



Service Manual

Groundsmaster[®] 3000/3000-D

Preface

The purpose of this publication is to provide the service technician with information for troubleshooting, testing, and repair of major systems and components on the Groundsmaster 3000 and 3000-D.

REFER TO THE TRACTION UNIT AND CUTTING UNIT OPERATOR'S MANUALS FOR OPERATING, MAINTENANCE AND ADJUSTMENT INSTRUCTIONS. Space is provided in Chapter 2 of this book to insert the Operator's Manuals and Parts Catalogs for your machine. Replacement Operator's Manuals are available by sending complete Model and Serial Number to:

The Toro Company
8111 Lyndale Avenue South
Bloomington, MN 55420

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



This safety symbol means **DANGER, WARNING, or CAUTION, PERSONAL SAFETY INSTRUCTION**. When you see this symbol, carefully read the instructions that follow. Failure to obey the instructions may result in personal injury.

NOTE: A NOTE will give general information about the correct operation, maintenance, service, testing or repair of the machine.

IMPORTANT: The IMPORTANT notice will give important instructions which must be followed to prevent damage to systems or components on the machine.



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Safety

Product Records
and Maintenance

Ford Gasoline
Engine

Peugeot Diesel
Engine

Hydraulic System
and Transaxle

Electrical
System

2WD Rear Axle

4WD Rear Axle

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84 inch
Cutting Units

Contour 82
Cutting Unit

72 inch
Cutting Units

Electrical
Diagrams



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Safety Instructions

The GROUNDMASTER® 3000 and 3000-D was tested and certified by TORO for compliance with the B71.4—1990 specifications of the American National Standards Institute. Although hazard control and accident prevention partially are dependent upon the design and configuration of the machine, these factors are also dependent upon the awareness, concern, and proper training of the personnel involved in the operation, transport, maintenance, and storage of the machine. Improper use or maintenance of the machine can result in injury or death. To reduce the potential for injury or death, comply with the following safety instructions.



Before Operating

1. Read and understand the contents of this manual before starting and operating the machine. Become familiar with all controls and know how to stop quickly. A free replacement manual is available by sending complete Model and Serial Numbers to:

The Toro Company
8111 Lyndale Avenue South
Minneapolis, Minnesota 55420–1196.

Use the Model and Serial Number when referring to your machine. If you have questions about this Service Manual, please contact:

The Toro Company
Commercial Service Department
8111 Lyndale Avenue South
Minneapolis, Minnesota 55420.

2. Never allow children to operate the machine. Do not allow adults to operate the machine without proper instruction. Only trained operators, skilled in slope operation and who have read this manual should operate this machine.

- 3. Never operate machine when under the influence of drugs or alcohol.
- 4. Remove all debris or other objects that might be picked up and thrown by cutter blades or fast moving components from other attached implements. Keep all bystanders away from the operating area.
- 5. Keep all shields and safety devices in place. If a shield, safety device, or decal is defective or damaged, repair or replace it before operation is commenced. Also, tighten any loose nuts, bolts, and screws to insure machine is in safe operating condition.
- 6. Do not wear loose-fitting clothing because it could get caught in moving parts. Always wear long pants and substantial shoes. Wearing safety glasses, safety shoes, and a helmet is advisable and required by some local ordinances and insurance regulations.

7. Check interlock switches daily for proper operation. Do not rely entirely on safety switches -shut off engine before getting off seat. If a switch fails, replace it before operating the machine. The interlock system is for your protection, so do not bypass it. Replace all interlock switches every two years. Interlock switches should be adjusted so:
 - A. Engine cannot be started unless traction pedal is released (neutral position).
 - B. Engine stops if operator gets off seat when traction pedal is depressed.
 - C. PTO disengages if operator gets off seat when PTO lever is ENGAGED (on position).
8. Fill fuel tank with diesel fuel before starting the engine. Avoid spilling any fuel. Since diesel fuel is flammable, handle it carefully.
 - A. Use an approved fuel container.
 - B. Do not fill fuel tank when engine is hot or running.
 - C. Do not smoke while handling fuel.
 - D. Fill fuel tank outdoors and up to about one inch (25 mm) from the top of the tank, not the filler neck.
 - E. Wipe up any spilled fuel.
9. Sit on the seat when starting the engine and operating the machine.
10. Always use seat belt and ROPS together. Make sure seat is latched.
11. Before starting the engine:
 - A. Engage parking brake.
 - B. Make sure traction pedal is in neutral.
 - C. After engine is started, release parking brake and keep foot off traction pedal. Machine must not move. If movement is evident, the neutral return mechanism is adjusted incorrectly. Shut engine off and adjust until machine does not move when traction pedal is released.
12. Do not run the engine in a confined area without adequate ventilation. Exhaust fumes are hazardous and could possibly be deadly.
13. Maximum seating capacity is one person. Therefore, never carry passengers.
14. This traction unit is intended to be used with an implement. Refer to implement operator's manual for sound and vibration information and rear weight requirements.
15. Check carefully for overhead clearances before driving under any objects.

While Operating

16. Using the machine demands the operator's complete attention. To prevent loss of control:
 - A. Operate only in daylight or when there is good artificial light.
 - B. Drive slowly.
 - C. Avoid sudden stops and starts.
 - D. Look behind machine before backing up.
 - E. Watch for holes or other hidden hazards.
 - F. Do not drive close to a sand trap, ditch, creek, or hazard.
 - G. Reduce speed when making sharp turns and when turning on a hillside.
 - H. The cutting deck must be lowered when going down slopes for steering control.
17. Operator must be skilled and trained in how to drive on hillsides. Failure to use caution on slopes or hills may cause loss of control and vehicle to tip or roll possibly resulting in personal injury or death.
18. Traverse slopes carefully. Do not start or stop suddenly when traversing slopes or when traveling uphill or downhill.
19. If engine stalls or machine loses headway and cannot make it to the top of a slope, do not turn machine around. Always back slowly straight down the slope.
20. This product is designed to drive objects into the ground where they lose energy quickly in grassy areas. However, don't take an injury risk!! When a person or pet appears unexpectedly in or near the mowing area, STOP MOWING. Careless operation, combined with terrain angles, ricochets, or improperly positioned guards, can lead to thrown object injuries. Do not resume mowing until area is cleared.
21. Never raise the cutting unit or other attached implement while the blades or other parts are rotating.
22. If cutting blades or other implement components strike a solid object or the machine vibrates abnormally, disengage PTO, move throttle to SLOW, set parking brake, and shut engine off. Remove key from switch to prevent possibility of accidental starting. Check cutting unit or other implement and traction unit for damage and defective parts. Repair any damage before restarting the engine and operating the implement or cutting unit. Assure cutting unit blades are in good condition and blade bolts are torqued to proper specifications (See Cutting Deck Operator's Manual).
23. To stop machine, remove foot from traction pedal and use brakes. Gradually reversing the traction pedal can provide additional braking.

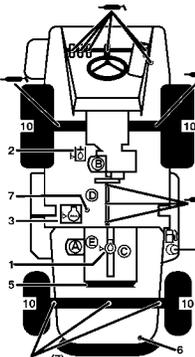
- 24.** Do not touch engine, muffler, or radiator while engine is running or soon after it has stopped. These areas could be hot enough to cause a burn.
- 25.** Lower the cutting unit or other attached implement to the ground and remove key from switch whenever machine is left unattended.
- 26.** Before getting off the seat:
- A. Move traction pedal to neutral position and remove foot from pedal.
 - B. Set the parking brake and disengage the PTO.
 - C. Shut the engine off and remove key from ignition switch. Wait for all movement to stop before getting off the seat.

Maintenance

- 27.** Remove key from ignition switch to prevent accidental starting of the engine when servicing, adjusting, or storing the machine.
- 28.** If major repairs are ever needed or assistance is desired, contact an Authorized TORO Distributor.
- 29.** To reduce potential fire hazard, keep the engine free of excessive grease, grass, leaves, and accumulations of dirt. Never wash a warm engine or electrical connections with water.
- 30.** If the cutting unit discharge area ever plugs, disengage PTO and shut engine off before removing the obstruction.
- 31.** Make sure machine is in safe operating condition by keeping nuts, bolts, and screws tight. Check attachment mounting hardware and all cutting unit blade mounting bolts frequently to assure they are torqued to proper specifications.
- 32.** Periodically inspect the roll bar and roll bar mounting. Repair, as necessary. Do not weld, cut, drill, or modify roll bar in any manner.
- 33.** Make sure all hydraulic line connectors are tight, and all hydraulic hoses and lines are in good condition before applying pressure to the system.
- 34.** Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks.
- Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin and do serious damage. If fluid is ejected into the skin, it must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result.
- 35.** Before disconnecting or performing any work on the hydraulic system, all pressure in system must be relieved by stopping engine and lowering implement to the ground.
- 36.** If the engine must be running to perform maintenance or an adjustment, keep clear of PTO shaft, cutting unit blades, and other moving parts.
- 37.** Do not overspeed the engine by changing the governor settings. To ensure safety and accuracy, have an Authorized TORO Distributor check maximum engine speed with a tachometer.
- 38.** Engine must be shut off before checking oil or adding oil to the crankcase.
- 39.** At the time of manufacture, the machine conformed to safety standards in effect for riding mowers. To ensure optimum performance and continued safety certification of the machine, use genuine TORO replacement parts and accessories. Replacement parts and accessories made by other manufacturers may result in non-conformance with the safety standards, and the warranty may be voided.

Safety and Instruction Decals (Groundsmaster 3000)

The following safety and instruction decals are mounted on the traction unit. If any decal becomes damaged or illegible, install a new decal. Part numbers are listed below or in your parts catalog.



GROUNDMASTER 3000 QUICK REFERENCE AID

CHECK/SERVICE (DAILY)

- ENGINE OIL LEVEL
- HYDRAULIC FLUID LEVEL
- ENGINE COOLANT LEVEL
- FUEL - GASOLINE ONLY
- FAN BELT TENSION
- RADIATOR SCREEN
- AIR CLEANER
- BRAKE FUNCTION
- INTERLOCK SYSTEM
- TIRE PRESSURE - 15 PSI/ 1.05 BAR
- GREASE POINTS (18)

SPECIFICATIONS/CHANGE INTERVALS

SEE OPERATOR'S MANUAL FOR INITIAL CHANGES	FLUID TYPE	CAPACITY	CHANGE INTERVAL	FILTER	FILTER PART NO.
ENGINE OIL	10W-30 SG	3.5 QUARTS	100 HOURS / 100 HOURS	FL-400A	94-3851
HYDRAULIC FLUID	MOBIL 424	12 QUARTS	600 HOURS / 600 HOURS		94-3851
INTERLOCK SWITCHES			2 YEARS		
SPARK PLUGS			400 HOURS	*AGRF22*AGRF22C	
COOLANT HOSES			1000 HOURS		
AIR CLEANER			1000 HOURS		94-1412
FUEL	UNLEADED	12 GALLONS	800 HOURS / 400 HOURS		FG736A
ENGINE COOLANT	50/50 WATER ETHYLENE GLYCOL	9 QUARTS	2 YEARS, WHICHEVER OCCURS FIRST		

93-5935 MOTO/CRAFT PART NUMBERS *** DO NOT USE BIODEGRADABLE OIL IN TRANSEXLE

Next to Right Side of Seat
(Part No. 93-5935)

CAUTION

CHECK PERFORMANCE OF ALL INTERLOCK SWITCHES DAILY
SEE OPERATOR'S MANUAL FOR INSTRUCTION DO NOT
DEFEAT INTERLOCK SYSTEM IT IS FOR YOUR PROTECTION

On Side of Tool Box
(Part No. 67-1710)

STARTER 20A SOLENOID	HIGH COOLANT TEMP RELAY	IMPLEMENT FLOAT RELAY	CRUISE RELAY (OPTIONAL)
PTO 20A	START RELAY	PTO RELAY	SEAT RELAY
SEAT 2A SWITCH			ENGINE SHUTDOWN DELAY RELAY
IGNITION 10A SWITCH			

In Compartment Behind Control panel
(Part No. 93-5933)

OPERATING INSTRUCTIONS

SEE OPERATOR'S MANUAL

STARTING ENGINE:

- PLACE TRACTION PEDAL IN NEUTRAL POSITION.
- DEPRESS BRAKE PEDALS.
- SET ENGINE SPEED CONTROL TO ONE THIRD SPEED.
- PULL CHOKE KNOB TO CLOSE CHOKE (COLD ENGINE).
- TURN IGNITION KEY TO START POSITION AND RELEASE.

STOPPING ENGINE:

- RETURN ENGINE SPEED CONTROL TO LOW IDLE.
- DISENGAGE IMPLEMENT.
- SET PARKING BRAKE.
- TURN IGNITION KEY TO OFF POSITION.
- REMOVE IGNITION KEY.

ENGAGE IMPLEMENT:

- LIFT SWITCH LEVER, PUSH FORWARD AND RELEASE.

DISENGAGE IMPLEMENT:

- PULL SWITCH LEVER REARWARD AND RELEASE.

HIGH ENGINE TEMPERATURE OVERRIDE:

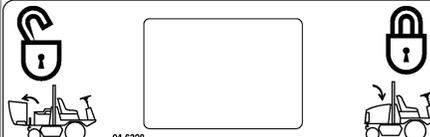
- DEPRESS AND HOLD BUTTON TO OVERRIDE HIGH ENGINE TEMPERATURE SHUTDOWN.

On Fuse Compartment Cover
(Part No. 93-5931)

WARNING



ON FAN SHROUD
(Part No. 77-3100)



94-6328

On Hood
(Part No. 93-6328)

! DANGER



CLOSE HOOD BEFORE FUELING

On Right Side Of Center Shroud
(Part No. 93-5617)

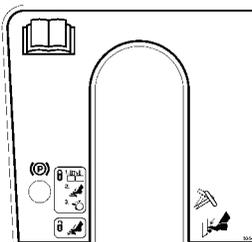
! DANGER

ESTA MAQUINA PUEDE SER RIESGOSA SI SE USA EN UNA MANERA INAPROPIADA. OPERADORES DEBEN ESTAR MUY BIEN ENTRENADOS EN LA MANERA APROPIADA DE OPERAR LA MAQUINA.

TO MINIMIZE THE RISK OF ACCIDENTS, INJURY OR DEATH:

- BEFORE LEAVING OPERATOR'S POSITION:
 - MOVE TRANSMISSION TO NEUTRAL
 - SET PARKING BRAKE
 - DISENGAGE POWER TAKE-OFF
 - SHUT OFF ENGINE
 - REMOVE IGNITION KEY
- KEEP ALL GUARDS AND COVERS IN PLACE.
- WAIT FOR ALL MOVEMENT TO STOP BEFORE SERVICING.
- STOP ENGINE BEFORE LEAVING SEAT, ADDING FUEL OR LIFTING HOOD.
- KEEP PEOPLE AND PETS A SAFE DISTANCE AWAY.
- GO SLOW AND AVOID SHARP TURNS ON SLOPES TO AVOID ROLLOVER.
- DECK MUST BE LOWERED WHEN GOING DOWN SLOPES FOR STEERING CONTROL. READ OPERATOR'S MANUAL.

On Tool Box Cover
(Part No. 93-5621)



On Steering Tower
(Part No. 95-0814)

! HYDRAULIC OIL ONLY

USE MOBIL 424

On Frame Above Front Axle
(Part No. 85-4730)

TRACTION PEDAL

FORWARD



REVERSE

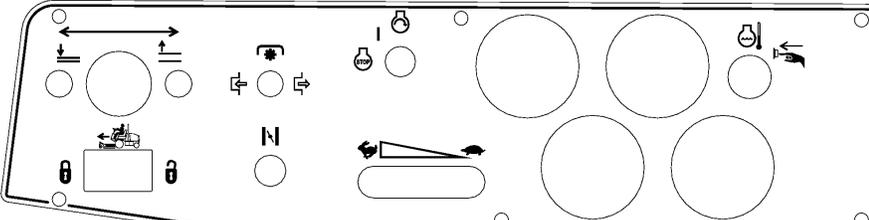


NO STEP
USE OTHER SIDE

CAUTION

TURN OFF PTO BEFORE RAISING IMPLEMENT TO TRANSPORT POSITION. DO NOT OPERATE IMPLEMENT IN TRANSPORT POSITION.

On Frame Next to Traction Pedal
(Part No. 92-5772)



On Control Panel
(Part No. 93-5426)

Safety and Instruction Decals (Groundsmaster 3000-D)

The following safety and instruction decals are mounted on the traction unit. If any decal becomes damaged or illegible, install a new decal. Part numbers are listed below or in your parts catalog.

GROUNDMASTER 3000-D QUICK REFERENCE AID

CHECK/SERVICE (DAILY)

- ENGINE OIL LEVEL
- HYDRAULIC FLUID LEVEL
- ENGINE COOLANT LEVEL
- FUEL - DIESEL ONLY
- FUEL/WATER SEPARATOR
- FAN BELT TENSION
- RADIATOR SCREEN
- AIR CLEANER
- BRAKE FUNCTION
- INTERLOCK SYSTEM
- TIRE PRESSURE - 15 PSI / 1.05 BAR
- REAR AXLE OIL LEVEL - (4WD ONLY)
- GREASE POINTS (2WD-18, 4WD-23)

SPECIFICATIONS/CHANGE INTERVALS

SEE OPERATOR'S MANUAL FOR INITIAL CHANGES.	FLUID TYPE	CAPACITY	CHANGE INTERVAL	FLUID FILTER	FILTER PART NO.
ENGINE OIL	15W-40 CE	4.75 QUARTS	100 HOURS	100 HOURS	74-7970 (A)
HYDRAULIC FLUID	MOBIL 424	12 QUARTS	600 HOURS	600 HOURS	94-3951 (B)
REAR AXLE - 4WD	MOBIL 424	1 QUART	600 HOURS		
INTERLOCK SWITCHES			2 YEARS		
COOLANT HOSES			1000 HOURS		
AIR CLEANER ELEMENT			1500 HOURS	1000 HOURS	94-1412 (C)
TIMING BELT			800 HOURS	400 HOURS	93-9720 (D)
FUEL SYSTEM	> 32° F NO. 2 DIESEL < 32° F NO. 1 DIESEL	12 GALLONS		400 HOURS	76-5220 (E)
ENGINE COOLANT	50% 93-7213 50% WATER	11.5 QUARTS		DRAIN & FLUSH	1500 HOURS OR 2 YEARS, WHICHEVER OCCURS FIRST

* - DO NOT USE BIODEGRADABLE OIL IN TRANSCAXLE OR 4WD AXLE

Next to Right Side of Seat
(Part No. 93-5934)

OPERATING INSTRUCTIONS

SEE OPERATOR'S MANUAL

STARTING ENGINE:

- PLACE TRACTION PEDAL IN NEUTRAL POSITION.
- DEPRESS BRAKE PEDALS.
- SET ENGINE SPEED CONTROL TO LOW IDLE.
- TURN IGNITION KEY TO RUN POSITION, GLOW INDICATOR WILL LIGHT.
- WHEN GLOW INDICATOR DIMS, TURN IGNITION KEY TO START POSITION AND RELEASE.

STOPPING ENGINE:

- RETURN ENGINE SPEED CONTROL TO LOW IDLE.
- DISENGAGE IMPLEMENT.
- SET PARKING BRAKE.
- TURN IGNITION KEY TO OFF POSITION.
- REMOVE IGNITION KEY.

ENGAGE IMPLEMENT:

- LIFT SWITCH LEVER, PUSH FORWARD AND RELEASE.

DISENGAGE IMPLEMENT:

- PULL SWITCH LEVER REARWARD AND RELEASE.

GROUND SPEED (HIGH RANGE):

- RAISE IMPLEMENT COMPLETELY.
- DEPRESS SWITCH FORWARD AND RELEASE, TRANSPORT INDICATOR WILL LIGHT.

HIGH ENGINE TEMPERATURE OVERRIDE:

- DEPRESS AND HOLD BUTTON TO OVERRIDE HIGH ENGINE TEMPERATURE SHUTDOWN.

On Fuse Compartment Cover
(Part No. 93-5930)

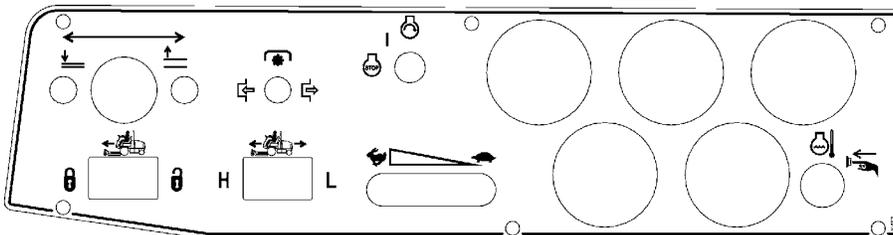
⚠ DANGER

ESTA MAQUINA PUEDE SER RIESGOSA SI SE USA EN UNA MANERA INAPROPIADA. OPERADORES DEBEN ESTAR MUY BIEN ENTRENADOS EN LA MANERA APROPIADA DE OPERAR LA MAQUINA.

TO MINIMIZE THE RISK OF ACCIDENTS, INJURY, OR DEATH:

- BEFORE LEAVING OPERATOR'S POSITION:
 - MOVE TRANSMISSION TO NEUTRAL
 - SET PARKING BRAKE
 - DISENGAGE POWER TAKE-OFF
 - SHUT OFF ENGINE
 - REMOVE IGNITION KEY
- KEEP ALL GUARDS AND COVERS IN PLACE.
- WAIT FOR ALL MOVEMENT TO STOP BEFORE SERVICING.
- STOP ENGINE BEFORE LEAVING SEAT, ADDING FUEL OR LIFTING HOOD.
- KEEP PEOPLE AND PETS A SAFE DISTANCE AWAY.
- ALWAYS USE SEAT BELT AND ROLL BAR TOGETHER AND HAVE SEAT PIVOT LATCHED.
- OPERATOR MUST BE SKILLED AND TRAINED IN SLOPE OPERATION. READ OPERATOR'S MANUAL.
- GO SLOW AND AVOID SHARP TURNS ON SLOPES TO AVOID ROLLOVER.
- DECK MUST BE LOWERED WHEN GOING DOWN SLOPES FOR STEERING CONTROL.

On Tool Box Cover
(Part No. 93-5621- Model 30301)
(Part No. 93-5622- Model 30302)



On Control Panel
(Part No. 93-5425)

⚠ CAUTION

CHECK PERFORMANCE OF ALL INTERLOCK SWITCHES DAILY. SEE OPERATOR'S MANUAL FOR INSTRUCTION. DO NOT DEFEAT INTERLOCK SYSTEM. IT IS FOR YOUR PROTECTION.

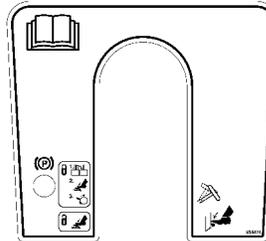
On Side of Tool Box
(Part No. 67-1710)

5A ACCESSORY	STARTER 20A SOLENOID	HIGH COOLANT TEMP RELAY	TRANSPORT RELAY	IMPLEMENT FLOAT RELAY	CRUISE RELAY (OPTIONAL)
LIGHT 20A KIT	PTO 20A (WASPTO)	START RELAY	PTO RELAY	SEAT RELAY	ENGINE SHUTDOWN DELAY RELAY
IMPLEMENT 5A	SEAT 7.5A SWITCH				
IMPLEMENT 25A (FOR BRAKE)	IGNITION 10A SWITCH				

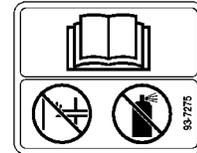
In Compartment Behind Control panel
(Part No. 93-5932)

⚠ WARNING

ON FAN SHROUD
(Part No. 77-3100)



On Steering Tower
(Part No. 95-0814)



On Radiator Near Inlet
(Part No. 93-7275)

HYDRAULIC OIL ONLY

USE MOBIL 424

On Frame Above Front Axle
(Part No. 85-4730)

TRACTION PEDAL

FORWARD

REVERSE

NO STEP
USE OTHER SIDE

⚠ CAUTION

TURN OFF PTO BEFORE RAISING IMPLEMENT TO TRANSPORT POSITION. DO NOT OPERATE IMPLEMENT IN TRANSPORT POSITION.

On Frame Next to Traction Pedal
(Part No. 92-5772)

Safety and Instruction Decals (84" Cutting Units)

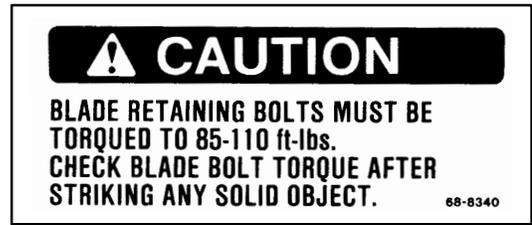
The following safety and instruction decals are mounted on the cutting unit. If any decal becomes damaged or illegible, install a new decal. Part numbers are listed below or in your parts catalog.



