Form No. 3325-400 Rev A

TORO®

Groundsmaster® 228-D

4-Wheel Drive Traction Unit

Model No. 30242—210000001 and Up

Operator's Manual

CE

English

Contents

2001 by The Toro Company 8111 Lyndale Avenue South Bloomington, MN 55420-1196

Introduction

Read this manual carefully to learn how to operate and maintain your product properly. The information in this manual can help you and others avoid injury and product damage. Although Toro designs and produces safe products, you are responsible for operating the product properly and safely.

Whenever you need service, genuine Toro parts, or additional information, contact an Authorized Service Dealer or Toro Customer Service and have the model and serial numbers of your product ready. Figure 1 illustrates the location of the model and serial numbers on the product.

Figure 1

1. Location of the model and serial numbers

Write the product model and serial numbers in the space below:

Model No. _____

Serial No. _____

This manual identifies potential hazards and has special safety messages that help you and others avoid personal injury and even death. Danger, Warning, and Caution are signal words used to identify the level of hazard. However, regardless of the hazard, be extremely careful.

Danger signals an extreme hazard that will cause serious injury or death if you do not follow the recommended precautions.

Warning signals a hazard that may cause serious injury or death if you do not follow the recommended precautions.

Caution signals a hazard that may cause minor or moderate injury if you do not follow the recommended precautions.

This manual uses two other words to highlight information. **Important** calls attention to special mechanical information and **Note:** emphasises general information worthy of special attention.

Safety

This machine meets or exceeds the B71.4 1999 specifications of the American National Standards Institute when weights are installed according to chart on page 14.

Note: The addition of attachments made by other manufacturers that do not meet American National Standards Institute certification will cause noncompliance of this machine.

Improper use or maintenance by the operator or owner can result in injury. To reduce the potential for injury, comply with these safety instructions and always pay attention to the safety alert symbol ⚠, which means CAUTION, WARNING, or DANGER—personal safety instruction." Failure to comply with the instruction may result in personal injury or death.

Safe Operating Practices

Training

- Read the Operator's Manual and other training material. If the operator(s) or mechanic(s) cannot read the language of the manual, it is the owner's responsibility to explain this material to them.
- Become familiar with the safe operation of the equipment, operator controls, and safety signs.
- All operators and mechanics should be trained. The owner is responsible for training the users.

- Never let children or untrained people operate or service the equipment. Local regulations may restrict the age of the operator.

- The owner/user can prevent and is responsible for accidents or injuries occurring to himself or herself, other people or property.

Preparation

- Evaluate the terrain to determine what accessories and attachments are needed to properly and safely perform the job. Only use accessories and attachments approved by the manufacturer.

- Wear appropriate clothing including hard hat, safety glasses and ear protection. Long hair, loose clothing or jewelry may get tangled in moving parts.

- Inspect the area where the equipment will be used and remove all objects such as rocks, toys and wire that can be thrown by the machine.

- Use extra care when handling diesel and other fuels. They are flammable and vapors are explosive.

    - Use only an approved container

    - Never remove the fuel cap or add fuel with the engine running. Allow the engine to cool before refueling. Do not smoke.

    - Never refuel or drain the machine indoors.

- Check that operator's presence controls, safety switches and shields are attached and functioning properly. Do not operate unless they are functioning properly.

Operation

- Never run an engine in an enclosed area.

- Only operate in good light, keeping away from holes and hidden hazards.

- Be sure all drives are in neutral and the parking brake is engaged before starting the engine. Only start the engine from the operator's position. Use seat belts, if provided.

- Slow down and use extra care on hillsides. Be sure to travel in the recommended direction on hillsides. Turf conditions can affect the machine's stability. Use caution while operating near drop–offs.

- Slow down and use caution when making turns and when changing directions on slopes.

- Never raise the deck with the blades running.

- Never operate with the power take-off shield, or other guards not securely in place. Be sure all interlocks are attached, adjusted properly, and functioning property.

- Do not change the engine governor setting or overspeed the engine.

- Stop on level ground, lower the implements, disengage the drives, engage the parking brake (if provided), and shut off the engine before leaving the operator's position for any reason.

- Stop the equipment and inspect the blades after striking objects or if an abnormal vibration occurs. Make necessary repairs before resuming operations.

- Keep your hands and feet away from the cutting units.

- Look behind and down before backing up to be sure of a clear path.

- Never carry passengers and keep pets and bystanders away.

- Slow down and use caution when making turns and crossing roads and sidewalks. Stop the blades if not mowing.

- Do not operate the mower under the influence of alcohol or drugs

- Use care when loading or unloading the machine into a trailer or truck

- Use care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.

Maintenance and storage

- Disengage the drives, lower the implement, set the parking brake, stop the engine and remove the key. Wait for all movement to stop before adjusting, cleaning or repairing.

- Clean grass and debris from the cutting units, drives, mufflers, and engine to help prevent fires. Clean up oil or fuel spillage.

- Let the engine cool before storing and do not store near flame.

- Do not store fuel near flames or drain indoors.

- Park the machine on level ground. Never allow untrained personnel to service the machine.

- Use jack stands to support components when required.

- Carefully release pressure from components with stored energy.

- Disconnect the battery before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect positive first and negative last.

- Use care when checking the blades. Wrap the blade(s) or wear gloves, and use caution when servicing them. Only replace the blades. Never straighten or weld them.

- Keep your hands and feet away from moving parts. If possible, do not make adjustments with the engine running.

- Charge batteries in an open well ventilated area, away from spark and flames. Unplug charger before connecting or disconnecting from the battery. Wear protective clothing and use insulated tools.

- Keep all parts in good working condition and all hardware tightened. Replace all worn or damaged decals.

Toro Mower Safety

This product is capable of amputating hands and feet and throwing objects. Always follow all safety instructions to avoid serious injury or death.

This product is designed for cutting and recycling grass. Any use for purposes other than these could prove dangerous to user and bystanders.

General Operation

- Allow only responsible adults who are familiar with the instructions to operate the machine.

- Be sure the area is clear of other people before mowing.Stop the machine if anyone enters the area.

- Do not mow in reverse unless absolutely necessary. Always look down and behind before and while backing.

- Slow down before turning. Sharp turns on any terrain may cause loss of control.

- Turn off the blades when not mowing.

- Keep hands, feet, hair and loose clothing away from attachment discharge area, underside of mower and any moving parts while the engine is running.

- Mow only in daylight or good artificial light.

- Watch for traffic when operating near or crossing roadways.

- Do not touch equipment or attachment parts which may be hot from operation. Allow to cool before attempting to maintain, adjust or service.

- Before operating a machine with roll over protection be certain the seat belts are attached and seat is latched to prevent the seat from pivoting forward.

- Use only Toro-approved attachments. Warranty may be voided if used with unapproved attachments.

Slope Operation

Slopes and ramps are a major factor related to loss-of-control and tip-over accidents, which can result in severe injury or death. All slopes and ramps require extra caution. If you cannot back up the slope or if you feel uneasy on it, do not mow it.

DO

- If you must ascend a steep slope, back up the hill, and drive forward down the hill, keeping the machine in gear.

- Remove obstacles such as rocks, tree limbs, etc. from the mowing area. Watch for holes, ruts or bumps, as uneven terrain could overturn the machine. Tall grass can hide obstacles.

- Use slow speed so that you will not have to stop while on the slope.

- Follow the manufacturer's recommendations for wheel weights or counterweights to improve stability.

- Use extra care with other attachments. These can change the stability of the machine.

- Keep all movement on slopes slow and gradual. Do not make sudden changes in speed or direction.

- Avoid starting or stopping on a slope. If the tires lose traction, disengage the blades and proceed slowly straight down the slope. Avoid raising the side decks on a slope.

- When operating the machine on slopes, banks or near drop offs, always have roll-over protection installed.

- When operating a machine with roll-over protection always use seat belt.

- Be certain that the seat belt can be released quickly if the machine is driven or rolls into ponds or water.

- Check carefully for overhead clearances (i.e., branches, doorways, electrical wires) before driving under any objects and do not contact them.

DO NOT

- Do not mow slopes exceeding 15 degrees.

- Avoid turning on slopes. If you must turn, turn slowly and gradually downhill, if possible.

- Do not mow near drop-offs, ditches, or embankments. The machine could suddenly turn over if a wheel goes over the edge of a cliff or ditch, or if an edge caves in.

- Do not mow on wet grass. Reduced traction could cause sliding.

- Do not try to stabilize the machine by putting your foot on the ground.

Service

- Never store the machine or fuel container inside where there is an open flame, such as near a water heater or furnace.

- Keep nuts and bolts tight, especially the blade attachment bolts. Keep equipment in good condition.

- Never tamper with safety devices. Check safety systems for proper operation before each use.

- Use only genuine replacement parts to ensure that original standards are maintained.

- Check brake operation frequently. Adjust and

service as required.

- Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes and clothing. Protect your face, eyes and clothing when working with a battery.

- Battery gases can explode. Keep cigarettes, sparks and flames away from the battery.

- Hydraulic fluid escaping under pressure can penetrate the skin and cause injury. Use cardboard or paper to find hydraulic leaks. Never use your hands.

Sound Pressure Level

This unit has an equivalent continuous A-weighted sound pressure at the operator ear of: 90 dB(A), based on measurements of identical machines per Directive 84/538/EEC and amendments.

Sound Power Level

This unit has a sound power level of: 105 dB(A) 1 pW, based on measurements of identical machines per Directive 84/538/EEC and amendments.

Vibration Level

Hand-Arm

This unit does not exceed a vibration level of 2.5 m/s^2 at the hands based on measurements of identical machines per ISO 5349 procedures.

Whole Body

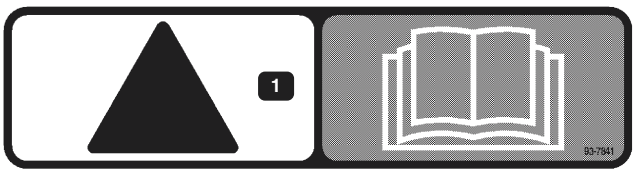
This unit does not exceed a vibration level of 0.5 m/s^2 at the posterior based on measurements of identical machines per ISO 2631 procedures.

Safety and Instruction Decals

Safety decals and instructions are easily visible to the operator and are located near any area of potential danger. Replace any decal that is damaged or lost.

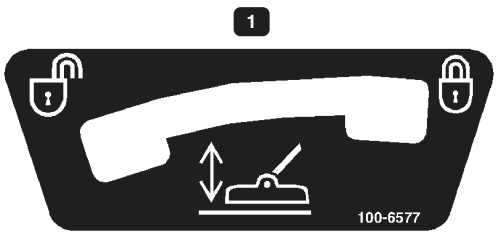
93-7830

1. Danger—See operator's manual
2. Wheel torque specifications



93-7841

1. Danger—See operator's manual

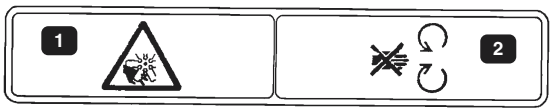


100-6577

1. Lock—Unlock the deck service lock

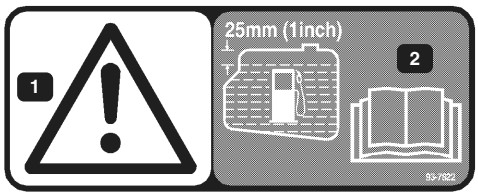
93-6680

1. Diesel fuel



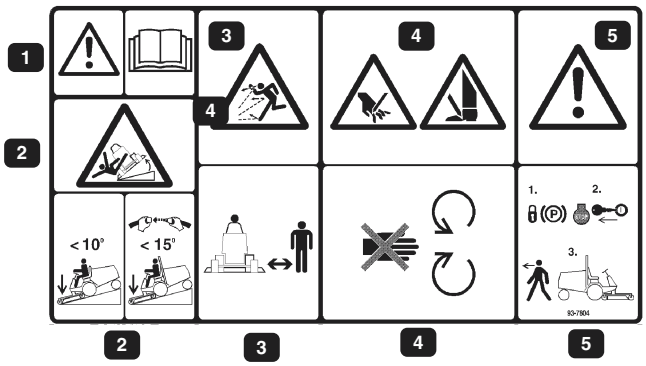
93-7272

1. Fan blades can cause injury
2. Stay away from moving parts



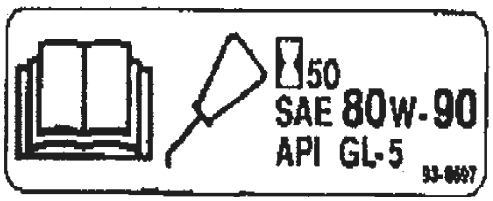
93-7822

1. Danger
2. See Operator's manual
3. Fill the fuel tank to 1" from bottom of the filler neck



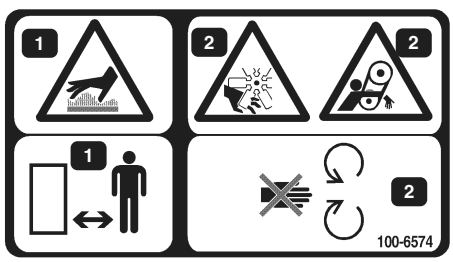
105-2512

1. Danger—Read operator's manual
2. Tipping hazard—Go slow and avoid sharp turns on slopes to avoid rollover. The deck must be lowered when going down slopes for steering control. Always wear seat belts with roll-over protection.
3. Thrown object hazard—keep bystanders away
4 Cutting hazard to hands or feet—stay away from rotating blades or moving parts.
5. Danger—set the parking brake, stop the engine and remove the key before leaving the operator's position.



