

GARDEN WAY

by **TROY-BILT**

SAFETY FIRST!

Before operating this equipment, read this Owner's Manual and the separate manual supplied by the engine manufacturer.

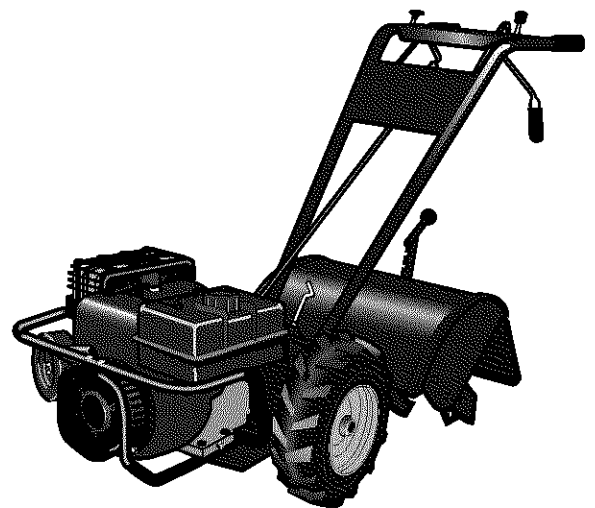
Model

12194

OWNER'S MANUAL

8HP Model Tiller

- Safety
- Assembly
- Controls
- Operation
- Maintenance
- Parts List



GARDEN WAY INCORPORATED

Dear Owner:

Thank you for purchasing our product. You now own one of the finest rear-tine rototillers available. It has been designed, engineered and manufactured to give you the best possible dependability and performance.

Please carefully read this Manual. It tells you how to safely and easily assemble, operate and maintain your machine. *Be sure that you and any other operators carefully follow the recommended safety practices at all times. Failure to do so could result in personal injury or property damage.*

Of course, if you should ever have any problems or questions, please contact your local authorized service dealer or call the Factory (see back cover).

We want to be sure that you are completely satisfied at all times.

See Back Cover for Customer Service information

Safety Alert Symbol



This is a safety alert symbol. It is used in this manual and on the unit to alert you to potential hazards. When you see this symbol, read and obey the message that follows it. Failure to obey safety messages could result in personal injury or property damage.

This machine meets voluntary safety standard B71.8 – 1996, which is sponsored by the Outdoor Power Equipment Institute, Inc., and is published by the American National Standards Institute.

WARNING

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

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SPARK ARRESTER WARNING TO RESIDENTS OF CALIFORNIA AND SEVERAL OTHER STATES

Under California law, and under the laws of several other states, you are not permitted to operate an internal combustion engine using hydrocarbon fuels on any forest, brush, hay, grain, or grass covered land; or land covered by any flammable agricultural crop without an engine spark arrester in continuous effective working order.

The engine on the unit is an internal combustion engine which burns gasoline, a hydrocarbon fuel, and must be equipped with a spark arrester muffler in continuous effective working order. The spark arrester must be attached to the engine exhaust system in such a manner that flames or heat from the system will not ignite flammable material. Failure of the owner/operator of the unit to comply with this regulation is a misdemeanor under California law (and other states) and may also be a violation of other state and/or federal regulations, laws, ordinances or codes. Contact your local fire marshal or forest service for specific information about which regulations apply in your area.

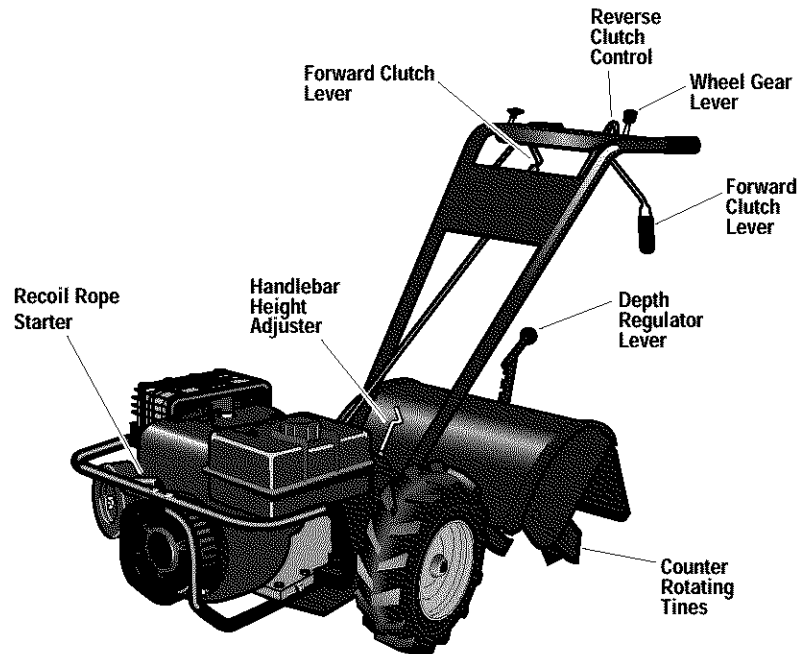


Figure 1-1

**Training**

1. Carefully read this Owner's Manual, the separate Engine Owner's Manual, and any

other literature you may receive. Be thoroughly familiar with the controls and the proper use of the tiller and its engine. Know how to stop the unit and disengage the controls quickly.

2. Never allow children to operate the tiller. Never allow adults to operate the tiller without proper instruction.
3. Keep the area of operation clear of all persons, particularly children and pets.
4. Keep in mind that the operator or user is responsible for accidents or hazards occurring to other people, their property, and themselves.

Preparation

1. Thoroughly inspect the area where the tiller is to be used and remove all foreign objects.
2. Be sure all control levers are released and the Wheel Gear Lever is in ENGAGE position before starting the engine.

3. Do not operate the tiller without wearing adequate outer garments. Avoid loose garments or jewelry that could get caught in moving parts.
4. Do not operate the tiller when barefoot or wearing sandals, sneakers, or light footwear. Wear protective footwear that will improve footing on slippery surfaces.
5. Do not till near underground electric cables, telephone lines, pipes or hoses. If in doubt, contact your telephone or utility company.
6. Warning: Handle fuel with care; it is highly flammable and its vapors are explosive. Take the following precautions:

- a. Store fuel in containers specifically designed for this purpose.
- b. The gas cap shall never be removed or fuel added while the engine is running. Allow the engine to cool for several minutes before adding fuel.
- c. Keep matches, cigarettes, cigars, pipes, open flames, and sparks away from the fuel tank and fuel container.

- d. Fill fuel tank outdoors with extreme care. Never fill fuel tank indoors. Use a funnel or spout to prevent spillage.
 - e. Replace all fuel tank and container caps securely.
 - f. If fuel is spilled, do not attempt to start the engine, but move the machine away from the area of spillage and avoid creating any source of ignition until fuel vapors have dissipated.
7. Never make adjustments when engine is running (unless recommended by manufacturer).

Operation

1. Do not put hands or feet near or under rotating parts.
2. Exercise extreme caution when on or crossing gravel drives, walks, or roads. Stay alert for hidden hazards or traffic. Do not carry passengers.

3. After striking a foreign object, stop the engine, remove the wire from the spark plug wire and prevent it from touching the spark plug, thoroughly inspect the machine for any damage, and repair the damage before restarting and operating the machine.

4. Exercise caution to avoid slipping or falling.

5. If the unit should start to vibrate abnormally, stop the engine, disconnect the spark plug wire and prevent it from touching the spark plug, and check immediately for the cause. Vibration is generally a warning of trouble.

6. Stop the engine, disconnect the spark plug wire and prevent it from touching the spark plug whenever you leave the operating position, before unclogging the tines, or when making any repairs, adjustments or inspections.

7. Take all possible precautions when leaving the machine unattended. Stop the engine. Disconnect spark plug wire and move it away from the spark plug. Move Wheel Gear Lever to ENGAGE.

8. Before cleaning, repairing, or inspecting, stop the engine and make certain all moving parts have stopped. Disconnect the spark plug wire and prevent it from touching the spark plug to prevent accidental starting.

9. Always keep the tiller tine hood flap down.

10. Never use the tiller unless proper guards, plates, or other safety protective devices are in place.

11. Do not run engine in an enclosed area. Engine exhaust contains carbon monoxide gas, a deadly poison that is odorless, colorless, and tasteless.

12. Keep children and pets away.

13. Never operate the tiller under engine power if the Wheel Gear Lever is in DIS-ENGAGE (FREEWHEEL). In this position, the wheels will not hold the tiller back and the revolving tines could propel the tiller rapidly backward, possibly causing loss of control. Always move the Wheel Gear Lever to ENGAGE before starting the engine or engaging the tines/wheels with the Forward Clutch or the Reverse Clutch.

14. Be aware that the tiller may unexpectedly bounce upward or jump backward if the tines should strike extremely hard packed soil, frozen ground, or buried obstacles like large stones, roots, or stumps. If in doubt about the tilling conditions, always use the following operating precautions to assist you in maintaining control of the tiller:

- a. **Walk behind and to one side of the tiller, using one hand on the handlebars. Relax your arm, but use a secure hand grip.**
- b. **Use slower engine speeds.**
- c. **Clear the tilling area of all large stones, roots and other debris.**
- d. **Avoid using downward pressure on handlebars. If need be, use slight upward pressure to keep the tines from digging too deeply.**
- e. **Before contacting hard packed soil at the end of a row, reduce engine speed and lift handlebars to raise tines out of the soil.**
- f. **In an emergency, stop tines and wheels by releasing whichever Clutch Lever is engaged. Do not attempt to restrain the tiller.**

15. Do not overload the tiller's capacity by attempting to till too deeply at too fast a rate.

16. Never operate the tiller at high transport speeds on slippery surfaces. Look behind and use care when backing up.

17. Do not operate the tiller on a slope that is too steep for safety. When on slopes, slow down and make sure you have good footing. Never permit the tiller to freewheel down slopes.

18. Never allow bystanders near the unit.

19. Only use attachments and accessories that are approved by Garden Way Inc.

20. Use tiller attachments and accessories when recommended.

21. Never operate the tiller without good visibility or light.

22. Never operate the tiller if you are tired, or under the influence of alcohol, drugs or medication.

23. Operators shall not tamper with the engine-governor settings on the machine; the governor controls the maximum safe operating speed to protect the engine and all moving parts from damage caused by over-

speed. Authorized service shall be sought if a problem exists.

24. Do not touch engine parts which may be hot from operation. Let parts cool down sufficiently.

25. Please remember: You can always stop the tines and wheels by releasing the Forward Clutch Lever or the Reverse Clutch Control (whichever lever you have engaged) or by moving the Throttle Control Lever to STOP.

26. To load or unload the tiller, see the instructions in Section 4 of this Manual.

27. Use extreme caution when reversing or pulling the machine towards you.

28. Start the engine carefully according to instructions and with feet well away from the tines.

29. Never pick up or carry a machine while the engine is running.

Maintenance and Storage

1. Keep the tiller, attachments and accessories in safe working condition.

2. Check all nuts, bolts, and screws at frequent intervals for proper tightness to be sure the equipment is in safe working condition.

3. Never store the tiller with fuel in the fuel tank inside a building where ignition sources are present such as hot water and space heaters, furnaces, clothes dryers, stoves, electric motors, etc.). Allow engine to cool before storing in any enclosure.

4. To reduce the chances of a fire hazard, keep the engine free of grass, leaves, or excessive grease.

5. Store gasoline in a cool, well-ventilated area, safely away from any spark- or flame-producing equipment. Store gasoline in an approved container, safely away from the reach of children.

6. Refer to the storage instructions in the Maintenance section of this Manual and the separate Engine Owner's Manual for instructions if the tiller is to be stored for an extended period.

7. Never perform maintenance while the engine is running or the spark plug wire is connected, except when specifically instructed to do so.

8. If the fuel tank has to be drained, do this outdoors.

Safety Decals

For your safety and the safety of others, various safety and operational decals are located on your unit (see Figure 1-2 below).

Keep the decals clean and legible at all times. Contact your local service dealer or the factory for replacements if any decals are damaged or missing.

Refer to the Parts List in this manual for decal locations, part numbers and ordering instructions.

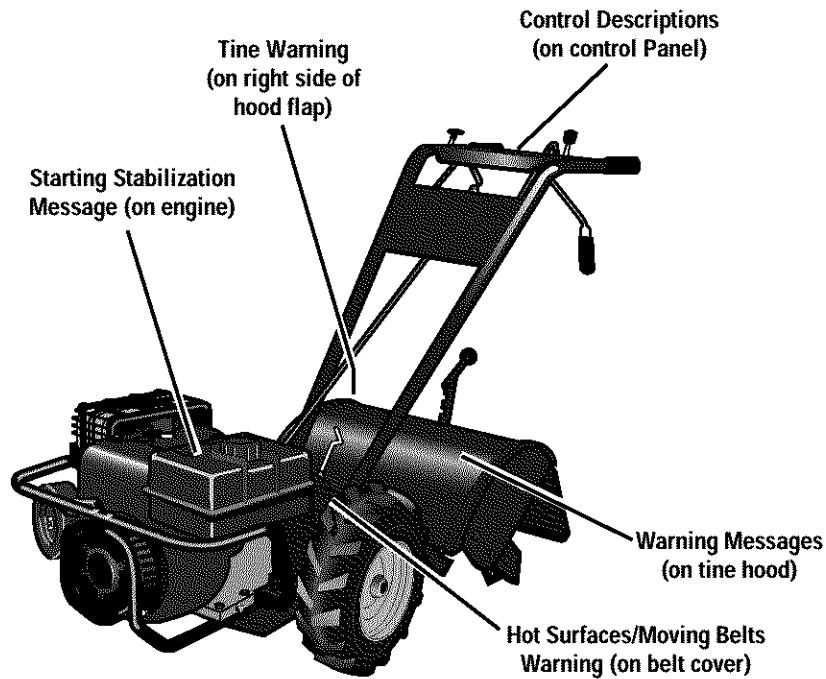


Figure 1-2: Location of Safety and Operating Decals

Operating Symbols

Various symbols (shown here, with word descriptions) may be used on the tiller and engine.



FAST



SLOW



STOP



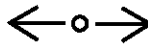
CHOKE ON



CHOKE OFF



TILLER DIRECTION



LEVER DIRECTION

R

REVERSE



ROTATING TINES

! WARNING

TO AVOID SERIOUS INJURY:

- READ THE OWNER'S MANUAL.
- KNOW LOCATIONS AND FUNCTIONS OF ALL CONTROLS.
- KEEP ALL SAFETY DEVICES AND SHIELDS IN PLACE AND WORKING.
- NEVER ALLOW CHILDREN OR UNINSTRUCTED ADULTS TO OPERATE TILLER.
- SHUT OFF ENGINE AND DISCONNECT SPARK PLUG WIRE BEFORE MANUALLY UNCLOGGING TINES OR MAKING REPAIRS.
- KEEP BYSTANDERS AWAY FROM MACHINE.
- KEEP AWAY FROM ROTATING PARTS.
- USE EXTREME CAUTION WHEN REVERSING OR PULLING THE MACHINE TOWARDS YOU.

⚠ WARNING

To prevent personal injury or property damage, do not start the engine until all assembly steps are complete and you have read and understand the safety and operating instructions in this Manual.

INTRODUCTION

Carefully follow these assembly steps to correctly prepare your tiller for use. It is recommended that you read this Section in its entirety before beginning assembly.

INSPECT UNIT

Inspect the unit and carton for damage immediately after delivery. Contact the carrier (trucking company) if you find or suspect damage. Inform them of the damage and request instructions for filing a claim. To protect your rights, put your claim in writing and mail a copy to the carrier within 15 days after the unit has been delivered. Contact us at the factory if you need assistance in this matter.

STEP 1: UNPACKING INSTRUCTIONS

1. Remove any cardboard inserts and packaging material from the carton. Remove any staples from the bottom of the carton and then lift the carton up and off the unit.
2. The tiller is heavy and you should not attempt to remove it from the shipping platform until the handlebars are installed and the Wheel Gear Lever is placed in DISENGAGE. The procedure for removing the tiller is explained in Step 2 of these assembly steps.
3. Remove the handlebar assembly from the carton. Do not remove the two control levers from the handlebars.
4. Remove the separate hardware bag from the carton. Check that you have the items listed next and shown in Figure 2-1 (parts shown at reduced sizes). Contact your local dealer or the factory if any items are missing or damaged.

HARDWARE PARTS LIST

Fig.#	Description	Qty.
1	Height Adjustment Handle (in Lit. Bag)	1
2	Keyed Washer	1
3	Plastic Tie Strap	4
4	Hairpin Cotter	3
5	Wheel Gear Lever Knob	1
6	Throttle Lever Knob (in Lit. Bag)	1
7	Straight Cotter Pin	1
8	Flat Washer (in Lit. Bag)	1
9	3/8"-16 x 1 Hex Hd. Screw	2
10	3/8" Flat Washers	2
11	3/8"-16 Nylock Lock Nut	2
12	#10-32 x 1/2" Round Hd. Screw	4
13	#10 Lockwasher	4
14	#10-32 Nut	4

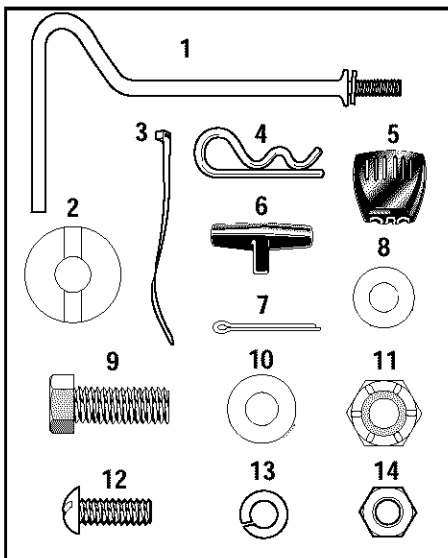


Figure 2-1: Loose hardware (see parts list above).

Tools/Materials Needed for Assembly

- (1) 3/8" open-end wrench*
- (2) 9/16" open-end wrenches*
- (1) Scissors (to trim plastic ties)
- (1) Ruler
- (1) Small board (to tap plastic knobs on control levers)
- (1) Automotive-type air pressure gauge
- (1) Clean oil funnel
- (1) Clean, high-quality motor oil. Refer to the Engine Owner Manual for motor oil specifications and quantity required. Do not overfill.

* Adjustable wrenches may be used.

IMPORTANT: Motor oil must be added to the engine crankcase before the engine is started. Follow the instructions in this *Assembly* section.

NOTE: LEFT and RIGHT sides of the tiller are as viewed from the operator's position behind the handlebars.

STEP 2: ATTACH HANDLEBARS

1. Remove the Reverse Clutch Control (B, Figure 2-2) from the handlebars (A). Remove any rubber bands from the handlebars.

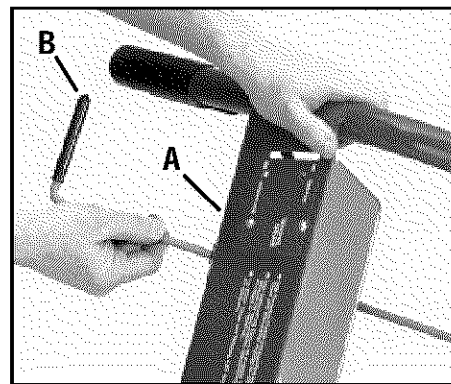


Figure 2-2: Remove Reverse Clutch Control.

2. Position the handlebar cross-brace (C, Figure 2-3) in front of the curved height adjustment bracket (D) and place the handlebar ends to the outside of the two mounting tabs on top of the transmission.

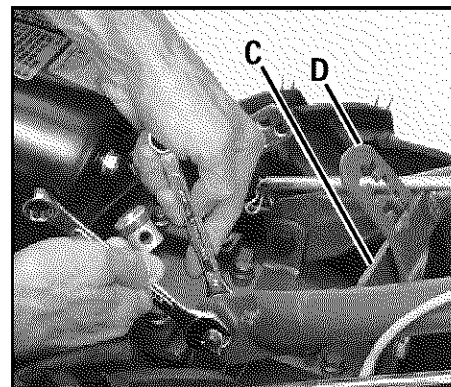


Figure 2-3: Attach handlebars.

3. Attach the handlebars to the mounting tabs with two 3/8-16 x 1" screws (heads of screws go to inside of tabs), 3/8" flat washers and 3/8-16 Nylock lock nuts (see Figure 2-3). Do not fully tighten the screws at this time.

4. Move the handlebar to align the threaded hole in the cross-brace with one of the four slots in the curved height adjustment bracket. Place the keyed washer (E, Figure 2-4) on the height adjustment handle (F) with the raised keys (edges) on the washer facing down.

