Form No. 3325–395

TORO®

Groundsmaster 228–D

4 Wheel Drive Traction Unit

Model No. 30242–210000001 and Up

Operator’s Manual

Language Name (Language Abbreviation)

Warning

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

Important The engine in this product is not equipped with a spark arrester muffler. It is a violation of California Public Resource Code Section 4442 to use or operate this engine on any forest-covered, brush-covered, or grass-covered land as defined in CPRC 4126. Other states or federal areas may have similar laws.

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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.

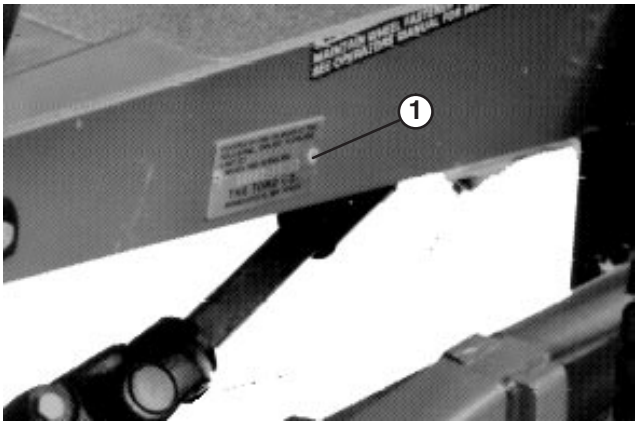


Figure 1

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:** emphasizes general information worthy of special attention.

Safety

This machine meets or exceeds the B71.4 1999 specifications of the American National Standards Institute, in effect at time of production.

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

The following instructions are from ANSI standard B71.4—1999.

Training

- Read the Operator's Manual and other training material. If the operator(s) or mechanic(s) can not read English 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 is to be used and remove all objects such as rocks, toys and wire which 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 fuel cap or add fuel with engine running. Allow 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 parking brake is engaged before starting engine. Only start 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 deck with the blades running.
- Never operate with the PTO 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 implements, disengage drives, engage parking brake (if provided), shut off engine before leaving the operator's position for any reason.
- Stop equipment and inspect blades after striking objects or if an abnormal vibration occurs. Make necessary repairs before resuming operations.
- Keep 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 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 drives, lower implement, set parking brake, stop engine and remove key. Wait for all movement to stop before adjusting, cleaning or repairing.
- Clean grass and debris from cutting units, drives, mufflers, and engine to help prevent fires. Clean up oil or fuel spillage.
- Let engine cool before storing and do not store near flame.
- Do not store fuel near flames or drain indoors.
- Park machine on level ground. Never allow untrained personnel to service machine.
- Use jack stands to support components when required.
- Carefully release pressure from components with stored energy.
- Disconnect battery before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect positive first and negative last.
- Use care when checking blades. Wrap the blade(s) or wear gloves, and use caution when servicing them. Only replace blades. Never straighten or weld them.
- Keep 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 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

The following list contains safety information specific to Toro products or other safety information that you must know that is not included in the ANSI standards.

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 blades when not mowing.
- Keep hands, feet, hair and loose clothing away from attachment discharge area, underside of mower and any moving parts while 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 ROPS (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 a steep slope must be ascended, 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 tires lose traction, disengage the blades and proceed slowly straight down the slope. Avoid raising side decks on a slope.
- When operating machine on slopes, banks or near drop offs, always have ROPS (roll over protection) installed.
- When operating a machine with ROPS (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 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 .5 m/s^2 at the posterior based on measurements of identical machines per ISO 2631 procedures.

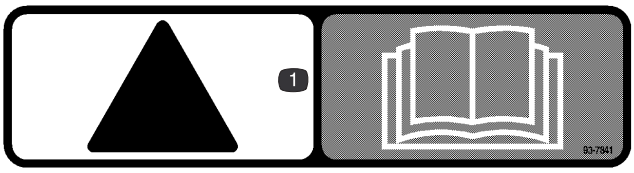
Safety and Instruction Decals

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

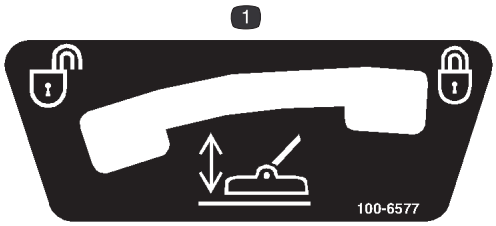
1. Danger–See operator's manual
2. Wheel torque specifications

67–1710
Cover with 93–7841 for CE



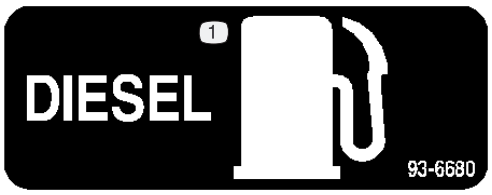
93–7841
Use to cover 67–1710 for CE

1. Danger–See operator's manual



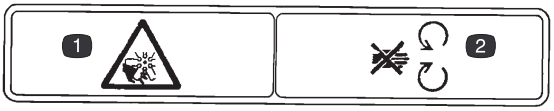
100–6577

1. Lock – Unlock deck service lock



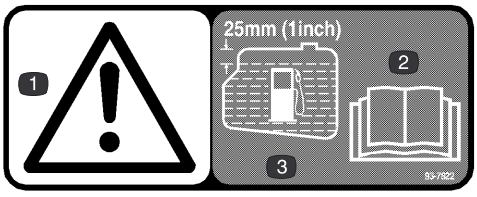
93–6680

1. Diesel fuel



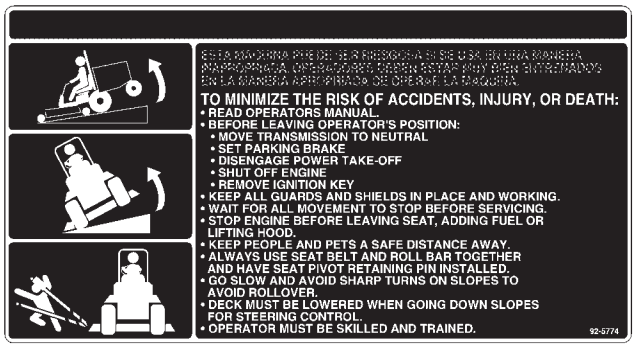
93–7272

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

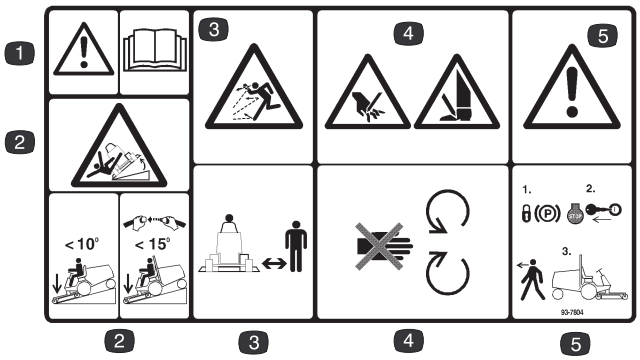


93–7822

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

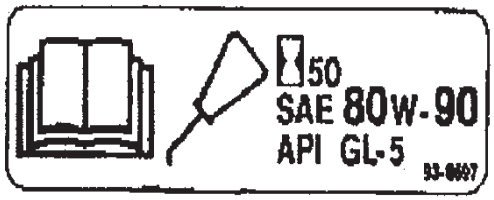


92–5774
Cover with 93–7804 for CE



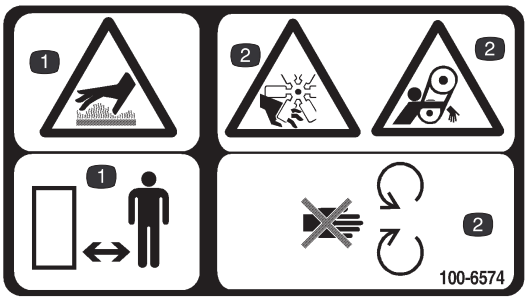
93–7804
Apply over 92–5774 for CE

1. Danger–Read operator's manual
2. Tipping hazard–Go slow and avoid sharp turns on slopes to avoid rollover. Deck must be lowered when going down slopes for steering control. Always wear seat belts with ROPS.
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.



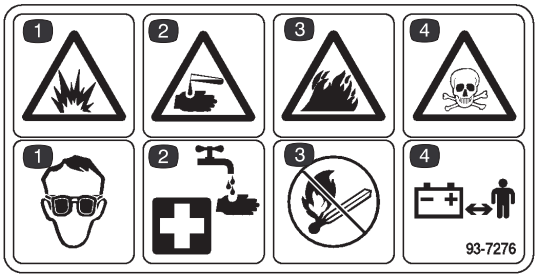
93–6697

1. Read operator's manual for lubrication intervals



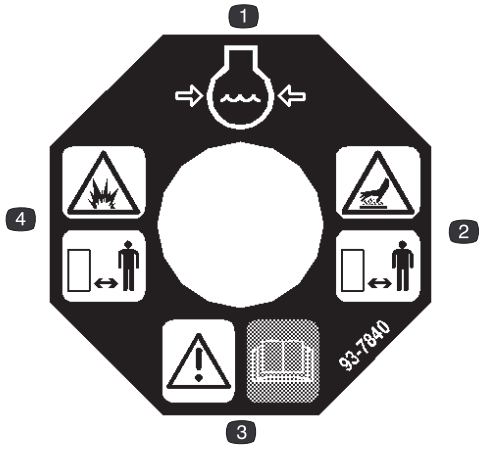
100–6574

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



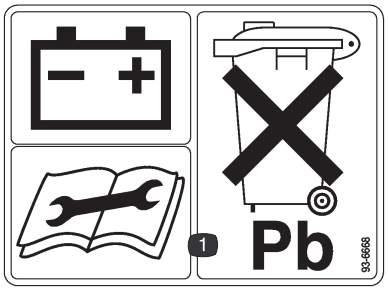
93-7276

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

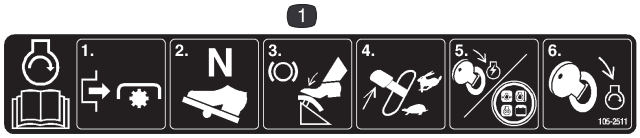
1. Coolant level
2. Hot surface–keep a safe distance
3. Danger–rear the operator's manual
4. Explosion hazard–stay away



93–6668

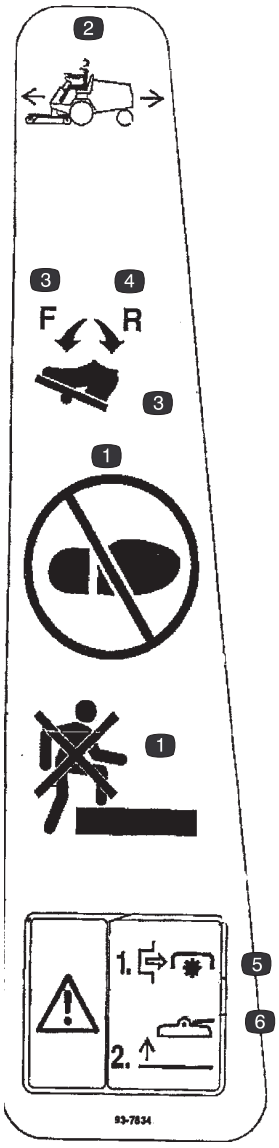
1. The battery contains lead. Do not throw it in the garbage.

105–2509
Cover with 105–2511 for CE



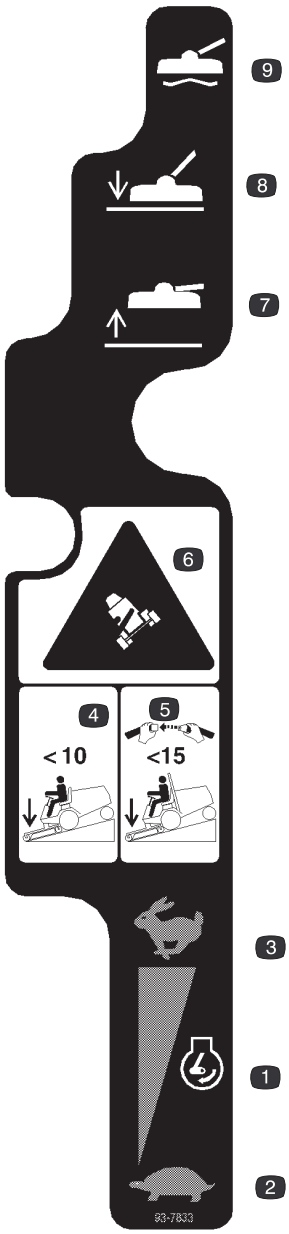
105–2511
Use to cover 105–2509 for CE

1. Read operator's manual for starting instructions



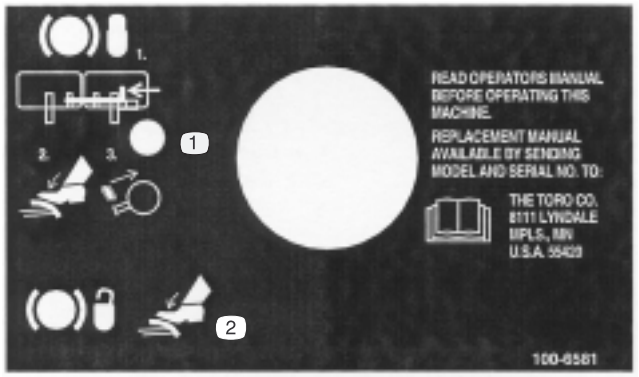
93–7834

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



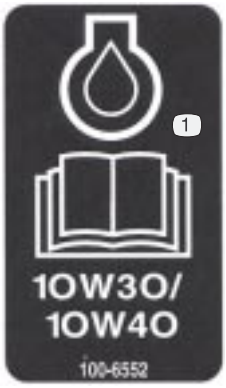
93–7833

1. Throttle control
2. Throttle–fast
3. Throttle–slow
4. Tipping hazard–Lower deck when going down slopes greater than 10 degrees
5. Tipping hazard–Lower 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



