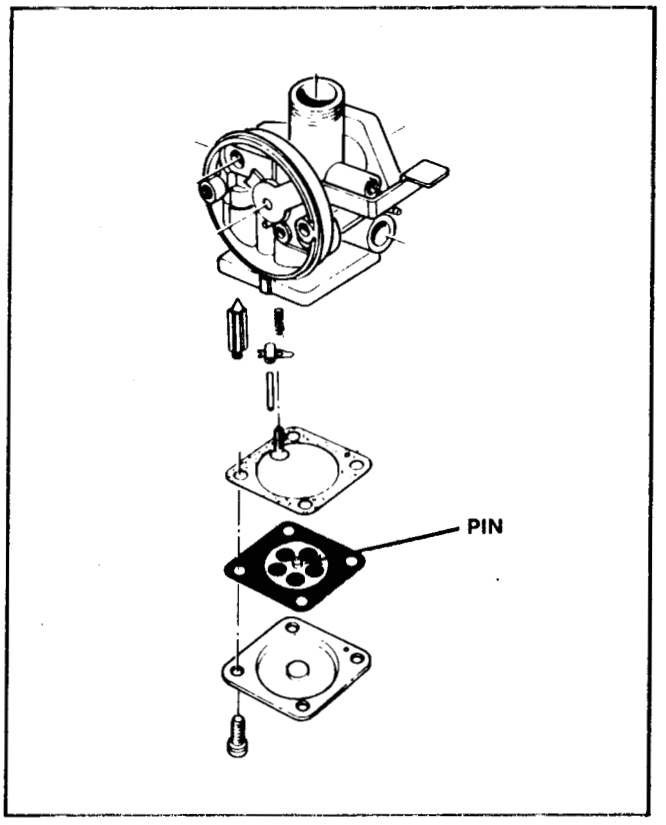

Figure 29

10. Replace the fuel diaphragm pump parts by installing the pump cover gasket against the carburetor, the pump diaphragm against the pump cover gasket, the pump cover against the pump diaphragm and securing these pieces with four screws with lock washers. See Figure 30.

NOTE: Sealant is not recommended on these gasket surfaces.

11. Install the throttle cable with attached throttle parts into the carburetor and secure by tightening the throttle fitting.

The carburetor is completely reassembled and ready for installation to the intake flange.

Carburetor - Reassembly (cont'd)

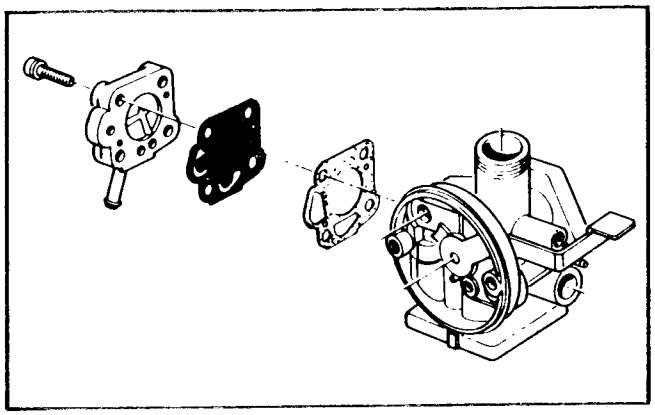

Figure 30

Carburetor - Installation

1. Install the intake flange with gaskets and heat shield making certain that the pulse hole is not obstructed by any of the intake components. Secure by tightening the screws to .3 to .45 kg m (26 to 38 in lbs). See Figure 31.

   The proper order for installing the intake components is:

   - gasket
   - heat shield
   - gasket
   - intake flange

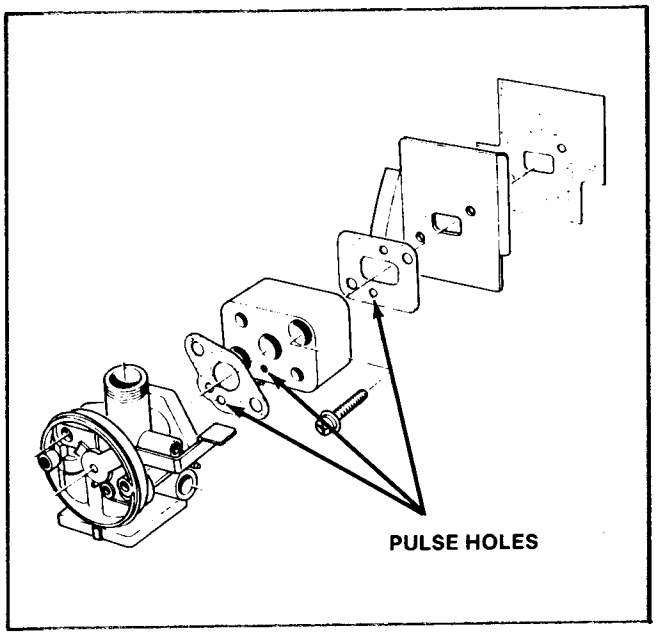

Figure 31

2. Place the carburetor gasket on the intake flange making sure that the pulse hole is not obstructed. Install the carburetor.

   Tighten the screws to .3 to .45 kg m, (26 to 38 in lbs.)

3. Ensure that the throttle cable is positioned as shown in Figure 32 to prevent throttle cable damage.

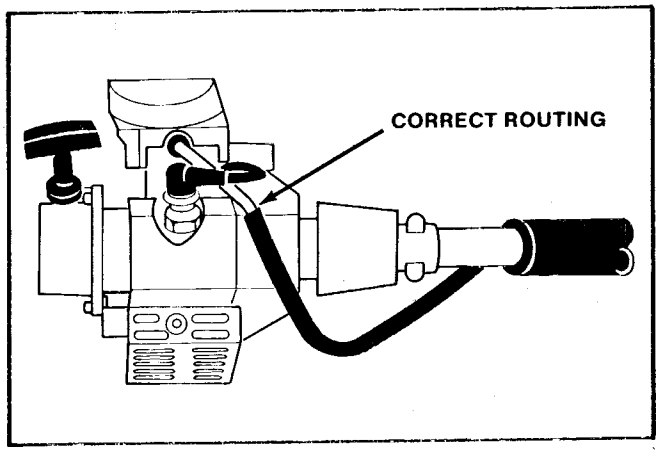

Figure 32

4. Attach the fuel feed line and the overflow line to the carburetor.

5. Place the air cleaner steel net, element and grid into the air cleaner cover and install the assembled air cleaner onto the carburetor. Secure with the two screws with lock washers and flat washers.

Carburetor Adjustment - Idle Speed

CAUTION: Stay clear of cutter head whenever engine is running.

1. With the engine running at operating temperature, the choke fully opened and, no load applied to the engine, turn the idle speed adjusting screw to achieve an idle in the range specified below.

TC3000 & TC4000	TC5000
3000 ± 200 rpm	2500 ± 200 rpm

See Figure 33.

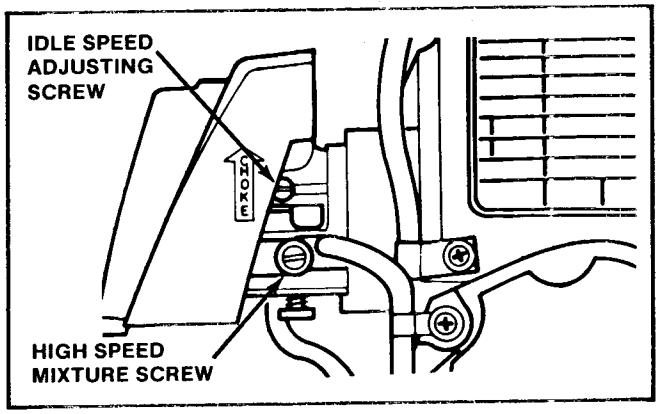

Figure 33

Carburetor Adjustment - Mixture

CAUTION: Stay clear of cutter head whenever engine is running.

1. The high speed mixture screw (see Figure 34) controls the fuel flow requirements during the engine's optimum demand. With the engine running at operating temperature, the choke fully opened and, no load applied to the engine, turn the high speed mixture screw to obtain the highest RPM. This should be approximately 2 to 3 turns out from fully closed.

   Turning the screw clockwise will make the air/fuel mixture lean (less fuel/more air).

   Turning the screw counterclockwise will make the air/fuel mixture rich (more fuel/less air).

   IMPORTANT: Turning the high speed mixture screw in too tightly may damage the tip.

Carburetor Adjustment - Throttle Valve

CAUTION: Stay clear of cutter head whenever engine is running.

1. Remove two screws securing the air cleaner cover to the trimmer and remove the air cleaner as an assembly.
2. Squeeze the throttle trigger and note the travel of throttle valve in the carburetor opening. The throttle valve should travel to the top of the carburetor opening when the trigger is in full throttle position.
3. To adjust, loosen the jam nut on throttle cable and rotate the turnbuckle to increase or decrease the travel of the throttle valve. See Figure 34.

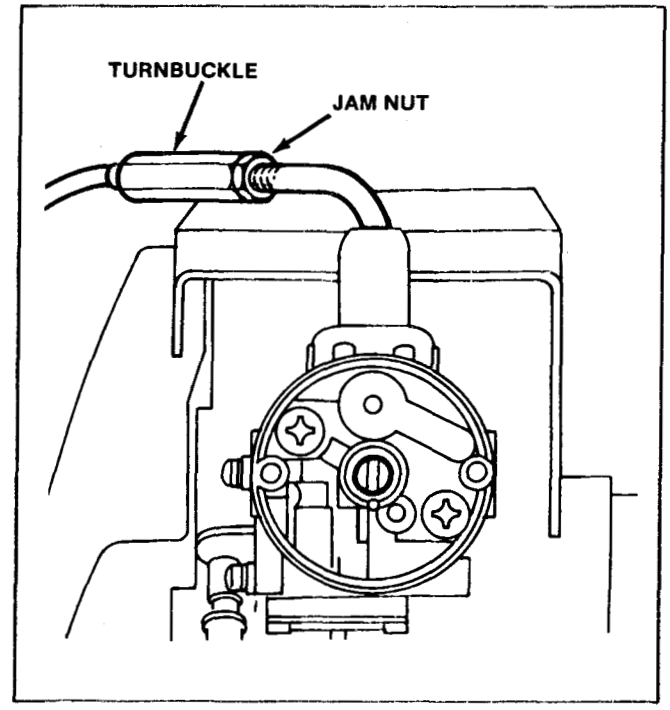

Figure 34

4. Tighten the jam nut and check the adjustment.
5. Reinstall the air cleaner cover assembly and secure using the two screws with flat washers and lock washers.
6. Check the idle speed and adjust if necessary. Refer to **Carburetor Adjustment - Idle Speed,** page 18.

SECTION 2 FUEL SYSTEM

FUEL TANK

Fuel Tank - Removal

1. Loosen the two locknuts and the corresponding hex screws that retain the fuel tank guard. Remove the fuel tank guard. See Figure 35.

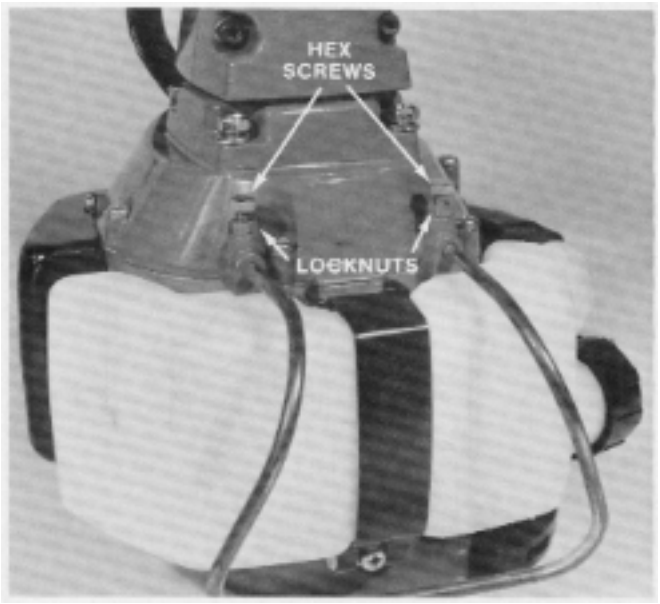

Figure 35

2. Loosen the locknut on the fuel tank strap screw then turn the screw counterclockwise until the strip is free from the bracket. See Figure 36.

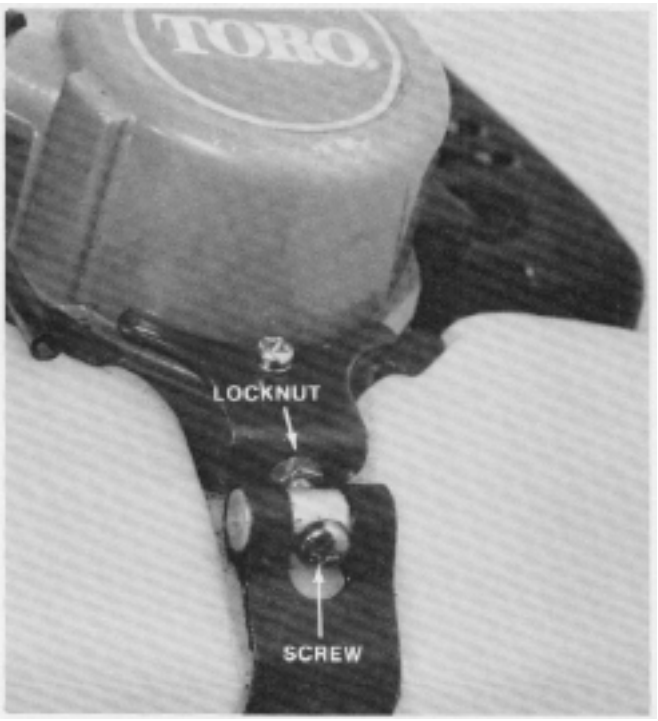

Figure 36

3. Remove the fuel tank.
4. The bracket can be removed, if necessary, by removing the single machine screw retaining it to the crankcase.
5. The strap can be removed, if necessary, by backing out the four phillips fan housing screws approximately 3/16" each. This will provide sufficient clearance to remove the strap.

   IMPORTANT: (TC5000 only) Do not loosen the fan housing screws unless absolutely necessary as loosening them will affect the ignition coil air gap. If removal of the strap is necessary, do not forget to reset the air gap before running engine.

Fuel Tank - Installation

1. With the fan housing loosely secured to the crankcase, slip the fuel tank strap into its slot on the underside of the engine. Tighten evenly the four phillips screws retaining the fan housing to the crankcase to .4 to .5 kg m (35 to 43 in lbs). See Figure 37.

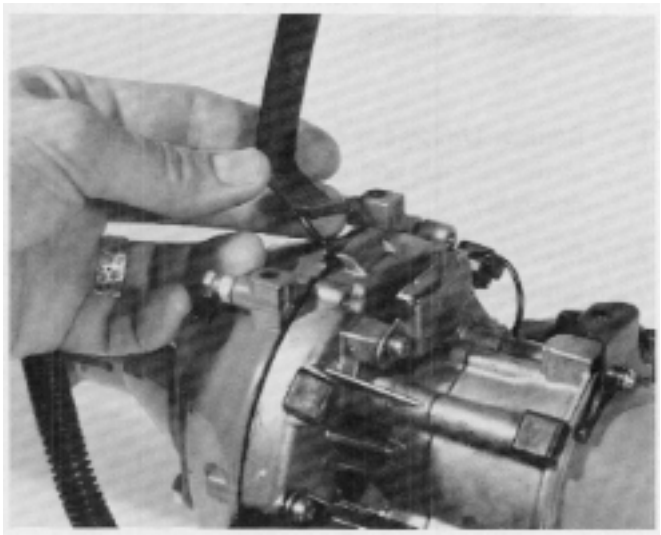

Figure 37

   NOTE: (TC5000 only) If the fan housing was loosened, the air gap must be reset before starting. See TC5000 Air Gap Adjustment, page 28.

2. Fasten the strap bracket to the underside of the crankcase using the single machine screw.
3. Start the fuel tank strap screw into the strap bracket and turn clockwise until the tank is seated on all four pads. DO NOT OVERTIGHTEN. Tighten the locknut.

Fuel Tank - Installation (cont'd)

4. Slide the fuel tank guard into the lower fan housing and tighten the two hex screws retaining it. Tighten the two corresponding locknuts.

5. Slide the retaining ring onto the fuel line, then push the line onto the fitting near the primer bulb. Slide the retainer ring down, over the fitting, to secure the line. See Figure 38.

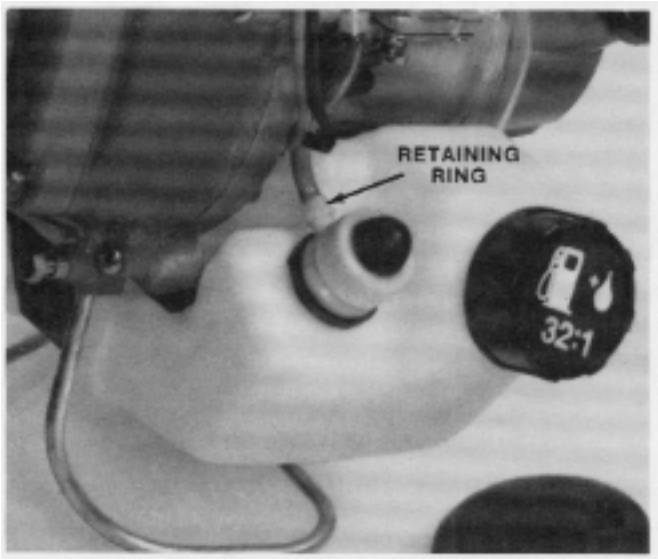

Figure 38

PRIMER PUMP

Primer Pump - Proper Use

Proper operation of the primer system is as follows: See Figure 39.

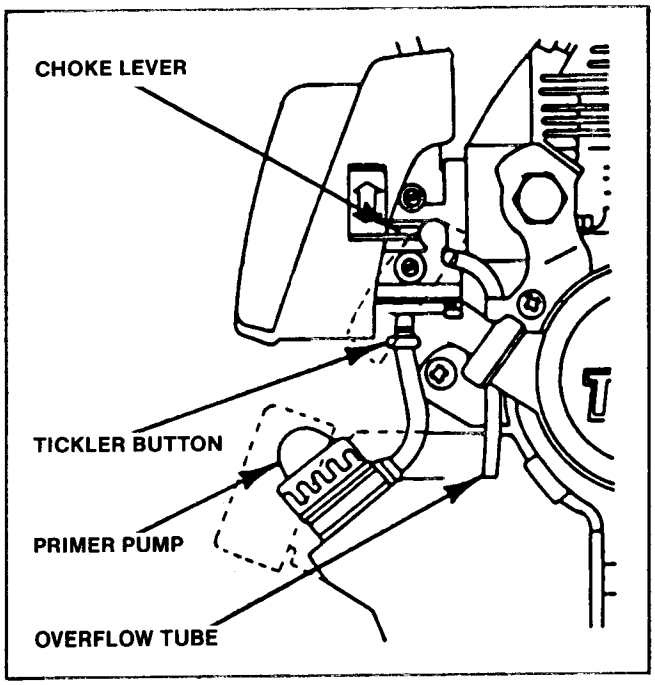

Figure 39

- Push the tickler button fully inward.
- Manually pump the primer pump until a small amount of fuel is emitted from the overflow tube.
- Stop pumping the primer pump and release the tickler valve. The engine is now ready to start.

Primer Pump - Operation

The primer system on the TC3000, TC4000 and TC5000 is used on cold starts only and ensures that fuel is present throughout the entire fuel system. It relies on manual pumping action to draw fuel into the primer and to pump it into the fuel line and the carburetor.

The primer pump uses a two step operation to pump fuel to the carburetor. Pushing on the primer diaphragm does the following: See Figure 40.

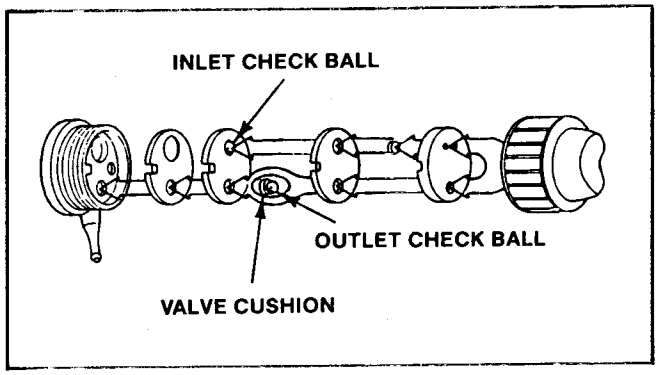

Figure 40

1. The inlet check ball seats.

2. The outlet valve is pushed against the porous valve cushion to allow fuel or air (whatever is in the primer diaphragm) to pass into the fuel line and carburetor.

   Releasing the primer diaphragm allows it to come back to its original shape which results in the following: See Figure 41.

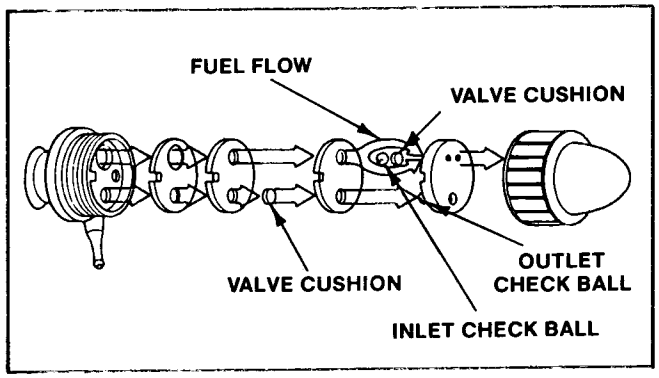

Figure 41

1. The vacuum produced by the diaphragm seals the outlet check valve. This prevents fuel from being drawn from the fuel line.

Primer Pump - Operation (cont'd)

2. The inlet valve is drawn toward the porous valve cushion which allows fuel to be drawn from the pickup line inside the tank. This action fills the primer diaphragm with fuel and readies it for the next pump.

Primer Pump - Disassembly

1. Pull the primer pump from the tank and remove the fuel line. The primer pump is press fit into the fuel tank. See Figure 42.

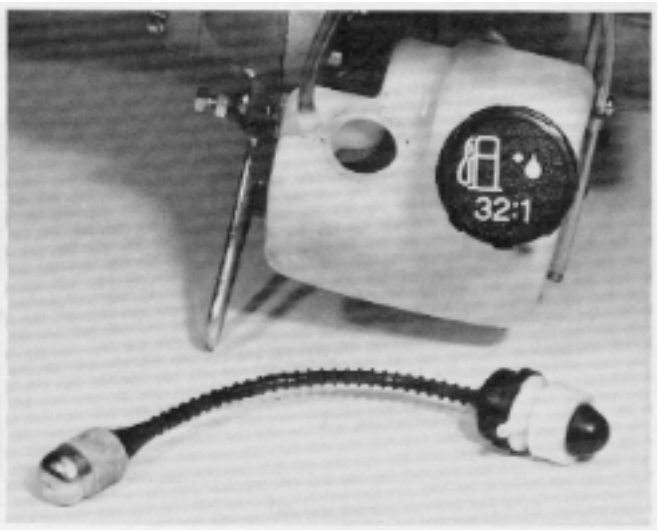

Figure 42

2. Unscrew the rubber cap/button from the pump. See Figure 43.

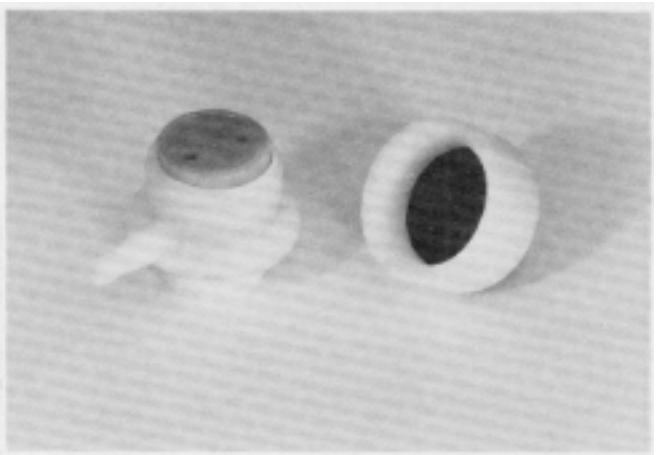

Figure 43

3. Carefully lift out the top valve seat with the valve cushion, and two ball valves. See Figure 44

4. Insert a thin, non-puncturing punch through the hole in the bottom of the pump and carefully push out gasket A, valve seat A with valve cushion, and gasket B.

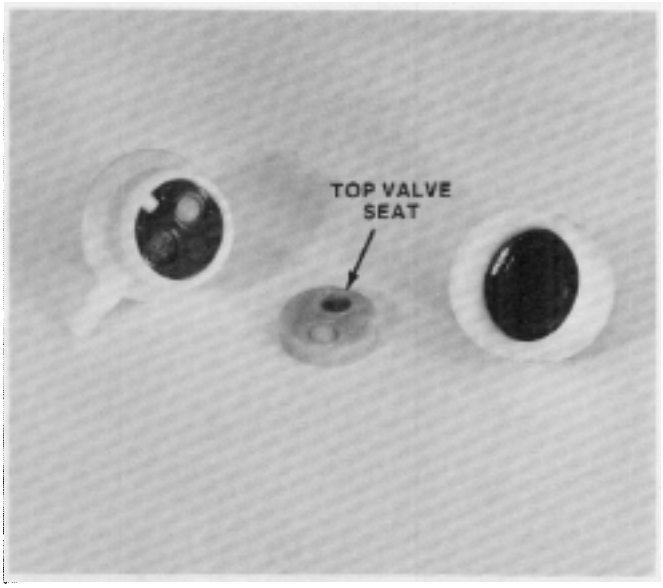

Figure 44

Primer Pump - Inspection

1. Inspect the disassembled primer pump for contamination or damaged parts.
2. Clean thoroughly in a mild soap and water solution.
3. If the primer pump is suspect after inspection, the entire primer pump assembly should be replaced.

Primer Pump - Reassembly

1. Before reassembling, familiarize yourself with the configuration of the parts to ensure they are properly installed. See Figure 45.

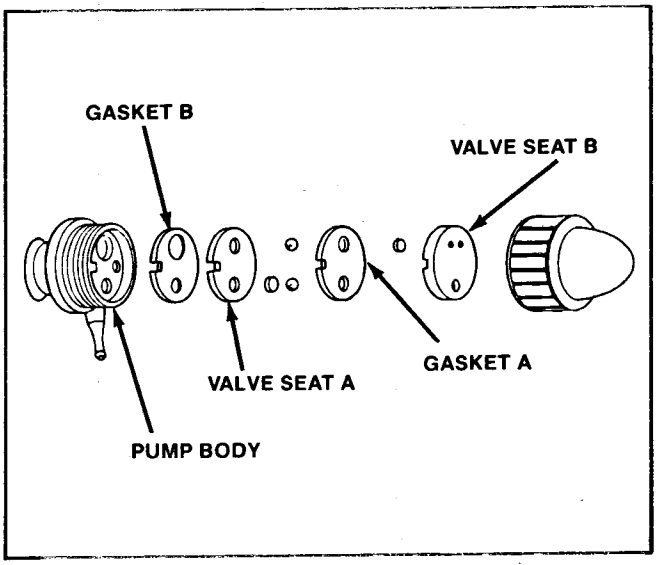

Figure 45

- Gasket "B" has two sizes of fuel orifices - one large and one small.
- Gasket "A" has one size of fuel orifices - both large.

Primer Pump - Reassembly (cont'd)

- Valve seat "A" has a locating notch that is cut through the seat.
- Valve seat "B" has a locating notch that is partially cut into the seat.
- Gasket "A" and valve seat "A" are inside the pump. Gasket "B" and valve seat "B" are to the outside.

2. Reassemble parts into the pump body. Position gasket B so the small fuel orifice is toward the outlet nozzle of the pump body.
3. Place valve seat A with valve seats up, on gasket B.
4. Push one valve cushion into valve seat A so it covers the double - holed fuel orifice.
5. Place gasket A on valve seat A.
6. Drop the two ball valves through gasket A to seat in valve seat A.
7. Place one valve cushion into valve seat B so that it covers the double-holed fuel orifice.
8. Set valve seat B with valve cushion into the pump body with assembled parts.
9. Secure all parts by screwing the rubber cap/button on the pump body.
10. Reinstall the pump into the tank opening and attach the fuel line.

Fuel Pickup Tube and Filter - Service

1. The fuel filter on the pickup tube can be inspected without removing the pickup assembly by "fishing" the filter out through the filter hole. See Figure 46.

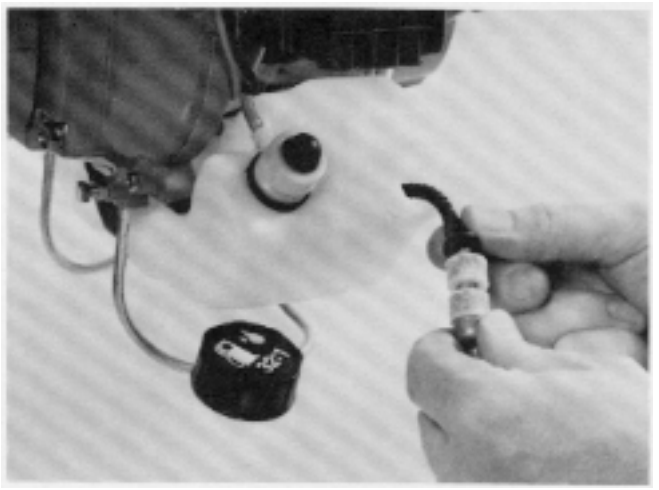

Figure 46

2. Pull the pickup weight from the end of the tube and remove the fiber filter elements. Inspect both of these elements and the fuel strainer located inside the pickup weight. Clean or replace as necessary.
3. Reassemble the pickup assembly making sure that the pickup tube fits snugly on the top of the fiber filter element.
4. If pickup tube removal is desired, it can be removed by removing the primer pump as described under **Primer Pump - Disassembly,** page 22.
5. Remove the fuel pickup tube by pulling it out of the tank. It is also pressed in.
6. Inspect the pickup tube for cracks or punctures and replace if necessary.
7. Reinstall the fuel pickup tube by lightly coating the barbed end with two cycle oil and pressing it into the proper tank orifice.