On Each Corner Of Cutting Unit
(Part No. 43-8480)



On Right & Left Covers
(Part No. 93-0299)



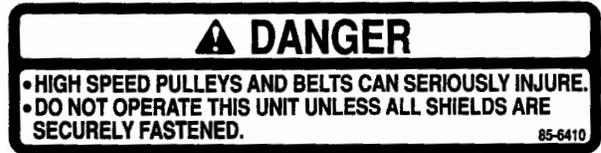
On Front of Cutting Unit
(Part No. 68-8340)



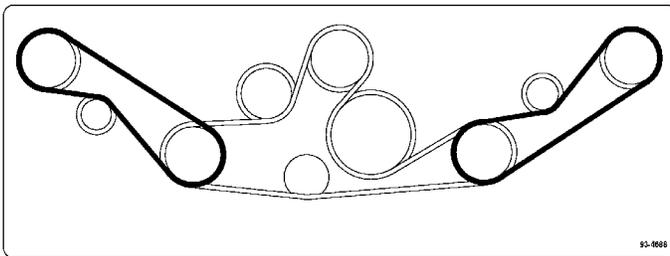
On Gearbox Base
(Part No. 93-6697)



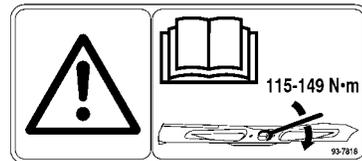
On Front of Deck
(Part No. 88-1270)



On Deck Channels, Under Covers
(Part No. 85-6410)

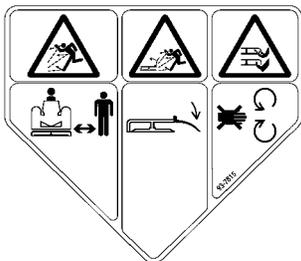


On Right Rear Top of Deck Under Cover
(Part No. 93-4688)

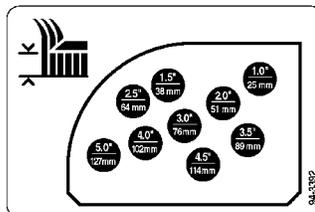


On Front of Cutting Unit

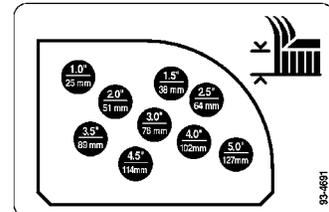
(Part No. 93-7818)
Replaces Decal Part No.
68-8340 for CE



On Each Corner Of Cutting Unit
(Part No. 93-7815)
Replaces Decal Part No.
43-8480 for CE



On Right Rear Top of Deck Under Cover
(Part No. 94-3392)



On left Rear Top of Deck Under Cover
(Part No. 93-4691)

⚠ DANGER

ROTATING BLADES UNDER ENTIRE MOWER DECK.
KEEP HANDS and FEET AWAY.
THROWN OBJECTS ARE DANGEROUS.
KEEP DEFLECTOR IN PLACE. KEEP BYSTANDERS AWAY.

66-1340

**On Front of Deck
(Part No. 66-1340)**

93-7824

**On Front Of Deck
(Part No. 93-7824)**
Replaces Decal Part No.
66-1340 for CE

1.0"	1.5"	2.0"	2.5"	3.0"	3.5"	4.0"	4.5"	5.0"
25 mm	38 mm	51 mm	64 mm	76 mm	89 mm	102 mm	114 mm	127 mm

93-4690

**On Each Castor Arm
(Part No. 93-4690)**

⚠ DANGER

**DEFLECTOR IS NOT IN PLACE.
DO NOT OPERATE.**

66-6380

**On Rear of Deck
(Part No. 66-6380)**

93-7828

**On Rear Of Deck
(Part No. 93-7828)**
Replaces Decal Part No.
66-6380 for CE

**DECAL NOT VISIBLE WHEN COVER
IS PROPERLY INSTALLED.**

93-4894

**On Each Castor Arm
(Part No. 93-4894)**

93-7814

**On Deck Channels, Under Covers
(Part No. 93-7814)**
Replaces Decal Part No. 85-6410 for CE

Safety and Instruction Decals (Contour 82" Cutting Unit)

The following safety and instruction decals are mounted on the cutting unit. If any decal becomes damaged or illegible, install a new decal. Part numbers are listed below or in your parts catalog.



On Sides of Right & Left Chambers
(Part No. 43-8480)



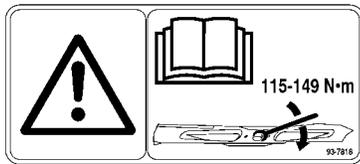
On Right & Left Chambers
(Part No. 93-0299)



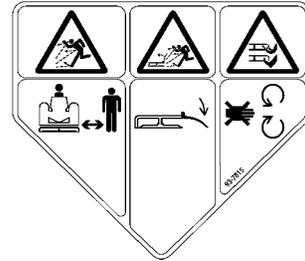
On Top of Chamber 3
(Part No. 68-8340)



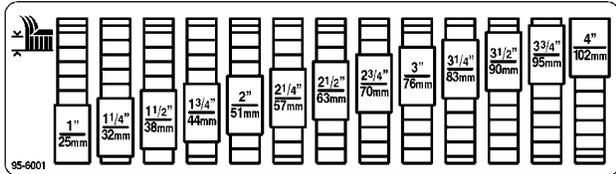
On Top of Chamber 2
(Part No. 88-1270)



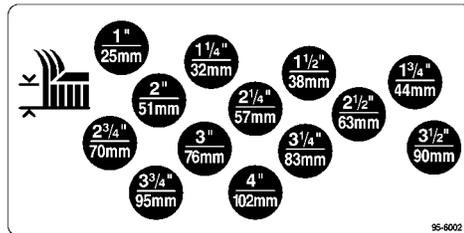
On Top of Chamber 3
(Part No. 93-7815)
Replaces Decal Part No.
68-8340 for CE



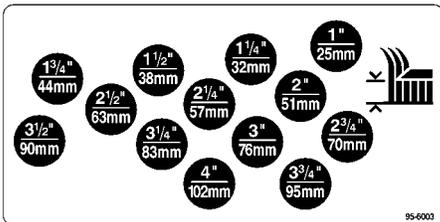
On Sides of Right & Left Chambers
(Part No. 93-7815)
Replaces Decal Part No.
43-8480 for CE



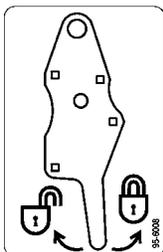
On Chamber 1 & 4 Castor Supports
(Part No. 95-6001)



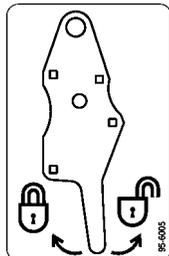
On Top of Rear Castor
(Chambers 2 & 4)
(Part No. 95-6002)



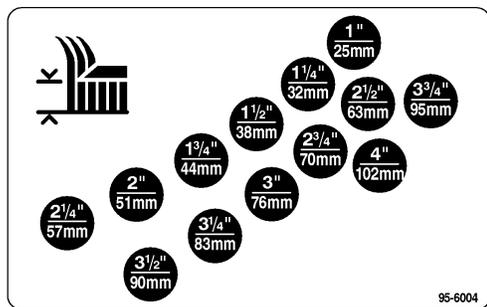
On Top of Rear Castor
(Chamber 1)
(Part No. 95-6003)



On Left Lift Arm
(Part No. 95-6008)



On Right Lift Arm
(Part No. 95-6005)



On Side of Rear Support
(Chamber 3)
(Part No. 95-6004)

Safety and Instruction Decals (Guardian 72" Recycler Cutting Unit)

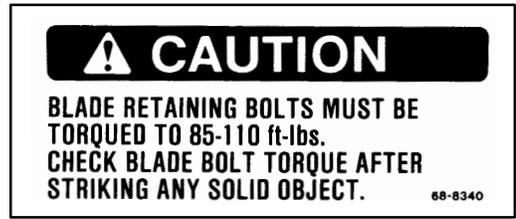
The following safety and instruction decals are mounted on the cutting unit. If any decal becomes damaged or illegible, install a new decal. Part numbers are listed below or in your parts catalog.



On Each Corner Of Cutting Unit (Part No. 43-8480)



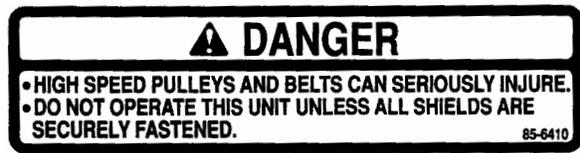
On Left Caster Arm (Part No. 93-0299)



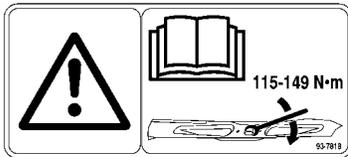
On Front of Cutting Unit (Part No. 68-8340)



On Gearbox Base (Part No. 93-6697)



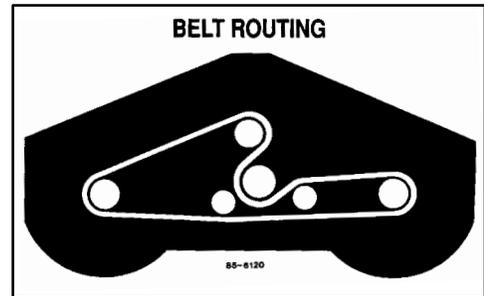
On Deck Channels, Under Covers (Part No. 85-6410)



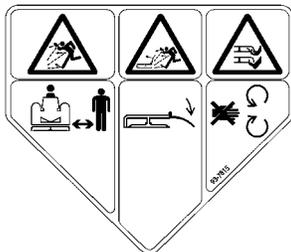
On Front of Cutting Unit (Part No. 93-7818)
Replaces Decal Part No. 68-8340 for CE



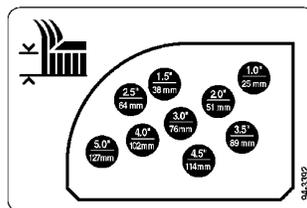
On Front of Deck (Part No. 88-1270)



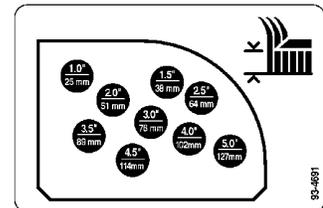
On Right Rear Top of Deck Under Cover (Part No. 85-6120)



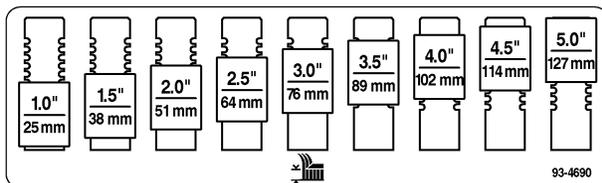
On Each Corner Of Cutting Unit (Part No. 93-7815)
Replaces Decal Part No. 43-8480 for CE



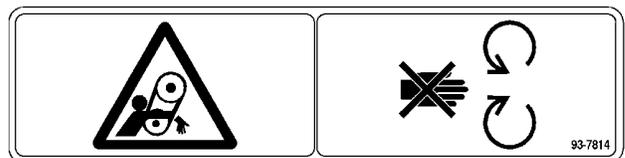
On Right Rear Top of Deck (Part No. 94-3392)



On left Rear Top of Deck (Part No. 93-4691)



On Front Deck Hanger (Part No. 93-4690)



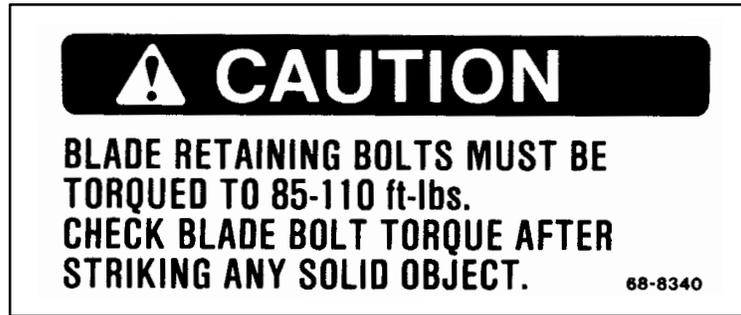
On Deck Channels, Under Covers (Part No. 93-7814)
Replaces Decal Part No. 85-6410 for CE

Safety and Instruction Decals (Rear Discharge 72" Cutting Unit)

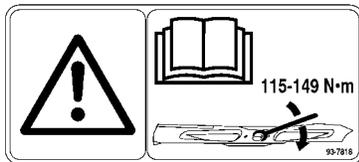
The following safety and instruction decals are mounted on the cutting unit. If any decal becomes damaged or illegible, install a new decal. Part numbers are listed below or in your parts catalog.



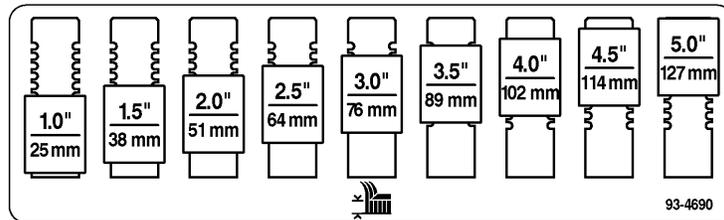
On Gearbox Base
(Part No. 93-6697)



On Front of Deck
(Part No. 68-8340)



On Front of Deck
(Part No. 93-7818)
Replaces Decal Part No.
68-8340 for CE



On Front Deck Hanger
(Part No. 93-4690)



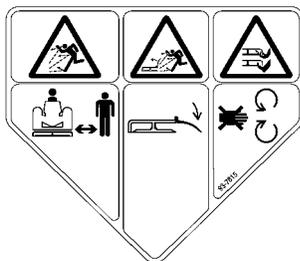
On Each Corner Of
Deck
(Part No. 43-8480)



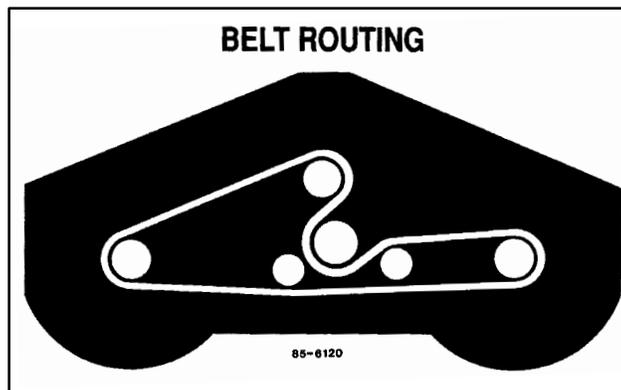
On Left Caster Arm
(Part No. 93-0299)



On Deck Channels, Under Covers
(Part No. 93-7814)
Replaces Decal Part No. 85-6410 for CE



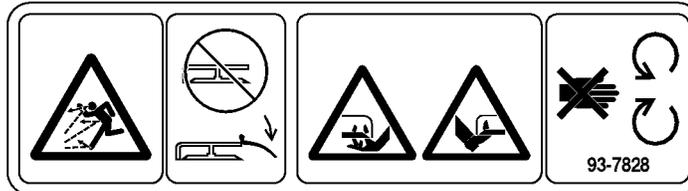
On Each Corner Of
Deck
(Part No. 93-7815)
Replaces Decal Part No.
43-8480 for CE



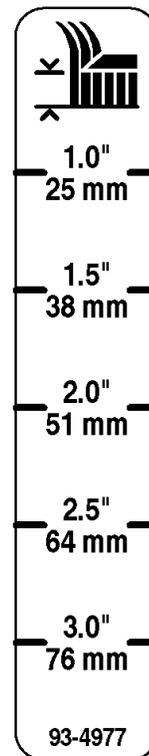
On Right Rear Top of Deck Under Cover
(Part No. 85-6120)



On Front of Deck
(Part No. 66-6380)



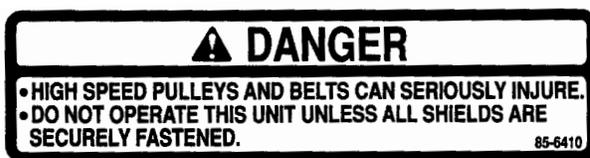
On Rear Of Deck
(Part No. 93-7828)
Replaces Decal Part No.
66-6380 for CE



On Rear Of Deck
(Part No. 93-4977)



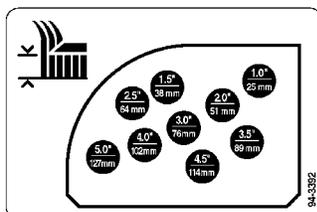
On Front of Deck
(Part No. 66-1340)



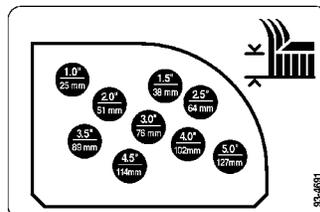
On Deck Channels, Under Covers
(Part No. 85-6410)



On Front Of Deck
(Part No. 93-7824)
Replaces Decal Part No.
66-1340 for CE



On Right Rear Top of Deck
(Part No. 94-3392)



On left Rear Top of Deck
(Part No. 93-4691)



On Front of Deck
(Part No. 88-1270)



Product Records and Maintenance

Product Records and Maintenance

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Product Records

Record information about your Groundsmaster 3000 or 3000–D on the OPERATION AND SERVICE HISTORY REPORT form. Use this information when referring to your machine.

Insert Operator’s Manuals and Parts Catalogs for your Groundsmaster 3000 or 3000–D at the end of this section.

Decimal and Millimeter Equivalents

Fractions	Decimals	mm	Fractions	Decimals	mm			
	1/64	0.015625	— 0.397	33/64	0.515625	— 13.097		
1/32	—	0.03125	— 0.794	17/32	—	0.53125	— 13.494	
	3/64	0.046875	— 1.191	35/64	—	0.546875	— 13.891	
1/16	—	0.0625	— 1.588	9/16	—	0.5625	— 14.288	
	5/64	0.078125	— 1.984	37/64	—	0.578125	— 14.684	
	3/32	—	0.9375	— 2.381	19/32	—	0.59375	— 15.081
	7/64	0.109275	— 2.778	39/64	—	0.609375	— 15.478	
1/8	—	0.1250	— 3.175	5/8	—	0.6250	— 15.875	
	9/64	0.140625	— 3.572	41/64	—	0.640625	— 16.272	
	5/32	—	0.15625	— 3.969	21/32	—	0.65625	— 16.669
	11/64	0.171875	— 4.366	43/64	—	0.671875	— 17.066	
3/16	—	0.1875	— 4.762	11/16	—	0.6875	— 17.462	
	13/64	0.203125	— 5.159	45/64	—	0.703125	— 17.859	
	7/32	—	0.21875	— 5.556	23/32	—	0.71875	— 18.256
	15/64	0.234375	— 5.953	47/64	—	0.734375	— 18.653	
1/4	—	0.2500	— 6.350	3/4	—	0.7500	— 19.050	
	17/64	0.265625	— 6.747	49/64	—	0.765625	— 19.447	
	9/32	—	0.28125	— 7.144	25/32	—	0.78125	— 19.844
	19/64	0.296875	— 7.541	51/64	—	0.796875	— 20.241	
5/16	—	0.3125	— 7.938	13/16	—	0.8125	— 20.638	
	21/64	0.328125	— 8.334	53/64	—	0.828125	— 21.034	
	11/32	—	0.34375	— 8.731	27/32	—	0.84375	— 21.431
	23/64	0.359375	— 9.128	55/64	—	0.859375	— 21.828	
3/8	—	0.3750	— 9.525	7/8	—	0.8750	— 22.225	
	25/64	0.390625	— 9.922	57/64	—	0.890625	— 22.622	
	13/32	—	0.40625	— 10.319	29/32	—	0.90625	— 23.019
	27/64	0.421875	— 10.716	59/64	—	0.921875	— 23.416	
7/16	—	0.4375	— 11.112	15/16	—	0.9375	— 23.812	
	29/64	0.453125	— 11.509	61/64	—	0.953125	— 24.209	
	15/32	—	0.46875	— 11.906	31/32	—	0.96875	— 24.606
	31/64	0.484375	— 12.303	63/64	—	0.984375	— 25.003	
1/2	—	0.5000	— 12.700	1	—	1.000	— 25.400	
	1 mm = 0.03937 in.			0.001 in. = 0.0254 mm				

U.S to Metric Conversions

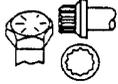
	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces (Avdp.)	Grams	28.3495
Pressure	Pounds/Sq. In.	Kilopascal	6.895
	Pounds/Sq. In.	Bar	0.069
Work	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flow	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subtract 32°
			2. Multiply by 5/9

Torque Specifications

Use these torque values when specific torque values are not given. DO NOT use these values in place of

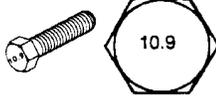
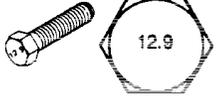
specified values. Torque values listed are for lubricated threads. Plated threads are considered to be lubricated.

Capscrew Markings and Torque Values - U.S. Customary

SAE Grade Number	5				8			
Capscrew Head Markings								
Capscrew Body Size	Capscrew Torque - Grade 5				Capscrew Torque - Grade 8			
	Cast Iron		Aluminum		Cast Iron		Aluminum	
	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm
1/4-20 -28	7 9	9 12	6 7	8 9	11 13	15 18	9 10	12 14
5/16-18 -24	15 17	20 23	12 14	16 19	22 24	30 33	18 19	24 25
3/8-16 -24	30 30	40 40	20 25	25 35	40 45	55 60	30 35	40 45
7/16-14 -20	45 50	60 65	35 40	45 55	65 70	90 95	50 55	65 75
1/2-13 -20	70 75	95 100	55 60	75 80	95 110	130 150	75 90	100 120
9/16-12 -18	100 110	135 150	80 85	110 115	140 155	190 210	110 125	150 170
5/8-11 -18	135 155	180 210	110 120	150 160	190 215	255 290	150 170	205 230
3/4-10 -16	240 270	325 365	190 210	255 285	340 380	460 515	270 300	365 410
7/8-9 -14	360 390	490 530	280 310	380 420	550 610	745 825	440 490	600 660
1-8 -14	530 590	720 800	420 480	570 650	820 890	1100 1200	660 710	890 960

Product Records and Maintenance

Capscrew Markings and Torque Values – Metric

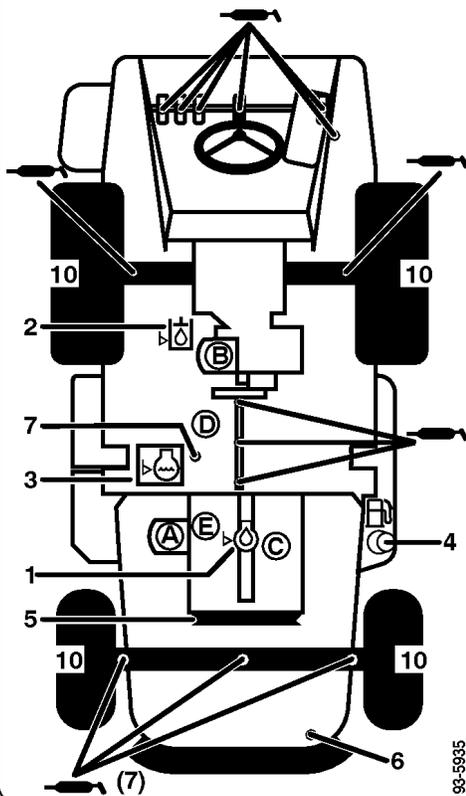
Commercial Steel Class	8.8				10.9				12.9			
Capscrew Head Markings												
Thread Diameter mm	Capscrew Torque - Class 8.8				Capscrew Torque - Class 10.9				Capscrew Torque - Class 12.9			
	Cast Iron		Aluminum		Cast Iron		Aluminum		Cast Iron		Aluminum	
	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm	ft-lb	Nm
6	5	9	4	7	9	14	7	11	9	14	7	11
7	9	14	7	11	14	18	11	14	18	23	14	18
8	18	25	14	18	23	32	18	25	27	36	21	28
10	30	40	25	30	45	60	35	45	50	70	40	55
12	55	70	40	55	75	105	60	80	95	125	75	100
14	85	115	65	90	120	160	95	125	145	195	110	150
16	130	180	100	140	175	240	135	190	210	290	165	220
18	170	230	135	180	240	320	185	250	290	400	230	310

GROUNDMASTER 3000 QUICK REFERENCE AID



CHECK/SERVICE (DAILY)

1. ENGINE OIL LEVEL
2. HYDRAULIC FLUID LEVEL
3. ENGINE COOLANT LEVEL
4. FUEL - GASOLINE ONLY
5. FAN BELT TENSION
6. RADIATOR SCREEN
7. AIR CLEANER
8. BRAKE FUNCTION
9. INTERLOCK SYSTEM
10. TIRE PRESSURE - 15 PSI / 1.05 BAR
11. GREASE POINTS (18)



SPECIFICATIONS/CHANGE INTERVALS

SEE OPERATOR'S MANUAL FOR INITIAL CHANGES.	FLUID TYPE	CAPACITY	CHANGE INTERVAL		FILTER PART NO.
			FLUID	FILTER	
ENGINE OIL	10W-30 SG	3.5 QUARTS	100 HOURS	100 HOURS	*FL-400A(A)
HYDRAULIC FLUID	MOBIL 424	12 QUARTS	800HOURS	800HOURS	94-3951 (B)
INTERLOCK SWITCHES			2 YEARS		
SPARK PLUGS			400 HOURS	*AGRF22*AGRF22C (C)	
COOLANT HOSES			1000 HOURS		
AIR CLEANER				1000 HOURS	94-1412 (D)
FUEL	UNLEADED	12 GALLONS	800 HOURS	400 HOURS	*FG795A(E)
ENGINE COOLANT	50/50 WATER ETHYLENE-GLYCOL	9 QUARTS	DRAIN AND FLUSH, 1500 HOURS OR 2 YEARS, WHICHEVER OCCURS FIRST		

93-5935

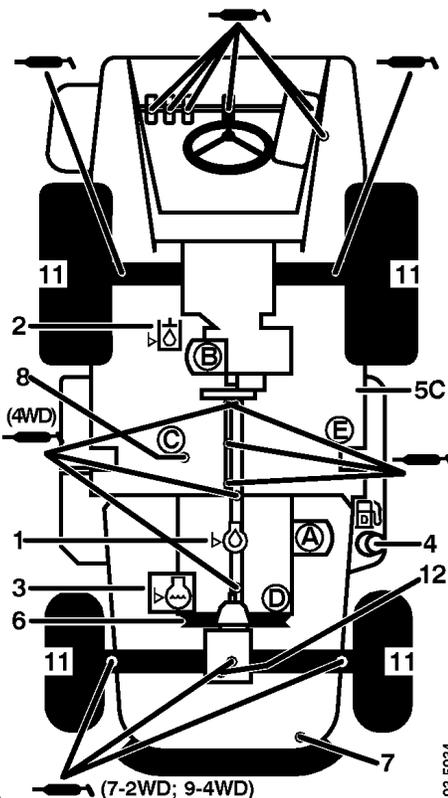
* MOTOCRAFT PART NUMBERS ** - DO NOT USE BIODEGRADABLE OIL IN TRANSAXLE

GROUNDMASTER 3000-D QUICK REFERENCE AID



CHECK/SERVICE (DAILY)

1. ENGINE OIL LEVEL
2. HYDRAULIC FLUID LEVEL
3. ENGINE COOLANT LEVEL
4. FUEL - DIESEL ONLY
5. FUEL/WATER SEPARATOR
6. FAN BELT TENSION
7. RADIATOR SCREEN
8. AIR CLEANER
9. BRAKE FUNCTION
10. INTERLOCK SYSTEM
11. TIRE PRESSURE - 15 PSI / 1.05 BAR
12. REAR AXLE OIL LEVEL - (4WD ONLY)
13. GREASE POINTS (2WD-18, 4WD-23)



SPECIFICATIONS/CHANGE INTERVALS

SEE OPERATOR'S MANUAL FOR INITIAL CHANGES.	FLUID TYPE	CAPACITY	CHANGE INTERVAL		FILTER PART NO.
			FLUID	FILTER	
ENGINE OIL	15W-40 CE	4.75 QUARTS	100 HOURS	100 HOURS	74-7970(A)
HYDRAULIC FLUID	MOBIL 424	12 QUARTS	800HOURS	800 HOURS	94-3951(B)
REAR AXLE - 4WD	MOBIL 424	1 QUART	400HOURS		
INTERLOCK SWITCHES			2 YEARS		
COOLANT HOSES			1000 HOURS		
AIR CLEANER ELEMENT				1000 HOURS	94-1412(C)
TIMING BELT			1500 HOURS		93-5720(D)
FUEL SYSTEM	> 32° F	NO. 2 DIESEL	800 HOURS	400 HOURS	76-5220(E)
	< 32° F	NO. 1 DIESEL	DRAIN/FLUSH		
ENGINE COOLANT	50% 93-7213 50% WATER	11.5 QUARTS	DRAIN & FLUSH, 1500 HOURS OR 2 YEARS, WHICHEVER OCCURS FIRST		

93-5934

* - DO NOT USE BIODEGRADABLE OIL IN TRANSAXLE OR 4WD AXLE

Lubrication

Traction Unit

 CAUTION
Before servicing or making adjustments to the machine, stop engine and remove key from the switch.