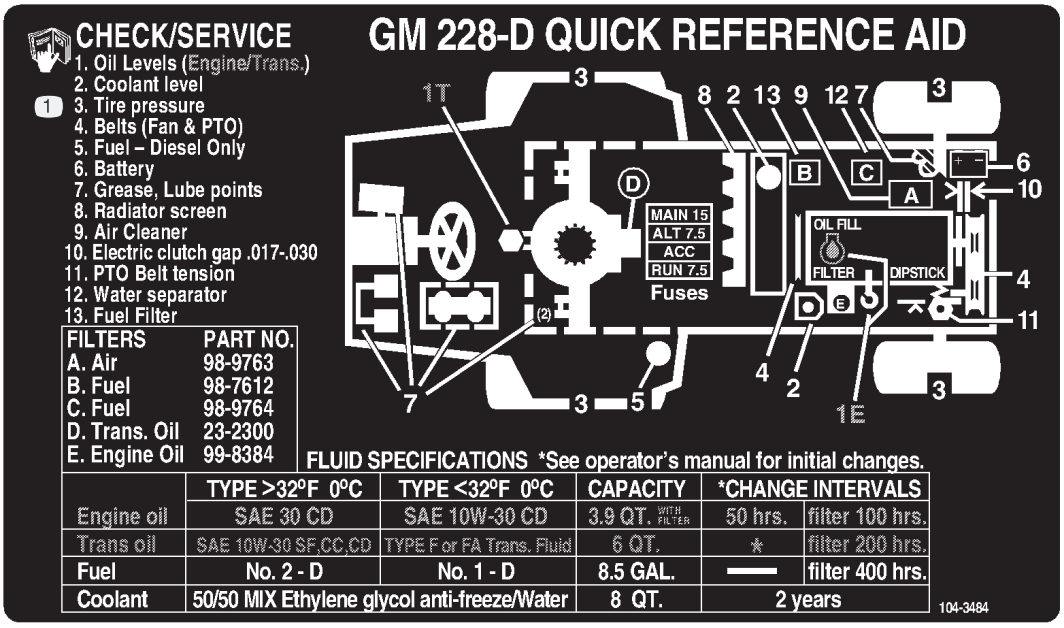
100–6581

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



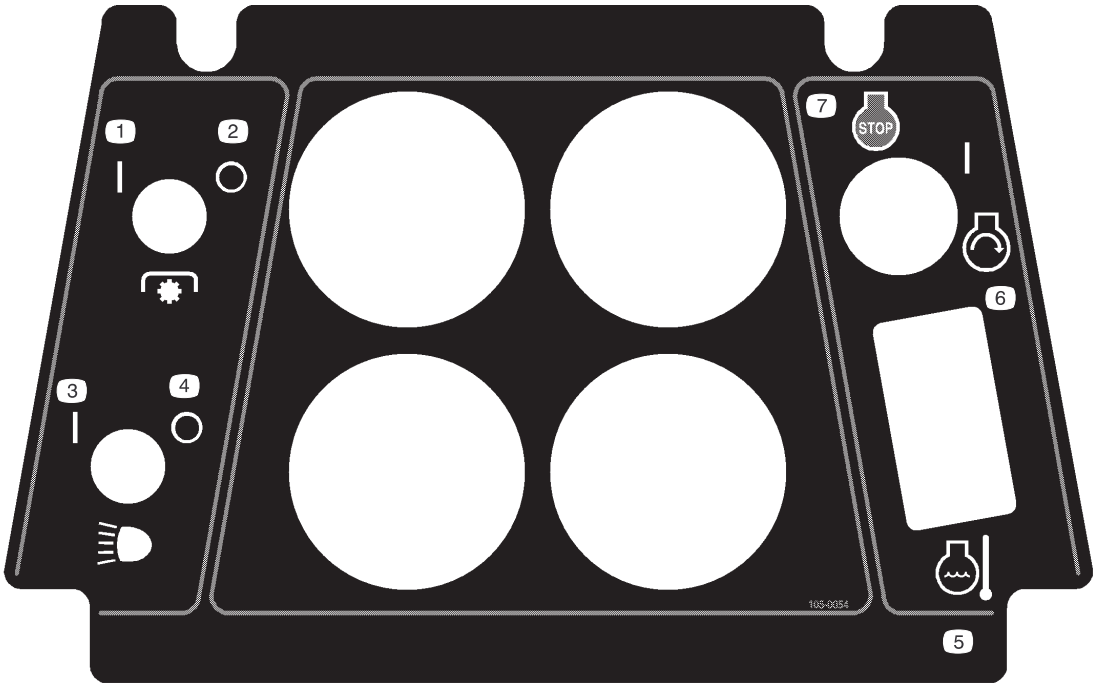
100–6552

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



Part No. 104–3484

1. See the operator's manual



Part No. 105–0054

1. Headlights–off
2. Headlights–on
3. PTO–off
4. PTO–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 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 mechanically driven from the front axle by a universal shaft. Axle has a bidirectional – overrunning clutch in rear driveshaft. When lubricating rear axle, use SAE 80W-90 gear lube, API GL-5. Lubricant capacity is approximately 3.1 qt. (2.9 L).
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	0–10 MPH 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, PTO 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.
PTO Drive	Splined PTO shaft is clutched by a torque-teamed HA Section, spring tensioned V-belt directly from engine output shaft. PTO shaft engaged by electric clutch/brake assembly. PTO 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	Prevents engine starting if traction pedal or PTO switch are engaged. Stops engine if operator leaves seat with either traction pedal or PTO switch engaged. Stops engine if traction pedal is engaged with parking brake engaged.

Measurements

Length	82 in.
Width (Rear Wheels)	47 in.
Height	50 in.
Weight	1150 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
Tire Chains (Rear–4 Wheel Drive))	Part No. 76–1840
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.

Setup

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

Note: Use this chart as a checklist to ensure that all parts necessary for assembly have been received. Without these parts, total set-up cannot be completed. Some parts may have already been assembled at the factory.

Description	Qty.	Use
Steering wheel Nut Screw Cap	1 1 1 1	Install steering wheel
Manual tube R–clamp Capscrew Washer	1 2 2 2	Install on right underside of seat
Roll pin Capscrew 5/16–18 x 1–3/4” lg. Locknut 5/16–18	1 2 2	Secure universal shaft to implement
Cylinder pin Cotter pin 3/16 x 1–1/2”	2 4	Secure deck lift arms to lift cylinders
Brake return springs	2	Mount to deck lift arms
Ignition & hood latch key	1	
Decals–CE	3	Apply to machine for CE
Operator’s Manual (Traction Unit) Parts Catalog	2 1	
CE Certificate	1	
Registration card	1	Fill out and return to Toro

Warning

- **PTO universal shaft is attached to traction unit frame. DO NOT ENGAGE PTO without first removing universal shaft or coupling it to a suitable implement.**

Install Rear Wheels

1. Remove nuts from wheel hubs. Mount wheels and torque nuts to 45–55 ft–lbs.

Install Steering Wheel

2. Remove steering wheel from seat plate. Remove screw and cap from steering wheel (Fig. 2).
3. Remove jam nut from steering shaft. Make sure foam seal is on steering shaft (Fig. 2). Slide steering wheel onto steering shaft.
4. Secure steering wheel to shaft with jam nut and tighten it to 10–15 ft–lb.
5. Mount cap to steering wheel with screw.

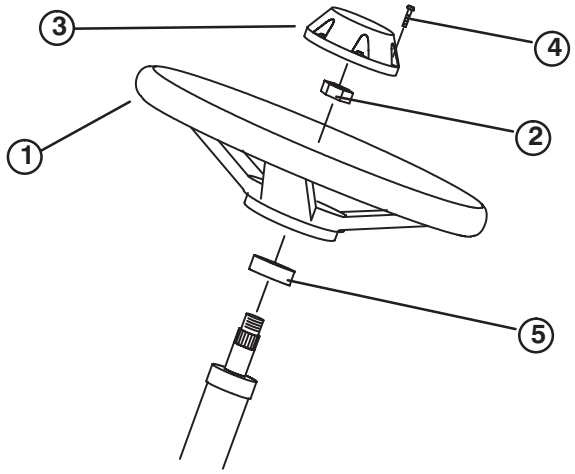


Figure 2

1. Steering wheel
2. Jam nut
3. Cap
4. Screw
5. Foam seal

Install Seat

The Groundsmaster 228–D is shipped without the seat assembly. Either optional Seat Kit, Model No. 30624 or 30625 must be installed.

Seat Kit, Model No. 30624, Standard Seat

1. Attach "U" springs to seat mounting brackets with (4) capscrews and flange nuts as shown in figure 3.

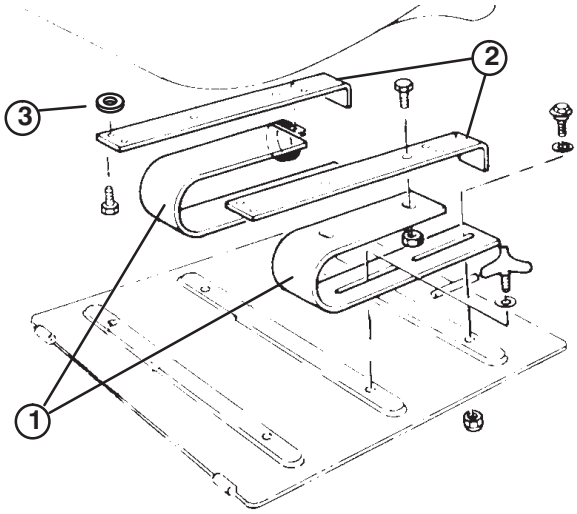


Figure 3

1. U–spring
2. Seat mounting bracket
3. Spacer

2. Secure seat mount assemblies to bottom of seat with (4) flange head capscrews and (4) spacers (Fig. 3). Spacers to be positioned between seat and seat mount.

Note: Mount the bracket in the forward set of tapped mounting holes in seat.

3. Remove hair pin cotter and pull back on locking spring flap to pivot mounting plate forward (Fig. 4).

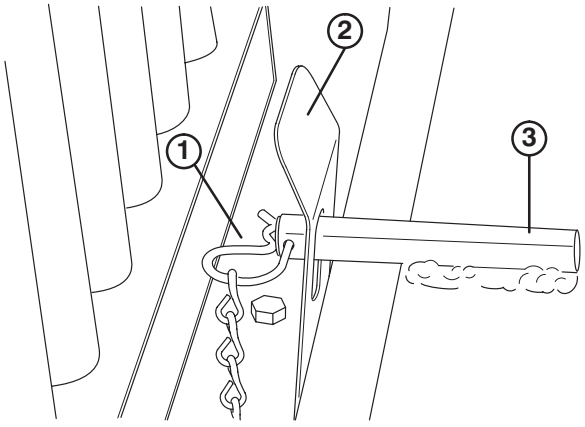


Figure 4

1. Hair pin
2. Lock spring flap
3. Seat mounting plate

4. Hold mounting plate in upright position with support rod (Fig. 5).

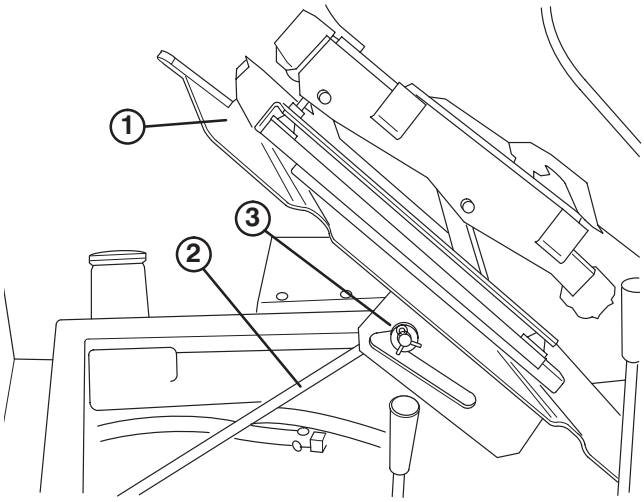


Figure 5

1. Mounting plate
2. Support rod
3. Indent

5. Mount seat and spring assembly to rear holes in seat mounting plate with two shoulder bolts, small I.D. flat washers and locknuts (Fig. 3 & 6).

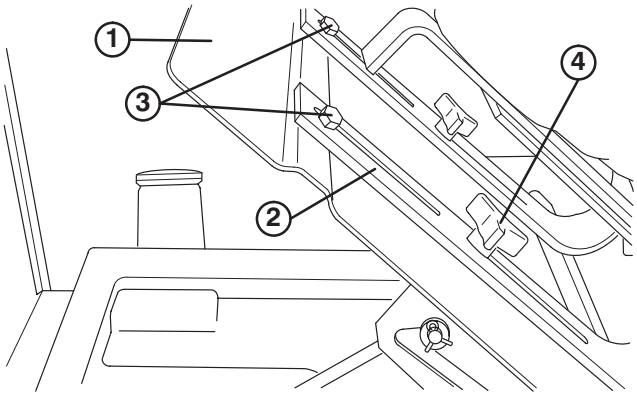


Figure 6

1. Mounting plate
2. Seat spring
3. Shoulder bolt with washer and locknut (2)
4. Adjustment handle (2)

6. Secure front slot of seat springs to traction unit front mounting holes with adjustment handles and flatwashers (Fig. 3 & 5).