FUEL CAP

Fuel Cap - Operation

The fuel tank cap on the TC3000, TC4000 and TC5000 is somewhat complex due to the requirements of the application. The cap must vent in order to prevent a vacuum or pressure buildup within the tank but must also prevent leakage of fuel.

The cap accomplishes the above by using a system of valves which work under different conditions. When the tank is under pressure, the following occurs: See Figure 47.

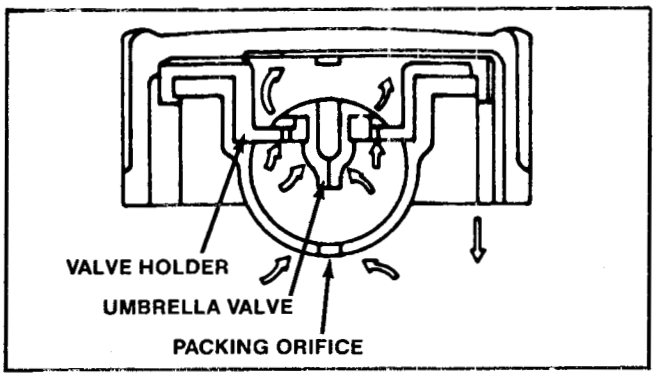

Figure 47

1. The pressure passes through the packing orifice so that it can act upon the umbrella valve.
2. The pressure passes through the two small orifices in the valve holder and lifts the umbrella portion of the umbrella valve off its seat.
3. Pressure passes into the top of the gas cap and isemitted to the atmosphere through the slits in the threads of the gas cap.

Fuel Cap - Operation (cont'd)

When a vacuum occurs within the tank, the following occurs: See Figure 48.

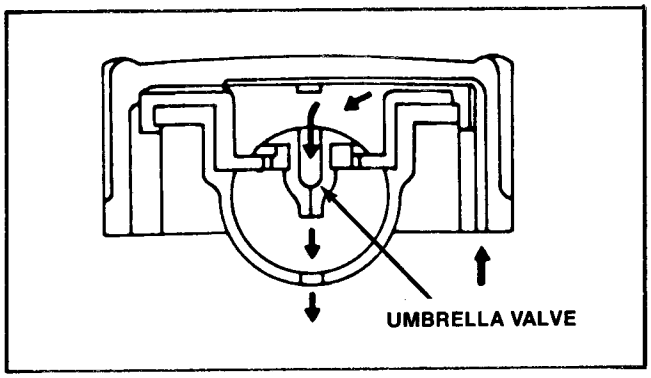

Figure 48

1. Atmospheric pressure enters the top of the gas cap through the slits in the gas cap threads.
2. Because a vacuum in the tank means that higher pressure is present outside the tank than within, the higher pressure passes down the stem of the umbrella valve and forces the stem orifice open.
3. The higher pressure passes through the packing orifice and enters the fuel tank thereby equalizing the pressure.

Fuel Cap - Disassembly

1. Remove the fuel cap from the tank.
2. Pry the gasket, holder and breather valve out of the tank cap. See Figure 49.

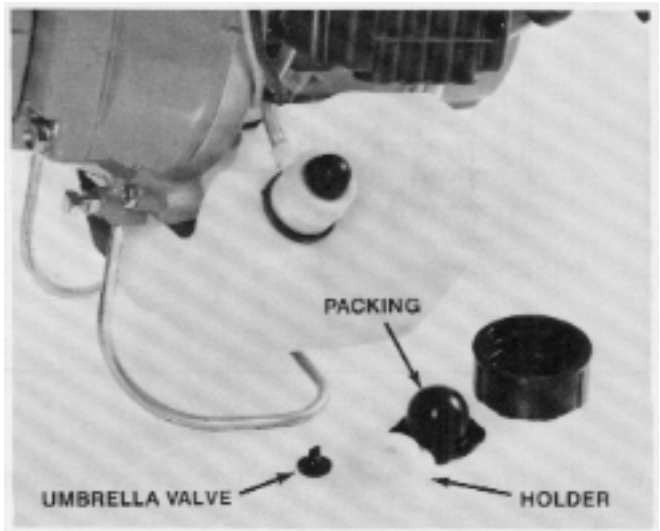

Figure 49

3. Clean these parts thoroughly.

Fuel Cap - Inspection

1. It is important that the fuel cap properly vents the tank. Inspect the gasket to ensure that the hole at the rounded end is unobstructed.
2. Check the two small pressure outlet holes in the holder to ensure that they are open.
3. The stem of the umbrella valve allows air into the tank to compensate for the fuel being used by the engine. Ensure that it will open and close by holding the flat end lengthwise between your thumbs and squeezing. See Figure 50.

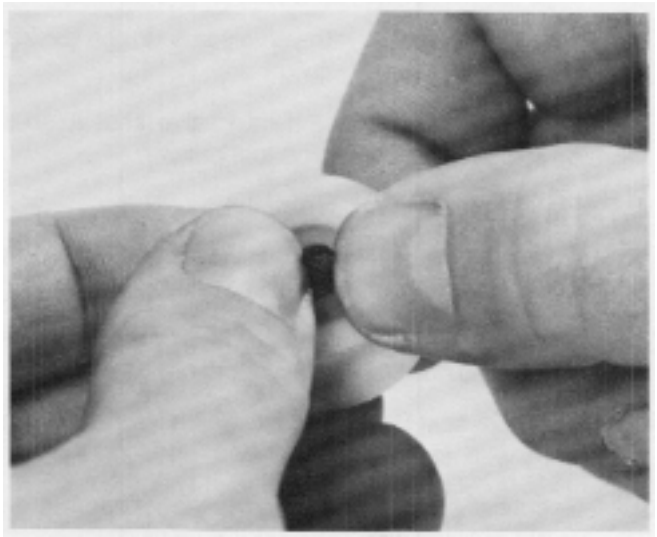

Figure 50

4. Clean all fuel cap parts thoroughly.

Fuel Cap - Reassembly

1. Position the holder inside the gasket, then screw this assembly into the fuel cap until it is fully seated in the top of the fuel cap.
2. Reinstall the cap on the fuel tank.

SECTION 3 IGNITION

Ignition Operation

The firing of the spark plug at the proper time is the culmination of a number of components working together. In the TC3000, TC4000, and TC5000 the components used are:

- Flywheel
- Ignition Coil
- Trigger Module
- Spark plug

See Figure 51.

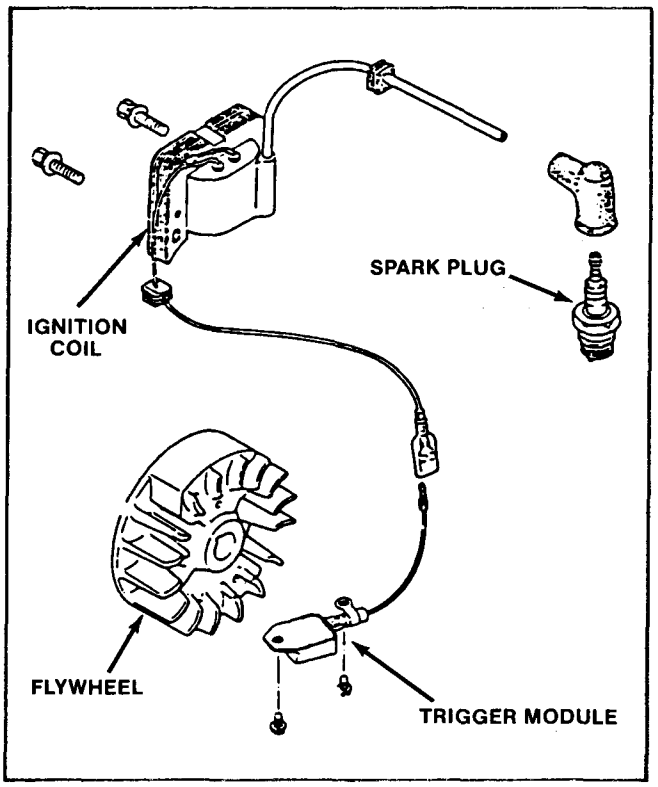

Figure 51

The following describes the function of each of the above components.

Ignition Operation - Flywheel

The flywheel is connected directly to the crankshaft and turns at the same speed as the engine. Imbedded in the flywheel are three magnets. These magnets rotate past the coil to generate electricity.

Imbedded in the opposite side of the flywheel is a steel counterweight which offsets the weight of the three magnets. It is **not** magnetic.

Ignition Operation - Ignition Coil

The ignition coil is actually a transformer. It is positioned close to the flywheel to allow the magnetic field of the flywheel magnets to cut through the coils to generate electricity. See Figure 52

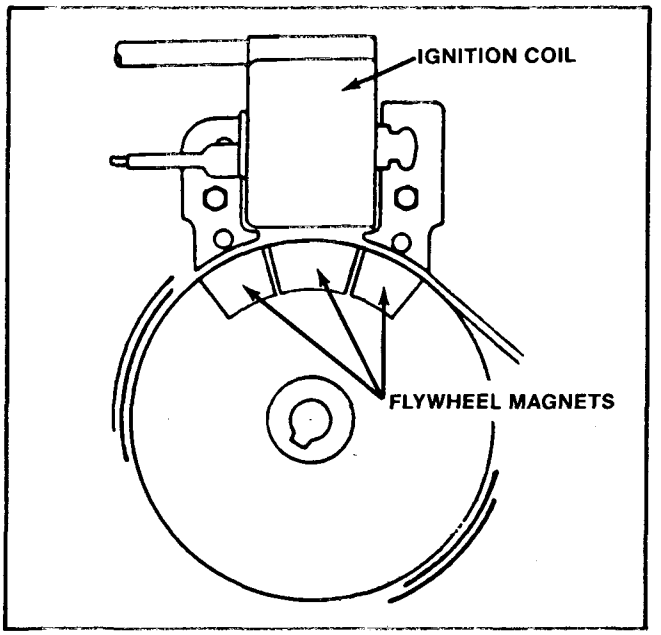

Figure 52

Low voltage is produced in the primary coil which is sent to the trigger module. The primary voltage is much too low to produce a spark at the spark plug.

The secondary coil serves to amplify the voltage produced in the primary. To accomplish this, the secondary coil must have many more windings than the primary. The higher the ratio between the primary coil windings to secondary coil windings, the greater the voltage amplification will be.

However, even though the secondary coil in the TC1000 has considerably many more windings than the primary, the voltage produced is still not high enough to produce spark across the spark plug electrodes. To further amplify the voltage, the trigger module is used...

Ignition Operation - Trigger Module

The trigger module amplifies the voltage in the secondary coil by breaking the primary circuit just as the primary voltage reaches its peak. This breaking of the primary circuit results in a rapid collapse of the magnetic field surrounding the primary coil. The collapse of the primary magnetic field induces a large voltage surge in the secondary which is sufficient to produce a spark across the spark plug electrodes.

Before getting into the actual electronics used inside the trigger module, it is important to have an understanding of the voltage waveform produced by the flywheel magnets moving by the ignition coil. See Figure 53.

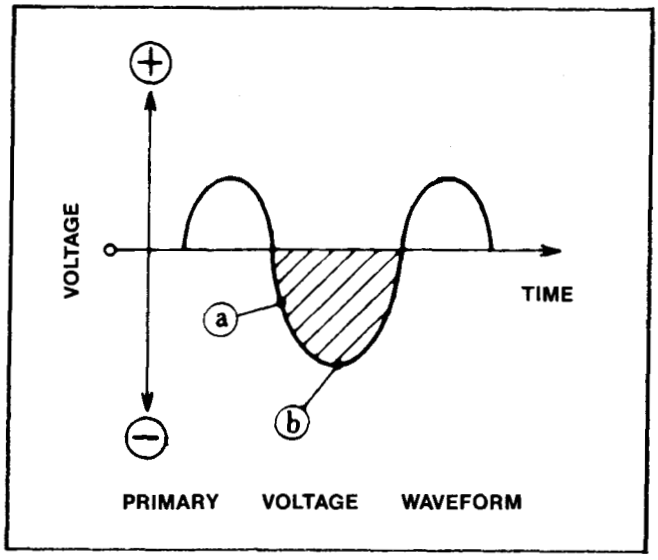

Figure 53

As the magnets rotate past the coil, voltage is produced. This voltage, when uninterrupted, is first positive, then negative as the magnet passes by the coil. This effect is caused by the two opposing poles of the magnet.

Explanation of the trigger module also requires an understanding of the NPN transistor. See Figure 54.

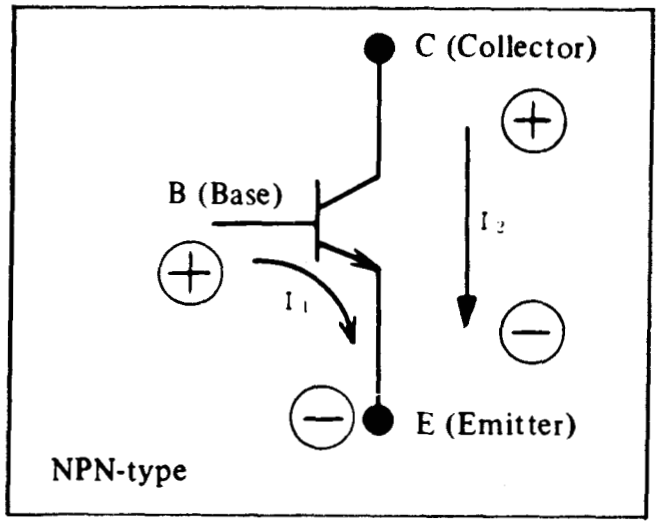

Figure 54

A transistor has a certain minimum voltage that it requires across the base and emitter (points B and E in Figure 54 above) before it will "turn on". Once it has turned on, it allows a small current, I1, to flow as shown above. At the same time, the transistor allows a large current, I2, to flow from point C to E. The magnitude of current I2 will vary in proportion to the smaller current, I1.

Thus, the transistor functions as an amplifier in that it allows a small current to control a large one.

The following is the process the trigger module uses to break the primary circuit to produce spark: See Figure 55

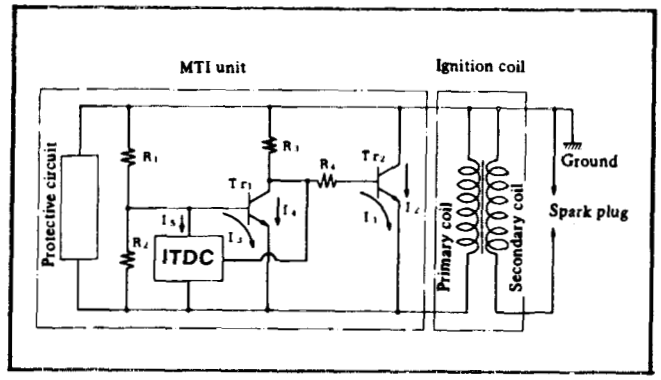

Figure 55

1. The magnet passes by the coil and induces an alternating voltage.
2. As the voltage begins to increase, (approximately point "a" in Figure 53) transistor Tr2 is turned on and current flows from point "C" to point "D" through R3, R4, and Tr2. See Figure 56.

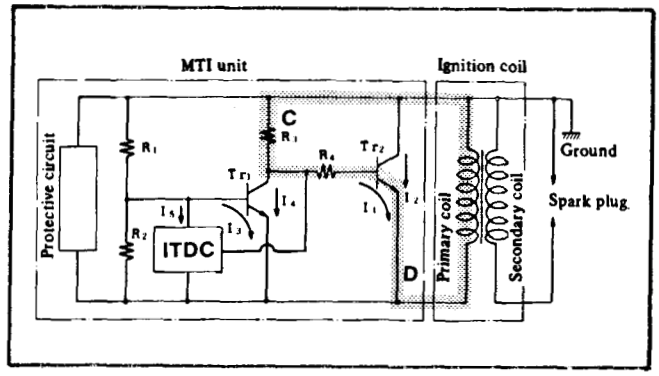

Figure 56

3. Current I1 flowing through Tr2 induces a larger current I2. Note that current I1 is very small and that I2 is much larger. See Figure 57.

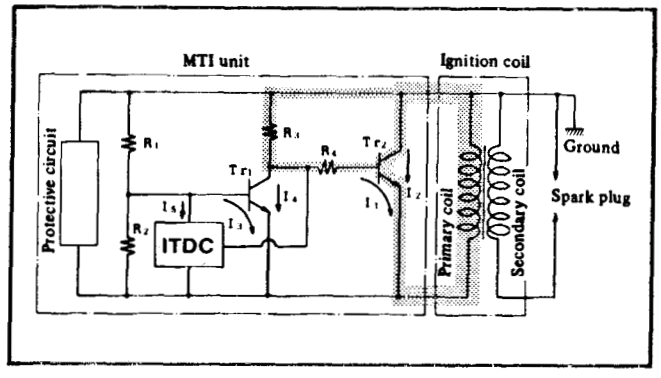

Figure 57

4. When the voltage is at the point "a" level as denoted in "Figure 53, Tr1 is still in the off mode

Ignition Operation - Trigger Module (cont'd)

and allows no current I3 or I4 to flow.

5. As the voltage produced in the primary coil reaches its negative peak (point "b" in Figure 53), transistor Tr1 is turned on and allows small current I3 and large current I4 to flow. See Figure 58.

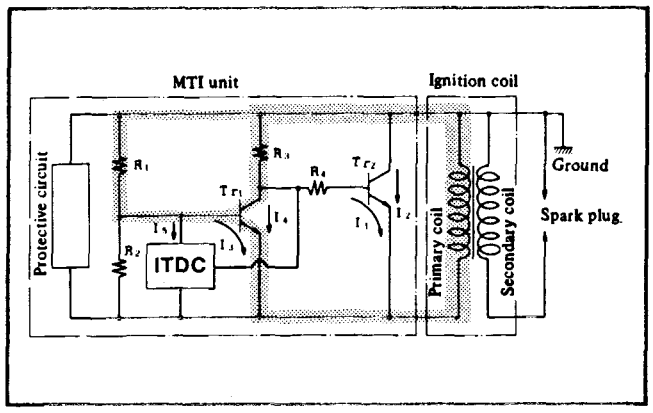

Figure 58

6. When transistor Tr1 turns on, nearly all of the current flow through R4 and Tr2 is diverted through path I4 since it is the path of least resistance. This drop in current I1 results in transistor Tr2 turning off.

7. When Tr2 turns off, current I2 drops rapidly and causes the magnetic field surrounding the primary coil to rapidly collapse. This in turn causes a voltage surge in the secondary which is sufficient to produce a spark across the spark plug.

Another task the trigger module performs is to limit the maximum revolutions per minute that the engine will attain. It does this by means of the ITDC (ignition timing delay circuit) which can also be seen in Figure 55.

This circuit senses the engine speed, and, as it approaches 10,000 rpm, it delays the turning on of transistor Tr1 slightly. This retards the timing and prevents the engine from further acceleration.

Ignition Operation - Spark Plug

The spark plug is used to ignite the air/fuel mixture by producing a spark just before the piston reaches top dead center. A spark plug is typically constructed as shown in Figure 56.

There are two critical areas important to proper spark plug function. The firstis that the electrodes are properly gapped and are clean. This ensures that a strong spark will be present and that it occurs at the proper time. Excessive gap or fouling can delay firing enough to cause a loss of power or stalling.

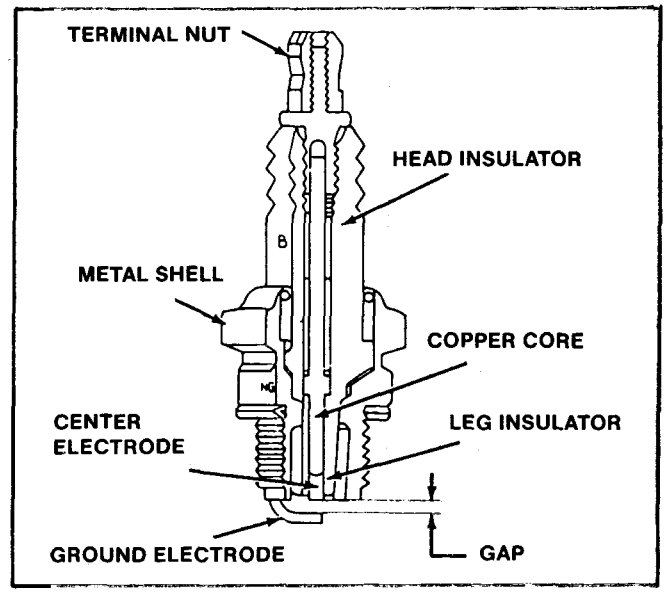

Figure 59

The other important area is the insulator. The insulator prevents arcing from taking place in another portion of the plug, away from the electrodes. Because of the extremely high voltage present, even a slight crack or fouling of the head insulator can result in arcing and a malfunction of the plug.

AIR GAP ADJUSTMENT

The space between the coil and the flywheel magnets is called the "air gap". Because the coil mounting holes are oversized, air gap on the TC3000, TC4000, and TC5000 is adjustable. It is important to set it to the proper specification to ensure strong spark and proper timing.

TC3000/TC4000 Air Gap Adjustment - Preparation

1. For convenience, remove the engine from the drive tube as described under **Engine - Removal from Drive Tube,** page 40.

2. With the recoil assembly on a hard flat surface, use an impact wrench to remove the four fan housing screws. Remove the fan housing.

TC3000/TC4000 Air Gap Adjustment

NOTE: If coil performance is suspect, check the air gap with a feeler gauge prior to loosening the two coil mounting screws. It should be 0.4 to 0.5 mm (0.016 to 0.020").

1. Loosen the two coil mounting screws. Position a feeler gauge between the coil and the flywheel near one of the coil mounting screws and tighten. Repeat this procedure for the other end of the coil. Air gap adjustment is now complete. See Figure 60.

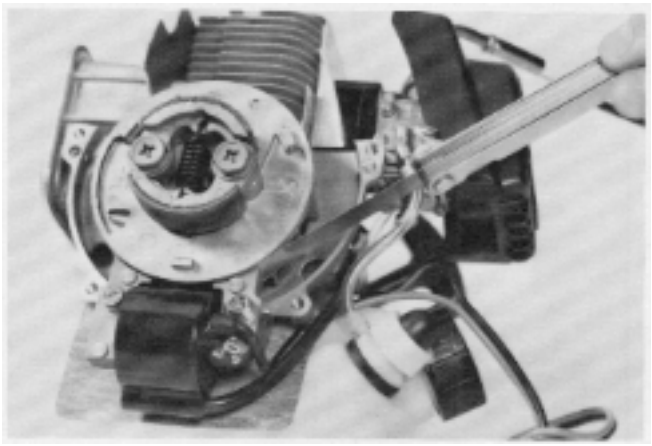

Figure 60

TC3000/TC4000 Air Gap Adjustment - Reassembly

1. Install the fan housing. Tighten the screws to 0.4 to 0.5 kg m (35 to 43 in lbs).
2. Install the plastic fan housing cover using three Phillips screws.
3. Mount the engine on the drive tube as described in **Engine - Installation on Drive Tube**, page 45.

TC5000 Air Gap Adjustment - Preparation

1. Remove the carburetor as described under **Carburetor - Removal**, page 14.
2. Remove the three screws securing the muffler cover and remove the cover. Also remove the muffler at this time.
3. Remove the screw securing the cylinder cover to the cylinder. Remove the cover.

TC5000 Air Gap Adjustment

1. The coil on the TC5000 is mounted to the inside of the fan housing. The two coil mounting screws are located near the base of the cylinder. Loosen both coil mounting screws. See Figure 61
2. Insert a feeler gauge between the coil and the flywheel near one of the coil mounting screws. See Figure 62. When the correct gap is achieved, tighten the screw with an 8 mm open end wrench. Repeat this procedure for the other coil mounting screw. This completes the air gap adjustment.

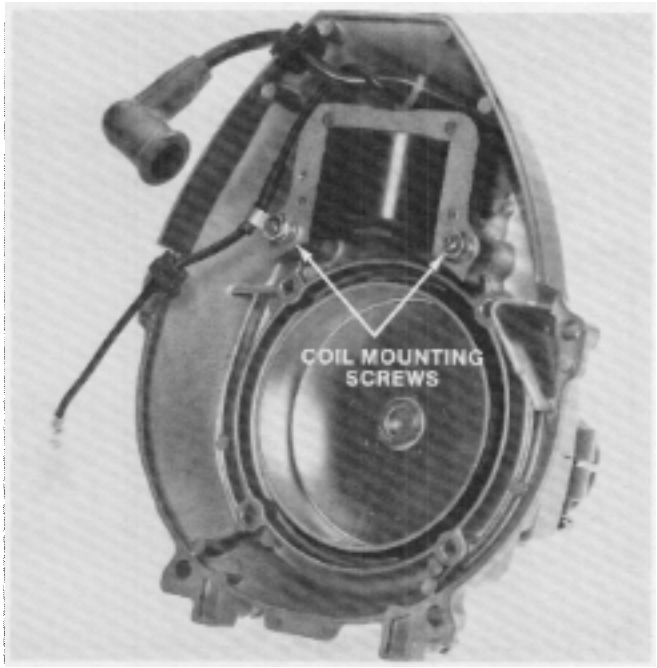

Figure 61

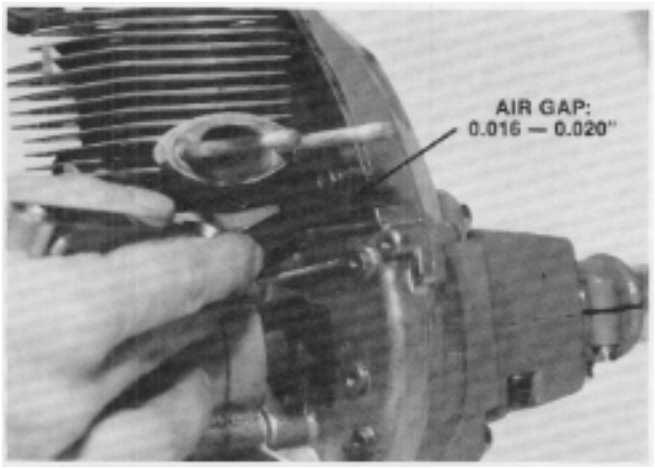

Figure 62

TC5000 Air Gap Adjustment - Reassembly

1. Install the cylinder cover. Make sure that the coil wire and grommet are properly positioned in the cylinder cover slot.
2. Install the muffler and muffler cover.
3. Install the carburetor as described in Section I under **Carburetor - Installation,** page 18.

COIL

Coil - Removal

1. Remove the engine from the drive tube as described under **Engine - Removal from Drive Tube,** page 40.
2. Remove the muffler cover and the cylinder cover.

Coil - Removal (cont'd)

3. Remove the fuel tank as described under **Fuel Tank - Removal,** page 20, to gain access to ignition wiring.

4. Pull out the two male connectors leading into the female connector found beneath the carburetor.

5. Position the engine assembly so that the recoil housing is resting on a hard, flat surface. Remove the four Phillips head screws retaining the fan housing with an impact wrench and lift off the fan housing. (The TC5000 has the coil mounted in the fan housing so be careful not to damage any wires while removing the housing.)

6. Remove the trigger module and gasket. See Figure 63.

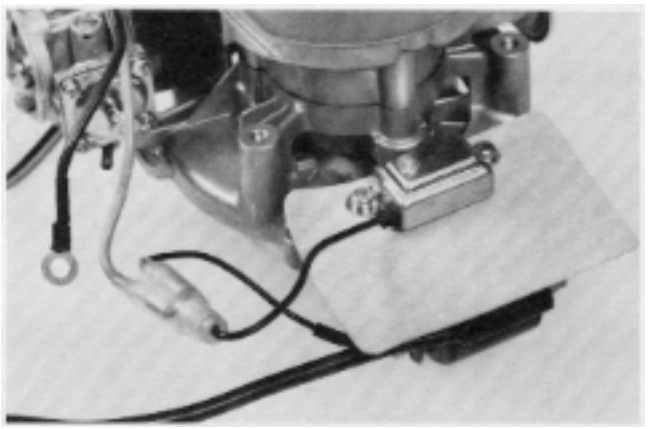

Figure 63

Coil - Installation

1. Install the trigger module using two machine screws. Be sure to install the rubber insulating gasket beneath it. See Figure 63.

2. Install the coil with the proper air gap by following the procedure found under heading: **AIR GAP ADJUSTMENT,** page 27.

SECTION 4 RECOIL STARTER

Recoil Starter - Operation

An exploded view of the recoil assembly used on the TC3000, TC4000 and the TC5000 is shown below. See Figure 64.