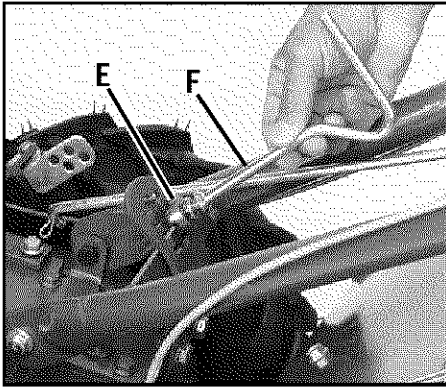


Figure 2-4: Install adjustment handle.

5. Thread the height adjustment handle (F, Figure 2-3) into the threaded hole in the handlebar cross-brace, making sure that the raised keys on the washer fit into the selected slot on the curved bracket. Tighten the handle securely. Next, securely tighten the two screws that attach the handlebars ends to the mounting tabs.
6. To remove the tiller from its shipping platform, first carefully unwrap the Wheel Gear Lever and cable assembly (G, Figure 2-5) from around the engine. Next, move the lever to the DISENGAGE position (this allows the wheels to rotate).

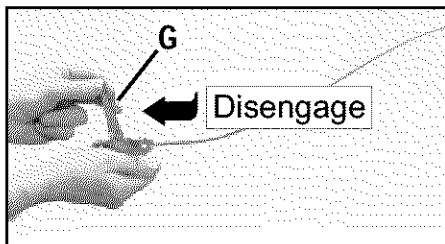


Figure 2-5: Put Wheel Gear Lever in DISENGAGE position.

IMPORTANT: Use the DISENGAGE position only when the engine is not running. Before starting the engine, the Wheel Gear Lever must be placed in the ENGAGE position (see Section 3 for details).

STEP 3: ATTACH REVERSE CLUTCH LEVER

1. Slide the Reverse Clutch Control (removed in Step 2) down through the hole in the left side of the handlebar control panel and pass it above the cross-brace at the lower end of the handlebar.
2. Insert the end of the lever (H, Figure 2-6) through the hole in the pivot (I). Note there are two small holes in the lower end of the lever.

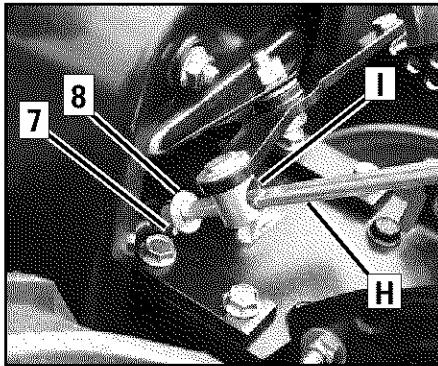


Figure 2-6: Install Reverse Clutch Control.

3. Install a 5/16" flat washer (8, Figures 2-1 and 2-6) and secure it with a 5/8" long straight cotter pin (7) through the bottom hole in the lever. Spread the legs of the straight cotter pin apart and bend them over to prevent the pin from coming loose.

STEP 4: ATTACH FORWARD CLUTCH ROD

1. The upper end of the Forward Clutch rod is attached to the bottom of the handlebar control panel. Turn the rod (L, Figure 2-7) so that its end points inward toward the clutch swivel plate (HH).

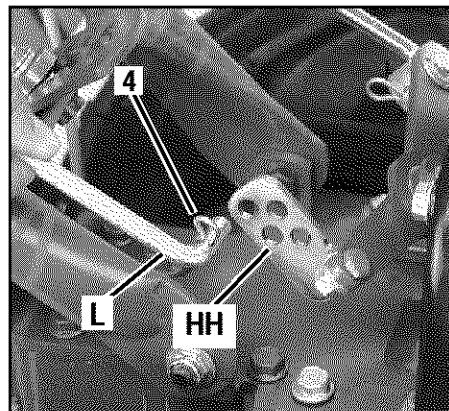


Figure 2-7: Install Forward Clutch rod.

2. Insert a hairpin cotter down through the hole in the rod that is located closest to the bend (see 4, Figures 2-1 and 2-7).
3. There are four numbered holes in the clutch swivel plate and four numbered slots in the curved height adjustment bracket (see Figure 2-8). For correct operation of the Forward Clutch rod, the numbered hole used for the Forward Clutch rod must match with the numbered slot in the height adjustment bracket. For example, if the handlebar is set into slot #1, then the Forward Clutch rod must be installed into hole #1 of the clutch swivel plate.

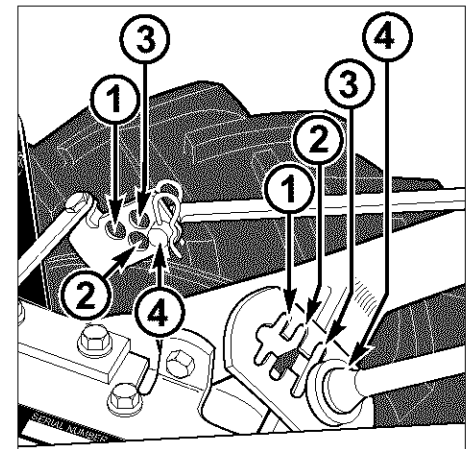


Figure 2-8: Numbered settings for handlebar height slots and clutch swivel plate holes.

IMPORTANT: Whenever the handlebar height is changed, the hole position of the Forward Clutch rod must be changed accordingly. Changing the handlebar height changes the tension on the Forward Clutch rod – this tension must be adjusted by relocating the rod into the appropriate hole in the clutch swivel plate.

4. Select the proper hole in the clutch swivel plate and insert the Forward Clutch rod so that the tip faces inward (see Figure 2-8). *Secure the rod by inserting a second hairpin cotter (4, Figures 2-1 and 2-7) through the hole near the tip of the rod.*
5. Check for correct tension on the Forward Clutch rod as follows:
 - (a) Two interconnected Forward Clutch levers hang beneath the control panel. Lift and hold the right-side lever against the handlebar grip.

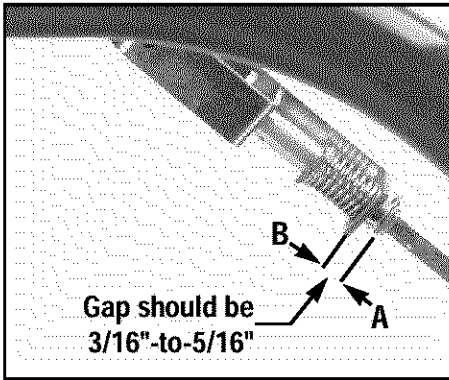


Figure 2-9: While squeezing Forward Clutch lever, measure gap between end of bracket and E-ring.

(b) While squeezing the lever, measure the gap between the E-ring (A, Figure 2-9) and the lower end of the clutch rod bracket (B). The gap should be between 3/16" and 5/16".

NOTE: A stack of five pennies is approximately 5/16" thick.

(c) If the gap is incorrect:

(1) First check that the Forward Clutch rod is in the correct hole in the clutch swivel plate (Figure 2-8). If not, reposition the rod and repeat Step 5b.

(2) If the Forward Clutch rod is in the correct hole and the gap is incorrect, you will need to adjust the length of the Forward Clutch rod. To do this, first release the Forward Clutch lever and then disconnect the rod from the clutch swivel plate (remove hairpin cotter at end of rod and pull rod out of hole in clutch swivel plate).

If the gap is more than 5/16", rotate the rod counterclockwise (as viewed from the front of tiller) to decrease the gap. Reinstall the rod in the correct clutch swivel plate hole, secure it with the hairpin cotter, and repeat Steps 5a and 5b.

If the gap is less than 3/16", rotate the rod clockwise (as viewed from the front of tiller) to increase the gap. Reinstall the rod into the correct clutch swivel plate hole (Figure 2-8), secure it with the hairpin cotter, and repeat Steps 5a and 5b.

STEP 5: CHECK TRANSMISSION GEAR OIL LEVEL

The transmission was filled with gear oil at the factory. However, you should check the gear oil level to make certain it is correct.

IMPORTANT: Do not operate the tiller if the gear oil level is low. Doing so will result in severe damage to the transmission components.

1. Move the tiller to a level area.
2. Pull the Depth Regulator Lever (M, Figure 2-10) straight back and then slide it to the second notch from the top. If the lever does not move freely, lift the tine hood flap and look for a plastic tie securing the lever. Cut and remove the tie.

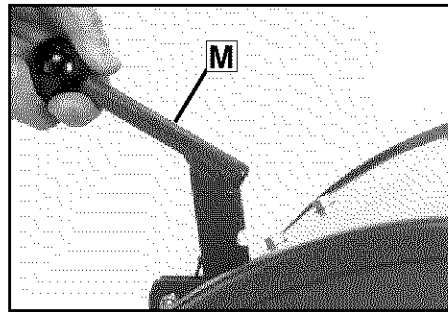


Figure 2-10: Put lever in second notch.

3. Remove the oil level check plug (N, Figure 2-11) on the left-side of the transmission. (Due to dried paint on the plug threads, it may require some force to remove the plug the first time.) The gear oil level is correct if oil starts to flow out of the hole as the plug is removed. If so, securely reinstall the plug.

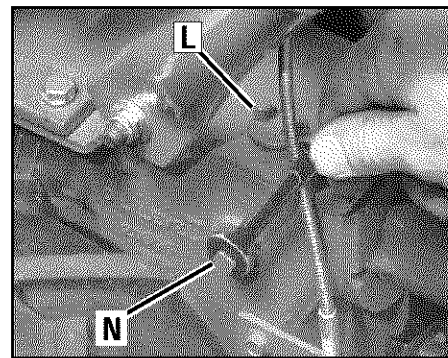


Figure 2-11: Gear oil level check plug (N) and fill hole (L).

4. If oil does not flow from the check hole, add SAE 140, SAE 85W-140 or SAE 80W-90 weight gear oil (preferably use API rated GL-4 gear oil; however, GL-5 can be used for small top-offs) as follows:

NOTE: Do not use automatic transmission fluid or motor oil in the transmission.

- (a) Clean area around oil fill hole (L, Figure 2-11) and unscrew oil fill plug.
- (b) Using a clean funnel, slowly add gear oil (O, Figure 2-12) until it flows from the oil level check hole (N, Figure 2-11). Securely reinstall the oil level check plug (N).
- (c) Reinstall and tighten the oil fill plug.

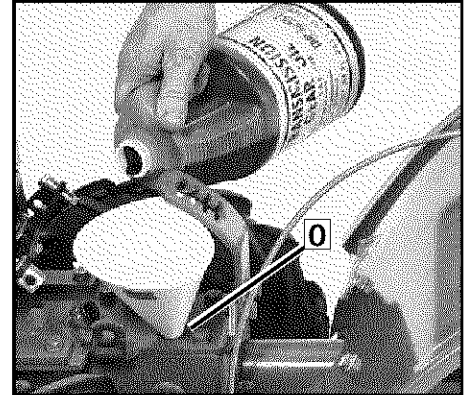


Figure 2-12: Adding gear oil.

STEP 6: ADD MOTOR OIL TO ENGINE

The tiller is shipped without oil in the engine.

IMPORTANT: Do not start the engine without first adding motor oil. Severe engine damage will result if the engine is run without oil.

1. With the unit on level ground, pull the Depth Regulator Lever (M, Figure 2-10) back and then move it up or down until the engine is level.
2. Add motor oil according to the instructions provided in the engine manufacturer's Engine Owner's Manual (included in the unit's literature package).

STEP 7: ATTACH ENGINE THROTTLE LEVER

For shipping purposes, the engine throttle cable assembly is wrapped around the engine. Carefully unwrap the cable and attach it as follows:

1. Route the throttle cable up the right-side handlebar.
2. Insert the lever (P, Figure 2-13) up through the slot in the control panel, labeled *ENGINE THROTTLE*.

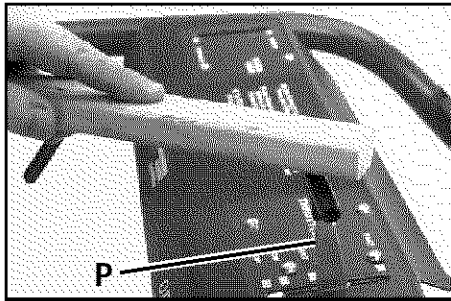


Figure 2-13: Install knob onto engine throttle lever.

3. Insert the two #10-32 x 1/2" round head screws down through the "+" marks on the control panel decal and through the holes in the base of the engine throttle lever.
4. Hold the engine throttle lever base against the bottom of the control panel and secure it with the two #10 lockwasher and #10-32 nuts.
5. Place the "T" shaped engine throttle lever knob onto the end of the lever and use a board to tap the knob down until it seats firmly on the lever (see Figure 2-13).
6. Move the lever forward and backward – it should move freely through the full range of travel. (Note that there is a detent at the SLOW setting which catches the lever. This detent prevents the lever from unintentionally moving to the STOP setting when you are just trying to slow the engine down.) If the lever is difficult to move away from the STOP setting, loosen both screws and move the lever assembly slightly to the left. Retighten both screws and recheck the movement. Adjust the lever as needed.
7. Secure the throttle cable to the right-side handlebar with two plastic ties (R, Figure 2-14) located about two feet apart. The serrated side of the tie should be on the inside of the loop. Snip off any excess tie length with scissors.

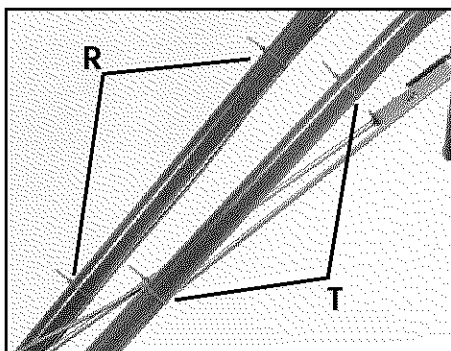


Figure 2-14: Proper plastic tie placement.

STEP 8: ATTACH WHEEL GEAR LEVER

For shipping purposes, the wheel gear cable is wrapped around the transmission. Carefully unwrap the cable and attach it as follows:

1. Route the wheel gear cable up the left-side handlebar and insert the lever (S, Figure 2-15) up through the slot in the control panel, labeled *WHEEL GEAR*.
2. Insert two #10-32 x 1/2" round head screws down through the "+" marks on the control panel decal and through the holes in the base of the lever.
3. Secure the base with two #10 lockwashers and #10-32 nuts.
4. Place the wheel gear lever knob on the end of the lever and use a board to tap the knob down until it seats firmly on the lever (see Figure 2-15).
5. Secure the cable to the left-side handlebar with two plastic ties (T, Figure 2-14) located about two feet apart. Snip off any excess tie length with scissors.

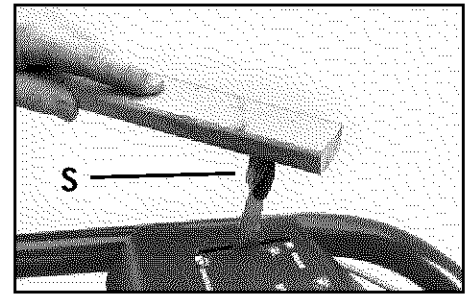


Figure 2-15 Install knob onto wheel gear lever.

STEP 9: CHECK TIRE AIR PRESSURE

Use an automotive-type tire pressure gauge to check the air pressure in both tires. Deflate or inflate both tires evenly between 15 and 20 PSI (pounds per square inch). Be sure that both tires have equal air pressure or the unit will pull to one side.

STEP 10: CHECK HARDWARE TIGHTNESS

Inspect the hardware on the unit and tighten any loose screws, bolts and nuts.

IMPORTANT: This completes the assembly steps. Read the rest of this Manual before you operate your tiller.

SPECIFICATIONS

TILLER HEIGHT (with Depth Regulator Lever in highest setting):

Without Handlebars	25"
Handlebars in lowest setting.....	38-1/4"
Handlebars in highest setting	48"

TILLER LENGTH

Without handlebars.....	49"
Handlebars in lowest setting.....	69"

TILLER WIDTH

Hood width	22"
Tilling width	20"
Wheel width	18-1/2"
Handlebar width.....	20-1/4"

TILLER WEIGHT

Approximate weight (without oil or gas).....	204 lbs.
----------------------------------------------	----------

TRANSMISSION GEAR OIL SPECIFICATIONS

For small top-offs: Use SAE 140, SAE 85W-140, or SAE 80W-90 gear oil with an API rating of either GL-4 or GL-5.

For Full Replacement: Use SAE 140 or SAE 85W-140 gear oil with API rating of GL-4 (do not use GL-5).

⚠ WARNING

Before operating your machine, carefully read and understand all safety, controls and operating instructions in this Manual, the separate Engine Owner's Manual, and on the decals on the machine.

Failure to follow these instructions can result in serious personal injury.

TILLER FEATURES AND CONTROLS

This section describes the location and function of the controls on your tiller. Refer to Section 4: *Operation* for detailed operating instructions.

Practice using these controls, with the engine shut off, until you understand the operation of the controls and feel confident with each of them.

IMPORTANT: Refer to the separate engine manufacturer's Engine Owner's Manual for information about the controls on the engine.

WHEEL GEAR LEVER

This lever (A, Figure 3-1) has two positions: ENGAGE and DISENGAGE.

In the ENGAGE position, the wheels will start turning when either the Forward Clutch or the Reverse Clutch is engaged.

NOTE: The tines will also start turning when either clutch is engaged.

⚠ DANGER

Never place the Wheel Gear Lever in DISENGAGE (Freewheel) when the engine is running.

Having the Wheel Gear Lever in DISENGAGE and then engaging the tines/wheels with either the Forward Clutch or the Reverse Clutch could allow the tines to propel the tiller rapidly backward.

Failure to follow this instruction could result in personal injury or property damage.

The DISENGAGE (freewheel) position places the wheels in freewheeling mode to allow the wheels to turn without starting the engine. Use the DISENGAGE position only when the engine is not running.

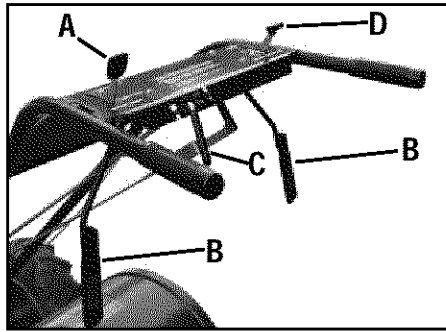


Figure 3-1: Control panel.

To shift to ENGAGE, gently (do not force) move the lever forward while rolling the tiller a few inches forward or backward. (Moving the tiller helps align the transmission shift mechanism). The wheels will not freewheel when the lever is properly set in the ENGAGE position.

To shift to DISENGAGE, move the lever rearward, without rolling the tiller. The wheels roll freely when the lever is properly set in the DISENGAGE position.

FORWARD CLUTCH LEVERS

Two interconnected levers (B, Figure 3-1) control engagement of the forward drive to the wheels and power to the tines.

⚠ WARNING

Never engage wheels and tines with Forward Clutch or Reverse Clutch unless Wheel Gear Lever is in ENGAGE.

Engaging the Forward Clutch or Reverse Clutch when wheels are not engaged could allow the tines to rapidly propel tiller backward.

Failure to follow this warning could result in personal injury or property damage.

To Operate Forward Clutch:

1. Before engaging the Forward Clutch, put the Wheel Gear Lever into the ENGAGE position (see "WARNING" above).
2. Lift and hold one or both levers against the handlebar grips to engage the wheels and tines.
3. Release BOTH levers to disengage wheels and tines. All forward motion will stop (engine will continue to run).

IMPORTANT: The Forward Clutch Levers are connected to a mechanical interlock that automatically shifts a separate Wheel

Gear Lever (A, Figure 3-1) into ENGAGE position when either Forward Clutch Lever is pulled up against the handlebars. This is a safety feature designed to prevent the wheels from being in DISENGAGE (freewheel) position when the tines are rotating.

Before starting the engine, test the function of the mechanical interlock as follows:

1. Put Wheel Gear Lever into DISENGAGE position and roll tiller back and forth a few inches. Wheels should roll freely.
2. Without rolling the tiller, squeeze either Forward Clutch Lever against the handlebar grips. As the levers move upward, the mechanical interlock automatically moves the Wheel Gear Lever forward into the ENGAGE position (roll tiller back and forth a few inches). If it does, the wheels will not roll freely when you push and pull on the handlebars.
3. The mechanical interlock works properly if it functions as described in Step 2. If the mechanical interlock does not function properly, do not operate the tiller until it has been corrected (see your authorized dealer or contact the factory).

REVERSE CLUTCH CONTROL

This control (C, Figure 3-1) engages the reverse drive to the wheels and power to the tines. It is used for moving the tiller short distances in a reverse direction.