7. Connect seat switch connector to traction unit wire harness connector.

8. Adjust seat to desired operating position. Loosen adjustment handles, slide seat fore or aft in slotted holes and tighten adjustment handles to secure in place.

Seat Kit, Model No. 30625, Deluxe Seat:

1. Position threaded mounting studs of seat suspension into holes in seat mounting plate.

2. Remove hair pin cotter and pull back on locking spring flap to pivot mounting plate forward (Fig. 4).

3. Hold mounting plate in upright position with support rod (Fig. 5).

4. Secure seat suspension to seat mounting plate with (4) flange locknuts (Fig. 7).

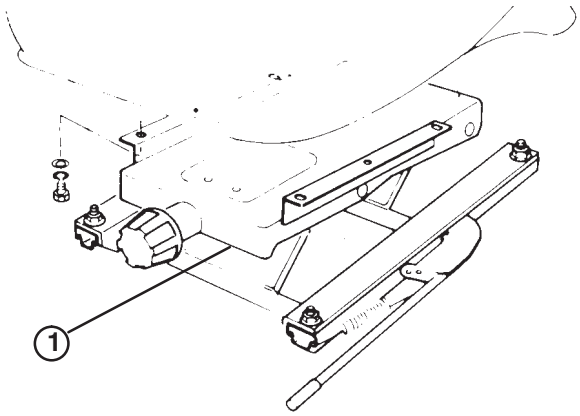


Figure 7

1. Seat suspension

5. Mount seat to seat suspension with (4) capscrews, lockwashers and flatwashers (Fig. 7).

6. Connect seat switch connector to traction unit wire harness connector.

7. Adjust seat for operator's comfort and weight. To adjust seat fore and aft, pull handle on left side of seat assembly outward (Fig. 8). Release handle to lock seat

position. To adjust for operator's weight, turn spring tension knob; clockwise to increase tension, counterclockwise to decrease spring tension (Fig. 8).

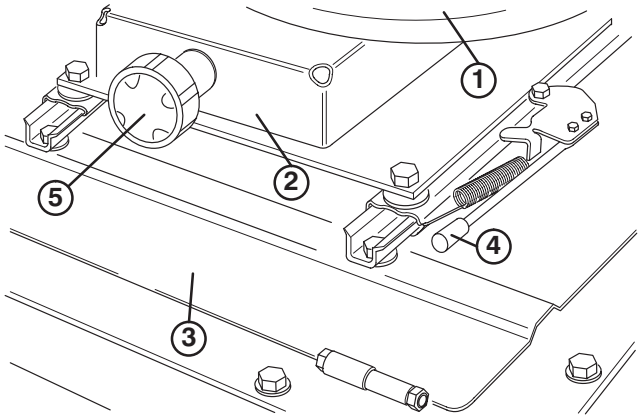


Figure 8

1. Seat
2. Suspension assembly
3. Mounting plate
4. Forward/backward handle
5. Spring tension knob

Install Seat Belt

1. Install tether straps and each end of seat belt to holes in back of seat with (2) 7/16 x 20 – 1" lg. capscrews, 7/16 flatwashers and 7/16 lockwashers. Tighten securely. Latch side of belt to be mounted to left side of seat.

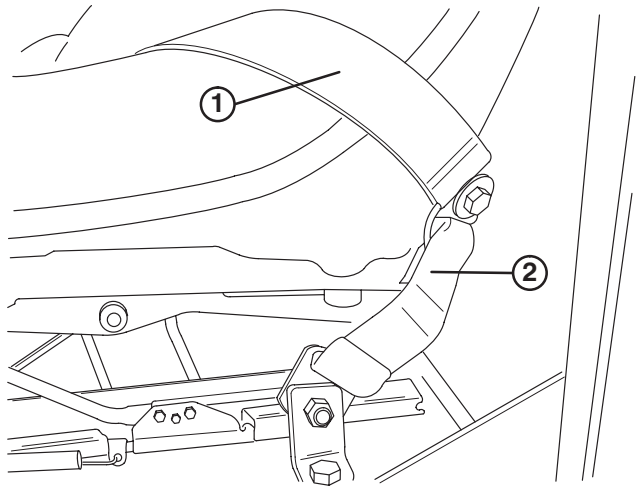


Figure 9

1. Seat belts
2. Tether strap

Install Manual Tube

1. Remove manual tube and R–clamps secured to seat plate. Retain (2) mounting capscrews and flatwashers.

2. Loosely mount R–clamps to outer holes in right side of seat with (2) capscrews and flatwashers previously removed. (Fig. 10).

3. Install manual tube into R–clamps, insert manual into tube and thread cap into tube (Fig. 10). Tighten capscrews.

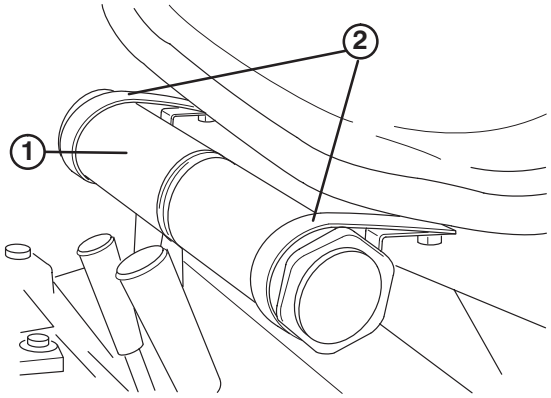


Figure 10

1. Manual tube
2. R–clamps

Install Rops

1. Remove capscrews, flatwashers, and flange lock nuts secured to legs of ROPS frame.

2. Lower ROPS frame over machine while aligning mounting holes with frame mounting holes located behind fenders. ROPS leg with bracket to be positioned on right side of machine.

3. Secure each leg of ROPS to machine frame with a capscrew, (2) flatwashers and a flange lock nut previously removed (Fig. 11). Shorter capscrew used to secure right leg of ROPS frame. Capscrew heads to be positioned outward. Torque fasteners to 50-60 ft–lbs.

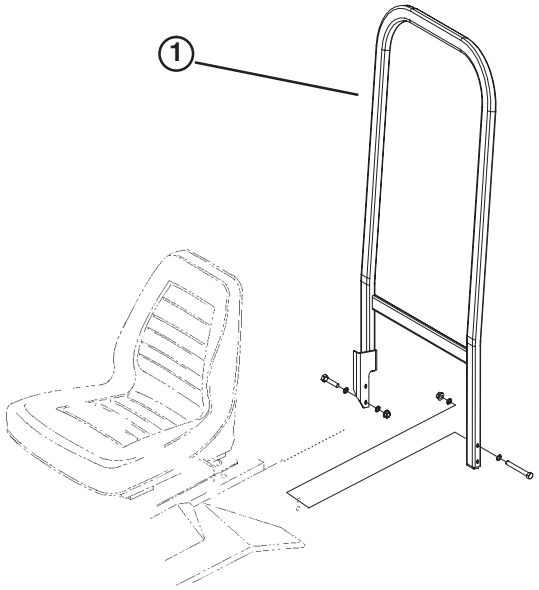


Figure 11

1. ROPS

Note: When operating machine, always use the seat belt and ROPS together.

Connect Battery

1. Lift engine cover. Check to see that the battery is securely fastened in place (Fig. 12).

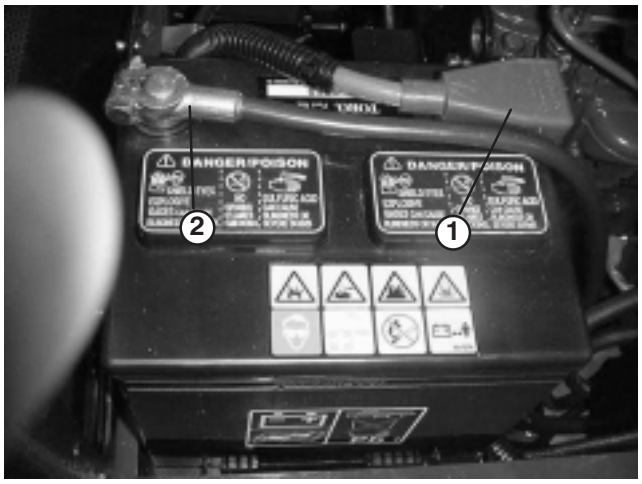


Figure 12

1. Positive (+) battery cable
2. Negative (–) battery cable

2. Check battery charge with a hydrometer. If battery needs charging, be sure at least one of the battery cables is disconnected from the battery before the charger is connected.

3. Secure the cables to the proper battery post. The positive (+) red cable goes to the positive post and the negative (–) black cable goes to the negative post on the battery.

Warning

- **Connecting cables to the wrong post could damage the electrical system and result in personal injury.**

Note: Make sure battery cables are routed away from any sharp edges or moving parts.

4. Coat the terminal with sealant such as Grafo 112X, Toro Part No. 505-47 and install the rubber boot onto positive terminal.

Check Tire Pressure

The tires are over–inflated for shipping. Therefore, release some of the air to reduce the pressure. Correct air pressure in front and rear tires is 20 psi.

Install Rear Weight

Four Wheel Drive Groundsmaster 228–D Series Traction Units do not need additional rear weight to comply with ANSI B71.4–1999 Standard.

Before Operating

Check Engine Oil

The engine is shipped with 4 qt (3.8 l) of oil in the crankcase; however, level of oil must be checked before and after the engine is first started.

1. Park machine on a level surface, stop engine and remove key from ignition switch. Open hood.
2. Remove dipstick (Fig. 13), wipe clean and reinstall dipstick. Remove dipstick and check oil level. Oil level should be up to FULL mark on dipstick

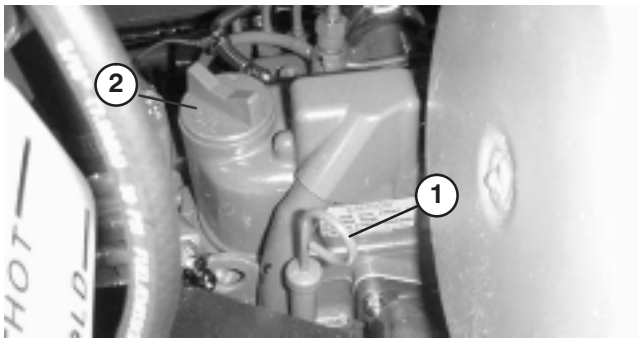


Figure 13

1. Dipstick
2. Oil fill

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

Check Cooling System

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

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

Caution

- **If engine has been running, pressurized hot coolant can escape when radiator cap is removed and cause burns.**

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

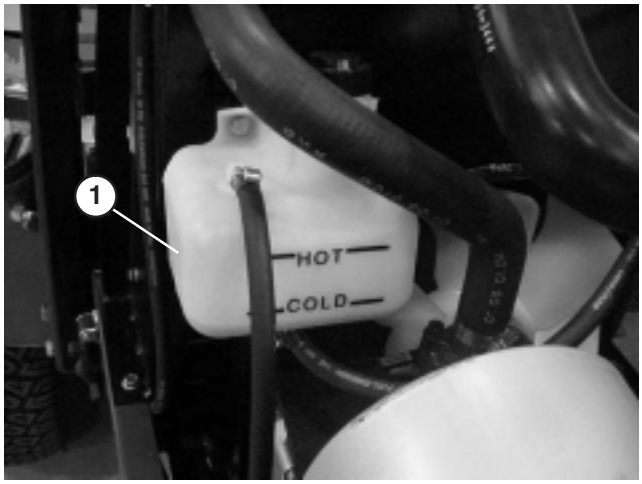


Figure 14

1. Expansion tank

Figure 15

1. Expansion Tank

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

Check Hydraulic System Fluid

The hydraulic system was 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. Temperature/viscosity recommendations are:

Expected Ambient Temperature	Recommended Viscosity and Type
(Extreme) over 90° F	SAE 30, Type SF, CC or CD engine oil.
(Normal) 40–100° F	SAE 10W-30 or 10W-40. Type SF, CC or CD engine oil.
(Cool–Spring/Fall) 30–50° F	SAE 5W-30, Type SF, CC or 30–50° F CD engine oil.
(Winter) Below 30° F	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.**

The axle housing acts as the reservoir for the system. 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 level of transmission oil before engine is first started and daily thereafter.

1. Position machine on a level surface. Place all control in neutral position and start the engine. Run engine at lowest possible RPM to purge the system of air. **DO NOT ENGAGE PTO.** Cycle steering wheel several times fully to the left and right. Raise the cutting unit to extend lift cylinders, aiming steering wheels straight forward and stop the engine.
2. Remove dipstick cap (Fig. 16) from filler neck and wipe it with a clean rag. Screw dipstick cap finger-tight onto filler neck; then remove it and check level of fluid. If level is not within 1/2 inch (13 mm) from the groove in the dipstick (Fig. 16), add SAE 10W-30 engine oil, or, if used, automatic transmission fluid to raise level to groove mark. Do not overfill.