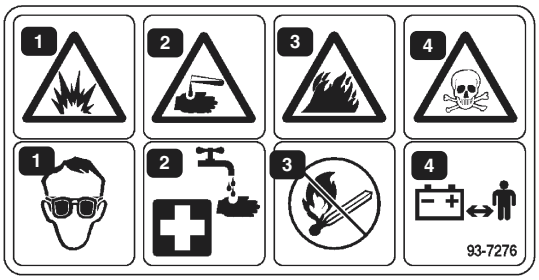
93-6697

1. read the operator's manual for lubrication intervals.



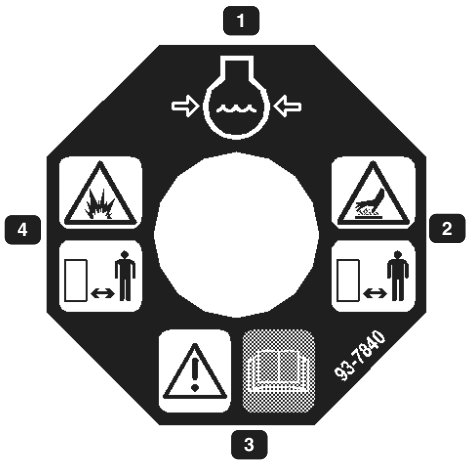
100-6574

1. Hot surface stay away
2. Stay away from moving parts



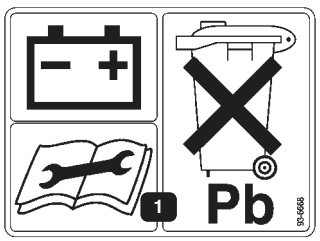
93-7276

1. Explosion hazard—wear eye protection.
2. Caustic liquid hazard—flush with water and seek first aid.
3. Fire hazard — no sparks, flame, or smoking
4. Poison—keep children a safe distance from the battery.



93-7840

1. Coolant level
2. Hot surface—keep a safe distance
3. Danger—rear the operator's manual
4. Explosion hazard—stay away

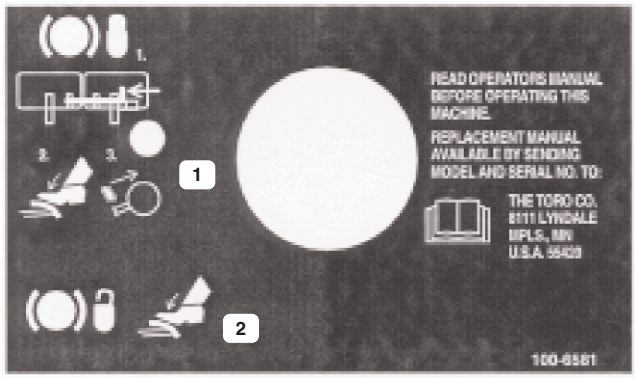


93-6668

1. The battery contains lead. Do not throw it in the garbage.

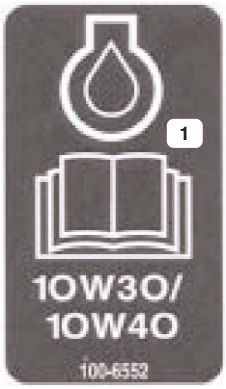
105-2511

1. Read operator's manual for starting instructions



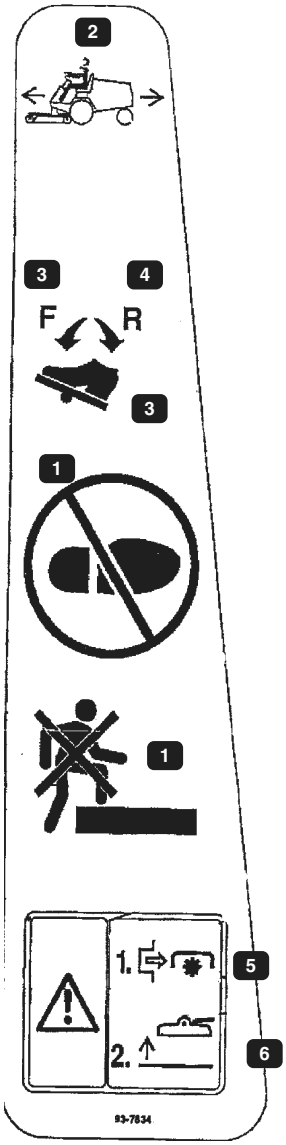
100-6581

1. To lock parking brake—Latch pedals together, apply brake pedals and pull up on knob
2. To unlock parking brake—step on brake pedals



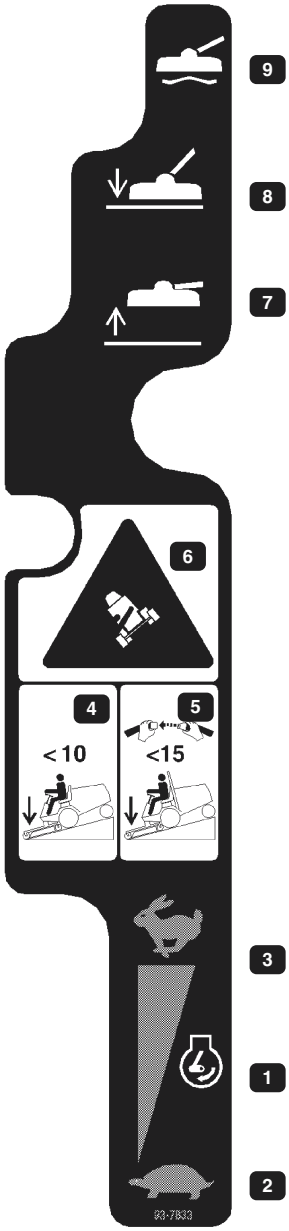
100-6552

1. Refer to Operator's Manual for engine oil specifications



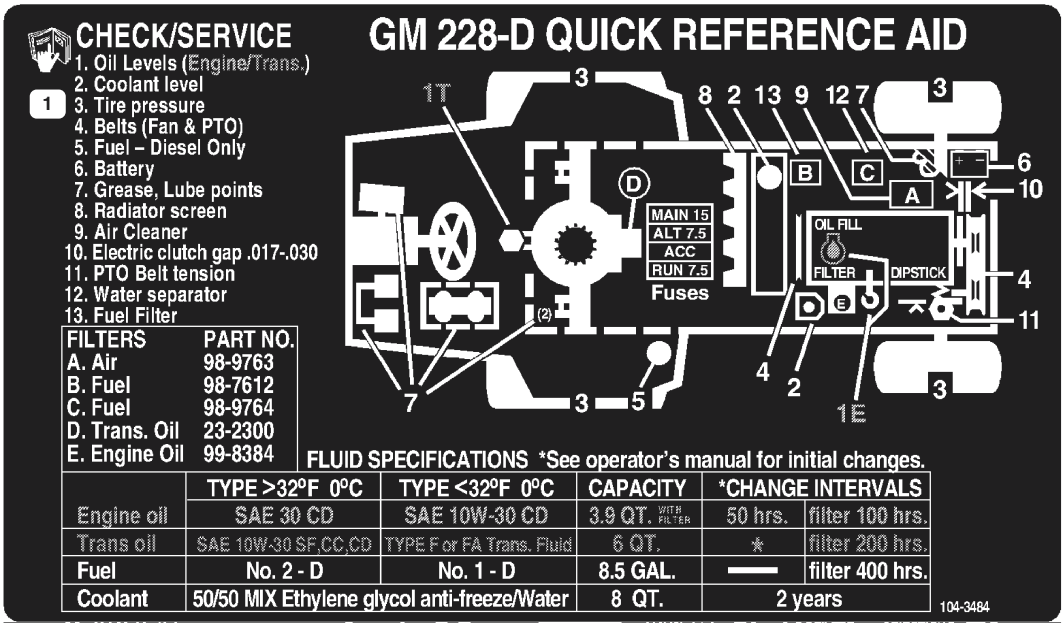
93-7834

1. No step
2. Traction pedal
3. Traction—forward
4. Traction—reverse
5. Danger—Shut off power take-off prior to raising decks
6. Danger—Do not operate decks when they are in raised position



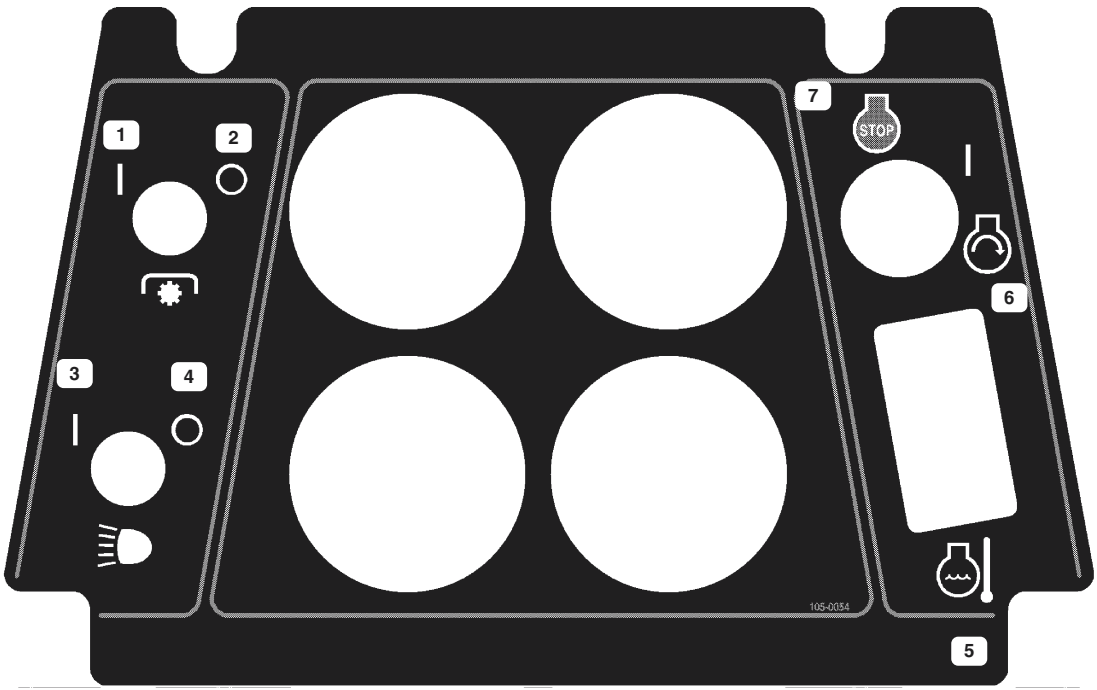
93-7833

1. Throttle control
2. Throttle—fast
3. Throttle—slow
4. Tipping hazard—Lower the deck when going down slopes greater than 10 degrees
5. Tipping hazard—Lower the deck when going down slopes greater than 10 degrees
6. Danger—tipping hazard
7. Lift lever—raise position
8. Lift lever—lower position
9. Lift lever—float position



Part No. 104-3484

1. See the operator's manual



Part No. 105-0054

1. Headlights—off
2. Headlights—on
3. Power take-off—off
4. Power take-off—on
5. Engine coolant temperature
6. Engine—start
7. Engine—stop