To Operate Reverse Clutch:**⚠ WARNING**

- Use extreme caution when reversing or pulling the machine towards you. Look behind to avoid obstacles.
- Never attempt to till in reverse.

Failure to follow this warning could result in personal injury or property damage.

1. Before engaging the Reverse Clutch, put the Wheel Gear Lever into ENGAGE. (see "WARNING" at left).
2. Release the Forward Clutch Levers.
3. To move the tiller in reverse, first stop all forward motion. Lift up the handlebars until the tines clear the ground and pull the Reverse Clutch lever out.

The wheels will rotate in a reverse direction as long as the lever is held in REVERSE. To stop the wheels and tines, release the lever and it will return to NEUTRAL. **Never attempt to till while moving in reverse direction.**

DEPTH REGULATOR LEVER

This lever (E, Figure 3-2) controls the tilling depth of the tines. Pull the lever straight back and slide it up or down to engage the notched height settings.

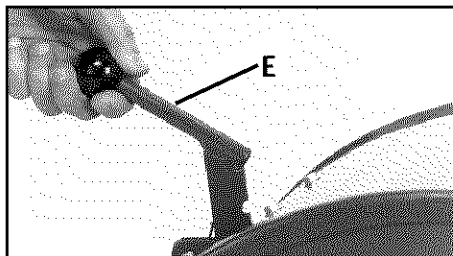


Figure 3-2: Depth Regulator Lever.

The highest notch (lever all the way down) raises the tines approximately 1-1/2 inches off the ground. This "travel" position allows the tiller to be moved without the tines digging into the ground.

Moving the lever up increases the tilling depth. The lowest notch allows a tilling depth of approximately six to eight inches, depending on soil conditions.

For best results, always begin tilling at a very shallow depth setting and gradually increase tilling depth.

⚠ WARNING

- Place Depth Regulator Lever in "travel" position before starting engine. This position prevents the tines from touching the ground until you are ready to begin tilling.
- Do not attempt to till too deeply too quickly. Gradually work down to deeper tilling depths.

Failure to follow this warning could result in personal injury or property damage.

HANDLEBAR HEIGHT ADJUSTMENT

Handlebar height is adjustable to four different settings. When setting the height, keep in mind that the handlebars will be lower when the tines are engaged in the soil.

⚠ WARNING

Whenever the handlebar height is changed, the Forward Clutch shift mechanism must be readjusted.

Before adjusting or checking the Forward Clutch mechanism, shut engine off, disconnect spark plug wire and prevent it from touching spark plug.

Failure to follow this warning could cause the Forward Clutch mechanism to operate improperly which could result in personal injury or property damage.

To Adjust Handlebar Height:

1. Stop engine, wait for all parts to stop moving and then disconnect spark plug wire.
2. Loosen the two screws at lower ends of handlebar.
3. Loosen height adjustment handle (F, Figure 3-3) and pull keyed washer (G) free from slots in curved height adjustment bracket.

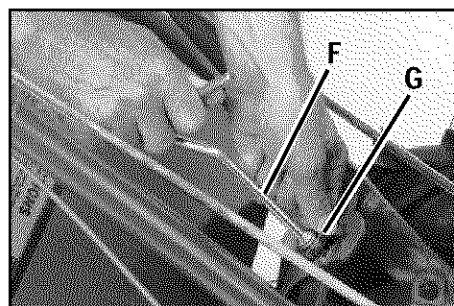


Figure 3-3: Adjusting handlebar height.

4. Move handlebars to a new slot setting and insert the raised key on the keyed washer into the slot. Tighten the height adjustment handle securely.
5. Retighten the two screws at ends of handlebar.
6. Adjust the tension on the Forward Clutch rod shift mechanism as follows:

- (a) Remove inner hair pin cotter from end of Forward Clutch rod.
- (b) There are four numbered holes in the clutch swivel plate (see Figure 3-4) and four numbered slots in the curved height adjustment bracket. For correct operation of the Forward Clutch mechanism, the numbered holes used for the Forward Clutch rod must match the numbered slot in the height adjustment bracket. Example: If handlebar is in slot #4, put Forward Clutch rod into hole #4 of clutch swivel plate.

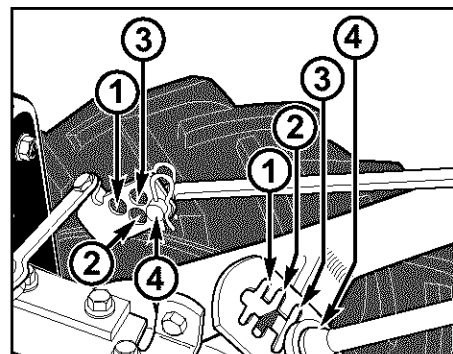


Figure 3-4: Handlebar height slots and clutch swivel plate holes.

- (c) Select the correct hole in the clutch swivel plate and insert the Forward Clutch rod (tip faces inward). Secure the rod with a hairpin cotter.
- (d) Check for correct tension on the Forward Clutch rod as described in item 5 of Step 4: Attach Forward Clutch Rod in Section 2.

ENGINE CONTROLS

IMPORTANT: The engine is equipped with either a choke control or a primer bulb. Refer to the Engine Owner's Manual (included in tiller literature package) to identify which device is on your engine.

RECOIL STARTER

The recoil starter (H, Figure 3-5) is used to "pull-start" the engine. See *Engine Starting and Stopping* in Section 4 for detailed engine starting instructions.

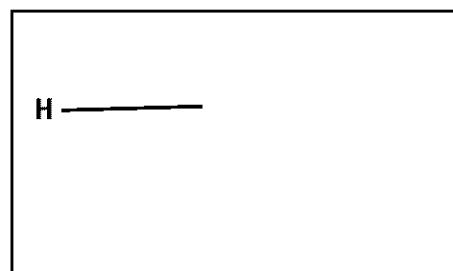


Figure 3-5: Recoil starter handle.

ENGINE THROTTLE LEVER

The throttle lever (D, Figure 3-1) is used to adjust engine speed as well as stop the engine. Use the START position when starting the engine. Pull the lever all way back to the STOP position to shut the engine off.

⚠ WARNING

Before operating your machine, carefully read and understand all safety (Section 1), controls (Section 3) and operating instructions (Section 4) in this Manual, in the separate Engine Owner's Manual, and on the decals on the machine.

Failure to follow these instructions can result in serious personal injury.

INTRODUCTION

Read this Section of the manual thoroughly before you start the engine. Then, take time to familiarize yourself with the basic operation of the tiller before using it. Find an open, level area and practice using the tiller controls without engaging the tines in the soil (put tines in "travel" setting). Only after you've become completely familiar with the tiller should you begin using it in the garden.

BREAK-IN OPERATION

Perform the following maintenance during the first hours of new operation (see Section 5: *Maintenance* and the maintenance section of the Engine Owner's Manual).

1. Change motor oil after first 2 hours of new engine operation.
2. Check for loose or missing hardware on unit. Tighten or replace as needed.
3. Check tension on forward drive belt after first 2 hours of operation.
4. Check transmission gear oil level after first 2 hours of operation.

STARTING AND STOPPING ENGINE

The following steps describe how to start and stop the engine. **Do not engage the tines or wheels until you have read all of the operating instructions in this Section. Also review the safety rules in Section 1: Safety and the tiller and engine controls information in Section 3: Features and Controls.**

Pre-Start Checklist

Do the following before starting the engine.

1. Check unit for loose or missing hardware. Service as required.
2. Check motor oil level. See Engine Owner's Manual.

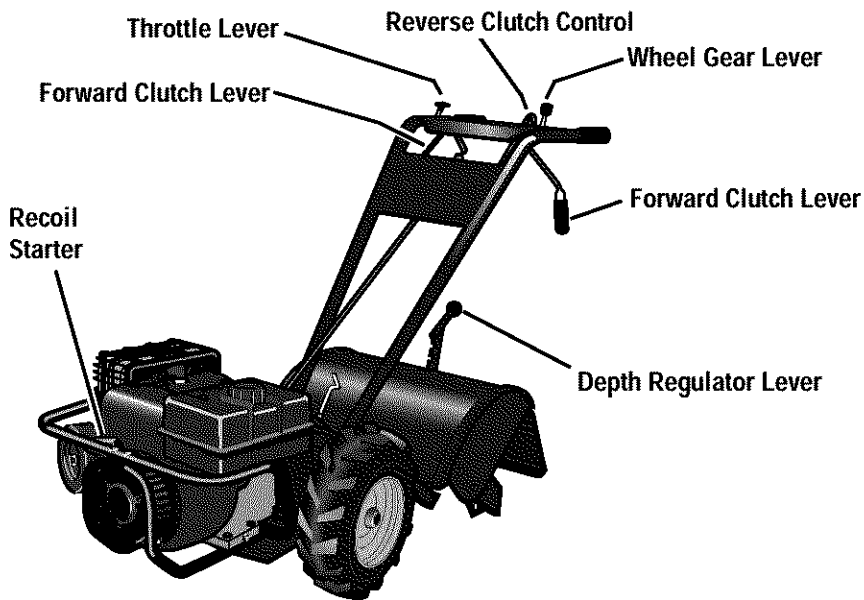


Figure 4-1

3. Check that all safety guards and covers are in place.

4. Check air cleaner and engine cooling system. See Engine Owner's Manual.

5. Select a forward belt speed range (see *Changing Belt Speed Ranges* in this Section).

⚠ DANGER

GASOLINE IS HIGHLY FLAMMABLE AND ITS VAPORS ARE EXPLOSIVE.

Follow gasoline safety rules in this manual (see Section 1) and in the separate Engine Owner's Manual.

Failure to follow gasoline safety instructions can result in serious personal injury and property damage.

6. Fill the fuel tank with gasoline according to the directions in the separate Engine Owner's Manual. Follow all instructions and safety rules carefully.

7. Attach spark plug wire to spark plug.

Starting the Engine

1. Complete the *Pre-Start Checklist*.
2. Put the Wheel Gear Lever (Figure 4-1) into the ENGAGE position.
3. Put the Depth Regulator Lever into the "travel" position (lever all the way down) so that the tines are clear of the ground.
4. Release all controls on the tiller.

⚠ CAUTION

To help prevent serious personal injury or damage to equipment:

- Before starting engine, put Wheel Gear Lever into ENGAGE position.
- Before starting engine, put Forward Clutch Levers and Reverse Clutch Control into neutral (disengaged) positions by releasing controls.
- Never run engine indoors or in an enclosed, poorly ventilated area. Engine exhaust contains carbon monoxide, an odorless and deadly gas.
- Avoid engine muffler and nearby areas. Temperatures in these areas may exceed 150°F.

⚠ WARNING

Keep away from rotating tines. Rotating tines will cause injury.

5. If the engine is equipped with a fuel shutoff valve, turn the valve to the open position, as instructed in the separate Engine Owner's Manual.
6. Move the Engine Throttle Lever into the START position.
7. Choke or prime the engine as instructed in the separate Engine Owner's Manual.

8. Check behind you to avoid contacting any obstacles when pulling the starter rope. Place one hand on the fuel tank to stabilize the unit and use the recoil starter to start the engine as instructed in the Engine Owner's Manual. When the engine starts, gradually move the choke lever (on engines so equipped) to the NO CHOKE, CHOKE OFF or RUN position, whichever applies.

9. Use the FAST throttle speed setting when tilling.

Stopping the Engine

1. To stop the wheels and tines, release the Forward Clutch levers or the Reverse Clutch Control (whichever control is in use).

2. To stop the engine, move the Engine Throttle Lever into the STOP position.

OPERATING TILLER

⚠ WARNING

Before tilling, contact your telephone or utilities company and inquire if underground equipment or lines are on your property.

The following pages provide guidelines to using your tiller effectively and safely in various gardening applications. Be sure to read *Tilling Tips & Techniques* in this Section before you actually put the tines into the soil.

1. Follow the *Pre-Start Checklist* on the previous page. Be sure that the Wheel Gear Lever is in the ENGAGE position.

2. Move the Depth Regulator Lever into the "travel" position (lever all the way down) so that the tines clear the ground. Use this position when practicing with or transporting the tiller. When you are ready to begin tilling, move the Depth Regulator Lever into the desired depth setting (see *Tilling Tips & Techniques*).

3. Start the engine and allow it to warm up. When warm, move the throttle control into the FAST speed setting.

4. For forward motion of the wheels and power to the tines:

- (a) Pull up and hold the Forward Clutch levers against the handlebars. To stop the wheels and tines, release both levers.

⚠ WARNING

Do not push down on the handlebars to try to make the tiller till more deeply. This prevents the wheels from holding the tiller back and can allow the tines to rapidly propel the tiller backward toward the operator, which could result in loss of control, property damage, or personal injury.

- (b) As the tiller moves forward, relax and let the wheels pull the unit along while the tines dig. Walk behind and a little to one side of the tiller. Use a light but secure grip with one hand on the handlebars, but keep your arm loose. See Figure 4-2. Let the tiller move ahead at its own pace. Do not push down on the handlebars to try and force the tiller to dig deeper – this takes weight off the wheels, reduces traction, and causes the tines to try and propel the tiller.



Figure 4-2: Use one hand to guide tiller when moving forward.

5. For reverse motion of the wheels and tines:

- (a) Look behind and exercise caution when operating in reverse. **Do not till while in reverse.**
- (b) Stop all forward motion before reversing. Lift the handlebars with one hand until the tines are off the ground and then pull the Reverse Clutch control out (see Figure 4-3). To stop reverse motion, let go of the Reverse Clutch Control.



Figure 4-3: Raise tines off ground and look behind when moving in reverse.

6. To turn the tiller around:

- (a) Practice turning in a level, open area. Be very careful to keep your feet and legs away from the tines.
- (b) To start a turn, reduce the engine speed and then lift the handlebars until the engine and tines are balanced over the wheels (Figure 4-4).



Figure 4-4: Find balance point before turning.

- (c) With the tiller balanced, push sideways on the handlebar to move the tiller in the direction of the turn (Figure 4-5). After completing the turn, slowly lower the tines into the soil and increase the engine speed.



Figure 4-5

Stopping the Tiller and Engine

1. To stop the wheels and tines, release the Forward Clutch levers or the Reverse Clutch Control (whichever is engaged).
2. To stop the engine, move the Engine Throttle Lever to STOP.
3. If the engine is equipped with a fuel shutoff valve, close the valve as instructed in the Engine Owner's Manual.

⚠ WARNING

Before changing belt speeds, stop engine, wait for all parts to stop moving, let engine cool and disconnect spark plug wire.

Failure to follow these instructions could result in personal injury.

CHANGING BELT RANGE SPEEDS

The tiller has two forward belt range speeds for the wheels and tines: Low and High. The two ranges are obtained by moving the forward drive belt between two sets of grooves on the forward drive pulley and the transmission drive pulley.

NOTE: The High speed belt range is recommended for all tilling purposes. The Low speed belt range will operate the tines and wheels at a slower forward speed, which may be suitable in some conditions (such as tilling in very hard ground).

To Change from Low to High Speed:

1. Stop the engine, allow it to cool, and disconnect the spark plug wire.
2. Move the Wheel Gear Lever into the DISENGAGE position.
3. Remove the two nuts from the plastic belt cover on top of the transmission and remove the belt cover.
4. From beneath the tiller, move the forward drive belt out of the transmission low speed groove (B, Figure 4-10) and into the high speed groove (D).
5. Pull upward on the belt to remove any slack and slip the belt out of the engine drive pulley low speed groove (A, Figure 4-10) and into the high speed groove (C).

NOTE: If the belt is difficult to move, pull on the engine start rope while pushing the belt with your finger (engine drive pulley will turn as start rope is pulled).

6. Check that the belt is within the forward belt guide (E, Figures 4-10 and 4-11) on the right-side of the unit and is within the forward idler (F, Figure 4-11) on the left-side. Be sure that the belt is situated in the center grooves (C and D, Figure 4-10) of the engine (upper) and transmission (lower) pulleys.

7. Reinstall the plastic belt cover and secure it with the two nuts.

8. Put Wheel Gear Lever in ENGAGE and reconnect spark plug wire before attempting to start the engine.

To Change from High to Low Speed:

1. Stop the engine, allow it to cool, and disconnect the spark plug wire.

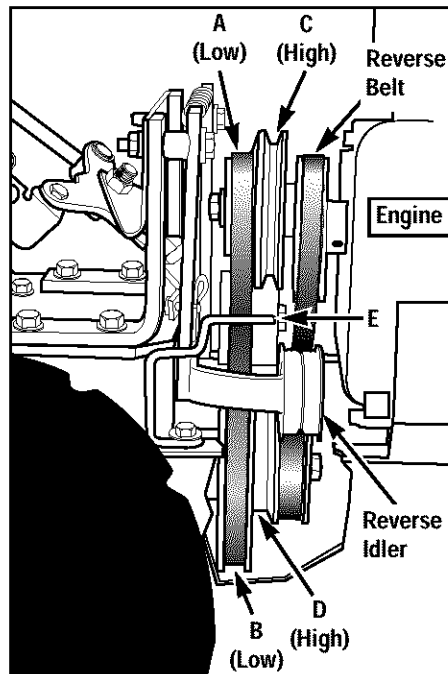


Figure 4-10: Right-side view of engine and transmission pulleys (engine is at right-side of view).

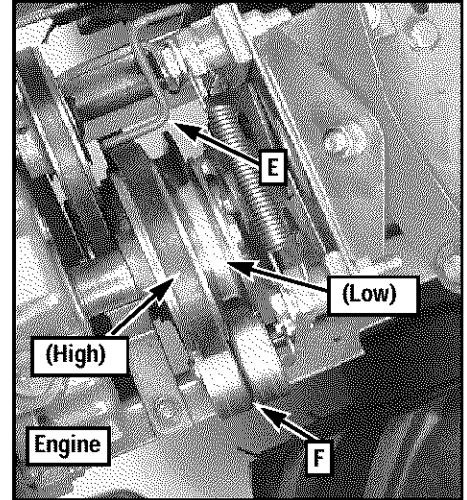


Figure 4-11: Top view of forward drive pulley system (engine is at left-side of view).

2. Put Wheel Gear Lever in DISENGAGE.

3. Remove the two nuts from the plastic belt cover on top of the transmission and remove the belt cover.

4. From beneath the tiller, move the forward drive belt out of the transmission pulley high speed groove (D, Figure 4-10) and into the low speed groove (B).

5. Pull upward on the belt to remove any slack and slip the belt out of the engine drive pulley high speed groove (C, Figure 4-10) and into the low speed groove (A).

NOTE: If the belt is difficult to move, pull on the engine start rope while pushing the belt with your finger (engine drive pulley will turn as start rope is pulled).

6. Check that the belt is within the forward belt guide (E, Figures 4-10 and 4-11) on the right-side of the unit and is within the forward idler (F, Figure 4-11) on the left-side. Be sure that the belt is situated in the rear grooves (A and B, Figure 4-10) of the engine (upper) and transmission (lower) pulleys.

7. Reinstall the plastic belt cover and secure it with the two nuts.

8. Put the Wheel Gear Lever in ENGAGE and reconnect the spark plug wire before attempting to start the engine.

TILLING TIPS & TECHNIQUES

Tilling Depths

- This is a CRT (counter-rotating tine) tiller. As the wheels pull forward, the tines rotate backward. This creates an "uppercut" tine action which digs deeply, uprooting soil and weeds. Don't overload the engine, but dig as deeply as possible on each pass. On later passes, the wheels may tend to spin in the soft dirt. Help them along by lifting up slightly on the handlebar (one hand, palm up, works most easily).
- Avoid the temptation to push down on the handlebars in an attempt to force the tiller to dig deeper. Doing so takes the weight off the powered wheels, causing them to lose traction. Without the wheels to hold the tiller back, the tines will attempt to propel the tiller backward, towards the operator. (Sometimes, slight downward pressure on the handlebars will help get through a particularly tough section of sod or unbroken ground, but in most cases this won't be necessary.)
- When cultivating (breaking up surface soil around plants to destroy weeds, see Figure 4-9), adjust the tines to dig only 1" to 2" deep. Using shallow tilling depths helps prevent injury to plants whose roots often grow close to the surface. If needed, lift up on the handlebars slightly to prevent the tines from digging too deeply. (Cultivating on a regular basis eliminates weeds, and loosens and aerates the soil for better moisture absorption and faster plant growth.)
- Watering the garden area a few days prior to tilling will make tilling easier, as will letting the newly worked soil set for a day or two before making a final, deep tilling pass.

Choosing Correct Wheel and Tine Speeds

With experience, you will find the "just right" tilling depth and tilling speed combination that is best for your garden.

Set the engine throttle lever at a speed to give the engine adequate power and yet allow it to operate at the slowest possible speed...at least until you have achieved the maximum tilling depth you desire. Faster engine speeds may be desirable when making final passes through the seedbed or when cultivating. Selection of the correct engine speed, in relation to the tilling depth, will ensure a sufficient power level to do the job without causing the engine to labor.

