

DISASSEMBLY



WARNING

Accidental starts! Before servicing the engine or equipment, always disconnect the spark plug leads to prevent the engine from starting accidentally. Ground the leads to prevent sparks that could cause fires. Make sure the equipment is in neutral.

GENERAL

Clean all parts thoroughly as the engine is disassembled. Only clean parts can be accurately inspected and gauged for wear or damage. There are many commercially available cleaners that will quickly remove grease, oil and grime from engine parts. When such a cleaner is used, follow the manufacturer's instructions and safety precautions carefully.

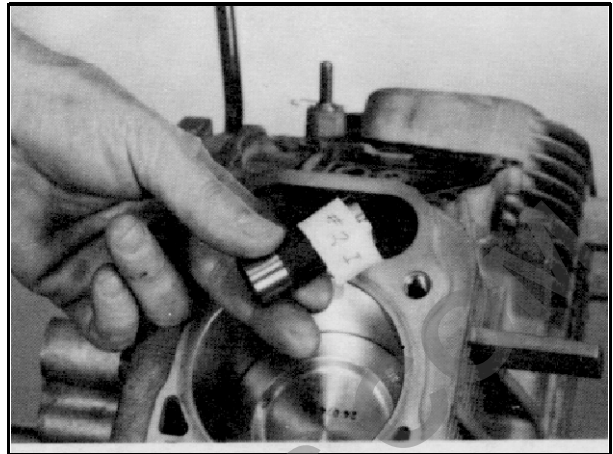
Make sure all traces of the cleaner are removed before the engine is reassembled and placed into operation. Even small amounts of these cleaners can quickly break down the lubricating properties of engine oil.

Typical Disassembly Sequence

The following sequence is suggested for complete engine disassembly. The sequence can be varied to accommodate options or special equipment.

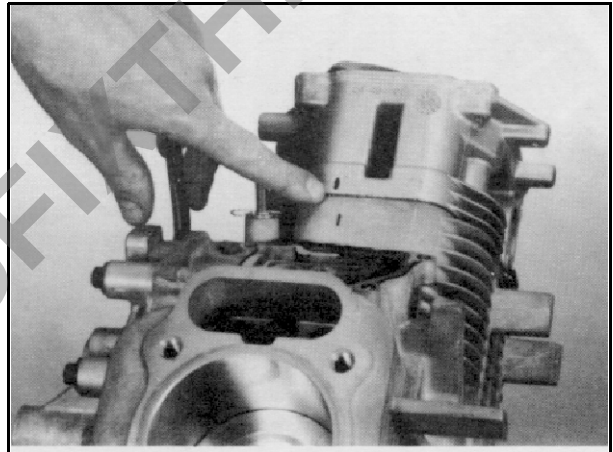
1. Disconnect spark plug leads.
2. Shut off and/or drain all fuel from the tank.
3. Drain oil from crankcase and remove oil filter.
4. Remove muffler.

5. Remove air cleaner assembly.
6. Remove control panel (if so equipped).
7. Remove fuel pump.
8. Remove throttle controls.
9. Remove external governor controls.
10. Remove carburetor.
11. Remove electric starter motor.
12. Remove outer baffles and blower housing.
13. Remove Oil Sentry™ (if so equipped).
14. Remove inner baffles and breather cover.
15. Remove valve covers.
16. Remove ignition modules.
17. Remove intake manifold.
18. Remove spark plugs.
19. Remove cylinder heads and hydraulic lifters.
20. Remove grass screen and fan.
21. Remove flywheel.
22. Remove stator and backing plates.
23. Remove closure plate assembly.
24. Remove camshaft.
25. Remove connecting rods with pistons and rings.
26. Remove crankshaft.
27. Remove governor cross shaft.



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Mark Position of Hydraulic Lifters

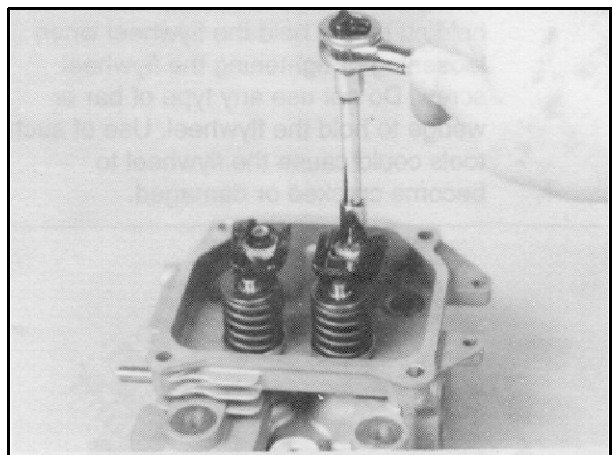


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Match Marks on Cylinder Barrel and Heads

Disassemble Cylinder Heads

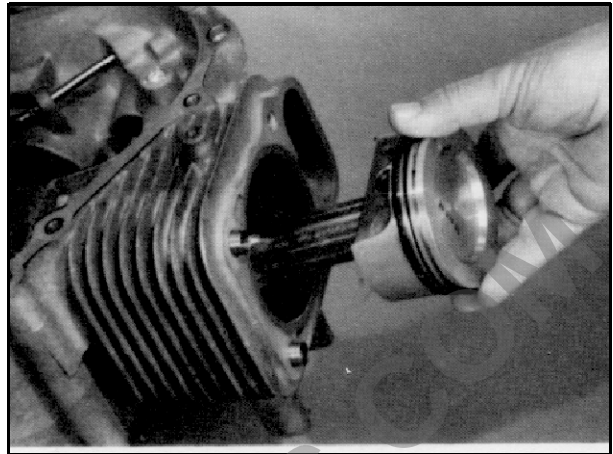
1. Remove the two hex. flange screws, rocker arm pivots and rocker arms from cylinder head.



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Removing Rocker Arms

2. Carefully remove the connecting rod and piston assembly from the cylinder bore.
3. Repeat the above procedures for the other connecting rod and piston assembly.

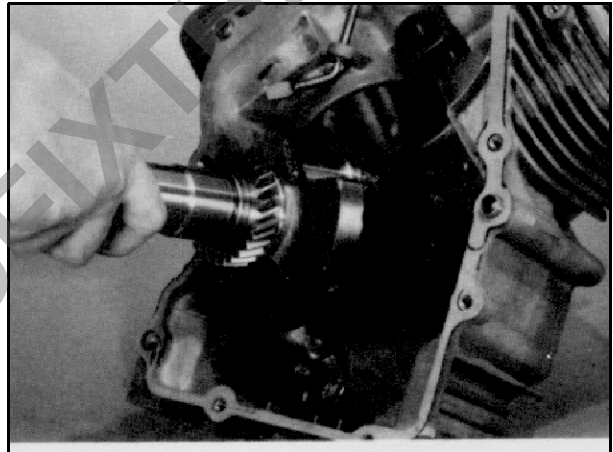


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Removing Piston/Connecting Rod Assemblies

Remove Crankshaft

1. Carefully pull the crankshaft from the crankcase. Note thrust ring washers and shims if used.

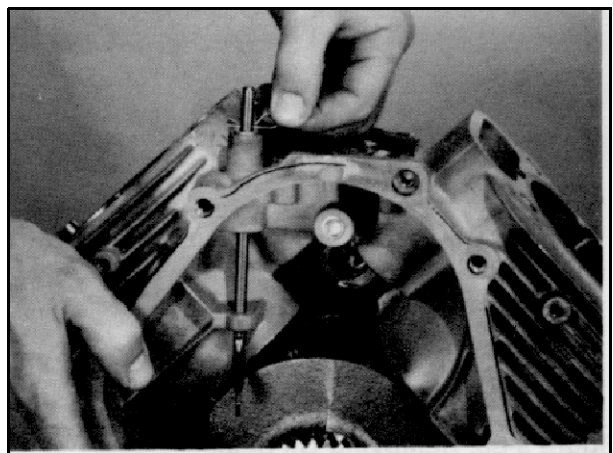


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Removing Crankshaft

Remove Governor Cross Shaft

1. Remove the hitch pin and plain washer from the governor cross shaft.



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Removing Governor Cross Shaft Hitch Pin

Valve and Valve Lifters (Cont'd)

Intake Valve Guide I.D.