Specifications

Note: Specifications and design subject to change without notice.General Specifications

Engine	Kubota three-cylinder, 4-cycle, liquid-cooled diesel engine. 26 hp @ 3000. Engine governed to 3200–3250 rpm high idle, no load.
Air Cleaner	Heavy-duty remote mounted.
Fuel Tank Capacity	8.5 gal. (32 l) Equipped with a fuel filter/water separator to capture water in the fuel.
Fuel Pump	12-volt electric (transistor type) w/replaceable fuel filter.
Cooling System	7 qt (6.6 l) capacity. Remote-mounted expansion tank 1 qt (0.946 l) capacity. System contains a 50/50 mix of ethylene glycol anti-freeze and water. Front mounted air/oil cooler used to cool hydraulic oil for the hydrostatic transmission.
Electrical	12 volt with 530 cold cranking amps at 0° F and 75-minute reserve capacity at 80° F.
Drive Coupling	Transmission driven by steel shaft with flexible rubber couplings at each end.
Transmission	Hydrostatic, U-type. Implement Relief Setting—700–800 psi (4,826–5,516 kPa).
Hydraulic Filter	Replaceable 25-micron filter mounted directly to the transmission.
Front Axle	The front axle serves as a hydraulic fluid reservoir and mates directly with the transmission. Approximately 6 qt (5.7 l) capacity.
Rear Axle	The rear axle is mchanically driven from the front axle by a universal shaft. The axle has a be-directional overrunning clutch in the rear driveshaft. When lubricating the rear axle, use SAE 80W-90 gear lube, API GL-5. Lubricant capacity is 2.9 liter (3.1 qt.)
Brakes	Mechanical drum-type. Individually controlled by two pedals connected by cable and conduit for steering assist. Pedals may be latched together for two wheel braking. Lever provided for parking brake.
Tires	Front Tires—23 x 8.50-12, Rear Tires—16 x 6.50-8. All tires: 4-ply rating, tubeless type. Pressure—20 psi (138 kPa).
Ground Speed	0–16 kmh forward and reverse.
Main Frame	Frame is welded, formed steel.
Instrumentation	Fuel gauge, water temperature gauge, hour meter and warning lights for high temperature shutdown, oil pressure, amperage and glow plug are mounted on the console.
Controls	Throttle, power take-off switch, parking brake, implement lift, implement lift lock, ignition switch and high temperature override switch are all hand-operated. Forward/reverse traction pedal and turning brakes are foot-operated.

Power take-off drive	The power take-off shaft is clutched by a belt directly from the engine output shaft. The power take-off shaft engaged by an electric clutch/brake assembly. Power take-off speed—2200 RPM@3250 RPM engine speed.
Implement Connection	Universal joint and telescoping shaft assembly.
Lift Cylinders	Two with 2 in. (51 mm) bore, 3.5 in. (89 mm) stroke.
Interlock Switches	Prevent engine starting if the traction pedal or power take-off switch are engaged. Stops the engine if the operator leaves the seat with either the traction pedal or power take-off switch engaged. Stops the engine if the traction pedal is engaged with parking brake engaged.

Measurements

Length	208 cm (82 in.)
Width (Rear Wheels)	119.4 cm (47 in.)
Height	127 cm (50 in.)
Weight	442 kg (1185 lb.)

Optional Equipment

52” Side Discharge Cutting Unit	Model No. 30555
52” Rear Discharge Cutting Unit	Model No. 30568
62” Side Discharge Cutting Unit	Model No. 30551
62” Guardian Recycler Cutting Unit	Model No. 30569
72” Side Discharge Cutting Unit	Model No. 30553
48” V-Plow Kit	Model No. 30750
V-Plow Mounting Kit	Model No. 30749*
Arm Rest Kit	Model No. 30707
Rear Discharge Shield Kit	Model No. 30578
Rear Weight Box Kit	Part No. 24-5780
Grass Collection System	Model No. 30502**
Wide Tires w/rim	
23 x 10.5-12, 4 ply	Part No. 62-7020
23 x 10.5-12, 6 ply	Part No. 69-9870
Wheel Weights-50 lbs. (23kg.)	Part No. 11-0440
Rear Weight Kit—70 lbs. (32 kg.)	Part No. 24-5780
Weight Kit—20 lbs.	Part No. 92-8763
Tire Chains (Front)	Part No. 11-0390
Standard Seat Kit	Model No. 30624
Deluxe Seat Kit	Model No. 30625

*Required with 30750 V-plow. Tire chains, part no. 11-0390 recommended.

** 52” Blower Kit (for Model 30555 deck) or Model 30506 62” Blower Kit (for Model 30551 deck) can be used with either Model No. 30504, 9 cu. ft. Hopper Kit or Model No. 30505, 15 cu. ft. Hopper Kit.

Installing Rear Weights

Two-Wheel Drive Groundsmaster 228-D Series traction units comply with ANSI B71.4-1999 Standard when equipped with rear weight. Use chart below to determine combinations of weight required. Order parts from your

	Rear Weight Required	Left Side Weight Required	Weight Part Number	Weight Description	Quantity
52” Rear Discharge Deck (Model 30568) or 52” Side Discharge Deck	20 lbs.	0 lbs.	92-8763	Weight Kit – 20 lb.	1
52” Side Discharge Deck with 9 cu. ft. Hopper	0 lbs.	0 lbs.	--	--	
52” Side Discharge Deck with 15 cu. ft. Hopper	0 lbs.	215 lbs.	77-6700 & 92-9670 & 24-5780	75 lb. Wheel Weight & Bracket Kit & Rear Weight Kit	1 1 1
62” Side Discharge Deck (Model 30564) or 62” Side Discharge Deck with 9 cu. ft. Hopper	55 lbs.	0 lbs.	24-5790 325-8 3253-7 3-8847 3217-9 92-8763	Rear Weight—35 lb. Capscrew-½-13 x 2” Lockwasher-½ Spacer Nut-½ & Weight Kit-20 lb	1 2 2 2 2 1
62” Side Discharge Deck with 15 cu. ft. Hopper	0 lbs.	75 lb.*	* 77-6700	75 lb. Wheel Weight	1
62” Guardian Recycler Deck (Model 30569)	70 lbs	0 lbs.	24-5780		1
72” Side Discharge Deck (Model 30575)	90 lbs	0 lbs.	24-5780 & 92-8763	Rear Weight Kit & Weight Kit-20 lb.	1

local Authorized Toro Distributor.

* 75 lb. wheel weight (included with 15 cu. ft. hopper) required on the left wheel

Before Operating

Check the Engine Oil

The engine is shipped with 4 qt (3.8 l) of oil in the crankcase; however, check the oil level before and after you first start the engine.

1. Park the machine on a level surface, stop the engine and remove the key from the ignition switch. Open the hood.

2. Remove the dipstick (Fig. 2), wipe it clean and reinstall it. Remove it again and check the oil level. The level should be up to the FULL mark on the dipstick

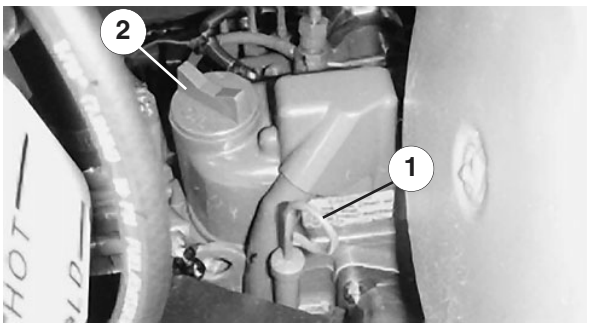


Figure 2

1. Dipstick
2. Oil fill

3. If the oil is below the FULL mark, remove the fill cap and add SAE 10W-30 CD, CE, CF, CF-4 or CG-4 classification oil until the level reaches the FULL mark on the dipstick. DO NOT OVERFILL.

4. Install the oil fill cap and close the hood.

Check the Cooling System

Clean debris from the screen and radiator/oil cooler daily, more often if conditions are extremely dusty and dirty; refer to *Engine Cooling System*.

The cooling system is filled with a 50/50 solution of water and permanent ethylene glycol anti-freeze. Check the level of coolant in the expansion tank at the beginning of each day before you start the engine. Cooling system capacity is 7 quarts (6.6 l).

CAUTION

if the engine has been running, pressurized hot coolant can escape and cause burns when you remove the radiator cap.

1. Check the level of coolant in the expansion tank. Coolant level should be between the marks on the side of the tank.

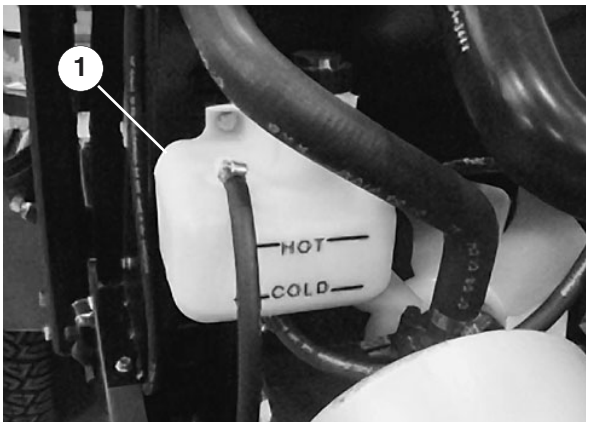


Figure 3

1. Expansion tank

2. If the coolant level is low, remove the expansion tank cap and replenish the system. DO NOT OVERFILL.

3. Install the expansion tank cap.

Check Hydraulic System Fluid

The hydraulic system will operate with any high-quality detergent oil having the American Petroleum Institute—API—"service classification" SF, CC or CD. Oil viscosity—weigh —must be selected according to anticipated ambient temperature. Temperature/viscosity recommendations are:

Expected Ambient Temperature	Recommended Viscosity and Type
(Extreme) over 32° C	SAE 30, Type SF, CC or CD engine oil
(Normal) 4–37° C	SAE 10W-30 or 10W-40, Type SF,CC or CD engine oil
(Cool) –1 to 10° C	SAE 5W-30, Type SF, CC or CD engine oil
(Winter) Below –1° C	Type “F” or “FA” ATF Automatic Transmission Fluid

Note: Do not mix engine oil and automatic transmission fluid or hydraulic component damage may result. When changing fluids, also change the transmission filter. **DO NOT USE DEXRON II ATF**.

The transmission and axle housing are shipped from the factory with approximately 5 quarts (4.7 l) of SAE 10W-30 engine oil. However, check the level of transmission oil before first starting the engine and daily thereafter.

1. Position the machine on a level surface. Place all controls in neutral position and start the engine. Run the engine at lowest possible RPM to purge the system of air. **DO NOT ENGAGE** the power take-off. Turn the steering wheel several times fully to the left and right. Raise the cutting unit to extend the lift cylinders, aiming the wheels straight forward, and stop the engine.

2. Remove the dipstick cap (Fig. 4) from the filler neck and wipe it with a clean cloth. Screw the dipstick cap finger-tight onto the filler neck; then remove it and check the level of fluid. If the level is not within ½ inch (13 mm) from the groove in the dipstick (Fig. 4), add SAE 10W-30 engine oil, or, if used, automatic transmission fluid to raise the level to groove mark. Do not overfill.

   Important When adding transmission fluid to the hydraulic system, use a funnel with a fine wire screen—200 mesh or finer—and make sure the funnel and transmission fluid are immaculately clean. This prevents accidentally contaminatimg the hydraulic system.

3. Thread the dipstick fill cap finger-tight onto the filler neck. It isn’t necessary to tighten the cap with a wrench.

4. Check all hoses and fittings for leaks.

Figure 4
1. Hydraulic system reservoir fluid/add dipstick cap

Fill the Fuel Tank

CAUTION

Under certain conditions, diesel fuel and fuel vapors are highly flammable and explosive. A fire or explosion from fuel can burn you and others and can cause property damage.

- Use a funnel and fill the fuel tank outdoors, in an open area, when the engine is off and is cold. Wipe up any fuel that spills.
- Do not fill the fuel tank completely full. Add fuel to the fuel tank until the level is 1 in. (25 mm) below the bottom of the filler neck. This empty space in the tank allows the fuel to expand.
- Never smoke when handling fuel, and stay away from an open flame or where fuel fumes may be ignited by a spark.
- Store fuel in a clean, safety-approved container and keep the cap in place.