Let the Tiller Do the Work	Avoid Making Footprints	Avoid Tilling Soggy, Wet Soil
While tilling, relax and let the wheels pull the tiller along while the tines do the digging. Walk on the side that is not yet finished (to avoid making footprints in the freshly tilled soil) and lightly, but securely grip the handlebar with just one hand.	Whenever possible, walk on the untilled side of the unit to avoid making footprints in your freshly tilled or cultivated soil. Footprints cause soil compaction that can hamper root penetration and contribute to soil erosion. They can also "plant" unwanted weed seeds back into the freshly tilled ground.	Tilling wet soil often results in large, hard clumps of soil that can interfere with planting. If time permits, wait a day or two after heavy rains to allow the soil to dry before tilling. Test soil by squeezing it into a ball. If it compresses too easily, it is too wet to till.

Preparing Seedbeds

- When preparing a seedbed, go over the same path twice in the first row, then overlap one-half the tiller width on the rest of the passes (see Figure 4-6). When finished in one direction, make a second pass at a right angle as shown in Figure 4-7. Overlap each pass for best results (in very hard ground, it may take three or four passes to thoroughly pulverize the soil.)



Figure 4-6

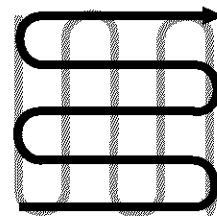


Figure 4-7

- If the garden size will not permit lengthwise and then crosswise tilling, then overlap the first passes by one-half a tiller width, followed by successive passes at one-quarter width (see Figure 4-8).



Figure 4-8

Cultivating

With planning, you can allow enough room between rows to cultivate (see Figure 4-9). Leave room for the hood width, plus enough extra room for future plant growth.

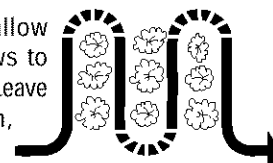


Figure 4-9

TILLING TIPS & TECHNIQUES (cont.)

Tilling On Slopes

Read the following recommendations before tilling on slopes:

If you must garden on a moderate slope, please follow two very important guidelines:

1. Till only on moderate slopes, never on steep ground where footing is difficult (review safety rules in Section 1: *Safety* of this manual).
2. Till up and down slopes rather than across slopes. Tilling vertically on a slope allows maximum planting area and also leaves room for cultivating.

IMPORTANT: When tilling on slopes, maintain correct motor oil level (check every one-half hour of operation). The slope incline causes the oil to slant away from its normal level which can starve engine parts of lubrication. Keep the motor oil level at the full point at all times!

Clearing the Tines

The tines have a self-clearing action which eliminates most tangling of debris in the tines. However, occasionally dry grass, stringy stalks or tough vines may become tangled. Follow these procedures to help avoid tangling and to clean the tines, if necessary.

- To reduce tangling, set the depth regulator deep enough to get maximum "chopping" action as the tines chop the material against the ground. Also, try to till under crop residues or cover crops while they are green, moist and tender.
- While tilling, try swaying the handlebars from side to side (about 6" to 12"). This "fishtailing" action often clears the tines of debris.
- If tangling occurs, lift the tines out of the soil and run the tiller in reverse (if unit is equipped with powered reverse) for a few feet. This reversing action of the tines should unwind most of the debris.
- It may be necessary to remove the debris by hand (a pocket knife will help you to cut away the material). Stop the engine and disconnect the spark plug wire before clearing the tines by hand.

⚠ WARNING

Do not operate the tiller on a slope too steep for safe operation. Till slowly and be sure that you have good footing. Never permit the tiller to freewheel down slopes. Failure to follow this warning could result in personal injury.

Tilling Up and Down Slopes (Vertical Tilling)

- To minimize soil erosion, add enough organic matter to the soil for good moisture-holding texture, and avoid leaving footprints or wheel marks.
- When tilling vertically, try to make the first pass uphill (the tiller digs more deeply going uphill than it does downhill). In soft soil or weeds, you may have to lift the handlebars slightly while going uphill. When going downhill, overlap the first pass by about one-half the width of the tiller.

⚠ WARNING

Before clearing the tines by hand, stop the engine, allow all moving parts to stop and disconnect the spark plug wire. Remove the ignition key on electric start models. Failure to follow this warning could result in personal injury.

LOADING AND UNLOADING TILLER

⚠ WARNING

Loading and unloading the tiller into a vehicle is potentially hazardous and we don't recommend doing so unless absolutely necessary, as this could result in personal injury or property damage.

However, if you must load or unload the tiller, follow the guidelines given next.

- Before loading or unloading, stop the engine, wait for all parts to stop moving, disconnect the spark plug wire and let the engine and muffler cool.
- The tiller is too heavy (over 175 lbs., depending on model) and bulky to lift safely by one person. Two or more people should share the load.
- Use sturdy ramps and manually (engine shut off) roll the tiller into and out of the vehicle. Two or more people are needed to do this.
- Ramps must be strong enough to support the combined weight of the tiller and any handlers. The ramps should provide good traction to prevent slipping; they should have side rails to guide the tiller along the ramps; and they should have a locking device to secure them to the vehicle.
- The handlers should wear sturdy footwear that will help to prevent slipping.
- Position loading vehicle with ramp angle as flat as possible (the less incline to the ramp, the better). Turn vehicle's engine off and apply its parking brake.
- When going up the ramps, stand in the normal operating position and push the tiller ahead of you. Have a person at each side to turn the wheels.
- When going down ramps, walk backward with the tiller following you. Keep alert for any obstacles behind you. Position a person at each wheel to control the speed of the tiller. Never go down ramps tiller-first, as the tiller could tip forward.
- Place wooden blocks on the downhill side of the wheels if you need to stop the tiller from rolling down the ramp. Also, use the blocks to temporarily keep the tiller in place on the ramps (if necessary), and to chock the wheels in place after the tiller is in the vehicle.
- After loading the tiller, prevent it from rolling by engaging the wheels (put Wheel Gear Lever into ENGAGE). Chock the wheels with blocks and securely tie the tiller down.

⚠ WARNING

Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, disconnect spark plug wire and move wire away from spark plug. Remove ignition key on electric start models.

Failure to follow these instructions can result in serious personal injury or property damage.

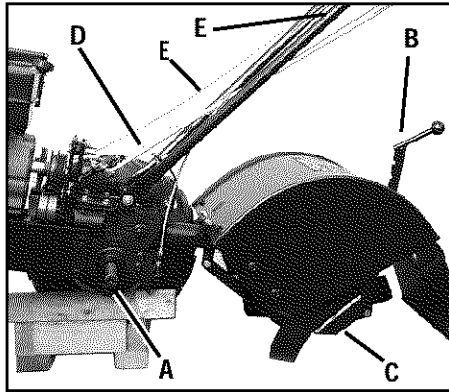


Figure 5-1

- Grease back, front and sides of depth regulator lever (B, Figure 5-1).
- Remove tines and clean tine shafts (C, Figure 5-1). Inspect for rust, rough spots or burrs (especially around holes). File or sand smooth and coat ends of shaft with grease.
- Oil the threads on the handlebar height adjustment handle (D, Figure 5-1).
- Oil the outer casings of the engine throttle cable and the wheel gear cable (E, Figure 5-1). Allow oil to soak in and then wipe off any excess.
- Oil the various pivot points (F, Figure 5-2) on the shifting mechanism, the handlebar, and the idler arms (do not allow oil on the belts or pulleys).

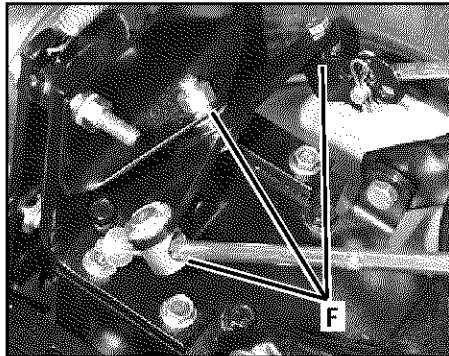


Figure 5-2

CHECK TIRE AIR PRESSURE

Check the air pressure in both tires. Deflate or inflate both tires evenly to between 15 and 20 PSI (pounds per square inch). Be sure that both tires have equal air pressure or the unit will pull to one side.

CHECK FOR OIL LEAKS

Before each use, check your tiller for signs of an oil leak—usually a dirty, oily accumulation either on the unit or on the floor where it has been parked.

A little seepage around a cover or oil seal is usually not a cause for alarm. However, if the oil drips overnight, then immediate attention is needed—ignoring a leak can result in severe transmission damage.

If a cover leaks, try tightening any loose screws or bolts. If the fasteners are tight, a new gasket or oil seal may be required. If the leak is from around a shaft and oil seal, the oil seal probably needs to be replaced. See your authorized dealer or contact the factory for service or advice.

IMPORTANT: Never operate the tiller if the transmission is low on oil. Check the oil level after every 30 hours of operation and whenever there is any oil leakage.

CHECK HARDWARE

Check the unit for loose or missing hardware after every 10 operating hours. Loose or missing hardware can lead to equipment failure, poor performance, or oil leaks.

Be sure to check the three end cap mounting screws located at the rear of the transmission (Figure 5-3). Lift the tine flap to service those screws.



Figure 5-3

TRANSMISSION GEAR OIL SERVICE

Check the transmission gear oil level after every 30 hours of operation or whenever you notice any oil leak. Operating the tiller when the transmission is low on oil can result in severe damage.

A. To Check Transmission Gear Oil Level:

1. Check the gear oil level when the transmission is cool. Gear oil expands in warm operating temperatures and will result in an incorrect oil level reading.

MAINTENANCE SCHEDULE

PROCEDURE	NOTES
Check motor oil level	2, 3
Clean engine	2, 7
Check drive belt tension	1, 4
Check nuts and bolts	1, 4
Change motor oil	1, 4, 6
Lubricate tiller	4
Service foam pre-cleaner air filter (if so equipped)	7
Service paper air filter (if so equipped)	7
Check gear oil level in transmission	1, 5
Check tines for wear	5
Check air pressure in tires	5
Service spark plug	7

NOTES

- 1 - After first 2 hours of break-in operation.
- 2 - Before each use.
- 3 - Every 5 operating hours.
- 4 - Every 10 operating hours.
- 5 - Every 30 operating hours.
- 6 - Change more frequently in dusty or dirty conditions.
- 7 - See Engine Owner's Manual for service recommendations.
- 8 - Whichever time interval occurs first.

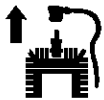
TILLER LUBRICATION

Proper lubrication of the tiller is an essential part of your maintenance program. After every 10 operating hours, oil or grease the lubrication points shown in Figures 5-1 and 5-2 and described below.

Use general purpose lubricating oil (#30 weight motor oil is suitable) and a general purpose grease (metal lubricant is preferred, if available).

- Remove wheels and clean wheel shaft (A, Figure 5-1). Apply a thin coating of grease to shaft before reinstalling wheels.

WARNING



Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug.

Failure to follow these instructions can result in serious personal injury or property damage.

2. To check the gear oil level (and to add oil, if necessary), refer to *STEP 5: Check Gear Oil Level in Transmission* in Section 2 of this manual.

B. To Drain and Refill the Transmission:

The transmission gear oil does not need to be changed unless it has been contaminated with dirt, sand or metal particles.

1. Prop up the left side of the unit securely. Remove the left-side wheel by removing the wheel mounting hardware.

2. Unscrew the plastic gear oil fill plug from the top of the transmission (L, Figure 2-11).

3. Place a clean pan below the transmission drain plug (Figure 5-4) and remove the drain plug. The oil will start flowing out of the drain hole (it may flow slowly, especially in cold temperatures).

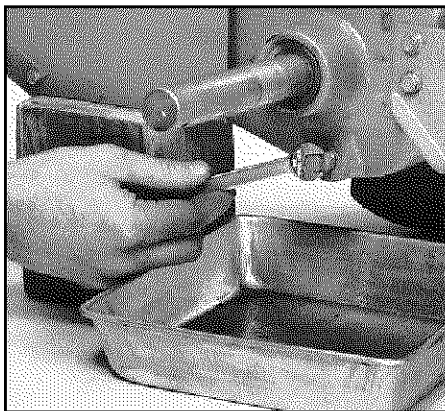


Figure 5-4: Remove drain plug to drain transmission gear oil (also remove oil fill plug and oil level check plug).

4. Remove the transmission gear oil level check plug that is located a few inches above the left-side wheel shaft (N, Figure 2-11).

5. When the oil stops flowing, tilt the transmission forward to drain oil from the rear of the transmission.

6. After draining the oil, clean the threads of the drain plug, apply a non-hardening, removable gasket sealant to the threads, and securely reinstall the drain plug.

7. Use a clean funnel to slowly add SAE 140 or SAE 85W-140 weight gear oil (with

an API rating of GL-4 only) to the transmission. The transmission holds approximately 3-1/4 pints (52-54 ounces). Tilt the tiller slightly backwards to make sure the gear oil reaches the rear (tine) end of the transmission. Stop adding gear oil when it begins to flow from the oil level check hole on the side of the transmission.

8. Securely reinstall the oil level check plug.

9. Securely reinstall the gear oil fill plug on top of the transmission.

10. Reinstall the wheel and remove the prop.

ENGINE OIL SERVICE

Check the motor oil level before starting the engine each day and after each 5 hours of continuous operation. Running the engine when the oil level is low will quickly ruin the engine.

It is recommended that you change the motor oil after every 10 hours of operation and even sooner when operating in extremely dirty or dusty conditions.

A. To Check the Motor Oil Level:

1. Move the tiller to a level area and stop the engine.

2. Level the engine by moving the Depth Regulator Lever into the second notch from the top.

3. Clean the area around the oil dipstick or oil fill tube (whichever applies) to prevent dirt from falling into the crankcase.

4. On engines with an oil fill tube, remove the filler cap and add oil (if required) until it reaches the top of the tube. Reinstall the filler cap.

5. On engines with a dipstick, remove it, wipe it clean, and reinstall it finger-tight. Remove the dipstick again and check the reading. Add oil (if required) to bring the level to the FULL mark. Do not overfill.

B. To Change the Motor Oil:

Change the motor oil as instructed in the separate Engine Owner's Manual.

AIR CLEANER SERVICE

The engine air cleaner filters dirt and dust out of the air before it enters the carburetor. Operating the engine with a dirty, clogged air filter can cause poor performance and damage to the engine. Never operate the engine without the air cleaner installed. Inspect and service the air cleaner more often if operating in very dusty or dirty conditions.

Service the air cleaner as instructed in the separate Engine Owner's Manual.

SPARK PLUG SERVICE

Inspect and clean or replace the spark plug after every 100 operating hours or annually. Clean the plug and set the gap as described in the separate Engine Owner's Manual.

In some areas, local law requires using resistor spark plugs to suppress ignition signals. If the engine was originally equipped with a resistor spark plug, use the same type for replacement.

SPARK ARRESTER SCREEN SERVICE

If the engine muffler is equipped with a spark arrester screen, remove and clean it according to the time intervals and instructions in the separate Engine Owner's Manual.

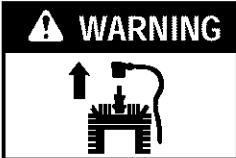
ENGINE CLEANING

The engine must be kept clean to assure smooth operation and to prevent damage from overheating. Refer to the separate Engine Owner's Manual for specific repair and cleaning instructions. All inspections and services must be done with the engine shut off and cool to the touch.

CARBURETOR/GOVERNOR CONTROL ADJUSTMENTS

WARNING

Operators shall not tamper with the engine governor settings; the governor controls the maximum safe operating speed to protect the engine and all moving parts from damage caused by overspeed. Authorized service shall be sought if a problem exists.



WARNING Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug. Failure to follow these instructions can result in serious personal injury or property damage.

The carburetor was adjusted at the factory for best operating speed. Refer to the separate Engine Owner's Manual for any adjustment information or see your authorized engine service dealer.

The governor controls the maximum safe operating speed and protects the engine and all moving parts from damage caused by overspeeding. Do not tamper with the engine governor settings. Seek authorized service if a problem exists.

THROTTLE CONTROL ADJUSTMENT

If the engine does not respond to various throttle lever settings, refer to the separate Engine Owner's Manual for service information or contact your local authorized engine service dealer.

WHEEL GEAR CABLE ADJUSTMENT

When the Wheel Gear Lever is in DISENGAGE, the wheels will roll freely (free-wheel). The wheels should not roll freely when the lever is in ENGAGE. If the wheels roll freely when the Wheel Gear Lever is in ENGAGE, the wheel gear cable needs to be adjusted as described below.

1. With the engine shut off and the spark plug wire disconnected, put the Wheel Gear Lever in ENGAGE.
2. Loosen the top adjustment nut (A, Figure 5-5) on the wheel gear cable bracket located on the left side rear of the transmission.

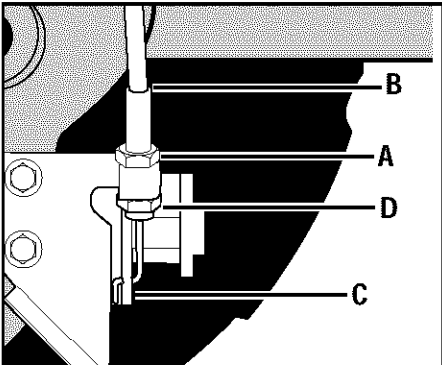


Figure 5-5: Wheel gear cable assembly.

3. Push wheel gear cable (B) down and roll tiller slightly forward or backward until eccentric lever (C) engages (locks) wheels. Hold cable in that position and tighten top (A) and bottom (D) adjustment nuts.

4. Move Wheel Gear Lever to ENGAGE and DISENGAGE several times to check adjustment. The wheels should not roll when the lever is in ENGAGE, but they should roll when the lever is in DISENGAGE. Readjust the cable as required.

OFF SEASON STORAGE

When the tiller won't be used for extended periods, prepare it for storage as follows:

1. Clean the tiller and engine.
 2. Do routine tiller lubrication (see *Tiller Lubrication*) and check for loose parts and hardware (see *Check Hardware*).
 3. Protect the engine by performing the engine storage instructions in the separate Engine Owner's Manual.
- NOTE: Be sure to protect the fuel lines, carburetor and fuel tank from gum deposits by removing fuel or by treating fuel with a fuel stabilizer (follow engine manufacturer's recommendations).
4. Store unit in a clean, dry area.
 5. Never store the tiller with fuel in the fuel tank in an enclosed area where gas fumes could reach an open flame or spark, or where ignition sources are present (space heaters, hot water heaters, furnaces, etc.).

TINES

The tines will wear with use and should be inspected at the beginning of each tilling season and after every 30 operating hours. Tines can be replaced individually or as a complete set. Never inspect or service the tines unless the engine is stopped and the spark plug wire is disconnected.

NOTE: The tiller hood must be removed to take off either a single tine holder or individual tines. The hood is secured to the transmission housing with two rear bolts and two front bolts.

Tine Inspection

With use, the tines (Figure 5-6) will become shorter, narrower and pointed. Badly worn tines will result in a loss of tilling depth and reduced effectiveness when chopping up and turning under organic matter.

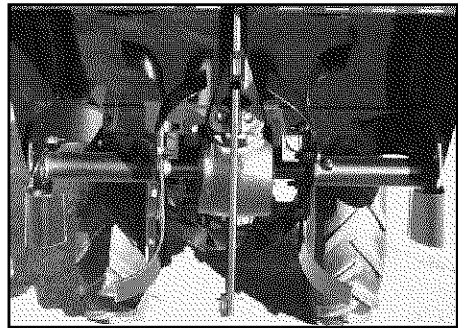


Figure 5-6: Four tine gangs: two per side.

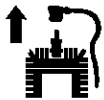
Removing and Installing Tine Assemblies

1. Use a 9/16" socket, 6" extension, a ratchet, and a 9/16" box wrench to loosen the nut (A, Figure 5-7) and bolt (B) that secure the tine holder to the tine shaft.
2. Use a rubber mallet to tap the tine holder loose.
3. Slide the tine assembly off the tine shaft.
4. Repeat Steps 1-through-3 above to remove the other tine assembly.
5. Installing the tine assembly is simply the reverse of its removal. Be sure the cutting edges face so they will enter the soil first when the tiller is moving forward— **this means the cutting edges face toward the operator position.**

First be sure to remove any rust, uneven spots or burrs from the tine shaft, using fine sandpaper. Then grease the tine shaft before reinstalling the tine assemblies. Tighten the hardware very securely.

Removing and Installing Individual Tines

1. Use two 9/16" box end wrenches to remove the two bolts (C, Figure 5-7), and nuts (D) that secure the tine to its tine holder.