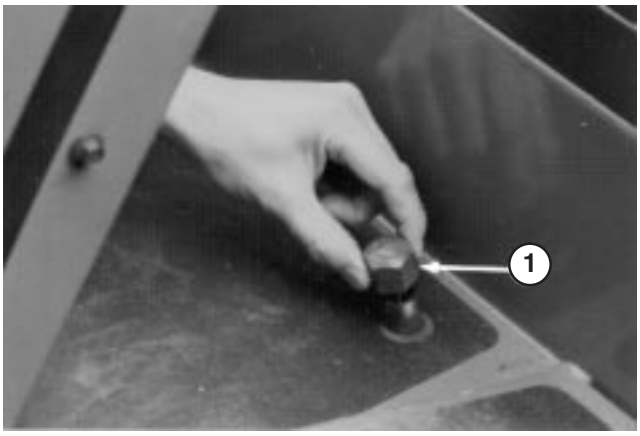


Figure 16

1. Hydraulic system reservoir fluid/add dipstick cap

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

3. Thread dipstick fill cap finger-tight onto filler neck. It is not necessary to tighten cap with a wrench.
4. Check all hoses and fittings for leaks.

Fill Fuel Tank

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.**

1. Using a clean rag, clean area around fuel tank cap.
2. Remove cap from the fuel tank (Fig. 17).
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 fuel tank cap tightly after filling tank.

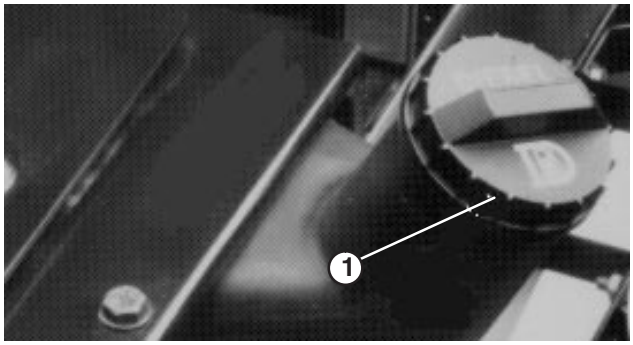


Figure 17

1. Fuel tank cap

Check Rear Axle

The rear axle has three separate reservoirs which use SAE 80W-90 wt. 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 check plugs from axle and make sure lubricant is up to bottom of each hole. If level is low, remove fill plugs and add enough lubricant to bring the level up to the bottom of the check plug holes (Fig. 18 & 19).

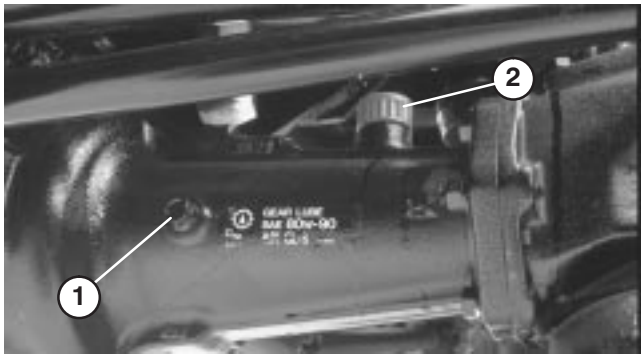


Figure 18

1. Check plug
2. Fill plug

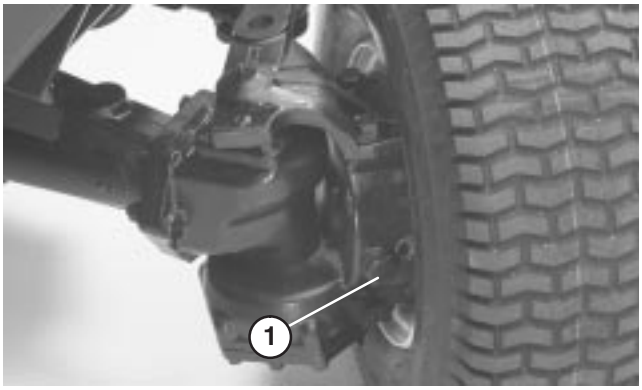


Figure 19

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

Check Bidirectional Clutch Lubricant

1. Position the machine on a level surface.
2. Rotate clutch (Fig. 20) so check plug (shown in 12 O'clock position) is positioned at 4 O'clock.

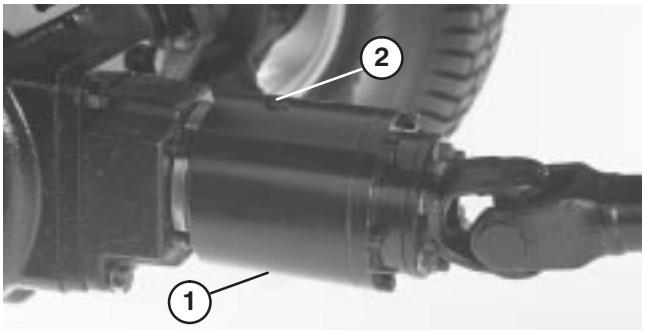


Figure 20

1. Bidirectional clutch
2. Check plug

3. Remove check plug. Fluid level should be up to hole in clutch. If fluid level is low, add Mobil Fluid 424. Clutch should be approximately 1/3 full.
4. Install check plug.

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

Controls

Service Brakes

The left and right brake pedals (Fig. 21) are connected to the left and right front wheels. Since both brakes work independently of each other, 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 could be damaged when brakes are used to turn sharply. To make a “quick-stop”, depress both brake pedals together. Always lock brakes together when transporting the traction unit.

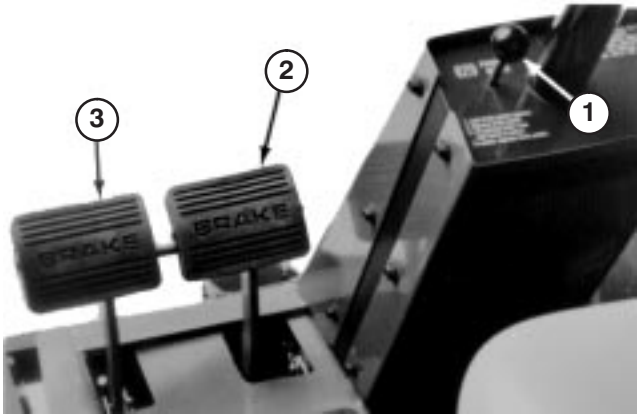


Figure 21

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

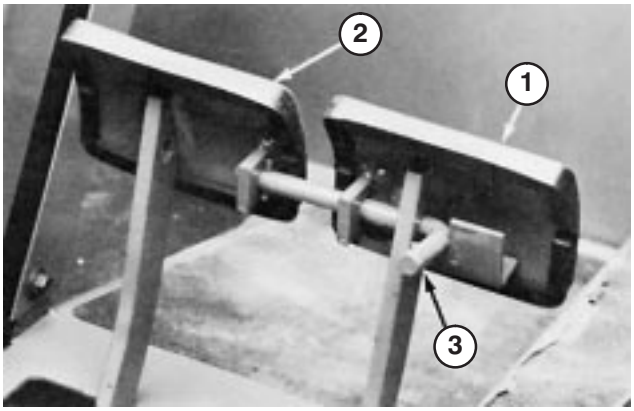


Figure 22

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 lock arm (Fig. 22) on left brake pedal so that it locks together with the right pedal. Next, push down fully on both pedals and pull parking brake knob out (Fig. 21) then release the pedals. To release parking brake, depress both pedals until parking brake knob retracts. Before starting the engine, however, lock arm may be disengaged from left brake pedal so both pedals work independently with each front wheel.

Traction Pedal

Traction pedal (Fig. 23) has two functions: one is to make the machine move forward, the other is to make it move rearward. Using the heel and toe of the right foot, depress top of pedal to move forward and bottom of pedal to move rearward. Ground speed is proportionate to how far pedal is depressed. For maximum ground speed, traction pedal must be fully depressed while throttle is in FAST position. Maximum speed forward is 10 mph (16 Km/hr) (approx.). To get maximum power under heavy load or when ascending a hill, have throttle in FAST position while depressing traction pedal slightly to keep engine rpm high. When engine rpm begins to decrease, release traction pedal slightly to allow rpm to increase.

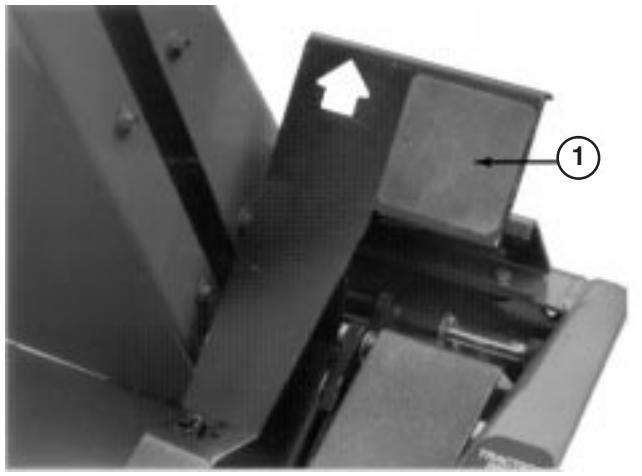


Figure 23

1. Traction pedal

Caution

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

Hydraulic LIft Lever

The hydraulic lift lever (Fig. 24) has three positions: FLOAT, TRANSPORT and RAISE. To lower cutting unit to the ground, move lift lever forward into notch in seat platform — FLOAT. The FLOAT position is used for mowing and when machine is not in operation. To raise cutting unit, pull lift lever rearward to the RAISE position.

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

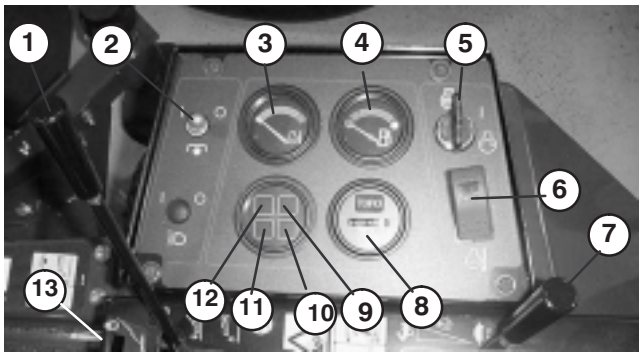


Figure 24

1. Hydraulic Lift lever
2. PTO 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

PTO Switch

Pull up on sleeve on toggle switch handle and move handle to ON to ENGAGE electric PTO clutch (Fig. 24). Pull up on sleeve and move handle to OFF to DISENGAGE electric PTO clutch. The only time the PTO 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. 24) registers the temperature of the coolant in the cooling system. If temperature of coolant gets too high the engine will shut off automatically.

Fuel Gauge

The fuel gauge (Fig. 24) indicates quantity of fuel remaining in fuel tank.

Ignition Key Switch

Three positions: OFF, ON / Preheat and START. (Fig. 24).

Temperature Override Switch

Press and hold override switch (Fig. 24) to start engine after high temperature shut down. Use only for emergency operation.

Throttle

Throttle (Fig. 24) is used to operate engine at various speeds. Moving throttle forward increases engine speed — FAST; rearward decreases engine speed — SLOW. The throttle controls the speed of the cutter blades and, in conjunction with traction pedal, controls ground speed of the traction unit.

Hour Meter

The hour meter (Fig. 24) registers accumulated hours of engine operation.

Engine Coolant Temperature Warning Light

The light illuminates and engine shuts down when coolant reaches a excessively high temperature (Fig. 24).

Glow Plug Indicator

When lit, indicates glow plugs are on (Fig. 24).

Charge Indicator

Illuminates when system charging circuit malfunctions (Fig. 24).

Oil Pressure Warning Light

The oil pressure warning light (Fig. 24) glows when oil pressure in engine drops below a safe level. If low oil pressure ever occurs, stop engine and determine the cause. Repair the damage before starting the engine again.

LIft Lever Lock

Lock lift lever (Fig. 24), in raised position, when performing maintenance on cutting unit.

Seat Adjusting Handle

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

Seat Adjusting Handle — Deluxe Seat

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

Operation

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

Starting/Stopping 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. Engine has ceased running due to lack of fuel.

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

Refer to Bleeding The Fuel System.

1. Ensure parking brake is set, PTO switch is in OFF position and lift lever is in TRANSPORT or FLOAT position. Remove foot from traction pedal and insure it is in neutral.
2. Move throttle control to full FAST position.
3. Turn ignition switch to ON / Preheat position. An automatic timer will control preheat for 6 seconds. After preheat, turn key to START position. CRANK ENGINE FOR NO LONGER THAN 15 SECONDS. Release key when engine starts. If additional preheat is required, turn key to OFF position then to ON / preheat position. Repeat process as required.
4. Run engine at idle speed or partial throttle until engine warms up.

Note: Move throttle to FAST position when restarting a warm engine.

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

Caution

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

6. To stop engine, move throttle control backward to SLOW position, move PTO switch to OFF position and rotate ignition key to OFF. Remove key from switch to prevent accidental starting.

Bleeding Fuel System

1. Park the machine on a level surface. Make sure fuel tank is at least half full.
2. Unlatch and raise hood.

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.**

3. Open the air bleed screw on the fuel injection pump (Fig. 25).

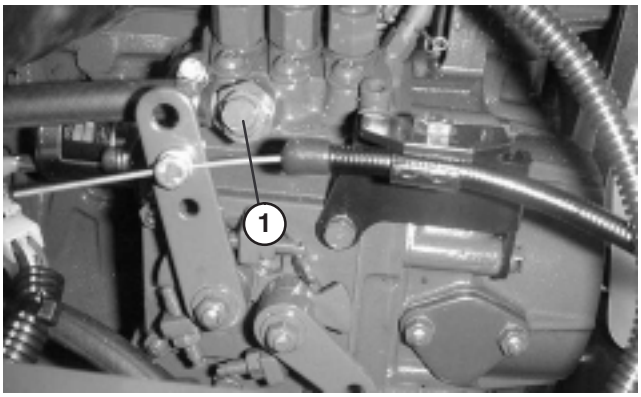


Figure 25

1. Fuel injection pump bleed screw

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

Note: Normally, engine should start after above bleeding procedures are followed. However, if engine does not start, air may be trapped between injection pump and injectors; refer to Bleeding Air From Injectors.