1. Using a clean cloth, clean area around the fuel tank cap.

2. Remove the cap from the fuel tank (Fig. 5).

3. Fill the 8.5 gallon (32 l) tank to within 1 inch (25

mm) from the bottom of the filler neck with diesel fuel.

4. Install the fuel tank cap tightly after filling tank.

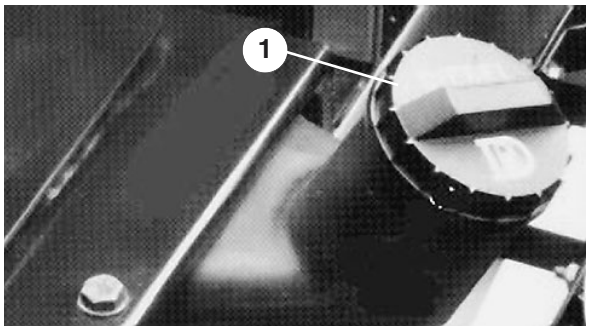


Figure 5

1. Fuel tank cap

Check the Rear Axle Lubricant

The rear axle has three separate reservoirs that use SAE 80W-90 weight gear lube. Although the axle is shipped with lubricant from the factory, check the level before operating the machine.

1. Position the machine on a level surface.

2. Remove the check plugs from the axle and make sure lubricant is up to the bottom of each hole. If the level is low, remove the fill plugs and add enough lubricant to bring the level up to the bottom of the check plug holes (Fig. 6).

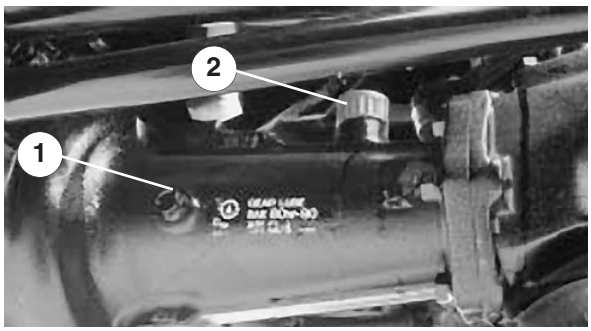


Figure 6

1. Check plug
2. Fill plug

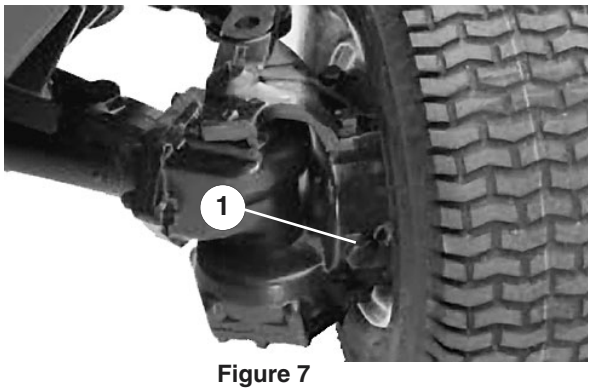


Figure 7

1. Fill/check plug (one on each end of the axle)

Check the Bi-Directional Clutch's Lubricant

1. Position the machine on a level surface.

2. Rotate the clutch (Fig 8) so the check plug (shown in the 12:00 o'clock position) is positioned at 4:00 o'clock.

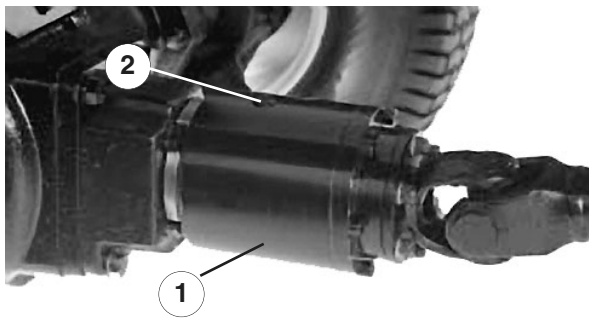


Figure 8

1. Bi-directional clutch
2. Check plug

3. Remove the check plug. Fluid level should be up to the hole in the clutch. If the fluid level is low, add Mobil Fluid 424. The clutch should be approximately ⅓ full.

4. Install the check plug.

Note: do not use engine oil (i.e., 10W30) in the bi-directional clutch. Anti-wear and extreme pressure additives will cause undesirable clutch performance.

Controls

Service Brakes

The left and right brake pedals (Fig. 9) are connected to the left and right front wheels. Since both brakes work independently, the brakes can be used to turn sharply or to increase traction if one wheel tends to slip while operating on certain slope conditions. However, wet grass or soft turf can be damaged when brakes are used to turn sharply. To make a "quick-stop", depress both brake pedals together. Always lock the brakes together when transporting the traction unit.

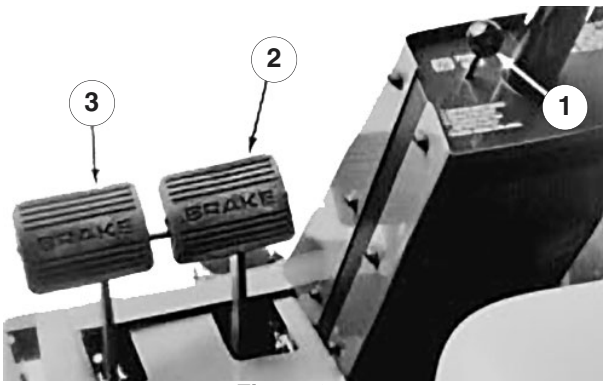


Figure 9

1. Parking brake knob
2. Right brake pedal
3. Left brake pedal

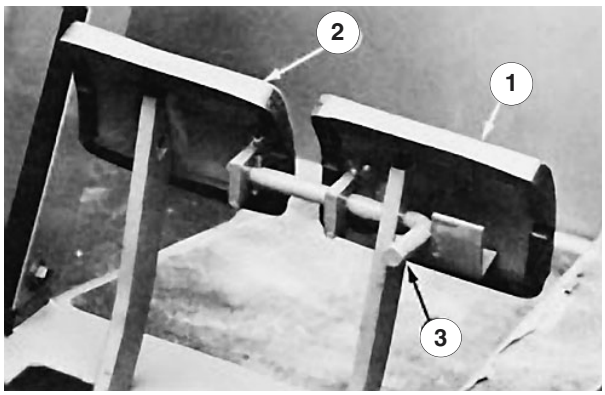


Figure 10

1. Left brake pedal
2. Right brake pedal
3. Lock arm

Parking Brake

Whenever the engine is shut off, the parking brake must be engaged to prevent accidental movement of the machine. To engage the parking brake, push the lock arm (Fig. 10) on so that it locks together with the right pedal. Next, push down fully on both pedals and pull parking brake knob out (Fig. 9) then release the pedals. To release the parking brake, depress both pedals until the parking brake knob retracts. Before starting the engine, however, the lock arm may be disengaged from the left brake pedal so both pedals work independently with each front wheel

Traction Pedal

The traction pedal (Fig. 11) has two functions: to make the machine move forward, and to make it move backward. Depress the top of the pedal to move forward and bottom of the pedal to move rearward. Ground speed is proportionate to how far you depress the pedal. For maximum ground speed, the traction pedal must be fully depressed while the throttle is in the FAST position. Maximum speed forward is 10 mph (16 Km/hr) (approx.). To get maximum power with a heavy load or when climbing a hill, have the throttle in the FAST position while depressing the traction pedal slightly to keep engine rpm high. When engine rpm begins to decrease, release the traction pedal slightly to allow rpm to increase.

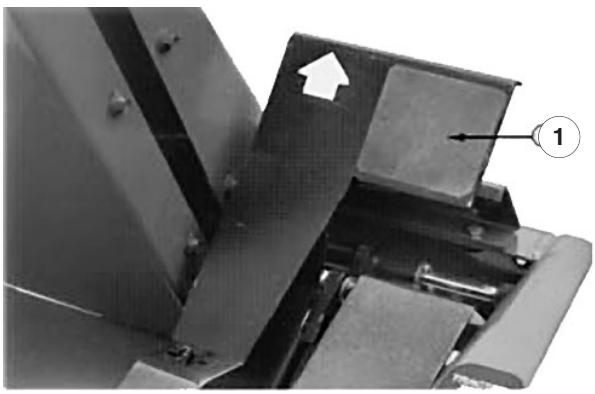


Figure 11

1. Traction pedal

Hydraulic Lift Lever

CAUTION

Never raise the cutting unit while the blades are rotating because it is hazardous.

The hydraulic lift lever (Fig. 12) has three positions: FLOAT, TRANSPORT and RAISE. To lower the cutting unit to the ground, move the lift lever forward into the notch in the seat platform—FLOAT. Use the FLOAT position for mowing and when the machine is not in operation. To raise the cutting unit, pull the lift lever rearward to the RAISE position.

After the cutting unit is raised, let the lift lever move to the TRANSPORT position. The cutting unit must be raised when driving from one work area to another.

Figure 12

1. Hydraulic lift lever
2. Power take-off switch
3. Temperature gauge
4. Fuel gauge
5. Ignition key switch
6. Temperature override switch
7. Throttle
8. Hour meter
9. Engine coolant temperature
10. Glow plug indicator
11. Charge indicator
12. Oil pressure indicator
13. Lift lever lock

Power Take-Off Switch

Pull up on the sleeve on the toggle switch handle and move handle to ON to engage the power take-off clutch (Fig. 12). Pull up on the sleeve and move the handle to OFF to disengage the power take-off clutch. The only time the power take-off switch should be in the ENGAGE position is when the implement is down, in operating position and ready to begin operation.

Temperature Gauge

The temperature gauge (Fig. 12) registers the temperature of the coolant in the cooling system. If coolant temperature becomes too high, the engine will shut off automatically.

Fuel Gauge

The fuel gauge (Fig. 12) indicates the quantity of fuel remaining in the fuel tank.

Ignition Key Switch

Three positions: OFF, ON/Preheat and START (Fig. 12).

Temperature Override Switch

Press and hold the over-ride switch (Fig. 12) to start the engine after a high-temperature shut down. Use only for emergency operation.

Throttle

The throttle (Fig. 12) is used to operate the engine at various speeds. Moving the throttle forward increases engine speed—FAST; rearward decreases engine speed—SLOW. The throttle controls the speed of the cutter blades and, with the traction pedal, controls the traction unit's ground speed.

Hour Meter

The hour meter (Fig. 12) registers accumulated hours of engine operation.

Engine Coolant Temperature Warning Light

The light illuminates and the engine shuts down when coolant reaches an excessively high temperature (Fig. 12).

Glow Plug Indicator

When lit, indicates that the glow plugs are on (Fig. 12).

Charge Indicator

Illuminates when the system's charging circuit malfunctions (Fig. 12).

Oil Pressure Warning Light

The oil pressure warning light (Fig. 12) glows when engine oil pressure drops below a safe level. If low oil pressure occurs, stop the engine and determine the cause. Repair the damage before starting the engine again.

Lift Lever Lock

Lock the lift lever (Fig. 12) in the raised position when performing maintenance on the cutting unit.

Seat Adjusting Handle

To adjust the seat, loosen the adjusting knobs and slide the seat to the desired position. Tighten the knobs to lock the seat in place.

Seat Adjusting Handle—Deluxe Seat

To adjust the seat, move the lever on the left side outward, slide the seat to the desired position and release the lever so it will lock in that position.

Operation

Note: Determine the left and right sides of the machine from the normal operating position.

Starting/Stopping the Engine

Important the fuel system must be bled if any of the following situation have occurred.

A. Initial start up of a new machine.

B. The engine has ceased running due to lack of fuel.

C. Maintenance has been performed on fuel system components; i.e., filter replaced, separator serviced, etc.

Refer to *Bleeding the Fuel System*.

1. Ensure the parking brake is set, the power take-off switch is in the OFF position and the lift lever is in the TRANSPORT or FLOAT position. Remove your foot from the traction pedal and make sure it is in neutral.

2. Move the throttle control to the 1/2-speed position.

3. Turn the ignition switch to the ON/Preheat position. An automatic timer will control preheat for 6 seconds. After preheat, turn the key to the START position. CRANK THE ENGINE FOR NO LONGER THAN 15 SECONDS. Release the key when the engine starts. If additional preheat is required, turn the key to the OFF position then to the ON/preheat position. Repeat the process as required.

4. Run the engine at idle speed or partial throttle until the engine warms up.

Note: Move the throttle to the ½-speed position when restarting a warm engine.