New	7.038/7.058 mm (0.2771/0.2779 in.)
Max. Wear Limit	7.134 mm (0.2809 in.)

Exhaust Valve Guide I.D.

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TROUBLESHOOTING

Troubleshooting Guide

When troubles occur, be sure to check the simple causes which, at first, may seem too obvious to be considered. For example, a starting problem could be caused by an empty fuel tank.

Some common causes of engine troubles are listed below. Use these to locate the causing factors.

Engine Cranks but will not Start

1. Empty fuel tank.
2. Fuel shutoff valve closed.
3. Dirt or water in the fuel system.
4. Clogged fuel line.
5. Spark plug lead disconnected.
6. Key switch or kill switch in "off" position.
7. Faulty spark plugs.
8. Faulty ignition module.
9. Smart Spark™ malfunction (CH22 & CH25).
10. Carburetor solenoid malfunction.

Engine Starts but does not Keep Running

1. Restricted fuel tank cap vent.
2. Dirt or water in the fuel system.
3. Faulty choke or throttle controls.
4. Loose wires or connections that short the kill terminal of ignition module to ground.
5. Faulty cylinder head gasket.
6. Faulty carburetor.

Engines Starts Hard

1. PTO drive is engaged.
2. Dirt or water in the fuel system.
3. Clogged fuel line.
4. Loose or faulty wires or connections.
5. Faulty choke or throttle controls.
6. Faulty spark plugs.
7. Low compression.
8. Weak spark.

Engine will not Crank

1. PTO drive is engaged.
2. Battery is discharged.
3. Safety interlock switch is engaged.
4. Loose or faulty wires or connections.
5. Faulty key switch or ignition switch.
6. Faulty electric starter or solenoid.
7. Seized internal engine components.

Engine Runs but Misses

1. Dirt or water in the fuel system.
2. Spark plug lead disconnected.
3. Loose wires or connections.
4. Engine overheated.
5. Faulty ignition module.
6. Faulty spark plugs.
7. Carburetor adjusted incorrectly.
8. Smart Spark™ malfunction (CH22 & CH25).

Engine will not Idle

1. Restricted fuel tank cap vent.
2. Dirt or water in the fuel system.
3. Faulty spark plugs.
4. Idle fuel adjusting needle improperly set.
5. Idle speed adjusting screw improperly set.
6. Low compression.
7. Stale fuel and/or gum in carburetor.

Engine Overheats

1. Air intake/grass screen, cooling fins, or cooling shrouds clogged.
2. Excessive engine load.
3. Low crankcase oil level.
4. High crankcase oil level.
5. Faulty carburetor.
6. Lean fuel mixture.
7. Smart Spark™ malfunction (CH22 & CH25).

Specifications, Tolerances, and Special Torque Values

Description

General Specifications

Power (@ 3600 RPM, corrected to SAE J1349)

CH18 13.4kW(18HP)

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Periodic Maintenance**WARNING****Accidental Starts!**

Before servicing the engine or equipment, always disconnect the spark plug leads to prevent the engine from starting accidentally. Ground the leads to prevent sparks that could cause fires. Make sure the equipment *is* in neutral.

Maintenance Schedule

These required maintenance procedures should be performed at the frequency stated in the table. They should also be included as part of any seasonal tune up.

Frequency	Maintenance Required	Refer to:
Daily or Before Starting Engine	Fill fuel tank. Check oil level. Check air cleaner for dirty ¹ , loose, or damaged parts. Check air intake and cooling areas, clean as necessary ¹ .	Section 5 Section 6 Section 4 Section 4
Every 25 Hours	Service precleaner element ¹ .	Section 4
Every 100 Hours	Service air cleaner element ¹ . Change oil. Remove cooling shrouds and clean cooling areas ¹ .	Section 4 Section 6 Section 4
Every 200 Hours	Change oil filter. Check spark plug condition and gap.	Section 6 Section 8

¹ Perform these maintenance procedures more frequently under extremely dusty, dirty conditions.

Storage

If the engine will be out of service for two months or more, use the following storage procedure:

1. Clean the exterior surfaces of the engine.
2. Change the oil and oil filter while the engine is still warm from operation. See "Change Oil and Oil Filter" in Section 6.
3. The fuel system must be completely emptied, or the gasoline must be treated with a stabilizer to prevent deterioration. If you choose to use a stabilizer, follow the manufacturer's

recommendations, and add the correct amount for the capacity of the fuel system. Fill the fuel tank with clean, fresh gasoline. Run the engine for 2 to 3 minutes to get stabilized fuel into the carburetor.

To empty the system, drain the fuel tank and carburetor, or run the engine until the tank and system are empty.

4. Remove the spark plugs and add one tablespoon of engine oil into each spark plug hole. Install plugs and **ground** spark plug leads do not connect the leads to the plug. Crank the engine two or three revolutions.
5. Store the engine in a clean, dry place.

GT18, GT20, GT22 REPAIR MANUAL

CONTENTS



SECTION 1 - ENGINE SYSTEMS

SECTION 2 - ELECTRICAL

SECTION 3 - PTO SYSTEM

SECTION 4 - HYDROSTATIC TRANSMISSIONS

SECTION 5 - HYDRAULICS

SECTION 6 - STEERING AND FRONT AXLE

SECTION 7 - LIFT LINKAGE

SECTION 8 - SPECIFICATIONS

SECTION 9 - MOWER DECKS

Adjustments

NOTE: Do not tamper with the governor setting. Overspeed is hazardous and could cause personal injury.

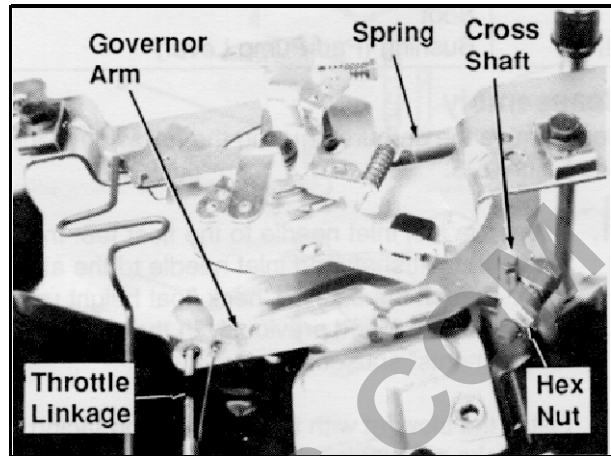
General

The governed speed setting is determined by the position of the throttle control. It can be variable or constant, depending on the engine application.

Initial Adjustment

Make this adjustment whenever the governor arm is loosened or removed from the cross shaft. Adjust as follows:

1. Make sure the throttle linkage is connected to the governor arm and the throttle lever on the carburetor.
2. Loosen the hex. nut holding the governor lever to the cross shaft.
3. Move the governor lever TOWARDS the carburetor as far as it will move (wide open throttle) and hold in position.
4. Insert a nail into the hole on the cross shaft and rotate the shaft COUNTER- CLOCKWISE as far as it will turn, then tighten hex. nut securely.