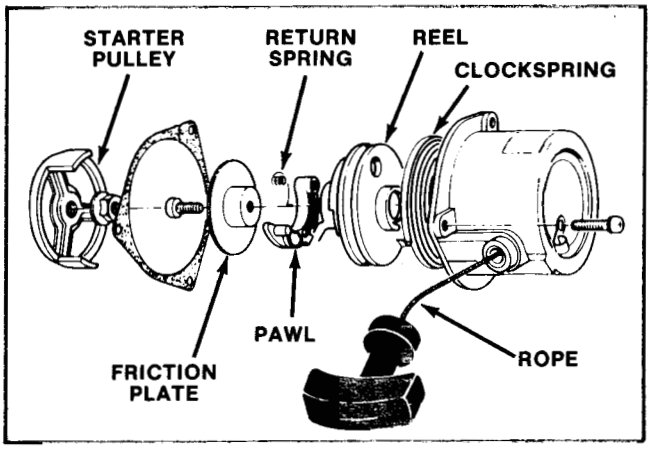

Figure 64

The recoil mechanism shown in Figure 64 functions as follows:

The operator pulls the rope which in turn results in the reel spinning. As the reel turns, it winds up a clock spring in the recoil housing. The clock spring rewinds the rope once the "T" handle is released.

Note that the pawl pivots in the recoil reel and that it is kept in its normally retracted position by the return spring. See Figure 65.

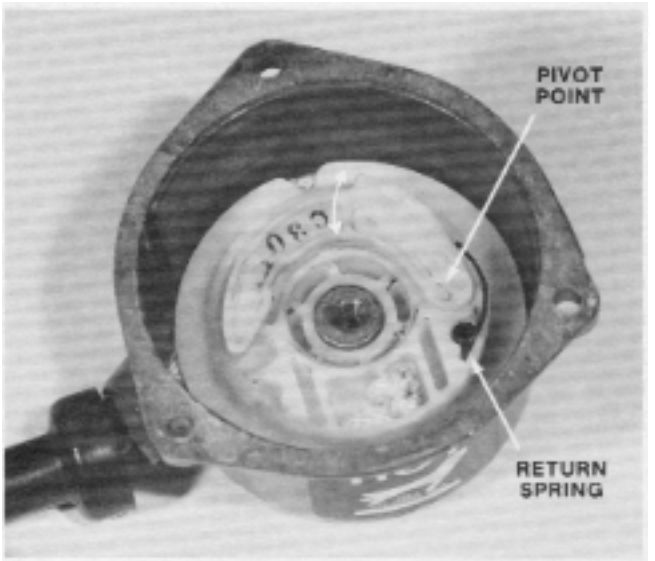

Figure 65

As the reel begins to turn, the pawl turns with it. However, it is in contact with the friction plate which does not rotate. This contact between the pawl and the friction plate forces the pawl outward so that it engages the starter pulley and in turn, forces the engine to turn over.

When the reel stops turning, the starter pawl is forced back into its normal retracted position by the return spring.

Recoil Mechanism - Removal

1. Remove the three (TC3000 and TC4000) or four (TC5000) screws retaining the recoil housing to the crankcase and remove the recoil starter unit.

   NOTE: There is no spring tension against the recoil starter housing. It should not fly off nor unwind during removal from the crankcase.

Recoil Mechanism - Disassembly

1. Pull out a loop of starter rope approximately 30 cm (12 inches) and tie a tight slip knot to keep it from rewinding. This loop will provide the slack necessary to untie the knot from the "T" handle. See Figure 66.

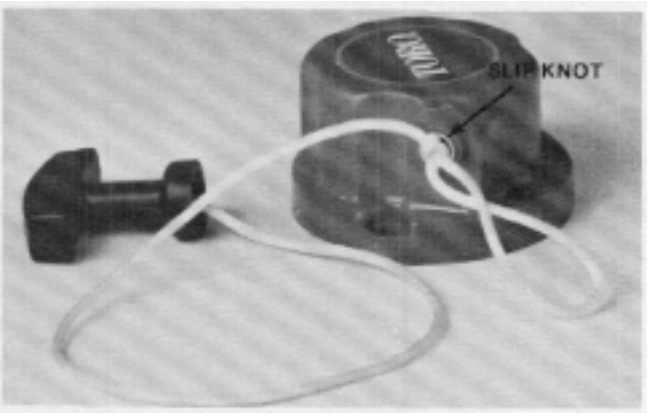

Figure 66

   Once the "T" handle has been removed, allow the rope to slowly retract into the recoil housing.

2. Remove the bind screw.

   CAUTION: Once the bind screw is removed, it is possible for the recoil spring to fly out of the recoil housing. Eye protection and leather gloves are recommended during servicing of the recoil housing.

3. Gently lift off as an assembly the friction plate, friction spring, and pawl.

CAUTION: remove the friction plate and reel components carefully as jerking them out may cause the recoil spring to come out of the recoil housing.

4. Remove the return spring. See Figure 67.

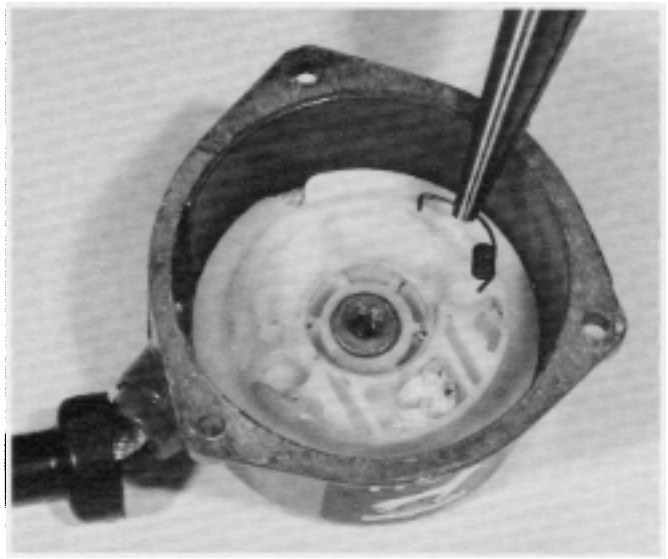

Figure 67

5. Gently lift out the recoil reel with a needle nose pliers.

CAUTION: If the reel is jerked from the recoil starter case, the spring may fly out of position.

6. Untie the knot in the recoil rope and remove the rope from the recoil reel.

7. If it is necessary to remove the recoil spring, do so by carefully turning the recoil housing over (spring side down) and rapping it on a hard flat surface. Be sure to stay clear of the spring when performing this operation.

IMPORTANT: Do not remove the recoil spring unless it is absolutely necessary. Once unsprung, the spring should be replaced.

Recoil Mechanism - Reassembly

1. If the recoil spring was removed during disassembly, replace it with a *new* one. Position the spring with the wire on it into the recoil housing as shown in Figure 68.

CAUTION: Do not remove the wire surrounding the spring until the spring is installed in the recoil housing. Removing the wire prematurely may result in personal injury.

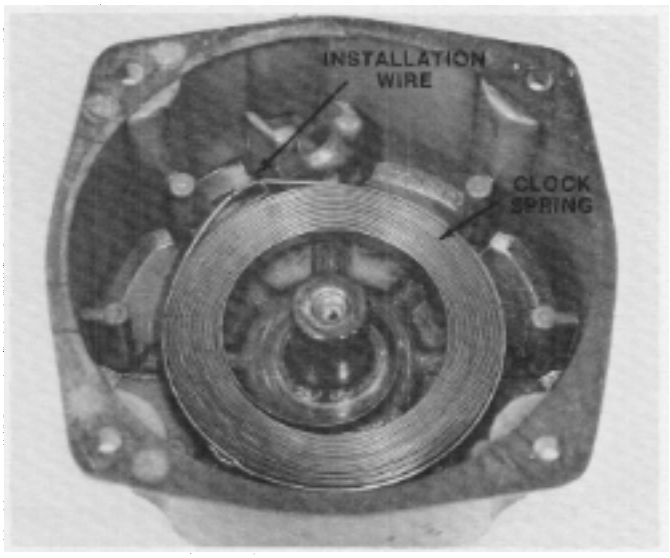

Figure 68

2. Insert one end of the recoil rope into the appropriate hole in the recoil reel. Tie a single loop knot in that end of the rope and pull it down into the hole making sure that no portion of the rope protrudes out of the recess. See Figure 69.

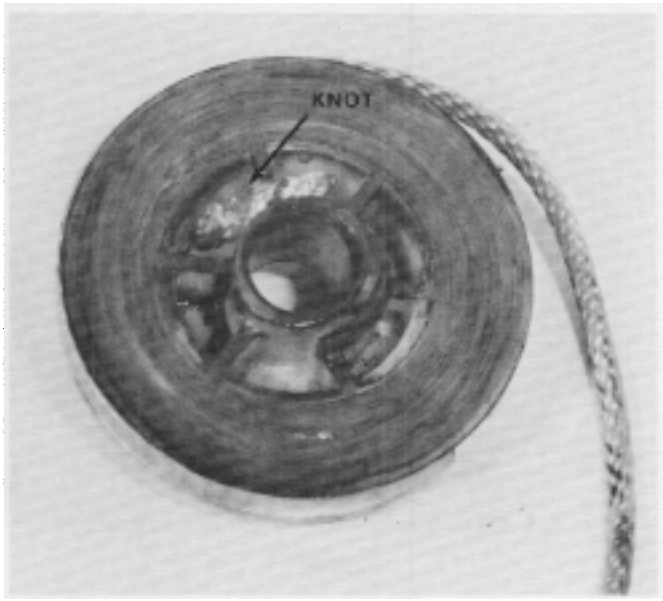

Figure 69

3. Position the spring in the starter case so that the spring's inner end is approximately 3 mm (1/8 inch) from the shaft. This distance ensures that the reel hook will engage the spring. See Figure 70.

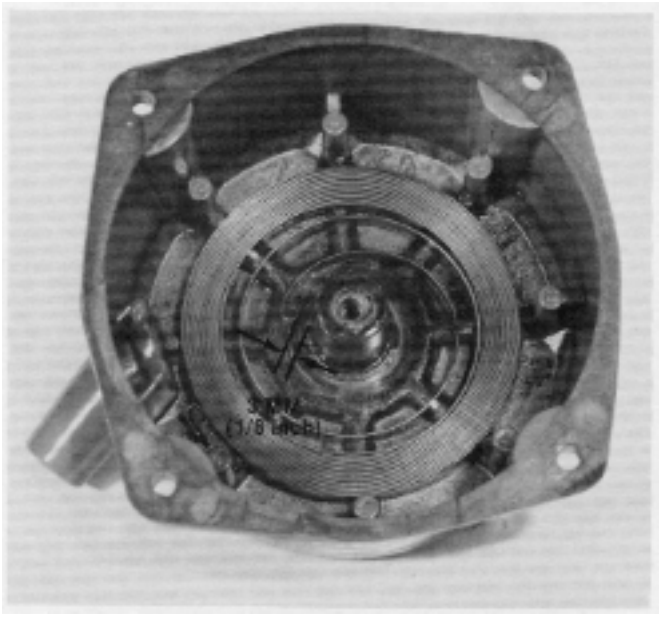

Figure 70

NOTE: If the spring jumped out of the recoil housing, the recoil spring should be replaced.

4. Wind the recoil rope onto the reel in a *counterclockwise* direction (as viewed from the side of the reel *without* the knot in it). Hook the end of the rope in the slot provided in one of the reel flanges. Leave about 15 cm (6 inches) of rope. See Figure 71.

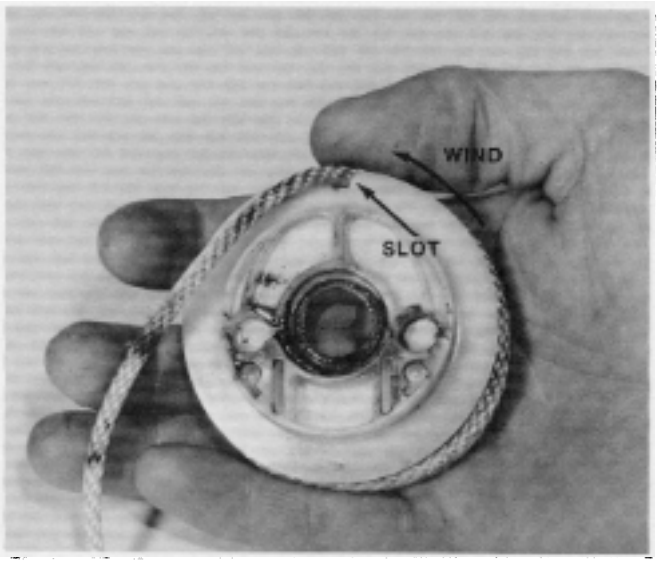

Figure 71

5. Position the recoil spring so that the end of the spring is about 3mm (1/8 inch) from the center post to ensure proper engagement with the reel.

6. Line up the end of the recoil spring with the slot in the reel and install the reel. It may help to rock the reel back and forth slightly in order to get the parts to properly mate.

6. Insert the pawl return spring into position as shown in Figure 72.

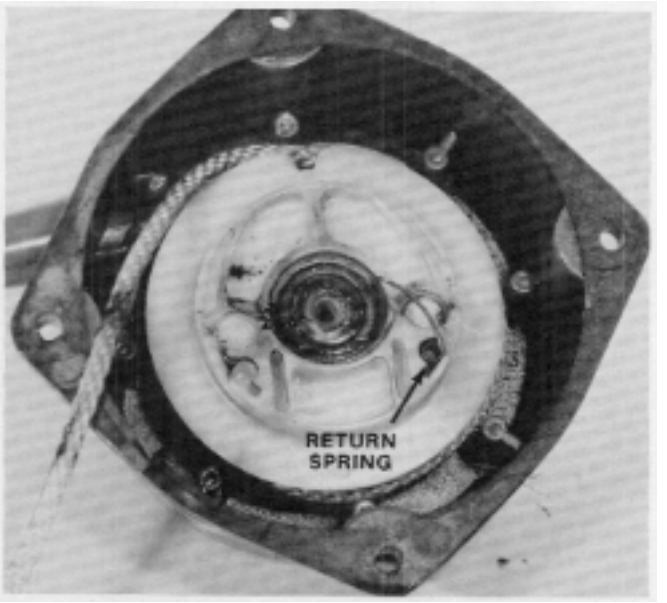

Figure 72

7. Place the friction plate, friction plate spring and pawl onto the recoil reel as an assembly. Make sure that the end of the pawl return spring is properly positioned on the outside of the pawl then install the bind screw. Tighten to 0.8 to 1.0 kg m (70 to 80 in lbs).

8. Prewind the spring approximately one and one half turns in a counterclockwise direction then slip the end of the rope through the hole in the recoil housing.

9. Pull about 30 cm (12 inches) of rope out of the recoil and tie a tight slip knot in it. This will keep the recoil rope from retracting into the housing during installation of the "T" handle.

10. Slide the "T" handle then the metal reinforcement onto the recoil rope. Secure by tying a knot in the end of the rope then inserting it into the slot in the top of the "T" handle.

11. Release the slip knot be giving if a sharp tug.

Recoil Mechanism - Installation

1. Position the recoil starter gasket on the crankcase and install the recoil starter. Tighten all retaining screws evenly so as not to damage the recoil housing.

   NOTE: The recoil housing is self-centering and requires no special centering procedure.

Starter Pulley - Removal

1. Remove the recoil starter as described under **Recoil Mechanism - Removal**, page 30.
2. Remove the starter pulley nut by turning it counterclockwise. See Figure 73.

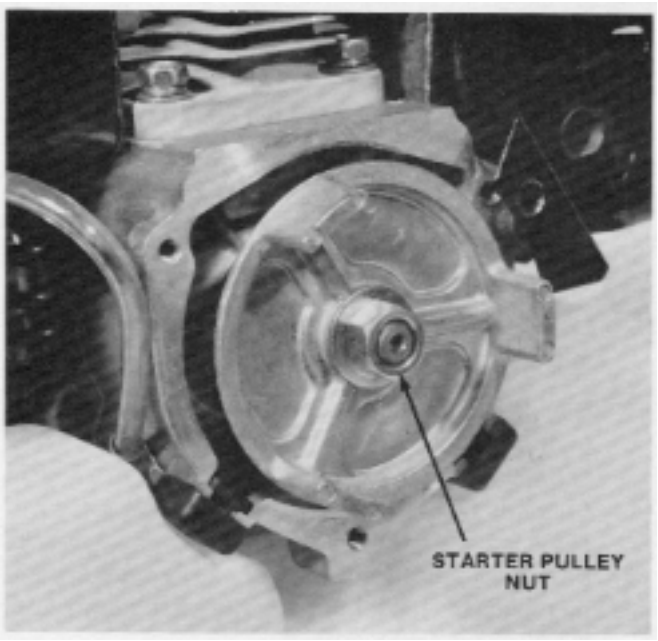

Figure 73

3. The starter pulley is threaded onto the crankshaft and is removed by turning it counterclockwise. If the engine turns while trying to remove it, place a piece of wood on one of the starter pulley ratchets and tap to loosen.

Starter Pulley - Installation

1. Thread the starter pulley onto the crankshaft.
2. Install the flywheel nut, tightening to 1.0 to 1.3 kg m (87 to 113 in lbs).
3. Install the recoil starter as described under **Recoil Mechanism - Installation.**

SECTION 5 CLUTCH SHOES AND FLYWHEEL

Clutch Shoes and Flywheel - Operation

The TC3000, TC4000 and TC5000 use a centrifugal type clutch. The clutch is constructed of two shoes and a spring. These parts are fastened to the flywheel as shown in Figure 74.

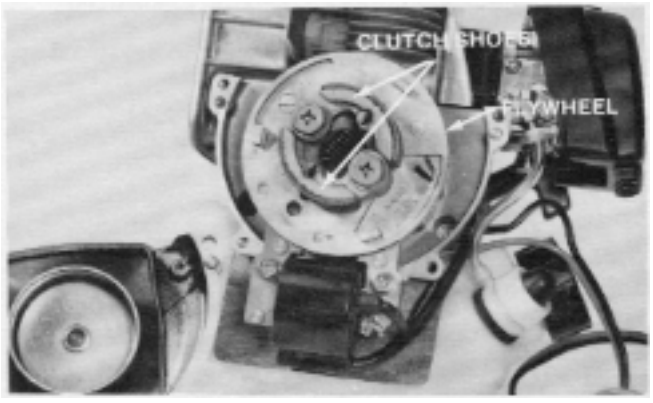

Figure 74

Operation of the clutch is as follows:

1. When the trimmer engine speed is less than 3900 ± 200 rpm (3300 ± 200 rpm on the TC5000) the spring holds the two clutch shoes in, away from the clutch drum.
2. As the engine speed reaches 3900 ± 200 rpm (3300 ± 200 rpm on the TC5000) the centrifugal force of the weights overcomes the spring and the shoes make contact with the clutch drum. This contact forces the drum to rotate with the engine so that power is transmitted to the trimmer head.
3. Under deceleration, disengagement takes place at a speed approximately 400 rpm less than the engagement speed. The difference between engagement and disengagement speeds occurs because the shoes resist disengagement slightly when they are in contact with the clutch drum.

   NOTE: Operating the trimmer for long periods of time near the engagement speed may cause the clutch to slip and overheat. This can result in peeling of the clutch shoes.

Clutch Shoes and Flywheel - Disassembly

1. Remove the engine from the drive tube as described under **Engine - Removal from Drive Tube**, page 40.
2. With the recoil assembly on a hard flat surface, use an impact wrench to remove the four housing screws.
3. Remove the fan housing.

   IMPORTANT: (TC5000 only). The coil is mounted to the inside of the fan housing on the TC5000. To avoid damaging the coil ground lead, pull up on the muffler side of the housing only, and swing the fan housing out of the way in a manner similar to that of opening a book.

Clutch Shoes and Flywheel - Inspection

1. Inspect the clutch pads for even wear. Also inspect the clutch shoes for evidence of cracking.
2. Inspect the clutch drum (found in the fan housing) for roundness and even wear.
3. Check the flywheel magnets using the screwdriver method:. Hold the handle end of a flat bladed screwdriver between your thumb and forefinger. Bring the tip of the screwdriver to within 3/4" to 1" of the magnet to be tested. The screwdriver should be drawn to the flywheel. If not, the flywheel should be replaced. Repeat this step for each magnet on the flywheel. See Figure 75.

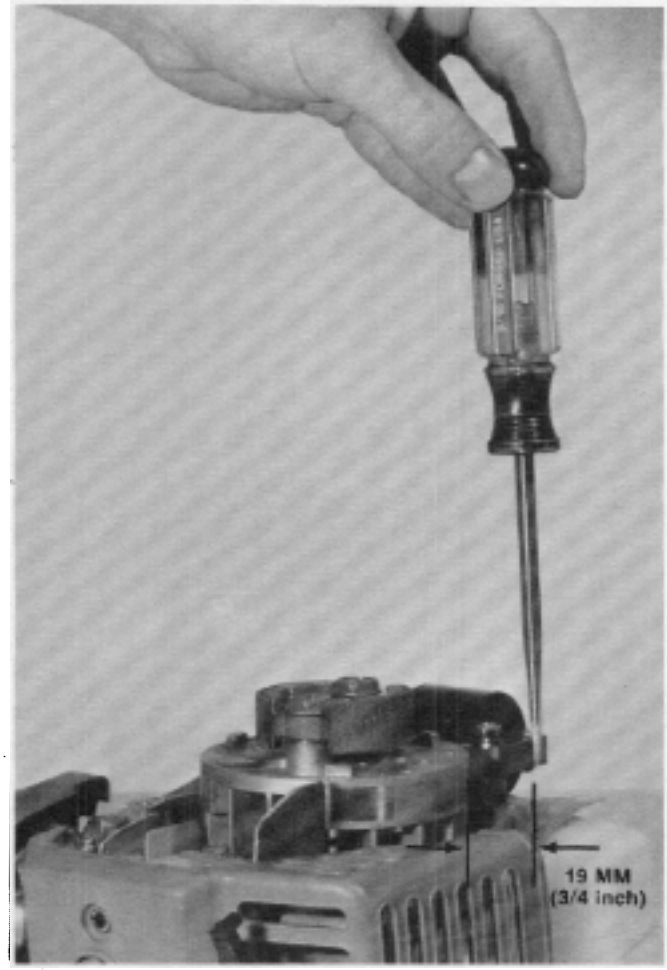

Figure 75

Clutch Shoes and Flywheel - Inspection (cont'd)

4. Check the flywheel for cracks or broken fins.

Clutch Shoes and Flywheel - Removal

1. Make note of the markings on the top of the clutch shoes to ensure proper installation later.
2. For convenience, remove the two fasteners securing the coil to the block and move the coil to the side.
3. Using a strap wrench to hold the flywheel, remove the two bolts retaining the clutch shoes. The shoes, complete with the spring, can then be removed as an assembly.

   IMPORTANT: The flywheel is of cast aluminum design. Methods of holding the flywheel other than with a strap-wrench may damage the flywheel.
4. Remove the flywheel nut by turning it counterclockwise using a strap-wrench to hold the flywheel.
5. Remove the flywheel using Toro flywheel puller part number 41-7650. See Figure 76.

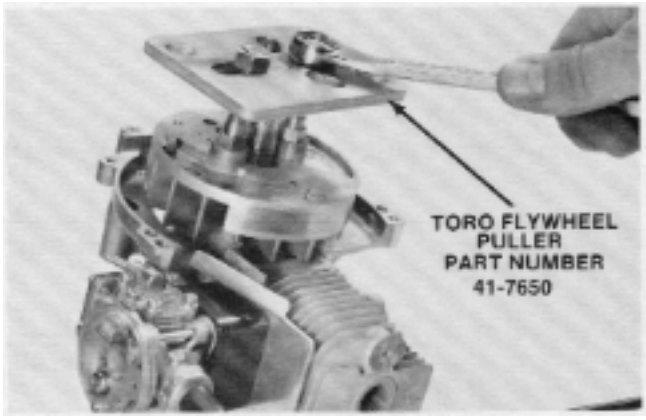

Figure 76

IMPORTANT: Use of a knockoff tool may dimple the races in the crankshaft ball bearing. This could lead to early failure of the bearing.

6. Replace any damaged or worn parts.

Clutch Shoes and Flywheel - Reassembly

1. If the flywheel was removed, install the flywheel key, then place the flywheel, fan side down, onto the crankshaft. Hold the flywheel using a strap wrench and tighten the flywheel nut to 1.0 to 1.3 kg m (87 to 113 in lbs).
2. Insert the clutch bolts through the clutch shoes making sure that the markings you made note of earlier are facing up. Then slide a flat washer over the threads of each bolt so that the washer rests between the flywheel and the clutch shoes. See Figure 77.

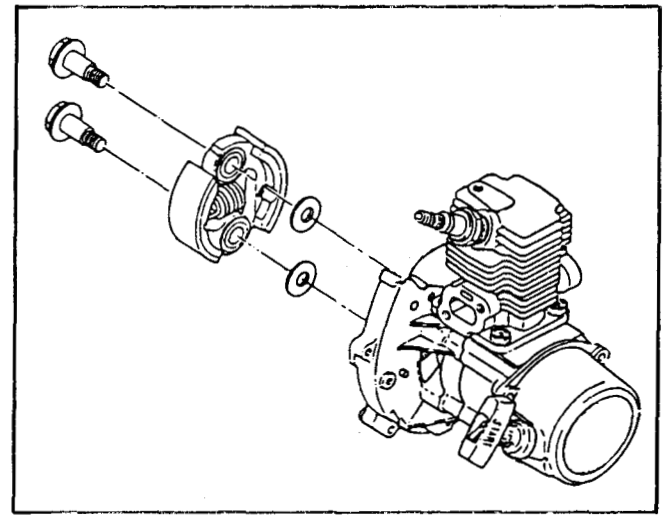

Figure 77

3. Use a small amount of Blue "Loctite" on the clutch bolt threads and install the clutch shoe assembly. Tighten the clutch bolts to 0.6 to 0.8 kg m (52 to 69 in lbs).
4. Refer to **Coil - Installation**, page 29, for the remainder of the reassembly procedure.

CLUTCH DRUM and CLUTCH HOUSING

Clutch Drum and Clutch Housing - Disassembly

1. Remove the snap ring from the drive shaft end of the clutch drum.
2. Press the clutch drum out of the clutch case by pressing on the drive shaft only.

   NOTE: Removing the clutch drum requires pressing or driving on the drive shaft. This will dimple the ball bearings and could lead to a premature failure. Whenever the clutch drum is removed, the clutch housing ball bearing should be replaced.
3. Remove the large snap ring retaining the bearings.
4. Press out the bearing on an arbor press and remove the washer.
5. Inspect all parts and replace as necessary.

Clutch Drum and Clutch Housing - Reassembly

The TC3000 clutch drum and clutch housing are assembled as shown in Figure 78.

Clutch Drum and Clutch Housing - Reassembly (cont'd)

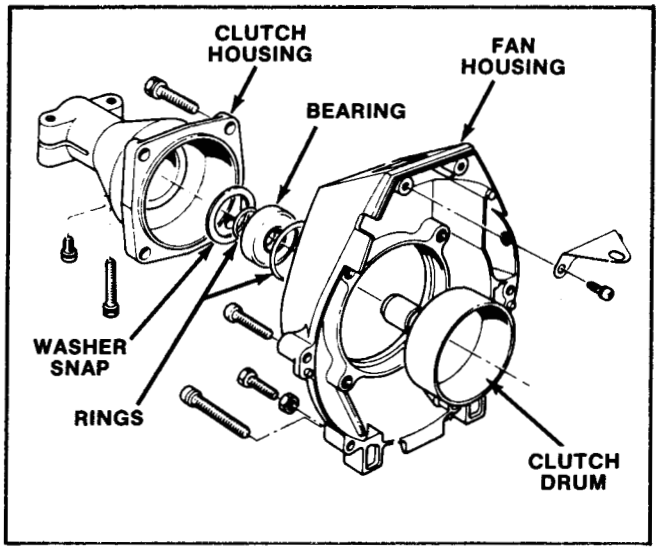

Figure 78

The TC4000 and TC5000 clutch drum and clutch housing is assembled as shown in Figure 79.

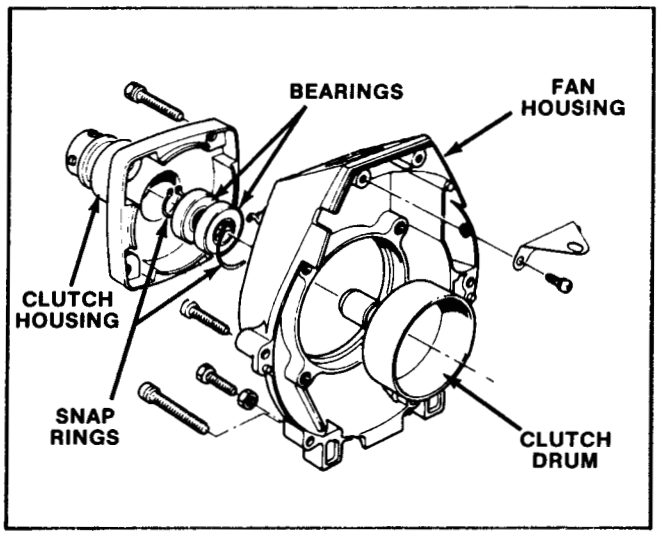

Figure 79

1. Insert the washer into the clutch housing.
2. Press a new bearing into the clutch housing.

   IMPORTANT: Press only on the outer race of the bearing. Pressing on the inner race will damage the race inside the bearing and may lead to premature failure.
3. Install the large snap ring.
4. Support the inner race of the clutch housing bearing from the drive shaft end with a sleeve or deep well socket and press the clutch drum into the housing. See Figure 80.