WARNING

Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug.

Failure to follow these instructions can result in serious personal injury or property damage.

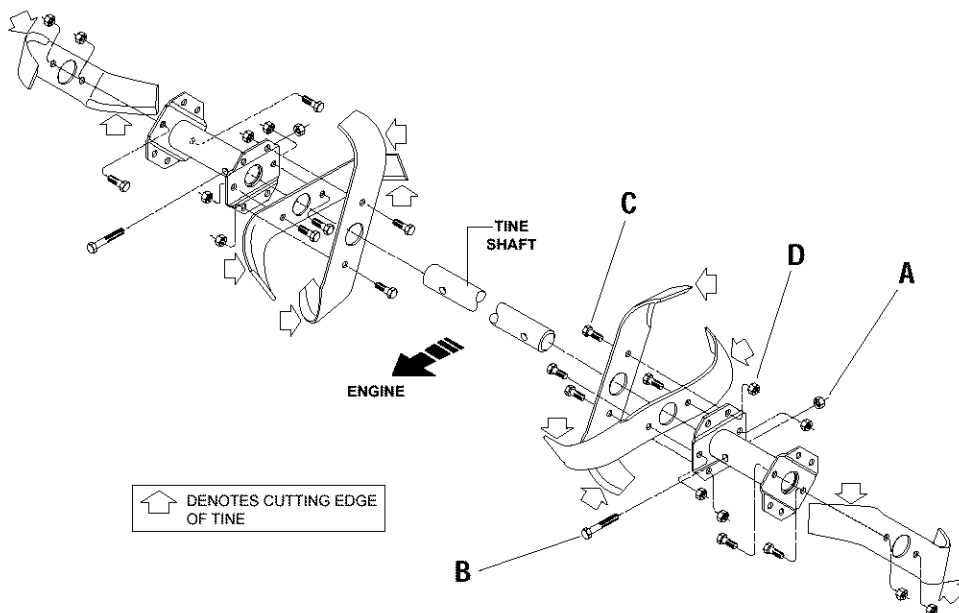


Figure 5-7: Complete tine assemblies— holders, tines and hardware.

WARNING

This is a CRT (counter-rotating tine) tiller and its tines must be mounted in the direction shown in Figure 5-7. If mounted with the curves in the opposite direction, the tiller will dig poorly and be more likely to run backward.

Failure to comply could result in personal injury or property damage.

NOTE: If the nuts are rusted, apply penetrating oil to the bolt and nut. Let the oil soak in for a few minutes before loosening the nut. Always loosen the nut rather than the bolt.

2. When installing individual tines, install them in the reverse order from which they were removed. The two sets of inboard tines are installed so one tine faces toward the transmission housing and the other tine faces away from it. The single outboard tine on each side faces toward the transmission housing. Also be sure the cutting edges face so they will enter the soil first when the tiller is moving forward— **this means the cutting edges face toward the operator position.**

CHECKING AND ADJUSTING TENSION ON DRIVE BELTS

WARNING

Follow the belt adjustment instructions carefully. An incorrect adjustment could result in the Forward Clutch mechanism engaging too soon. This could cause loss of tiller control and result in personal injury or property damage.

Maintaining correct tension on the drive belts is important to good tilling performance and long belt life. A loose belt will slip on the engine and transmission pulleys and cause the tines and wheels to slow down – or stop completely – even though the engine is running at full speed. A loose belt will also result in premature wear to the belt.

While checking belt tension, also check for cracks, cuts or frayed edges. A belt that is in poor condition should be replaced.

The tension on a new forward drive belt should be checked after the first two (2) hours of operation. Thereafter, check the tension after every ten (10) hours of operation.

The reverse drive belt, because it is used more sparingly, will probably not require an initial tension adjustment until a significant number of operating hours has passed.

To Check and Adjust Tension on the Forward Drive Belt:

1. Checking for correct belt tension is the same as that described in item 5, *Step 4: Attach Forward Clutch Rod*. Before checking, shut off the engine, disconnect the spark plug wire, and allow the engine and muffler to cool down. If, after following the adjustment procedures, you cannot get the correct gap on the forward clutch rod adjustment bracket, you will need to make a secondary adjustment as described next.

2. Disconnect the Forward Clutch Rod (A, Figure 5-9) from the swivel plate (B) by removing the innermost hairpin cotter (C).

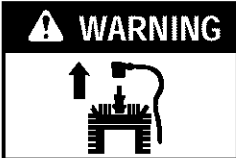
3. Unthread the Forward Clutch Rod (in a counterclockwise direction as viewed from the front of the unit) until one or two threads on the rod extend above the rectangular nut (D, Figure 5-10) on the forward clutch bracket.

4. Remove the belt cover.

5. Slip the forward drive belt (E, Figure 5-9) off the engine-driven forward drive pulley by pushing it off (away from engine) with your left hand while pulling engine starter rope with your right hand.

6. On the **left** side of the unit (from operator's position) remove the hairpin cotter from the clevis pin (F, Figure 5-11) that connects the forward idler arm (G) to the forward adjustable link (H). Push inward on the forward idler arm (G) and remove the clevis pin (F).

7. There are two holes in the forward adjustable link (H, Figure 5-11). Push inward on the forward idler arm (G) and install the clevis pin (F) through the **inner** hole in the forward adjustable link (H) and out through the single hole in the forward idler arm (G). Secure the clevis pin with the hairpin cotter.



WARNING Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug.
Failure to follow these instructions can result in serious personal injury or property damage.

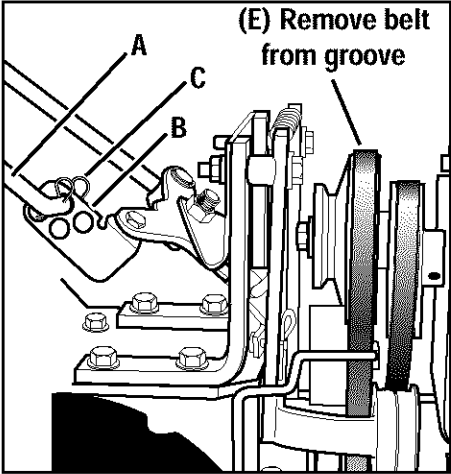


Figure 5-9: Disconnect Forward Clutch Rod and move forward drive belt out of groove in engine forward drive pulley.

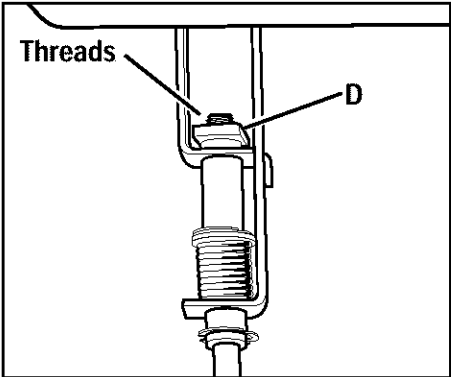


Figure 5-10: One or two threads on Forward Clutch Rod should be exposed above rectangular nut.

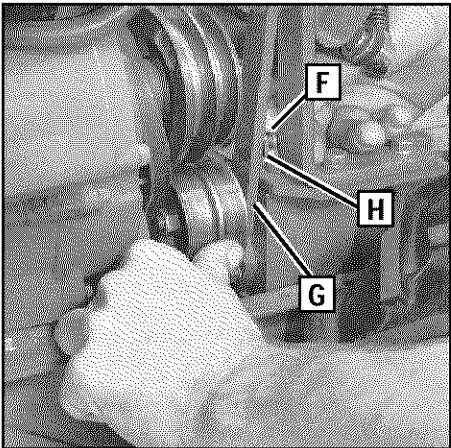


Figure 5-11: Remove clevis pin from outer hole in forward adjustable link and move to inner hole in link.

NOTE: While pushing inward on the forward idler arm, be sure that the forward drive belt is moved off to the right side of the tiller. This creates more room to install the clevis pin when the forward idler arm is pushed inward.

IMPORTANT: When the clevis pin is installed in the inner hole of the forward adjustable link, the number of additional belt tension adjustments are limited. If, with future tension adjustments, you find that you cannot screw the forward clutch rod any farther into the rectangular nut on the forward clutch bracket, it means that the forward drive belt must be replaced. Before doing so, the clevis pin must be returned to the OUTSIDE hole in the forward adjustable link.

8. Replace the forward drive belt in the High speed groove (groove closest to engine) or the Low speed groove (rear-most) groove of the engine drive pulley and in the matching groove of the transmission pulley. Be sure the belt is to the inside of the wire formed belt guide (I, Figure 5-12) and to the inside of the forward drive idler pulley (J).

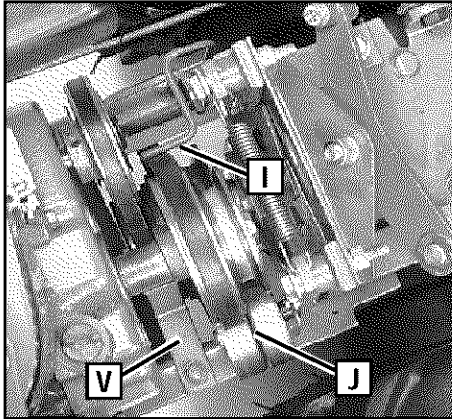


Figure 5-12: Top view of belts and pulleys.

9. Reinstall the belt cover and secure it with the two nuts.

10. Readjust the forward drive belt tension by following the instructions in Section 3: Handlebar Height Adjustment.

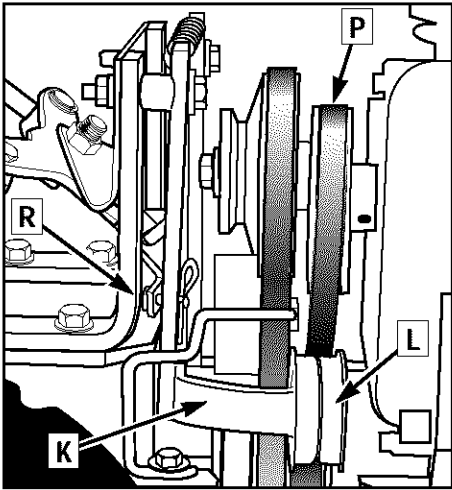


Figure 5-13

To Check and Adjust Tension on the Reverse Drive Belt:

1. Remove the belt cover after first shutting off the engine, disconnecting the spark plug wire, and allowing the engine and muffler to cool down.
2. Stand at the front of the tiller and use your left hand to push the reverse idler arm (K, Figure 5-13) inward as far as possible (the reverse idler pulley [L] is attached to the reverse idler arm).

Hold the idler arm in this position and look at the position of the belt tension guide mark (M, Figure 5-14) that is stamped into the face of the reverse adjustable link (N, Figure 5-14).

- The tension is correct if the guide mark (M, Figure 5-14) is anywhere to the left of the guide pin (O), as viewed from the

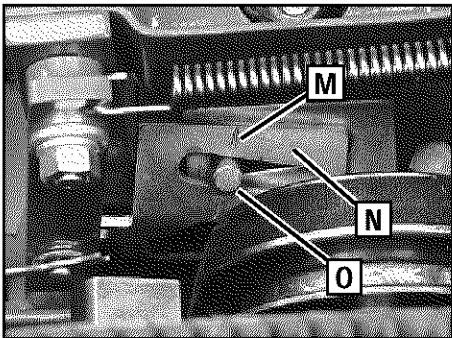
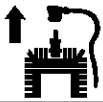


Figure 5-14: While pushing reverse idler arm inward, stand at engine end and check position of guide mark (M) and guide pin (O).

WARNING



Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug.

Failure to follow these instructions can result in serious personal injury or property damage.

front of the unit (not the operator's position). If the belt tension is correct, reinstall the belt cover and secure it with the two nuts.

- If the guide mark is aligned with the guide pin, or moves to the right side of the guide pin, then the belt is too loose and the tension must be readjusted as described next.

3. The reverse idler pulley (L, Figure 5-13) regulates the tension that is applied to the reverse drive belt (P). The following adjustment will allow the reverse idler pulley to apply more tension to a loose belt.

4. Remove the belt cover.

5. Slip the reverse belt (P, Figure 5-13) off the engine-driven reverse (upper) pulley.

6. On the **right** side of the unit (as viewed from operator's position), remove the hairpin cotter from the clevis pin (R, Figure 5-13) that connects the reverse idler arm (K) to the reverse adjustable link. Push inward on the reverse idler arm (K) and remove the clevis pin (R).

7. There are two holes in the reverse adjustable link (S, Figure 5-15). Push inward on the reverse idler arm (K) and install the clevis pin (R) through the **inner** hole in the reverse adjustable link (S) and out through the single hole in the reverse idler arm (K). Secure the clevis pin with the hairpin cotter.

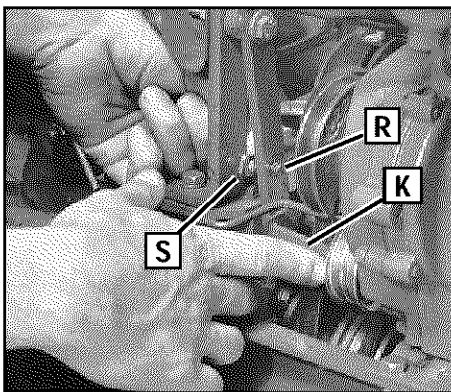


Figure 5-15: Installing clevis pin in inside hole of reverse adjustable link.

8. Reinstall the reverse belt (P, Figure 5-13) on the reverse (upper) pulley, making sure the belt is located to the inside of the reverse idler pulley (L, Figure 5-13).

9. Reinstall the belt cover and secure it with the two nuts.

IMPORTANT: If, in future tests for reverse belt tension, the guide mark should again align with or move to the right side of the guide pin, it means that the reverse belt is worn beyond adjustment. Before installing a new belt, you must return the clevis pin to the **OUTSIDE** hole in the reverse adjustable link.

FORWARD DRIVE BELT REMOVAL AND INSTALLATION

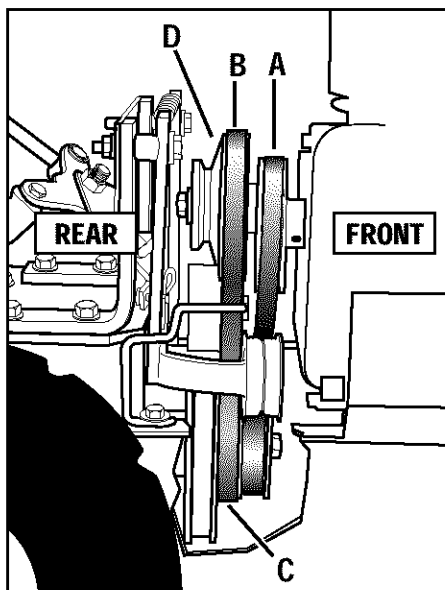


Figure 5-16: Belt drive system.

This model has two forward speeds (High and Low) and one reverse speed. The forward engine pulley (D, Figure 5-16) has two grooves for the two forward speeds. The reverse engine pulley (A, Figure 5-16) has one groove for the one reverse speed. The transmission pulley (C, Figure 5-16) has three grooves. The groove closest to the engine is for the reverse belt. The middle groove is for the High speed forward belt range; the rearmost groove is for the Low speed forward belt range.

A. Removing the Forward Drive Belt:

1. Stop the engine, allow it to cool and disconnect the spark plug wire before working near the belts.

2. Remove the reverse drive belt (A, Figure 5-16) by following the *Removing the Reverse Drive Belt* instructions in this section.

3. Move the forward drive belt (B, Figure 5-16) completely off the engine forward drive pulley (D).

4. Slip the forward drive belt completely off the transmission drive pulley (C, Figure 5-16) by moving it to the front of the pulley.

5. Pull the forward drive belt up and off the pulleys by feeding the bottom half of the belt in between the engine and transmission pulleys.

B. Installing the Forward Drive Belt:

1. The reverse drive belt must be removed before installing the forward drive belt.

2. Slip the forward drive belt down between the rear of the engine forward drive pulley (D, Figure 5-16) and feed the bottom half in between the engine and transmission pulleys (see Figure 5-17). Be sure that the belt is to the inside of the forward idler pulley and forward belt guide (see J and I, Figure 5-12).

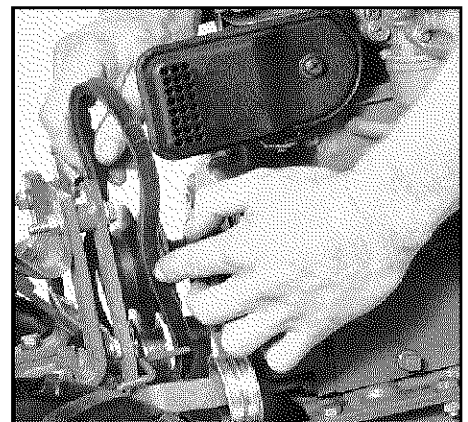
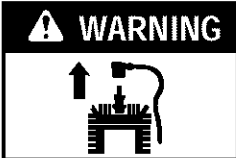


Figure 5-17: Install forward drive belt over rear of engine forward pulley and bring lower half of belt down and in front of transmission pulley.



WARNING Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug. Failure to follow these instructions can result in serious personal injury or property damage.

3. Slip the forward drive belt down and over the front of the transmission pulley (C, Figure 5-16). NOTE: For additional working room, loosen the reverse belt guide (V, Figure 5-12) and twist it out of the way.
4. Put the lower half of the belt into the High speed groove (middle groove) or the Low speed groove (rearmost groove) of the transmission pulley (C, Figure 5-16).
5. Put the upper half of the belt in the High speed groove (groove closest to engine) or the Low speed groove (rearmost groove) of the engine forward drive pulley (D, Figure 5-16).

IMPORTANT: Make sure that the forward drive belt is to the inside of the wire belt guide (I, Figure 5-12) and the forward idler pulley (J).

6. If you loosened the belt guide, wait until the reverse drive belt is installed before securing the belt guide.
7. Install the reverse drive belt.
8. Install the belt cover and secure it with the two nuts.
9. If you installed a new belt, check the tension after two hours of operation (every 10 hours thereafter).

REVERSE DRIVE BELT REMOVAL AND INSTALLATION

NOTE: The forward drive belt must be installed before installing the reverse drive belt.

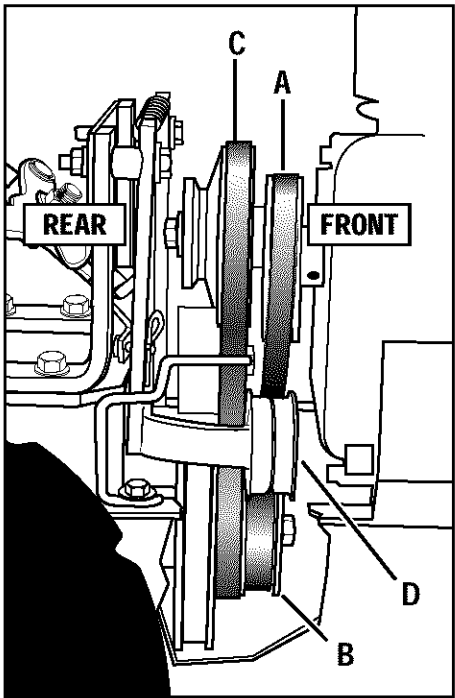
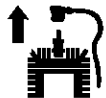


Figure 5-18: Removing and installing reverse belt.

- A. Removing the Reverse Drive Belt:**
1. Stop the engine and allow it to cool before working near the belts. Be sure the spark plug wire is disconnected and on electric start models the ignition key is removed.
 2. Remove the belt cover by removing the two nuts. For easier access to the transmission (lower) pulley, remove the transmission cover located below the transmission pulley.

3. Slip the reverse belt off the engine reverse pulley (A, Figure 5-18). If necessary, work the belt off the pulley with your left hand while pulling the engine recoil starter rope with your right hand.
4. Push the upper half of the reverse belt downward to create slack in the belt. Then reach underneath the transmission and slip the belt off the front of the transmission pulley (B, Figure 5-18).
5. Pull the belt up and past the engine reverse pulley (A, Figure 5-18).

- B. Installing the Reverse Drive Belt:**
1. Slip the reverse belt down between the engine reverse pulley (A, Figure 5-18) and the engine forward drive pulley (C).
 2. Loop the bottom half of the belt over the front of the transmission pulley (B, Figure 5-18) and seat the belt in the front groove of the pulley.
 3. Place the belt to the inside of the reverse idler pulley (D, Figure 5-18) and the reverse belt guide (V, Figure 5-12). Then slip the upper end into the groove of the engine reverse pulley (A, Figure 5-18).
 4. If the reverse belt guide (V, Figure 5-12) was loosened previously, center the belt guide on the belt and tighten the mounting screw securely.
 5. Install the belt cover and secure it with the two nuts. If the lower transmission cover was removed, reinstall it with the four self-tapping screws.