Checking 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 PTO switch is in the OFF position. In addition, the engine will stop when the PTO control is engaged or traction pedal is depressed with operator off the seat or when parking brake is engaged.

Caution

If safety interlock switches are disconnected or damaged the machine could operate unexpectedly causing 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 or not.**

1. Move PTO switch to OFF position and remove foot from traction pedal so it is fully released.
2. Rotate the ignition key to START. Engine should crank. If engine cranks, proceed to step 3. If engine does not crank, there may be a malfunction in the interlock system.
3. Raise off the seat and engage the PTO switch while the engine is running. The engine should stop within 2 seconds. If engine stops, the switch is operating correctly; thus, proceed to step 4. If engine does not stop, there is a malfunction in the interlock system.
4. Raise off the seat and depress the traction pedal while engine is running the PTO lever is disengaged. The engine should stop within 2 seconds. If engine stops, the switch is operating correctly; thus, proceed to step 5 If engine does not stop, there is a malfunction in the interlock system.
5. Engage the parking brake. Depress the traction pedal while engine is running and the PTO lever is disengaged. The engine should stop within 2 seconds. If engine stops, the switch is operating correctly; thus, continue operation. If engine does not stop, there is a malfunction in the interlock system.

Operating Characteristics

Practice driving the GROUNDSMASTER® 228–D 4 Wheel Drive before initial operation because it has a hydrostatic transmission and its characteristics are different than some turf maintenance machines. Some points to consider when operating the traction unit and cutting unit are 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 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 allows the engine, working with the transmission, to sense the proper ground speed while maintaining high blade tip speed necessary for good quality-of-cut. Therefore, allow traction pedal to move upward as engine speed decreases, and depress pedal slowly as speed increases. By comparison, when driving from one work area to another—with no load and cutting unit raised—have throttle in FAST position and depress traction pedal slowly but fully to attain maximum ground speed.

Caution

This machine produces sound levels in excess of 85dBA at the operators ear and can cause hearing loss through extended periods of exposure.

Wear hearing protection when operating this machine.

Another characteristic to consider is the operation of the brakes. The brakes can be used 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 slips and loses traction. If this situation occurs, depress uphill brake pedal gradually and intermittently until the uphill wheel stops slipping; thus, increasing traction on the downhill wheel. If independent braking is not desired, engage the lever on left brake pedal with right pedal. This provides simultaneous braking at both wheels.

Before stopping the engine, disengage all control and move throttle to SLOW. Moving throttle to SLOW reduces high engine speed, noise and vibration. Turn ignition key to OFF to stop the engine.

Pushing Or Towing Traction Unit

In an emergency, the traction unit can be pushed or towed 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 2 to 3 mph (3.2 to 4.8 Km/hr) because transmission may be damaged. IF traction unit must be moved a

considerable distance, transport it on a truck or trailer. Whenever traction unit is pushed or towed, by-pass valve must be open.

1. Remove hair pin, pivot seat platform forward and locate seat support rod in 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. 26) while pushing or towing the machine.

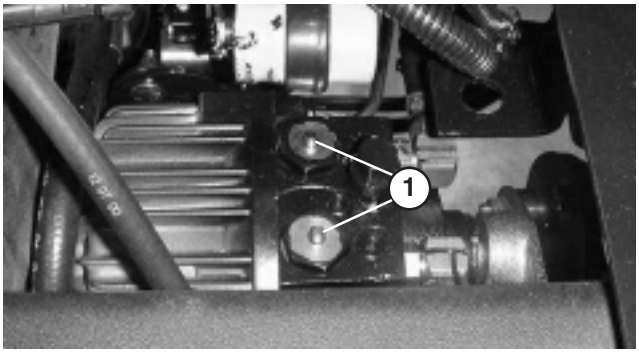


Figure 26

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

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

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

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 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. 26). 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: PTO universal shaft (Fig. 27); lift arm pivot bushings (Fig. 28), brake pivot bushings (Fig. 29); Drive shaft (3) (Fig. 30); tie rod ends (2), cylinder rod ends (2), steering pivots (2) and axle pivot pin (Fig. 31); PTO tension pivot (Fig. 32) and rear PTO bearing (Fig. 32). Also apply grease to both brake cables at the drive wheel and brake pedal ends (Fig. 29).

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.

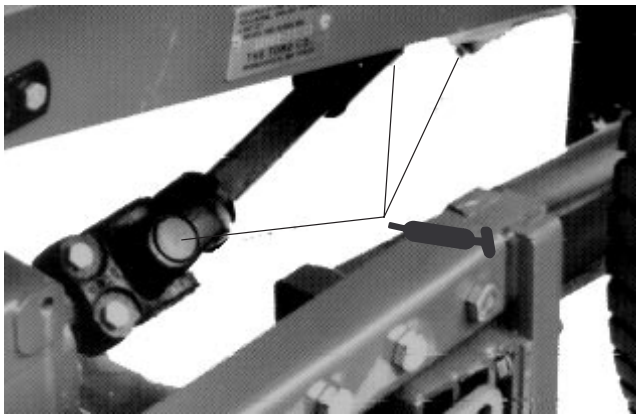


Figure 27

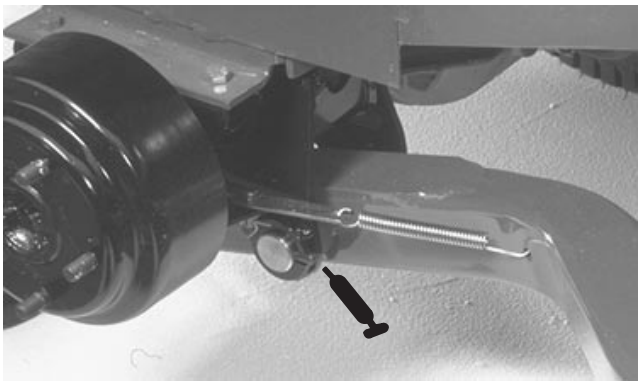


Figure 28

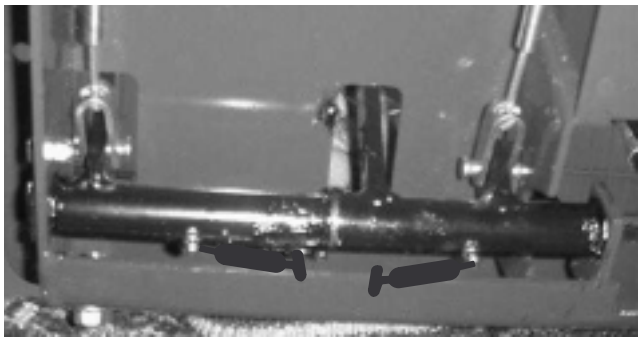


Figure 29

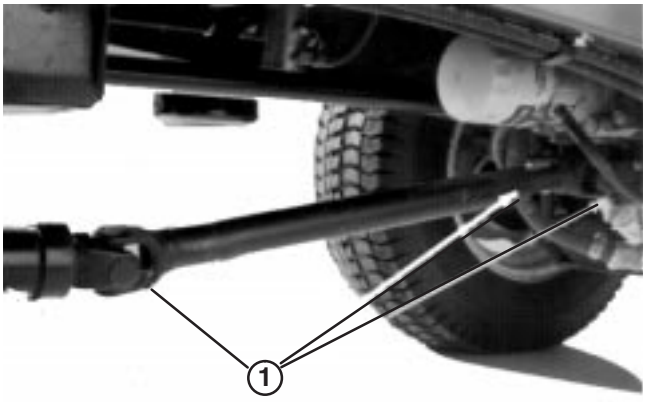


Figure 30

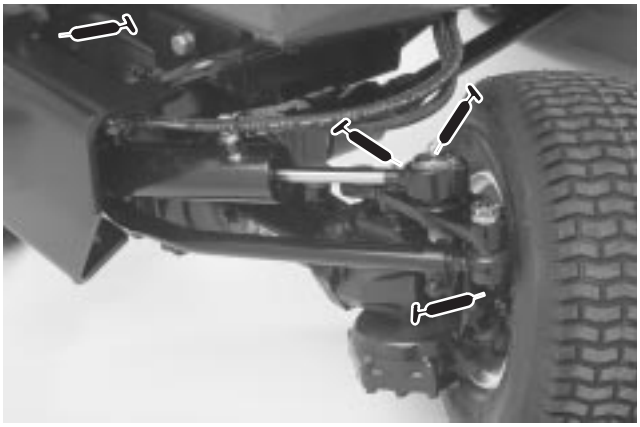


Figure 31

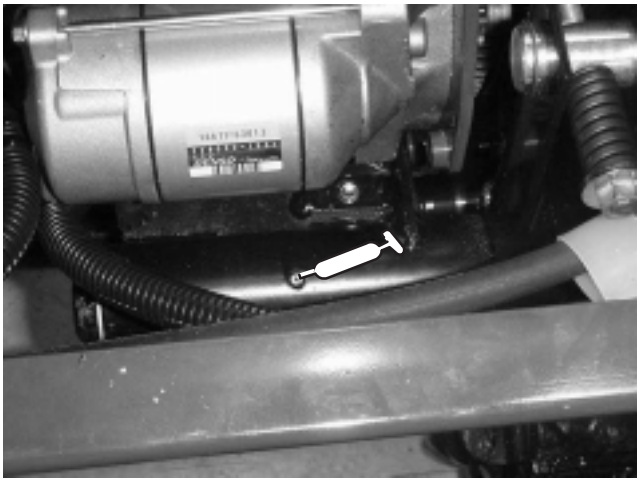
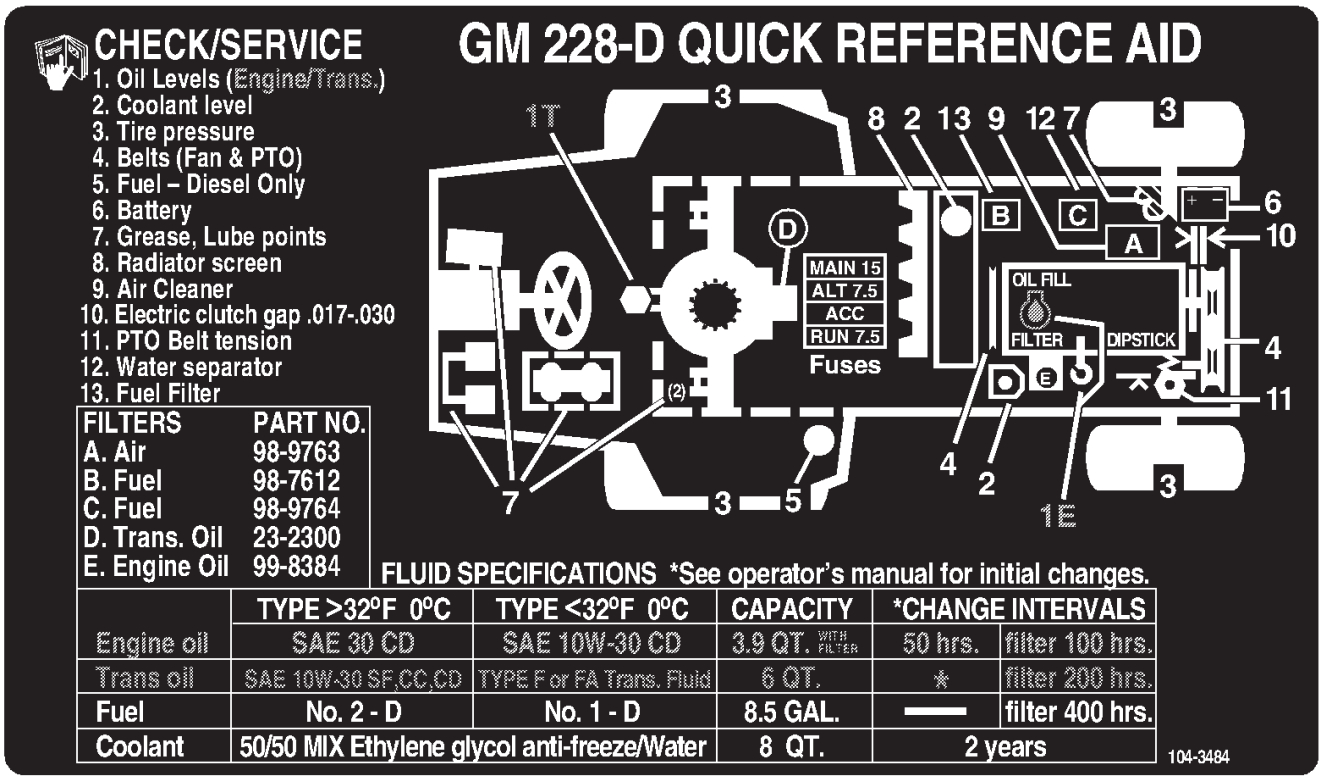


Figure 32

Service Interval Chart



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 first 10 hours	• Check PTO Belt Tension • Check Fan and Alternator Belt Tension • Change Transmission Filter • Torque Wheel Lug Nuts
After first 50 hours	• Change Engine Oil Filter • Torque Head, Adjust Valves and Check Engine RPM
Every 50 hours	• Check Battery Fluid Level • Check Battery Cable Connections • Lubricate All Grease Fittings • Lubricate Brake Cables • Check Cutting Unit Gear Box Oil Level • Clean Under Cutting Unit Belt Covers • Check Cutting Unit Drive Belt Adjustment • Change Engine Oil • Inspect Air Filter, Dust Cup, and Baffle
Every 100 hours	• Change Engine Oil Filter • Check Electric Clutch Gap Adjustment • Check PTO Belt Tension • Check Fan and Alternator Belt Tension • Inspect Cooling System Hoses
Every 200 hours	• Check Rear Wheel Toe–In and Steering Linkage • Change Transmission Filter • Torque Wheel Lug Nuts
Every 400 hours	• Service Air Filter • Drain and Clean Fuel Tank • Change Cutting Unit Gear Box Oil • Change Fuel/Water Separator Filter • Change rear axle lubricant • Coat Transmission Bypass Pins with Grease • Torque Head, Adjust Valves and Check Engine RPM
Every 1000 hours	• Replace Moving Hoses • Replace Safety Switches • Coolant System – Flush/Replace Fluid • Replace Hydraulic Oil

Caution

If you leave the key in the ignition switch, someone could accidently 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

Duplicate this page for routine use.