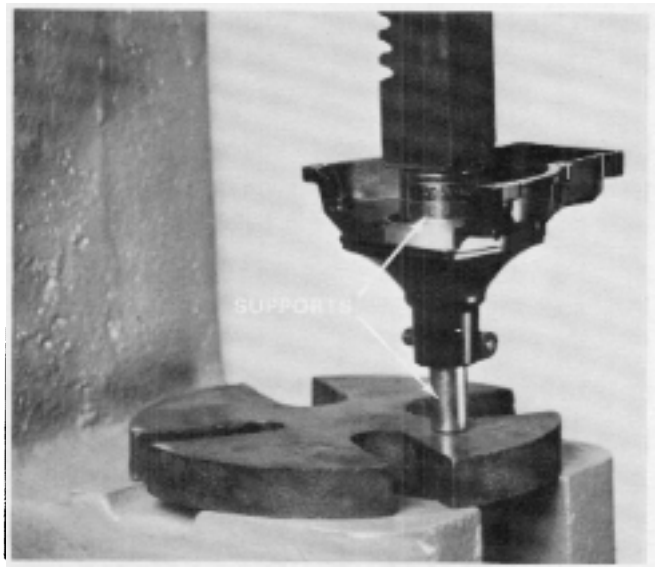

Figure 80

5. Install the small snap ring in the drive shaft end of the housing.
6. Check to ensure that the clutch drum rotates freely and is true.

ISOLATION MOUNT (TC4000 and TC5000 only)

Isolation Mount - Operation

The TC4000 and TC5000 trimmers use a vibration isolation system called an Isolation Mount. See Figure 81.

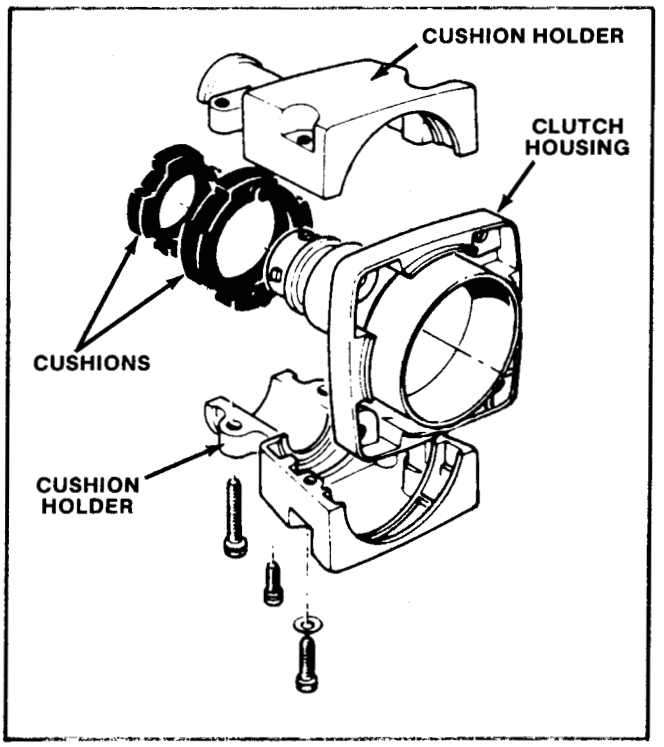

Figure 81

Isolation Mount - Operation (cont'd)

The system is constructed of two rubber cushions and a cushion holder. The cushions are positioned between the holder and the clutch housing and are actually the only two points of contact between the engine and the drive tube. This arrangement allows vibration to pass only through the two rubber cushions and reduces the amount of vibration that is transmitted to the operator.

Under normal circumstances, the Isolation Mount should not require any maintenance for the life of the product. However, if an increase in vibration is noted, the cushions should be inspected and, if found to be damaged or compressed, should be replaced.

Isolation Mount - Disassembly

1. Remove the single locating screw and the two clamping screws that secure the engine to the drive tube and separate the engine from the drive tube. See Figure 82.

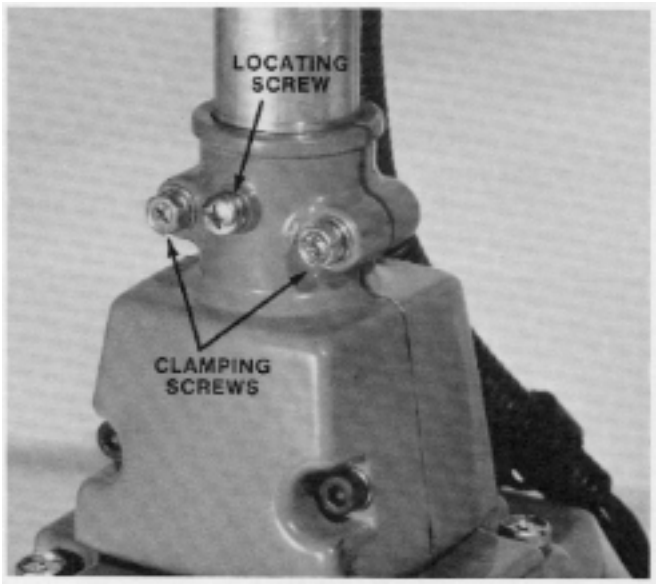

Figure 82

NOTE: It is not necessary to remove the throttle linkage.

2. Remove the two allen screws that secure the two halves of the cushion holder and separate the halves.
3. Inspect the rubber cushions for wear and damage. Replace if necessary.

Isolation Mount - Reassembly

1. Position the rubber cushions on the clutch housing as shown in Figure 83.

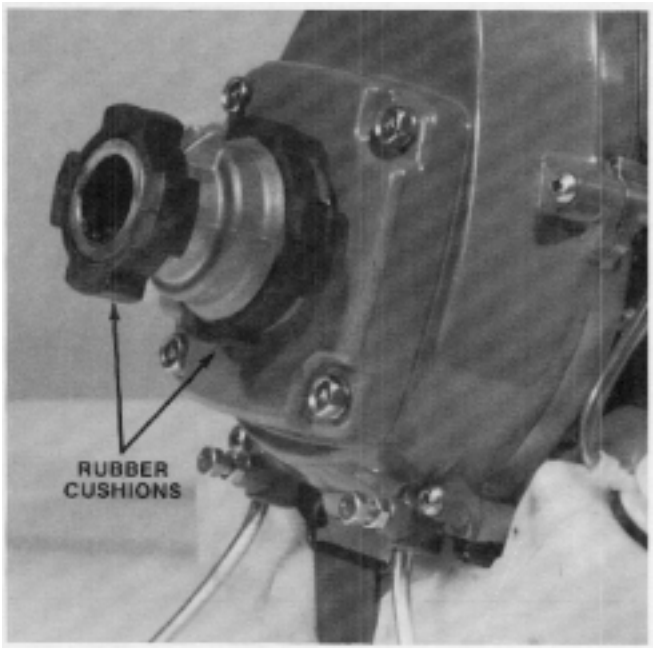

Figure 83

NOTE: Good contact between the cushions and the clutch housing is essential in minimizing vibration. Therefore, bonding the cushion to the clutch housing with a cyanoacrylate type glue (Super Glue®) is recommended.

2. Place the two cushion holder halves around the cushions so that the locating screw is on the bottom side of the engine. Secure the cushion holder with the two allen screws.
3. Position the engine properly on the drive tube and secure with the locating screw and the two clamping screws. It may be necessary to rotate the cutter implement slightly in order to get the drive shaft and the clutch drum to mate properly.

SECTION 6 ENGINE

Engine - Operation

The engine used in the TC3000, TC4000, and TC5000 is based upon a two-stroke, port to port design. The term "two-stroke" refers to the number of operations the piston goes through in order to complete a single combustion cycle. Those two operations are called an intake stroke (where an air/fuel mix is drawn into the combustion chamber) and an exhaust stroke (where the exhaust gases are purged from the combustion chamber).

The term port to port refers to the way in which the intake and exhaust gases enter and exit the engine. These engines use no valves, but rather, rely on the piston passing by the intake and exhaust ports to control the flow of gases. Hence the term: port to port.

There are four major components that are involved in the combustion cycle:

- Piston
- Intake Port
- Exhaust Port
- Scavenger Ports

Their relative locations can be seen in Figure 84.

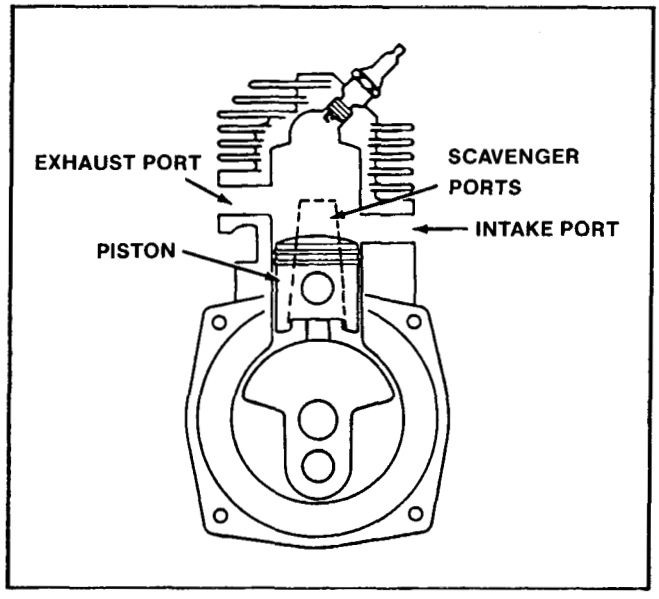

Figure 84

Proper operation of these engines relies on nine separate phases. Beginning with the piston at a midway point of its upward stroke, those nine phases are described below.

1. The piston closes the scavenger ports. This prevents prevents equalization of pressures between the lower crankcase and the combustion chamber. See Fig. 85.

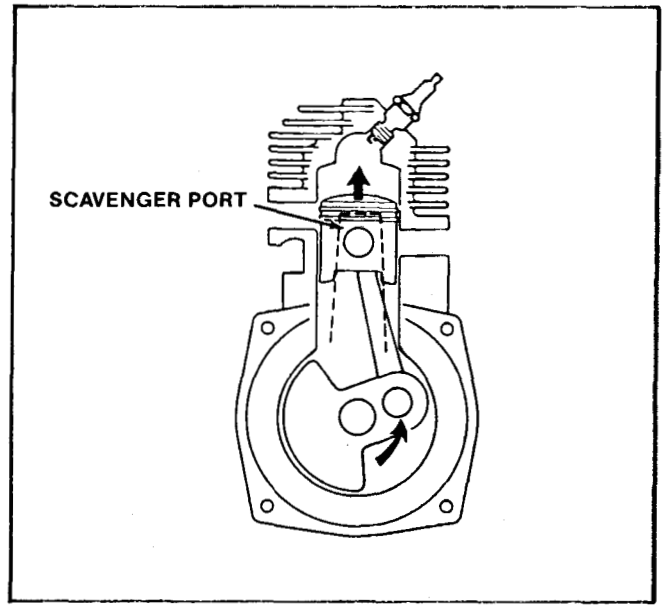

Figure 85

2. As the piston continues its upward stroke, vacuum begins to build within the lower crankcase. That vacuum will later be used to draw the intake mixture. See Fig. 86.

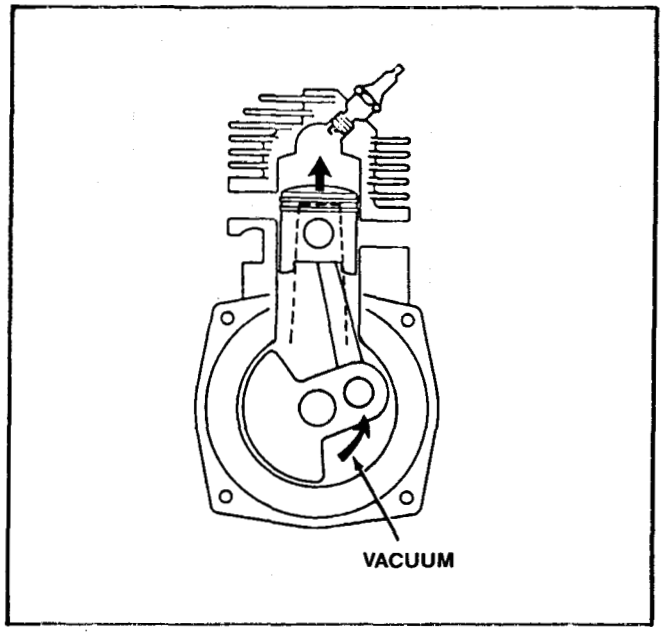

Figure 86

3. The piston covers the exhaust port which completely seals the combustion chamber. See Fig. 87.

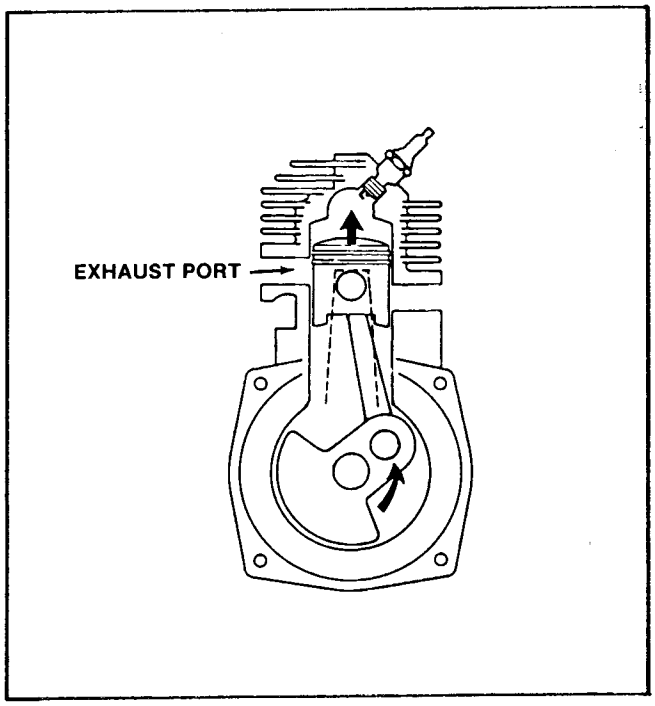

Figure 87

4. The upward movement of the piston builds pressure (compression) in the combustion chamber. See Fig. 88.

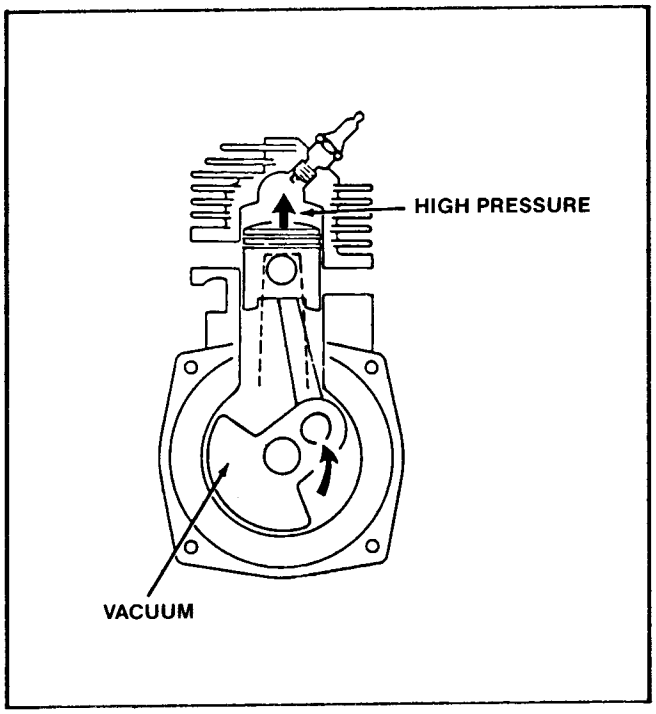

Figure 88

5. The lower skirt of the piston rises above the intake port and allows a fresh air/fuel mixture to be drawn into the lower crankcase. See Figure 89.

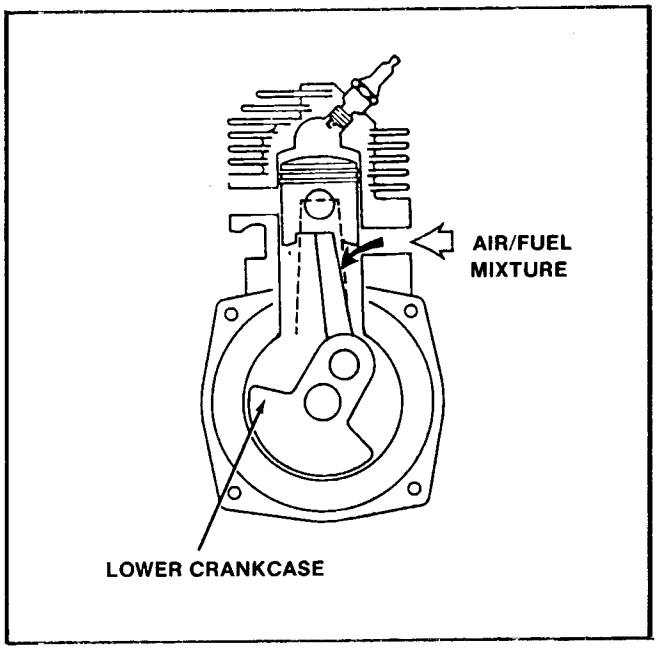

Figure 89

6. The spark plug fires before the piston reaches the top of its stroke. This sets off combustion of the air/fuel mixture sealed in the combustion chamber.

   Note that the piston continues its upward movement even after the plug has fired. This "post combustion compression" continues until the piston reaches top dead center and results in a more complete burn. See Figure 90.

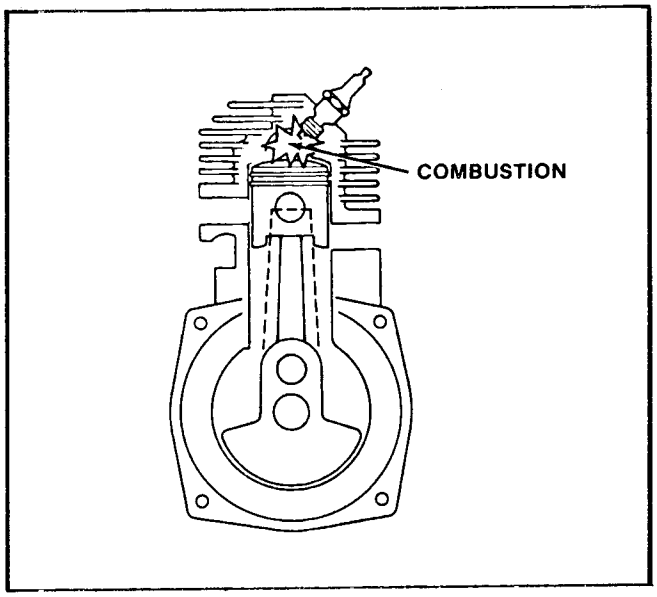

Figure 90

7. The piston then begins its downward stroke. As this occurs, pressure begins to build in the lower crankcase. See Figure 91.

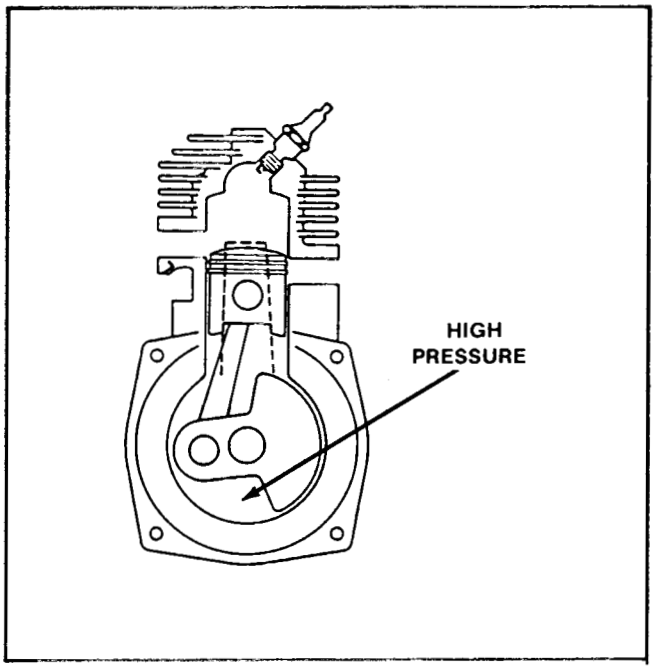

Figure 91

8. The exhaust port is uncovered by the piston and the exhaust gases are allowed to exit. See Figure 92.

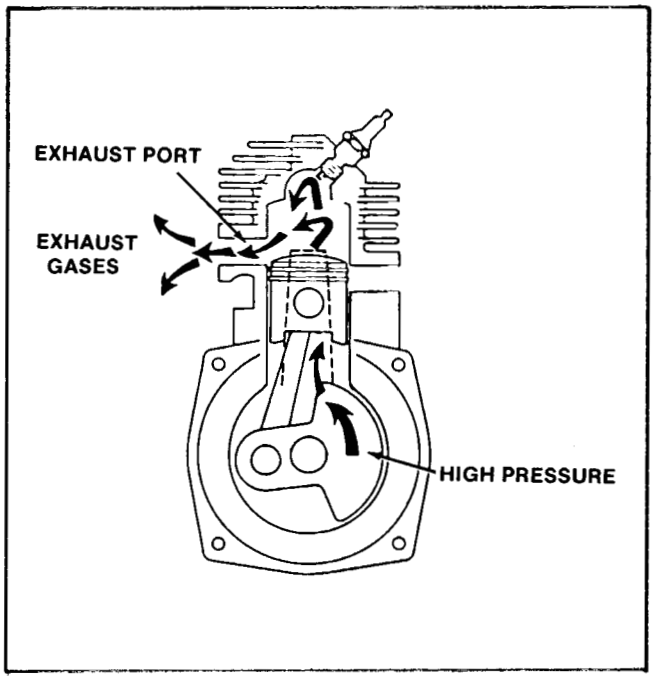

Figure 92

9. The scavenger ports are uncovered resulting in a fresh air/fuel mixture being forced into the combustion chamber by the crankcase pressure. Note that this process is not 100% efficient and that some exhaust gases are mixed with the fresh air/fuel mixture. See Figure 93.

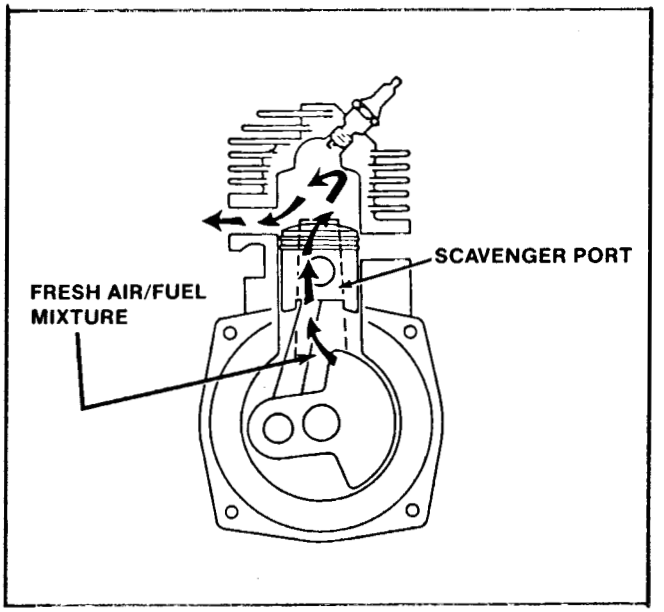

Figure 93

Drawing a fresh mixture into the combustion chamber completes the combustion cycle. The complete cycle took one full turn of the crankshaft.

Engine - Removal From Drive Tube

1. Pull the spark plug lead from the spark plug.
2. Pull the ignition switch wires from the rear of the throttle control grip. A needle nose plier may help. See Figure 94.

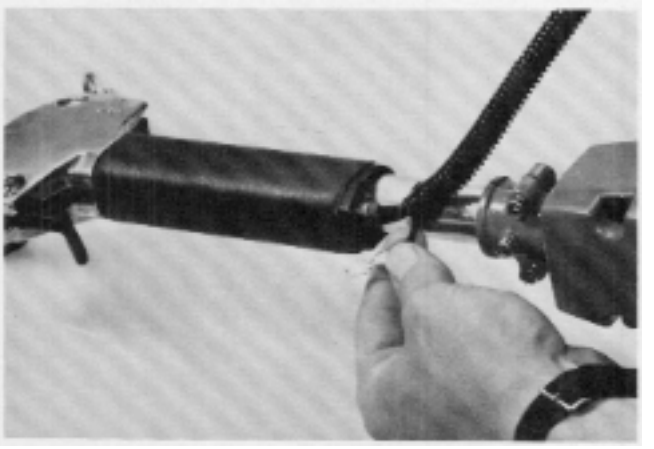

Figure 94

3. Remove the two screws retaining the throttle control housing to the drive tube and remove the throttle cable from the trigger.
4. Pull the throttle cable out of the throttle control grip.
5. Loosen the locating screw and the clamping screws. See Fig. 95.

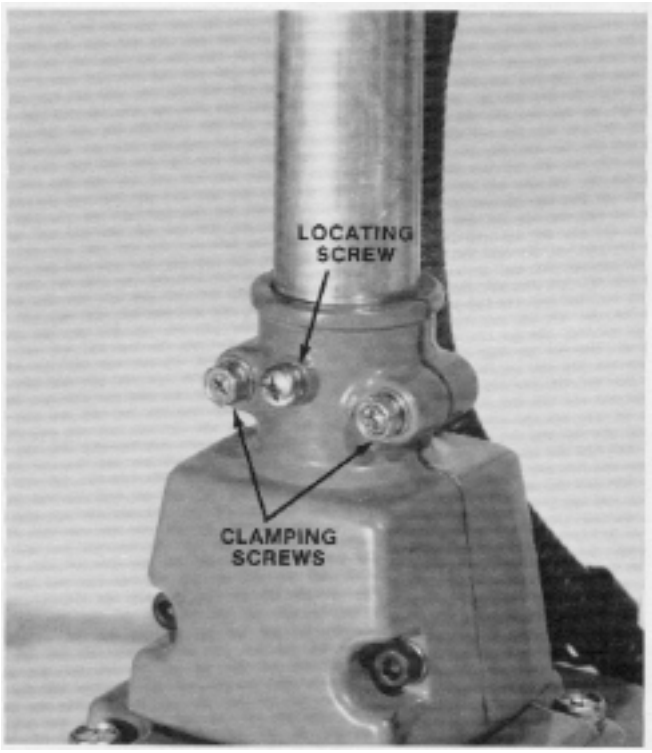

Figure 95

6. Pull the engine off the tube.
7. Wipe off excessive grease, oil, and dirt, using lintless rags and commercial degreaser.
8. Look for obvious damage and wear, e.g. cracked fuel lines, cracked dust covers, broken and chipped cooling fins on the cylinder head, loose screws, or signs of leakage.

Engine - Disassembly

1. Remove the air cleaner and carburetor as described under **Carburetor - Removal,** page 14.
2. Remove the muffler cover, muffler and spark plug.
3. Remove the clutch and flywheel as described under **Clutch Shoes and Flywheel - Removal,** page 35.
4. Remove the recoil assembly as described under **Recoil Mechanism - Removal,** page 30.
5. Remove the nut securing the starter pulley to the crankshaft. See Figure 96.
6. Remove the starter pulley by turning it counterclockwise until it is completely unscrewed. Be careful not to lose the washer.
7. Remove the two bolts securing the cylinder to the crankcase.

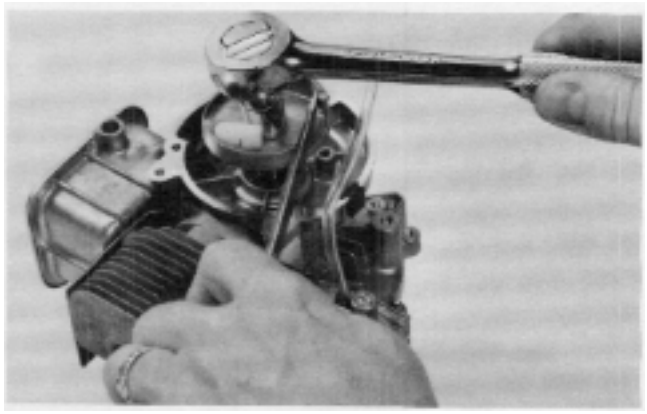

Figure 96

8. Carefully pull the cylinder and cylinder gasket from the crankcase being careful not to damage the cylinder bore or piston assembly.

   NOTE: The exhaust port is on the right side when viewed from the recoil end.

   NOTE: If crankshaft axial (end) play is suspect, use a dial indicator to check the axial (end) play before disassembling the crankcase. Make note of this measeurement. See Figure 97.

maximum allowable end play
.55 mm (.020")

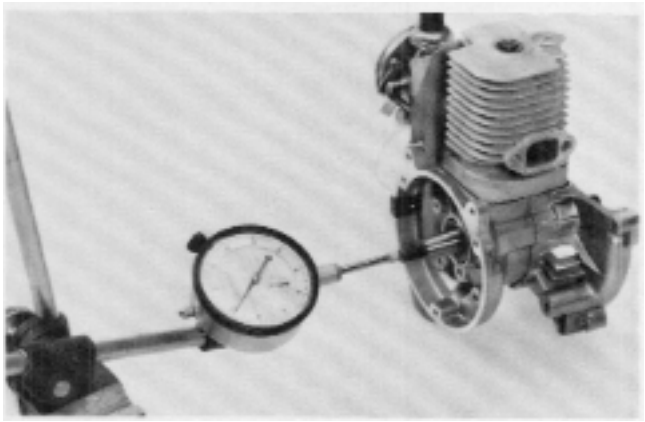

Figure 97

9. From the flywheel end, remove the three screws with lockwashers securing the crankcase halves together and pull apart the crankcase halves. Carefully remove the crankshaft with attached connecting rod and piston. Note that the crankshaft ends are different. The keyway is used to house the flywheel key and will be on the end with the flywheel and coil. See Figure 98.