The machine 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 or immediately after every washing.

The grease fitting locations and quantities are:

2 Wheel Drive Models only—Steering cylinder ball joint, Rear axle tie rod (2), Rear axle pivot (1) Rear Spindle Shafts (2) (Fig. 1).

4 Wheel Drive Models only—Steering cylinder ball joints, Rear axle tie rod (2), Rear axle pivot (1), Double Cardan joints (2 ea. side) (Fig. 2) and Rear Drive Shaft (3) (Fig.3)

All Models—Intermediate Drive Shaft (3) (Fig. 4); Pedal Pivots (5), Traction pedal (In square tube under floor plate) (1) (Fig. 5) and Lift arm pivot (2) (Fig. 6).

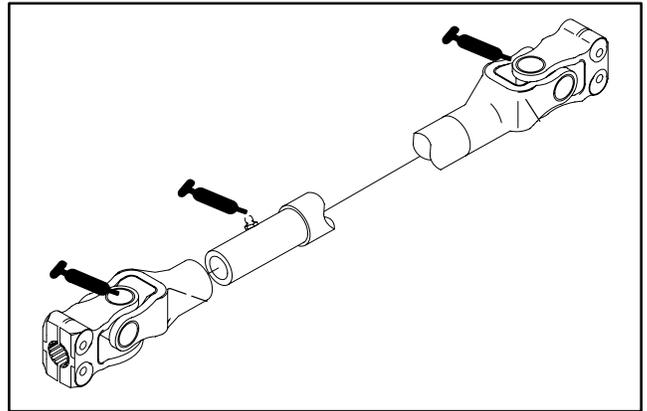


Figure 3

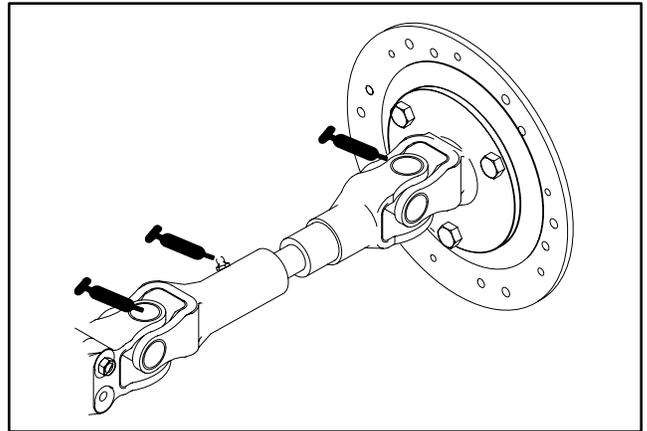


Figure 4



Figure 1

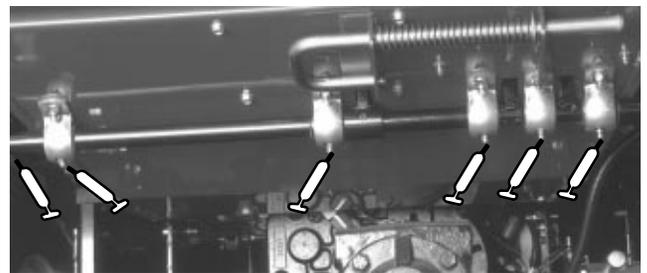


Figure 5

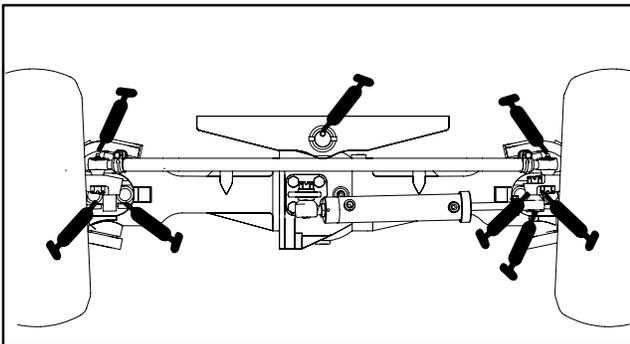


Figure 2



Figure 6

Product Records and Maintenance

Cutting Units

If machine is operated under normal conditions, lubricate castor bearings and bushings with No. 2 general purpose lithium base grease or molybdenum base grease, after every 8 hours of operation or daily, whichever comes first. Lubricate fittings immediately after every washing, regardless of the interval listed.



CAUTION

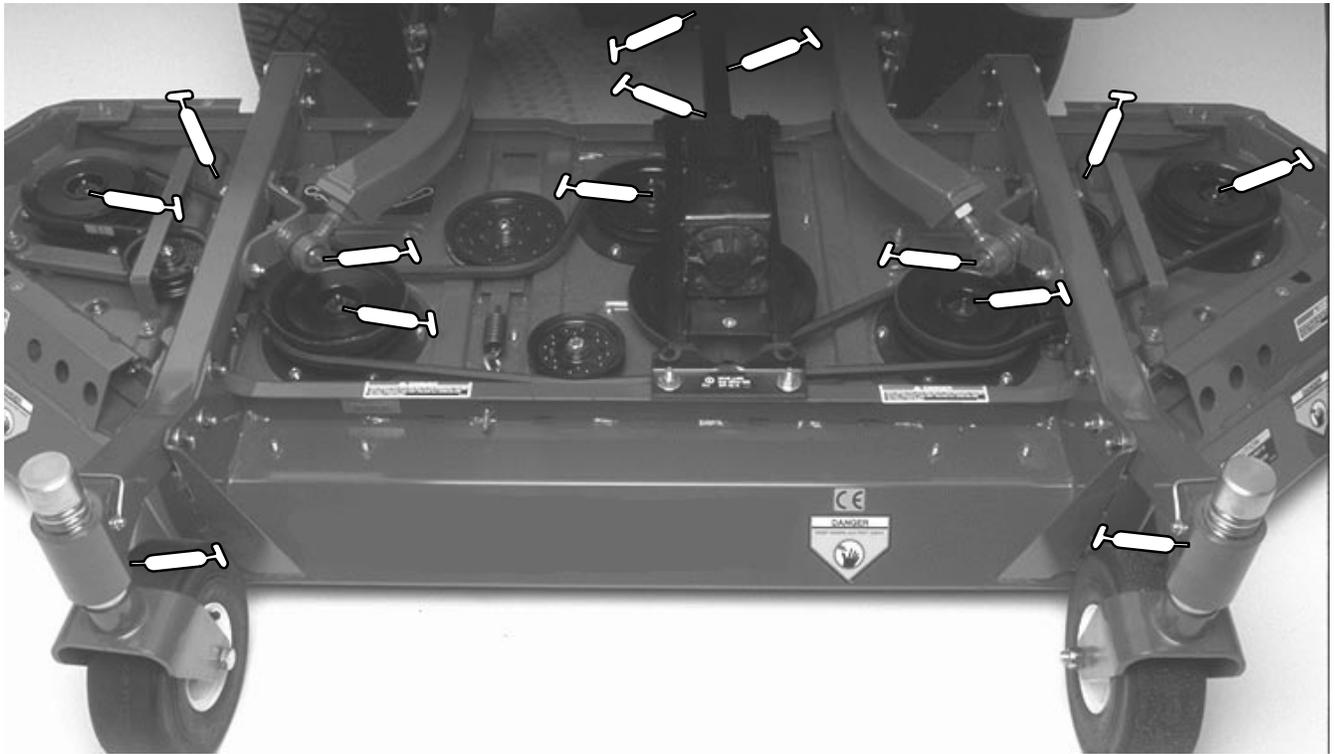
Before servicing or making adjustments to the machine, stop engine and remove key from the switch.

Guardian 84" Recycler Cutting Unit



Figure 7

Rear Discharge 84" Cutting Unit



Product Records
and Maintenance

Figure 8

Contour 82" Cutting Unit

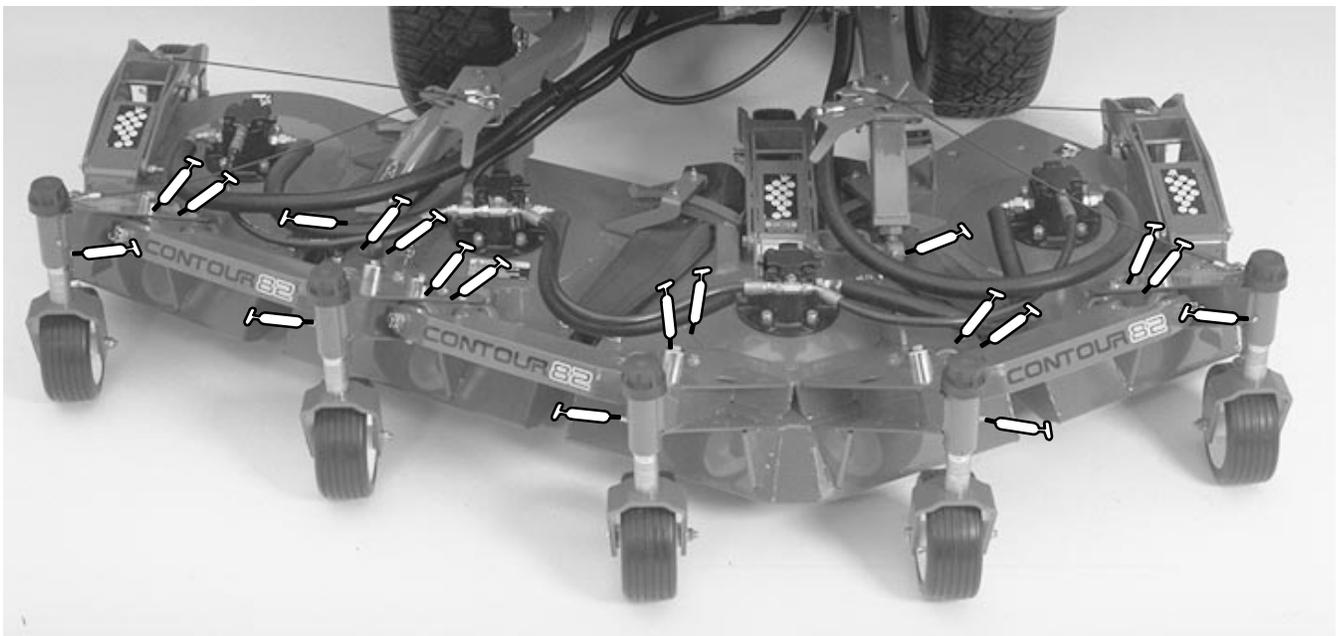


Figure 9

Guardian 72" Recycler Cutting Unit



Figure 10

Rear Discharge 72" Cutting Unit

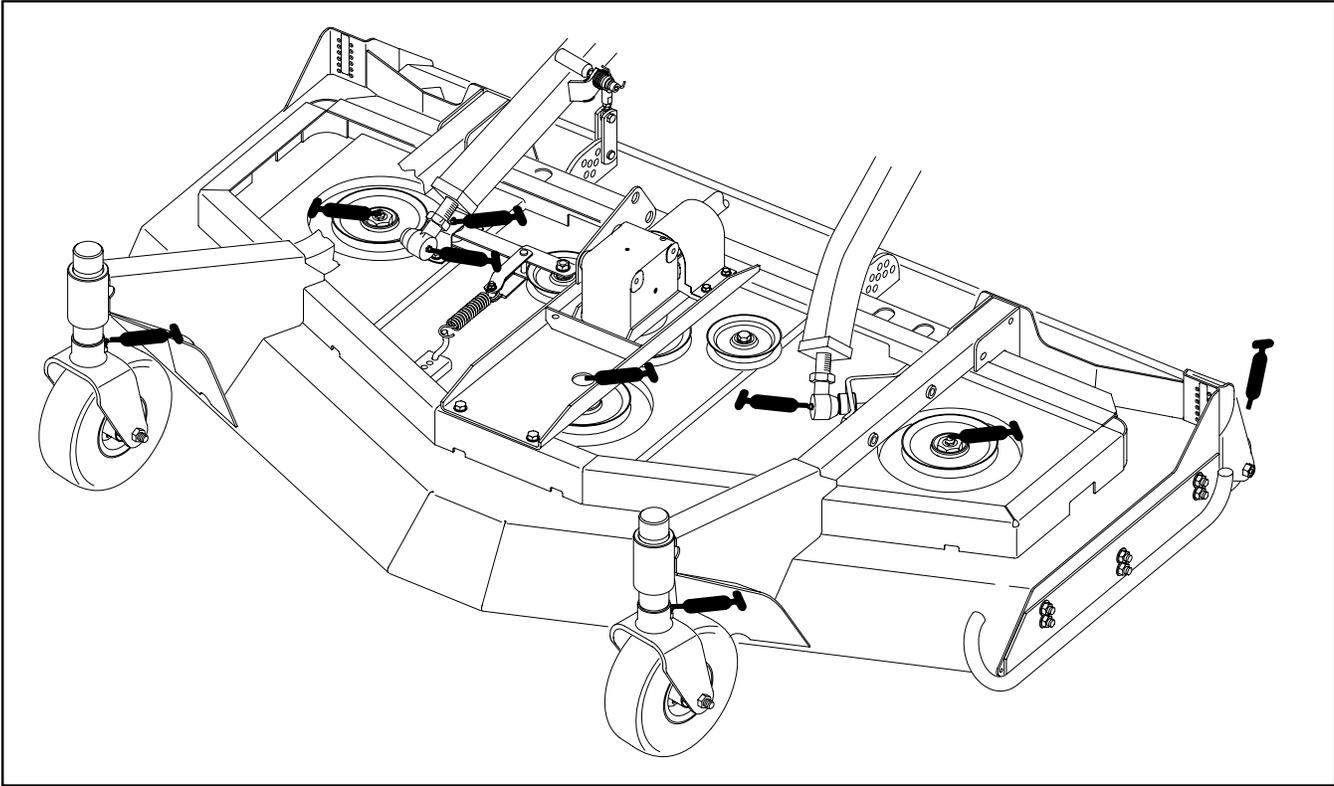


Figure 11



EQUIPMENT OPERATION AND SERVICE HISTORY REPORT
for
GROUNDMASTER® 3000

TORO Model and Serial Number: _____-_____

Engine Numbers: _____

Transmission Numbers: _____

Drive Axle(s) Numbers: _____

Date Purchased: _____ Warranty Expires _____

Purchased From: _____

Contacts: Parts _____ Phone _____

 Service _____ Phone _____

 Sales _____ Phone _____

Groundsmaster® 3000 Daily Maintenance Check List

Unit Designation: _____

TORO ID #: _____-_____

Daily Maintenance: (duplicate this page for routine use)

Check proper section of Operator's Manual for fluid specifications

Maintenance Check Item ▼	Daily Maintenance Check For Week Of _____						
	MON	TUES	WED	THURS	FRI	SAT	SUN
✓ Safety Interlock Operation							
✓ Brake Operation							
✓ Engine Oil & Fuel Level							
✓ Cooling System Fluid Level							
✓ Radiator & Screen for Debris							
✓ Unusual Engine Noises							
✓ Unusual Operating Noises							
✓ Hydraulic System Oil Level							
✓ Hydraulic Hoses for Damage							
✓ Fluid Leaks							
✓ Tire Pressure							
✓ Instrument Operation							
Lubricate All Grease Fittings ¹							
Touch-up Damaged Paint							

¹= Immediately after every washing, regardless of the interval listed.

Notation for areas of concern: Inspection performed by _____

Item	Date	Information
1		
2		
3		
4		
5		
6		
7		
8		

Product Records and Maintenance

Groundsmaster® 3000 Supervisor Maintenance Work Order

Date: _____

(Duplicate this page for routine use.)

Unit Designation:	TORO I.D. #: _____
Hours:	Service to perform (circle):
Technician:	A B C D E Other
Remarks:	

A – Service (every 50 hours)

- Lubricate All Grease Fittings
- Inspect Air Filter
- Check Battery Level/Cable Connections
- Check Cutting Unit Gearbox Oil Level
- Clean Under Cutting Unit Belt Covers
- Check Cutting Unit Drive Belt Adjustment
- _____
- _____
- _____

B – Service (every 100 hours)

- Change Engine Oil and Filter
- Inspect Cooling System Hoses
- Check Tension of all drive belts
- A – Service Required**
- _____
- _____
- _____
- _____
- _____

C – Service (every 200 hours)

- Torque Wheel Lug Nuts
- Check Governor Oil Level
- Service Spark Arrestor Muffler
- A and B – Service Required**
- _____
- _____

D – Service (every 400 hours)

- Service Air Filter
- Change Fuel Filter
- Inspect Fuel Lines and Connections
- Change Spark Plugs
- Check Engine RPM (idle & Full Throttle)
- Torque Head Bolts and Adjust Valves
- Change Cutting Unit Gearbox Oil
- A, B and C – Service Required**
- _____

E – Service (every 800 hours)

- Drain and Clean Fuel Tank
- Pack Rear Axle Bearings
- Check Rear Wheel Toe-In
- Change Hydraulic Oil
- Change Hydraulic Filter
- A, B, C, and D – Service Required**
- _____
- _____
- _____

Other – Annual Service & Specials

- Replace Moving Hoses
- Replace Safety Switches
- Cooling System Flush/Replace Fluid
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

(See Operator's and Service Manual for specifications and procedures.)



EQUIPMENT OPERATION AND SERVICE HISTORY REPORT
for
GROUNDMASTER® 3000-D

TORO Model and Serial Number: _____-_____

Engine Numbers: _____

Transmission Numbers: _____

Drive Axle(s) Numbers: _____

Date Purchased: _____ Warranty Expires _____

Purchased From: _____

Contacts: Parts _____ Phone _____

 Service _____ Phone _____

 Sales _____ Phone _____

Groundsmaster® 3000–D Maintenance Schedule

Minimum Recommended Maintenance Intervals

Maintenance Procedure	Maintenance Interval & Service				
<div style="border: 1px solid black; padding: 5px;"> Lubricate All Grease Fittings Inspect Air Filter Check Battery Level/Cable Connections Check Cutting Unit Gearbox Oil Level Clean Under Cutting Unit Belt Covers Check Cutting Unit Drive Belt Adjustment </div>	Every 50hrs	Every 100hrs	Every 200hrs	Every 400hrs	Every 800 hrs
‡ Change Engine Oil and Filter Inspect Cooling System Hoses † Check Fan and Alternator Belt Tension	<i>A Level Service</i>				
† Torque Wheel Lug Nuts			<i>C Level Service</i>		
Service Air Filter Change Fuel Filter Inspect Fuel Lines and Connections ‡ Check Engine RPM (idle and full throttle) Check Rear Axle Oil Level (4wd) Change Cutting Unit Gearbox Oil <input type="checkbox"/> Change Rear Axle Oil (4wd)			<i>D Level Service</i>		
<input type="checkbox"/> Change Hydraulic Oil (see note below) <input type="checkbox"/> Change Hydraulic Oil Filter (see note below) Inspect Engine Timing Belt (see note below) Drain and Clean Fuel Tank Pack 2WD Rear Axle Bearings Check Rear Wheel Toe-In			<i>E Level Service</i>		
† Initial break in at 10 hours					
‡ Initial break in at 50 hours					
<input type="checkbox"/> Initial break in at 200 hours					
Replace Moving Hoses Replace Safety Switches Cooling System Flush/Replace Fluid	Annual Recommendations: Items listed are recommended every 1500 hours or 2 years, whichever occurs first.				

(See Operator's Manual for specifications and procedures.)

NOTE: Replace Timing Belt after every 1500 hours of operation or if worn, cracked, oil soaked or any time the Belt is removed or loosened.

NOTE: Replace Hydraulic Oil and Filter every 400 hours of operation if machine is equipped with Model 30726 Auxiliary Hydraulic Kit.

Groundsmaster® 3000–D Daily Maintenance Check List

Unit Designation: _____

TORO ID #: _____-_____

Daily Maintenance: (duplicate this page for routine use)

Check proper section of Operator’s Manual for fluid specifications

Maintenance Check Item ▼	Daily Maintenance Check For Week Of _____						
	MON	TUES	WED	THURS	FRI	SAT	SUN
✓ Safety Interlock Operation							
✓ Brake Operation							
✓ Engine Oil & Fuel Level							
✓ Cooling System Fluid Level							
Drain Water/Fuel Separator							
✓ Radiator & Screen for Debris							
✓ Unusual Engine Noises ¹							
✓ Unusual Operating Noises							
✓ Hydraulic System Oil Level							
✓ Hydraulic Hoses for Damage							
✓ Fluid Leaks							
✓ Tire Pressure							
✓ Instrument Operation							
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.

Notation for areas of concern: Inspection performed by _____

Item	Date	Information
1		
2		
3		
4		
5		
6		
7		
8		

Product Records and Maintenance

Groundsmaster® 3000-D Supervisor Maintenance Work Order

Date: _____

(Duplicate this page for routine use.)

Unit Designation:	TORO I.D. #: _____
Hours:	Service to perform (circle): A B C D E Other
Technician:	_____

Remarks:

A – Service (every 50 hours)

- Lubricate All Grease Fittings
- Inspect Air Filter
- Check Battery Level/Cable Connections
- Check Cutting Unit Gearbox Oil Level
- Clean Under Cutting Unit Belt Covers
- Check Cutting Unit Drive Belt Adjustment
- _____
- _____
- _____

B – Service (every 100 hours)

- Change Engine Oil and Filter
- Inspect Cooling System Hoses
- Check Fan and Alternator Belt Tension
- A-Level Service Required**
- _____
- _____
- _____
- _____
- _____

C – Service (every 200 hours)

- Torque Wheel Lug Nuts
- A and B – Service Required**
- _____
- _____

D – Service (every 400 hours)

- Service Air Filter
- Change Fuel Filter
- Inspect Fuel Lines and Connections
- Check Engine RPM (Idle & Full Throttle)
- Check Rear Axle Oil Level (4WD)
- Change Cutting Unit Gearbox Oil
- Change Rear Axle Oil (4WD)
- A, B, and C – Service Required**
- _____

E – Service (every 600 hours)

- Inspect Timing Belt
- Drain and Clean Fuel Tank
- Pack 2WD Rear Axle Bearings
- Check Rear Wheel Toe-In
- Hyd. Oil (see note on Maint. Sched.)
- Hyd. Filter (see note on Maint. Sched.)
- A, B, C, and D – Service Required**
- _____
- _____

Other – Annual Service & Specials

- Replace Moving Hoses
- Replace Safety Switches
- Cooling System Flush/Replace Fluid
- Timing Belt (see note on Maint. Sched.)
- _____
- _____
- _____
- _____

(See Operator's and Service Manual for specifications and procedures.)



Ford VSG-411 Engine

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Ford Gasoline
Engine

General Information

The engine used in the Groundsmaster 3000 is manufactured by Ford Motor Company. Order service and repair parts for Ford engines from you local Ford Power Products Dealer. See the Ford VSG-411/413 Engine Service Manual for engine identification information.