Maintenance Check Item	For the week of:						
	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Sun.
Check Safety Interlock Operation							
Check Grass Deflector in Down Position							
Check Brake Operation							
Check Fuel Level							
Check Engine Oil Level							
Check Cooling System Fluid Level							
Check Drain Water/Fuel Separator							
Check Air Filter Restriction Indicator[3]							
Check Radiator & Screen for Debris							
Check Unusual Engine Noises[1]							
Check Unusual Operating Noises							
Check Transmission Oil Level							
Check Hydraulic Hoses for Damage							
Check Fluid Leaks							
Check Tire Pressure							
Check Instrument Operation							
Check Condition of Blades							
Lubricate All Grease Fittings[2]							
Touch–up Damaged Paint							

[1]= Check 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

Important Refer to your engine operator's manual for additional maintenance procedures.

Maintenance

General Air Cleaner Maintenance

1. Check air cleaner body for damage which could possibly cause an air leak. Replace a damaged air cleaner body.
2. Service the air cleaner filter when air cleaner indicator (Fig. 33) shows red or every 400 hours (more frequently in extreme dusty or dirty conditions). Do not over service air filter.

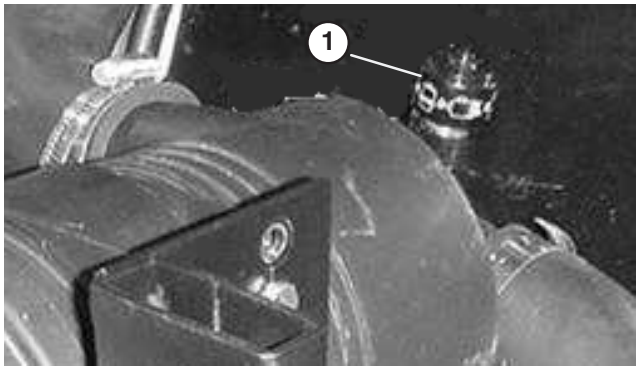


Figure 33

1. Air cleaner indicator

3. Be sure cover is sealing around air cleaner body.

Servicing Air Cleaner

1. Pull latch outward and rotate air cleaner cover counter–clockwise. Remove cover from body (Fig. 34). Clean inside of air cleaner cover.

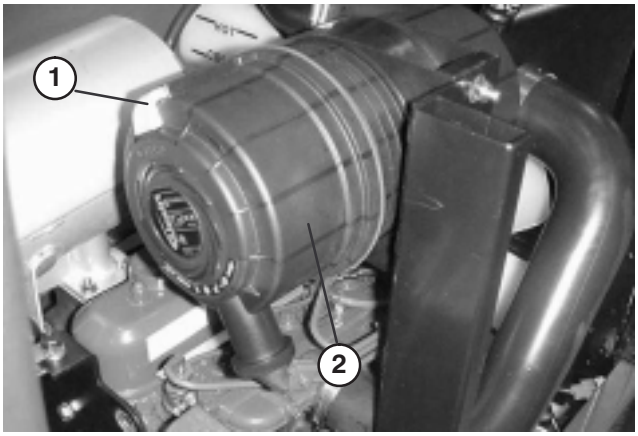


Figure 34

1. Air cleaner latch
2. Air cleaner cover

2. Gently slide filter (Fig. 35) out of air cleaner body to reduce the amount of dust dislodged. Avoid knocking filter against air cleaner body.

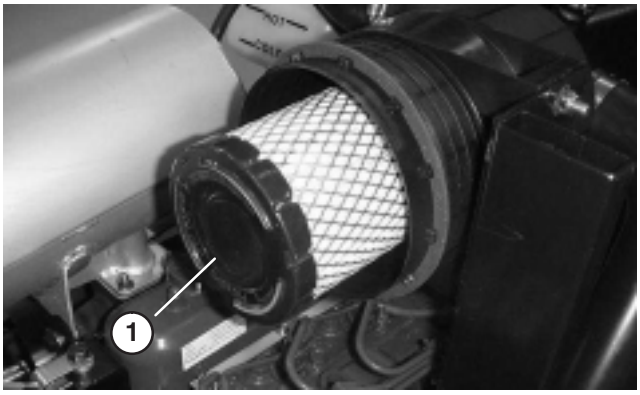


Figure 35

1. Filter

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

Cleaning Air Filter

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

B. Keep air hose nozzle at least 2” from filter and move 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 new filter for shipping damage. Check sealing end of filter. Do not install a damaged filter.
5. Insert new filter properly into air cleaner body. Make sure filter is sealed properly by applying pressure to outer rim of filter when installing. Do not press on flexible center of filter.
6. Reinstall cover and secure latch. Make sure cover is positioned with TOP side up.
7. Reset indicator (Fig. 33) if showing red.

Cleaning 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, if necessary, clean any debris off these parts. However, it will be necessary to check and clean the screen and radiator frequently in extremely dusty and dirty conditions.

Note: If engine shuts off due to overheating, first check the radiator and screen for excessive buildup 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 Engine Oil And Filter

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

1. Position machine on a level surface.
2. Open the hood. Set drain pan under the oil pan and in line with drain plug (Fig. 36).
3. Clean area around drain plug.

Figure 36

1. Drain plug

4. Remove oil drain plug and allow oil to flow into drain pan.
5. Remove and replace oil filter (Fig. 37).

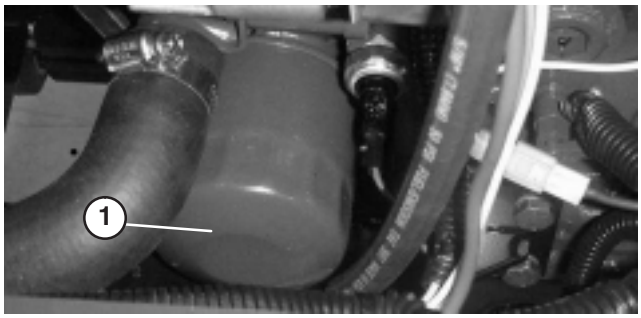


Figure 37

1. Oil filter

6. After oil is drained, reinstall drain plug and wipe up any oil that is spilled.
7. Fill crankcase with oil; refer to Check Crankcase Oil.

Servicing Fuel System

Note: Refer to Fill Fuel Tank With Diesel Fuel for proper fuel recommendations.

Fuel Tank

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

Fuel Lines and Connections

Check 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 water separator (Fig. 38) daily.

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

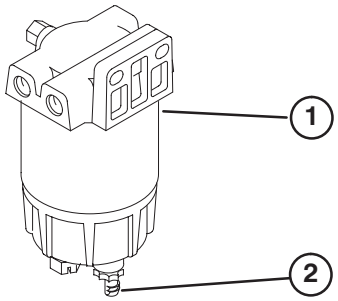


Figure 38

1. Water separator 2. Drain plug

Replace filter canister after every 400 hours of operation.

1. Clean area where filter canister mounts.

2. Remove filter canister and clean mounting surface.

3. Lubricate gasket on filter canister with clean oil.

4. Install filter canister by hand until gasket contacts mounting surface, then rotate an additional 1/2 turn.

Replacing Fuel Pre Filter

Replace the fuel pre filter (Fig. 39), located between fuel tank and 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 lines are removed (Fig. 39).

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

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.**

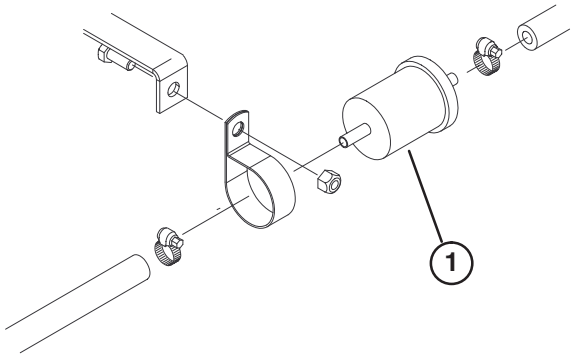


Figure 39

1. Fuel pre filter

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

Bleeding Air From Injectors

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

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

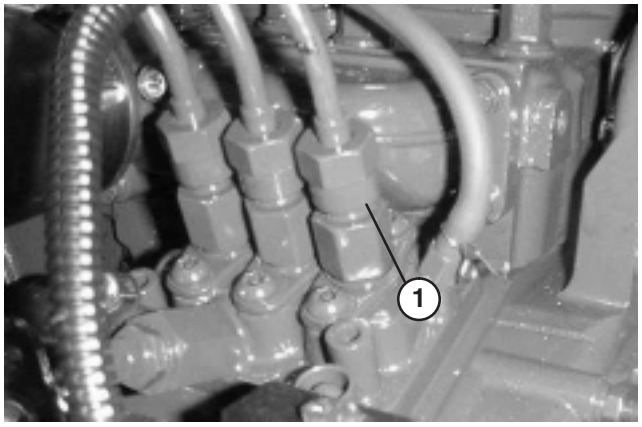


Figure 40

1. No. 1 injector nozzle

2. Move throttle to FAST position.

3. Turn key in key switch to START position and watch fuel flow around connector. Turn key to OFF position when solid flow is observed.

4. Tighten pipe connector securely.

5. Repeat steps on remaining nozzles.

Alternator Belt

1. Condition and Tension – Check condition and tension of belts (Fig. 41) after every 100 operating hours.

A. Proper tension will allow 3/8 in. (10 mm) deflection when a force of 10 lbs. is applied on the belt midway between the pulleys.

B. If deflection is not 3/8 in. (10 mm), loosen alternator mounting bolts. Increase or decrease alternator belt tension and tighten bolts. Check deflection of belt again to assure tension is correct.

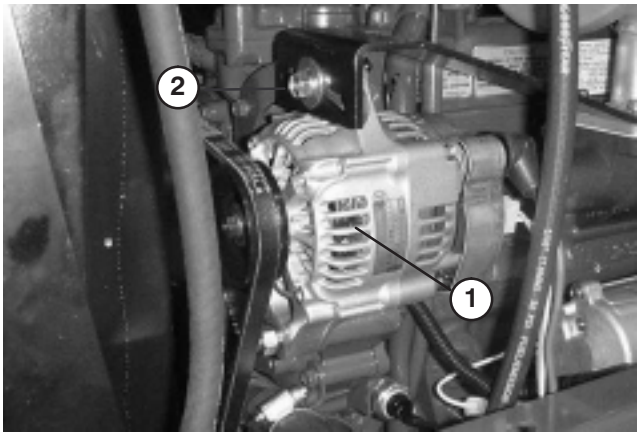


Figure 41

1. Alternator
2. Mounting bolt

Adjusting Throttle

1. Adjust throttle cable (Fig. 42) so governor lever on engine contacts low and high speed set bolts before throttle lever contacts slot in control panel.

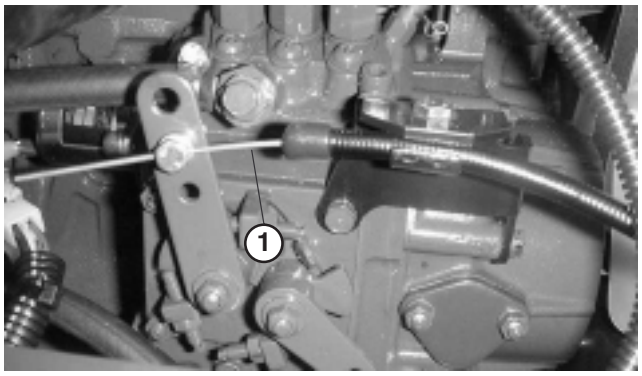


Figure 42

1. Throttle cable

PTO Belt

To Check Tension:

1. Turn 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. 43).

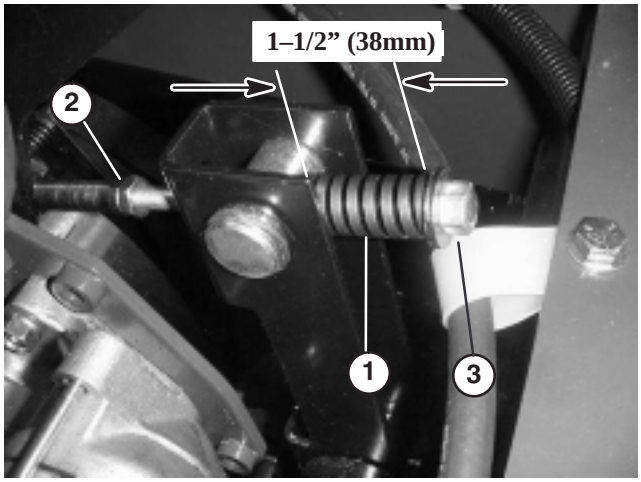


Figure 43

1. Tensioning spring
2. Tensioning rod jamnut
3. Tension adjusting bolt

3. Use a 1/2" wrench to tighten or loosen the belt tensioning spring (Fig. 43). Adjust spring to a length of 1-1/2" (38 mm).