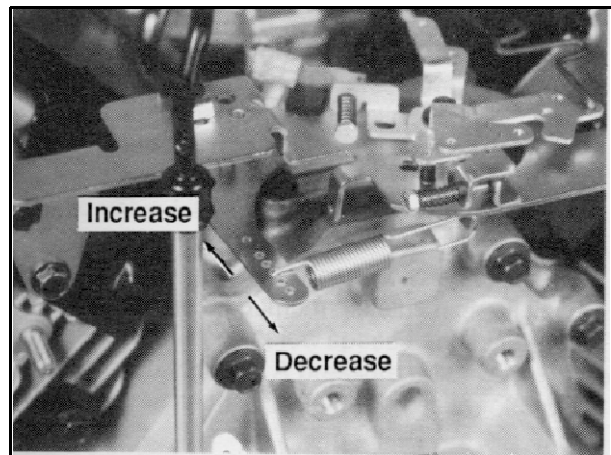
Governor Linkage

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Sensitivity Adjustment

Governor sensitivity is adjusted by repositioning the governor spring in the holes on the governor lever. If speed surging occurs with a change in engine load, the governor is set too sensitive. If a big drop in speed occurs when normal load is applied, the governor should be set for greater sensitivity. Adjust as follows:

1. To increase the sensitivity, move the spring closer to the governor lever pivot point.
2. To decrease the sensitivity, move the spring away from the governor lever pivot point.



Governor Sensitivity Adjustments

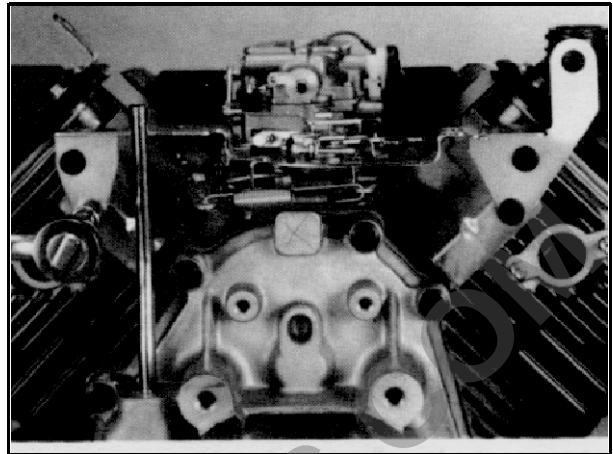
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Remove Control Panel (If so equipped)

1. Disconnect low oil light wires.
2. Disconnect choke control cable from throttle control bracket.
3. Disconnect throttle control shaft from throttle control bracket.
4. Remove panel from housing.

Remove Throttle & Choke Controls

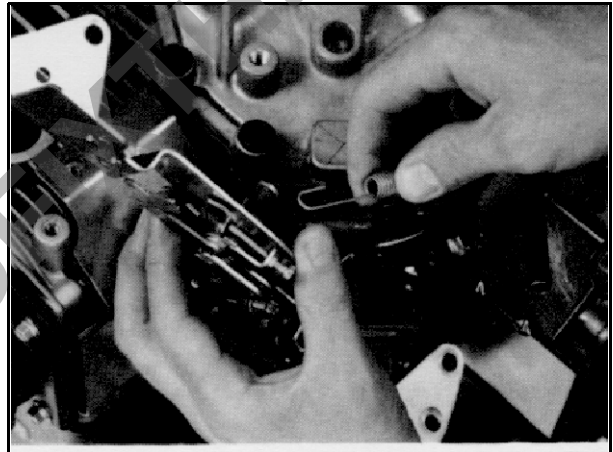
1. Remove the four hex. flange screws securing the control bracket to the cylinder heads.



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Removing Control Bracket

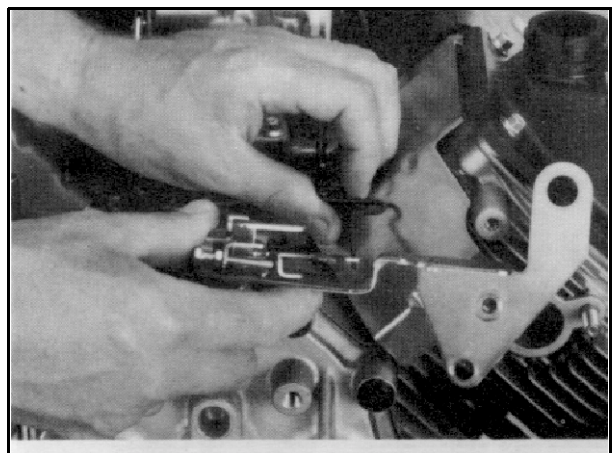
2. Mark spring hole locations and disconnect the spring from the governor lever.



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Disconnecting Spring from Bracket

3. Remove the choke linkage from the choke actuator lever and carburetor.

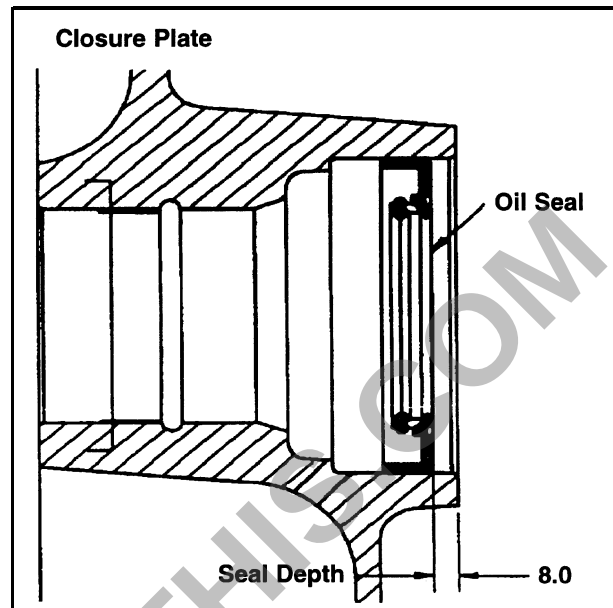


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Disconnecting Choke Linkage from Actuator Lever

Install Closure Plate Oil Seal

1. Check to make sure that there are no nicks or burrs in the crankshaft bore of the closure plate.
2. Apply a light coat of engine oil to the outside diameter of the oil seal.
3. Drive the oil seal into the closure plate using a seal driver. Make sure the oil seal is installed straight and true in bore to depth shown.

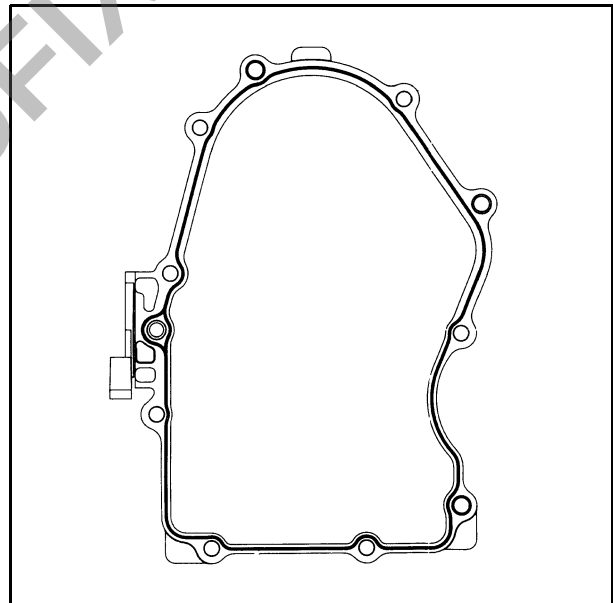


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Oil Seal Depth in Closure Plate**Install Closure Plate Assembly**

RTV silicone sealant is used as a gasket between the closure plate and the crankcase. Refer to "Special Tools" of this manual for a listing of approved sealants. Always use fresh sealant. Using outdated sealant can result in leakage.