Specifications

Item	Specification																				
Make / Designation	Ford Model VSG-411																				
Firing Order	1-2-4-3																				
Ignition Timing	Distributorless Ignition System (DIS) Timing controlled by Universal Electronic Spark Control (UESC)																				
Spark Plug	Motorcraft AGSF22C or AGRF22 or equivalent																				
Spark Plug Gap	0.040 in. (1.0 mm)																				
Crankcase Oil Capacity	3.5 U.S. qt. (3.25 liter) including filter																				
Oil Service Classification	API SG																				
Oil Viscosity	<table border="0"> <tr> <td>Ambient temperature</td> <td>(single viscosity oil)</td> </tr> <tr> <td>-10 to +60°F</td> <td>SAE 10</td> </tr> <tr> <td>+10° to +90°F</td> <td>SAE 20</td> </tr> <tr> <td>Above +32°F</td> <td>SAE 30</td> </tr> <tr> <td>Above +50°F</td> <td>SAE 40</td> </tr> <tr> <td>Ambient temperature</td> <td>(multi-viscosity oil)</td> </tr> <tr> <td>Below +60°F</td> <td>SAE 5W-30</td> </tr> <tr> <td>-10 to +90°F</td> <td>SAE 10W-30</td> </tr> <tr> <td>Above -10°F</td> <td>SAE 10W-40 or 10W50</td> </tr> <tr> <td>Above +10°F</td> <td>SAE 20W40 or 20W50</td> </tr> </table>	Ambient temperature	(single viscosity oil)	-10 to +60°F	SAE 10	+10° to +90°F	SAE 20	Above +32°F	SAE 30	Above +50°F	SAE 40	Ambient temperature	(multi-viscosity oil)	Below +60°F	SAE 5W-30	-10 to +90°F	SAE 10W-30	Above -10°F	SAE 10W-40 or 10W50	Above +10°F	SAE 20W40 or 20W50
Ambient temperature	(single viscosity oil)																				
-10 to +60°F	SAE 10																				
+10° to +90°F	SAE 20																				
Above +32°F	SAE 30																				
Above +50°F	SAE 40																				
Ambient temperature	(multi-viscosity oil)																				
Below +60°F	SAE 5W-30																				
-10 to +90°F	SAE 10W-30																				
Above -10°F	SAE 10W-40 or 10W50																				
Above +10°F	SAE 20W40 or 20W50																				
Fuel	Unleaded gasoline 87 octane or higher																				
Coolant	50 / 50 ethylene glycol anti-freeze and water																				
Cooling System Capacity	9 U.S. qt. (8.5 liter)																				
Carburetor Idle Speed Setting (throttle arm against stop)	1350 ± 50 RPM																				
Governor Idle Speed Setting	1500 ± 50 RPM																				
Governor High Speed Setting	3150 ± 100 RPM																				

Adjustments

Belt Adjustments

Check condition and tension of belts after every 100 hours of operation. Replace belts as required.

Alternator Belt

The alternator belt should be tensioned so when it is pressed firmly with thumb, midway between pulleys, it deflects .25 inch (6.4 mm).

1. To adjust belt tension, loosen bolt securing brace to engine, bolt securing alternator to brace and alternator mounting bolt.
2. Rotate alternator away from engine.
3. Hold alternator in position after proper belt tension setting is achieved and tighten alternator and brace bolts to secure adjustment.

Cooling & Governor Fan Belts

The cooling and governor fan belts should be tensioned so when they are pressed firmly with thumb, midway between pulleys, they deflect .38 inch (9.7 mm).

1. To adjust belt tension, loosen upper and lower nuts securing idler arm to front engine mount.
2. Pull out on idler arm until desired belt tension is achieved.
3. Tighten mounting nuts to secure adjustment.

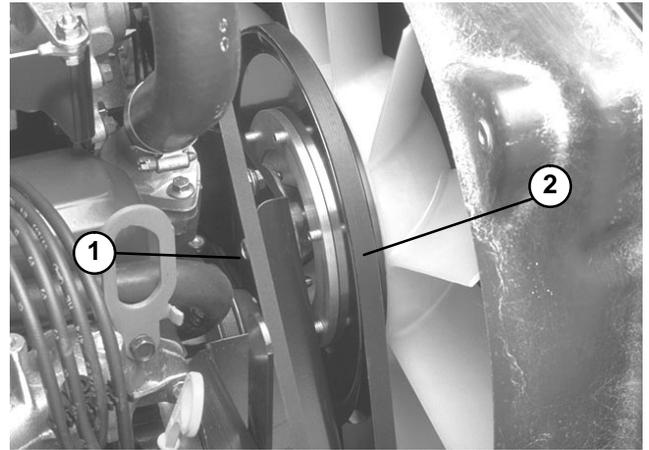


Figure 1

1. Cooling Fan Belt
2. Governor Fan Belt

Governor Adjustment

1. With engine shut off, move throttle control to FAST position and open hood. Check between the throttle arm and the stop on the carburetor base to make sure there is 1/32" (0.8 mm). If gap is not correct, adjust throttle rod by turning ball joint ends until gap is 1/32" (0.8 mm). If gap is correct, proceed to step 2.



WARNING

Engine must be running so final adjustment of the governor can be performed. To guard against possible personal injury, engage parking brake and keep hands, feet, face and other parts of the body away from fan or other moving parts.

2. Start engine and move throttle to SLOW position. Allow engine to warm up to normal operating temperature.

3. Rotate throttle arm closed until it contacts stop.

4. Check idle speed and adjust carburetor idle speed screw if necessary to attain 1350 ± 50 rpm.

5. Release throttle arm, loosen jam nut on governor low idle speed screw and adjust it to attain 1500 ± 100 rpm.

6. Slowly move throttle to FAST position until engine speed reaches 3150 ± 100 rpm. Shut off engine. Adjust high idle stop screw until it contacts speed control lever.

IMPORTANT: Do not over speed the engine because the transmission could be damaged.

7. Move throttle rapidly from SLOW to FAST. The engine should not surge. If engine surges, proceed to step 8.

8. Check V-belts from engine to governor pulley and assure they are tight. If belts are loose, the engine will surge. If belts are tensioned properly, loosen jam nut that retains the anti-surge screw. Rotate screw clockwise 1/8 turn at a time until surging stops. Should governor continue to surge, check the following:

- A. Carburetor too rich or too lean.
- B. Binding in throttle linkage.
- C. Governor worn internally.

IMPORTANT: Never rotate anti-surge screw in too far so that speed of engine increases.

9. Bump the throttle lever with your hand so engine speeds up momentarily. If governor is working properly, engine speed should return to normal within one or two surges of the governor. More than two surges of the governor usually indicates that the anti-surge screw must be turned in slightly more than it is. When adjustment is correct, lock jam nut against governor body.

10. Check low and high idle speed to be sure there is no change from the initial setting. If high idle speed has increased, anti-surge has been turned into the governor too far and it must be backed out. Then repeat the entire adjustment procedure.

Note: If the throttle control on the instrument panel will not stay in the FAST position during operation, remove the panel cover and tighten the nut at base of throttle lever assembly.

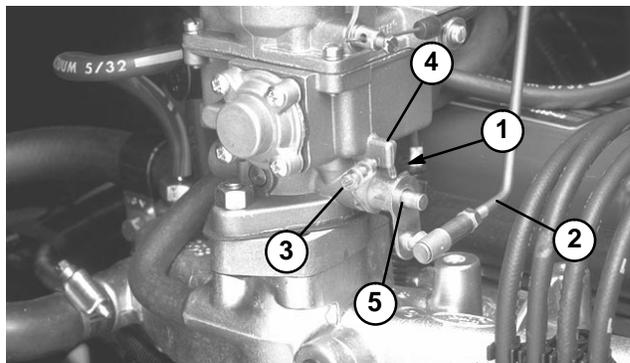


Figure 2

- 1. 1/32" (0.8 mm)
- 2. Throttle rod
- 3. Carburetor idle speed screw
- 4. Stop
- 5. Throttle arm

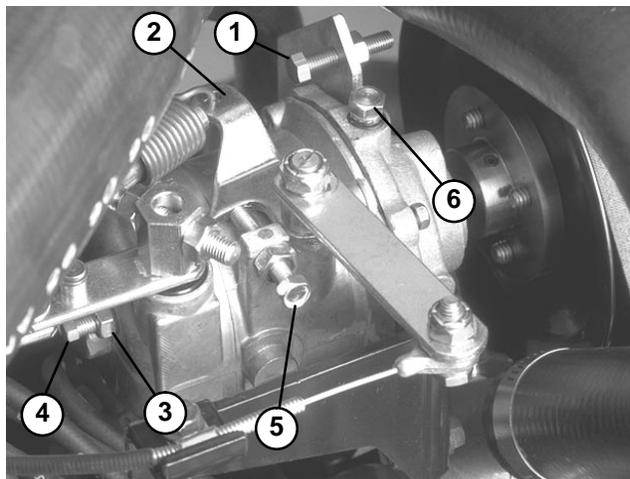


Figure 3

- 1. High idle stop screw
- 2. Speed control lever
- 3. Jam nut
- 4. Anti-surge screw
- 5. Low idle stop screw

Service and Repairs

Check Engine Oil

Crankcase capacity is 3–1/2 U.S. qt. (3.3 liter) with filter.

1. Park machine on a level surface. Rotate hood latch fully counterclockwise and open hood.
2. Remove dipstick and wipe it with a clean rag. Insert dipstick into tube and make sure it is fully seated. Remove dipstick and check level of oil. If level of oil is low, add enough oil to raise level to notch in dipstick. **DO NOT OVERFILL.**
3. Install dipstick into tube.
4. If oil level is low, clean area around oil fill cap, remove cap and add oil until level reaches FULL mark on dipstick. **DO NOT OVERFILL.**
5. The engine uses any high-quality detergent oil having the American Petroleum Institute—API—“service classification” SG. Oil viscosity—weight— must be selected according to ambient temperature. Temperature/viscosity recommendations are:

Single Viscosity Oils

Outside Temperature

–10°F to +60°F	SAE 10W
+10°F to +90°F	SAE 20W–20
Above +32°F	SAE 30
Above +50°F	SAE 40

Multi-Viscosity Oils

Outside Temperature

Below +60°F	SAE 5W–30
–10°F to +90°F	SAE 10W–30
Above –10°F	SAE 10W–40 or 10W50
Above +10°F	SAE 20W–40 or 20W50

IMPORTANT: Check level of oil after every 5 hours of operation or daily. Change oil after initial 50 hours and every 100 hours thereafter. Change oil and filter more frequently when engine is operated in extremely dusty or dirty conditions.

6. Install oil fill cap.
7. Close hood and secure latch.

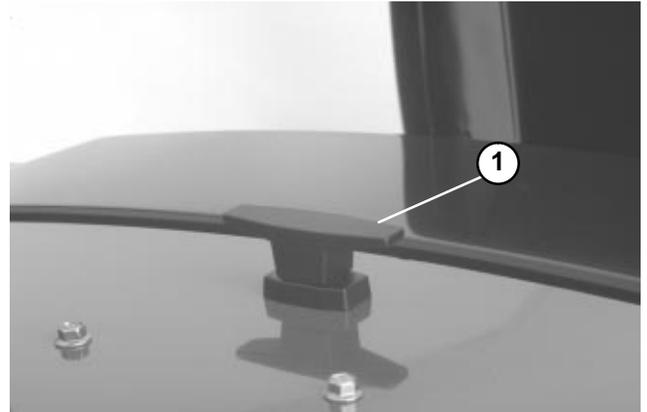


Figure 4
1. Hood Latch

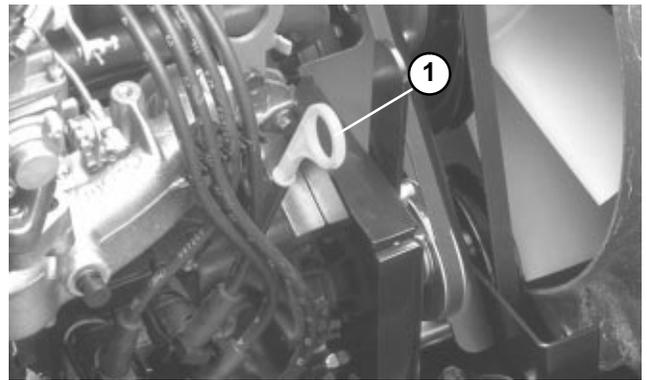


Figure 5
1. Dipstick

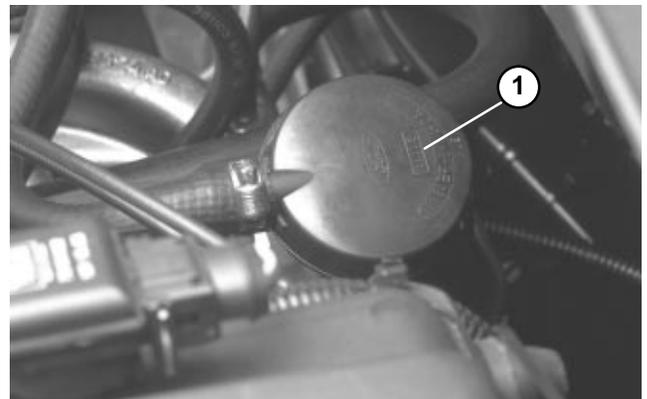


Figure 6
1. Oil Fill Cap

Change Engine Oil and Filter

Change oil and filter initially after the first 50 hours of operation, thereafter change oil and filter every 100 hours.

1. Remove drain plug (Fig. 7) and let oil flow into drain pan. When oil stops, install drain plug.
2. Remove oil filter (Fig. 8). Apply a light coat of clean oil to the new filter seal before screwing it on. **DO NOT OVER-TIGHTEN.**
3. Add oil to crankcase. Capacity is 3.5 U.S. quarts (3.3 liters) with filter. Refer to Check Engine Oil.

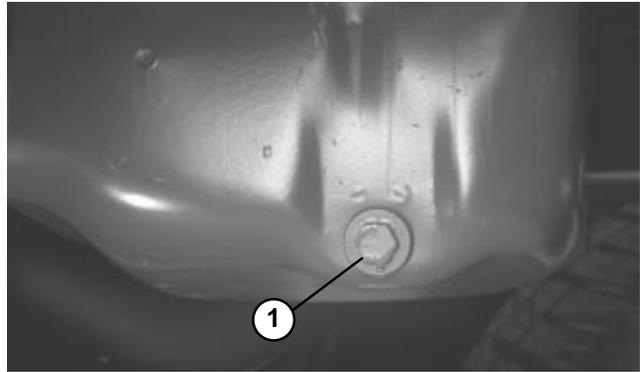


Figure 7

1. Drain Plug

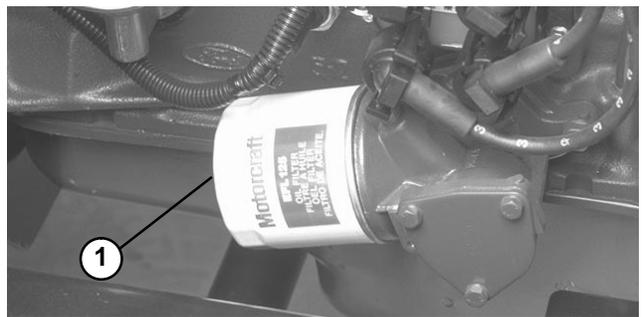


Figure 8

1. Oil Filter

Check Coolant

Capacity of system is 9 U.S. qt. (8.5 liters).

Clean debris off screen, oil cooler and radiator daily, hourly if conditions are extremely dusty and dirty; refer to Cleaning Radiator and Screen.

The cooling system is filled with a 50/50 solution of water and permanent ethylene glycol anti-freeze. Check level of coolant at beginning of each day before starting the engine.

1. Park machine on a level surface. Rotate hood latch fully counterclockwise and open hood.
2. Check coolant level. Coolant should be up to COLD line on reserve tank, when engine is cold.



CAUTION

If engine has been running, pressurized hot coolant can escape and cause burns if radiator cap is removed. Allow engine to cool at least 15 minutes or until the radiator cap is cool enough to touch without burning hand.

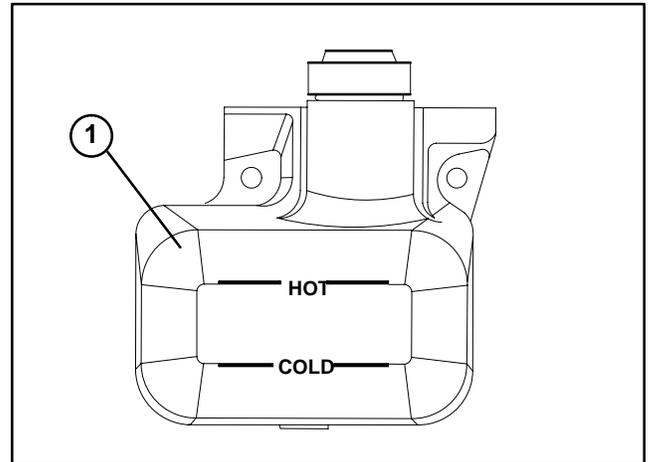


Figure 9
1. Reserve Tank

3. If coolant is low, remove reserve tank cap and add a 50/50 mixture of water and permanent ethylene glycol anti-freeze. **DO NOT OVERFILL.**
4. Install reserve tank cap.
5. Close hood and secure latch.

Cooling System Service

1. Removing Debris – Remove debris from rear screen, oil cooler and radiator daily, clean more frequently in dirty conditions.

IMPORTANT: Never spray water onto a hot engine as damage to engine may occur.

- A. Turn engine off and clean hood screen thoroughly.
- B. Release hood latch and raise hood. Clean engine area thoroughly of all debris.
- C. Clean both sides of oil cooler and radiator area thoroughly with compressed air. **Do not use water.**
- D. Close hood and secure latch.

Note: Do not use water to clean engine or electrical components, as damage may occur.

2. Maintaining Cooling System – Capacity of the system is 9 quarts (8.5 liters). Always protect cooling system with a 50/50 solution of water and permanent ethylene glycol anti-freeze. **DO NOT USE WATER ONLY IN COOLING SYSTEM.**

- A. After every 100 operating hours, inspect and tighten hose connections. Replace any deteriorated hoses.
- B. After every 2 years, drain and flush the cooling system. Add anti-freeze (refer to Check Cooling System).



Figure 10
1. Rear Screen

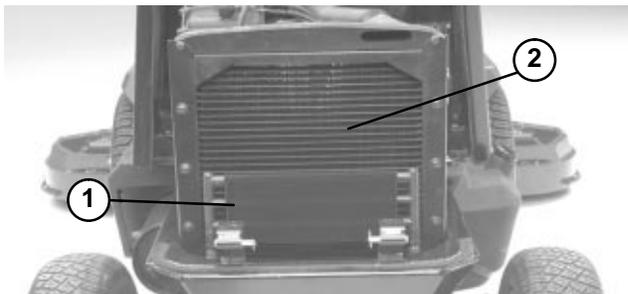


Figure 11
1. Oil Cooler
2. Radiator

General Air Cleaner Service

1. Inspect air cleaner after every 50 hours of operation. More frequent in dusty or dirty conditions.
2. Check air cleaner body for damage which could possibly cause an air leak. Replace a damaged air cleaner body.
3. Service the air cleaner filter every 400 hours (more frequently in extreme dusty or dirty conditions). Do not over service air filter.
4. Be sure cover is sealing around air cleaner body.



CAUTION

Never operate machine without complete air cleaner assembly in place and latched properly or a damaged air cleaner Debris entering engine can cause engine failure.

Service Air Cleaner

1. Release latches securing air cleaner cover to air cleaner body. Separate cover from body. Clean inside of air cleaner cover.
2. Gently slide filter (Fig. 13) out of air cleaner body to reduce the amount of dust dislodged. Avoid knocking filter against air cleaner body.

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

Washing Method

- A. Prepare a solution of filter cleaner and water and soak filter element about 15 minutes. Refer to directions on filter cleaner carton for complete information.
- B. After soaking filter for 15 minutes, rinse it with clear water. Maximum water pressure must not exceed 40 psi to prevent damage to the filter element. Rinse filter from clean side to dirty side.
- C. Dry filter element using warm, flowing air (160° F) max), or allow element to air-dry. Do not use a light bulb to dry the filter element because damage could result.

Compressed Air Method

- 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.
5. Inspect new filter for shipping damage. Check sealing end of filter. Do not install a damaged filter.
 6. 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.
 7. Reinstall cover and secure latches. Make sure cover is positioned with TOP side up.

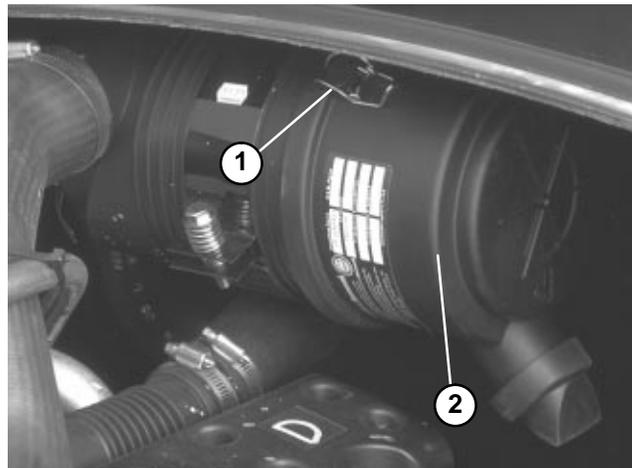


Figure 12

1. Air cleaner latches
2. Dust cup

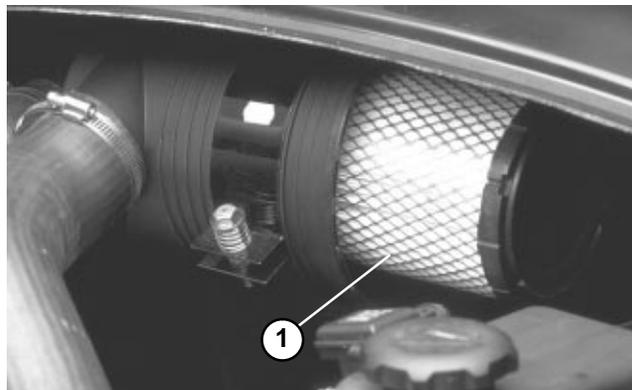


Figure 13

1. Air cleaner filter

Fuel System Service

Fuel Tank

Drain and clean fuel tank every 800 hours of 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 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.



DANGER

Because gasoline is flammable, caution must be used when storing or handling it. Do not fill fuel tank while engine is running, hot, or when machine is in an enclosed area. Vapors may build up and be ignited by a spark or flame source many feet away. **DO NOT SMOKE** while filling the fuel tank to prevent the possibility of an explosion. Always fill fuel tank outside and wipe up any spilled gasoline before starting engine. Use a funnel or spout to prevent spilling gasoline and fill tank to about 1 inch (25 mm) below the filler neck. Store gasoline in a clean, safety-approved container and keep the cap in place on the container. Keep gasoline in a cool, well-ventilated place, never in an enclosed area such as a hot storage shed. To assure volatility, do not buy more than a 6 month supply. Gasoline is a fuel for internal combustion engines; therefore, do not use it for any other purpose. Since many children like the smell of gas, keep it out of their reach because the fumes are explosive and dangerous to inhale.

Replacing Fuel Filter (Fig. 14)

Replace the fuel filter after every 400 hours of operation or yearly, whichever comes first.

1. Disconnect elbow fitting from rear of fuel filter.
2. Disconnect front of filter from elbow fitting.
3. Install new filter and connect fittings. Start engine and check for leaks.

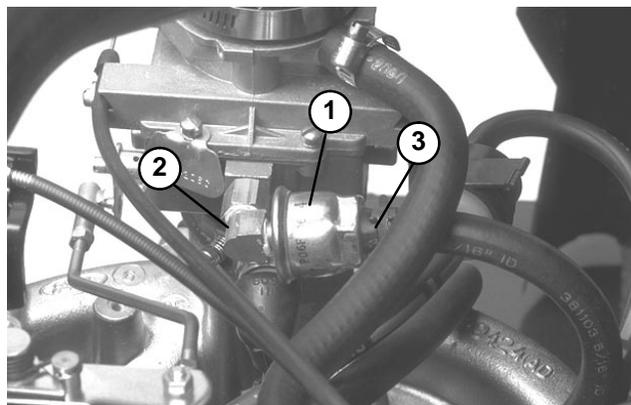


Figure 14

1. Fuel filter
2. Rear elbow
3. Front elbow

Replacing Spark Plugs

Change spark plugs after every 400 operating hours to assure proper engine performance and reduce exhaust emission level.

Correct spark plug to use is a Motorcraft-AGSF22C or AGRF22 or equivalent.

Recommended air gap is .040" (1.016 mm).

Note: The spark plug usually lasts a long time; however, the plug should be removed and checked whenever the engine malfunctions.

1. Clean area around spark plugs so foreign matter cannot fall into cylinder when spark plug is removed.
2. Pull spark plug wires off spark plugs and remove plugs from cylinder head.

3. Check condition of side electrode, center electrode, and center electrode insulator to assure there is no damage.

IMPORTANT: A cracked, fouled, dirty or otherwise malfunctioning spark plug must be replaced. Do not sand blast, scrape, or clean electrodes by using a wire brush because grit may eventually release from the plug and fall into the cylinder. The result is usually a damaged engine.

4. Set air gap between center and side of electrodes at .040" (1.016 mm). Install correctly gapped spark plug and tighten plug to 11–15 ft-lb. If torque wrench is not used, tighten plug firmly.
5. Install spark plug wires.

Check Governor Oil Level

The governor is shipped with oil in it, but the level of oil must be checked after every 250 hours of operation.

1. Position machine on level surface and shut engine off.
2. Disengage hood latch and open the hood.
3. Clean area around check plug on governor.
4. Remove check plug. Oil level must be up to bottom of filler hole. If oil level is low, remove oil fill plug and add same oil that is being used in engine. When oil is at point of overflowing out of check plug hole, install the check plug and fill plug.