WARNING

Before inspecting, cleaning or servicing the machine, shut off engine, wait for all moving parts to come to a complete stop, remove ignition key on electric start models, disconnect spark plug wire and move wire away from spark plug.

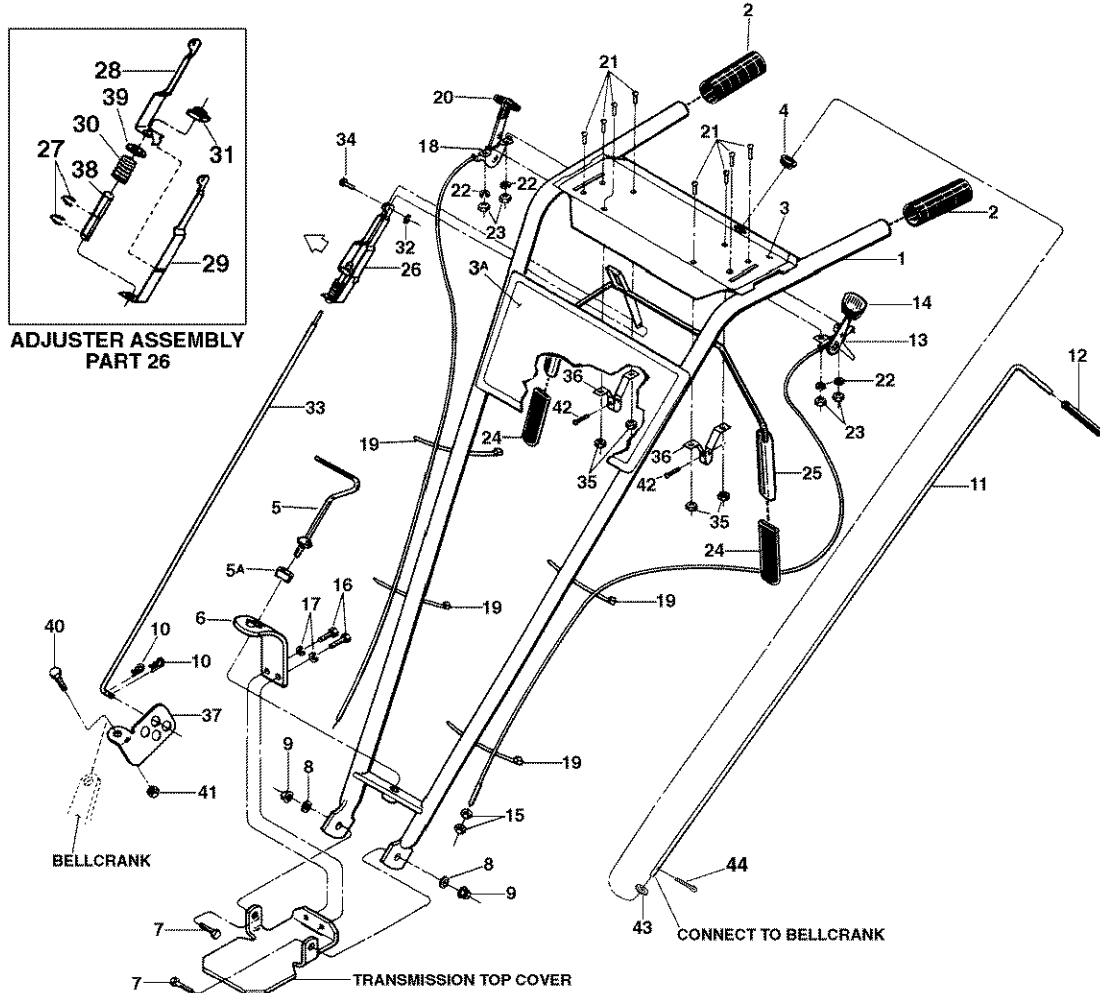
Failure to follow these instructions can result in serious personal injury or property damage.

TROUBLESHOOTING

Before performing any troubleshooting procedures, refer to the appropriate safety, operating or maintenance instructions in this Manual or in the Engine Owner's Manual. Contact your local authorized engine service dealer for engine service. Contact your local authorized tiller dealer or the factory for all other service problems.

PROBLEM	POSSIBLE CAUSE	CORRECTION
Engine does not start.	<ol style="list-style-type: none"> 1. Spark plug wire disconnected. 2. Engine Throttle Control Lever incorrectly set. 3. Fuel tank empty. 4. Choke control (if so equipped) in incorrect position. 5. Stale gasoline. 6. Dirty air filter(s). 7. Defective or incorrectly gapped spark plug. 8. Carburetor out of adjustment. 9. Misadjusted throttle control cable. 10. Dirt or water in fuel tank. 	<ol style="list-style-type: none"> 1. Reconnect wire. 2. Put lever in START position. 3. Add fuel. 4. See Engine Owner's Manual. 5. Drain fuel and add fresh fuel. 6. Clean or replace filter(s). 7. Inspect spark plug. 8. See Engine Service Dealer. 9. See Engine Service Dealer 10. See Engine Service Dealer.
Engine runs poorly.	<ol style="list-style-type: none"> 1. Defective or incorrectly gapped spark plug. 2. Dirty air filter(s). 3. Carburetor out of adjustment. 4. Stale gasoline. 5. Dirt or water in fuel tank. 6. Engine cooling system clogged. 	<ol style="list-style-type: none"> 1. Inspect spark plug (see Engine Owner's Manual). 2. Clean or replace (see Engine Owner's Manual). 3. See Engine Service Dealer. 4. Replace with fresh gasoline. 5. See Engine Service Dealer. 6. Clean air cooling system (see Engine Owner's Manual).
Engine overheats.	<ol style="list-style-type: none"> 1. Engine cooling system clogged. 2. Carburetor out of adjustment. 3. Oil level is low. 	<ol style="list-style-type: none"> 1. Clean air cooling area (see Engine Owner's Manual). 2. See Engine Service Dealer. 3. Check oil level (see Engine Owner's Manual).
Engine does not shut off.	Misadjusted throttle control cable.	See Engine Owner's Manual or Engine Service Dealer.
Wheels and Tines will not turn.	<ol style="list-style-type: none"> 1. Improper use of controls. 2. Forward Drive: Misadjusted forward clutch rod. 3. Reverse Drive: Broken or misadjusted belt. 4. Worn, broken, or misadjusted drive belt(s). 5. Internal transmission wear or damage. 6. Bolt and key loose in transmission pulley. 	<ol style="list-style-type: none"> 1. Review Sections 3 and 4. 2. See <i>Handlebar Height Adjustment</i>, Section 3. 3. Replace belt or adjust belt tension (Section 5). 4. See <i>Checking Drive Belt Tension</i>, Section 5. 5. Contact local dealer or the factory. 6. Tighten bolt; check that key is in place.
Tines turn, but wheels don't.	<ol style="list-style-type: none"> 1. Wheel mounting hardware missing. 2. Bolt and key loose in transmission pulley. 3. Internal transmission wear or damage. 4. Misadjusted wheel gear cable. 5. Wheel Gear Lever not fully engaged. 	<ol style="list-style-type: none"> 1. Replace hardware. 2. Tighten bolt; check that key is in place. 3. Contact local Dealer or the Factory. 4. See <i>Wheel Gear Cable Adjustment</i>, Section 5. 5. Engage lever (see Section 3).
Wheels Turn, but Tines Don't.	<ol style="list-style-type: none"> 1. Tine holder mounting hardware missing. 2. Internal transmission wear or damage. 	<ol style="list-style-type: none"> 1. Replace hardware. 2. Contact local Dealer or the Factory.
Poor tilling performance.	<ol style="list-style-type: none"> 1. Worn tines. 2. Improper Depth Regulator setting. 3. Incorrect throttle setting or belt range speed. 4. Belt(s) slipping. 	<ol style="list-style-type: none"> 1. See <i>Tines</i> (Section 5). 2. See <i>Tilling Tips & Techniques</i>, Section 4. 3. See Section 4. 4. See <i>Checking Drive Belt Tension</i>, Section 5.

DRAWING NO. 1

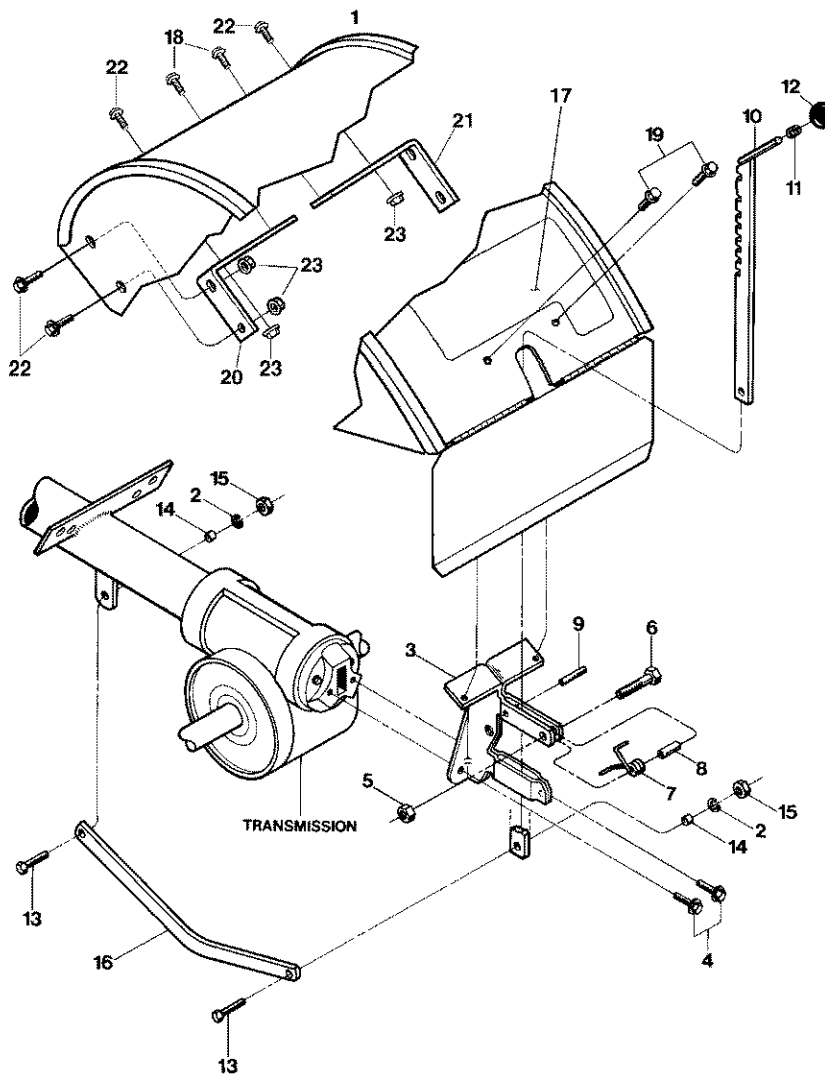


REF. No.	PART No.	DESCRIPTION	QTY.
1	1917117	Handlebars (Incl. Refs. 2, 3, 3A & 4)...	1
2	9126	Grip, Handlebar	2
3	1917537	Decal, Control Panel	1
3A	1916926	Decal, Logo	1
4	9251	Grommet	1
5	1186347	Height Adjustment Handle	1
5A	9955	Keyed Washer	1
6	1900475001	Bracket, Handlebar Height Adj.	1
7	1100046	Hex Hd. Screw, 3/8-16 x 1*	2
8	9904	Flat Washer, 3/8, S.A.E.	2
9	9837	Hex Lock Nut, 3/8-16	2
10	9338	Hair Pin Cotter	2
11	1916896	Reverse Clutch Control (Incl. Ref. 12) .	1
12	9198	Grip, Reverse Clutch Control	1
13	1916639	Wheel Gear Control & Cable Assy	1
14	9057	Knob, Wheel Gear Control Lever	1
15	1186211	Hex Nut, 5/16-24	2
16	1100068	Hex Hd. Screw, 3/8-16 x 3/4*	2
17	1100243	Lockwasher, 3/8	2
18	9445	Engine Throttle Control & Cable	2
19	9202	Cable Tie	4
20	9212	Knob, Throttle Control	1
21	1114748	Round Hd. Screw, #10-32 x 1/2	8
22	1100240	Lockwasher, #10	4

REF. No.	PART No.	DESCRIPTION	QTY.
23	1186208	Hex Nut, #10-32	4
24	9390	Grip, Lever	2
25	20863	Bail, Forward Clutch (Incl. two Ref. 24)	1
26	20862	Adjuster Assy. (Incl. Refs. 27, 28, 29, 30, 38 and 39)	1
27	9532	Klip Ring	2
28	20808	Adjuster, Right-Side	1
29	20809	Adjuster, Left-Side	1
30	9059	Spring, Adjuster	1
31	9522	Nut, Rectangular	1
32	9386	Klip Ring	1
33	20831	Rod, Forward Clutch	1
34	97083	Clevis Pin	1
35	9853	Sems Nut	4
36	20806	Bracket, Bail Support	2
37	20888	Swivel	1
38	9432	Bushing	1
39	9973	Washer	1
40	1100805	Hex Hd. Screw, 1/4-20 x 3/4*	1
41	9811	Nut, 1/4-20	1
42	9552	Hex Flg. Screw, self-tap, 1/4-20 x 1/2*	2
43	20545	Flat Washer, 5/16"	1
44	1185147	Cotter Pin	1

* Specify GRADE 5 if ordering part locally.

DRAWING NO. 2

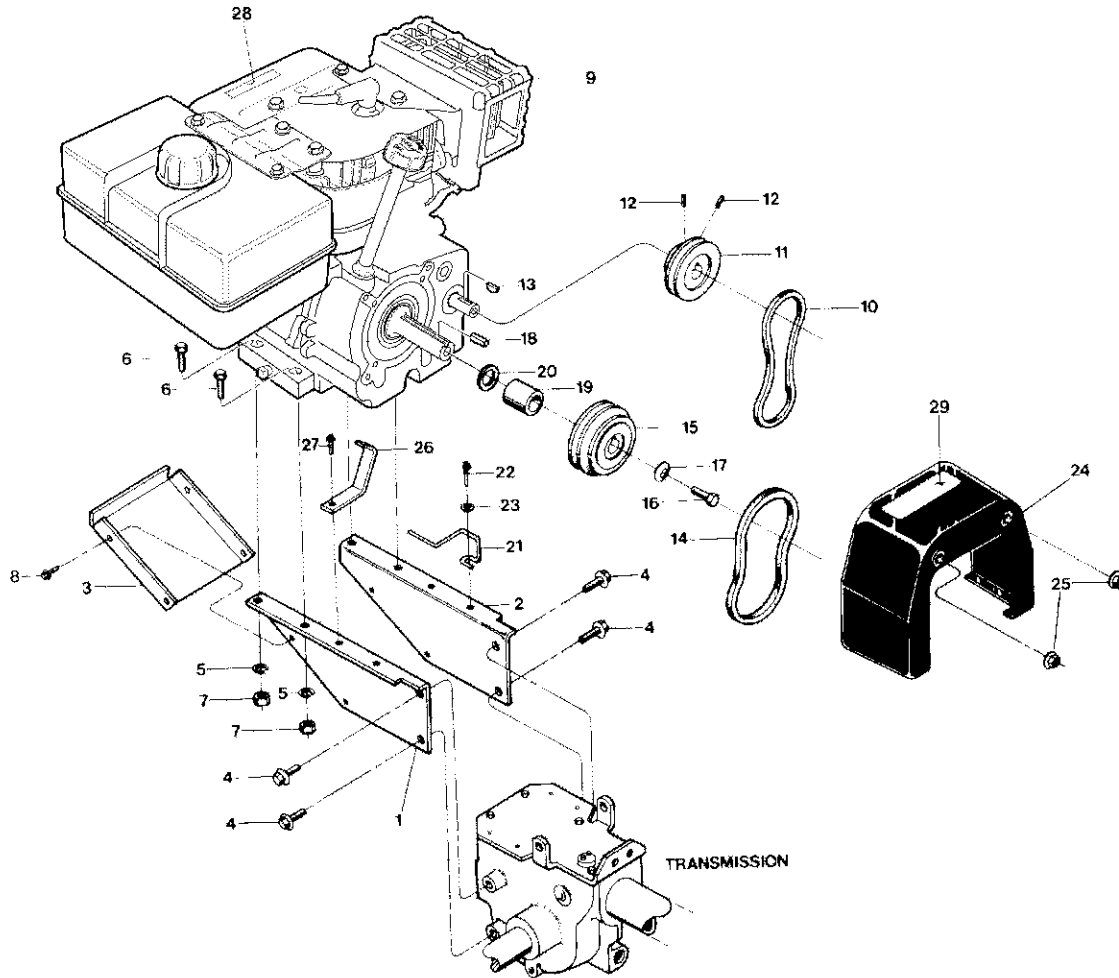


REF. No.	PART No.	DESCRIPTION	QTY.
1	1917118	Hood, Tine (Incl. Hinged Flap and Refs. 17, 17A & 17B)	1
2	1100243	Lockwasher, 3/8.....	2
3	1916184001	Bracket, Hood & Depth Regulator	1
4	90038	Hex Hd. Flg. Screw, 5/16-18 x 5/8*	2
5	9811	Hex Lock Nut, 1/4-20	1
6	1100069	Hex Hd. Screw, 1/4-20 x 1*	1
7	9384	Spring, Depth Regulator Plunger	1
8	9438	Spacer.....	1
9	9308	Roll Pin (spiral), 1/4 x 1	1
10	1916186001	Bar Assembly, Depth Adjustment.....	1
11	9120	Retaining Ring (Tolerance Ring)	1
12	9119	Knob, Depth Regulator (Incl. Ref. 11).	1
13	1100043	Hex Hd. Screw, 3/8-16 x 1-1/4*	2

REF. No.	PART No.	DESCRIPTION	QTY.
14	1113-1	Bushing (spacer).....	2
15	1186231	Hex Nut, 3/8-16.....	2
16	1916185001	Drag Bar, Depth Regulator	1
17	1917536	Decal, Operating Instructions.....	1
18	1766984	Hex Hd. Screw, self-tapping, 5/16-18 x 1/2*	2
19	9552	Hex Hd. Flg. Screw, self-tapping, 1/4-20 x 1/2*	2
20	1916700001	Support Bracket, Left-Side.....	2
21	1916701001	Support Bracket, Right-Side	1
22	1186328	Hex Hd. Screw, 5/16-18 x 5/8.....	6
23	1186391	Hex Nut, 5/16-18	6

* Specify GRADE 5 if ordering part locally.