1. Prepare the sealing surfaces of the crankcase and closure plate as directed by the sealant manufacturer.
2. Check to make sure that there are no nicks or burrs on the sealing surfaces of the closure plate or crankcase.
3. Apply a 1/16" bead of sealant to the sealing surface of the closure plate. See figure for sealant pattern.
4. Make sure end of governor cross shaft is lying against the bottom of cylinder 2 inside of crankcase.



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Closure Plate Sealant Pattern

Governor Assembly Installation Notes

Fit the sleeve into the governor assembly, and install them as a set.

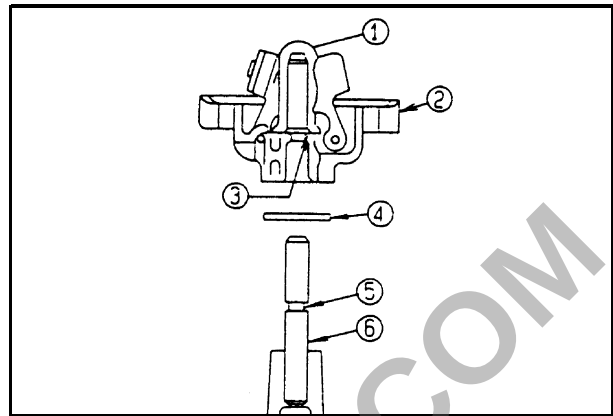
NOTE: The sleeve and the governor assembly cannot be installed separately. Push the set onto the shaft until inner flange snaps into the groove securely.

Spin the governor assembly by hand and check that the flyweights operate freely and the center sleeve moves outward.

Governor Assembly Inspection

Visually check the assembly for wear and damage.

If any part is worn or damaged, replace the assembly.



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1. Sleeve
2. Governor Assembly
3. Inner Flange
4. Thrust Washer
5. Groove
6. Shaft

Governor Shaft Removal

Remove camshaft (see Camshaft Tappet Removal in the camshaft/Crankshaft chapter).

Unscrew the governor arm clamp nut, and remove the governor arm.

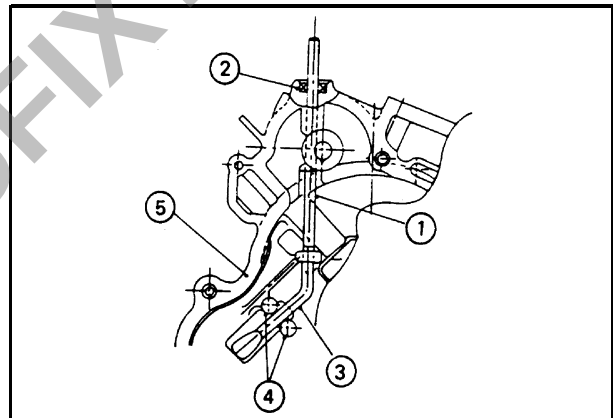
Turn the governor shaft clockwise 1/4 turn to remove governor shaft.

NOTE: It is not necessary to remove the governor shaft unless it is being replaced.

Replace the oil seal only if the lip shows signs of leakage or it has been damaged.

The oil seal must be assembled with seal lip towards inside of the engine.

Press in the oil seal 1.0 mm (0.04 in) below the crankcase surface.



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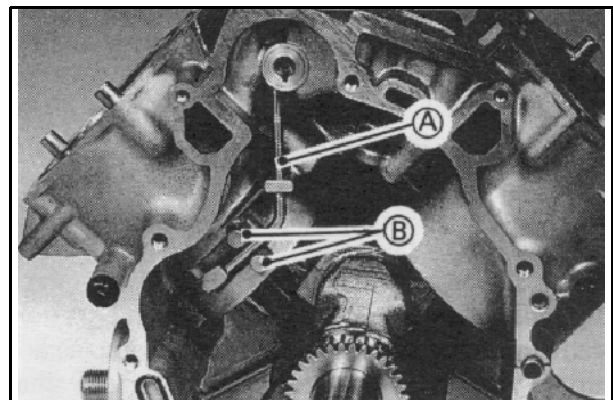
1. Governor Shaft
2. Oil Seal
3. Shaft Arm
4. Projections
5. Crankcase

Governor Shaft Installation Notes

Install the governor shaft (A) by properly positioning shaft arm between projections (B) as shown.

NOTE: Install the governor shaft before installing the camshaft to the crankcase.

Check that the governor shaft moves freely in its operating range.



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CYLINDER HEAD

Compression Measurement

Before measuring compression, do the following.

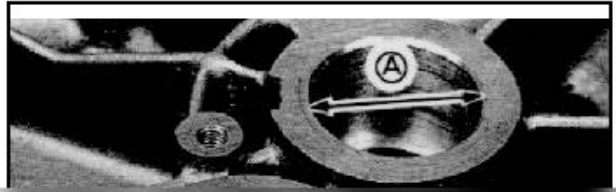
Be sure the battery is fully charged.



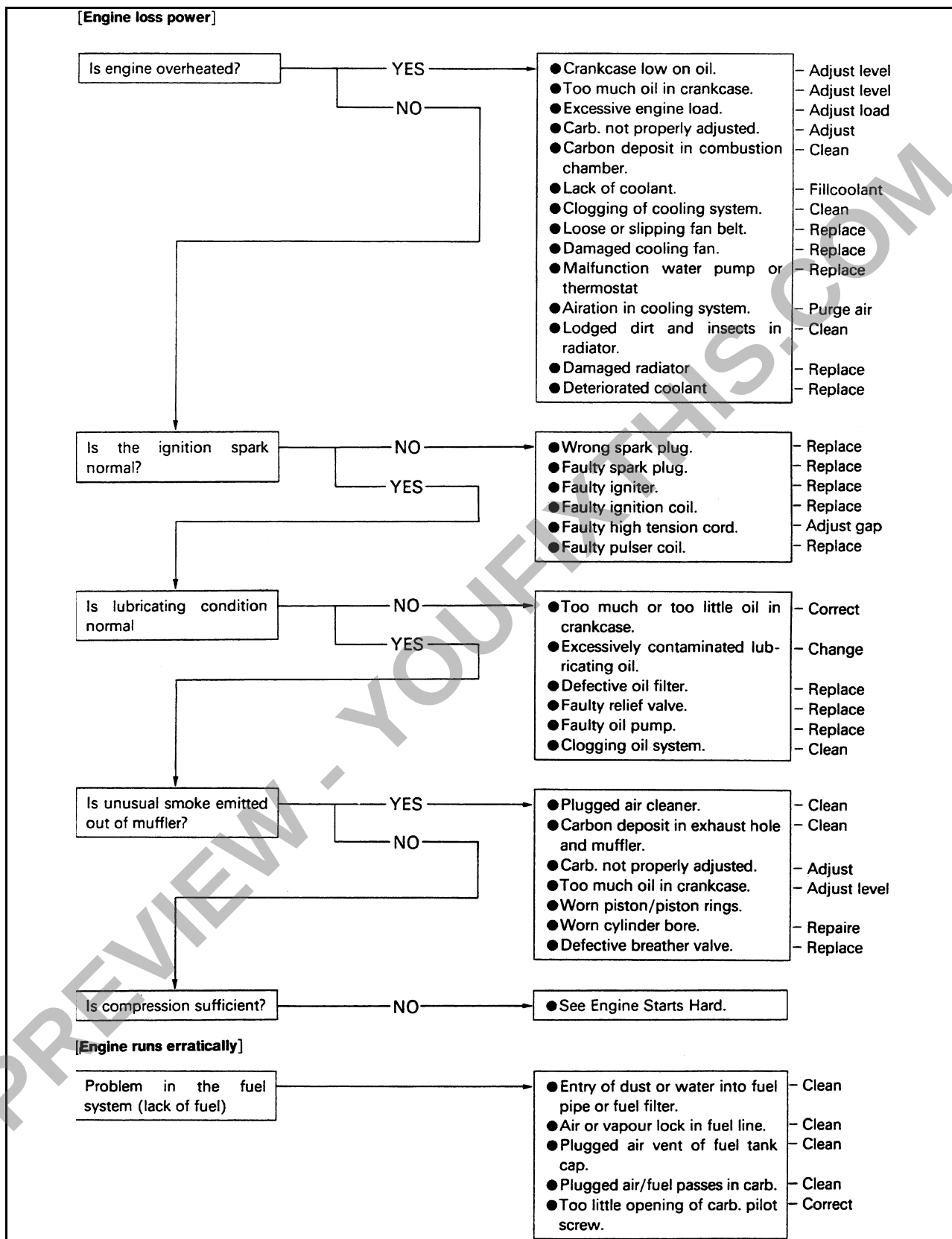
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Measure the inside diameter (A) of the PTO shaft bearing on the crankcase cover at several points. This bearing is not replaceable. Replace the crankcase cover if the inside diameter is more than the service limit.