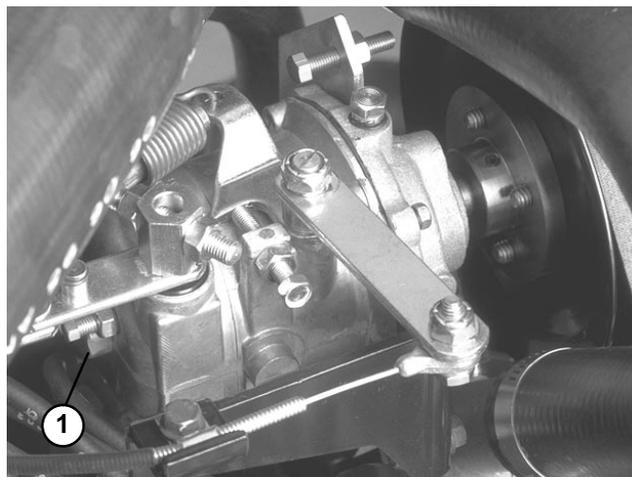


Figure 15
1. Oil check plug

Servicing Spark Arrestor Muffler

Every 200 hours operation, clear the muffler of carbon buildup.

1. Remove pipe plug from clean-out port at lower side of muffler.



CAUTION

Be careful while working around muffler as it may be hot and could cause injury.

2. Start engine. Plug the normal muffler exit with block of wood or metal plate so exhaust flow will be forced out of the clean-out port. Continue to block exit until carbon deposits cease coming out port.



CAUTION

Do not stand in line with the clean-out port. Always wear safety glasses.

3. Stop engine and replace pipe plug.



Peugeot TUD5 Engine

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Peugeot Diesel
Engine

Specifications

Item	Specification
Make / Designation	Peugeot TUD5 4 cycle, in-line, overhead cam, liquid cooled diesel engine
Governor Adjustment	High idle 2650 ± 50 RPM Low Idle 1500 ± 100 R(M
Oil	SAE 15W-40 CE
Oil capacity	4.75 U.S. qt. with filter (4.5 liters)
Coolant	50/50 mixture water and Peugeot recommended antifreeze (Toro Part No. 93-7213)
Coolant capacity	11.5 U.S. qt. (10.9 liters)

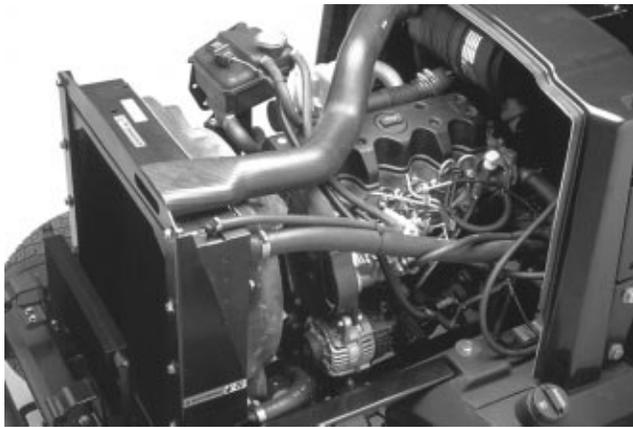


Figure 1

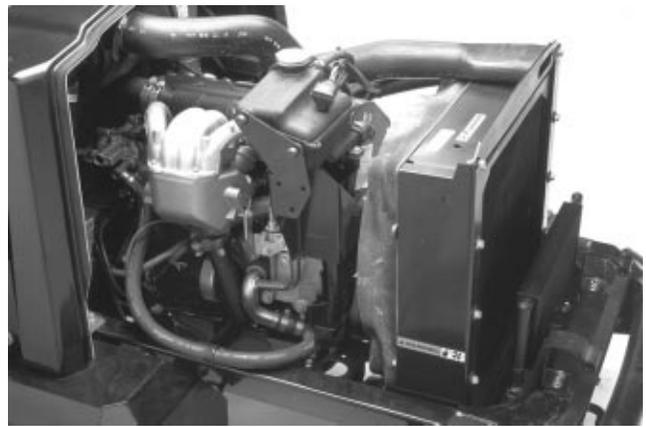


Figure 2

Special Tools

Compression Test Kit (TOR3003A)

0–1000 PSI Gauge allows testing of diesel engines to check general operating condition of engine.

Kit contains:

- Case
- Gauge with hose
- Glow plug hole adapters



Figure 3

Valve Spring Compression Tool (TOR4024T)

Use for removing valve springs.

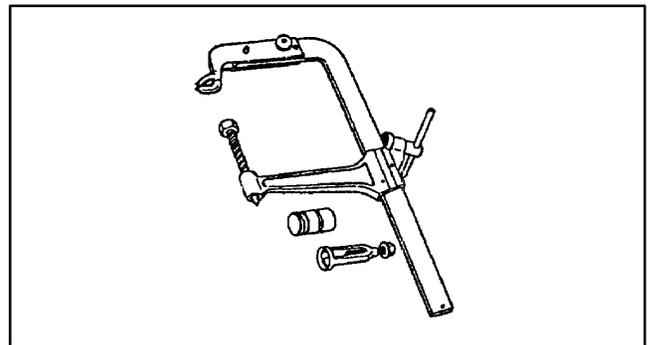


Figure 4

Air Filter Element Cleaner (TOR277220)

A solution of filter cleaner and water may be used to wash the air filter element of the Donaldson 3–stage air cleaners.

DANGER: This compound contains sodium metasilicate which may cause burns and is harmful if swallowed. Keep this chemical out of the reach of children.



Figure 5

Injection Nozzle Tester (TOR463610)

When used along with the adapter, TOR437580, injection nozzles may be examined by performing the following tests:

- Injection pressure test.
- Chattering test.
- Nozzle leakage test.
- Spray test.

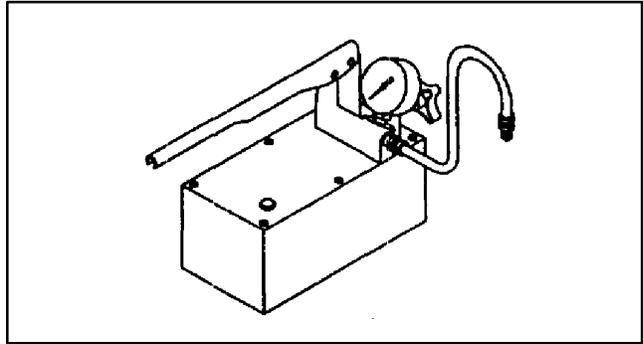


Figure 6

Digital Belt Tension Tool (TOR4075)

Tool is used to accurately adjust the cam drive belt tension. **NOTE: This tool is not included in TOR4080 kit. Order separately.**

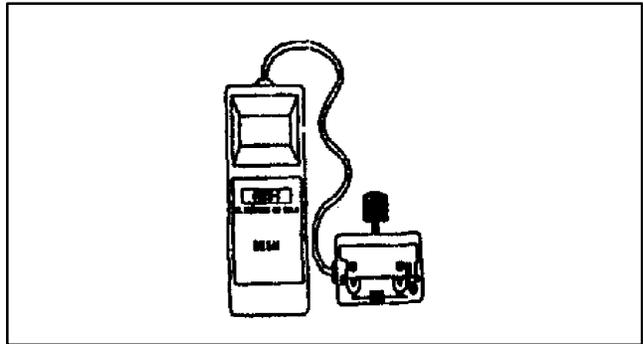


Figure 7

Peugeot TUD5 Diesel Engine Service Tool Kit (TOR4080)

Kit includes: TOR4081, TOR4082, TOR4083, TOR4084, TOR4085, TOR4086, TOR4087, TOR4088.

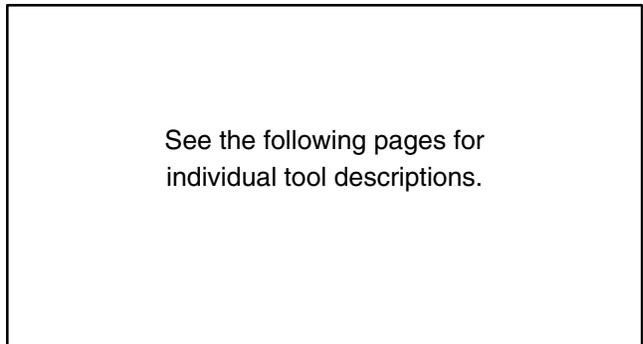


Figure 8

Valve Guide Seal Remover (TOR4081)

Use to remove old valve guide seals.

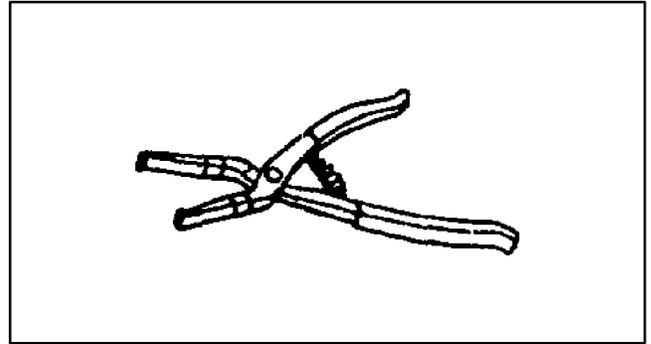


Figure 9

Injector Socket (TOR4082)

A special deep socket to remove and install injectors.

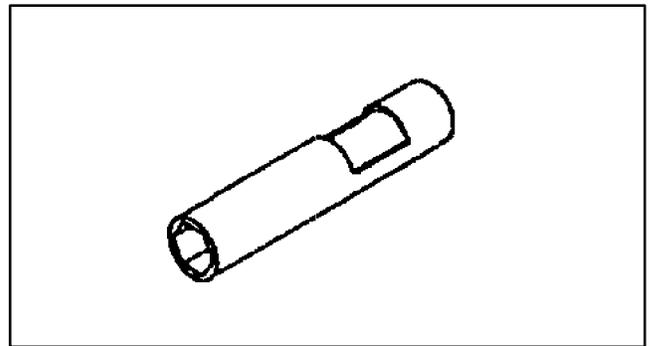


Figure 10

Torque Angle Gauge (TOR4083)

Provides a method to tighten the fastener a specified number of degrees after torque loads are applied. Calibrated in degrees in large easy to read increments. 1/2 inch square drive.

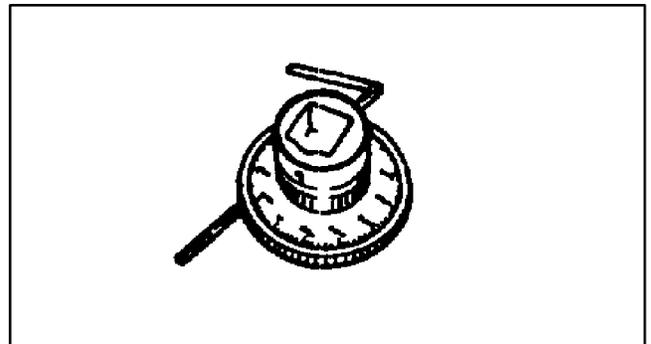


Figure 11

Camshaft Pinion Setting Tool (TOR4084)

Tool is used to hold the camshaft gear and / or injector pump gear while tightening the fasteners.

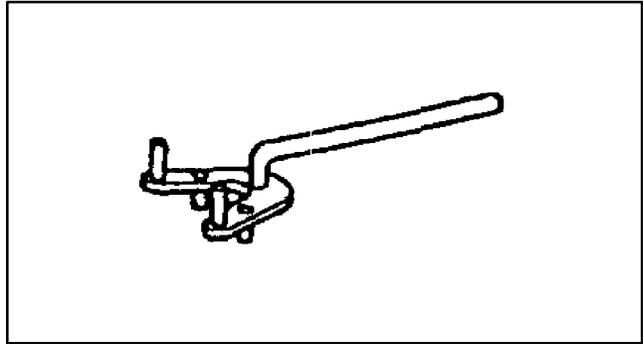


Figure 12

Timing Pin Set (TOR4085)

Tool set is used to set injection pump engine timing.

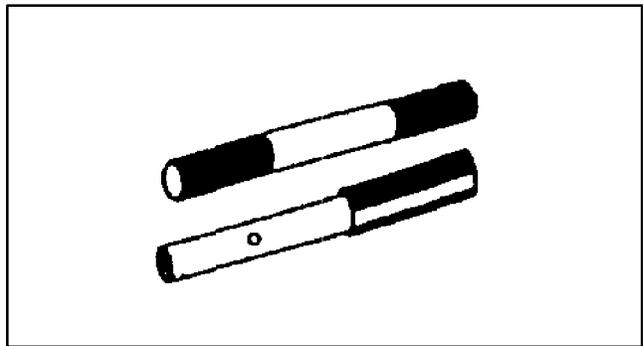


Figure 13

Rear Main Seal Installer (TOR4086)

Tool is used to install the crankshaft rear main seal.

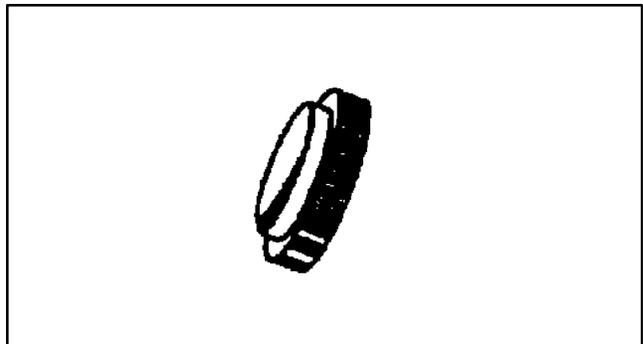


Figure 14

Front Seal Installer (TOR4087)

Tool is used to install the crankshaft front seal.

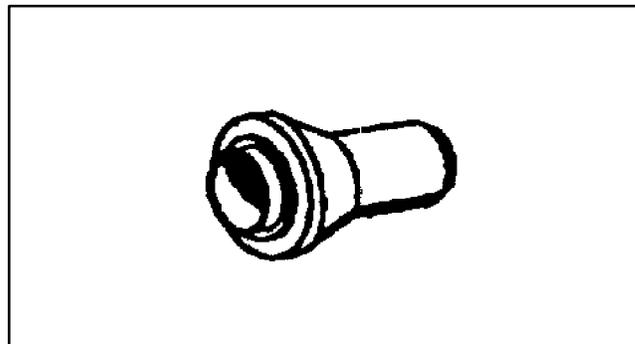


Figure 15

Camshaft Seal Installer (TOR4088)

Tool is used to install the camshaft seal.

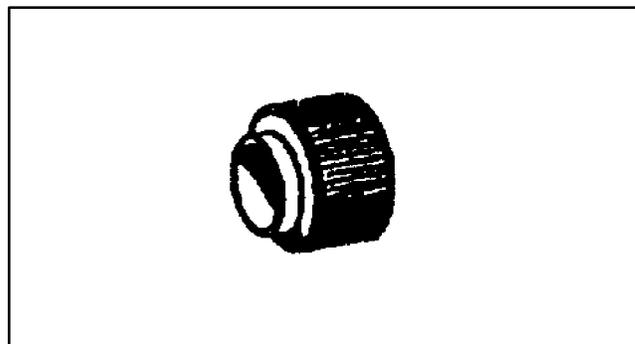


Figure 16

Adjustments



CAUTION

Before servicing or making adjustments to the machine, stop engine and remove key from the switch.

Engine Belts

Check condition and tension of belts after every 100 hours of operation (Fig. 17). Replace belts as required.

Alternator Belt

1. Proper tension will allow 1/8 in. (3.2 mm) deflection on the belt midway between the pulleys, when pressed firmly with thumb.
2. If deflection exceeds 1/8 in. (3.2 mm), loosen alternator mounting bolts. Adjust belt tension and tighten mounting bolts. Check deflection of belt again to assure tension is correct.

Fan Belt

1. Proper tension will allow 3/8 in. (9.5 mm) deflection on the belt midway between the pulleys, when pressed firmly with thumb.
2. If deflection exceeds 3/8 in. (9.5 mm), loosen pulley mounting bolt. Adjust belt tension and tighten mounting bolt. Check deflection of belt again to assure tension is correct.

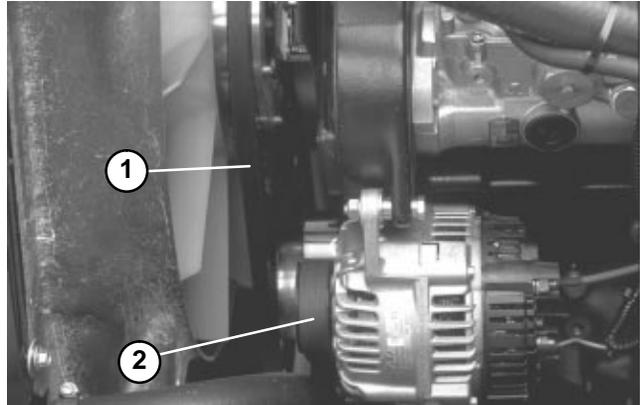


Figure 17

1. Fan Belt
2. Alternator belt

Service and Repairs



CAUTION

Before servicing or making adjustments to the machine, stop engine and remove key from the switch.

Check Engine Oil

Crankcase capacity is 4.75 U.S. qt. (4.5 liters) with filter.

1. Park machine on a level surface. Rotate hood latch fully counterclockwise and open hood.
2. Remove dipstick and wipe it with a clean rag. Insert dipstick into tube and make sure it is fully seated. Remove dipstick and check level of oil. If level of oil is low, add enough oil to raise level to notch in dipstick. DO NOT OVERFILL.
3. If oil level is low, clean area around oil fill cap, remove cap and add SAE 15W-40 CE oil until level reaches FULL mark on dipstick. DO NOT OVERFILL.
4. Install oil fill cap.
5. Close hood and secure latch.

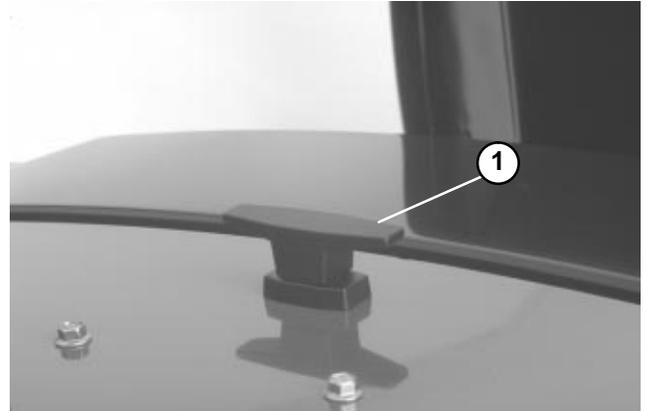


Figure 18
1. Hood Latch

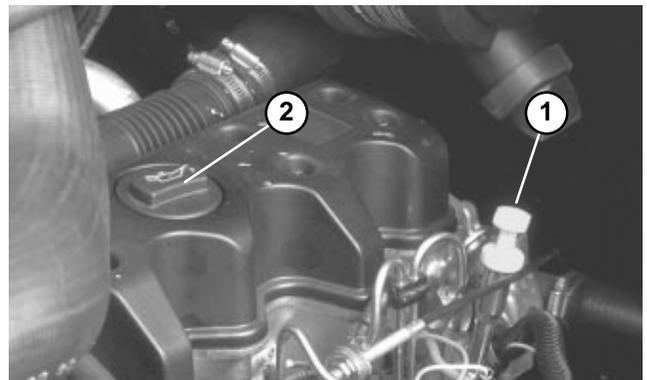


Figure 19
1. Dipstick
2. Oil Fill Cap

Change Engine Oil and Filter

Change oil and filter initially after the first 50 hours of operation, thereafter change oil and filter every 100 hours.

1. Remove drain plug (Fig. 20) and let oil flow into drain pan. When oil stops, install drain plug and new plug seal, Part No. 74-7850.
2. Remove oil filter (Fig. 21). Apply a light coat of clean oil to the new filter seal before screwing it on. **DO NOT OVER-TIGHTEN.**
3. Add 15W-40 CE oil to crankcase. Capacity is 4.75 quarts with filter.

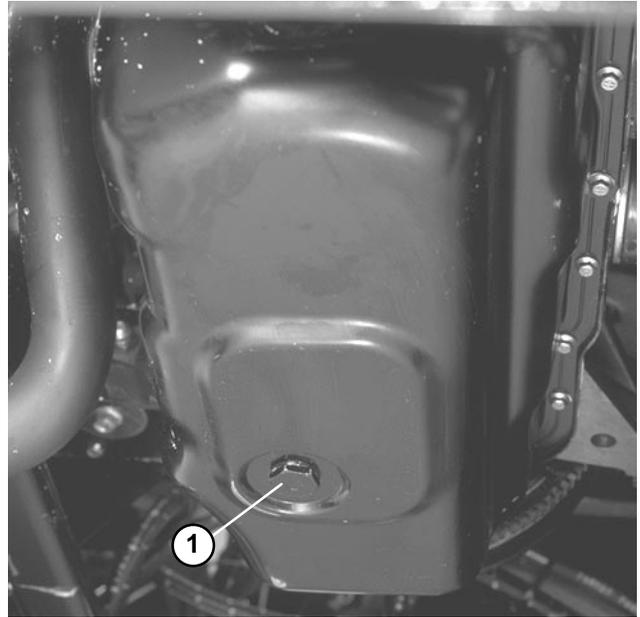


Figure 20
1. Drain Plug

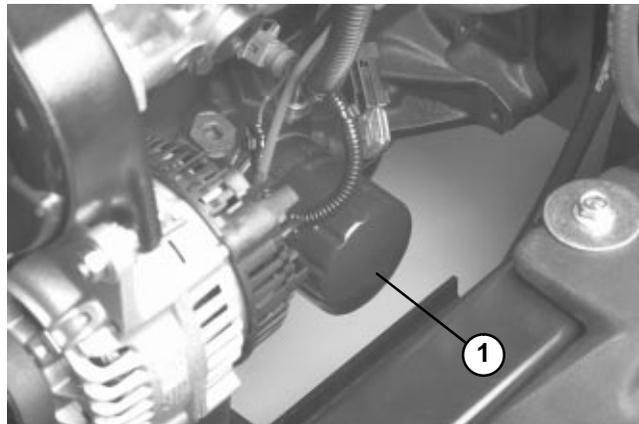


Figure 21
1. Oil Filter

Check Cooling System

Capacity of system is 11.5 qts. (10.9 l).

Check cooling system if low water level light illuminates.

1. Park machine on a level surface. Release hood latch and open hood.
2. Remove degasser tank cap and check coolant level. **Coolant level should be up to or above tabs in degasser tank, when engine is cold.**



CAUTION

If engine has been running, pressurized hot coolant can escape and cause burns if degasser cap is removed. Allow engine to cool at least 15 minutes or until the degasser cap is cool enough to touch without burning hand.

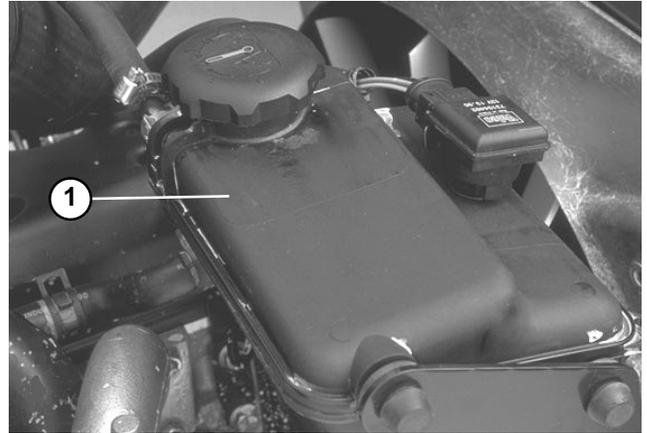


Figure 22
1. Degasser Tank

3. If coolant is low, remove degasser tank cap and add a 50/50 mixture of water and Peugeot recommended anti-freeze (Toro Part No. 93-7213). **DO NOT USE WATER ONLY OR ALCOHOL/METHANOL BASE COOLANTS.**
4. Install degasser tank cap.
5. Close hood and secure latch.

Cooling System Service

1. Removing Debris – Remove debris from rear screen, oil cooler and radiator daily, clean more frequently in dirty conditions.

IMPORTANT: Never spray water onto a hot engine as damage to engine may occur.

- A. Turn engine off and clean hood screen thoroughly.
- B. Release hood latch and raise hood. Clean engine area thoroughly of all debris.
- C. Clean both sides of oil cooler and radiator area thoroughly with compressed air. **Do not use water.**
- D. Close hood and secure latch.

Note: Do not use water to clean engine or electrical components, as damage may occur.

2. Maintaining Cooling System – Capacity of the system is 11.5 quarts. Always protect cooling system with a 50/50 solution of water and Peugeot recommended anti-freeze (Part No. 93-7213). **DO NOT USE WATER ONLY IN COOLING SYSTEM.**

- A. After every 100 operating hours, inspect and tighten hose connections. Replace any deteriorated hoses.
- B. After every 2 years, drain and flush the cooling system. Add anti-freeze (refer to Check Cooling System).



Figure 23
1. Rear Screen

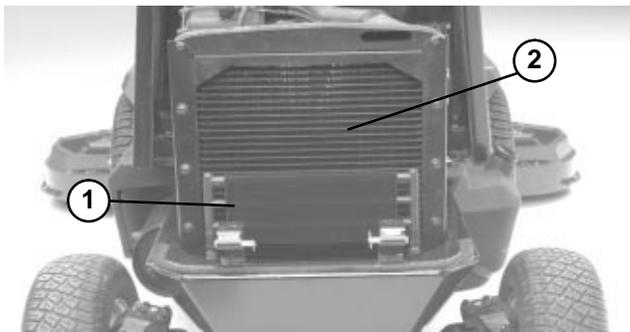


Figure 24
1. Oil Cooler
2. Radiator

General Air Cleaner Maintenance

1. Inspect air cleaner after every 50 hours of operation. More frequent in dusty or dirty conditions.
2. Check air cleaner body for damage which could possibly cause an air leak. Replace a damaged air cleaner body.
3. Service the air cleaner filter every 400 hours (more frequently in extreme dusty or dirty conditions). Do not over service air filter.
4. Be sure cover is sealing around air cleaner body.



CAUTION

Never operate machine without complete air cleaner assembly in place and latched properly or a damaged air cleaner. Debris entering engine can cause engine failure.