5. When the engine is started for the first time, or after an engine oil change, or overhaul of the engine, transmission or axle, operate the machine in forward and reverse for one to two minutes. Also operate the lift lever and power take-off lever to assure proper operation of all parts. Turn the steering wheel to the left and right to check steering response. Then shut the engine off and check fluid levels. Also check for oil leaks, loose parts and any other noticeable malfunctions.

CAUTION

Shut the engine off and wait for all moving parts to stop before checking for oil leaks, loose parts or other malfunctions.

6. To stop the engine, move the throttle control backward to the SLOW position, move the power take-off switch to the OFF position and turn the ignition key to OFF. Remove the key from the switch to prevent accidental starting.

Bleeding the Fuel System

1. Park the machine on a level surface. Make sure the fuel tank is at least half full.

DANGER

Under certain conditions, diesel fuel and fuel vapors are highly flammable and explosive. A fire or explosion from fuel can burn you and others and can cause property damage.

- Use a funnel and fill the fuel tank outdoors, in an open area, when the engine is off and is cold. Wipe up any fuel that spills.
- Do not fill the fuel tank completely full. Add fuel to the fuel tank until the level is 1 in. (25 mm) below the bottom of the filler neck. This empty space in the tank allows the fuel to expand.
- Never smoke when handling fuel, and stay away from an open flame or where fuel fumes may be ignited by a spark.
- Store fuel in a clean, safety-approved container and keep the cap in place.

2. Unlatch and raise the hood.

3. Open the air bleed screw on the fuel injection pump (Fig. 13).

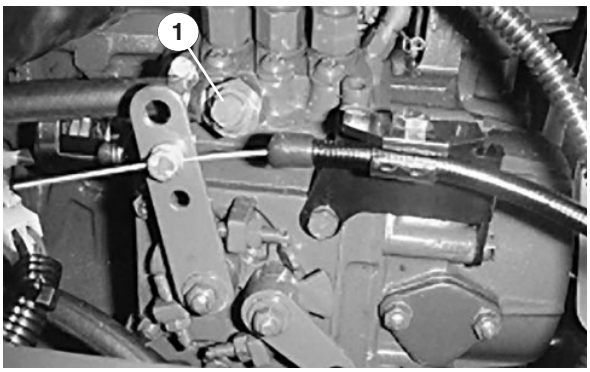


Figure 13
1. Fuel injection pump bleed screw

4. Turn the key in the ignition switch to the ON position. The electric fuel pump will begin operation, forcing air out around air bleed screw. Leave the key in the ON position until a solid stream of fuel flows out around the screw. Tighten the screw and turn the key to OFF.

   Note: Normally, the engine should start after these bleeding procedures. However, if it doesn't, air may be trapped between the injection pump and the injectors; refer to *Bleeding Air from the Injectors,* page 31

Checking the Interlock System

The purpose of the safety interlock system is to prevent the engine from cranking or starting unless the traction pedal is in neutral and the power take-off switch is in the OFF position. Also, the engine will stop when the power take-off control is engaged or the traction pedal is depressed with operator off the seat or when the parking brake is engaged.

CAUTION

If the safety interlock switches are disconnected or damaged, the machine could operate unexpectedly and cause personal injury.

- Do not tamper with the interlock switches.
- Check the operation of the interlock switches daily and replace any damaged switches before operating the machine.
- Replace switches every two years, regardless of whether they are operating properly.

1. Move the power take-off switch to the OFF position and remove your foot from the traction pedal.

2. Turn the ignition key to START. The engine should crank. If the engine cranks, go to step 3. If the engine does not crank, there may be a malfunction in the interlock system.

3. Rise off the seat and engage the power take-off switch while the engine is running. The engine should stop within 2 seconds. If the engine stops, the switch is operating correctly; go to step 4. If the engine does not stop, there is a malfunction in the interlock system.

4. Rise off the seat and depress the traction pedal while the engine is running the power take-off lever is disengaged. The engine should stop within 2 seconds. If the engine stops, the switch is operating correctly; go to step 5. If the engine does not stop, there is a malfunction in the interlock system.

5. Engage the parking brake. Depress the traction pedal while the engine is running and the power take-off lever is disengaged. The engine should stop within 2 seconds. If the engine stops, the switch is operating correctly; continue operation. If the engine does not stop, there is a malfunction in the interlock system.

Operating Characteristics

Practice driving the GROUNDSMASTER 228-D

before initial operation because it has a hydrostatic transmission and its characteristics are different than some turf maintenance machines with which you may be familiar. Pay attention to the transmission, engine speed, load on the cutting blades, and the importance of the brakes.

To maintain enough power for the traction unit and cutting unit while mowing, regulate the traction pedal to keep engine rpm high and somewhat constant. A good rule to follow is: decrease ground speed as the load on the cutting blades increases; and increase ground speed as load on the blades decreases. This lets the engine—working with the transmission—sense the proper ground speed while maintaining the high blade speed necessary for good quality of cut. Therefore, allow the traction pedal to move upward as engine speed decreases, and depress the pedal slowly as speed increases. By comparison, when driving from one work area to another—with no load and the cutting unit raised—have the throttle in the FAST position and depress the traction pedal slowly, but fully, to attain maximum ground speed.

CAUTION

This machine produces sound levels in excess of 85dBA at the operator's ear and can cause hearing loss through extended periods of exposure. Wear hearing protection when operating this machine.

You can use the brakes to assist in turning the machine; however, use them carefully, especially on soft or wet grass because the turf may be torn accidentally. The brakes can be used to great advantage to control the direction of the cutting unit when trimming along fences or similar objects. The other benefit of the brakes is to maintain traction. For example; in some slope conditions, the uphill wheel may slip and lose traction. If this occurs, depress the uphill brake pedal gradually and intermittently until the uphill wheel stops slipping. If you don't want independent braking, engage the lever on the left brake pedal with the right pedal. This provides simultaneous braking at both wheels.

Before stopping the engine, disengage all controls and move the throttle to SLOW. Moving the throttle to SLOW reduces engine speed, noise and vibration.

Turn the ignition key to OFF to stop the engine.

Pushing or Towing the Traction Unit

In an emergency, the you can push or tow the traction unit for a very short distance. However, Toro does not recommend this as standard procedure.

Important Do not push or tow the traction unit faster than 3.2 to 4.8 kmh because transmission may be damaged. If you want to move the traction unit a considerable distance, transport it on a truck or trailer. Whenever the traction unit is pushed or towed, by-pass valve must be open.

1. Remove the hair pin, pivot the seat platform forward and locate the seat support rod in the detent notch.

2. Depress and hold the pins located in the center of the two (2) check valve assemblies in the top of the transmission (Fig. 14) while pushing or towing the machine.

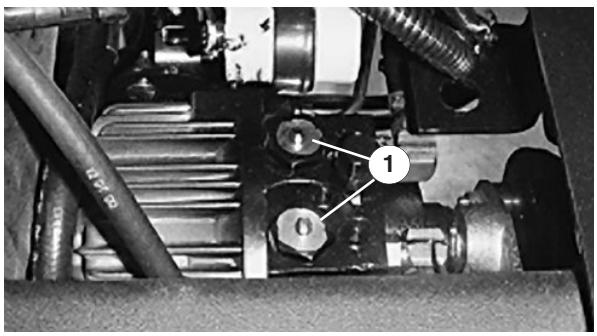


Figure 14

1. Transmission check valve by-pass pins (2)

3. Start the engine momentarily after completing repairs and make sure the pins are in the full, disengaged (fully up) position.

Important Running the machine with the by-pass valve open will overheat the transmission.

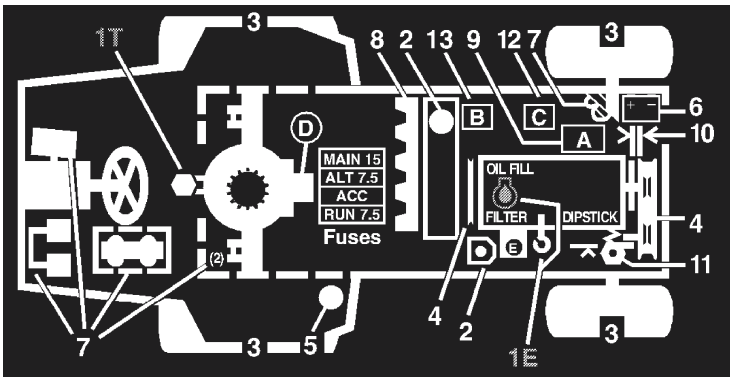
Maintenance

Note: Determine the left and right sides of the machine from the normal operating position.

Recommended Maintenance Schedule

Maintenance Service Interval	Maintenance Procedure
After the first 10 hours	• Check the power take-off belt tension. • Check the fan and alternator belt tension. • Change the transmission filter. • Torque the wheel lug nuts.
After first 50 hours	• Change the engine oil filter. • Torque the engine head and check engine RPM.
Every 50 hours	• Check the battery fluid level. • Check the battery cable connections. • Lubricate all grease fittings. • Lubricate the brake cables. • Check the cutting unit gear box oil level. • Clean under the cutting unit belt covers. • Check the cutting unit drive belt adjustment. • Change the engine oil. • Inspect the air filter and baffle
Every 100 hours	• Change the engine oil filter. • Check the electric clutch gap adjustment • Check the power take off belt tension. • Check the fan and alternator belt tension. • Inspect the cooling system hoses.
Every 200 hours	• Check rear wheel toe-in and steering linkage. • Change the transmission filter. • Torque the wheel lug nuts.
Every 400 hours	• Service the air filter • Drain and clean the fuel tank. • Change the cutting unit's gear box oil • Change the fuel/water separator filter. • Pack the rear wheel bearings. • Coat the transmission bypass pins with grease • Torque the head, adjust the valves and heck engine RPM.
Every 1000 hours or 2 years, whichever occurs first	• Replace moving hoses. • Replace safety switches. • Flush and replace the coolant system fluid. • Replace the hydraulic oil.

Service Interval Charts



Filters	Part No.
A. Air	98-9763
B. Fuel	98-7612
C. Fuel	98-9764
D. Transmission oil	23-2300
E. Engine oil	99-8384

CHECK/SERVICE (DAILY)

1. Oil levels (Engine/Trans)
2. Coolant level
3. Tire pressure
4. Belts (Fan and power take off)
5. Fuel—Diesel only
6. Battery
7. Grease, lube points
8. Radiator screen
9. Air filter
10. Electrical clutch gap .017-.030
11. PTO Belt tension
12. Water separator
13. Fuel filter

Fluid Specifications/Change Intervals

	Type>0° C	Type<0° C	Capacity	Change Intervals	
Engine oil	SAE 30 CD	SAE 10W-30 CD	3.7 l with filter	50 hours	filter 100 hours
Transmission oil	SAE 10W-30 SF, CC, CD	Type F or FA transmission fluid	5.7 l	*	filter 200 hours
Fuel	No. 2-D	No. 1-D	32.2 l		filter 400 hours
Coolant	50/50 mix Ethylene glycol anti-freeze/water		7.6 l	2 years	

CAUTION

If you leave the key in the ignition switch, someone could accidentally start the engine and seriously injure you or other bystanders. Remove the key from the ignition and disconnect the wire from the spark plug before you do any maintenance. Set the wire aside so that it does not accidentally contact the spark plug.

Daily Maintenance Checklist

- ✓ Check safety interlock operation.
- ✓ Check that the grass deflector is in the down position.
- ✓ Check brake operation.
- ✓ Check fuel level
- ✓ Check the engine oil level.
- ✓ Check the cooling system fluid level.
- ✓ Drain and drain the water/fuel separator.
- ✓ Check the air cleaner restriction indicator[3].
- ✓ Check the radiator and screen for debris.
- ✓ Check unusual engine noises. [1]
- ✓ Check unusual operating noises
- ✓ Check the transmission oil level.
- ✓ Check the hydraulic hoses for damage.
- ✓ Check for fluid leaks.
- ✓ Check the tire pressure.
- ✓ Check instrument operation.
- ✓ Check blade condition.
- ✓ Lubricate all grease fittings. [2]
- ✓ Touch up damaged paint.

[1] Check the glow plug and injector nozzles if hard starting, excess smoke, or rough running is noted.
[2] Immediately **after every** washing, regardless of the interval listed.
[3] If indicator shows red

Lubrication

Greasing Bearings And Bushings

The traction unit has grease fittings that must be lubricated regularly with No. 2 General Purpose Lithium Base Grease. If the machine is operated under normal conditions, lubricate all bearings and bushings after every 50 hours of operation. Bearings and bushings must be lubricated daily when operating conditions are extremely dusty and dirty. Dusty and dirty operating conditions could cause dirt to get into the bearings and bushings, resulting in accelerated wear. Lubricate grease fitting immediately after every washing, regardless of interval specified.