DRAWING NO. 3



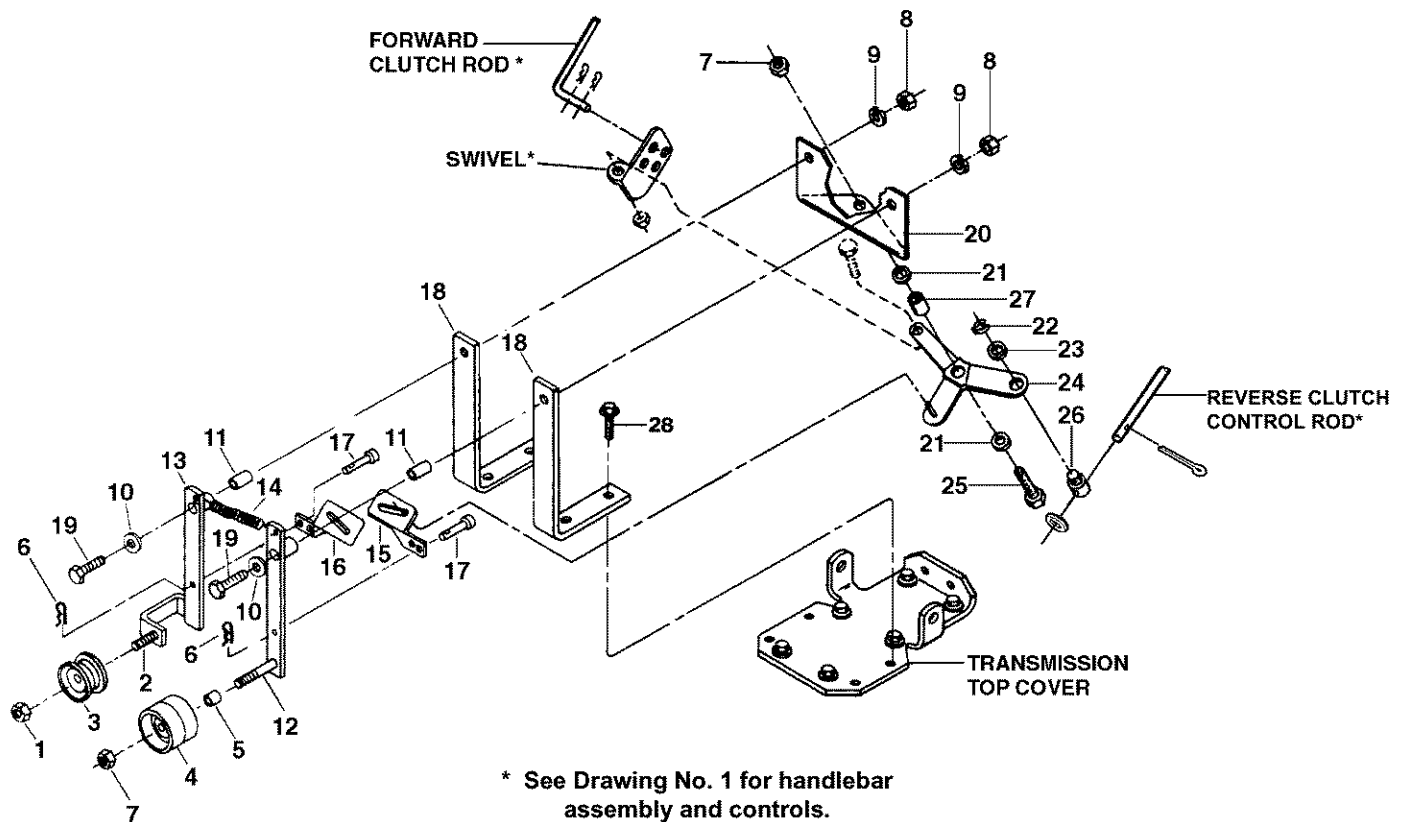
REF. No.	PART No.	DESCRIPTION	QTY.	REF. No.	PART No.	DESCRIPTION	QTY.
1	1916604001	Engine Support Bracket, Left-Side	1	17	9944	Washer, Disc Spring (concave surface faces forward pulley)	1
2	1916602001	Engine Support Bracket, Right-Side....	1	18	9301	Key, 3/16 sq. x 1	1
3	1916189001	Engine Support Bracket (Pan), Front...	1	19	50141	Spacer	1
4	1186329	Hex Hd. Flg. Screw, 5/16-18 x 3/4*	4	20	1138-2	Shim	A/R
5	1100242	Lockwasher, 5/16.....	4	21	1916190001	Forward Belt Guide.....	1
6	1100799	Hex Hd. Screw, 5/16-18 x 1-1/2*	4	22	9573	Hex Hd. Screw, Self-Tapping, 1/4-20 x 3/4*	1
7	1186321	Hex Nut, 5/16-18.....	4	23	9900	Flat Washer, (Plain), 1/4, S.A.E.	1
8	1900396	Hex Hd. Screw, Self-Tapping, #10-32 x 1/2,	4	24	1904569	Cover (incl. Ref. 29)	1
9	**	Engine	1	25	1186391	Whiz Lock Nut, 5/16-18,	2
10	9022	Flat Belt, Reverse Drive	1	26	1916191001	Reverse Belt Guide.....	1
11	2477	Reverse Pulley (Engine Driven).....	1	27	9552	Hex Hd. Flg. Screw, self-tapping, 1/4-20 x 1/2*	1
12	9561	Socket Hd. Set Screw, 1/4-20 x 1/4* ..	2	28	1900766	Decal, Stabilization.....	1
13	9361	Woodruff Key, (Size #5)	1	29	1904557	Decal, Hot Surfaces/Belt Warning	1
14	1909404	V-Belt, Forward Drive	1				
15	2476	Forward Pulley (Engine Driven).....	1				
16	1100004	Hex Hd. Screw, 5/16-24 x 3/4*	1				

* Specify GRADE 5 if ordering part locally.

** Contact the factory or an authorized dealer for replacement engine information. See an authorized engine service dealer for engine parts or service. Refer to engine nameplate for engine type and code.

A/R – As Required

DRAWING NO. 4

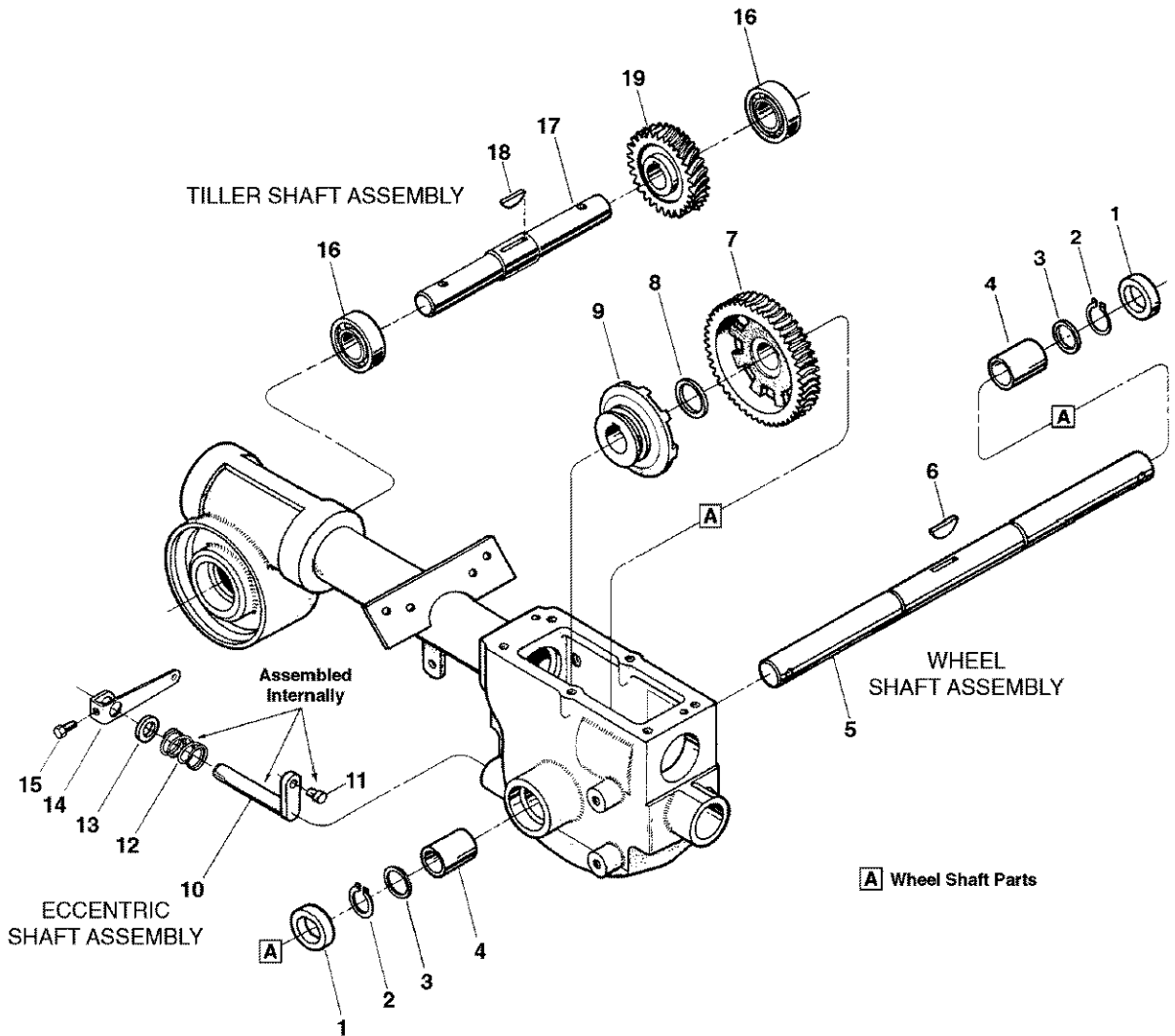


REF. No.	PART No.	DESCRIPTION	QTY.
1	1185506	Hex Lock Nut, 3/8-16	1
2	1110043	Hex Hd. Screw, 3/8-16 x 1-1/4**	1
3	1909266	Idler Pulley, Reverse Direction	1
4	9193	Idler Pulley, Forward Direction	1
5	1113-1	Spacer	1
6	9338	Hairpin Cotter	2
7	1110108	Locknut-hex, 3/8-16	2
8	1186230	Hex Lock Nut, 5/16-18	2
9	1100242	Lockwasher-5/16	2
10	20545	Plain Washer, 5/16	2
11	9479	Pivot Bushing	2
12	1916192001	Forward Idler Arm, Left-Side	1
13	1909682001	Reverse Idler Arm, Right-Side	1
14	1492	Spring	1

REF. No.	PART No.	DESCRIPTION	QTY.
15	20517-01	Forward Link	1
16	20517-02	Reverse Link	1
17	9340	Pin	2
18	1916194001	Mounting Bar	2
19	1111607	Hex Hd. Screw, 5/16-18 x 2-1/4**	2
20	1916195001	Shifting Base	1
21	20553	Spacer (Bushing)	2
22	9532	Klip Ring	1
23	20546	Washer, Pivot	1
24	1916196001	Bellcrank	1
25	1100043	Hex Hd. Screw, 3/8-16 x 1-1/4**	1
26	1916897	Pivot (for Reverse Clutch Control)	1
27	20532	Bushing, Bellcrank	1
28	1186331	Hex Hd. Flg. Screw, 5/16-18 x 1*	4

** Specify GRADE 5 if ordering part locally.

DRAWING NO. 5



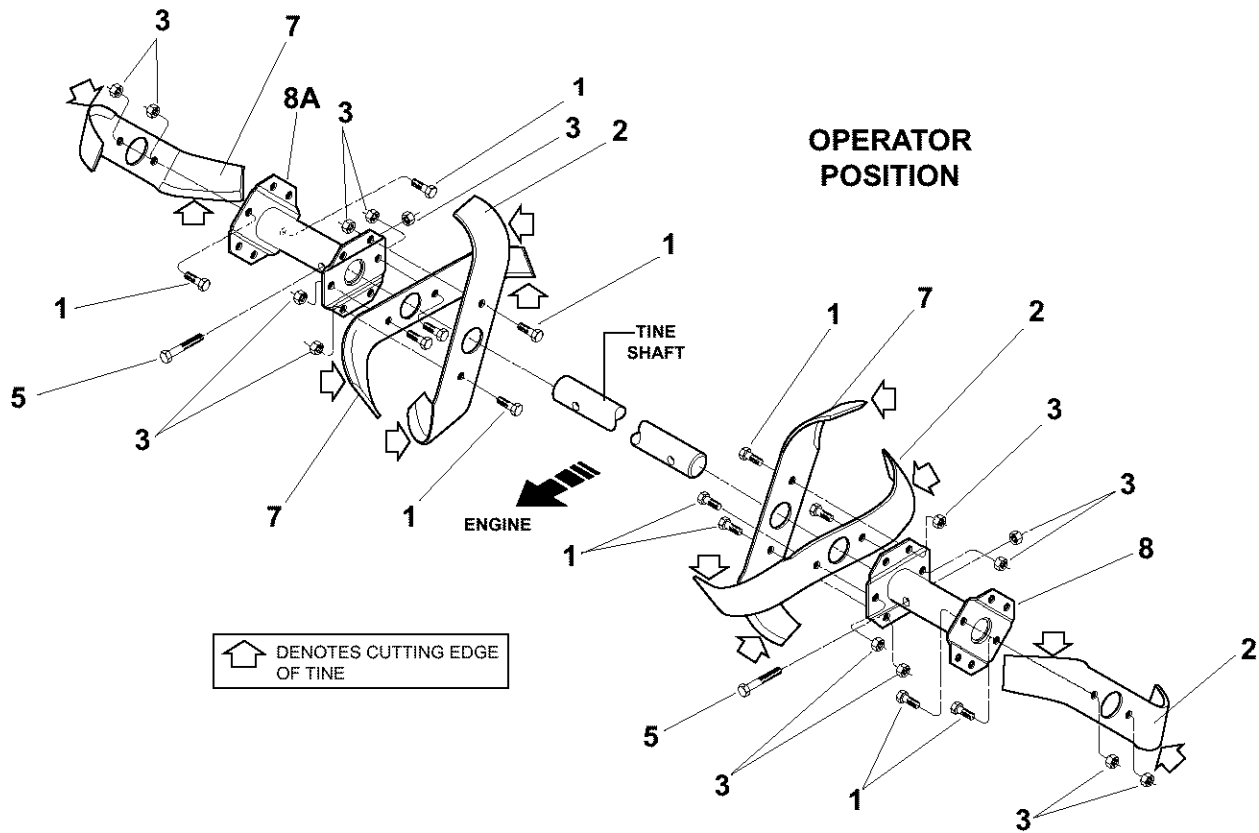
REF. No.	PART No.	DESCRIPTION	QTY.
1	9621	Oil Seal, Wheel Shaft	2
2	9511	Retaining Ring, External, Heavy-Duty	2
---	1166-1	Shim, 1-1/64 I.D., .062 thick	A/R
---	1166-2	Shim, same as above, but .030 thick.	A/R
---	1166-3	Shim, same as above, but .015 thick.	A/R
---	1166-4	Shim, same as above, but .010 thick.	A/R
4	1086	Bushing	2
5	1916711	Wheel Shaft (axle)	1
6	9373	Hi-Pro Key, 1/4 x 1-5/16	1
7	20914	Gear, Wheel Drive Worm	1
8	9935	Shim, 1.016 I.D. x 1.468 O.D. x .062 thick)	1

REF. No.	PART No.	DESCRIPTION	QTY.
9	20712	Clutch, Wheel Drive	1
10	20699	Eccentric Shaft	1
11	1442	Pin, Eccentric Shaft	1
12	9055	Spring	1
13	9622	Oil Seal, Eccentric Shaft	1
14	20757	Eccentric Shaft Lever	1
15	1100804	Hex Hd. Screw, 1/4-20 x 1/2*	1
16	97074	Ball Bearing	2
17	1916709	Tiller Shaft	1
18	1104	Woodruff Key 1/4 x 1-1/4	1
19	1904279	Tiller Drive Worm Gear (bronze)	1

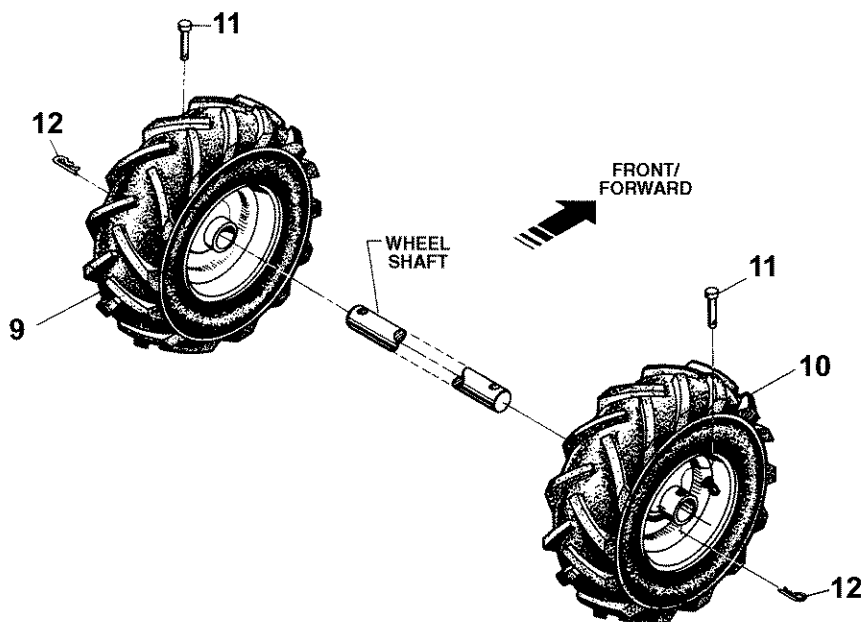
* Specify GRADE 5 if ordering part locally.

A/R - As Required

DRAWING NO. 6



Drawing No. 7



PARTS LIST - DRAWING NO. 6

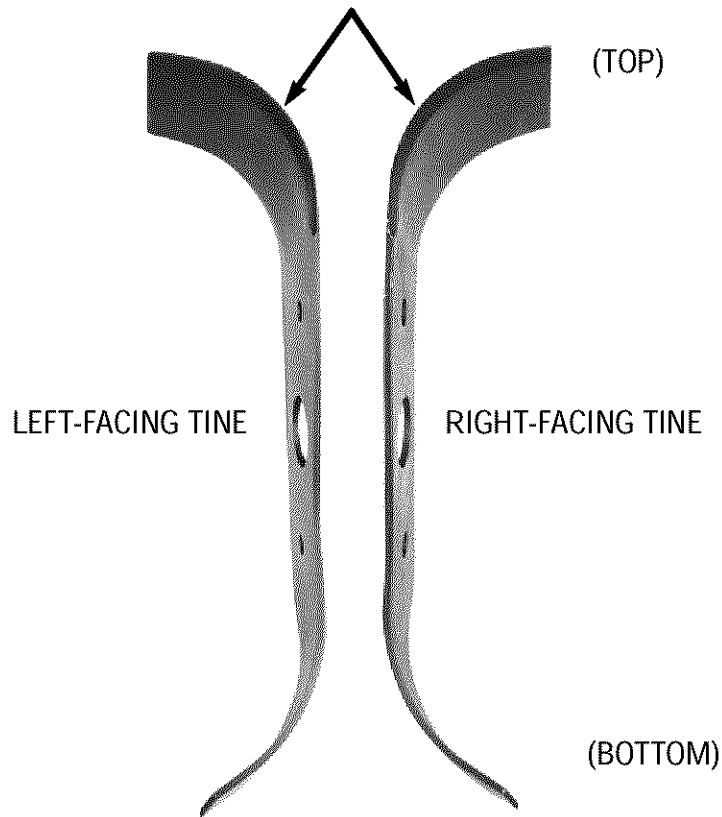
PARTS LIST - DRAWING NO. 7

REF. No.	PART No.	DESCRIPTION	QTY.
1	1100068	Hex Hd. Screw, 3/8-16 x 3/4*	12
2	1985101	Tine – twin-edged, right-facing	3
3	1110108	Hex Lock Nut, 3/8-16	14
5	1982612	Hex Hd. Screw, 3/8-16 x 2, Grade 8....	2
7	1985100	Tine – twin-edged, left-facing.....	3
8	1916693001	Tine Holder, left-side.....	1
8A	1916694001	Tine Holder, right-side	1

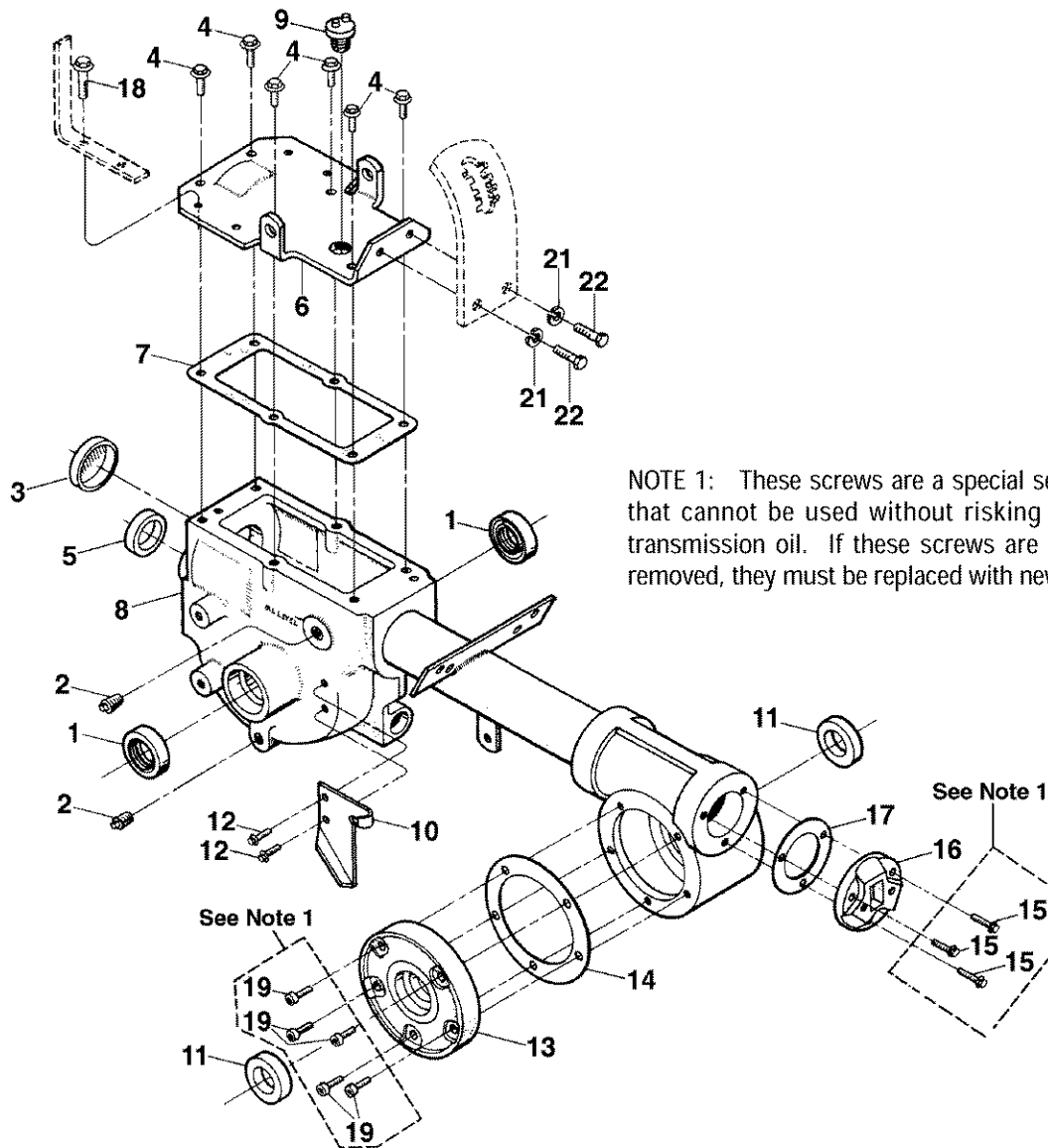
REF. No.	PART No.	DESCRIPTION	QTY.
9	1915056	Wheel & Tire Assy., left-side.....	1
10	1915057	Wheel & Tire Assy., right-side	1
11	9380	Clevis Pin, .312 x 1-3/4 long.....	2
12	9338	Hitch Pin	2

IMPORTANT: LEFT and RIGHT sides of tiller are determined by standing in the operator position (BEHIND THE HOOD) and facing the direction of forward travel.