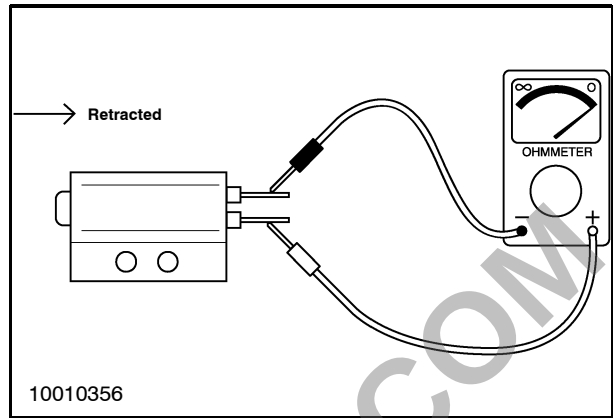
PTO Shaft Bearing Inside Diameter, Service



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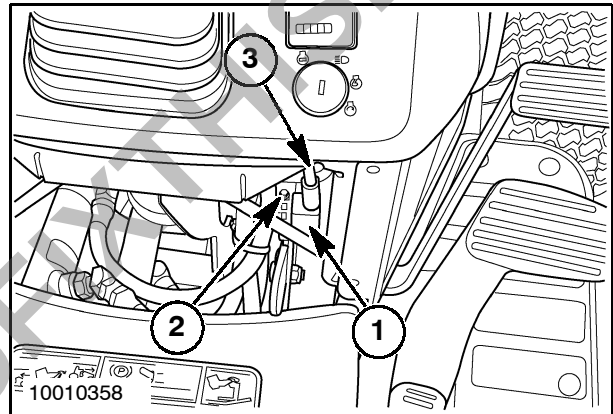
2. With the switch pushed in to the retracted position, connect the one ohmmeter lead to one of the switch terminals and the other ohmmeter lead to the other switch terminal. The ohmmeter should show little or no resistance indicating that there is continuity between the two terminals of the parking brake switch. If continuity does not exist between the terminals when the parking brake safety switch is in the retracted position, the switch is defective and requires replacement.



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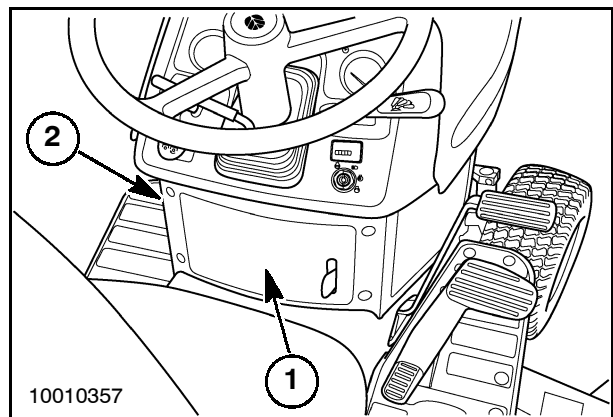
Installation

1. Install the parking brake switch, 1, onto the parking brake linkage by using the two retaining bolts, 2.
2. Connect the wire harness, 3, to the parking brake switch, 1.



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3. Install the rear shroud, 1, onto the tractor by using the four screws, 2.
4. Connect the negative (-) battery cable to the negative (-) battery terminal.



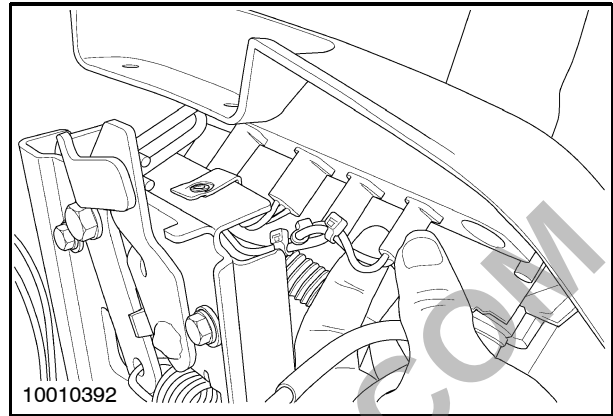
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INSTRUMENT PANEL LIGHTS

Bulb Removal

1. Disengage the PTO, set the parking brake, turn the ignition key to OFF, and remove the key.
2. Turn the bulb holder 1/4 turn counterclockwise, and remove it from the panel
3. Pull the bulb straight out of the bulb holder.

Bulb Number: GE 194



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Bulb Replacement

1. Align the bulb with the slot in the bulb holder and push the bulb into the slot.
2. Align the tabs on the bulb holder with the slots in the panel. Insert the bulb being careful not to damage the printed circuit connectors.

Rotate the bulb approximately 1/4 turn until it stops.

Bulb Number: GE 194

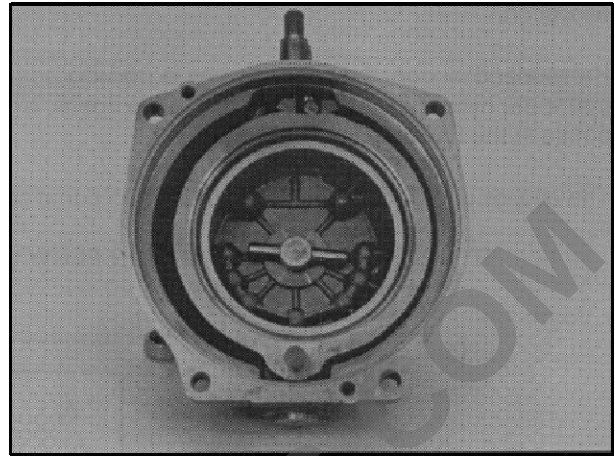
**GT20 & 22 Cruise Circuitry
(All Models After 2000)**

SW4
(CRUISE SWITCH)

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The operator controls the transmission by moving the control shaft connected to the cam ring within the pump. With the control shaft in neutral, or its centered position, no flow is generated by the pump and, therefore, the motor portion is at rest.

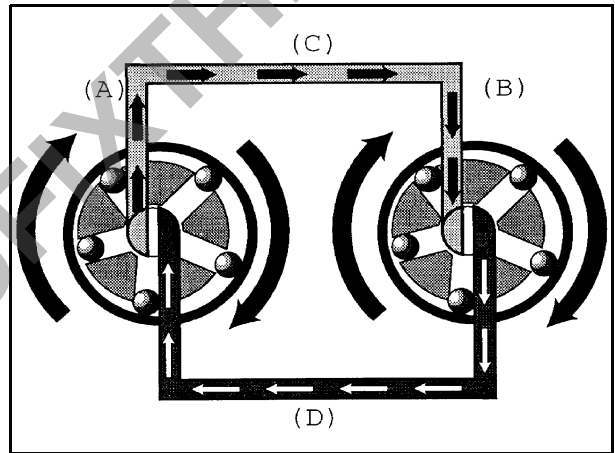
When the control shaft is moved from neutral in the "forward" direction, the cam ring in the pump is moved off center and the pump ball-pistons create a flow of fluid. The position of the control shaft/cam ring is infinitely variable and any flow rate is possible up to maximum cam ring movement/maximum pump displacement.