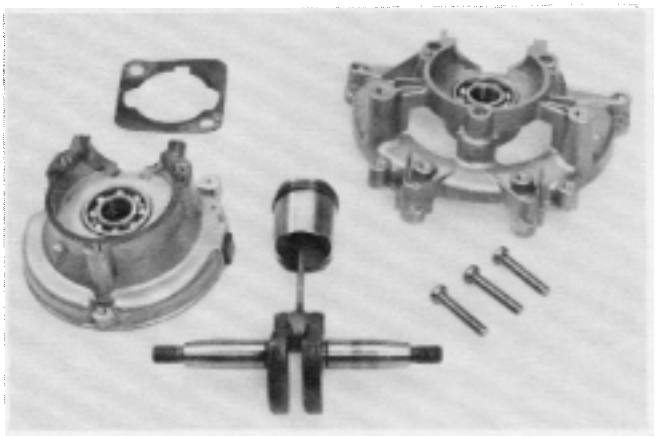

Figure 98

10. Remove the two snap rings retaining the piston pin in the piston.

11. Carefully push out the piston pin and lift the piston from the connecting rod. The connecting rod cannot be removed from the crankshaft. Note the position of the dot on the head of the piston. Reinstall the piston with the dot in the same direction. See Figure 99

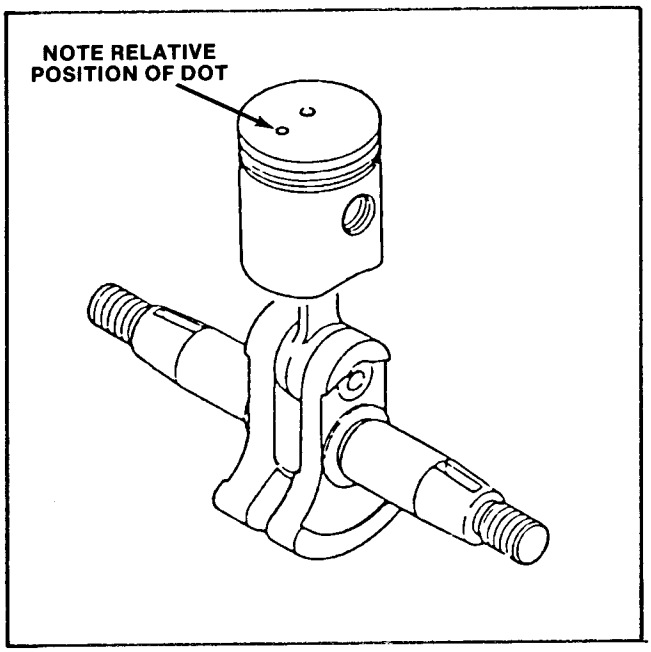

Figure 99

NOTE: Before removing the piston rings, note how they are installed. The hemispherically notched ends of the rings match the locating pins in the ring grooves. See Figure 100.

12. Use finger pressure to remove the piston rings from the piston.

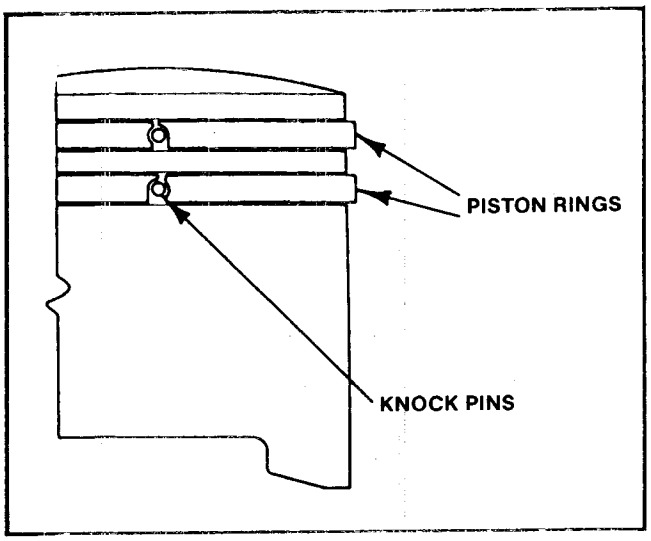

Figure 100

Engine - Cleaning After Disassembly

1. Clean all parts in appropriate solvents according to the solvent manufacturer's recommendations.

2. Inspect all parts for wear and damage. Make certain that moving parts will move freely.

3. Remove carbon from cylinder combustion chamber, exhaust port and piston. Carbon can be removed with a non-marring scraper. Be careful not to damage the cylinder's chrome plated bore. See Figure 101.

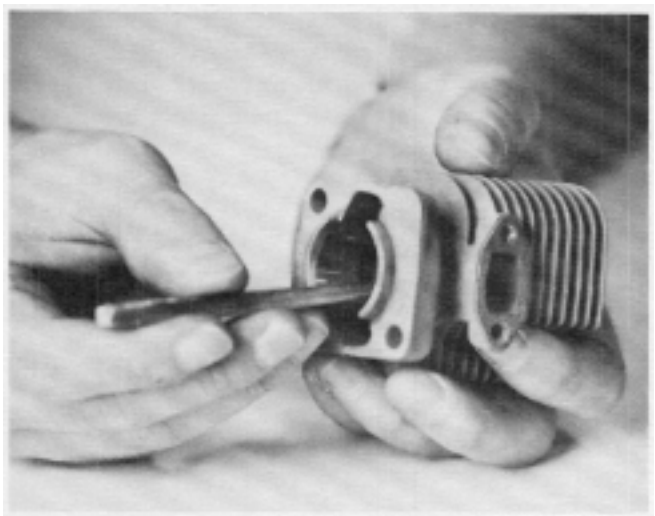

Figure 101

4. Decarbonize the muffler. Use a scraping tool to remove the carbon.

5. If the spark plug is to be reused, clean the spark plug.

6. Clean the air filter element in soap and water. Moisten the air filter element with clean, light-weight engine oil before installation.

Engine - Cleaning After Disassembly (cont'd)

7. Replace the fuel strainer on the pick-up tube inside the fuel tank. See Figure 102.

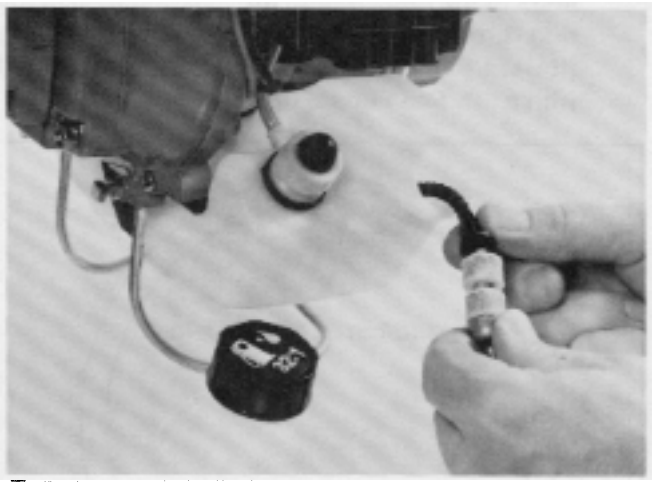

Figure 102

8. Clean the primer pump passages, valve cushions and ball valves.

Engine - Inspection

Inspect all parts for wear and damage. Do not reuse parts that are damaged or worn beyond specification.

1. Crankshaft Axial Play

maximum allowable axial play:
0.55mm (0.020")

Axial play can only be measured when the crankshaft and crankcase are assembled. If the axial play was not measured during disassembly, reassemble the crankshaft and crankcase with bearings making certain to properly torque the crankcase screws to 0.4 to 0.5 kg m (35 to 43 in lbs). See Figure 103.

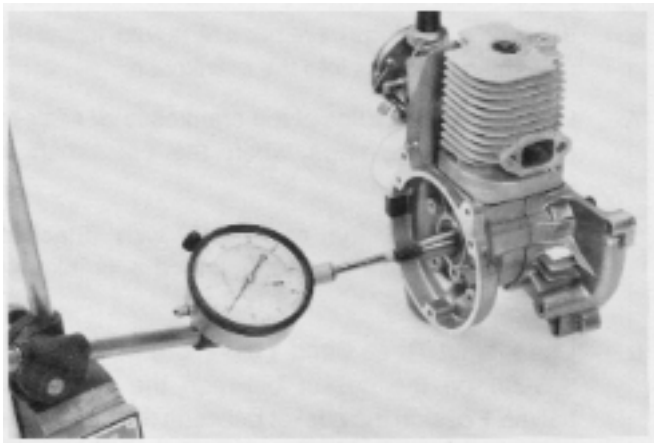

Figure 103

2. Crankshaft Run-out

maximum allowable run-out:
0.06 mm (.0024")

With the crankshaft removed from the crankcase, support the crankshaft on V-blocks. The V-blocks should be positioned no closer than 4 mm (3/16 inch) from the counter weights. Use a dial indicator and measure run-out at the position shown in Figure 104.

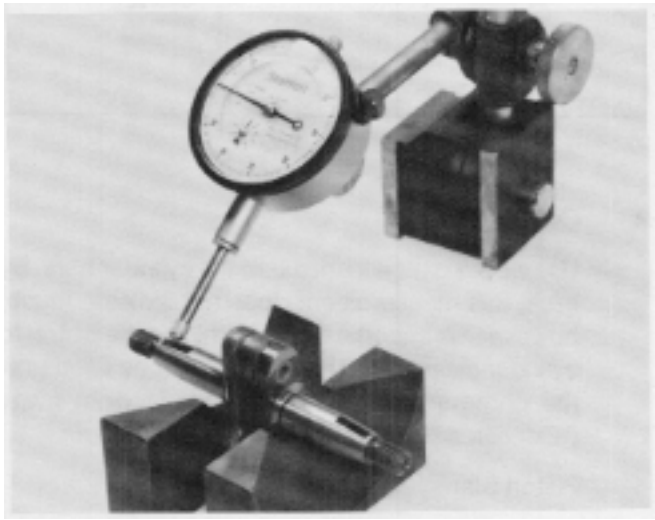

Figure 104

If any measurement is greater than the maximum allowable limit, the crankshaft should be replaced. Off-size crankshaft bearings are not available.

3. Piston Ring End Gap

maximum allowable end gap:
.7 mm (0.027")

Insert a piston ring into the cylinder skirt, making certain the ring is not tilted. Use a piston to push in the ring and ensure the ring is perpendicular in the cylinder bore. Use a feeler gauge to measure the piston ring gap between the ends of the piston ring. If the measured clearance is greater than the .7 mm (0.027"), the piston rings may require replacement. See Figure 105.

NOTE: Before replacing the piston rings, make certain that the piston to cylinder clearance is within specification.

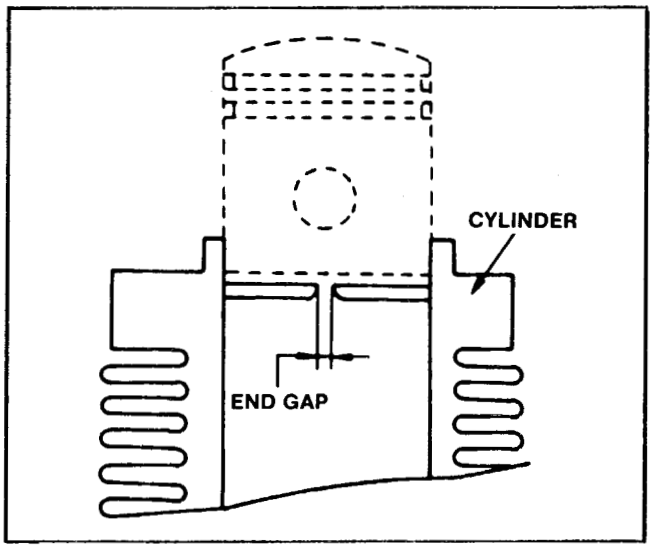

Figure 105

4. Cylinder Bore

   Use a bore gauge to measure the cylinder bore. By itself, this measurement does not indicate much, however it is important in determining the piston to cylinder clearance. The cylinder can be used until the chrome plating on the bore is worn away ("Exfoliates").

5. Piston Diameter

   Use a micrometer to measure the diameter of the piston in several places, recording the largest. As with the cylinder bore measurement, this measurement is important only in determining the piston to cylinder clearance.

6. Piston to Cylinder Bore Clearance

maximum allowable clearance 0.100 mm (.004")

   The difference between the recorded piston outer diameter and the cylinder bore measurement is the clearance. If the difference is greater than the maximum allowable clearance, replacement of the piston, piston pin and needle bearing as a set is recommended.

Engine - Reassembly

All parts, even if new, should be thoroughly cleaned. Make certain all parts have been inspected and are within specification.

Do not use worn and damaged parts. Use of worn and damaged parts may cause personal injury and engine failure.

1. Use finger pressure to install the two piston rings on the piston.

   IMPORTANT: The hemispherically notched ends of the rings match the locating pins in the ring grooves. Also note that the top side (toward piston crown) of the ring is stamped with a "T". See Figure 106.

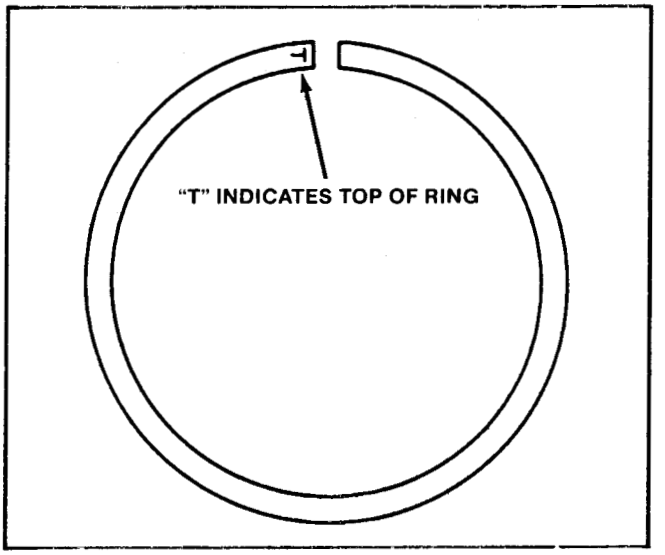

Figure 106

2. Install one of the piston pin retaining rings in the piston.
3. Insert the upper connecting rod bearing into the connecting rod.
4. Install the piston on the connecting rod by lightly lubricating the piston pin with clean engine oil, positioning the piston onto the connecting rod and pushing in the piston pin. If necessary, the piston pin can be driven into place by lightly tapping the pin with a hammer and a non-marring punch or drift pin.
5. Install the remaining piston pin retainer.
6. If the main bearings have been removed, install the new main bearings into the crankcase.
7. Lightly grease the lips of the crankcase oil seals to prevent seal damage when the crankshaft is installed.
8. Carefully install the crankshaft with attached connecting rod and piston into the crankcase halves.
9. Use sealant Three Bond 1104 (Toro part number 505-80) on the gasket between the crankcase halves. Position the gasket between the crankcase halves and assemble the crankcase halves with connecting rod and attached piston.

Engine - Reassembly (cont'd)

Install the four screws with lock washers to secure the crankcase halves together. Tighten the screws to 0.4 to 0.5 kg m (35 to 43 in lbs)

10. Install the cylinder upon the crankcase.

    Position the cylinder gasket upon the crankcase. Make sure the pulse hole opening in the gasket lines up with the crankcase opening. Lightly lubricate the bore of the cylinder with clean engine oil and carefully slide the cylinder down the piston and onto the crankcase. Note that the exhaust port is on the right when the engine is viewed from the recoil starter end.

    IMPORTANT: The piston rings are aligned with locating pins. Make sure that the end gap is aligned with these pins when inserting the piston into the cylinder.

11 Secure the cylinder onto the crankcase with the two hex head screws with lock washers. Tighten the fasteners to 0.4 to 0.5 kg m (35 to 43 in lbs).

12. Install the spark plug into the cylinder. Make certain the spark plug gap is set to .6 to .7 mm (.024 to .027").

13. Screw on the starter pulley and secure with the nut and the washer. Tighten to 1.0 to 1.3 kg m (87 to 113 in lbs).

14. Install the recoil assembly as described under **Recoil Mechanism - Installation,** page 32.

15. Install the flywheel, clutch shoes, tank and coil as described under **Clutch Shoes and Flywheel - Reassembly,** page 36.

16. Install the muffler and muffler cover.

17. Install the carburetor and air cleaner as described under **Carburetor - Installation**, page 18.

Engine - Installation on Drive Tube

1. Remove the locating screw from the clutch housing and mount the engine on the tube.

    NOTE: It may be necessary to turn the trimmer implement slightly to get the flex shaft and clutch drive shaft to mate.

2. Align the holes in the clutch housing and the drive tube and install the locating screw. Tighten the locating and clamping screw.

3. Feed the throttle cable through the throttle control grip and insert the end into the recess in the trigger.

4. Place the switch in the throttle control housing. Test for proper operation of the switch. The switch should be open in the "on" position and closed in the "off" position.

5. Mate the two throttle control case halves and secure with the two machine screws.

6. Route the throttle cable and switch wires from the carburetor over the top of the tube. See Figure 107.

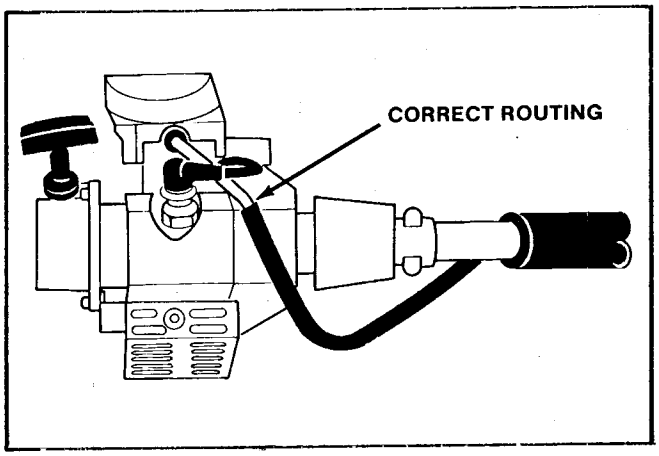

Figure 107

7. Plug the two wires into the female connectors in the throttle control. They may be connected either way as the ignition switch has no certain polarity.

8. Adjust the carburetor as described under **Carburetor Adjustment**, page 19.

SECTION 7 CONTROLS

The control unit on the TC3000 and TC4000 houses the on/off switch and throttle control trigger and is mounted on the drive tube. The TC5000 control and grip is mounted on the right handle.

Adjacent to the control unit is a padded grip which covers the connectors for the ignition ground leads and a portion of the throttle cable.

Control - Disassembly

1. Remove the two screws and locknuts securing the throttle control case halves. See Figure 108.

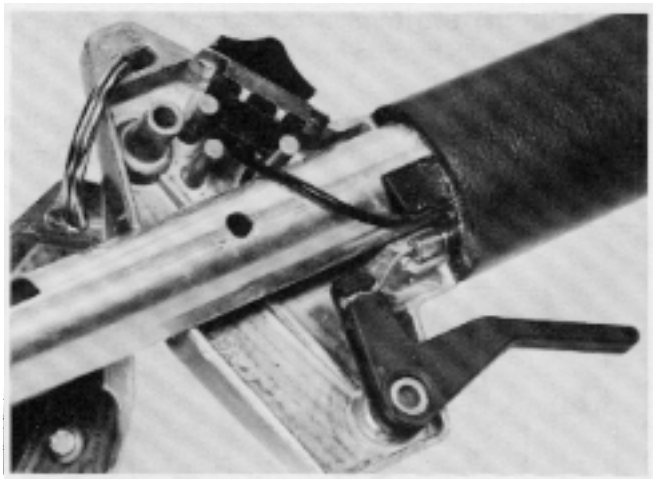

Figure 108

2. Disconnect the throttle cable and remove the trigger.
3. Disconnect the switch wires from the switch by inserting a small diameter drill or small wire into the release holes located in the bottom of the switch. See Figure 109.

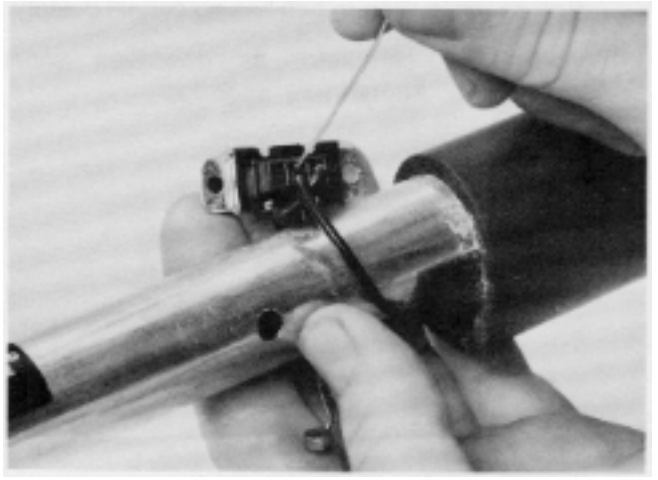

Figure 109

Control - Reassembly

1. Mount the right hand (as viewed from the rear of the trimmer) control half on the alignment hole just in front of the grip. See Figure 108.
2. Push the ends of the ignition kill wires into the holes provided in the bottom of the switch. It does not matter which way they are connected because they have the same polarity.
3. Mount the switch in the right control half as shown above in Figure 108.

CAUTION: Check to ensure that the switch will kill the engine. Use a Volt Ohm Meter or test light to check the switch. The switch should be closed in the "off" position and open in the "on" position.

4. Place the throttle trigger over the lower mounting boss and insert the throttle cable into the trigger. See Figure 108 above.
5. Cover the assembly with the other control half and secure with the two machine screws and locknuts.

Grip - Removal

1. On the TC3000 and TC4000, remove the engine as described under **Engine - Removal,** page 40.
2. Disconnect the two ignition kill wires from the rear of the grip. A needle nose pliers may help. See Figure 110.

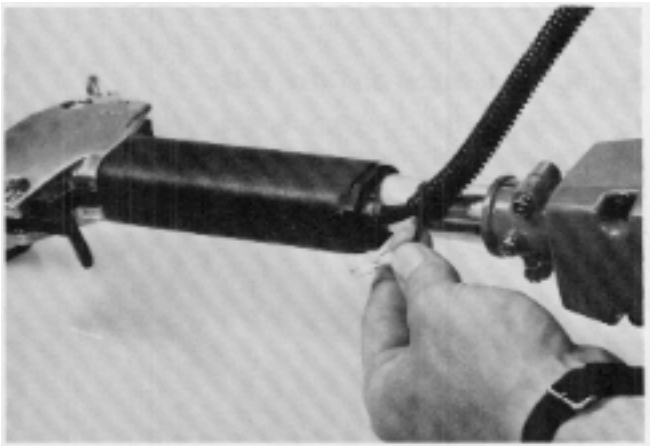

Figure 110

3. Remove the throttle control as described under **Control - Disassembly,** page 46.

Grip - Removal (cont'd)

4. Slide the grip assembly off the tube.

   NOTE: The grip is located on the tube with a plastic pin. The pin can be released by pulling or prying down on the throttle control end of the grip while sliding it toward the end of the tube. It may help to lubricate the tube with soapy water prior to this procedure. See Figure 111.

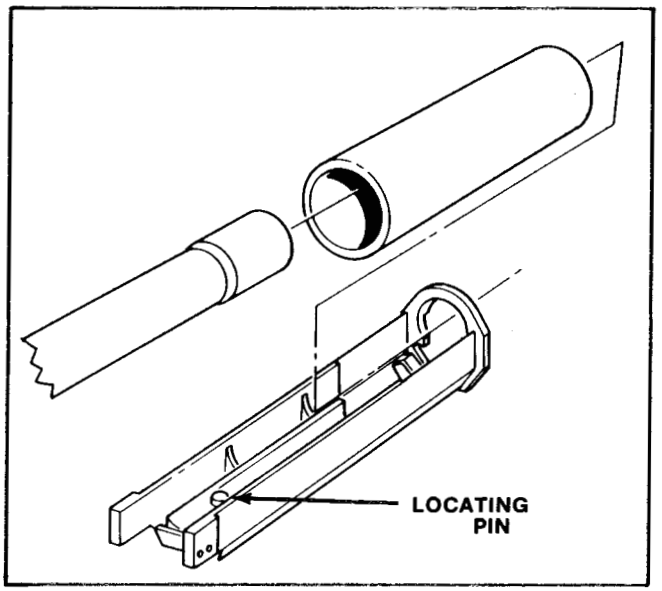

Figure 111

5. The ignition wire terminals may now be removed from the end of the grip.

Grip - Installation

1. Insert the switch wire terminals in the grip housing.
2. Slip the rubber grip over the control housing.
3. Lubricate the tube with a soap and water solution and slide the grip assembly onto the tube until the locating pin snaps into the hole in the tube.
4. (TC3000 and TC4000 only) Reinstall the engine on the drive tube as described under **Engine - Installation on Drive Tube,** page 45.
5. Push the two ignition kill wires into the rear of the grip. It does not matter which way they are connected because they have the same polarity.
6. Mount the throttle control as described under **Control - Installation on Drive Tube,** page 46.

SECTION 8 HANDLE

TC3000 Handle - Removal from Drive Tube

1. Remove the engine as descibed under **Engine - Removal from Drive Tube,** page 40.
2. Remove the grip and the control unit as described under **Grip - Removal from Drive Tube**, page 46.
3. Loosen the handle knob. See Figure 112.

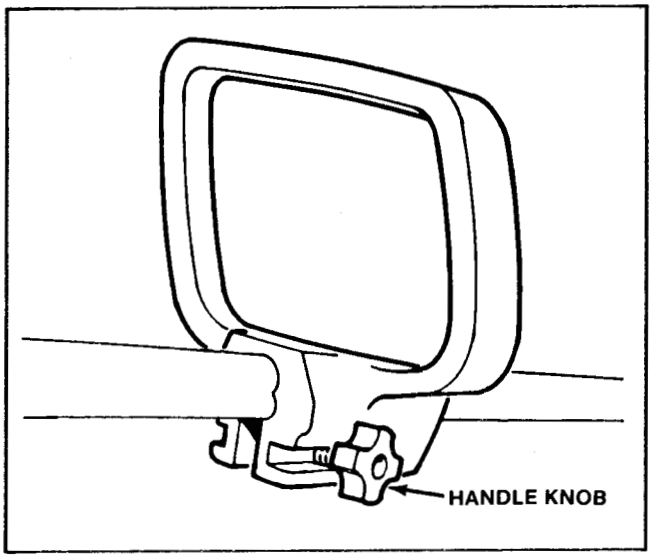

Figure 112

4. Slide the handle up, and off the drive tube. (Soaping the drive tube may aid in removing the handle.)

TC3000 Handle - Installation on Drive Tube

1. With the engine, grip and control unit removed, slide the handle onto the drive tube. (Soaping the handle may facilitate installation.)
2. Insert the carriage bolt into either side of the handle and secure with the knob.
3. Install the control and grip as described under **Grip - Installation on Drive Tube**, page 47.
4. Mount the engine as described under **Engine - Installation on Drive Tube**, page 45.

TC3000 Handle - Adustment

1. Loosen the handle knob.
2. Adjust to the desired handle height but do not cover the eye protection safety decal. See Figure 113.

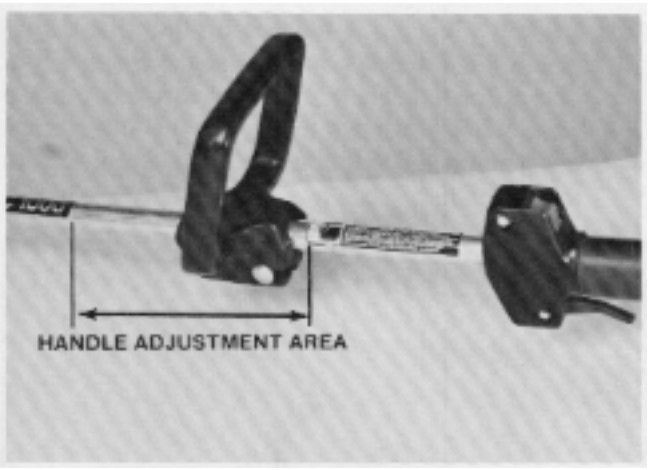

Figure 113

3. Hand tighten the handle knob.

TC4000 Handle - Removal From Tube

1. Loosen the five machine screws securing the two handle mount halves. See Figure 114.

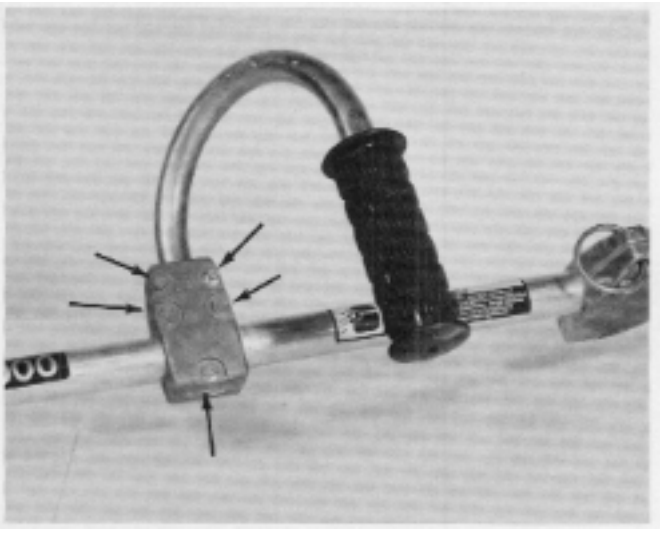

Figure 114

2. Remove the "J" handle from the mount halves.
3. If desired, complete removal by removing the five machine screws and the mounting halves from the drive tube.