Servicing the Air Cleaner

1. Release latches securing air cleaner cover to air cleaner body. Separate cover from body. Clean inside of air cleaner cover.
2. Gently slide filter (Fig. 26) out of air cleaner body to reduce the amount of dust dislodged. Avoid knocking filter against air cleaner body.
3. Inspect filter and discard if damaged. Do not wash or reuse a damaged filter.

Washing Method

- A. Prepare a solution of filter cleaner and water and soak filter element about 15 minutes. Refer to directions on filter cleaner carton for complete information.
- B. After soaking filter for 15 minutes, rinse it with clear water. Maximum water pressure must not exceed 40 psi to prevent damage to the filter element. Rinse filter from clean side to dirty side.
- C. Dry filter element using warm, flowing air (160°F) max), or allow element to air-dry. Do not use a light bulb to dry the filter element because damage could result.

Compressed Air Method

- 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.
5. Inspect new filter for shipping damage. Check sealing end of filter. Do not install a damaged filter.
 6. 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.
 7. Reinstall cover and secure latches. Make sure cover is positioned with TOP side up.

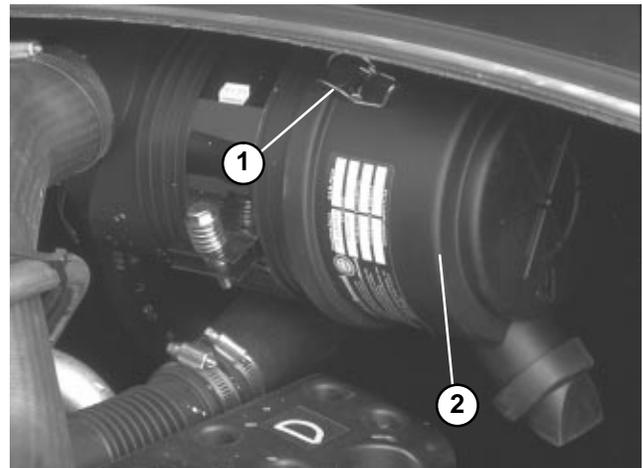


Figure 25
1. Air cleaner latches
2. Dust cup

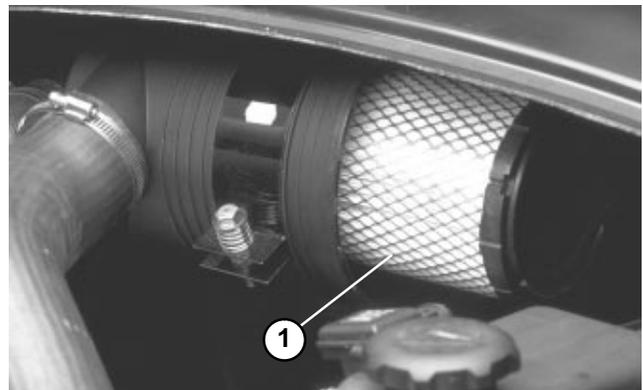


Figure 26
1. Air cleaner filter

Fuel System Service

Fuel Tank

Drain and clean fuel tank every 800 hours of 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 fuel to flush out the tank.



DANGER

Because diesel fuel is highly flammable, use caution when storing or handling it. Do not smoke while filling the fuel tank. Do not fill fuel tank while engine is running, hot, or when machine is in an enclosed area. Always fill fuel tank outside and wipe up any spilled diesel fuel before starting the engine. Store fuel in a clean, safety-approved container and keep cap in place. Use diesel fuel for the engine only; not for any other purpose.

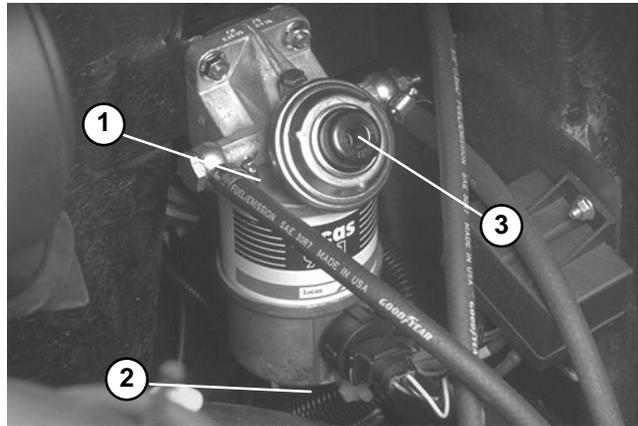


Figure 27

1. Fuel Filter
2. Drain Screw
3. Primer plunger

Fuel Lines and Connections

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

Draining Fuel Filter / Water Separator

Drain water or other contaminants from fuel filter / water separator daily.

1. Place a clean container under fuel filter.
2. Loosen drain screw on bottom of fuel filter and press primer plunger until only fuel is evident draining into container.

Changing Fuel Filter

Replace fuel filter if fuel flow becomes restricted, after every 400 hours of operation or annually, whichever comes first.

1. Loosen bolt and unscrew bottom filter cap from filter assembly. Remove cap, gaskets, o-ring and filter from assembly. Note position of gaskets and o-ring when disassembling from filter.
2. Install new filter, gaskets, o-ring with filter assembly cap.
3. Prime fuel system, refer to Priming Fuel System.

Priming Fuel System

IMPORTANT: The fuel system may need to be primed when a new engine is started for the first time, if it runs out of fuel or if maintenance is performed on the fuel system.

1. Unlatch and raise hood.
2. Insert a 3/16 inch (5 mm) hose over bleed screw and run other end into a container to catch fuel.
3. Loosen fuel filter / water separator bleed screw (Fig. 28) a few turns. Pump priming plunger until a steady stream of fuel comes out of hole in bleed screw. When fuel stops foaming, tighten the bleed screw during the downstroke of the priming plunger. Wipe up any spilled fuel.
4. Pump priming plunger until resistance is felt. Try to start engine. If engine does not start repeat step 3.

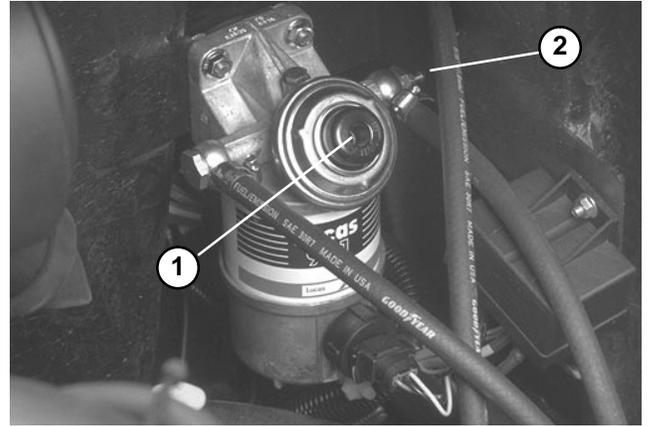


Figure 28

1. Primer Plunger 2. Bleed Screw

Frame, Fuel Tank and Battery

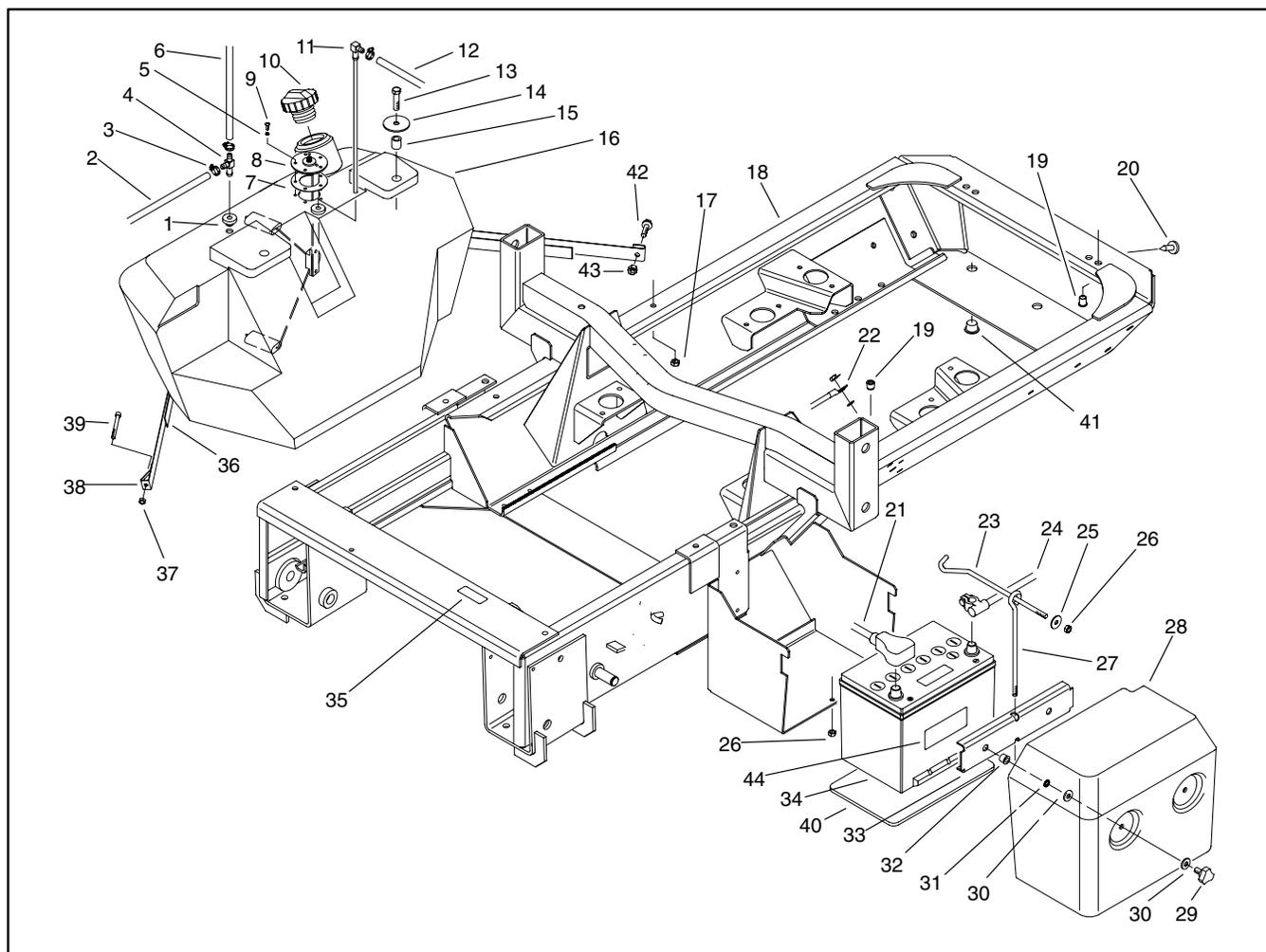


Figure 29

- | | | |
|----------------|----------------|-----------------------|
| 1. Bushing | 11. Stand pipe | 21. Battery cable (+) |
| 2. Fuel hose | 12. Fuel hose | 22. Ground cable |
| 3. Hose clamp | 13. Screw | 23. Battery rod |
| 4. Fitting | 14. Washer | 24. Battery cable (-) |
| 5. Lock washer | 15. Spacer | 25. Washer |
| 6. Fuel hose | 16. Fuel tank | 26. Lock nut |
| 7. Gasket | 17. Lock nut | 27. Threaded rod |
| 8. Fuel sender | 18. Frame | 28. Battery cover |
| 9. Screw | 19. Clinch nut | 29. Cover retainer |
| 10. Fuel cap | 20. Bumper | 30. Flat washer |
| | | 31. Retaining ring |

Muffler and Bumper

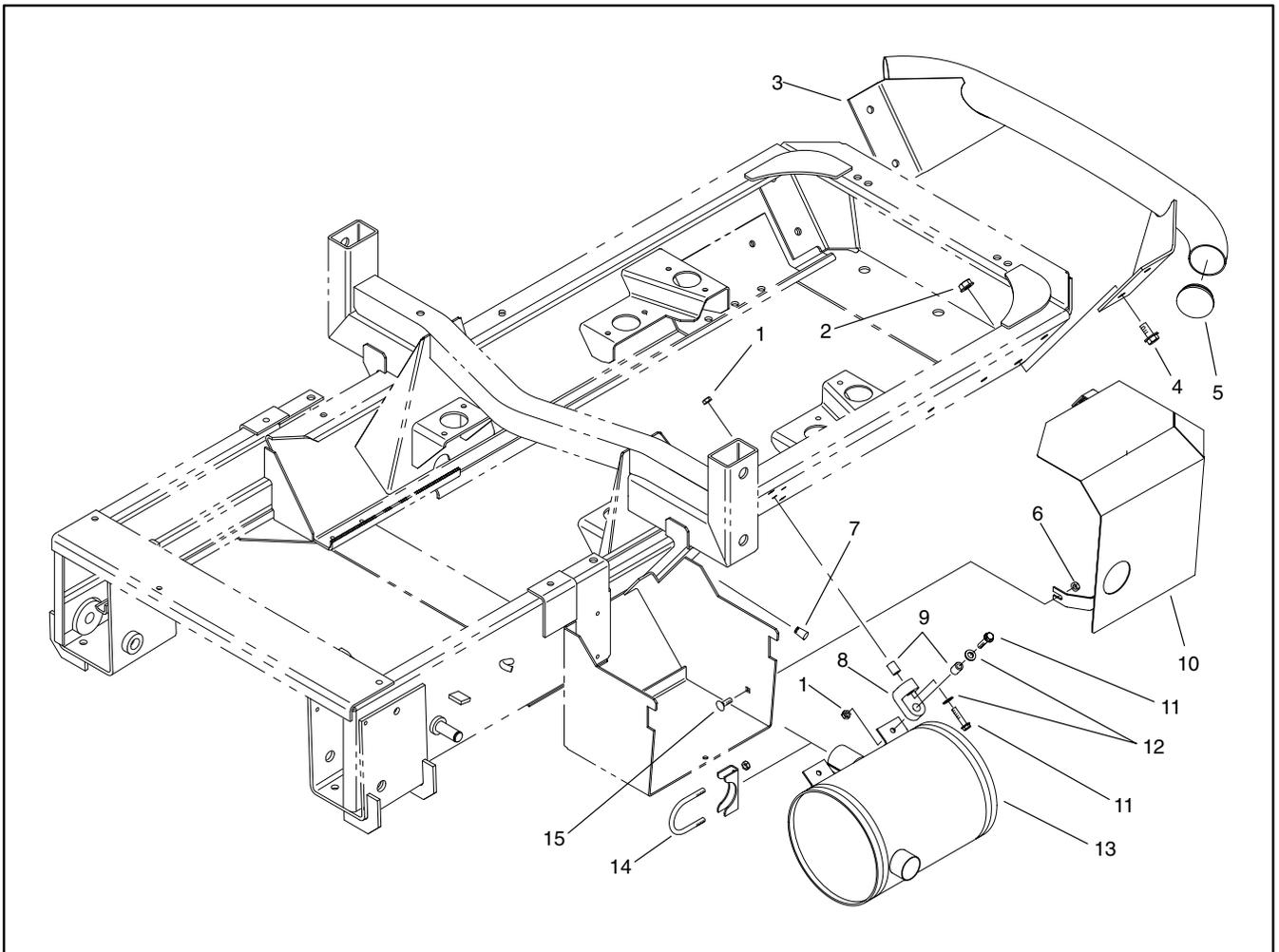


Figure 30

- 1. Lock nut
- 2. Nut
- 3. Bumper
- 4. Screw
- 5. Bumper cap

- 6. Nut
- 7. Clinch nut
- 8. Rubber hanger
- 9. Spacer
- 10. Muffler guard

- 11. Screw
- 12. Flat washer
- 13. Muffler
- 14. Muffler clamp
- 15. Carriage screw

Hood

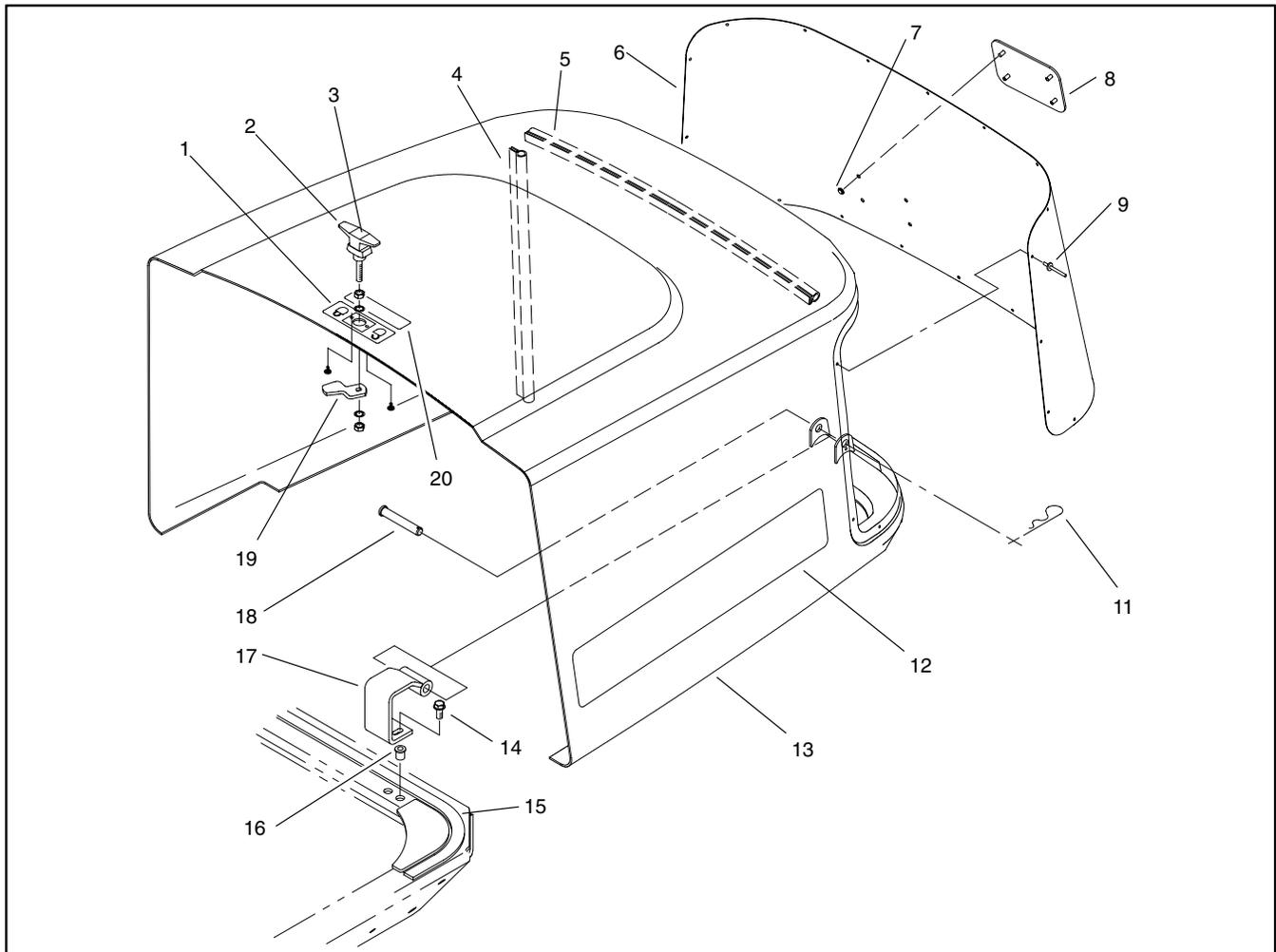


Figure 31

- | | | |
|-------------------|---------------------|----------------------------|
| 1. Decal | 8. Toro logo plate | 15. Foam strip |
| 2. Latch handle | 9. Pop rivet | 16. Clinch nut |
| 3. Decal | 10. Flat washer | 17. Hood pivot |
| 4. Side seal | 11. Hair pin cotter | 18. Clevis pin |
| 5. Top seal | 12. Decal | 19. Latch arm |
| 6. Rear screen | 13. Hood | 20. Caution decal (Europe) |
| 7. Tinnermann nut | 14. Screw | |

Center Shroud and Air Cleaner

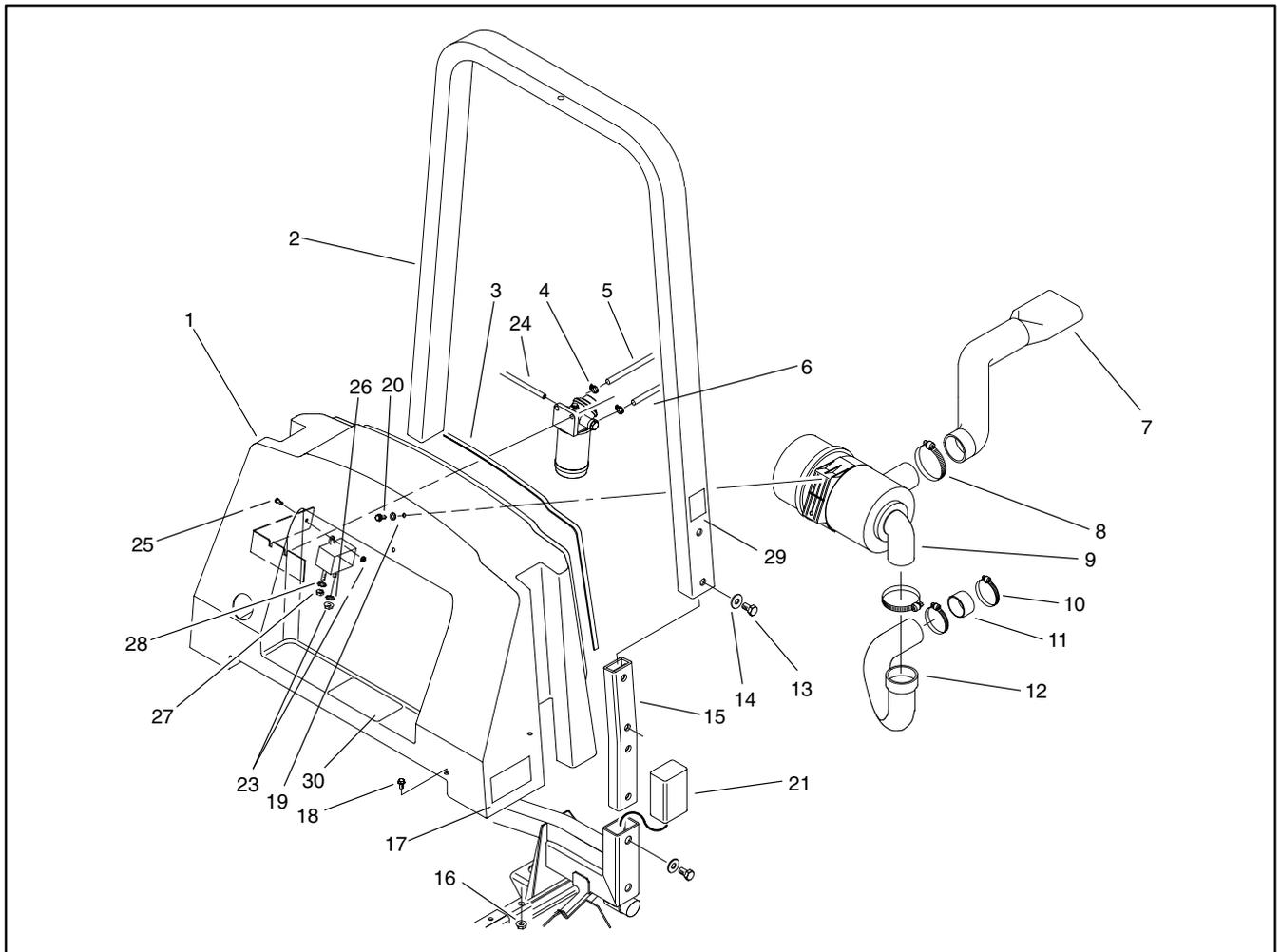


Figure 32

- | | | |
|---------------------|------------------------------------|-------------------------------------|
| 1. Center shroud | 11. Intake spacer | 21. Tube cover (Model 30301 only) |
| 2. ROPS | 12. Air cleaner hose | 22. Screw |
| 3. Foam strip | 13. Screw (Model 30302 only) | 23. Nut |
| 4. Hose clamp | 14. Washer (Model 30302 only) | 24. Hose |
| 5. Fuel hose | 15. Bar (Europe) | 25. Hose |
| 6. Fuel hose | 16. Nut | 26. Lock washer |
| 7. Air cleaner hose | 17. Decal – 4wd (Model 30302 only) | 27. Nut |
| 8. Hose clamp | 18. Screw | 28. Lock washer |
| 9. Air cleaner | 19. Flat washer | 29. ROPS decal |
| 10. Hose clamp | 20. Screw | 30. Safety decal (Model 30301 only) |