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Flow created by pump moves to fixed displacement motor through internal passageways. Because the motor is a fixed displacement unit, the motor requires a specific volume of fluid for it to make one complete revolution.

- (A) Pump
- (B) Motor
- (C) High Pressure
- (D) Low Pressure

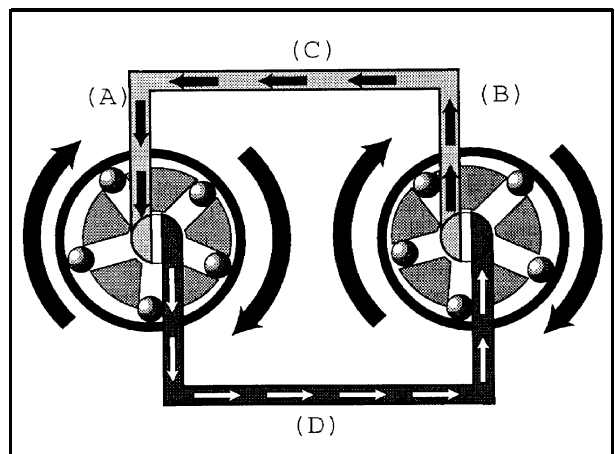


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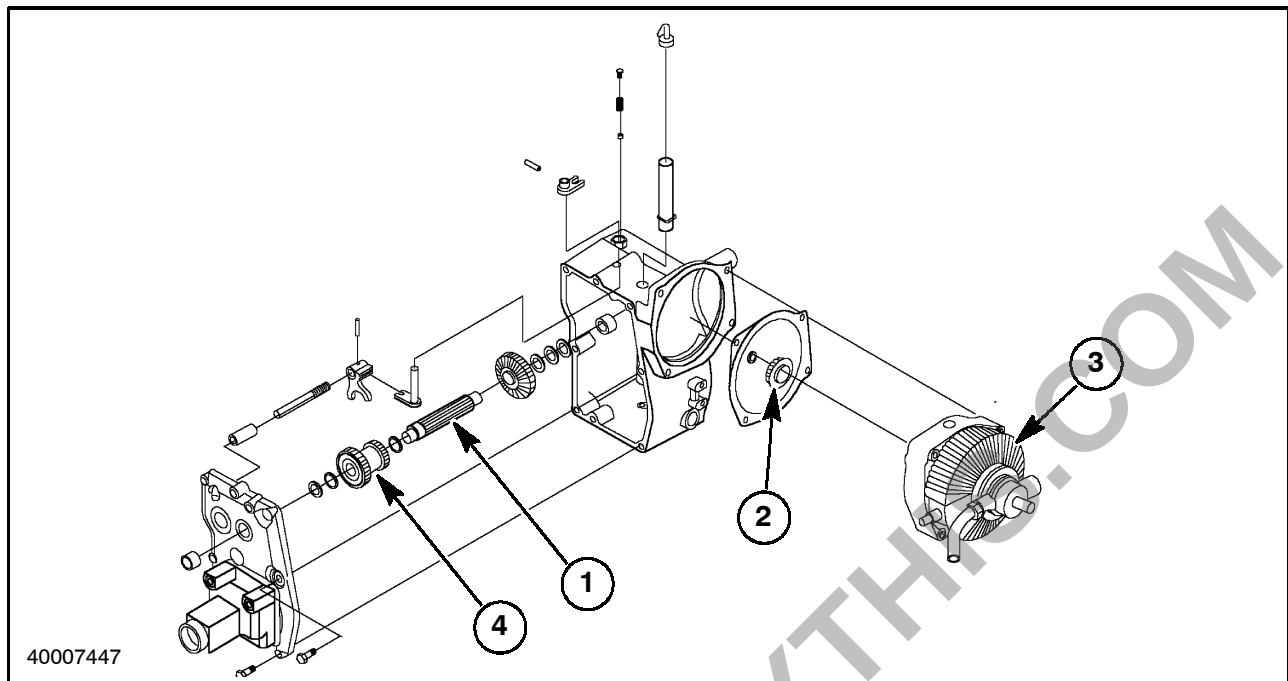
When the control shaft is moved from neutral to "reverse" direction, the cam ring is swung off center to the opposite side of the pump and the flow from the pump is "reversed". This flow is directed to the other side of the motor causing its output shaft to rotate in the opposite direction. The pump input shaft always rotates in one direction, dictated by the engine, while the motor output shaft rotates in either direction, depending on the direction of flow from the pump.

Pump discharge flow is high pressure (dictated by load) fluid. Flow returned from the motor to the pump is low (or charge) pressure fluid.

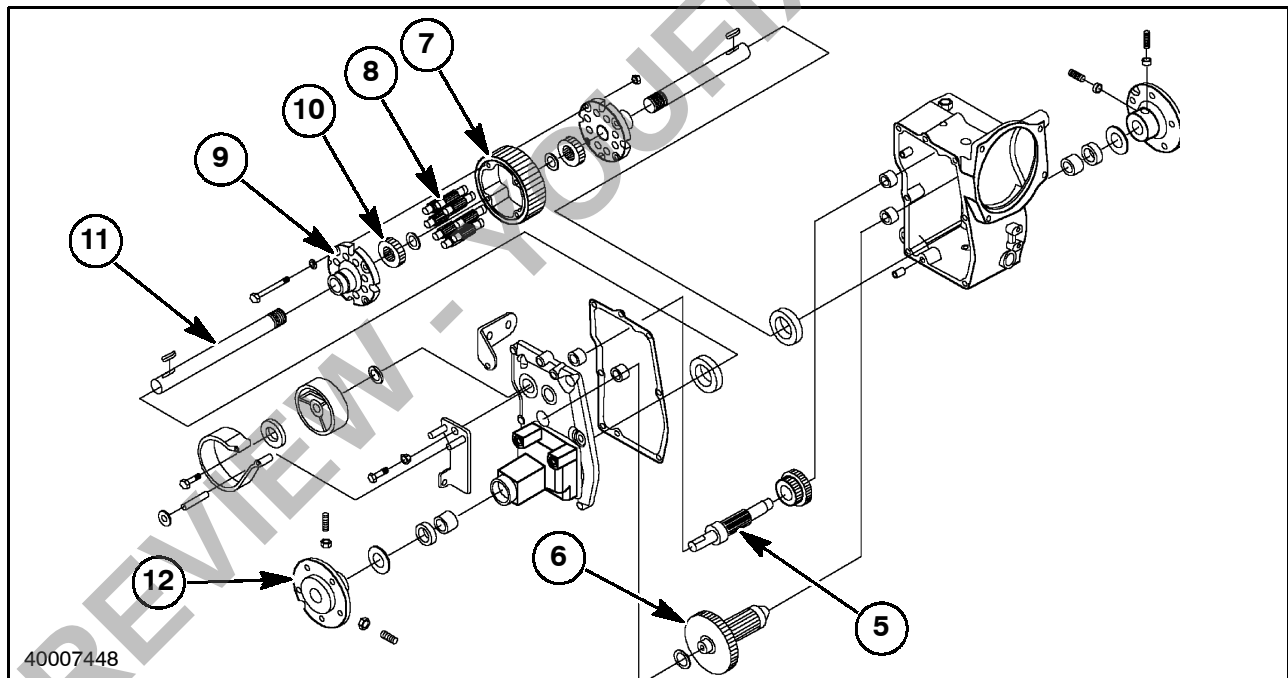
- (A) Pump
- (B) Motor
- (C) Low Pressure
- (D) High Pressure