TC4000 Handle - Installation on Drive Tube

1. Position the handle mount halves on the drive tube between the eye protection and the TC4000 decals. See Figure 115.

TC4000 Handle - Installation on Drive Tube (cont'd)

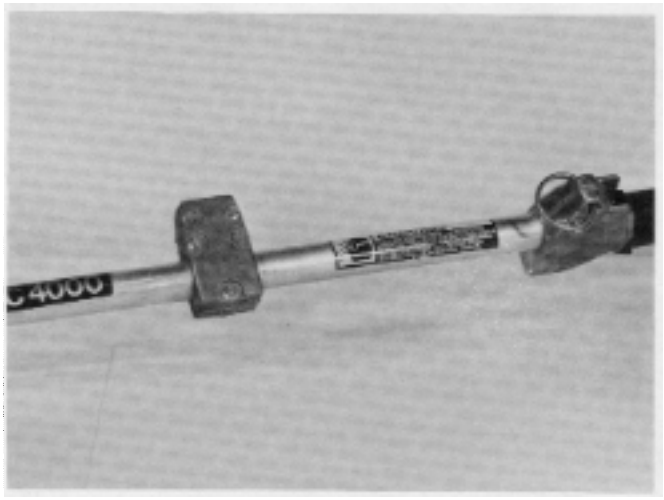

Figure 115

Note: The mounting configuration shown in Figure 114 is most surtable for right handed operators. Left handed operators may find it more comfortable if the ounting halves are installed as shown in Figure 116.

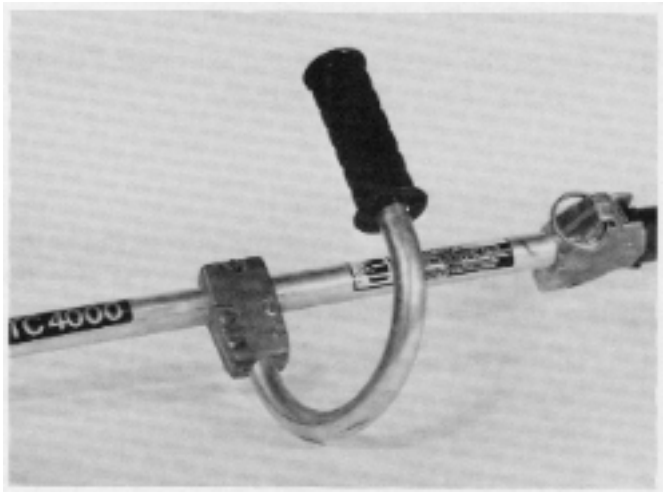

Figure 116

2. Loosely fasten the handle mounts with the five machine screws and locknuts.
3. Insert the "J" handle into the handle mount and adjust as described under **TC4000 Handle - Adjustment,** page 49.

TC4000 Handle - Adjustment

Described below is a suggested "nominal" setting for the TC4000 handle. Once a nominal postion is set, the operator may wish to adjust as desired.

1. Loosen the five machine screws that secure the handle mount to the drive tube about one turn each.
2. Position the handle mount approximately 20 cm (8 inches) from the control mount. See Figure 117.

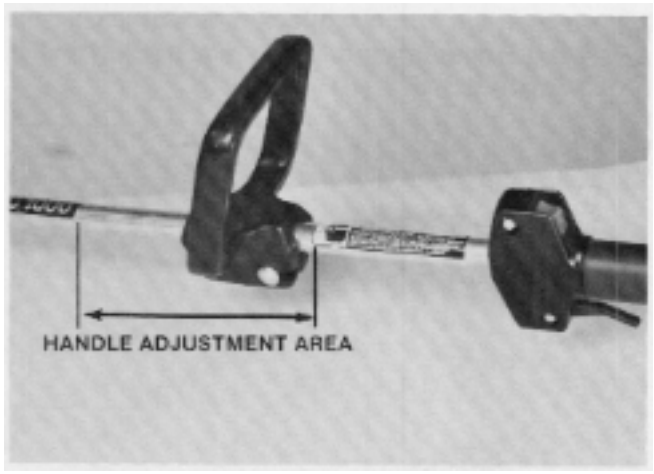

Figure 117

3. Adjust the "J" handle so that it has a slight rearward tilt (about 15 degrees).
4. Tighten the machine screws to retain this setting.

TC5000 Handle - Removal From Drive Tube.

1. Remove the two screws securing the control to the handle and remove the upper control half. Remove the throttle cable from the trigger and pull the throttle cable out of the grip. Loosely reinstall the upper control half with the two machine screws.
2. Pull the two ignition kill wires out of the rear of the grip. See Figure 118.

Figure 118

TC5000 Handle - Removal From Drive Tube (cont'd)

3. Loosen the four nylon lock nuts that secure the handle mount to the drive tube and pull the handles from the mount. See Figure 119.

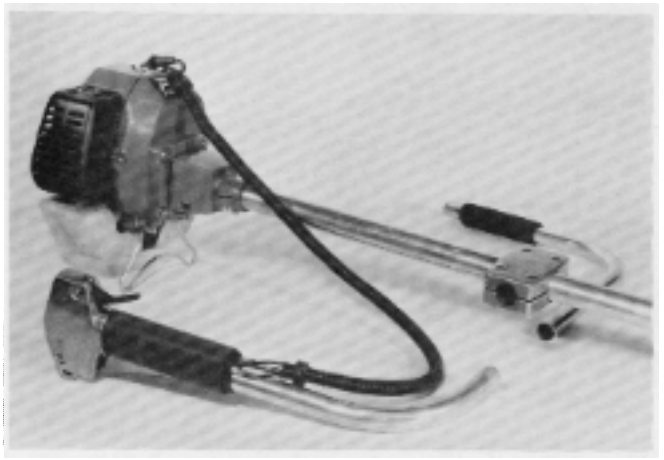

Figure 119

4. Remove the lock nuts and the handle mount from the drive tube.

TC5000 Handle - Installation on Drive Tube

1. Loosely fasten the handle mount halves to the drive tube with four carriage bolts and lock nuts.
2. Before inserting the handles into the handle mount, check to ensure that the retainer tabs are intact and are bent out slightly. See Figure 120.

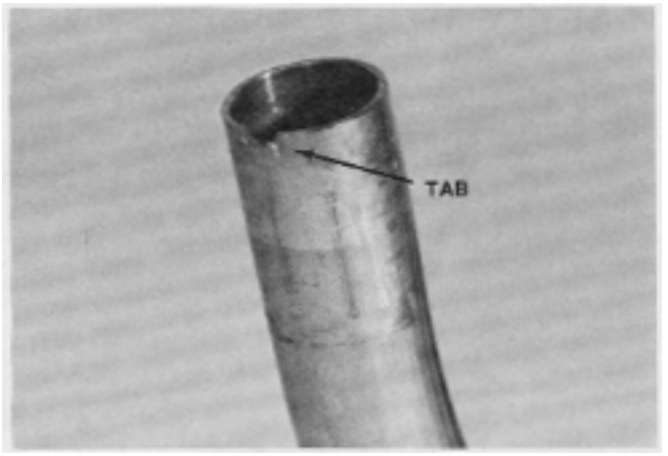

Figure 120

3. Before inserting the handle into the mount, remove the upper control half. Insert the throttle cable into the rear of the grip and attach the cable to the trigger as shown in Figure 121.

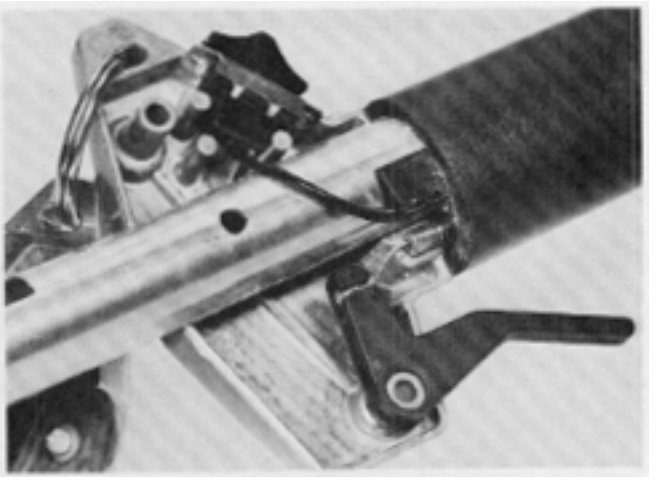

Figure 121

4. Plug the two ignition kill wires into the rear of the grip.

   NOTE: It does not matter which way the wires are connected since they have the same polarity.

5. Insert the handle with the control in it into the right (as viewed from the engine end) side of the handle mount. Insert the other handle into the left side of the mount but do not tighten yet.
6. Adjust the handle as described under **TC5000 Handle - Adjustment**, page 50.

TC5000 Handle - Adjustment

Described below is a suggested "nominal" setting for the TC5000 handle. Once a nominal postion is set, the operator may wish to adjust as desired.

1. Loosen the four nuts on the bottom side of the handle mount and pull the halves apart slightly to unseat them from the drive tube.
2. Position the handle mount so that it is 35 cm (14 inches) from the clutch housing. See Figure 122.

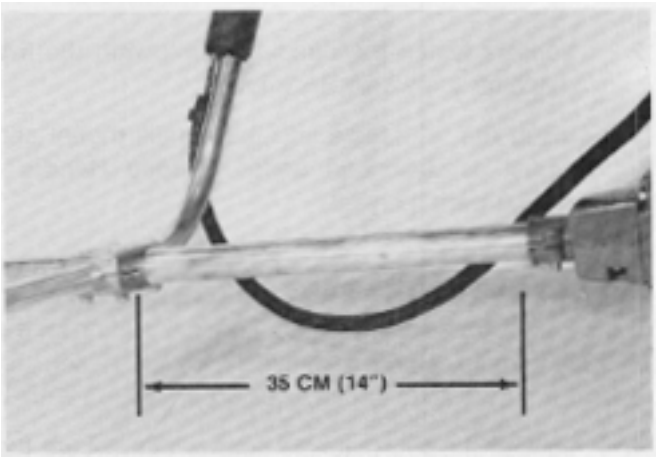

Figure 122

TC5000 Handle - Adjustment (cont'd)

3. With the handle mount nuts still loose, rotate the handles so that they have a slight forward tilt. See Figure 123.

Figure 123

4. Tighten the four lockwashers to secure the setting.

SECTION 9 SHIELD

CAUTION: Never attempt any service of the trimmer head without first shutting off the engine and allowing the implement to come to a complete stop.

The shield is an important device which is intended to help prevent the operator's feet from coming into contact with the cutter implement and reduce the amount of flying debris. Do not operate the trimmer without the shield in place.

Shield - Removal from Drive Tube

1. Remove the cutter implement by inserting a flat blade screwdriver into the hole in the top of the shield, then rotating the cutter implement clockwise (as viewed from the bottom of the trimmer). See Figure 124.

CAUTION: Heavy gloves are recommended when installing or removing the blade to avoid lacerations.

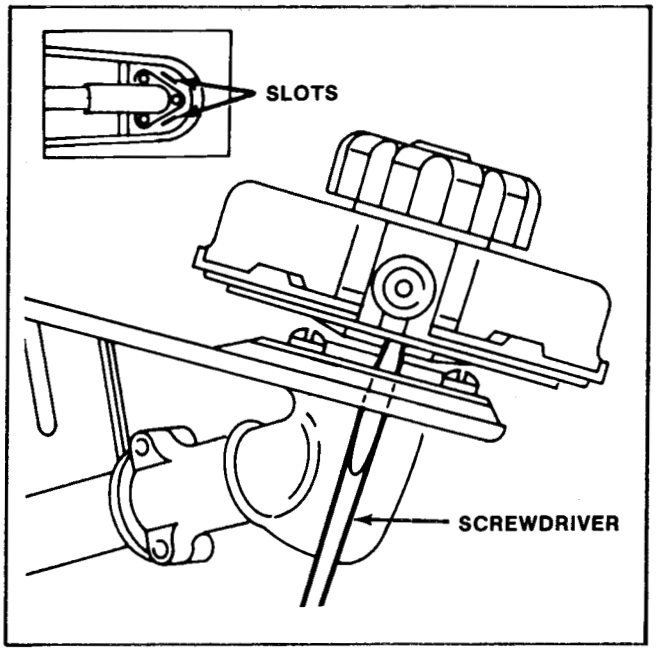

Figure 124

2. Remove the dust cap from the drive shaft.
3. Remove the three screws securing the shield to the gearbox and, on units with serial numbers 60000001 and up, remove the grass wrap shield.
4. Remove the four machine screws and nylon lock nuts that secure the two portions of the shield to the shield bracket.
5. The shield bracket can be removed if desired by first removing the gearbox. Remove the gearbox be removing the locating screw and the two clamping screws then pulling the gearbox straight off the shaft.
6. Remove the shield bracket by loosening the two clamping screws and sliding the bracket off the shaft.

Shield - Installation on Drive Tube

See Figure 125.

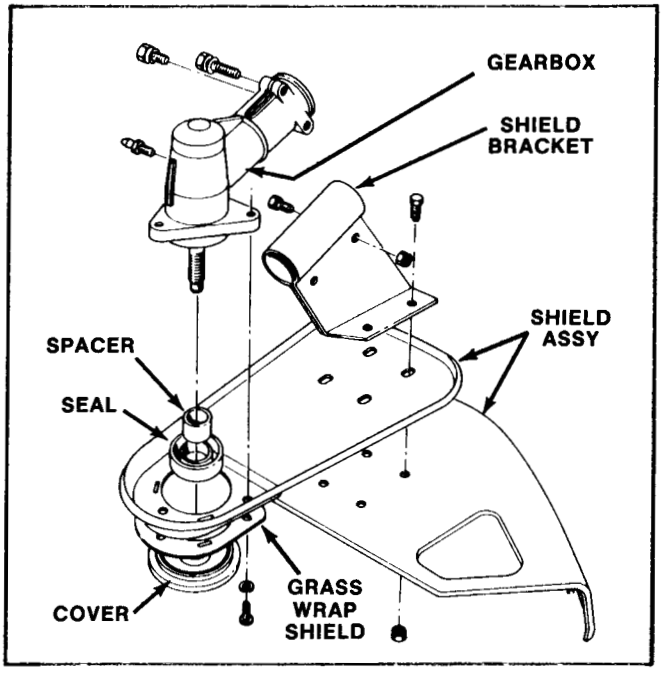

Figure 125

1. If the shield bracket was removed earlier, begin by sliding it onto the drive tube. Do not tighten the clamping screws at this time.
2. Before installing the gearbox make sure that the drive shaft is properly positioned in the drive tube. See Figure 126.
3. Slide the gearbox onto the drive tube. It may be necessary to rotate the cutter implement slightly to get the drive shaft to line up with the upper gear of the gearbox. Remove the locating screw and visually line up the locating screw hole and the hole in the drive tube. Insert the locating screw and tighten single locating screw and two clamping screws.

Shield - Installation on Drive Tube (cont'd)

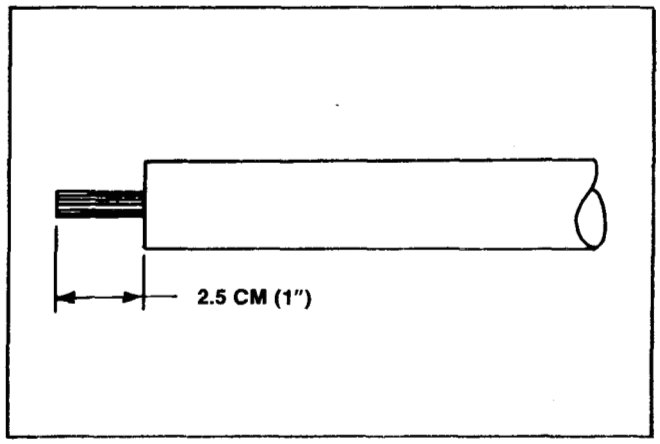

Figure 126

4. Install the two portions of the shield as shown in Figure 125. Secure with the four machine screws and nylon lock nuts.
5. On units with serial numbers 6000001 and up, place the grass wrap shield around the drive shaft. See Figure 125.
6. Secure the shield (and grass wrap shield on certain units) to the gearbox with the three Phillips head machine screws.
7. Tighten the two clamping screws on the shield bracket.
8. Install the dust cap on the gearbox drive shaft.
9. Mount the cutter implement on the drive shaft and tighten by inserting a flat bladed screwdriver into the slot in the top of the shield and turning the cutter implement counterclockwise.

Shield - Mounting Cutter Knife on Shield

A single or dual line Tap and Trim® cutter head may be used as the cutter implement on any of the straight shaft trimmers. To ensure proper line length, a cutter knife may be mounted to the shield.

1. Remove the original shield from the shield support by removing the four machine screws and lock nuts.
2. (TC3000 and TC4000 only). Replace the original shield with a new shield, Toro part number 61-4571.

   (TC5000) Using the cutter knife as a template, drill three holes in the shield. See Figure 127.
3. Mount the cutter knife (Toro part number 61-4540) on the shield using three machine screws and nylon lock nuts (Toro part numbers 32105-8 and 3296-2 respectively). See Figure 127.

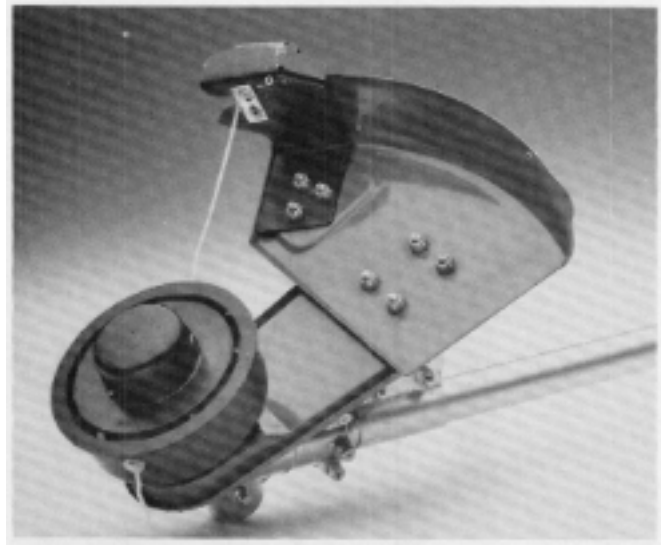

Figure 127

SECTION 10 GEARBOX

The gears inside the gearbox used on the Toro straight shaft trimmers are not replaceable individually. If damaged or defective, the gearbox must be replaced as an entire unit.

Regular maintenance is important in ensuring long life from the gearbox. It should be lubricated after every 40 hours of use with a number 2 general purpose lithium base grease.

Gearbox - Removal

1. Remove the cutter implement by inserting a flat blade screwdriver into the hole in the top of the shield, then rotating the cutter implement clockwise (as viewed from the bottom of the trimmer). See Figure 128.

CAUTION: Whenever removing a brush or saw blade from the trimmer, grasp it with a rag or heavy gloves to avoid lacerations.

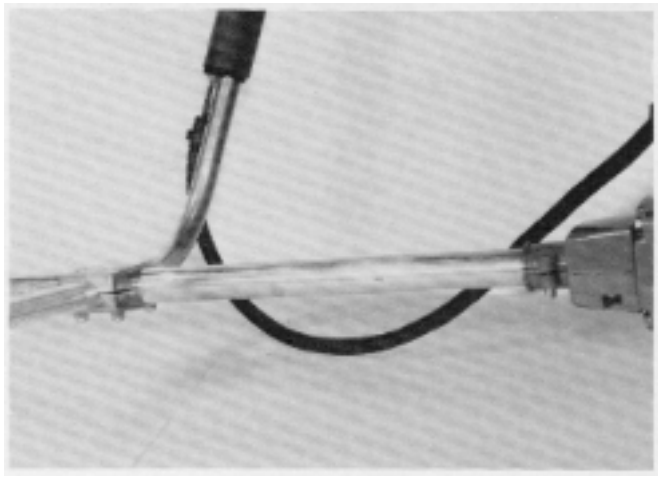

Figure 128

2. Remove the dust cap from the drive shaft.
3. Remove the three screws securing the shield to the gearbox and, on units with serial numbers 60000001 and up, remove the grass wrap shield.
4. Remove the four machine screws and nylon lock nuts that secure the two portions of the shield to the shield bracket and remove the shield.
5. Loosen the two clamping screws and one locating screws securing the gearbox to the drive tube and remove the gearbox.

Gearbox - Installation on Drive Tube

1. Before installing the gearbox make sure that the drive shaft is properly positioned in the drive tube. See Figure 129.

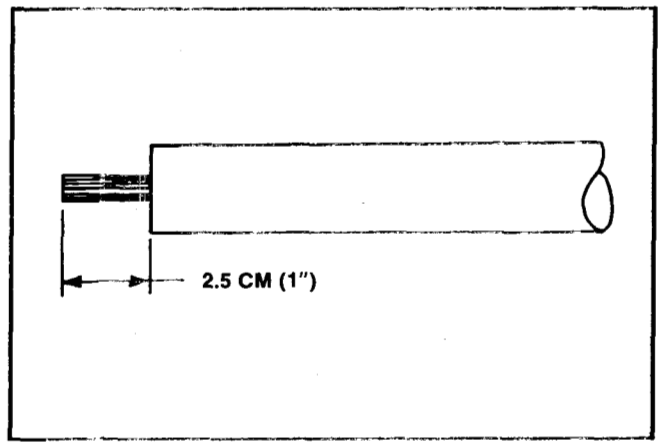

Figure 129

2. Slide the gearbox onto the drive tube. It may be necessary to rotate the cutter implement slightly to get the drive shaft to line up with the upper gear of the gearbox. Remove the locating screw and visually line up the locating screw hole and the hole in the drive tube. Insert the locating screw and tighten the single locating screw and two clamping screws. See Figure 130

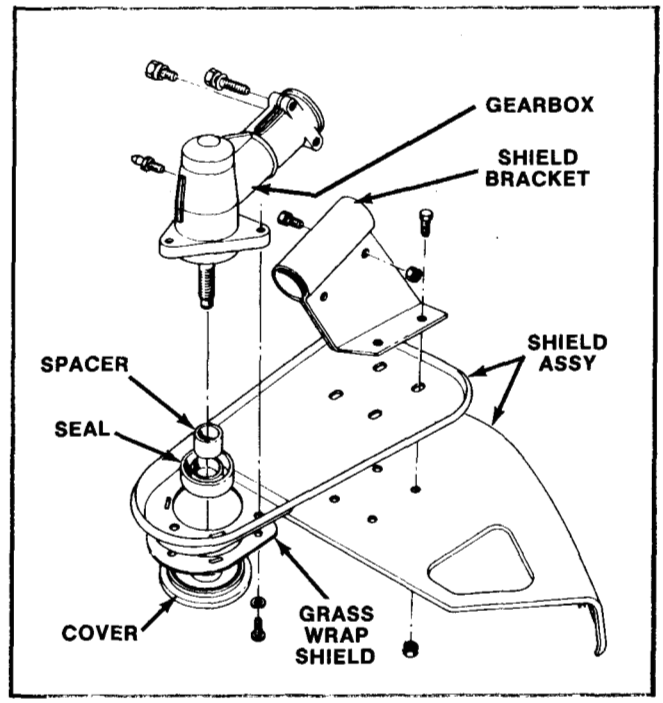

Figure 130

Gearbox - Installation On Drive Tube (cont'd)

3. Install the two portions of the shield as shown in Figure 130. Secure with the four machine screws and nylon lock nuts.
4. On units with serial numbers 6000001 and up, place the grass wrap shield around the drive shaft. See Figure 130.
5. Secure the shield (and grass wrap shield on sertain units) to the gearbox with the three Phillips head machine screws.
6. Tighten the two clamping screws on the shield bracket.
8. Install the dust cap on the gearbox drive shaft.
9. Mount the cutter implement on the drive shaft and tighten by inserting a flat bladed screwdriver into the slot in the top of the shield and turning the cutter implement counterclockwise.

Gearbox - Seal Removal

A seal is used in the lower portion of the gearbox to keep contaminants from entering as well as to retain grease within the gearbox.

1. Remove the cutter implement by inserting a flat bladed screwdriver into the hole in the top of the shield, then rotating the cutter implement clockwise (as viewed from the bottom of the trimmer). See Figure 131.

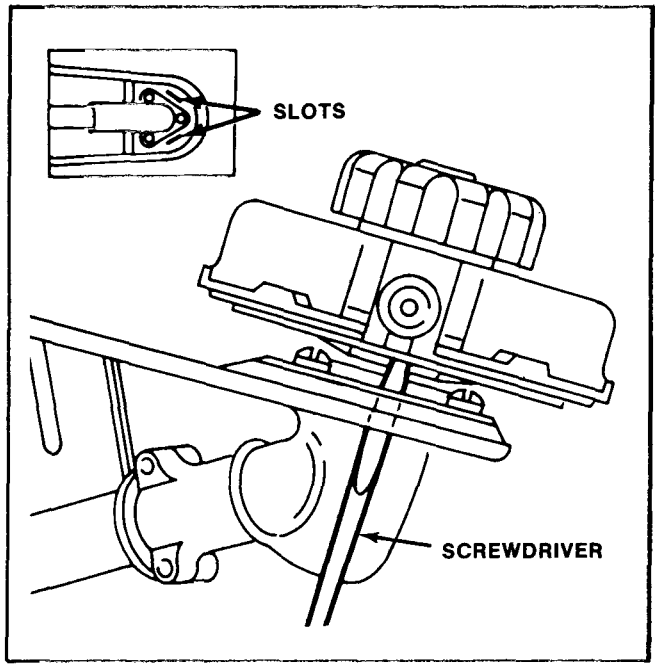

Figure 131

CAUTION: Whenever removing a brush or saw blade from the trimmer, grasp it with a rag a heavy gloves to avoid lacerations.

2. Remove the dust cap from the drive shaft.
3. Remove the sleeve from the cutter head drive shaft by grasping with a pliers and pulling straight off. See Figure 132.

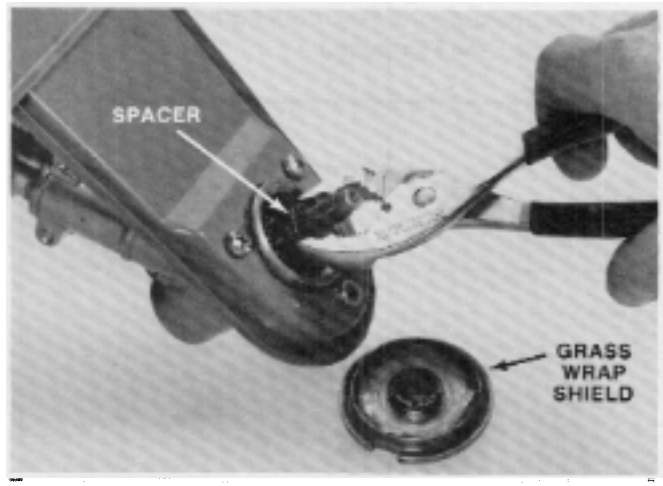

Figure 132

4. Remove the seal.

Gearbox - Seal Installation

1. Press the new seal into the gearbox with hollow portion of the seal facing the gearbox. Use a 1 1/4 inch socket to press it in.
2. Lubricate the sleeve with grease and slide on the splined shaft until it bottoms out.
3. Install the dust cap on the gearbox drive shaft.
4. Mount the cutter implement on the drive shaft and tighten by inserting a flat bladed screwdriver into the slot in the top of the shield and turning the cutter implement counterclockwise.

SECTION 11 DRIVE SHAFT AND TUBE

The drive tube and shaft assemblies used on the TC3000, TC4000 and TC5000 utilize a common shaft. This shaft is made of steel and is hardened on both ends. For positive engagement with the clutch and gearbox, a nine tooth spline is used on both ends.

The drive tubes vary slightly in dimension between the three straight shaft trimmers, but are similarly constructed. Each use an aluminum tube that houses five oil impregnated bushings. These bushings are positioned approximately every nine inches inside the shaft. They are supported by rubber grommets that hold them in place. See Figure 133.

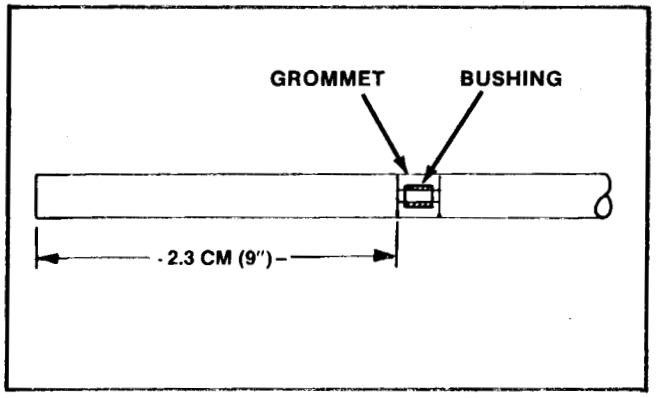

Figure 133

Neither the drive tube nor the drive shaft is serviceable. If either is worn to the point where the shaft begins to vibrate excessively, both should be replaced.