Apply a liberal coating of grease to the check valve pins once each year (Fig. 14). Also grease the bearings in the rear axle every 500 hours, or yearly, whichever comes first (not shown). The traction unit has bearings and bushings that must be lubricated, and these lubrication points are: power take-off universal shaft (Fig. 15); lift arm pivot bushings (Fig. 16), brake pivot bushings (Fig. 17); drive shaft (3) (Fig. 18); tie rod ends (2), cylinder rod ends (2), steering pivots (2) and axle pivot pin (Fig 19); power take-off tension pivot (Fig. 20) and rear power take-off bearing (Fig. 20). Also apply grease to both brake cables at the drive wheel and brake pedal ends (Fig. 17).

1. Wipe grease fitting clean so foreign matter cannot be forced into the bearing or bushing.
2. Pump grease into the bearing or bushing.
3. Wipe up excess grease.

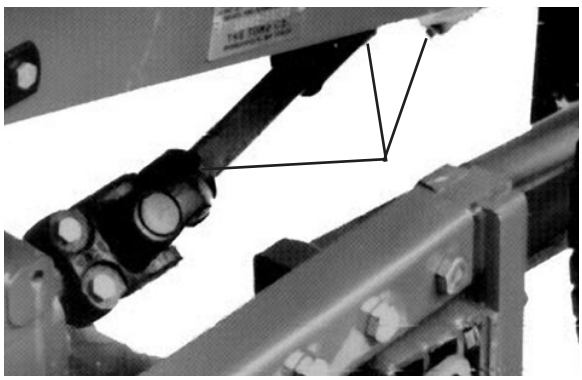


Figure 15

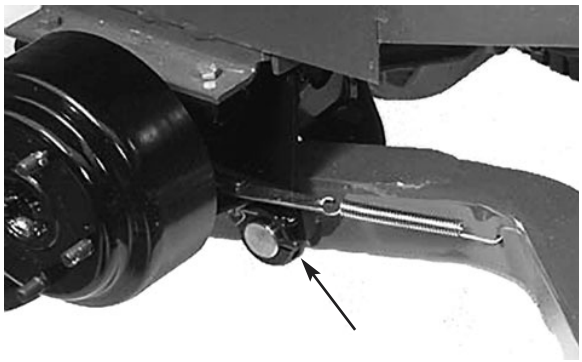


Figure 16

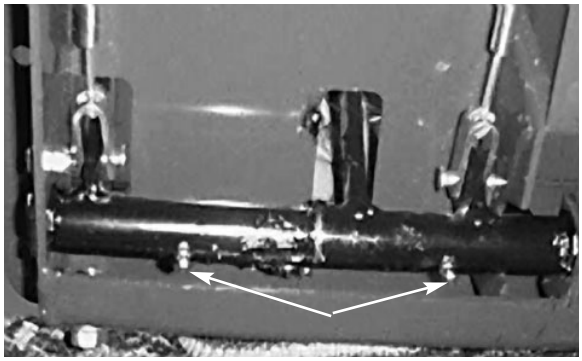


Figure 17

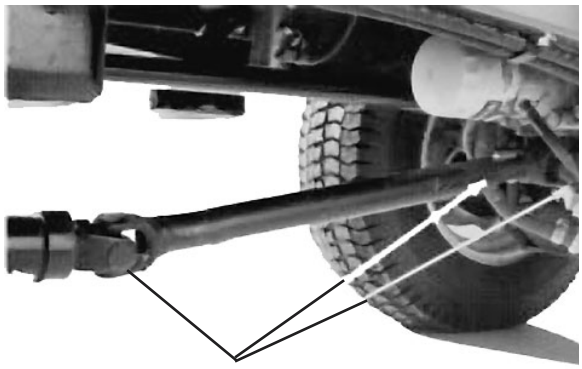


Figure 18

Figure 19

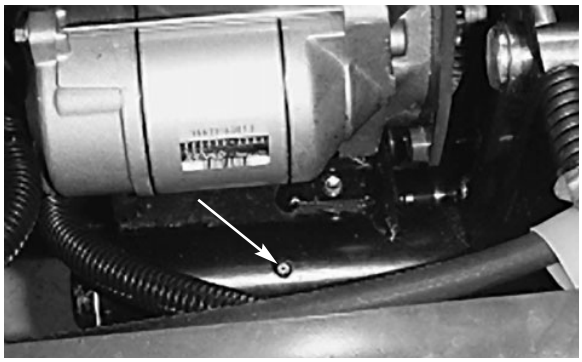


Figure 20

General Air Cleaner Maintenance

1. Check air cleaner body for damage that could possibly cause an air leak. Replace a damaged air cleaner body.

2. Service the air cleaner filter when the air cleaner indicator (Fig. 21) shows red or every 400 hours (more often in extreme dusty or dirty conditions). Do not over-service the air filter.

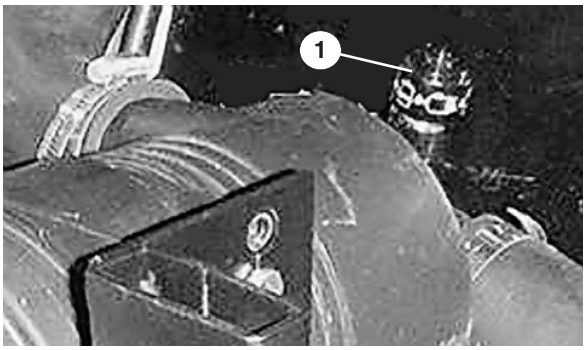


Figure 21

1. Air cleaner indicator

3. Be sure the cover seals around the air cleaner body.

Servicing the Air Cleaner

1. Pull the latch outward and turn the air cleaner cover counter-clockwise. Remove the cover from the body (Fig. 22). Clean the inside of the air cleaner cover.

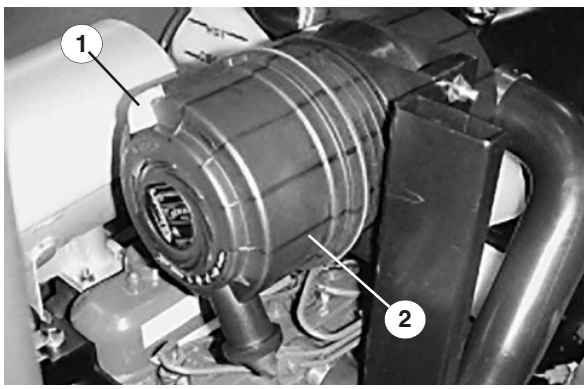


Figure 22

1. Air cleaner latch
2. Air cleaner cover

2. Gently slide the filter (Fig. 23) out of the air cleaner body to reduce the amount of dust dislodged. Avoid knocking the filter against the air cleaner body.

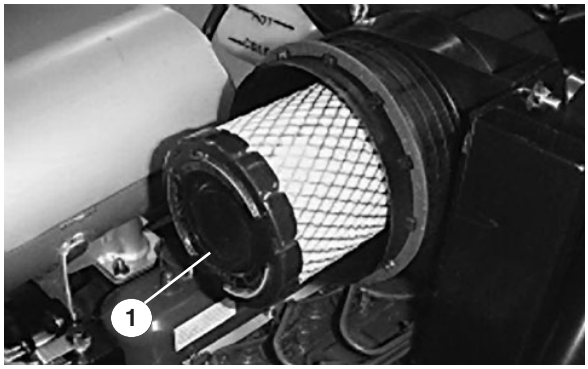


Figure 23

1. Filter

3. Inspect the filter and discard it if it is damaged. Do not wash or reuse a damaged filter.

Cleaning the Air Filter

A. Blow compressed air from inside to the outside of dry filter element. Do not exceed 689 kPa (100 psi) to prevent damage to the element.

B. Keep the air hose nozzle at least 2” from the filter and move the nozzle up and down while rotating the filter element. Inspect for holes and tears by looking through the filter toward a bright light.

4. Inspect the new filter for shipping damage. Check the sealing end of the filter. Do not install a damaged filter.

5. Insert the new filter into the air cleaner body. Make sure the filter is sealed properly by applying pressure to the outer rim of filter when installing. Do not press on the flexible center of the filter.

6. Reinstall the cover and secure the latch. Make sure the cover is positioned with the TOP side up.

7. Reset the indicator (Fig. 21) if it is showing red.

Cleaning the Radiator and Screen

To prevent the engine from overheating, the screen and radiator must be kept clean. Normally, check the screen and radiator daily and clean any debris off these parts. However, it will be necessary to check and clean the screen and radiator more often in extremely dusty and dirty conditions.

Note: If the engine shuts off due to overheating, first check the radiator and screen for excessive build-up of debris.

To thoroughly clean the radiator:

1. Remove the screen.
2. Working from the fan side of the radiator, either spray the radiator with a water hose or blow with compressed air.
3. After the radiator is thoroughly cleaned, clean out debris that may have collected in the channel at the radiator base.
4. Clean and install the screen.

Changing the Engine Oil and Filter

Check the oil level after each day's operation or each time you use the machine. Change oil after every 50 hours of operation; change the oil filter after first 50 hours and every 100 hours operation thereafter. If possible, run the engine just before changing the oil because warm oil flows better and carries more contaminants.

1. Position the machine on a level surface.
2. Open the hood. Set a drain pan under the oil pan, in line with the drain plug (Fig. 24).
3. Clean the area around the drain plug.

Figure 24

1. Drain plug

4. Remove the oil drain plug and let oil to flow into drain pan.
5. Remove and replace the oil filter (Fig. 25).

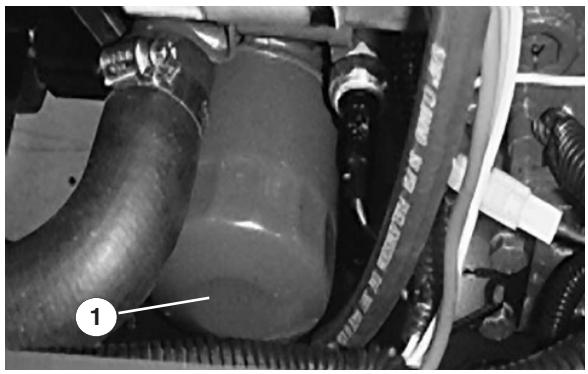


Figure 25

1. Oil filter

6. After the oil has drained, reinstall the drain plug and wipe up any oil that spilled.
7. Fill the crankcase with oil; refer to *Check the Engine Oil,* page 15.

Servicing the Fuel System

Note: Refer to *Fill the Fuel Tank with Diesel Fuel,* page 16 for proper fuel recommendations.

Fuel Tank

Drain and clean the fuel tank after every 800 hours operation or yearly, whichever comes first. Also, drain and clean the tank if the fuel system becomes contaminated or if the machine will be stored for an extended period. Use clean diesel fuel to flush out the tank.

Fuel Lines and Connections

Check the lines and connections every 400 hours or yearly, whichever comes first. Inspect for deterioration, damage or loose connections.

Water Separator

Drain water or other contaminants from the water separator (Fig. 26) daily.

1. Place a clean container under the fuel filter.
2. Loosen the drain plug on the bottom of filter canister. Tighten the plug after draining.

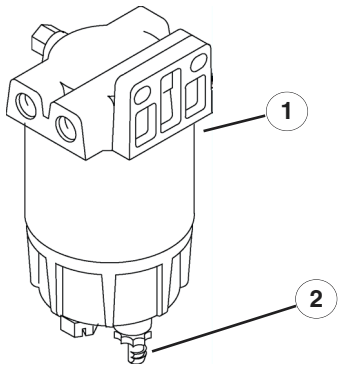


Figure 26

Water separator
2. Drain plug

Replace the filter canister after every 400 hours of operation.

1. Clean the area where the filter canister mounts.
2. Remove the filter canister and clean the mounting surface.
3. Lubricate the gasket on the filter canister with clean oil.
4. Install the filter canister by hand until the gasket contacts the mounting surface, then turn it an additional ½ turn.

Replacing the Fuel Pre Filter

Replace the fuel pre filter (Fig. 27), located between the fuel tank and the fuel pump, after every 400 operating hours or yearly, whichever occurs first.