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1



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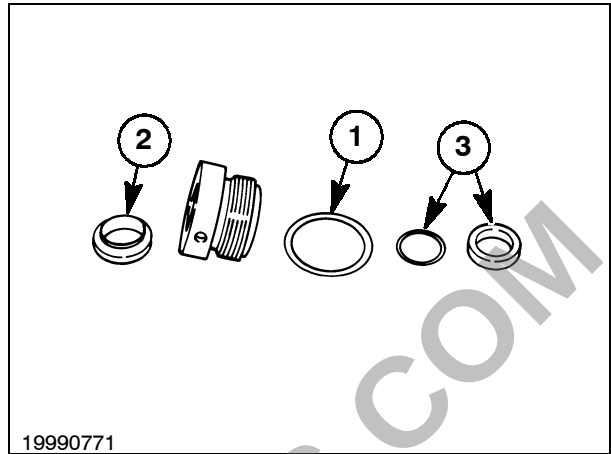
DESCRIPTION OF OPERATION

The transaxle on the GT series garden tractor consists of a drive gear shaft, 1, driven by a gear, 2, on the HST transmission unit, 3. Power is transmitted from the drive gear shaft, 1, to the Hi-Lo gears, 4, which are operator selected by a control lever located on the right rear fender. Power is directed from the Hi-Lo gear shaft, 5, to the intermediate gear, 6,

through the intermediate gear shaft to the differential ring gear, 7. The differential assembly consists of a group of eight pinion gears, 8, mounted to the differential end caps, 9, that drive the axle gears, 10. The axle gears, 10, are splined to the axle shafts, 11, allowing power to be transmitted to the rear wheels, via the keyed, axle mounted wheel hubs, 12.

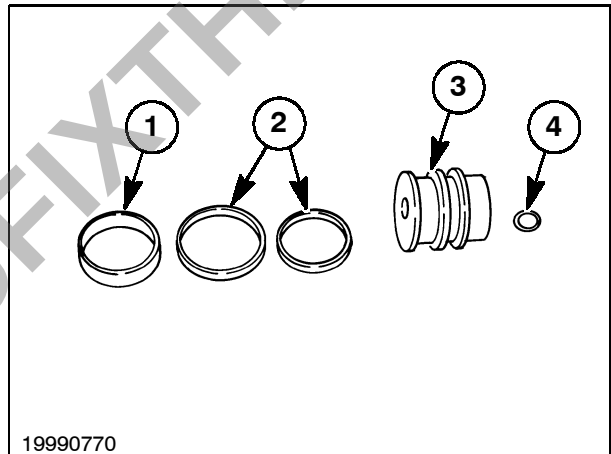
Assembly

1. Install new O ring, 1, wiper ring, 2, and rod seal, 3, in the grooves in the gland head.



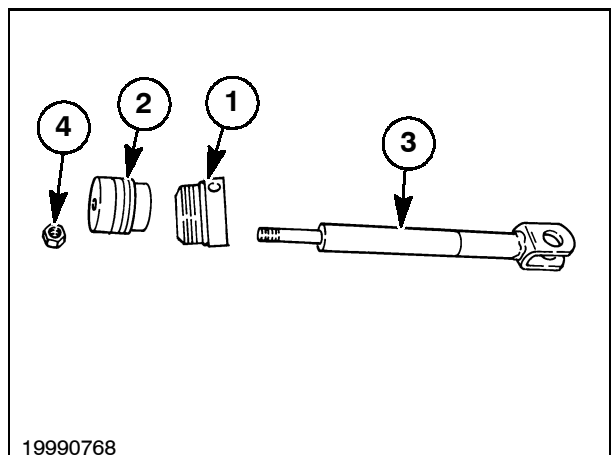
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2. Install the piston ring, 1, and back-up piston seal, 2, on the piston, 3.
3. Install the rod O ring seal, 4, in its groove in the piston.

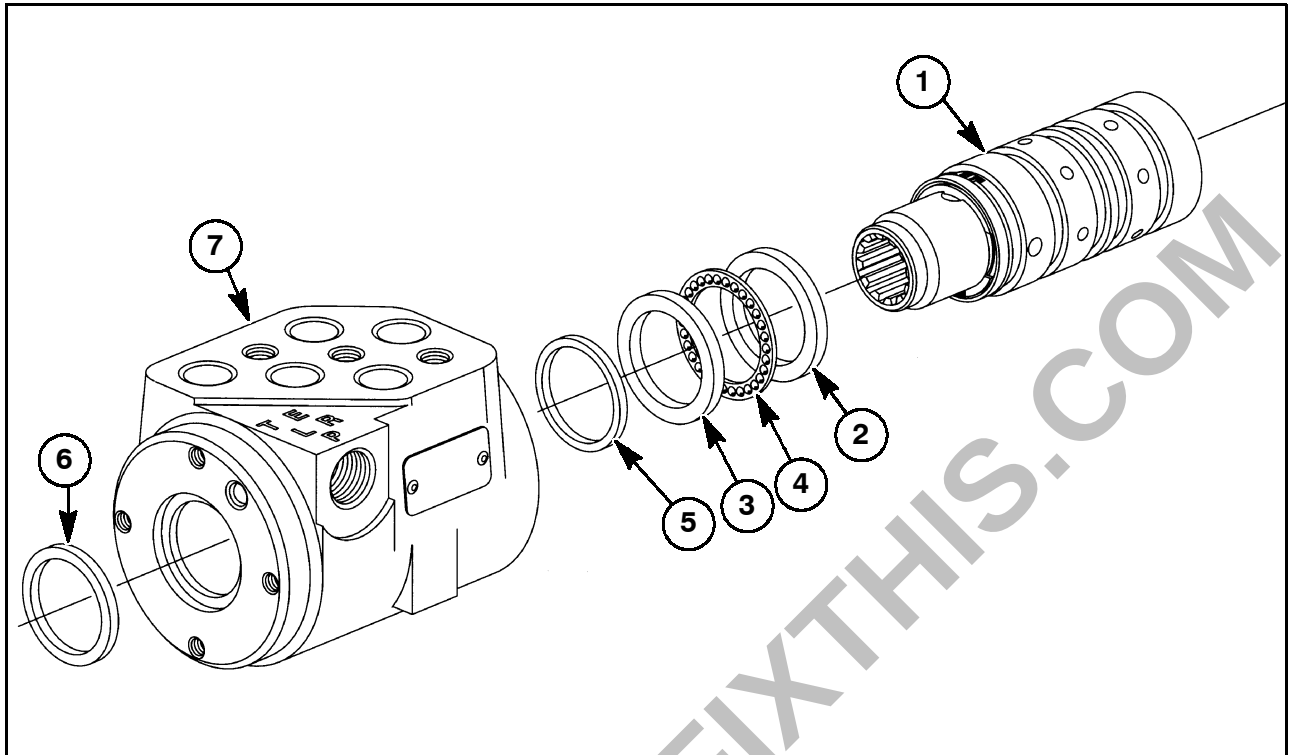


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4. Install the gland head, 1, and piston, 2, on the cylinder rod, 3, and secure with nut, 4.
5. Install the piston and rod assembly in the cylinder tube and tighten the gland head.