4. Tighten jam nut.

To Replace Belt:

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

2. Loosen the tensioning rod jam nut (Fig. 43).

3. Using a 1/2" wrench, loosen the belt tensioning spring (Fig. 43) all the way.

4. Rotate PTO pulley toward the engine and remove the belt (Fig. 44).

5. Install the new PTO belt and re–tension the pulley spring to 1-1/2" (38 mm) (Fig. 43).

6. Tighten the jam nut (Fig. 43) and close the hood.

PTO Clutch Adjustment

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

1. Turn engine off and remove the ignition key. Set the parking brake. Raise the engine hood and allow the engine to cool.
2. Remove the left hand clutch retainer bracket nut and bolt so that the retainer bracket rubber bumper can be removed (Fig. 44).

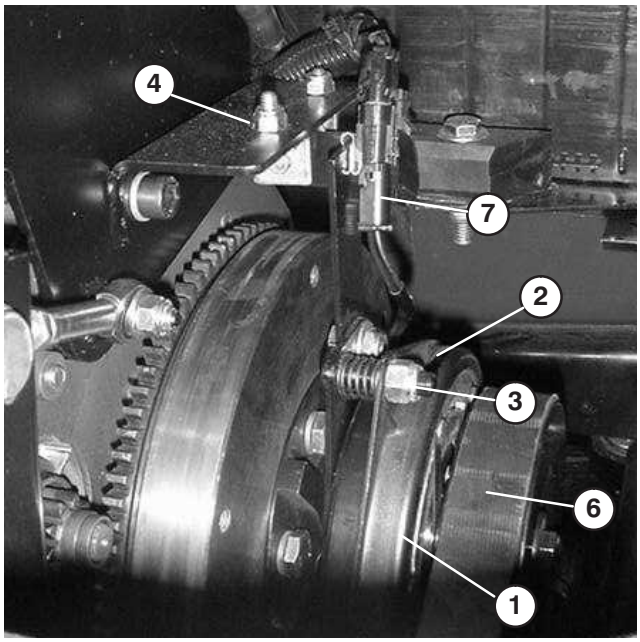


Figure 44

1. Clutch
2. .015" air gap
3. Adjusting nut (3)
4. Left retainer bracket nut & bolt
5. Electrical connector
6. PTO Belt

3. Unplug clutch electric connector (Fig. 44).
4. Adjust the air gap so that a .015 inch feeler gauge slides in between the clutch lining and friction plate with light pressure (Fig. 44). 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 electrical connector.

Adjusting Transmission For Neutral

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

1. Park machine on a level surface and shut engine off. Depress only the right brake pedal and engage the parking brake.
2. Jack up left front side of machine until tire is off shop floor. Support machine with jack stands to prevent it from falling accidentally.
3. Lift seat. Visually inspect traction linkage for possible binding condition, correct if necessary and check machine operation. if condition still exists, repeat steps 1 and 2 and proceed to step 4.
4. Loosen two locknut securing pump plate so plate is free to move (Fig. 45).
5. Start engine and rotate pump plate (Fig. 45) in either direction until wheel ceases rotation.

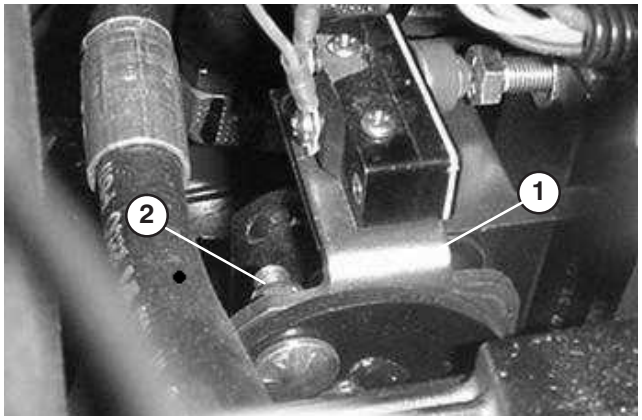


Figure 45

1. Pump plate
2. Locknut

6. Stop engine and tighten locknuts to secure pump plate (Fig. 45).
7. Start engine and check adjustment. Repeat adjustment, if necessary.
8. Stop the engine and release right brake. Remove jack stands and lower machine to the shop floor. Test drive the machine to be sure it does not creep.

Adjusting the Parking Brake Interlock Switch

1. Turn engine off and remove the ignition key. **Do not** engage the parking brake.
2. Remove (6) screws securing front steering tower cover to frame and remove cover (Fig. 46).

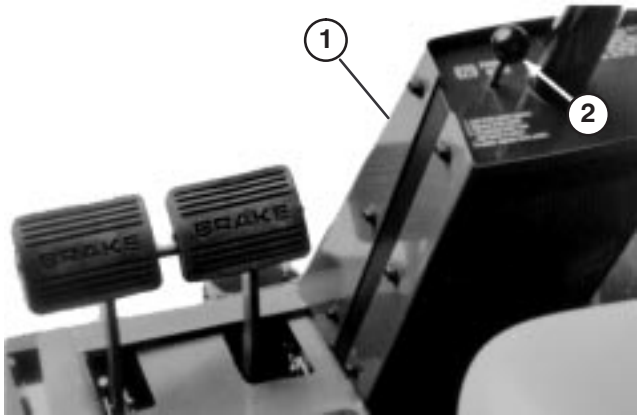


Figure 46

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

3. Disconnect switch pigtail connector from wire harness (Fig. 47).

4. Connect a continuity tester or ohm meter to switch harness connector.

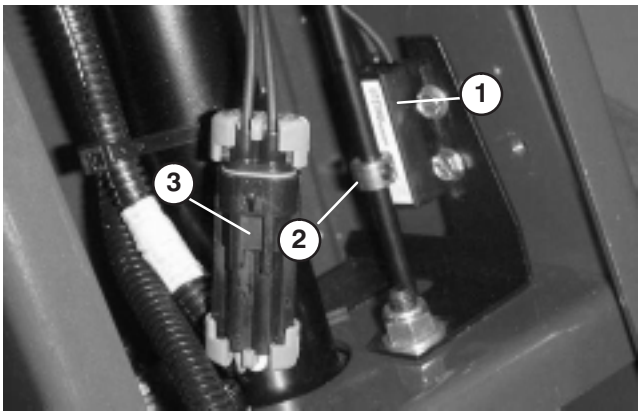


Figure 47

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

5. Loosen set screw securing collar to parking brake rod (Fig. 47).

6. Slowly move collar on rod until it is aligned with cross hairs on switch label (Fig. 47). Tighten collar set screw.

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

8. Check adjustment as follows:

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

9. Connect switch and install steering tower cover.

Changing 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 90° F	SAE 30, Type SF, CC or CD engine oil.
(Normal) 40–100° F	SAE 10W-30 or 10W-40. Type SF, CC or CD engine oil.
(Cool–Spring/Fall) 30–50° F	SAE 5W-30, Type SF, CC or 30–50° F CD engine oil.
(Winter) Below 30° F	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 system will minimize this condition.

The axle housing acts as the reservoir for the system. 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 level of transmission oil before engine is first started and daily thereafter.

1. Lower cutting unit to shop floor, set parking brake, and turn 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. 48).

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

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

6. Start engine, cycle steering and lift cylinders, and check for oil leaks. allow engine to run for about five minute. Then shut engine off.

7. After two minutes, check level of transmission fluid; refer to Check Hydraulic System Fluid.

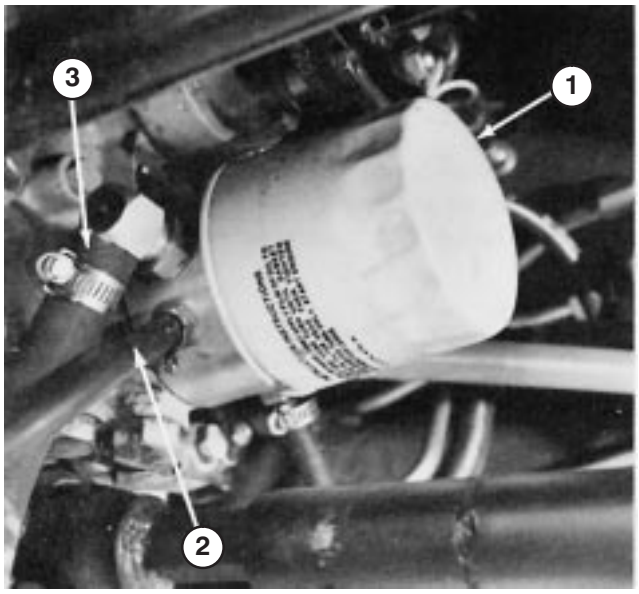


Figure 48

1. Filter
2. Return line
3. Suction line

Adjusting 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 do not work effectively. Free travel is the distance the brake pedal moves before braking resistance is felt.

The brakes should be checked for adjustment after the first 25 hours of operation and should only need adjusting after considerable use thereafter. These periodic adjustments can be performed where the brake cable connect 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 lock arm from right brake pedal so both pedals work independently of each other.

2. To reduce free travel of brake pedals — tighten the brakes — loosen front nut on threaded end of brake cable (Fig. 49). Then tighten rear nut to move cable backward until brake pedals have 1/2 to 1 inch (13 mm to 25 mm) of free travel. Tighten front nut after brakes are adjusted correctly.

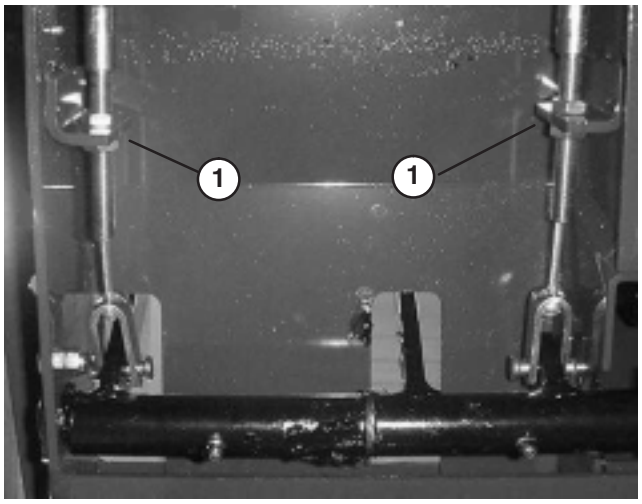


Figure 49

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 machine on a level surface.

2. Clean area around the (3) drain plugs, (1) on each end and (1) in the center (Fig. 50).

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

4. After oil is drained, apply thread locking compound on drain plug threads and reinstall in axle.

5. Fill axle with lubricant; refer to Check Rear Axle Lubricant.

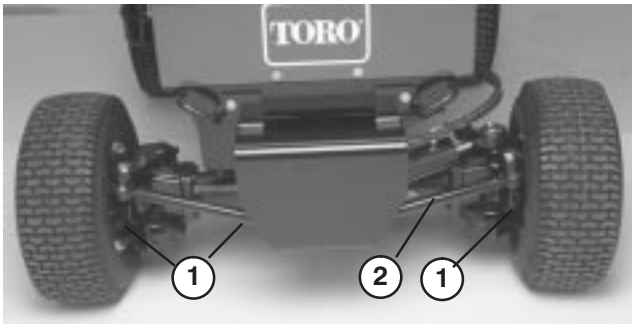


Figure 50

1. Drain plugs (3)
2. Tie rod

Changing Bidirectional Clutch Lubricant

After every 400 hours of operation, the oil in the bidirectional clutch must be changed.

1. Position the machine on a level surface.
2. Clean area around check plug on bidirectional clutch.
3. Rotate clutch so check plug is positioned downward (Fig. 51).

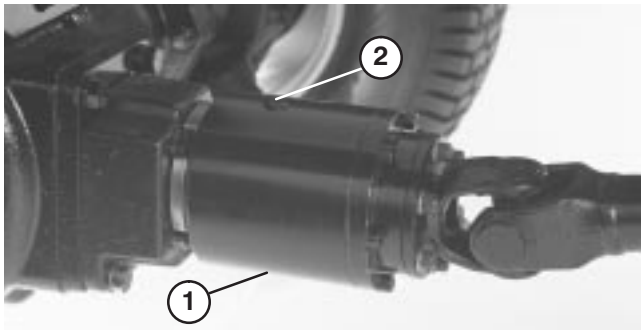


Figure 51

1. Bidirectional clutch
2. Check plug

4. Remove check plug allowing all lubricant to flow into drain pan.
5. Rotate clutch so check plug is positioned at 4 O'clock.
6. Add Mobil Fluid 424 until lubricant level is up to hole in clutch. Clutch should be approximately 1/3 full.
7. Install check plug.