Fan Bracket and Degasser

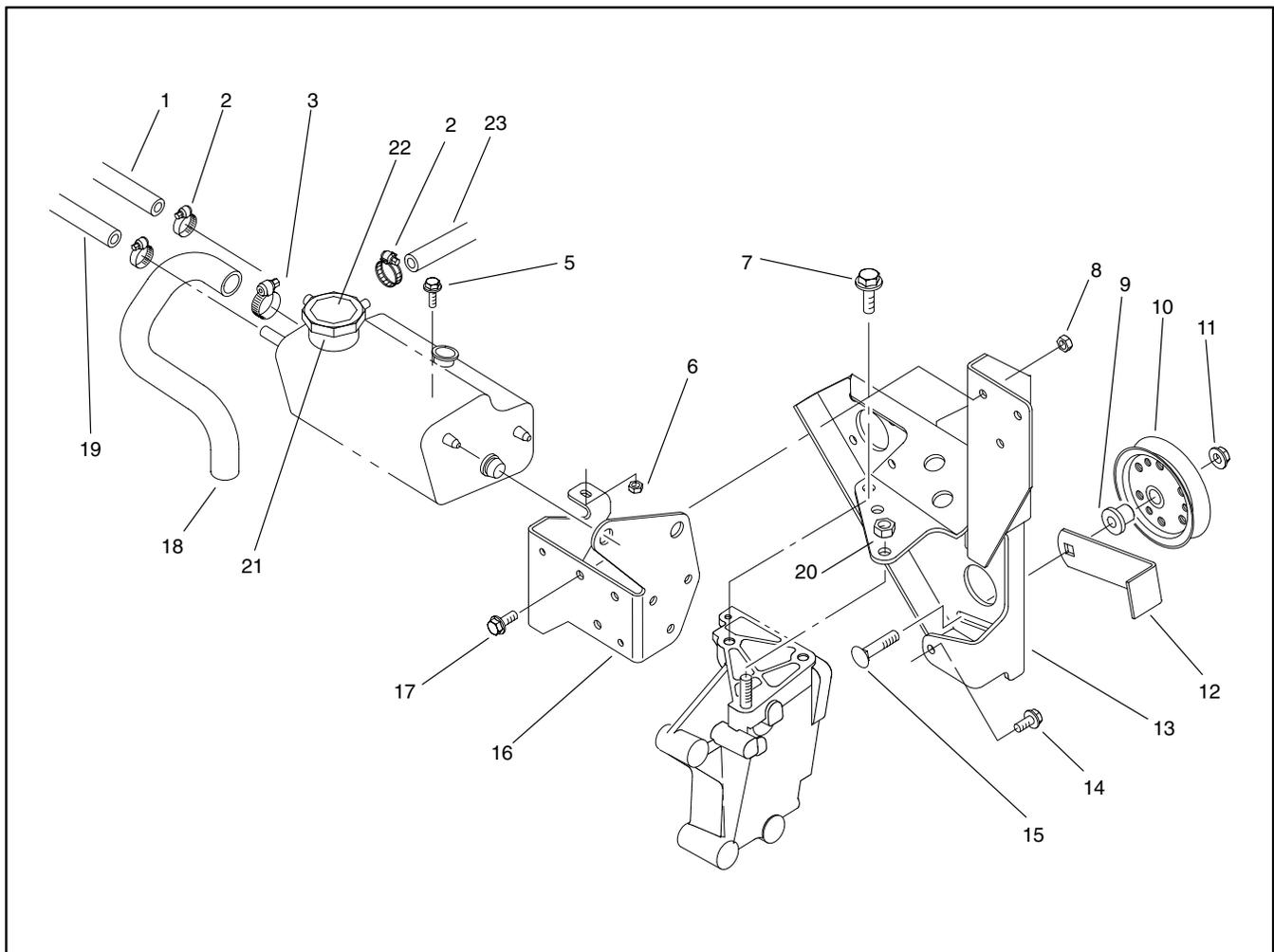


Figure 33

- 1. Hose
- 2. Hose clamp
- 3. Hose clamp
- 5. Screw
- 6. Lock nut
- 7. Screw
- 8. Lock nut

- 9. Idler spacer
- 10. Idler pulley
- 11. Nut
- 12. Lever
- 13. Fan bracket
- 14. Screw
- 15. Carriage screw

- 16. Degasser bracket
- 17. Screw
- 18. Degasser hose
- 19. Hose
- 20. Nut
- 21. Radiator cap
- 22. Decal

Radiator and Cooler

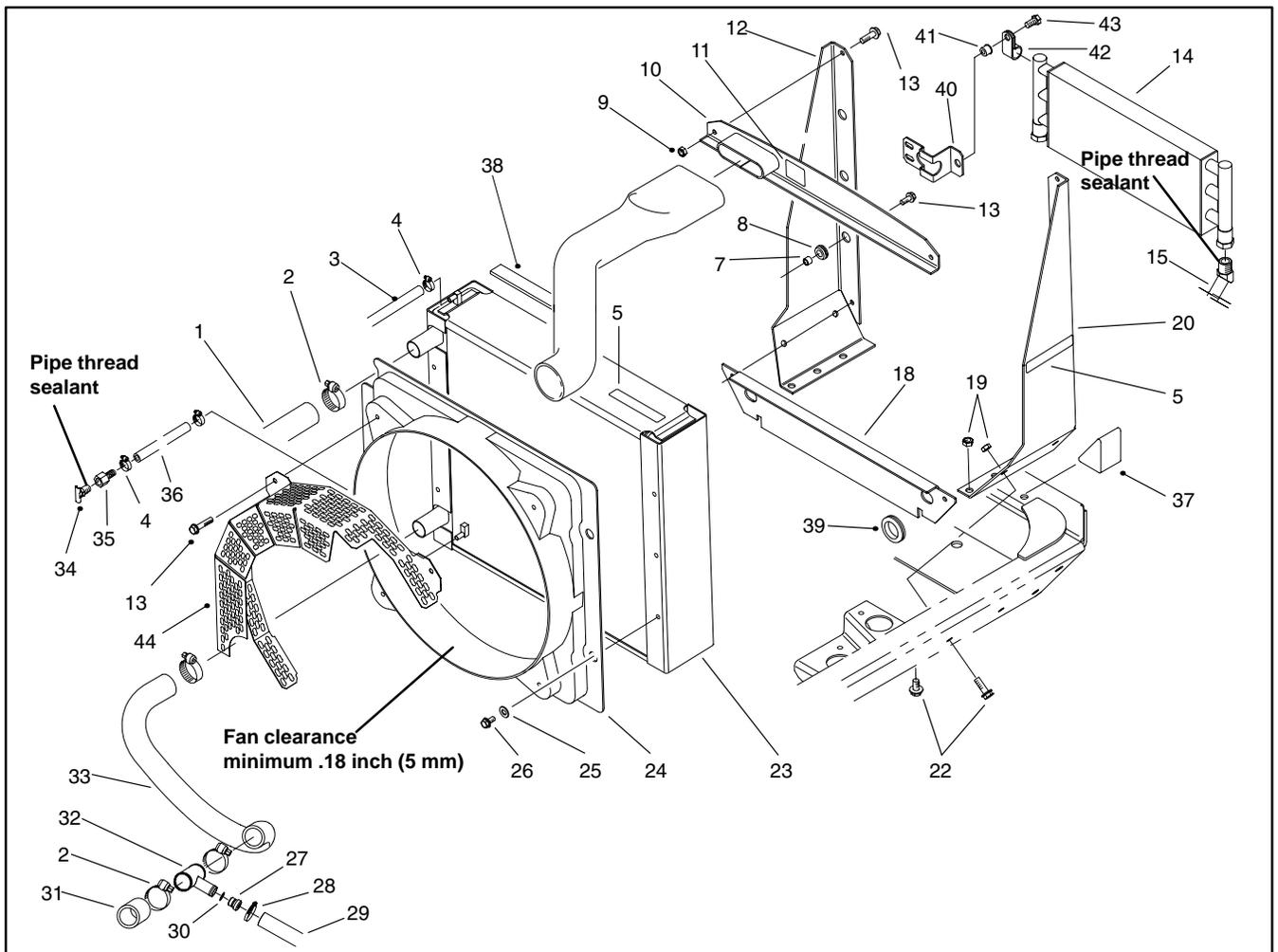


Figure 34

- | | | |
|-------------------------------------|----------------------------|--------------------------|
| 1. Upper radiator hose | 18. Lower radiator support | 33. Lower radiator hose |
| 2. Hose clamp | 19. Lock nut | 34. Drain cock fitting |
| 3. Hose | 20. LH radiator support | 35. Female hose barb |
| 4. Hose clamp | 22. Screw | 36. Hose |
| 5. Decal (Europe) | 23. Radiator | 37. Foam plug |
| 7. Spacer | 24. Radiator shroud | 38. Foam strip |
| 8. Rubber grommet | 25. Flat washer | 39. Rubber grommet |
| 9. Lock nut | 26. Screw | 40. Cooler mount bracket |
| 10. Upper radiator support | 27. Restriction fitting | 41. Clinch nut |
| 11. Decal – starting fluid (Europe) | 28. Clamp | 42. R-clamp |
| 12. RH radiator support | 29. Hose | 43. Screw |
| 13. Screw | 30. O-ring | 44. Shield |
| 14. Heat exchanger | 31. Radiator hose | |
| 15. Adapter fitting | 32. Radiator hose fitting | |

Engine

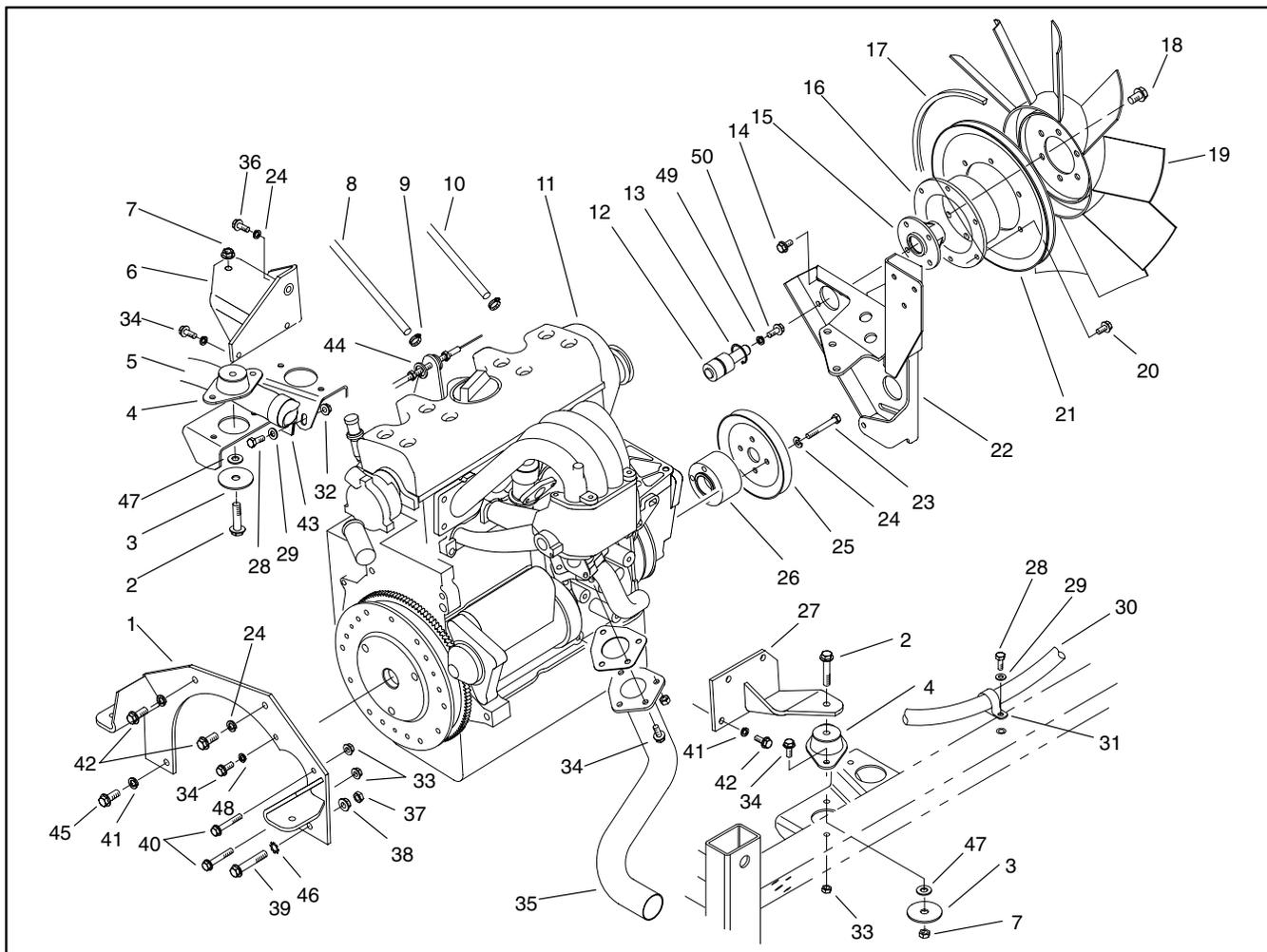


Figure 35

- | | | |
|------------------------|-----------------------|----------------------------------|
| 1. Front engine plate | 17. V-belt | 33. Lock nut |
| 2. Screw | 18. Screw | 34. Screw |
| 3. Snubbing washer | 19. Fan | 35. Exhaust pipe |
| 4. Engine mount | 20. Screw | 36. Screw |
| 5. Lower radiator hose | 21. Fan pulley | 37. Nut |
| 6. R.H. engine mount | 22. Fan bracket | 38. Nut |
| 7. Lock nut | 23. Screw | 39. Screw |
| 8. Fuel hose | 24. Lock washer | 40. Screw |
| 9. Hose clamp | 25. Crank pulley | 41. Lock washer |
| 10. Fuel hose | 26. Crank spacer | 42. Screw |
| 11. Engine | 27. L.H. engine mount | 43. R-clamp |
| 12. Bearing | 28. Screw | 44. Throttle cable mount |
| 13. Retaining ring | 29. Flat washer | 45. Screw |
| 14. Screw | 30. Hose | 46. Lock washer – external tooth |
| 15. Fan hub | 31. R-clamp | 47. Flat wash |
| 16. Fan hub | 32. Nut | 48. Lock washer |

NOTE: See the Toro Parts Catalog for more information.

Peugeot TUD5 Overhaul, Checking Tuning

See the Peugeot Citroen Moteurs TUD5 Overhaul, Checking, Tuning manual for detailed service information. See the Toro Parts Catalog for parts identification.

Refer to the **Special Tools** list starting on Page 4 – 3 of the Toro Groundsmaster 3000/3000–D Service Manual. The tool numbers referred to in the Peugeot manual are Peugeot numbers, which Toro does not use.

Use the TORO lubrication, maintenance and fluid recommendations if they are different from the information in the Peugeot manual.



Hydraulic System and Transaxle

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Hydraulic System
and Transaxle

Specifications

Item	Specification
Transaxle	Sauer–Sundstrand IHT–M15 Charge Pressure: 80 – 130 PSI (5.5 – 9 Bar) Implement Relief Pressure: 1,000 – 1,100 PSI (69 – 76 Bar) Traction Forward Pressure: 6,200 PSI (428 Bar) maximum Traction reverse pressure: 5,000 PSI (345 Bar) maximum
Manifold Block	Toro logic cartridge, elec./hyd., solenoid actuated Recommended Counterbalance Pressure: 84 inch decks: 220 PSI (15 Bar) 72 inch decks: 220 PSI (15 Bar) Contour 82 deck: 100 – 150 PSI (7 – 10 Bar) Brush: 225 PSI (16 Bar) Blower: 70 – 80 PSI (5 – 6 Bar) Implement Relief Pressure (Model 30724 Hyd. Kit): 1,000 – 1,100 PSI (69 – 76 Bar)
Steering Control	Eaton Series 2 steering control unit with power beyond
Hydraulic Fluid	Mobil 424 (see Check Hydraulic Fluid in Service and Repairs section of this chapter for alternatives)
Hydraulic Fluid Capacity	Approximately 12 U.S. qts. (11.4 liters)

General Information

Pushing or Towing Traction Unit

In an emergency, the traction unit can be pushed or towed. However, Toro does not recommend this as standard procedure.

IMPORTANT: Do no push or tow the traction unit faster than 10 mph (16 km/hr). If traction unit must be moved a considerable distance, transport it on a truck or trailer.

1. Locate towing lever on right side of axle assembly.
2. Remove cotter pin and clevis pin securing lever to plate on side of axle.
3. Pivot lever rearward until hole is aligned with rear hole in plate. Secure lever to rear hole with cotter pin and clevis pin previously removed.
4. After completion of towing operation, pivot lever back to original position and re-secure.

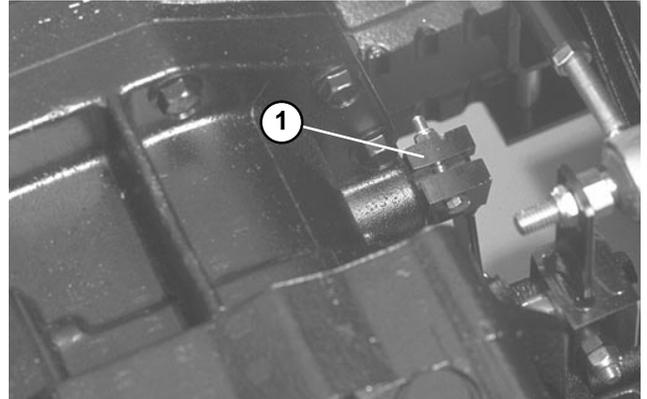


Figure 1
1. Towing Lever

Hydraulic Hoses

Hydraulic hoses are subject to extreme conditions such as, pressure differentials during operation and exposure to weather, sun, chemicals, very warm storage conditions or mishandling during operation or maintenance. These conditions can cause damage or premature deterioration. Some hoses are more susceptible to these conditions than others. Inspect the hoses frequently for signs of deterioration or damage.

When replacing a hydraulic hose, be sure that the hose is straight (not twisted) before tightening the fittings. This can be done by observing the imprint on the hose. Use two wrenches; one to hold the hose straight and one to tighten the hose swivel nut onto the fitting.



WARNING

Before disconnecting or performing any work on hydraulic system, all pressure in system must be relieved by stopping the engine and lowering or supporting the box and/or other attachment.

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate the skin and do serious damage. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

Hydraulic Fitting Installation

O-Ring Face Seal

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign material.
2. Make sure the O-ring is installed and properly seated in the groove. It is recommended that the O-ring be replaced any time the connection is opened.
3. Lubricate the O-ring with a light coating of oil.
4. Put the tube and nut squarely into position on the face seal end of the fitting and tighten the nut until finger tight.
5. Mark the nut and fitting body. Hold the body with a wrench. Use another wrench to tighten the nut to the correct flats from finger tight (F.F.T.). The markings on the nut and fitting body will verify that the connection has been tightened.

Size	F.F.T.
4 (1/4 in. nominal hose or tubing)	.75 ± .25
6 (3/8 in.)	.75 ± .25
8 (1/2 in.)	.75 ± .25
10 (5/8 in.)	1.00 ± .25
12 (3/4 in.)	.75 ± .25
16 (1 in.)	.75 ± .25

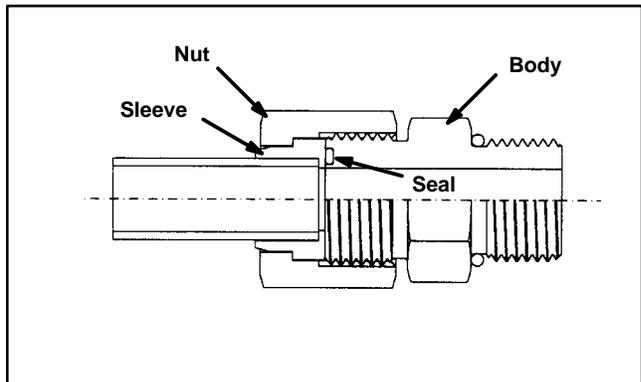


Figure 2

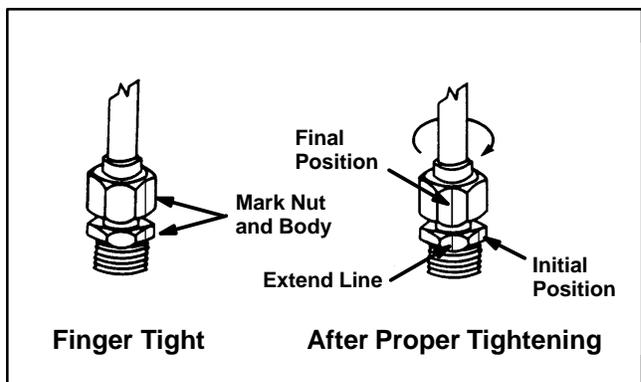


Figure 3

SAE Straight Thread O-Ring Port – Non-adjustable

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign material.
2. Always replace the O-ring seal when this type of fitting shows signs of leakage.
3. Lubricate the O-ring with a light coating of oil.
4. Install the fitting into the port and tighten it down full length until finger tight.
5. Tighten the fitting to the correct flats from finger tight (F.F.F.T.).

Size	F.F.F.T.
4 (1/4 in. nominal hose or tubing)	1.00 ± .25
6 (3/8 in.)	1.50 ± .25
8 (1/2 in.)	1.50 ± .25
10 (5/8 in.)	1.50 ± .25
12 (3/4 in.)	1.50 ± .25
16 (1 in.)	1.50 ± .25

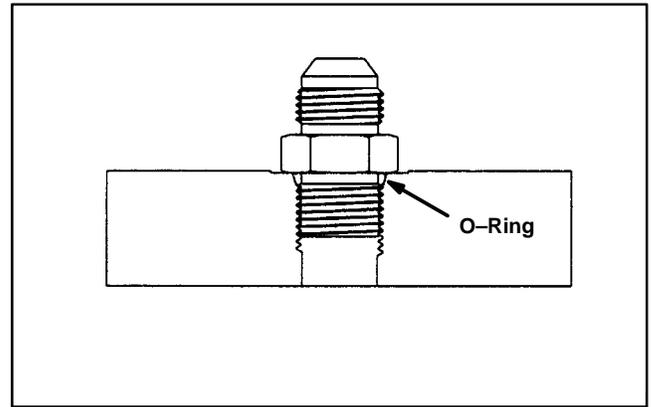


Figure 4

SAE Straight Thread O-Ring Port – Adjustable

1. Make sure both threads and sealing surfaces are free of burrs, nicks, scratches, or any foreign material.
2. Always replace the O-ring seal when this type of fitting shows signs of leakage.
3. Lubricate the O-ring with a light coating of oil.
4. Turn back the jam nut as far as possible. Make sure the back up washer is not loose and is pushed up as far as possible (Step 1).
5. Install the fitting into the port and tighten finger tight until the washer contacts the face of the port (Step 2).
6. To put the fitting in the desired position, unscrew it by the required amount, but no more than one full turn (Step 3).
7. Hold the fitting in the desired position with a wrench and turn the jam nut with another wrench to the correct flats from finger tight (F.F.F.T.) (Step 4).

Size	F.F.F.T.
4 (1/4 in. nominal hose or tubing)	1.00 ± .25
6 (3/8 in.)	1.50 ± .25
8 (1/2 in.)	1.50 ± .25
10 (5/8 in.)	1.50 ± .25
12 (3/4 in.)	1.50 ± .25
16 (1 in.)	1.50 ± .25