DRIVE SHAFT

Drive Shaft - Removal

1. Remove the locating screw and loosen the two clamping screws on the cutter head gearbox. See Figure 134.

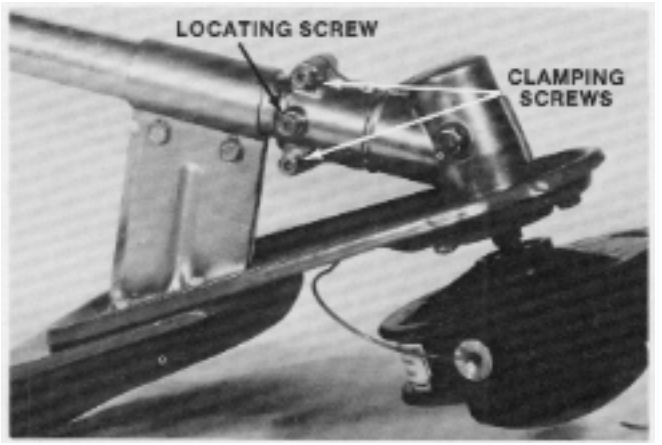

Figure 134

2. Loosen the two shield bracket screws closest to the drive tube, then pull the gearbox and shield assembly off the drive tube.
3. Pull the drive shaft from the tube being careful not to damage the splined end.
4. Inspect the shaft for excessive wear and evidence of overheating. If it appears replacement is necessary, replace both the shaft and the drive tube.

Drive Shaft - Installation

1. Grease the splined ends of the shaft to ensure that they are easy to remove if future service is necessary. Also, lubricate the smooth portion of the shaft with motor oil.
2. Slide the shaft into the drive tube until it engages the splined clutch shaft and bottoms out. The shaft should extend approximately 2.5 cm (1 inch) from the drive tube when it is fully seated. See Figure 135.

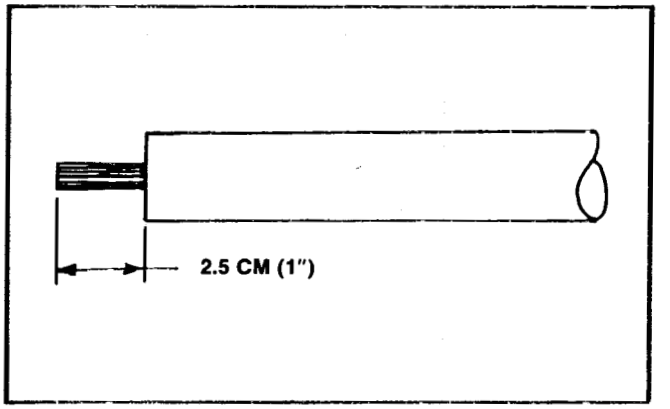

Figure 135

3. Remove the locating screw from the gearbox and slide the gearbox and shield assembly onto the drive tube.
4. Visually align the locating screw and the hole in the drive tube, then install and tighten the locating screw.
5. Tighten the two gearbox clamping screws and the shield bracket screws to secure the assembly.

DRIVE TUBE

Drive Tube - Removal

1. Remove the engine as described under **Engine - Removal from Drive Tube,** page 40.

Drive Tube - Removal (cont'd)

2. Remove the handle as described under **TC3000 Handle - Removal from Drive Tube,** page 48, **TC4000 Handle - Removal from Drive Tube,** page 48, or **TC5000 Handle - Removal from Drive Tube,** page 49.

3. Remove the control and grip as described under **Grip - Removal, page 46.**

4. Remove the gearbox locating screw then loosen the four other screws denoted by arrows in Figure 136.

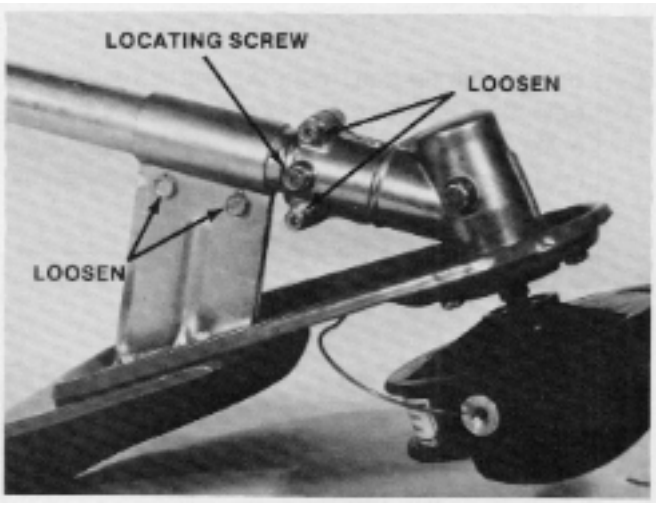

Figure 136

5. Remove the gearbox and shield assembly.

6. Remove the drive shaft from the tube being careful not to damage the splined ends of the shaft.

7. Inspect the tube for excessive wear, bends or excessive heat. Replace if necessary.

   NOTE: If it is necessary to replace the tube, the shaft should also be closely inspected as it may also require replacement.

Drive Tube - Installation

1. Mount the control and grip on the drive tube as described under **Grip - Installation,** page 47.

2. Mount the engine on the drive tube as described under **Engine - Installation on Drive Tube,** page 45.

3. Grease the splined ends of the drive shaft to ensure easy disassembly in the future. Lubricate the shaft with motor oil, and install into the drive tube. Approximately 2.5 cm (1 inch) will extend beyond the end of the drive tube once it is firmly seated.

4. Mount the gearbox and shield assembly by first removing the locating screw. Push the gearbox and shield assembly onto the tube and visually align the locating holes.

5. Secure the gearbox and shield by tightening the four screws denoted by arrows in Figure 36.

6. Mount the handle as described under **TC3000 Handle - Installation on Drive Tube,** page 48, **TC4000 Handle - Installation on Drive Tube,** page 49, or **TC5000 Handle - Installation on Drive Tube,** page 50.

SECTION 12 LEECO® MANUAL FEED HEAD

CAUTION: Never attempt any service of the trimmer head without first allowing the engine and the implement to come to a complete stop.

Leeco® Manual Feed Head - Spool Removal

1. Remove the knob on the bottom of the line feed assembly by holding the drum while turning the knob *clockwise*. See Figure 137.

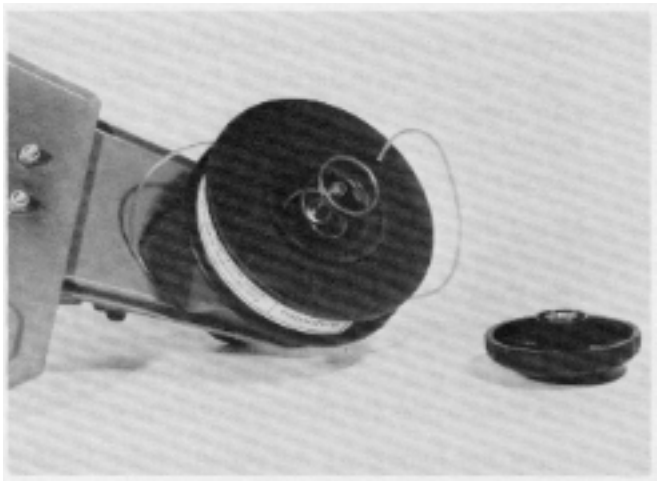

Figure 137

IMPORTANT: The knob is under slight spring pressure. Be sure to remove the knob slowly to prevent the entire trimmer head from falling off the shaft.

2. Remove the spring and spool.

Leeco® Manual Feed Head - Line Replacement

Replacement trimmer line is available from your local Toro retailer in either single line pieces or in 1-3 lb bulk packages.

The Leeco® head uses either 38 feet of 0.080" line or 20 feet of 0.095" line.

CAUTION: Do not substitute any type of wire or other string-like material as trimmer line. Use only Toro approved replacement monofilament line of .080" or .095" diameter. Use of improper line could result in personal injury.

1. To replace the trimmer line, first measure the appropriate length of line:

diameter	length
.080	38 feet
.095	20 feet

IMPORTANT: The Leeco® Head cuts with a dual line, however, DO NOT CUT THE LINE IN HALF.

2. Using a felt tip pen, mark the line at the halfway point then feed one end through each of the two holes in the hub of the spool. Pull the line through the holes until the mark you made is between the two holes in the hub. See Figure 138.

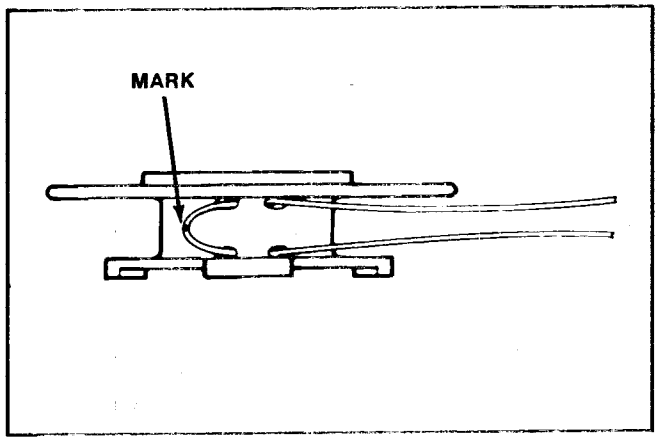

Figure 138

2. Wind the line on the spool in the direction of the arrow shown on the spool. Use no more than the recommended amount of line as it will otherwise extend beyond the spool flanges and cause binding. Avoid criss-crossing to help prevent line advancing problems later.

Leeco® Manual Feed Head - Spool Installation

1. Before installing the spool, inspect the two eyelets for wear and sharp edges. Replace if necessary.
2. Insert one end of the line into each of the two eyelets and making sure that the line on the spool does not unwind. See Figure 139.
3. Place the spring on the cutter head shaft and secure with the knob, turning the knob in counterclockwise to tighten.

   IMPORTANT: Do not over-tighten.

Leeco® Manual Feed Head - Spool Installation (cont'd)

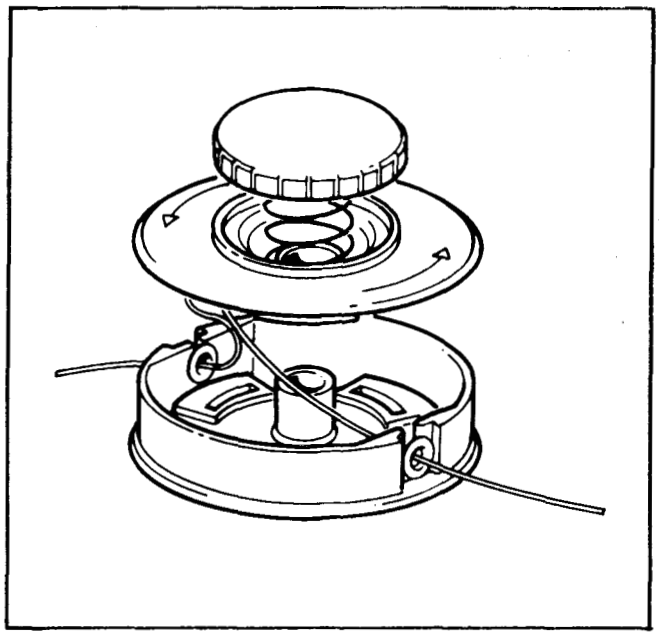

Figure 139

4. Cut off any excess line so that it does not strike the shield when fully extended.

Leeco® Manual Feed Head - Disassembly

1. Remove the head assembly by inserting a medium blade screwdriver into one of the two slots in the top of the shield. See Figure 140. This prevents the head from rotating.

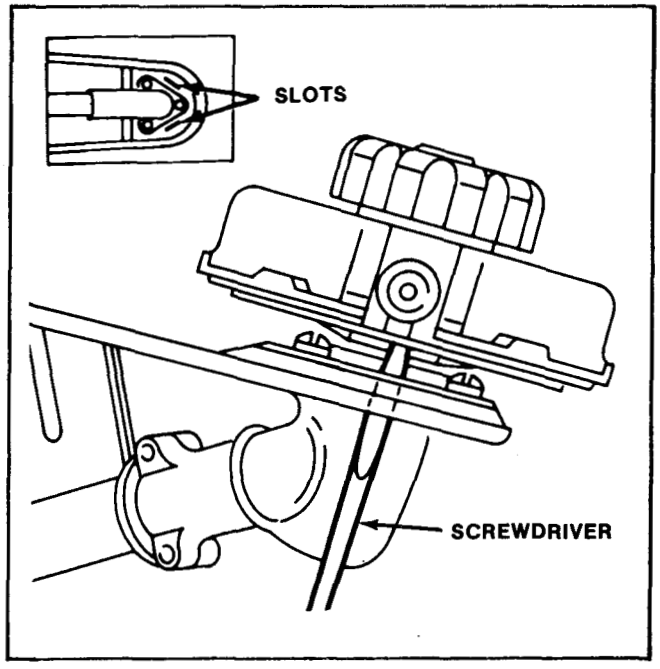

Figure 140

2. Turn the head *clockwise* to loosen and remove the head assembly from the drive shaft.
3. Hold the drum stationary while turning the knob clockwise to remove the knob. Hold onto the knob firmly as it is under slight spring pressure. Remove the knob, spring and spool.

Leeco® Manual Feed Head - Inspection

1. Inspect the drum, spool and knob for any damage which may impair their operation. Replace as required.
2. Inspect the eyelets for wear and sharp edges. Replace if necessary. They can be replaced individually.
3. Remove the cutter head shaft from the drum and inspect for damage. Replace if necessary.

Leeco® Manual Feed Head - Reassembly

1. Push the two eyelets into the slots provided in the drum making sure that they bottom out.
2. Install the cutter head shaft into the drum as shown in Figure 141.

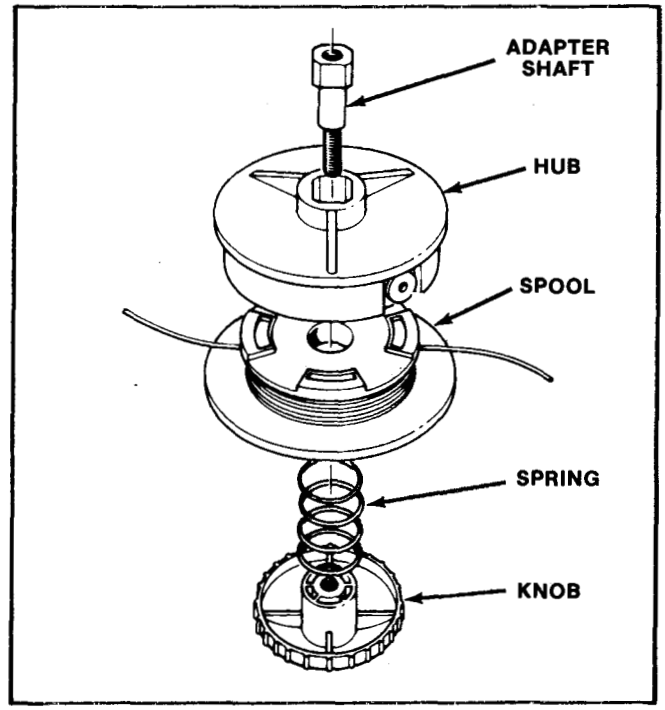

Figure 141

3. Wind line onto spool as described under **Leeco® Manual Line Feed Head - Line Replacement**, page 58.
4. Install the spool and line assembly into the drum, threading one line through each of the eyelets. See Figure 142.

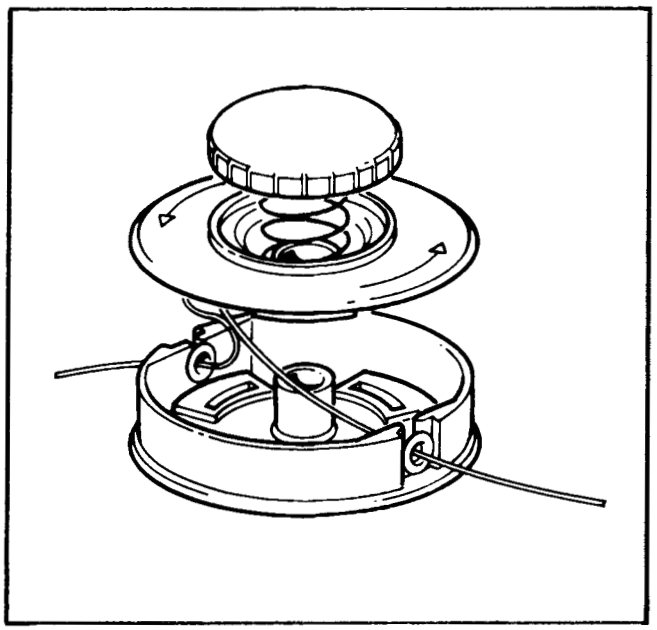

Figure 142

5. Place the spring on the cutter head shaft and secure with the knob.

   NOTE: Rotate the knob counterclockwise to tighten.

6. Reinstall the head assembly onto the drive shaft by turning counterclockwise. Insert a medium blade screwdriver into one of the slots shown in Figure 140 to prevent the drive shaft from rotating.

7. Cut off any excess line so that it does not strike the shield.

SECTION 13 KAAZ® MANUAL FEED HEAD

CAUTION: Never attempt any service of the trimmer head without first shutting off the engine and allowing the implement to come to a completer stop.

Kaaz® Manual Feed Head - Disassembly

1. Grasp the cutter head to prevent it from turning and remove the knob by turning it clockwise. See Figure 143.

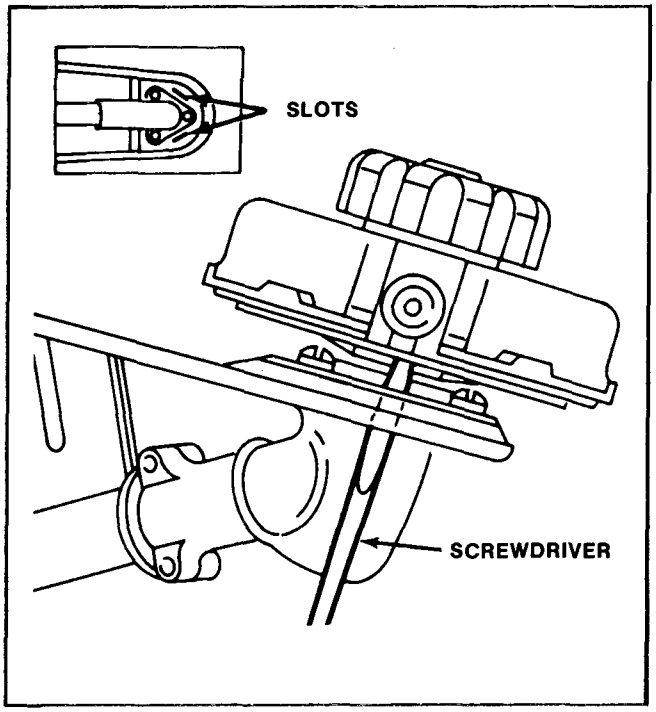

Figure 143

2. Pull the drum and spool assembly from the drive shaft.

3. Separate the drum, spool and spring being careful not to lose the two eyelets. Inspect for damaged parts and replace as necessary.

   NOTE: Inspect the internal diameter of the eyelets to ensure they are smooth. Burrs or sharp edges could cause the line to break at the eyelets.

Kaaz® Manual Feed Head - Line Replacement

Replacement trimmer line is available from your local Toro retailer in either single pieces or in 1-3 lb. bulk packages.

CAUTION: Do not substitute any type of wire or other string-like material as trimmer line. Use only Toro approved replacement monofilament line of .080" or .095" diameter. Use of improper line could result in personal injury.

1. To replace the trimmer line, first measure the appropriate length of line:

diameter	length
.080"	38 feet
.095"	20 feet

IMPORTANT: The Kaaz® Head cuts with a dual line, however, DO NOT CUT THE LINE IN HALF.

2. Using a felt tip pen, mark the trimmer line at the halfway point.

3. Thread the line through the retainer shown in Figure 144 until the mark and the retainer are aligned.

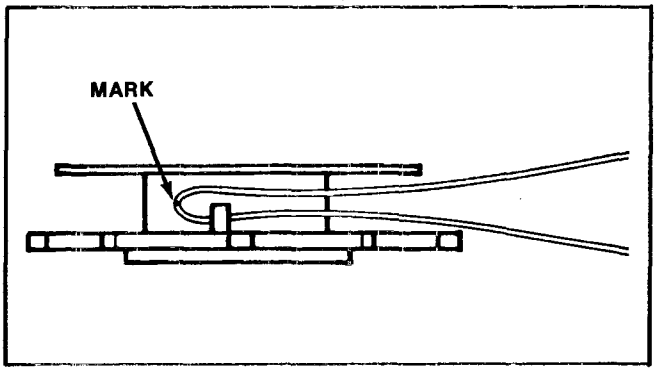

Figure 144

4. Wind the line on the spool in the direction of the arrow. Avoid criss-crossing the line as it may lead to line advancing problems later.

   NOTE: Do not allow the line to extend beyond the smaller flange as this may create binding.

Kaaz® Manual Feed Head - Reassembly

1. Prepare for reassembly by placing the spring on the drum as shown in Figure 145.

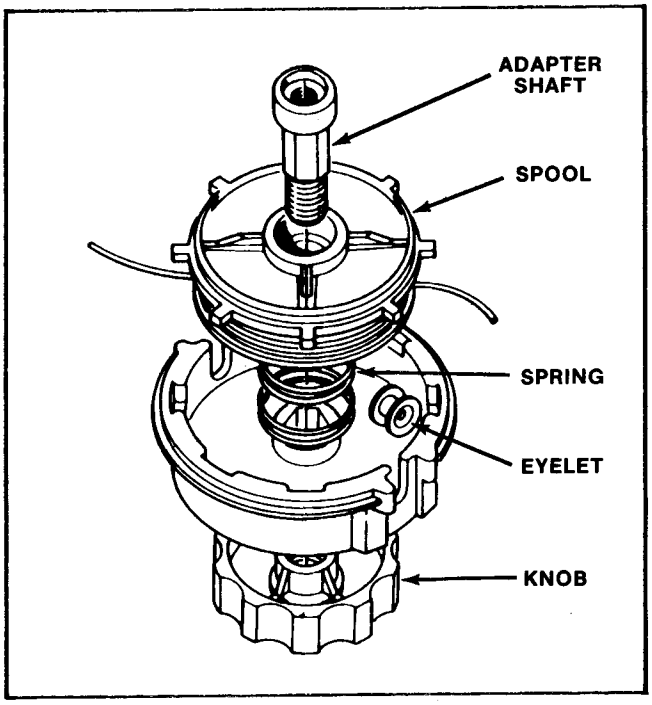

Figure 145

2. Thread one eyelet onto each end of the trimmer line and position the spool (with the small flange toward the spool) above the drum.
3. Push the eyelets into the slots in the drum making sure that they bottom out.
4. Place the spool and drum assembly on the cutter head shaft with the spool facing the shield.
5. Secure with the knob by turning counterclockwise.

   IMPORTANT: Make sure the ratchets on the spool flange line up with the recesses in the drum before tightening.
6. Adjust the length of the line so that it does not extend beyond the flange edge of the shield.

SECTION 14 PLASTIC FIXED LINE HEAD

CAUTION: Never attempt any service of the trimmer head without first allowing the engine and the implement to come to a complete stop.

Plastic Fixed Line Head - Line Replacement

The plastic fixed line head uses nylon line 2.5mm (.105") in diameter and 40 cm (16") in length.

CAUTION: Do not substitute any type of wire or other string-like material as trimmer line. Use only Toro approved replacement monofilament line of 2.5 mm (.105") diamater. Use of improper line could result in personal injury or death.

1. To replace the trimmer line, first cut the line to 40 cm (16") length.
2. Mark the center of the line with a felt tipped marker.
3. Thread the line through the cutter head guides as shown in Figure 146. Make sure that the centerline mark lines up on the cutter head shaft.

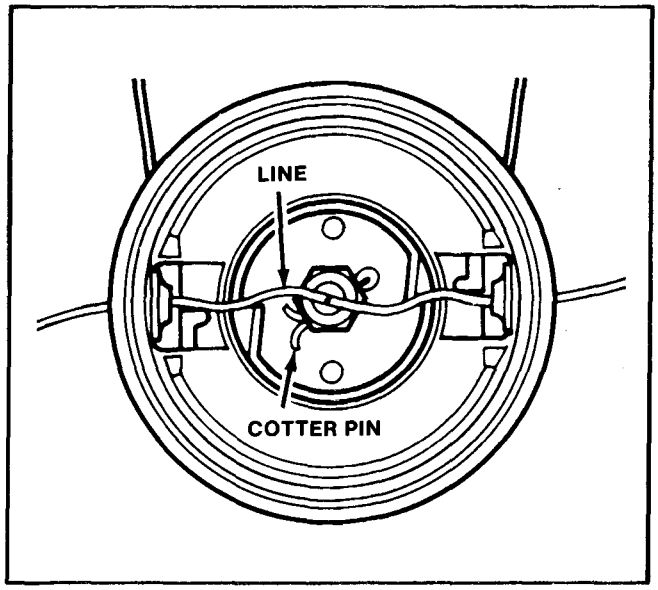

Figure 146

Plastic Fixed Line Head - Removal

1. Remove the existing cutter line from the spool.
2. Remove the cotter pin from the cutter head shaft.
3. Insert a flat bladed screwdriver into the slot in the top of the shield to prevent the cutter head from rotating during spool removal. Remove the nut by turning clockwise (as viewed from the bottom of the spool). See Figure 147.

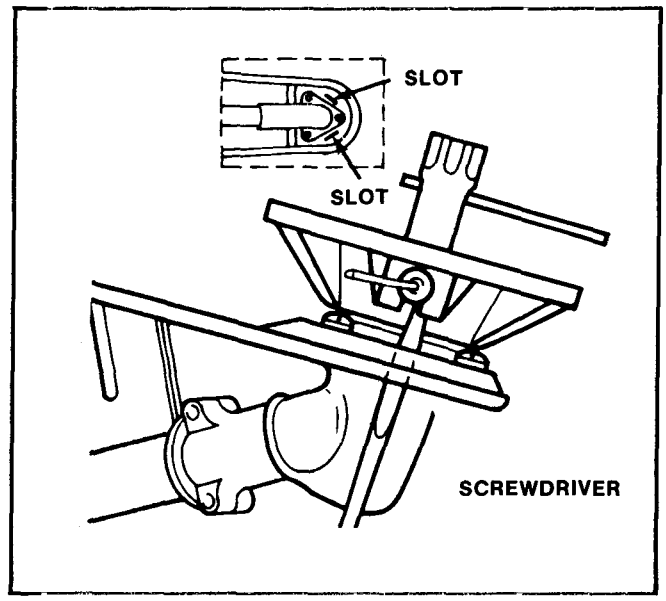

Figure 147

4. Remove the spool.
5. Inspect the spool for damage. Pay particular attention to the eyelets. Burrs in this area can lead to line breakage at the eyelet. See Figure 148.

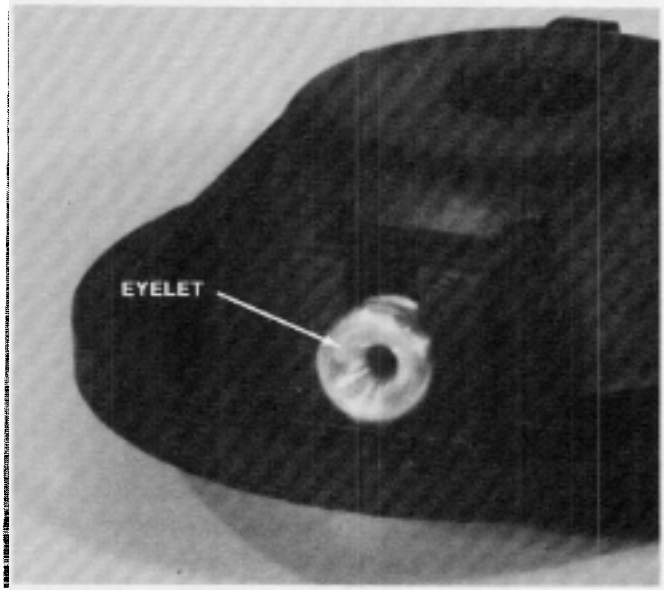

Figure 148

Plastic Fixed Line Head - Installation (cont'd)

NOTE: The following parts are required when installing the plastic fixed line head on a TC3000, TC4000 or TC5000 for the first time:

Part	Part Number
Nut	41-5410
Cotter Pin	3272-1

CAUTION: Never attempt any service of the trimmer head without first allowing the engine and the implement to come to a complete stop.

1. Mount the cutter head on the shaft. See Figure 149.

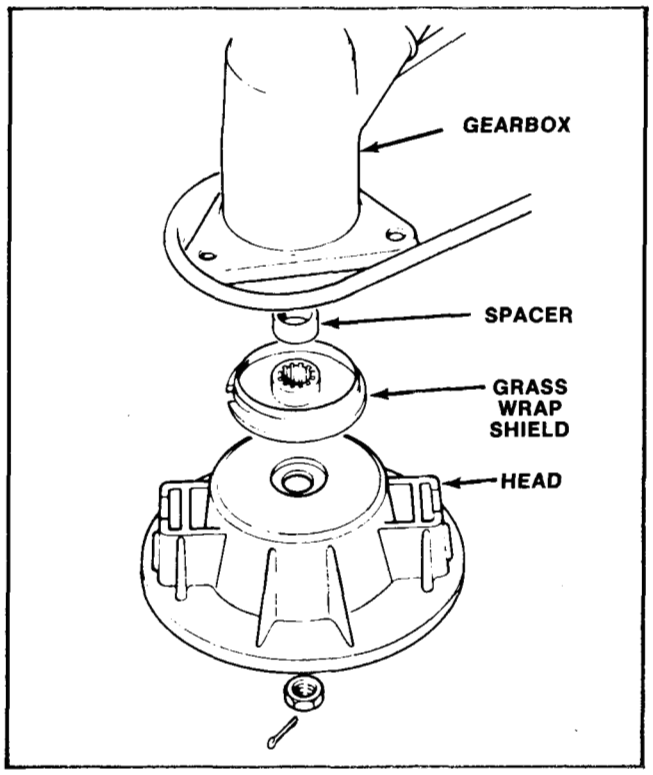

Figure 149

2. Loosely secure with the hex nut.

   NOTE: The nut has left hand threads so it will be necessary to turn it *counterclockwise* to get it started.