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

Rear Wheel Toe–in

The rear wheels should not toe–in or toe–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. Rotate the steering wheel so rear wheels are straight ahead.
2. Remove nuts securing one tie rod ball joint to mounting bracket on axle and disconnect ball joint from axle (Fig. 50).
3. Loosen screw on tie rod clamp. Rotate ball joint in or out to adjust length of tie rod.
4. Reinstall ball joint to mounting bracket and check wheel toe-in.
5. After attaining desired adjustment, tighten screw on tie rod clamp and re–secure ball joint to mounting bracket.

Servicing Battery

Important Before welding on the machine, disconnect 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 terminals and entire battery case clean because a dirty battery will slowly discharge. To clean the battery wash the entire case with 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 seat plate (Fig. 52).

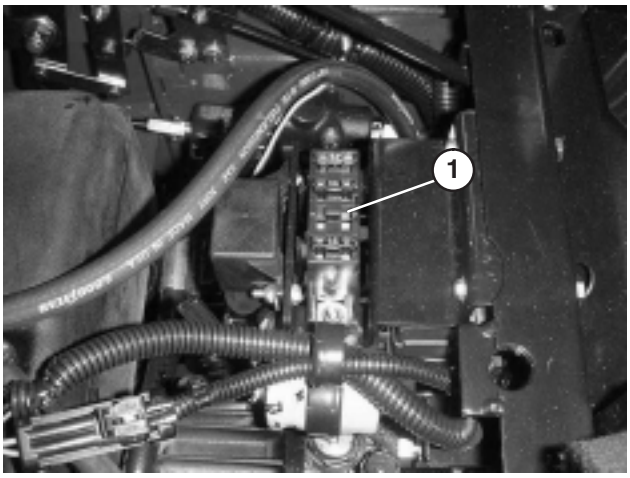
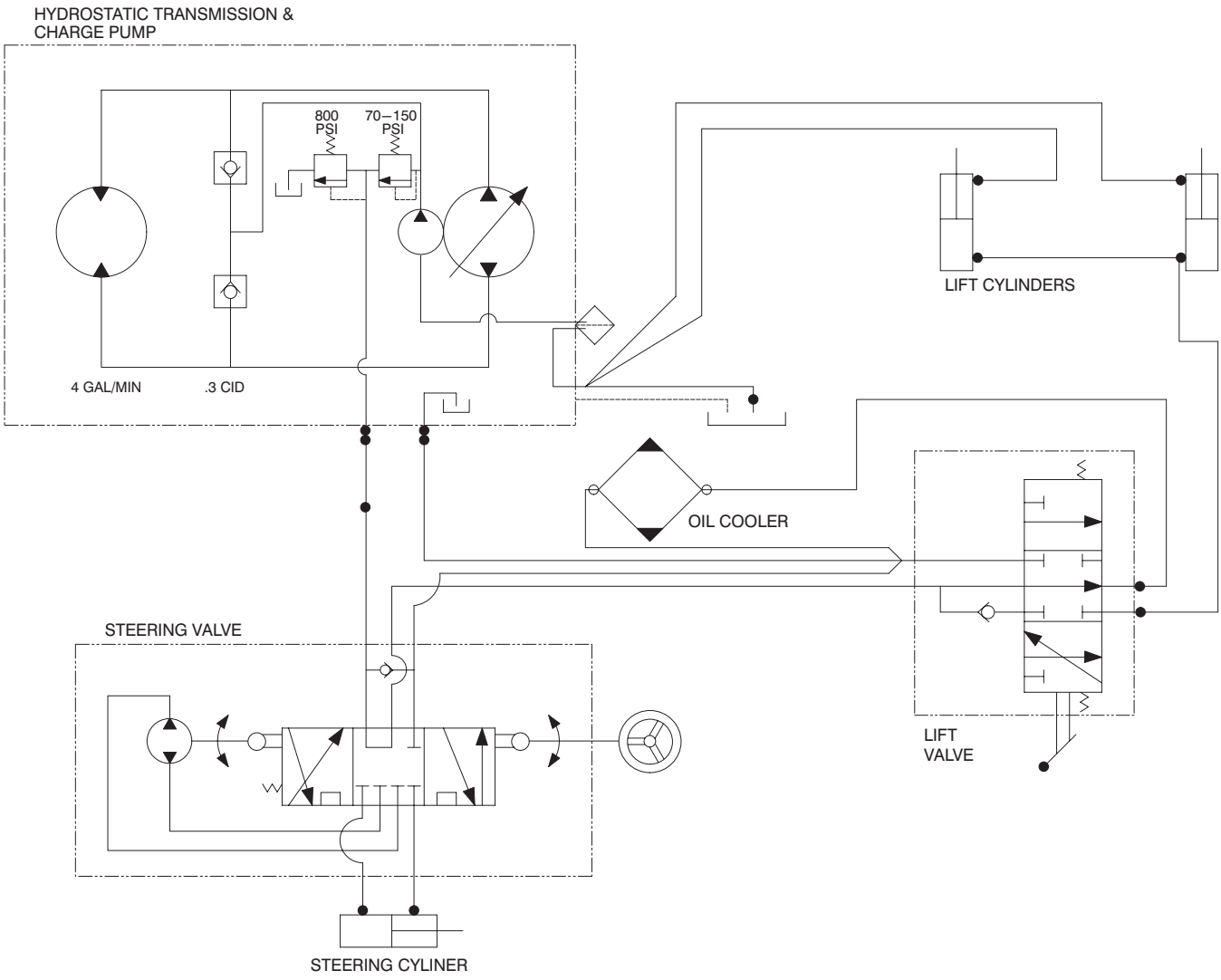


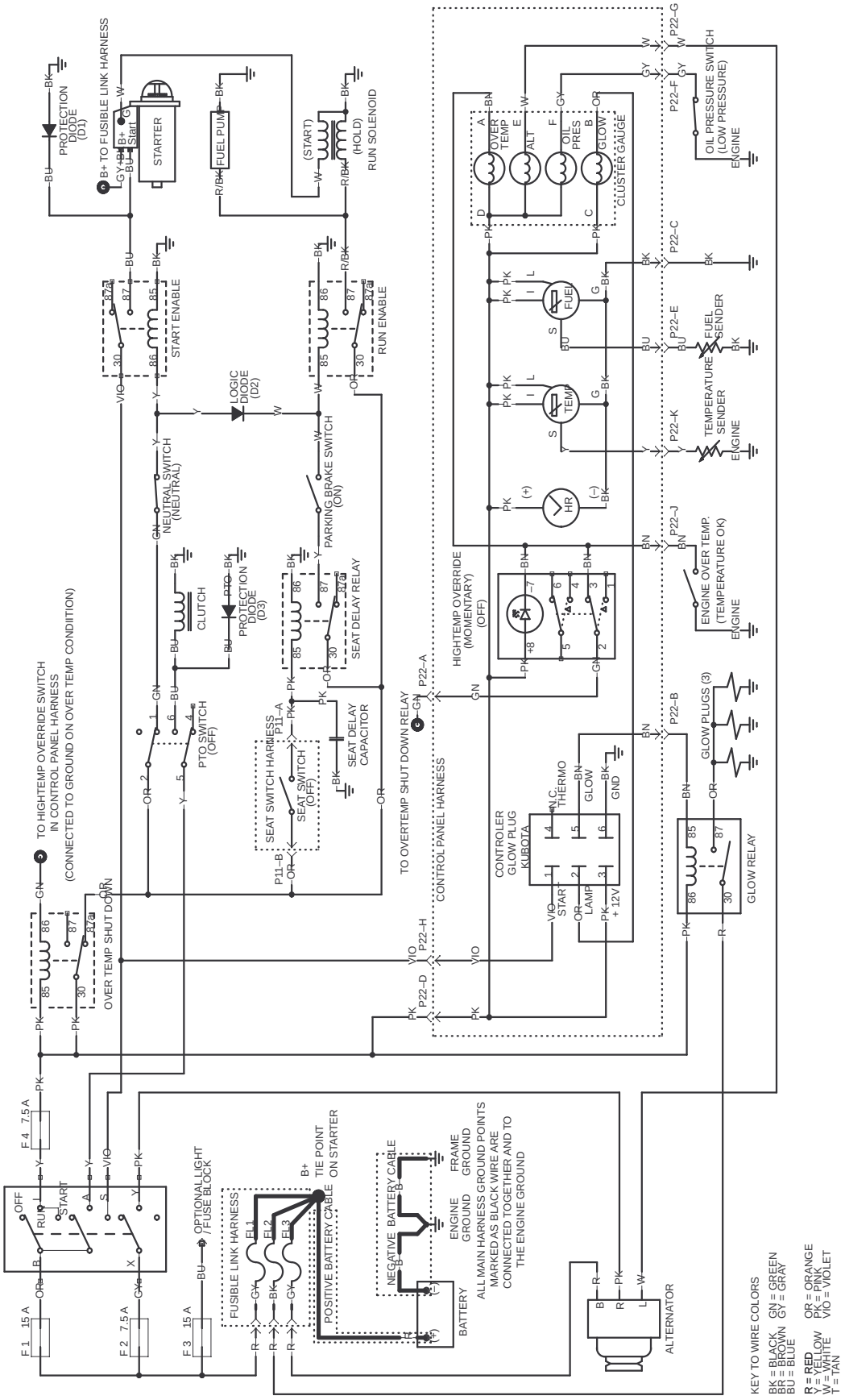
Figure 52

1. Fuse block

Hydraulic Schematic



Electrical Schematic



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
- P.T.O. Shaft Assembly
- all grease fittings and pivot points
- remove control panel and clean out inside of the control box
- beneath seat plate and top of transmission

2. Check the tire pressure. Inflate all traction unit tires to 20 psi.
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 paint on painted areas that are 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 Crankcase Oil.
4. Start the engine and run at idle speed for two minutes.
5. Drain diesel fuel from the fuel tank, fuel lines, pump, filter and separator. Flush 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.

The Toro General Commercial Products Warranty

A Two-Year Limited Warranty

Conditions and Products Covered

The Toro Company and its affiliate, Toro Warranty Company, pursuant to an agreement between them, jointly warrant your 1996 or newer Toro Commercial Product ("Product") purchased after January 1, 1997, to be free from defects in materials or workmanship for two years or 1500 operational hours*, whichever occurs first. Where a warrantable condition exists, we will repair the Product at no cost to you including diagnosis, labor, parts, and transportation. This warranty begins on the date the Product is delivered to the original retail purchaser.

* Product equipped with hour meter

Instructions for Obtaining Warranty Service

You are responsible for notifying the Commercial Products Distributor or Authorized Commercial Products Dealer from whom you purchased the Product as soon as you believe a warrantable condition exists.

If you need help locating a Commercial Products Distributor or Authorized Dealer, or if you have questions regarding your warranty rights or responsibilities, you may contact us at:

Toro Commercial Products Service Department
Toro Warranty Company
8111 Lyndale Avenue South
Bloomington, MN 55420-1196
952-888-8801 or 800-982-2740
E-mail: commercial.service@toro.com

Owner Responsibilities

As the Product owner, you are responsible for required maintenance and adjustments stated in your operator's manual. Failure to perform required maintenance and adjustments can be grounds for disallowing a warranty claim.

Items and Conditions Not Covered

Not all product failures or malfunctions that occur during the warranty period are defects in materials or workmanship. This express warranty does not cover the following:

- Product failures which result from the use of non-Toro replacement parts, or from installation and use of add-on, modified, or unapproved accessories
- Product failures which result from failure to perform required maintenance and/or adjustments
- Product failures which result from operating the Product in an abusive, negligent or reckless manner
- Parts subject to consumption through use unless found to be defective. Examples of parts which are consumed, or used up, during normal Product operation include, but are not limited to, blades, reels, bedknives, tines, spark plugs, castor wheels, tires, filters, belts, etc.
- Failures caused by outside influence. Items considered to be outside influence include, but are not limited to, weather, storage practices, contamination, use of unapproved coolants, lubricants, additives, or chemicals, etc.
- Normal "wear and tear" items. Normal "wear and tear" includes, but is not limited to, damage to seats due to wear or abrasion, worn painted surfaces, scratched decals or windows, etc.

Parts

Parts scheduled for replacement as required maintenance are warranted for the period of time up to the scheduled replacement time for that part.

Parts replaced under this warranty become the property of Toro. Toro will make the final decision whether to repair any existing part or assembly or replace it. Toro may use factory remanufactured parts rather than new parts for some warranty repairs.

General Conditions

Repair by an Authorized Toro Distributor or Dealer is your sole remedy under this warranty.

Neither The Toro Company nor Toro Warranty Company is liable for indirect, incidental or consequential damages in connection with the use of the Toro Products covered by this warranty, including any cost or expense of providing substitute equipment or service during reasonable periods of malfunction or non-use pending completion of repairs under this warranty. Except for the Emissions warranty referenced below, if applicable, there is no other express warranty. All implied warranties of merchantability and fitness for use are limited to the duration of this express warranty.

Some states do not allow exclusions of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Note regarding engine warranty: The Emissions Control System on your Product may be covered by a separate warranty meeting requirements established by the U.S. Environmental Protection Agency (EPA) and/or the California Air Resources Board (CARB). The hour limitations set forth above do not apply to the Emissions Control System Warranty. Refer to the Engine Emission Control Warranty Statement printed in your operator's manual or contained in the engine manufacturer's documentation for details.

Countries Other than the United States or Canada

Customers who have purchased Toro products exported from the United States or Canada should contact their Toro Distributor (Dealer) to obtain guarantee policies for your country, province, or state. If for any reason you are dissatisfied with your Distributor's service or have difficulty obtaining guarantee information, contact the Toro importer. If all other remedies fail, you may contact us at Toro Warranty Company.

Part No. 374-0031 Rev. –