1. Clamp both fuel lines that connect to the fuel filter so fuel cannot drain when you remove the lines (Fig. 27).

DANGER

Under certain conditions, diesel fuel and fuel vapors are highly flammable and explosive. A fire or explosion from fuel can burn you and others and can cause property damage.

- Use a funnel and fill the fuel tank outdoors, in an open area, when the engine is off and is cold. Wipe up any fuel that spills.
- Do not fill the fuel tank completely full. Add fuel to the fuel tank until the level is 1 in. (25 mm) below the bottom of the filler neck. This empty space in the tank allows the fuel to expand.
- Never smoke when handling fuel, and stay away from an open flame or where fuel fumes may be ignited by a spark.
- Store fuel in a clean, safety-approved container and keep the cap in place.

2. Loosen the hose clamps at both ends of the filter and pull the fuel lines off the filter.

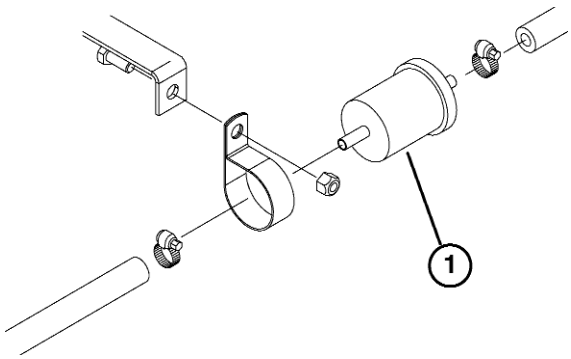


Figure 27

1. Fuel pre filter

3. Slide the hose clamps onto the ends of the fuel lines. Push the fuel lines onto the fuel filter and secure them with hose clamps. Be sure the arrow on the side of the filter points toward the

injection pump.

Bleeding Air from Injectors

Note: This procedure should be used only if the fuel system has been purged of air through normal priming procedures and the engine will not start; refer to *Bleeding the Fuel System*, page .21

1. Loosen the pipe connection to the No. 1 injector nozzle and holder assembly at injection pump.

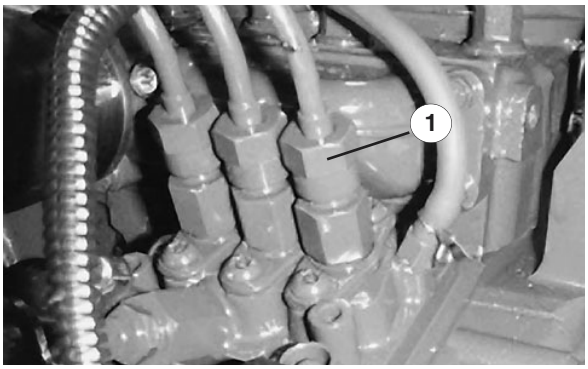


Figure 28

1. No. 1 injector nozzle

2. Move the throttle to the FAST position.

3. Turn the key in the key switch to START and watch the fuel flow around the connector. Turn the key to OFF when you see a solid fuel flow.

4. Tighten the pipe connector securely.

5. Repeat these steps on the remaining nozzles.

Alternator Belt

1. Condition and Tension—Check the condition and tension of the belts (Fig. 29) after every 100 operating hours.

A. Proper tension will allow ⅜ in. (10 mm) deflection when a force of 10 lbs. is applied on the belt midway between the pulleys.

B. If deflection is not ⅜ in. (10 mm), loosen the alternator mounting bolts. Increase or decrease alternator belt tension and tighten the bolts. Check belt deflection again to assure tension is correct.

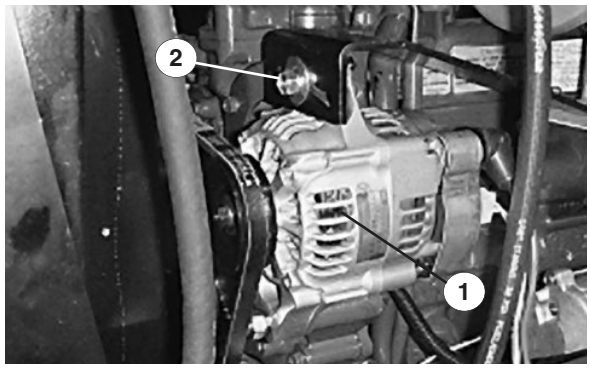


Figure 29

1. Alternator
2. Mounting bolt

Adjusting the Throttle

1. Adjust the throttle cable (Fig. 30) so the governor lever on the engine contacts the low- and high-speed set bolts before the throttle lever contacts the slot in the control panel.

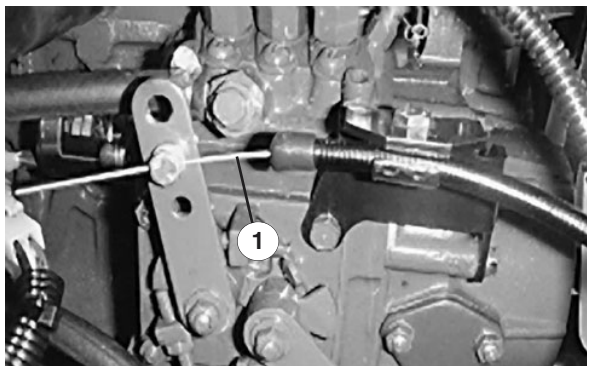


Figure 30

1. Throttle cable

Power Take-Off Belt

To Check Tension:

1. Turn the engine off and remove the ignition key. Set the parking brake. Raise the engine hood and allow the engine to cool.

2. Loosen the tensioning rod jam nut (Fig. 31).

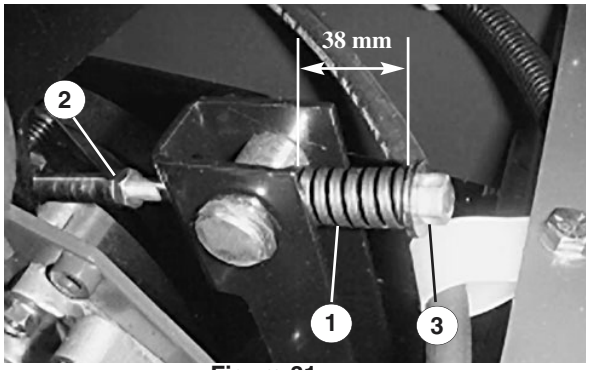


Figure 31

1. Tensioning spring
2. Tensioning rod jam nut
3. Tension adjusting bolt

3. Use a ½" wrench to tighten or loosen the belt-tensioning spring (Fig. 31). Adjust the spring to a length of 1-½" (38 mm).

4. Tighten the jam nut.

To Replace the Belt:

1. Turn off the engine and remove the ignition key. Set the parking brake. Raise the hood and let the engine cool.

2. Loosen the tensioning rod jam nut (Fig. 31).

3. Using a ½" wrench, loosen the belt tensioning spring (Fig. 31) completely.

4. Turn power take-off pulley toward the engine and remove the belt (Fig. 32).

5. Install the new power take-off belt and re-tension the pulley spring to 1-½" (38 mm) (Fig. 31).

6. Tighten the jam nut (Fig. 31) and close the hood.

Power Take-Off Clutch Adjustment

The power take-off electric clutch can be adjusted by following the following procedure:

1. Turn the engine off and remove the ignition key. Set the parking brake. Raise the engine hood and let the engine cool.

2. Remove the left-hand bracket nut and bolt so that you can remove the retainer bracket's rubber bumper (Fig. 32).

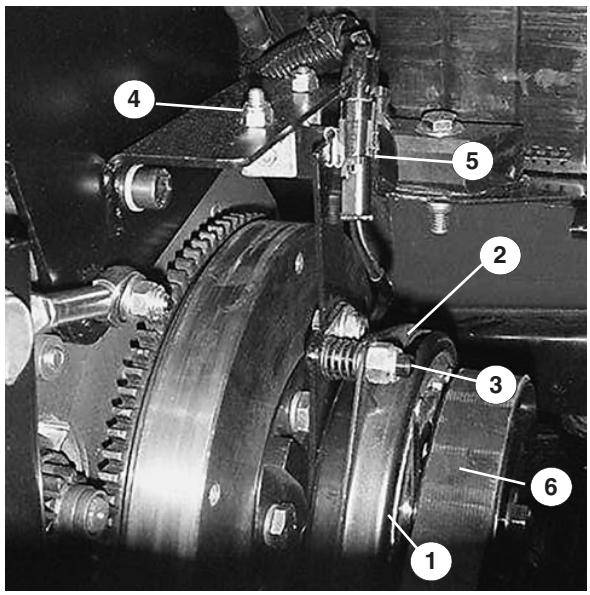


Figure 32

1. Clutch
2. .015" air gap
3. Adjusting nut (3)
4. Left retainer bracket nut & bolt
5. Electrical connector
6. Power take-off belt

3. Unplug the clutch's electric connector (Fig. 29).

4. Adjust the air gap so that a 0.015-inch feeler gauge slides between the clutch lining and friction plate with light pressure (Fig. 32). The gap can be decreased by turning the adjusting nut clockwise.

5. Rotate the clutch by hand and adjust all three air gaps. After all three gaps have been set, check all three again. Adjusting one gap can alter the other gaps.

6. Reinstall the bracket and retaining nut and bolt. Reconnect the clutch's electrical connector.

Adjusting the Transmission for Neutral

The machine must not creep when you release the traction pedal. If it does, an adjustment is required.

1. Park the machine on a level surface and shut the

engine off. Depress only the right brake pedal and engage the parking brake.

2. Jack up the left front side of the machine until the tire is off the shop floor. Support the machine with jack stands to prevent it from falling accidentally.

3. Lift the seat. Visually inspect the traction linkage for a possible binding condition. Correct it, if necessary, and check machine operation. If the condition still exists, repeat steps 1 and 2 and go to step 4.

4. Loosen the two locknuts securing the pump plate so the plate can move freely (Fig. 33).

5. Start the engine and rotate pump plate (Fig. 33) in either direction until the wheel ceases rotation.

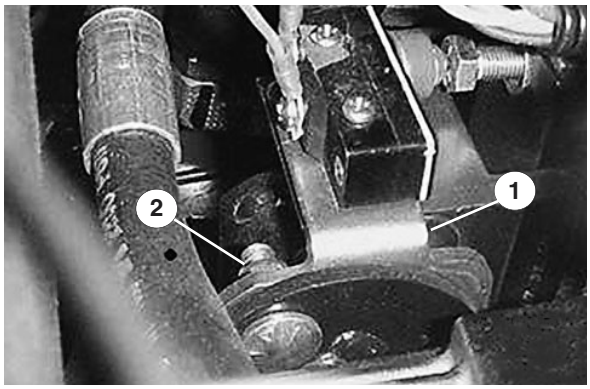


Figure 33

1. Pump plate
2. Locknut

6. Stop the engine and tighten the locknuts to secure the pump plate (Fig. 33).

7. Start the engine and check adjustment. Repeat the adjustment, if necessary.

8. Stop the engine and release the right brake. Remove the jack stands and lower the machine to the shop floor. Test drive the machine to be sure it doesn't creep.

Adjusting the Parking Brake Interlock Switch

1. Turn the engine off and remove the ignition key. Do not engage the parking brake.

2. Remove the (6) screws securing the front steering tower cover to frame and remove the cover (Fig. 34).

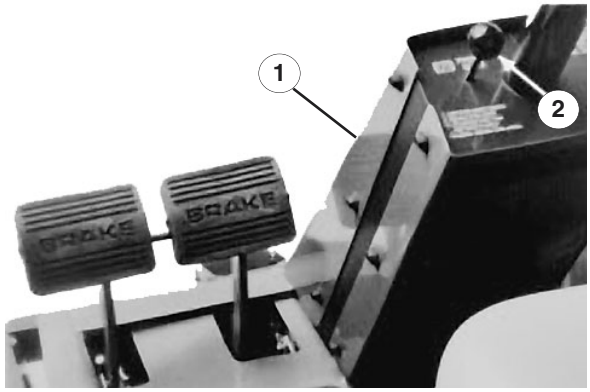


Figure 34

1. Front steering tower cover
2. Parking brake lever/rod

3. Disconnect the switch pigtail connector from the wire harness (Fig. 35).

4. Connect a continuity tester or ohmmeter to the switch harness connector.

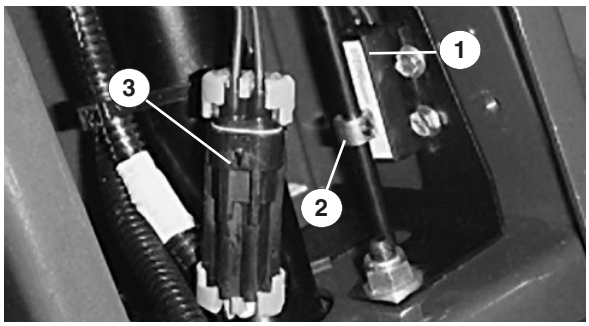


Figure 35

1. Parking brake interlock switch
2. Parking brake rod collar
3. Wire harness connector

5. Loosen the set screw securing the collar to the parking brake rod (Fig. 35).

6. Slowly move the collar on the rod until it is aligned with cross hairs on the switch label (Fig. 35). Tighten the collar set screw.