3. Insert a flat bladed screwdriver into the slot in the top of the shield to prevent the cutter head from rotating as shown in Figure 147.

4. Tighten the nut and install the cotter pin to prevent the nut from backing out.

5. Install the trimmer line as described under **Plastic Fixed Line Head - Line Replacement,** page 63.

SECTION 15 METAL FIXED LINE HEAD

CAUTION: Never attempt any service of the trimmer head without first allowing the engine and the implement to come to a complete stop.

Metal Fixed Line Head - Line Replacement

The aluminum fixed line head uses either 2.5 mm (.105") or 3.3 mm (.130") line. Because of the added load put on the engine when using the thicker line, be sure to cut the line to the proper length:

diameter	length
2.5mm (.105")	40.5 cm (16")
3.3 mm (.130")	35.5 cm (14")

1. To replace the trimmer line, first cut the line to the proper length mentioned above.

2. Mark the center of the line with a felt tipped marker.

3. Thread the line through the cutter head guides as shown in Figure 150. Make sure that the centerline mark lines up on the cutter head shaft.

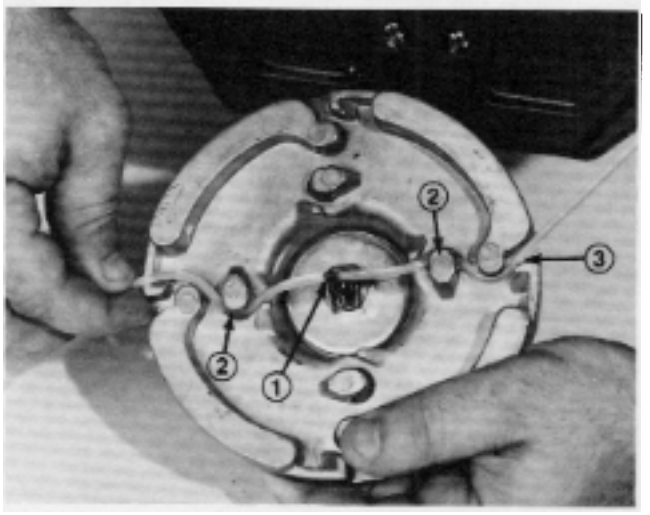

Figure 150

1. Center of line 2. Outer projections 3. Position in slot

IMPORTANT: While it is possible to use two lines with the metal fixed line head, best cutting results are obtained by using only one line.

Metal Fixed Line Head - Removal

1. Remove the existing cutter line from the spool.

2. Remove the cotter pin from the cutter head shaft.

3. Insert a flat bladed screwdriver into the slot in the top of the shield to prevent the cutter head from rotating during spool removal. Remove the nut by turning *clockwise* (as viewed from the bottom of the spool). See Figure 151.

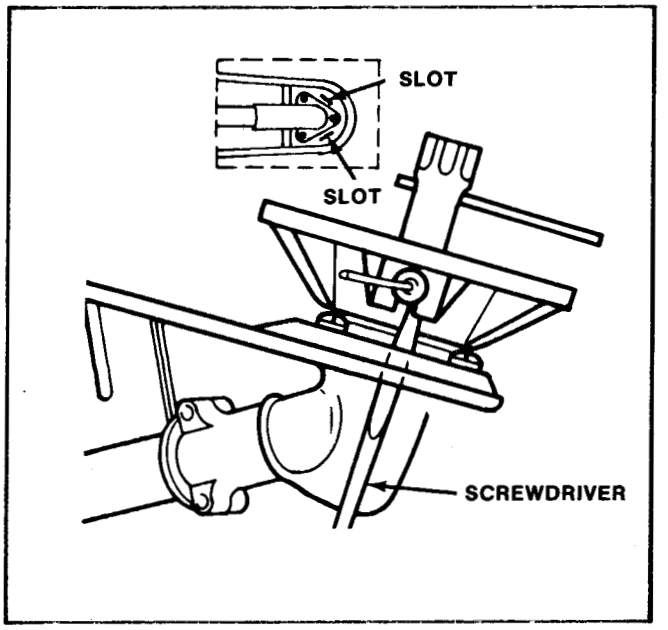

Figure 151

4. Remove the spool being careful not to lose the insert.

5. Inspect the spool for damage. Pay particular attention to the area where the line exits the spool. Burrs in this area can lead to premature line breakage at the point where it exits the spool. See Figure 152.

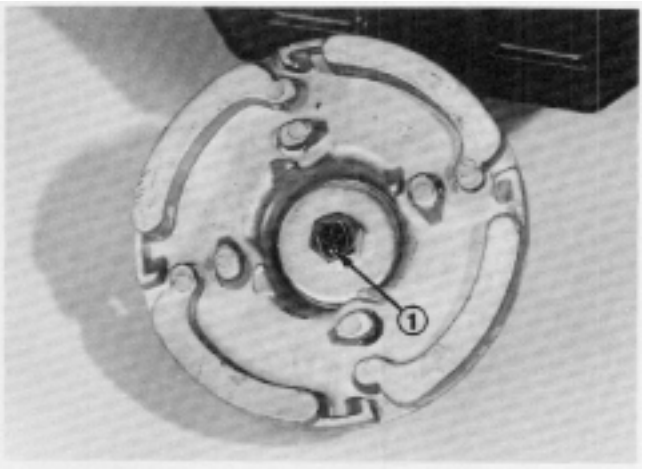

Figure 152

1. Cotter pin 2. Check for burrs

Metal Fixed Line Head - Installation

NOTE: The following parts are required when installing the metal fixed line head on a TC3000, TC4000 or TC5000 for the first time:

Part	Part Number
Plate Washer	41-4430
Nut	41-5410
Cotter Pin	3272-1

CAUTION: Never attempt any service of the trimmer head without first allowing the engine and the implement to come to a complete stop.

1. Place the insert around the flange on the lower gearbox cover. See Figure 153.

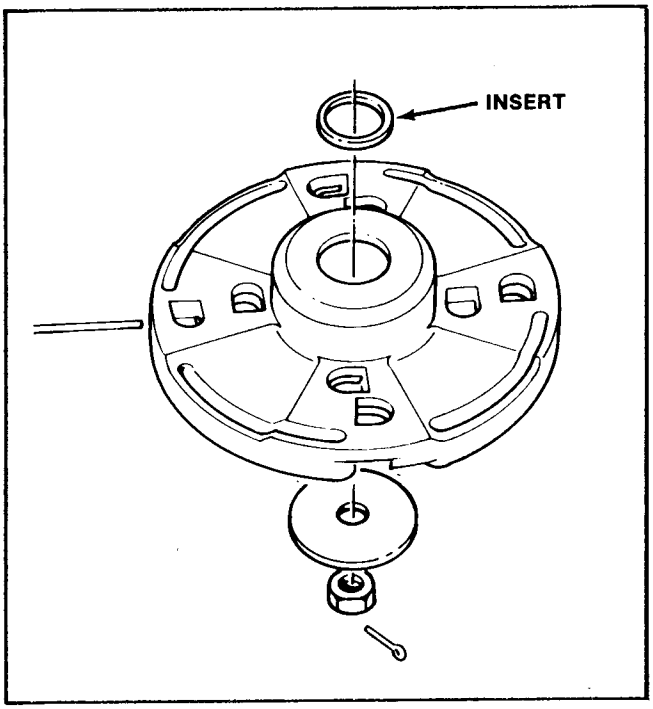

Figure 153

2. Mount the cutter head.
3. Place the plate washer on the shaft and loosely secure the cutter head assembly with the nut.

   NOTE: The cut has left hand threads so it will be necessary to it counterclockwise to get it started.
4. Insert a flat bladed screw driver into the slot in the top of the shield to prevent the cutter head from rotating as shown in Figure 151.

   Tighten the nut and install the cotter pin to prevent the nut from backing out. See Figure 154.

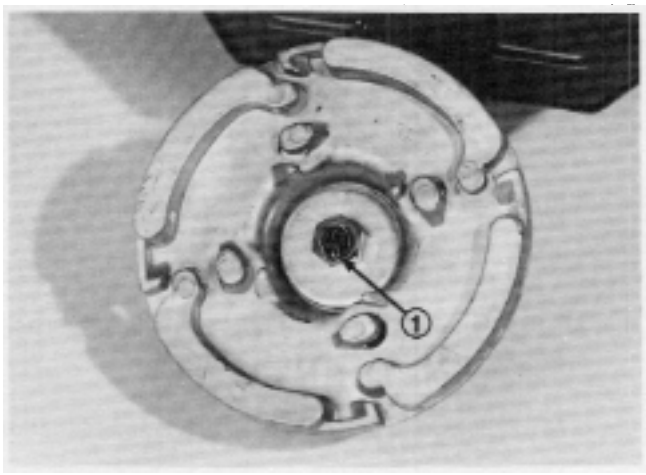

Figure 154

1. Cotter pin

5. Install the trimmer line as described under **Metal Fixed Line Head - Line Replacement**, page 65.

SECTION 16 TAP AND TRIM® HEAD

CAUTION: Never attempt any service of the trimmer head without first shutting off the engine and allowing the implement to come to a complete stop.

TAP AND TRIM® LINE REPLACEMENT

Tap and Trim® Spool - Removal

1. Insert a medium blade screwdriver into one of the two slots on the bottom of the spool and twist 1/4 turn to release the spool. See Fig. 155.

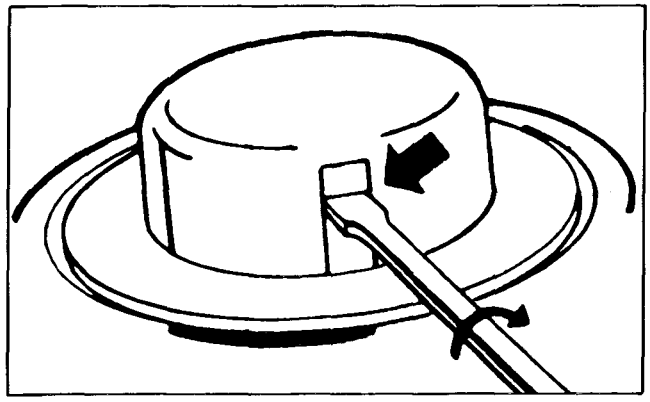

Figure 155

2. Remove the spool.

Tap and Trim® Spool - Line Replacement

Prewound Tap and Trim® spools are available through your local Toro retailer. If using a prewound spool, skip down to Tap and Trim® Spool Installation below.

While prewound spools are convenient, a more economical approach is to wind new line on the existing spool. Toro monofilament line can be purchased in bulk under Toro part number 41-6830 for one pound or 41-6830 for 3 pounds.

CAUTION: Do not substitute any type of wire or other string-like material as trimmer line. Use only Toro approved replacement monofilament line of .080" diameter. Use of improper line could result in personal injury.

1. To wind replacement line on the spool, first hook one end of the line into the keyhole slot in the top flange of the spool. See Fig. 156.

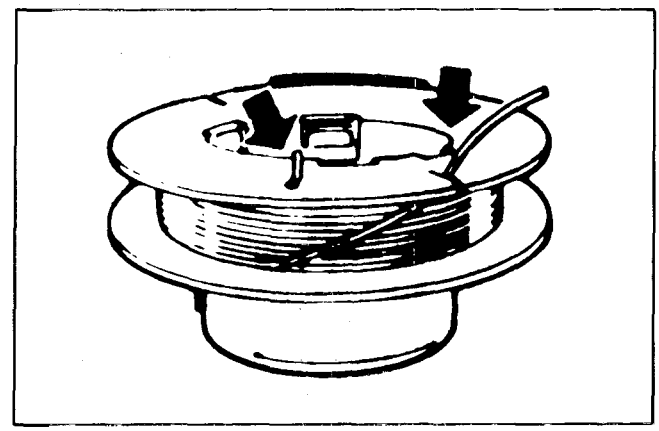

Figure 156

2. Wind the line on the spool in the direction of the arrow. Use no more than 38 feet of line as it will otherwise extend beyond the spool flanges and cause binding. Avoid criss-crossing to help prevent line advancing problems later.
3. Hook the end of the line in one of the two slots provided in the upper flange of the spool to keep the line tight while installing the spool.
4. Cut the line protruding from the keyhole slot so that only 1/2 inch remains.

Tap and Trim® Spool - Installation

1. Align the keys molded into the core with the eyelet on the drum. It may be necessary to depress the core and rotate to get the keys to line up properly. See Fig. 157

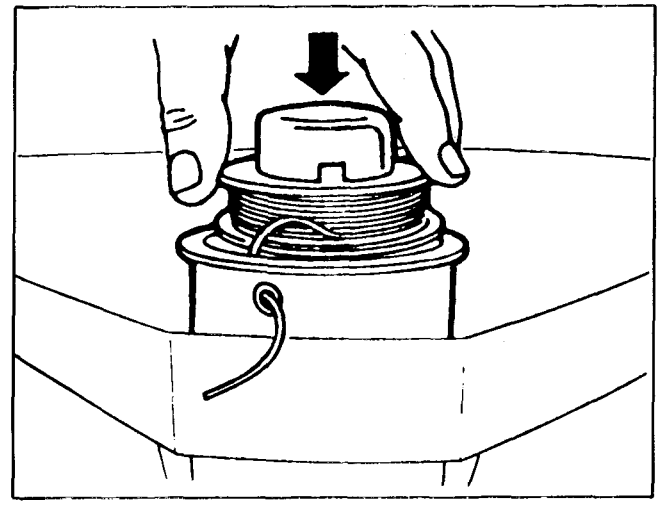

Figure 157

Tap and Trim Spool - Installation (cont'd)

2. With the trimmer line still in the slot in the top of the spool flange, thread the line through the eyelet in the drum.
3. Align the two screwdriver slots with the keys in the core and push the spool partially onto the core.
4. Pull on the line to release it from the spool flange then push the spool firmly onto the core until it "snaps" into place.

TAP AND TRIM® HEAD

Tap and Trim® Head - Disassembly

1. Insert a medium blade screwdriver into one of the two slots on the bottom of the spool and twist 1/4 turn to release the spool.
2. Remove the spool.
3. While holding the drum stationary, unscrew the core and driver assembly by rotating them counterclockwise.
4. Remove the core, the driver, the washer and the spring.
5. Pull the drum up and off the drive shaft.

Tap and Trim® Head - Inspection

1. Inspect the drum for any obvious damage to the plastic.
2. Make sure that the eyelet in the drum is intact and that the areas that contact the trimmer line are smooth.
3. Check that the rivet directly opposite the eyelet is still in place. (The purpose of the rivet is to counterbalance the eyelet.)

Tap and Trim® Head - Reassembly

1. Mount the drum on the drive shaft making sure that it mates properly with the coil pin.
2. Center the spring on the drive shaft and then place the washer, driver and core onto the shaft as an assembly. See Fig. 158.

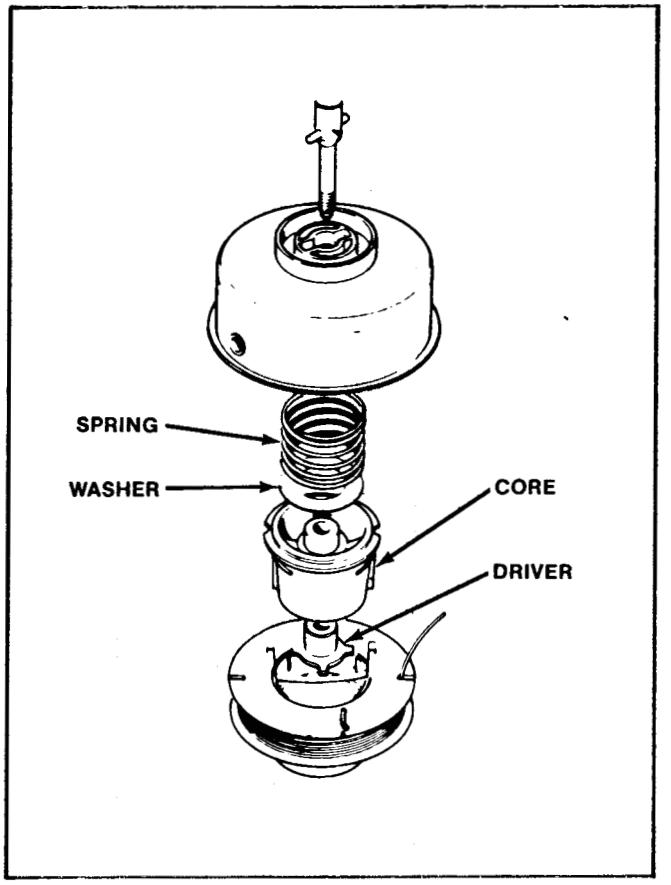

Figure 158

3. Screw the core and driver onto the drive shaft while holding the drum. It may be necessary to press on the driver in order to get it started on the threads. Screw the driver/core assembly on finger tight.
4. Make sure that the core indexes freely on the driver.
5. Install the spool as described under **Tap and Trim® Spool - Installation,** page 67.

SECTION 17 METAL BLADES

Toro offers two 20 cm (8 inches) blades that fit the straight shaft trimmer line. The eight tooth blade is designed for cutting brush and heavy weeds up to about 1.3 cm (1/2 inches). The eighty tooth blade should be used in heavy brush and if scrub trees greater than 2 cm (3/4") are present.

When using either blade, a harness is required to help maintain adequate control.

CAUTION: Never attempt any service of the trimmer head without first shutting off the engine and allowing the implement to come to a complete stop.

Metal Blade - Removal

1. Remove the cotter pin from the cutter head drive shaft.
2. Insert a flat bladed screwdriver into the slot in the top of the shield to prevent the blade from rotating during removal. See Figure 159.

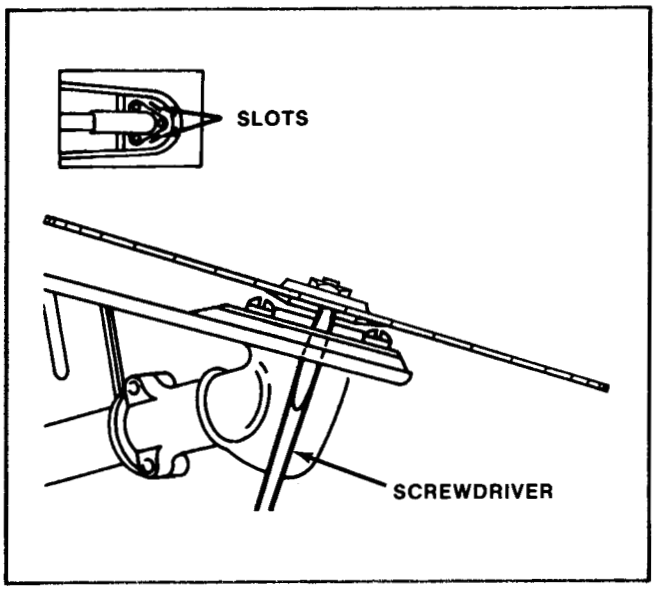

Figure 159

3. Remove the nut securing the blade by turning *clockwise* (the nut uses left hand threads).
4. Remove the blade adapter and blade. Inspect the blade for damage or cracks and replace if necessary.

Metal Blade - Installation

Note: If you are installing either the saw blade or the brush blade for the first time, you will require the Metal Blade Adapter Kit for Gas Trimmer, Toro part number 41-4440.

1. Mount the blade on the cutter head shaft. There should be a perfect fit between the lower gearbox cover flange and the hub on the blade.

   IMPORTANT: It is important to install the blade with the teeth pointing in the correct direction. Make sure that they are pointing as shown in Figure 160.

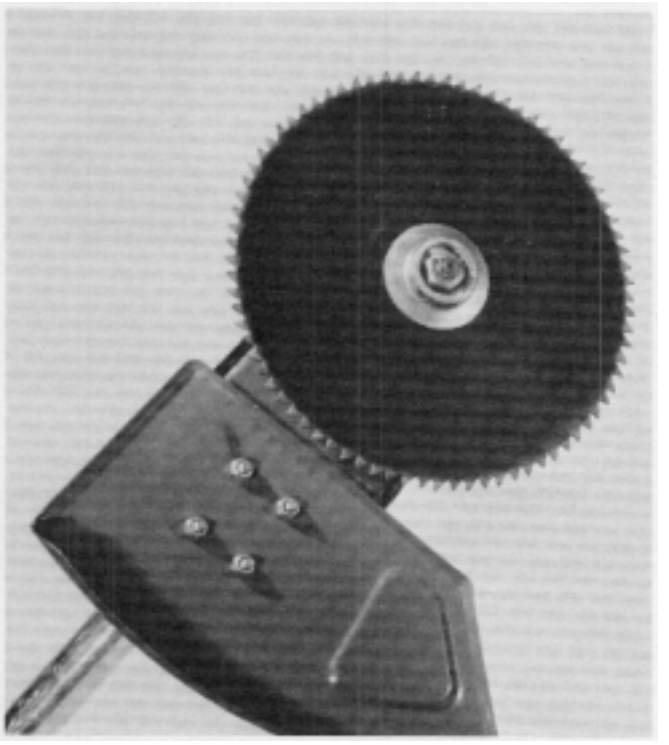

Figure 160

2. Place the blade adapter on the shaft and loosely secure with the hex nut.

   NOTE: The hex nut uses left hand threads and therefore must be turned *counterclockwise* to tighten.

3. Insert a flat bladed screwdriver into the slot in the top of the shield to prevent the blade from turning while tightening the nut. See Figure 159.

CAUTION: The teeth on the metal blades are very sharp. Heavy gloves are recommended when installing or removing the blade.

4. Insert a cotter pin in the shaft to prevent the hex nut from backing out.

SECTION 18 HARNESSES

Standard and Deluxe Harness - Assembly

1. (TC3000 and TC4000) Slip the ring into the throttle control. See Figure 161.

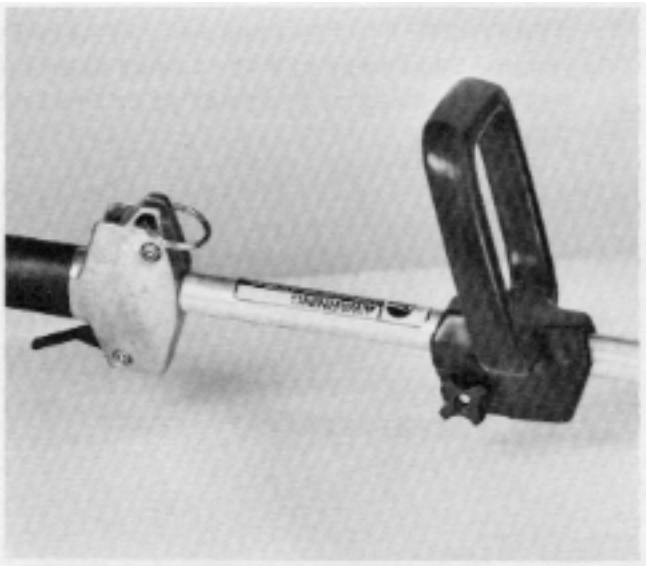

Figure 161

(TC5000) Mount the clamp and ring assembly onto the tube approximately 15 cm (6 inches) below the isomount housing. Secure with the nut and machine screw. See Figure 162.

3. Adjust the harness so that the trimmer line or blade rotates in a nearly level plane with a slight forward tilt.

4. (Deluxe Harness Only) Fasten the belt by threading the loose end through the buckle. See Figure 163.

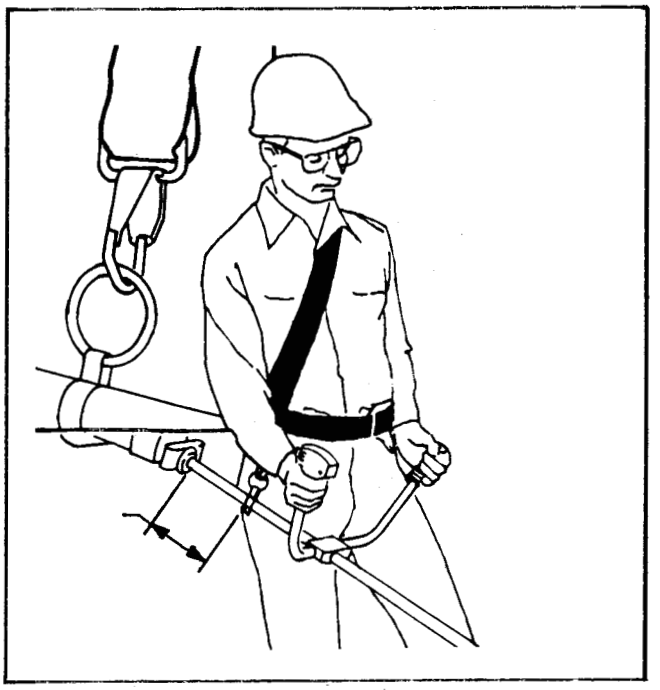

Figure 162

Figure 163

SECTION 19 Spark Arrestor Muffler

Spark arrestor mufflers are available for the straight shaft trimmers. These mufflers use a metal screen at the muffler to prevent sparks from exiting the muffler chamber.

They are recommended when trimming in dry areas and may be required by state or local laws.

Spark Arrestor Muffler - Removal

1. Remove the three screws that secure the muffler cover to the engine and remove the cover. See Figure 164.

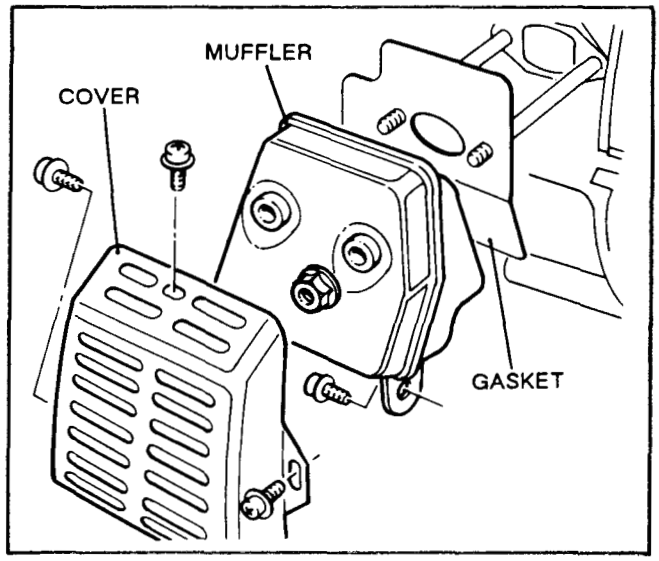

Figure 164

2. Remove the two nuts securing the muffler to the engine and the Phillips head screw near the fuel tank. Remove the muffler.
3. Remove the two Phillips head screws that secure the arrestor screen to the muffler and remove the screen.

Spark Arrestor Muffler - Installation

1. If installing the spark arrestor muffler for the first time, remove the original muffler cover and muffler.
2. Place the muffler gasket on the studs and install the muffler. Secure with the two hex nuts and the Phillips head screw.
3. Install the new muffler cover with three Phillips head screws.

Spark Arrestor Muffler - Maintenance

After every 50 hours of use, the arrestor screen and muffler body should be removed and soaked in a commercial carbon remover per the manufacturer's instructions.

1. Remove the muffler as described under **Spark Arrestor Muffler - Removal,** page 71.
2. Remove the two screws securing the spark arrestor to the muffler. See Figure 165

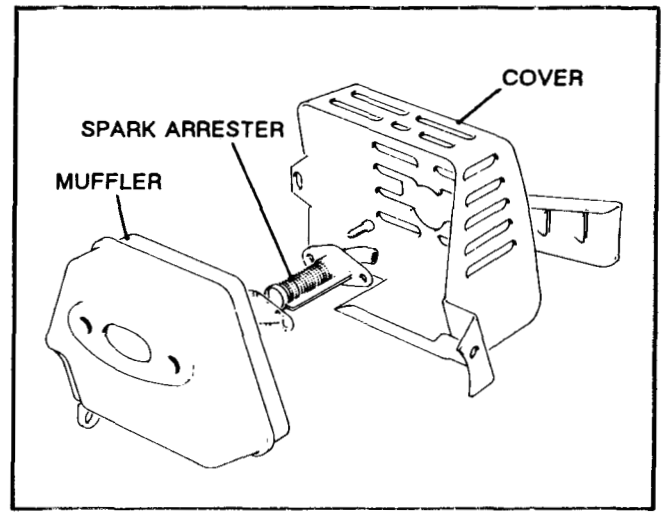

Figure 165

3. Soak the muffler and the spark arrestor screen in a commercial carbon remover per the manufacturer's instructions.
4. Blow out any loose carbon with compressed air.

IMPORTANT: Before reinstalling the muffler, be sure to remove all loose carbon particles or engine damage may result.

5. Reinstall the muffler as described under **Spark Arrestor Muffler - Installation,** page 71.