MOUNT TINES SO THE CUTTING EDGE AT THE TOP OF EACH TINE FACES THE OPERATOR



DRAWING NO. 8



NOTE 1: These screws are a special sealing screw that cannot be used without risking the loss of transmission oil. If these screws are loosened or removed, they must be replaced with new hardware.

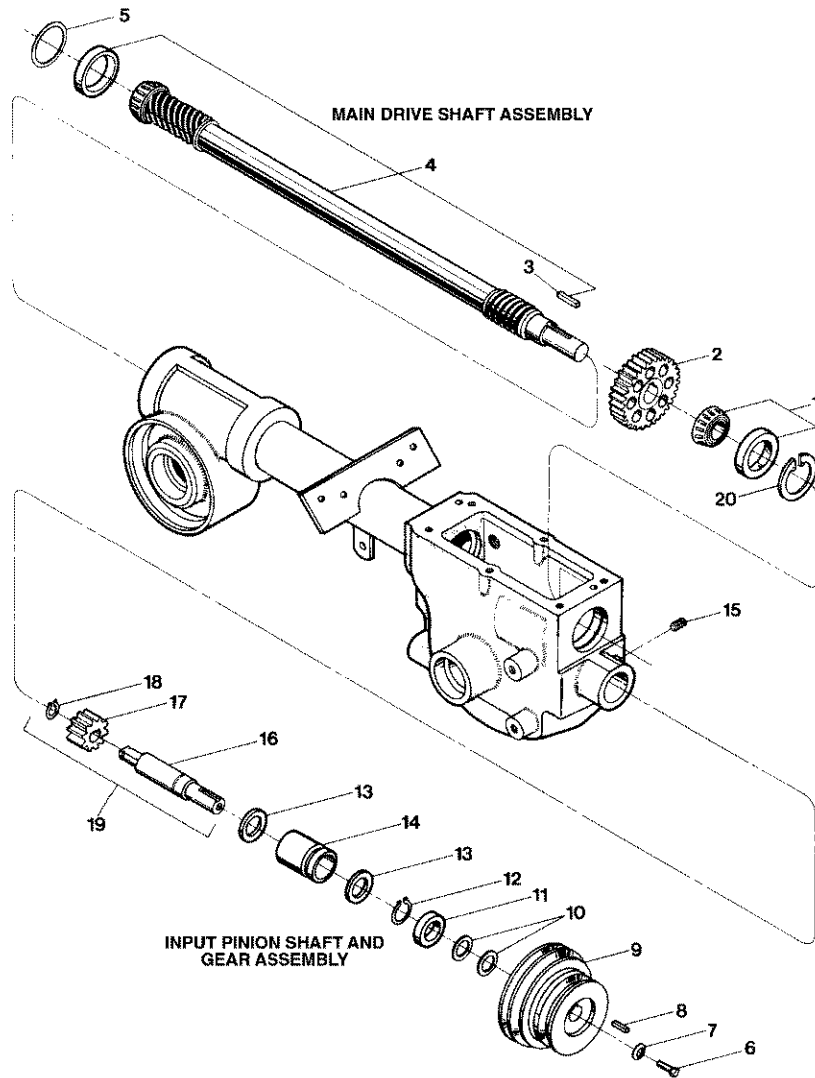
REF. No.	PART No.	DESCRIPTION	QTY.
1	9621	Oil Seal, Wheel Shaft (double lip).....	2
2	9726	Pipe Plug, 1/4	2
3	97076	Seal, Transmission Bore	1
4	1186329	Hex Hd. Flg. Screw, 5/16-18 x 3/4*	6
5	85030	Oil Seal, Input Pinion Shaft	1
6	1916193001	Cover, Transmission	1
7	20694	Gasket, Transmission Cover	1
8	20893	Transmission Case, Tube and Rear Housing Assembly	1
9	9467	Plug	1
10	1917101001	Plate, Wheel Drive Cable Mounting	1
11	97073	Oil Seal, Tiller Shaft.....	2
12	90038	Hex Hd. Flg. Screw, 5/16-18 x 5/8*	2

REF. No.	PART No.	DESCRIPTION	QTY.
13	1916199001	Cover, Tiller Housing (left-side)	1
14	1129-1	Gasket, Tiller Housing Cover, .010 (fits all covers)	A/R
15	1915089	Screw Kit (Incl. three 1/4-20 x 7/8" self-sealing screws)	A/R
16	1900881001	Rear Bearing Cap	1
17	1124-2	Gasket, .010.....	1
18	1186331	Hex Hd. Flg. Screw, 5/16-18 x 1*	4
19	1915087	Screw Kit (Incl. five 1/4-20 x 5/8 self-sealing screws)	A/R
21	1100243	Lockwasher, 3/8.....	2
22	1100068	Hex Hd. Screw, 3/8-16 x 3/4*	2

* Specify GRADE 5 if ordering part locally.

A/R - As Required

DRAWING NO. 9



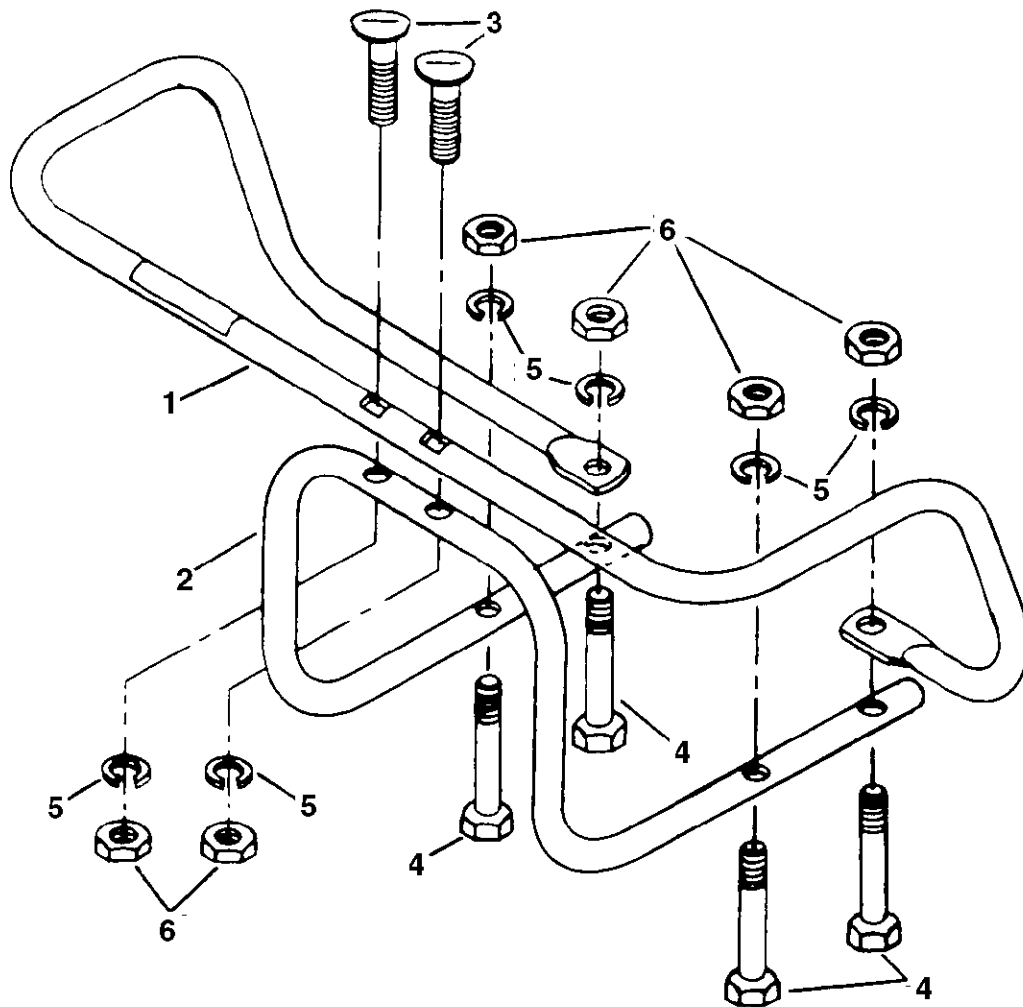
REF. No.	PART No.	DESCRIPTION	QTY.	REF. No.	PART No.	DESCRIPTION	QTY.
1	1714	Bearing, Tapered Roller (with race) ...	1	7	9944	Washer, Disc Spring (concave surface faces pulley).....	1
2	20718	Spur Gear, Main Drive Shaft.....	1	8	9301	Key, 3/16 sq. x 1	1
3	9301	Key, 3/16 sq. x 1	1	9	20507	Pulley, Transmission Drive.....	1
4	1916765	Main Drive Shaft – One-piece with single-lead worm at front and six-lead worm at rear (also includes pressed-on #1714 rear roller bearing, race for bearing & #9301 key).....	1	10	1440	Support Washer	2
5	1224-1	Shim, Rear Bearing Cap, .010 thick (see Note 1 below)	A/R	11	85030	Oil Seal (front), Input Pinion Shaft ...	1
5	1224-2	Shim, same as above, but .030 thick (see Note 1)	A/R	12	9500	Retaining Ring (snap ring), External..	1
5	1224-3	Shim, same as above, but .005 thick (see Note 1)	A/R	13	9953	Thrust Washer.....	2
...	1325C	Shim Set (Incl. the following shims: two 1224-1; two 1224-2; one #1224-3).....	A/R	14	9428	Bushing.....	1
6	1100004	Hex Hd. Screw, 5/16-24 x 3/4*	1	15	9677	Set Screw, 5/16-18 x 3/8*	1
				16	20791	Input Pinion Shaft	1
				17	20792	Gear, Input Pinion	1
				18	9093	Retaining Ring (snap ring), External..	1
				19	20799	Pinion Assy. (Incl. one each of Refs. 16, 17 and 18).....	A/R
				20	9517	Retaining Ring (snap ring), Internal ..	1
				21	94018	Sheave Shoulder Washer	1

* Specify GRADE 5 if ordering part locally.

A/R - As Required

NOTE 1 – Shim between drive shaft rear bearing and rear bearing cap to achieve 5-to-10 thousandths of an inch (.005-.010) end play on drive shaft.

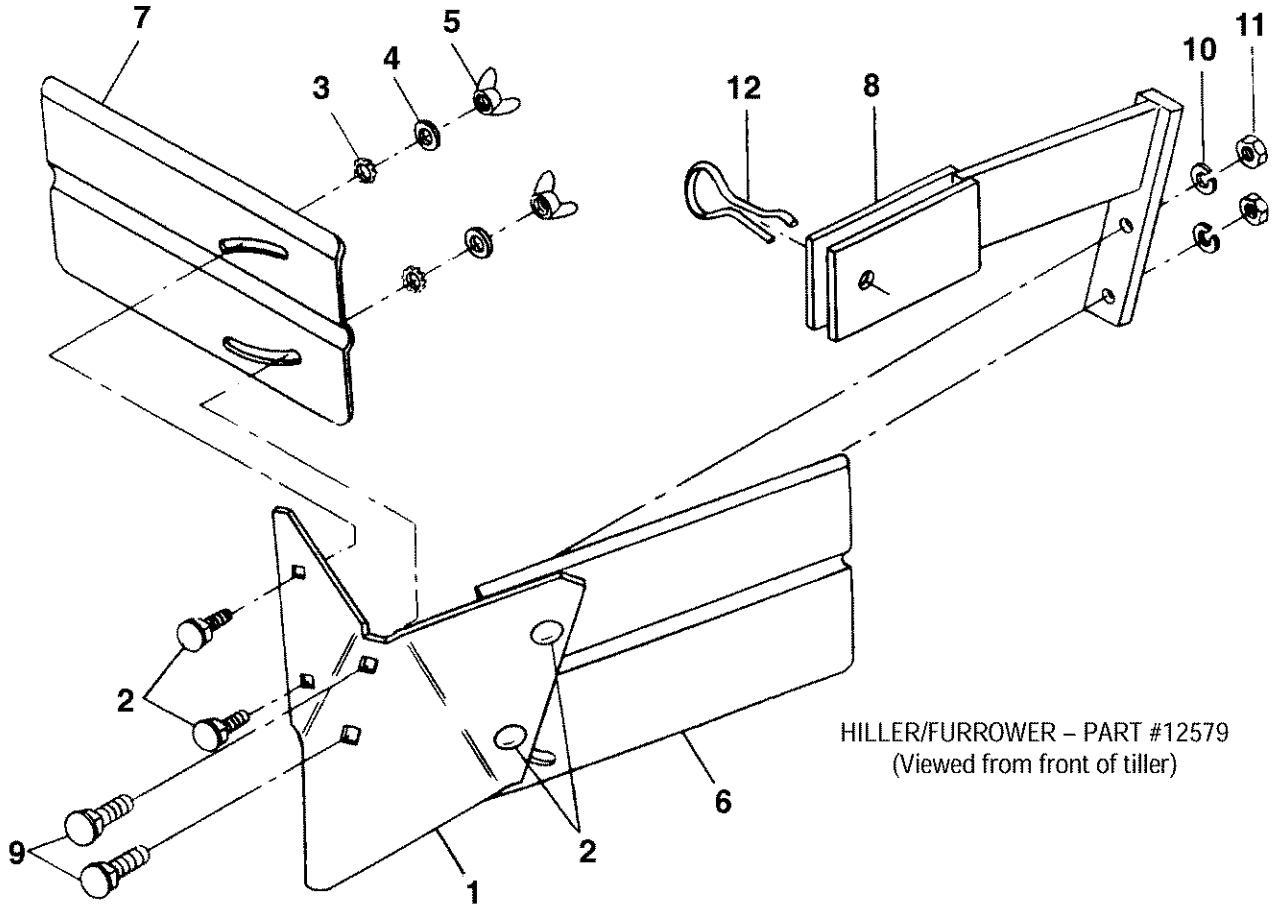
DRAWING NO. 10 (BUMPER ATTACHMENT)



REF. No.	PART No.	DESCRIPTION	QTY.
1	1916714001	Bumper, Top Section.....	1
2	1904758001	Bumper, Bottom Section.....	1
3	1731025	Curved Hd. Screw, 5/16-18 x 2 (special Screw); also see #1915811 hardware kit.....	2
4	1111608	Hex Hd. Screw, 5/16-18 x 2-1/2*, Not Avail. Separately (order #1915811 hardware kit).....	4

REF. No.	PART No.	DESCRIPTION	QTY.
5	1100242	Lockwasher, 5/16, Not Avail. Separately (order #1915811 hardware kit).....	6
6	1186230	Hex Nut, 5/16-18, Not Avail. Separately (order #1915811 hardware kit).....	6
---	1915811	Hardware Kit: Incl. two #1731025 curved-head screws; four #1111608 hex hd. screws; six #1100242 lockwashers; six #1186230 hex nuts ...	1

DRAWING NO. 11 (HILLER/FURROWER OPTIONAL ATTACHMENT)



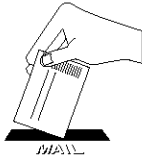
HILLER/FURROWER – PART #12579
(Viewed from front of tiller)

REF. No.	PART No.	DESCRIPTION	QTY.	REF. No.	PART No.	DESCRIPTION	QTY.
1	1900771001	Furrower-blade only.....	1	9	9725	Carriage Bolt-blade mounting, 3/8-16 x 1-1/2	2
2	1186098	Carriage Bolt-5/16-18 x 3/4	4	10	1100243	Lockwasher-3/8, plated	2
3	1177548	Star Washer-external tooth, 5/16.....	4	11	1186231	Nut-hex, 3/8-16, plated.....	2
4	9902	Plain Washer-5/16 S.A.E.....	4	12	9318	Pin-clinch	1
5	9824	Wing Nut-5/16-18.....	4	--	12579	Hiller/Furrower-complete attachment (owner must bolt blade to mounting bracket, and wings to blade). Instructions included	1
6	1900773001	Hiller Wing-left.....	1				
7	1900774001	Hiller Wing-right	1				
8	1900772001	Bracket-blade mounting.....	1				

CUSTOMER SERVICE INFORMATION

Owner Registration Card

Please fill out and mail the enclosed owner registration card. The purpose of this card is to register each unit at the Factory so that we can provide you with warranty benefits and informational bulletins.



Warranty Service

The warranty statement is included in the unit's literature package.

Model/Serial Numbers

A Model/Serial Numbers decal is located on top of the transmission. For ready reference, record these numbers in the spaces below.

Date of Purchase: _____

Model Number: _____

Serial Number: _____

Authorized Dealer Information

If you purchased your unit from an authorized dealer, record the dealer's address and phone number below for ready reference:

Dealer Name: _____

Address: _____

Phone: _____

IMPORTANT:

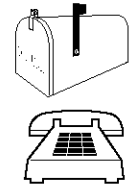
Left and right sides of the unit are determined by standing behind the unit, in the operator's position, and facing in the direction of forward travel.

NOTICE:

We reserve the right to change specifications, add improvements or discontinue the manufacture of any of our equipment without notice or obligation to purchasers of our equipment.

Customer Service and Technical Service

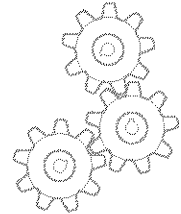
If you have questions or problems with the unit, contact your local dealer or the Factory. (When calling or writing, provide the Model/Serial Numbers of the unit.)



Replacement Parts

Factory specified replacement parts are available from your authorized dealer or directly from the factory. When ordering parts, be sure to provide the following:

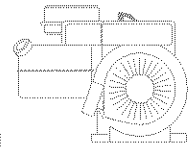
- Model/Serial Numbers of the unit.
- Part number of the part needed.
- Part Description.
- Quantity needed.



NOTE: All replacement parts must conform to our rigid quality specifications. Although some replacement parts we provide may vary slightly in shape, color or texture from the original parts, any variations will not affect the fit or performance of these parts on your unit.

Engine Service and Repair

For engine service or repair, contact your nearest authorized engine dealer (look in the Yellow Pages under "Engines-Gasoline"). The engine is warranted by the engine manufacturer. Any unauthorized work performed on the engine during the warranty period may void this warranty. For complete details on the engine warranty, refer to the engine owner manual.



⚠ WARNING

We urge using only genuine replacement parts, which meet all the latest requirements. Replacement parts manufactured by others could present safety hazards, even though they may fit on the unit.

For customer assistance, contact your nearest authorized dealer or:

GARDEN WAY INCORPORATED • 1 Garden Way • Troy, New York 12180

Customer Service: 1-800-437-8686 • Technical Service: 1-800-520-5520 • Parts Service: 1-800-648-6776

• FAX: (518) 233-4622 • WEBSITE: www.troybilt.com

Outside the United States and Canada:

Customer Service: (518) 233-4807 • Technical Service: (518) 233-4808 • Parts Service: (518) 233-4806 • FAX (518) 233-4622