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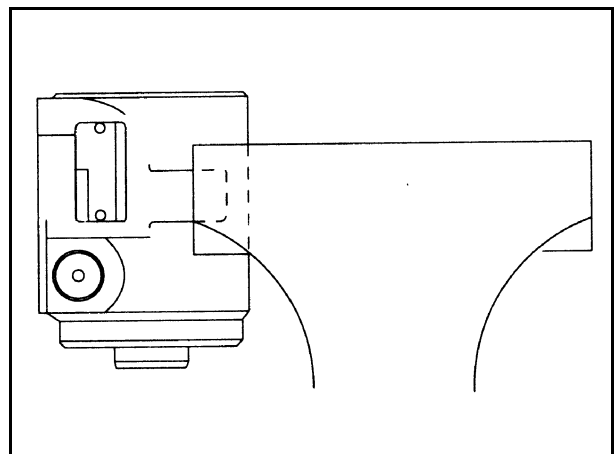


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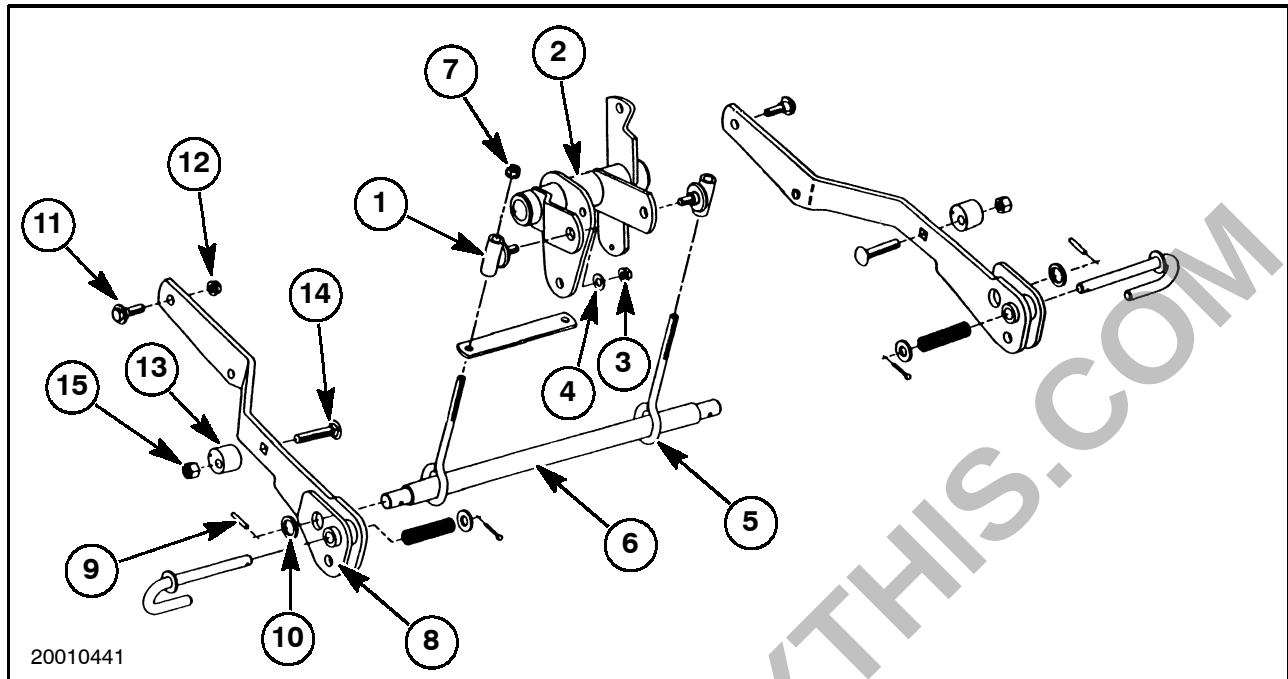
8. Install the thrust bearing race, 3, thrust bearing, 4, and other thrust bearing race, 2, into the housing, 7.
9. Apply a light coat of clean hydraulic fluid on the spool and sleeve assembly, 1, and slide it into the housing.

IMPORTANT: Take care not to damage the dust or quad seals.

10. Clamp the housing in a vise as shown. Use just enough clamping force to hold the housing securely.



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NOTE: Installation is the same for both lift sleeves.
The lift sleeves must pivot freely.

NOTE: Installation is the same for both lift arms.

5. Install the lift sleeve, 1, onto the outer side of the lever of the bellcrank and bushing assembly, 2, by using the lock nut, 3, with flat washer, 4.
6. Repeat Step 5 for installing the opposite side lift sleeve.
7. Position the two lift rods, 5, onto the lift bar, 6.
8. Insert the two lift rods, 5, up through the lift sleeves, 1, and thread a lock nut, 7, onto both of the lift rods, 5. Tighten the lock nuts until one layer of thread is showing above the nuts.
9. Slide the left lift arm, 8, onto the lift bar, 6, and secure by using the roll pin, 9, with the flat washer, 10.
10. Connect the rear of the lift arm, 8, onto the frame of the tractor by using the shoulder bolt, 11, with the lock nut, 12.
11. Install the lift adjustment stop, 13, by using the carriage screw, 14, with the lock nut, 15
12. Repeat steps 9 - 11 for installing the right lift arm.

See Adjusting the Deck Slope for Transport.

MOWER REMOVAL

Removing the Mower

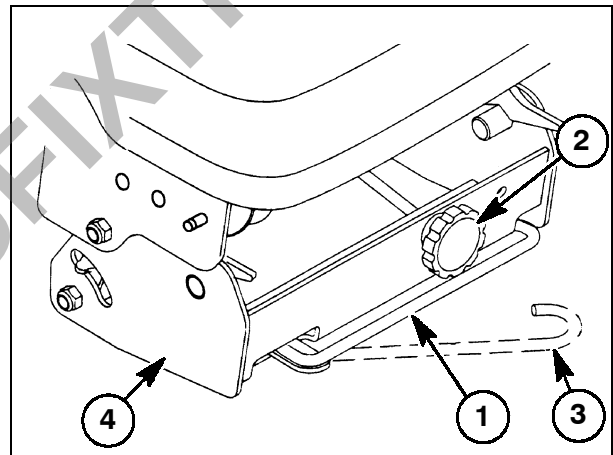
The mower is most easily removed from the tractor when done on a level concrete surface. Rougher dirt or lawn surfaces make removing the mower more difficult.

1. Apply the parking brake, start the tractor, and raise the attachment lift.
2. Get off the tractor. Place the mower height of cut lever in the lowest cut position.
3. Lower the deck until its weight is completely on its wheels, not on the tractor.
4. Turn the ignition key to "STOP" to stop the engine. Remove the key.
5. Remove the grill.

**CAUTION**

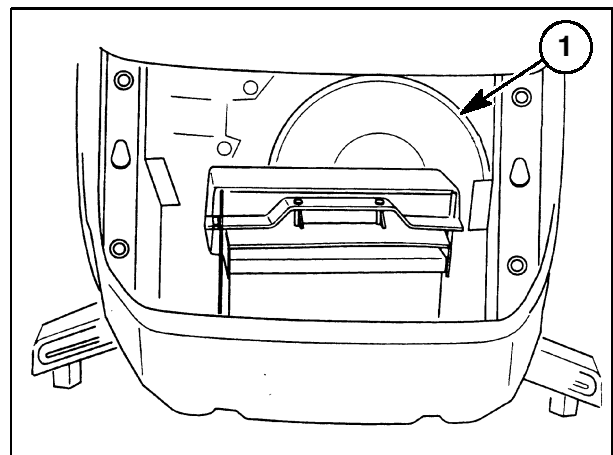
Components under the hood will be hot if the tractor has been running. Touching hot components can cause burns. Allow the tractor to cool before performing maintenance or touching components under the hood.

6. Pull the tension release arm, 1, on the pulley box, 4, to position 3, to release the tension on the drive belt.



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7. Remove the belt from around the PTO pulley, 1. Additional belt slack can be obtained (if needed) by turning the belt tension adjustment knob, 2, Figure 9-28.



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PREVIEW ONLY

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