7. With the parking brake disengaged, the switch circuit should have continuity. If there is no continuity, move the collar slightly up the rod until there is continuity and tighten the collar set

screw.

8. Check adjustment as follows:

   Engage the parking brake. Depress the traction pedal while the engine is running and the power take-off lever is disengaged. The engine should stop within 2 seconds. If the engine stops, the switch is operating correctly; you may continue operation. If the engine does not stop, there is a malfunction in the interlock system.

9. Connect the switch and install the steering tower cover.

Changing the Hydraulic Oil and Filter

Initially, replace the hydraulic system oil and filter after the first full day's operation—NOT TO EXCEED 10 HOURS. Replace the oil and filter every 250 hours thereafter. The hydraulic system is designed to operate on any high-quality detergent oil having the American Petroleum Institute— API—"service classification"

SF/CC or CD. Oil viscosity—weight—must be selected according to anticipated ambient temperature for the season in which product will be used.

Temperature/viscosity recommendations are:

Expected Ambient Temperature	Recommended Viscosity and Type
(Extreme) over 32° C	SAE 30, Type SF/CC or CD engine oil
(Normal) 4–37° C	SAE 10W-30 or 10W-40, Type SF/CC or CD engine oil
(Cool) –1 to 10° C	SAE 5W-30, Type SF/CC or CD engine oil
(Winter) Below –1° C	Type "F" or "FA" ATF Automatic Transmission Fluid

Note: Do not mix engine oil and automatic transmission fluid or hydraulic component damage may result. When changing fluids, also change transmission filter. **DO NOT USE DEXRON II ATF.**

Note: Fluid to operate the power steering is supplied by the hydraulic system transmission charge pump.

Cold weather start-up may result in "stiff" operation of the steering until the hydraulic system has warmed up. Using proper weight hydraulic oil in the system will minimize this condition.

The transmission and axle housing are shipped from the factory with approximately 5 quarts (4.7 l) of SAE 10W-30 engine oil. However, check the level of transmission oil before first starting the engine, and daily thereafter.

1. Lower the cutting unit to the shop floor, set the parking brake, and turn the engine OFF. Block the two rear wheels.

2. Jack up both sides of the front axle and support it with jack stands.

3. Clean the area around the hydraulic oil filter and remove the filter (Fig. 36).

Figure 36

1. Filter
2. Return line
3. Suction line

4. Remove the tube that connects the axle housing to the transmission and let the oil to flow into a drain pan.

5. Install the new hydraulic oil filter and connect the tube between the axle housing and transmission. Fill the axle (reservoir)(approx. 5 qt.); refer to *Check Hydraulic System Fluid, page 15.* Remove the jack stands.

6. Start the engine, cycle the steering and lift cylinders, and check for oil leaks. Let the engine run for about five minutes. Then shut the engine

off.

7. After two minutes, check the transmission fluid level; refer to *Check Hydraulic System Fluid*, page 15.

Adjusting the Service Brakes

Adjust the service brakes when there is more than one inch (25 mm) of “free travel” of the brake pedals, or when the brakes don’t work effectively. Free travel is the distance the brake pedal moves before you feel braking resistance.

Check brake adjustment after the first 25 hours of operation. After that, they should only need adjusting after considerable use. These periodic adjustments can be performed where the brake cable connects to the bottom of the brake pedals. When the cable is no longer adjustable, the star nut on inside of the brake drum must be adjusted to move the brake shoes outward. However, the brake cables must be adjusted again to compensate for this adjustment.

1. Disengage the lock arm from the right brake pedal so both pedals work independently.

2. To reduce free travel of the brake pedals, loosen the front nut on the threaded end of the brake cable (Fig. 37). Then tighten the rear nut to move the cable backward, until the brake pedals have 13 mm to 25 mm of free travel. Tighten the front nut after the brakes are correctly adjusted.

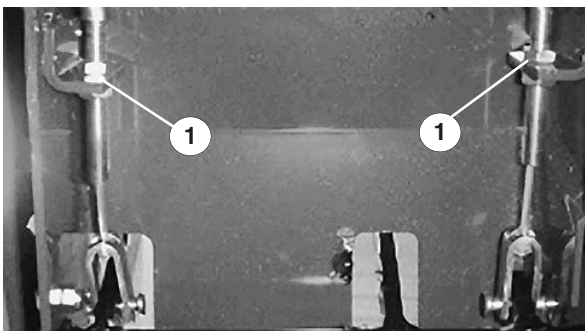


Figure 37

1. Brake cable jam nuts

Changing Rear Axle Lubricant

After every 400 hours of operation, the oil in the rear axle must be changed.

1. Position the machine on a level surface.

2. Clean the area around the three drain plugs, (1) on each end and (1) in the center (Fig. 38).

3. Remove the plugs, allowing the oil to drain into drain pans.

4. After oil is drained, apply thread-locking compound on the drain plug threads and install it in the axle.

5. Fill the axle with lubricant: refer to *Checking the Rear Axle Lubricant*, page 17.

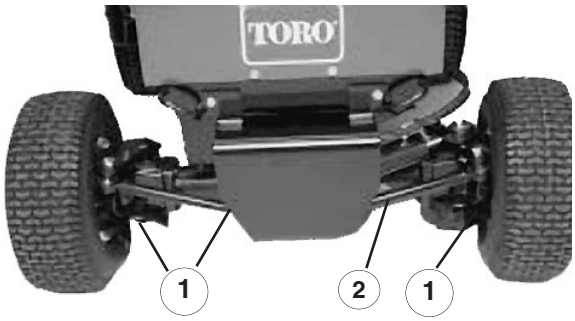


Figure 38

1. Drain plugs (3)
2. Tie rod

Changing the Bi-Directional Clutch’s Lubricant

After every 400 hours of operation, the oil in the bi-directional clutch must be changed.

1. Position the machine on a level surface.

2. Clean the area around the check plug on the clutch.

3. Rotate the clutch so the check plug is positioned downward (Fig 39).

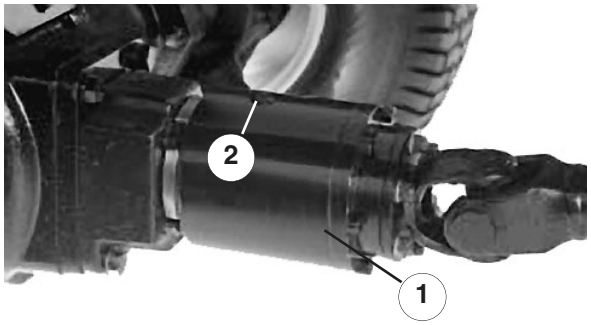


Figure 39

1. Clutch
2. Check plug

4. Remove the check plug allowing all lubricant to flow into the drain pan.

5. Rotate the clutch so the check plug is positioned at 4:00 o'clock.

6. Add Mobil Fluid 424 until the lubricant level is up to the hole in the clutch. The clutch should be approximately ⅓ full.

7. Install the check plug.

Note: Do not use engine oil (i.e., 10W30) in the clutch. Anti-wear and extreme pressure additives will cause undesirable clutch performance.

Rear Wheel Toe-In

The rear wheels should not toe-in or tow-out when they are adjusted correctly. To check the rear wheel toe-in, measure the center-to-center distance at wheel hub height, in front and in back of the rear tires. If the wheels toe-in or toe-out, an adjustment is required.

1. Turn the steering wheel so the rear wheels are straight ahead.

2. Remove the nuts securing one tie rod ball joint to the mounting bracket on the axle and disconnect the ball joint from the axle (Fig. 38).

3. Loosen the screw on the tie rod clamp. Rotate the ball joint in or out to adjust the length of the tie rod.

4. Install the ball joint to the mounting bracket and check wheel toe-in.

5. After attaining your desired adjustment, tighten the screw on the rod clamp and secure the ball joint to the mounting bracket.

Servicing the Battery

Important Before welding on the machine, disconnect the ground cable from the battery to prevent damage to the electrical system.

Note: Check battery condition weekly or after every 50 hours of operation. Keep the terminals and the entire battery case clean because a dirty battery will slowly discharge. To clean the battery, wash the entire case with a solution of baking soda and water. Rinse with clear water. Coat the battery posts and cable connector with Grafo 112X (Skin-over) grease, Toro Part No. 505-47 or petroleum jelly to prevent corrosion.

Wiring Harness Service

Prevent corrosion of wiring terminals by applying Grafo 112X (Skin-over) grease, Toro Part No. 505-47, to the inside of all harness connectors whenever the harness is replaced.

Whenever working with the electrical system, always disconnect battery cables, negative (–) cable first, to prevent possible wiring damage from short-outs.

Fuses

Fuses are accessible under the seat plate (Fig. 40).

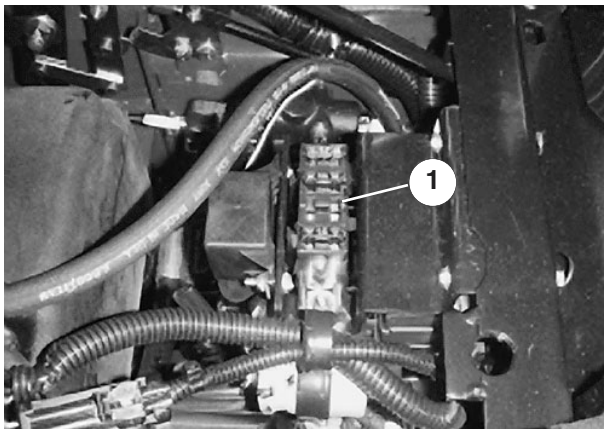


Figure 40

1. Fuse block

Storage

Traction Unit

1. Thoroughly clean the traction unit, cutting unit and the engine, paying special attention to these areas:
   - Radiator and radiator screen
   - Underneath the cutting unit
   - Under the cutting unit belt covers
   - Counterbalance springs
   - Power take-off shaft assembly
   - All grease fittings and pivot points
   - Remove control panel and clean the inside of the control box
   - Beneath the seat plate and the top of transmission
2. Check the tire pressure. Inflate all traction unit tires to 138 kPa.
3. Remove, sharpen and balance the cutting unit's blades. Reinstall the blades and torque the blade fasteners to 85-110 ft-lb (115-149 N m).
4. Check all fasteners for looseness; tighten as necessary.
5. Grease or oil all grease fittings, pivot points, and transmission by-pass valve pins. Wipe off any excess lubricant.
6. Lightly sand and use touch up the paint on where paint is scratched, chipped or rusted. Repair any dents in the metal body.
7. Service the battery and cables as follows:
   - **A.** Remove the battery terminals from the battery posts.
   - **B.** Clean the battery, terminals and posts with a wire brush and baking soda solution.
   - **C.** Coat the cable terminals and battery posts with Grafo 112X skin-over grease (Toro Part No. 505-47), or petroleum jelly to prevent corrosion.
   - **D.** Slowly recharge the battery for 24 hours every 60 days to prevent lead sulfation of the battery.

Engine

1. Drain the engine oil from the oil pan and replace the drain plug.
2. Remove and discard the oil filter. Install a new filter.
3. Refill the engine with 4 quarts (3.8 l) of recommended motor oil. Refer to *Changing the Engine Oil and Filter,* page 29..
4. Start the engine and run it at idle speed for two minutes.
5. Drain diesel fuel from the fuel tank, fuel lines, pump, filter and separator. Flush the fuel tank with clean diesel fuel and connect all fuel lines.
6. Thoroughly clean and service the air cleaner assembly.
7. Seal the air cleaner inlet and the exhaust outlet with weather-proof masking tape.

8. Check the oil filler cap and fuel tank cap to ensure they are securely in place.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