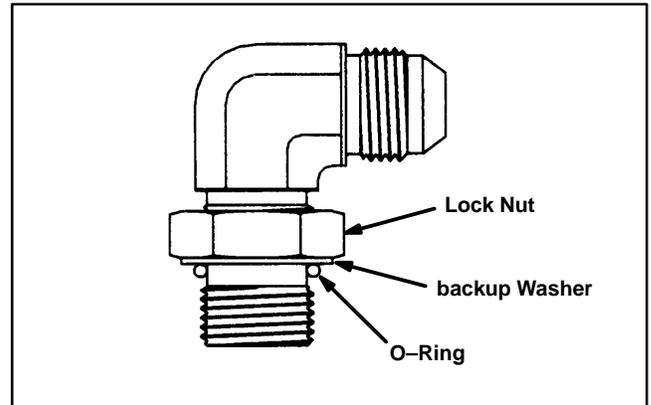


Figure 5

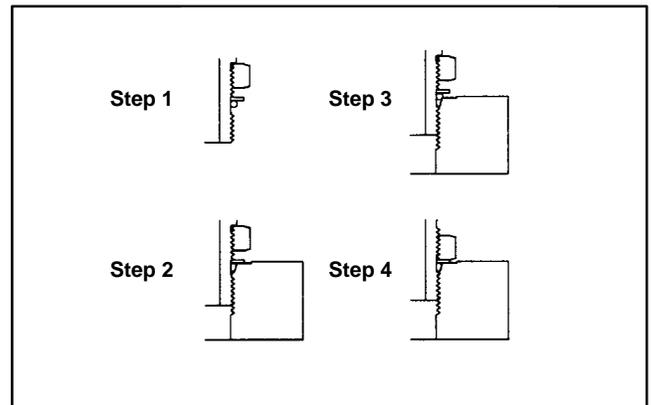
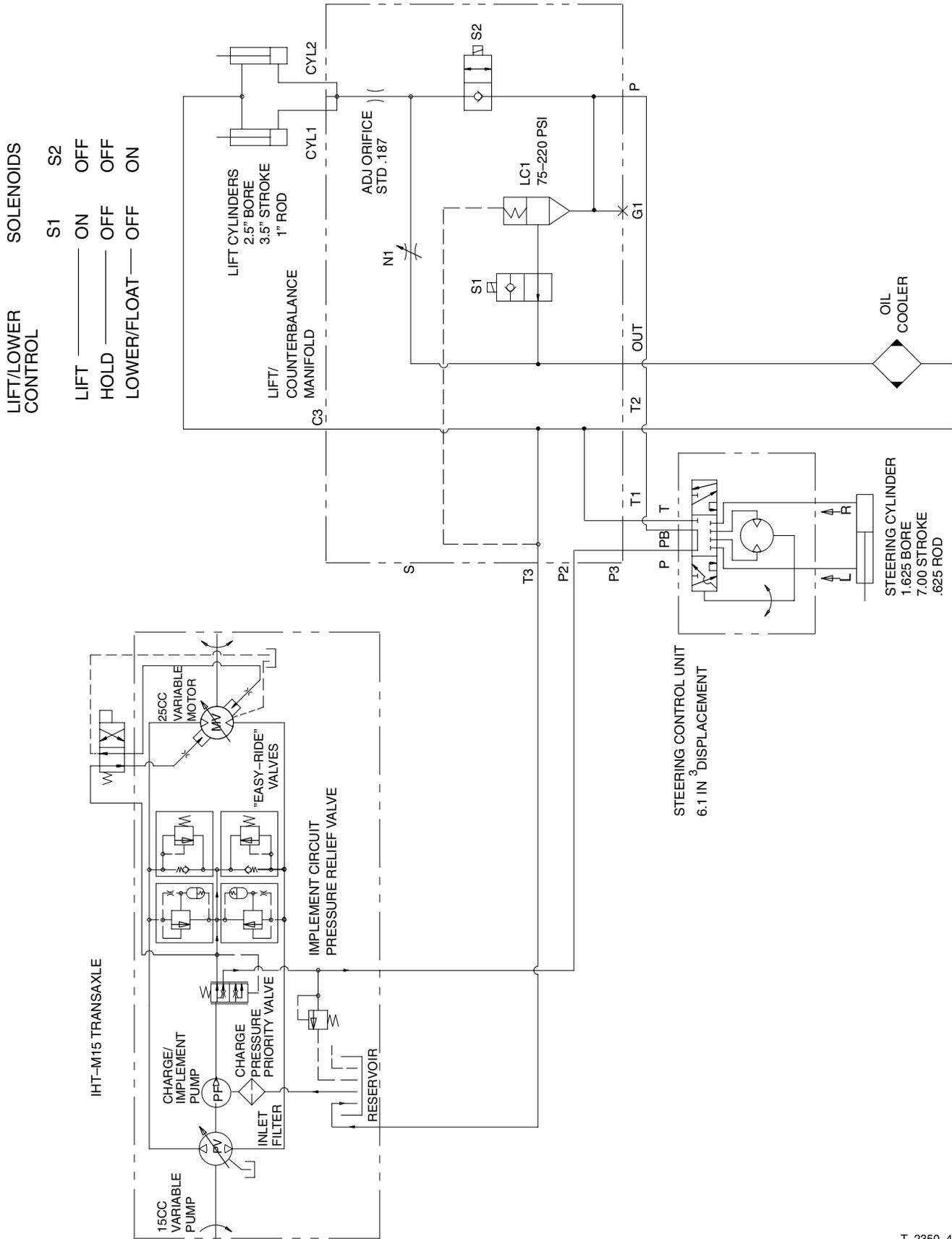
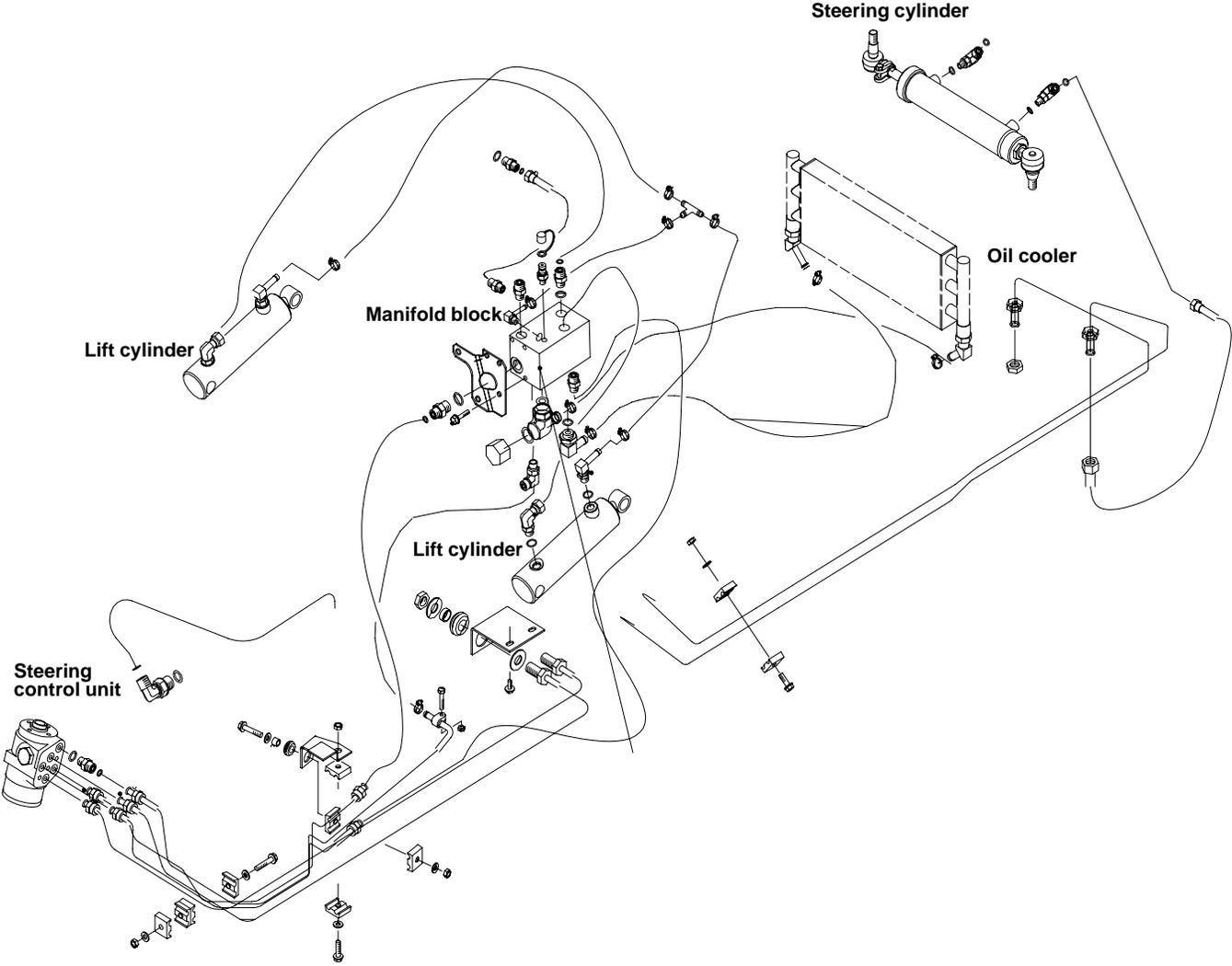


Figure 6

Hydraulic Schematic



Hydraulic Components



Special Tools

NOTE: Order special tools from the *TORO SPECIAL TOOLS AND APPLICATIONS GUIDE (COMMERCIAL PRODUCTS)*. Some tools may also be available from a local supplier.

Hydraulic Pressure Test Kit – TOR47009

Use to take various pressure readings for diagnostic tests. Quick disconnect fittings provided attach directly to mating fittings on machine test ports without tools. A high pressure hose is provided for remote readings. Contains one each: 1000 PSI (70 Bar), 5000 PSI (350 Bar) and 10000 PSI (700 Bar) gauges. Use gauges as recommended in Testing section of this chapter.



Figure 7

Hydraulic Test Fitting Kit – TOR4079

This kit includes a variety of O-ring Face seal fittings to enable you to connect test gauges into the system.

The kit includes: tee's, unions, reducers, plugs, caps, and male test fittings.

Toro Test Fitting Kit TOR4079		Union 1 Each Toro Tool Number	
Fitting	Tool Number	Size	Toro Tool Number
	Size	No 4 to No 8	Toro Tool Number
	No 4	No 10 to No 8	
	No 6	No 8 to No 6	
	No 8		
	Size	No 4	Toro Tool Number
	No 4	No 6	
	No 6	No 8	
	No 8		
	Size	No 4	Toro Tool Number
	No 4	No 6	
	No 6	No 8	
	No 8		
	Size	No 10 to No 8	Toro Tool Number
	No 8 to No 6		
	No 6 to No 4		
	No 4 to No 2		
	Size	No 4	Toro Tool Number
	No 6		
	No 8		
	No 10		
	Size	5/8" - 20	Toro Tool Number
	1/2" Pipe thread		

Figure 8

Measuring Container – TOR4077

Use this container for doing hydraulic motor efficiency testing (motors with case drain lines only). Measure efficiency of a hydraulic motor by restricting the outlet flow from the motor and measuring leakage from the case drain line while the motor is pressurized by the hydraulic system.



Figure 9

Hydraulic Tester – With Pressure and Flow Capabilities – TOR214678

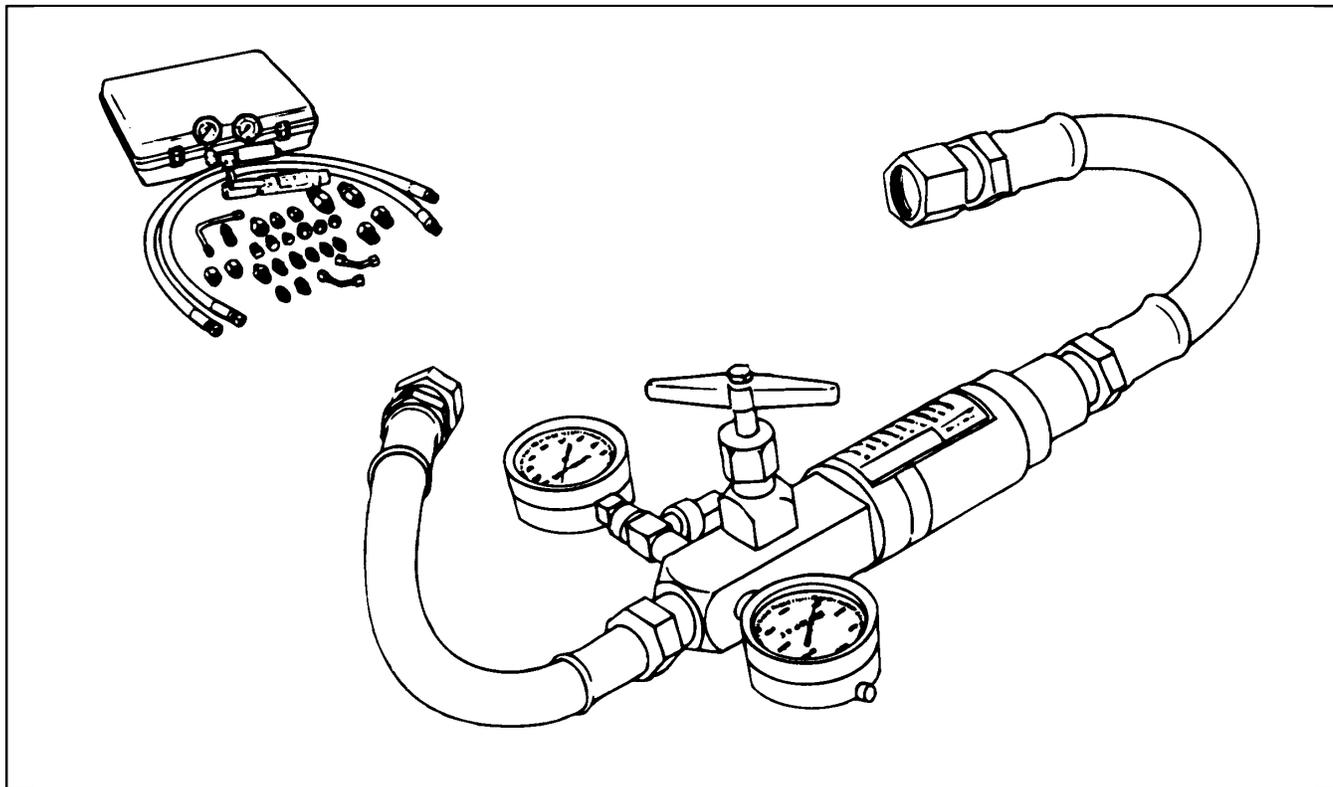


Figure 10

You must have o-ring face seal (ORFS) adapter fittings for this tester to use it on the Workman vehicle.

1. **INLET HOSE:** Hose connected from the system circuit to the inlet side of the hydraulic tester.
2. **LOAD VALVE:** If required, upon turning the valve to restrict flow, a simulated working load is created in the circuit.
3. **LOW PRESSURE GAUGE:** Low range gauge to provide accurate reading at low pressure, 0 – 1000 PSI.

This gauge has a protector valve which cuts out when pressure is about to exceed the normal range for the gauge. The cutout pressure is adjustable.

4. **HIGH PRESSURE GAUGE:** High range gauge to accommodate pressure beyond the capacity of the low pressure gauge, 0 – 5,000 PSI.
5. **FLOW METER:** This meter measures actual oil flow in the operation circuit, with a gauge rated at 15 GPM.
6. **OUTLET HOSE:** Hose from the outlet side of the hydraulic tester to be connected to the hydraulic system circuit.

Testing

The most effective method for isolating problems in the hydraulic system is by using hydraulic test equipment such as pressure gauges and flow meters in the circuits during various operational checks. (See the Special Tools section in this Chapter.)



CAUTION

Failure to use gauges with recommended pressure (psi) rating as listed in test procedures could result in damage to gauge and possible personal injury from leaking hot oil.

Before Performing Hydraulic Tests

All obvious areas such as oil supply, filter, binding linkage, loose fasteners, or improper adjustments must be checked before assuming that a hydraulic component is the source of the problem being experienced.



WARNING

Before disconnecting or performing any work on the hydraulic system, all pressure in the system must be relieved by stopping the engine and lowering or supporting the cutting units or other implements.

Keep body and hands away from pin hole leaks or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, not hands, to search for leaks. Hydraulic fluid escaping under pressure can have sufficient force to penetrate skin and do serious damage. If fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result.

1. Thoroughly clean the machine before disconnecting or disassembling any hydraulic components. Always keep in mind the need for cleanliness when working on hydraulic equipment.

2. Put caps or plugs on any hydraulic lines left open or exposed during testing or removal of components.

3. The engine must be in good operating condition. Use a tachometer when making a hydraulic test. Engine speed can affect the accuracy of the tester readings.

4. To prevent damage to tester or components, the inlet and the outlet hoses must be properly connected, and not reversed (tester with pressure and flow capabilities).

5. To minimize the possibility of damaging components, completely open load valve in hydraulic tester (when using tester with pressure and flow capabilities).

6. Install fittings finger tight, far enough to insure that they are not cross-threaded, before tightening with a wrench.

7. Position the tester hoses so that rotating machine parts will not make contact with them and result in hose or tester damage.

8. Check the oil level in the reservoir.

9. Check the control linkage for improper adjustment, binding or broken parts.

10. All hydraulic tests should be made with the hydraulic oil at normal operating temperature.

IMPORTANT: Test ports on the transaxle are painted closed. Opening the ports will loosen the paint. Make sure dirt or paint particles do not fall into the open port.

Charge Pressure Test

NOTE: See Sauer–Sundstrand IHT Service Manual for more information.

Use a 500 or 1,000 PSI (35 or 70 Bar) test gauge.

Specification: 80 to 130 PSI (5.5 to 9 Bar)

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.
2. Lower cutting unit, engage parking brake and stop the engine.
3. Remove the plug from the charge pressure port and install a 500 or 1,000 PSI (35 or 70 Bar) pressure gauge with extension hose.
4. Start the engine and move the throttle control all the way forward. Take pressure reading with machine stationary. Also take a pressure reading while operating the machine in forward and reverse. To test in forward and reverse, engage the brakes and push the traction pedal forward, then reverse.

NOTE: When you move the traction pedal to create pressure, move it a short distance first and wait for a change in sound before moving the pedal further. The change in sound indicates that the easy ride valves have closed.

If pressure is good under no load, but drops below specification when under traction load, the piston pump and motor should be suspected of wear and inefficiency. When the pump and/or motor is worn or damaged the charge pump is not able to supply enough oil to keep up with internal leakage in the closed loop circuit.

Charge Pressure Priority Valve Test

While checking charge pressure, check the the operation of the charge priority valve. Rotate the steering wheel to create back–pressure while observing the gauge. The gauge should not have a significant pressure increase during steering operation.

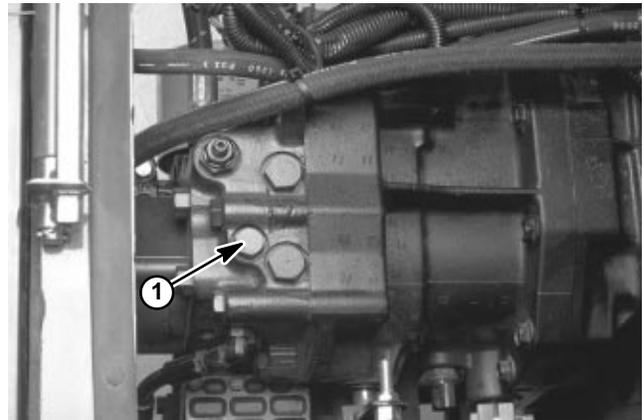


Figure 11

1. Charge pressure port

Forward Traction Test

NOTE: See Sauer–Sundstrand IHT Service Manual for more information.

Use a 10,000 PSI (700 Bar) gauge.

Specification: 6,200 PSI (428 Bar) maximum

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.
2. Lower cutting unit, engage parking brake and stop the engine.
3. Remove the plug from the forward traction pressure port and install a 10,000 PSI (700 Bar) pressure gauge with extension hose.
4. On 4WD machines, raise the implement and engage the transport switch so the IHT operates with less torque to the wheels. Engage the parking brake, and run the engine at full speed. Slowly push the traction pedal forward and listen for engagement of the easy ride valve. Continue to push the traction pedal and read the gauge.

NOTE: When you move the traction pedal to create pressure, move it a short distance first and wait for a change in sound before moving the pedal further. The change in sound indicates that the easy ride valve has closed.

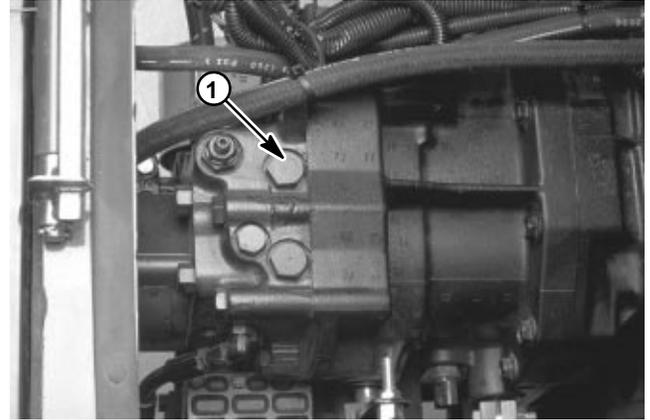


Figure 12

1. Forward traction pressure port

Reverse Traction Test

NOTE: See Sauer–Sundstrand IHT Service Manual for more information.

Use a 10,000 PSI (700 Bar) gauge.

Specification: 5,000 PSI (345 Bar) maximum

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.
2. Lower cutting unit, engage parking brake and stop the engine.
3. Remove the plug from the reverse traction pressure port and install a 10,000 PSI (700 Bar) pressure gauge with extension hose.
4. On 4WD machines, raise the implement and engage the transport switch so the IHT operates with less torque to the wheels. Engage the parking brake, and run the engine at full speed. Slowly push the traction pedal in reverse and listen for engagement of the easy ride valve. Continue to push the traction pedal and read the gauge.

NOTE: When you move the traction pedal to create pressure, move it a short distance first and wait for a change in sound before moving the pedal further. The change in sound indicates that the easy ride valve has closed.

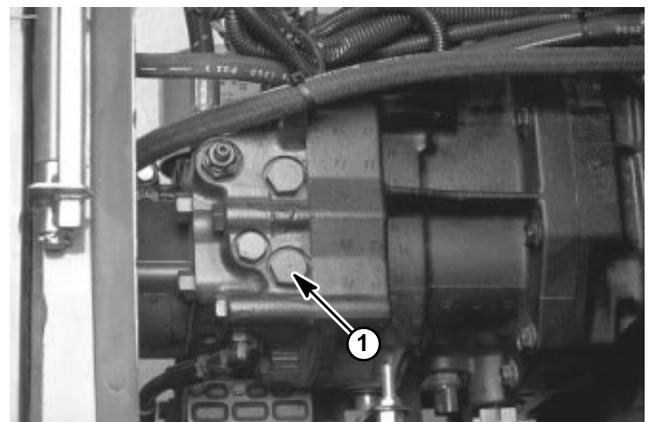


Figure 13

1. Reverse traction pressure port

Implement Relief Pressure Test

NOTE: See Sauer–Sundstrand IHT Service Manual for more information.

Use a 5,000 PSI (350 Bar) test gauge.

Specification: 1,000 to 1,100 PSI (69 to 76 Bar)

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.
2. Lower cutting unit, engage parking brake and stop the engine.
3. Install a 5,000 PSI (350 Bar) pressure gauge with quick connect adapter on the test port.
4. Start the engine and move the throttle control all the way forward. Pull back on the lift lever until the implement is fully raised. Continue holding the lift lever back to cause the relief valve to open, then read the gauge.

NOTE: Normal location for adjusting implement relief pressure is on the top of the IHT. If the machine is equipped with Model 30726 Hydraulic Kit, the original valve is permanently closed, and a new implement relief valve is installed in the hydraulic manifold. If the additional valve is present, adjust relief pressure at the new location only.

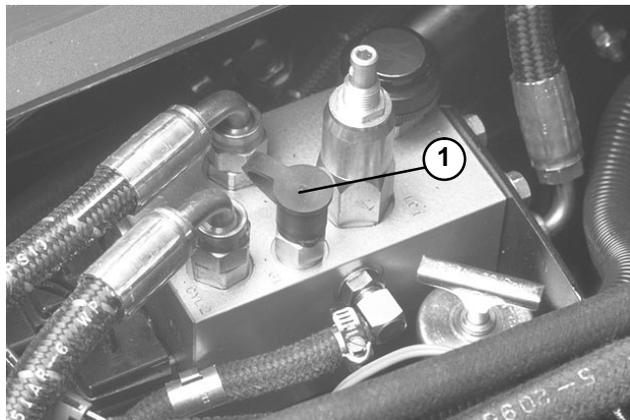


Figure 14
1. Test Port

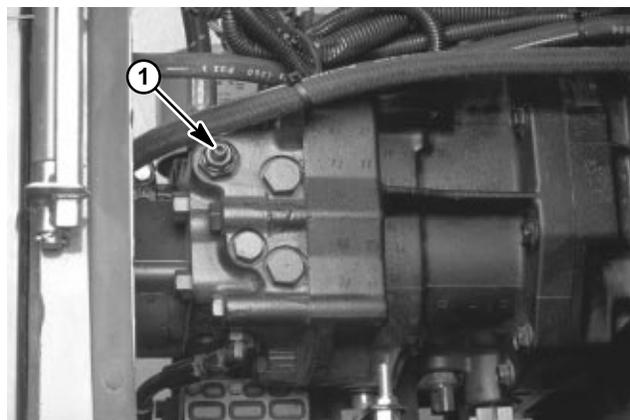


Figure 15

1. Implement relief valve (standard)

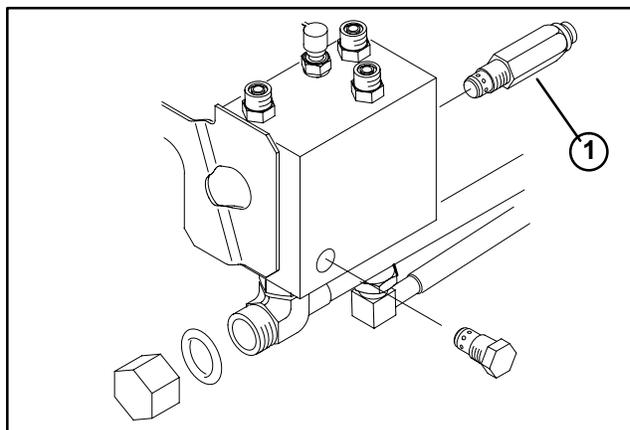


Figure 16

1. Implement relief valve (Port R1)
(Model 30726 Hydraulic Kit)

Counterbalance Pressure Test and Adjustment

Use a 500 or 1,000 PSI (35 or 70 Bar) test gauge.

Recommend counterbalance pressure:

84 inch decks: 220 PSI (15 Bar)

72 inch decks: 220 PSI (15 Bar)

Contour 82 deck: 100 – 150 PSI (7 – 10 Bar)

Brush: 225 PSI (16 Bar)

Blower: 70 – 80 PSI (5 – 6 Bar)

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.
2. Lower cutting unit, engage parking brake and stop the engine.
3. Install a 500 or 1,000 PSI (35 or 70 Bar) pressure gauge with quick connect adapter on the test port.
4. Start the engine and move the throttle control all the way forward. Read the gauge. Do not raise the implement when testing counterbalance pressure. Move the lift lever forward to make sure the lift system is in the “float” position.

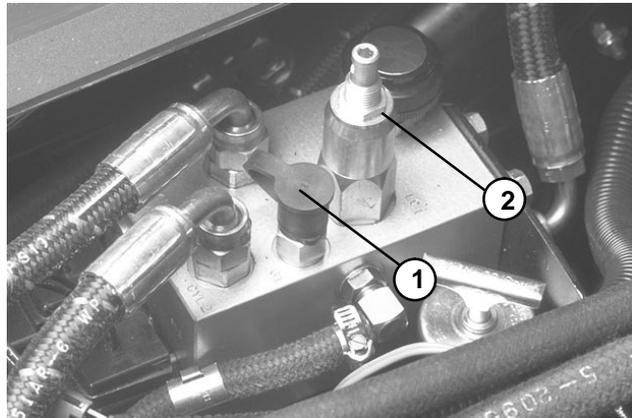


Figure 17

1. Test Port
2. Counterbalance valve

Steering Circuit Test

The steering and implement lift circuits are connected in series. If the implement lift operates correctly, the steering valve has adequate flow and pressure.

Cylinder Test

This test checks the steering cylinder for internal bypass, and assumes that the steering valve is working correctly. The Steering Valve Test will determine if the steering valve is faulty.

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.

2. Lower cutting unit, engage parking brake and stop the engine.

3. Install a tee fitting and a 5,000 PSI (350 Bar) test gauge onto the right side steering cylinder fitting. Use parts from TOR4079 test fitting kit or the following Toro parts:

- Cap (340-117)
- Plug (340-116)
- Tee (340-115)
- Quick connect fitting (86-5480)

4. Start the engine and move the throttle control all the way forward. Rotate the steering wheel counterclockwise until the cylinder reaches the end of its travel. Continue rotating the steering wheel (without excessive force) while watching the pressure gauge. Pressure should be 1,100 PSI (76 Bar). If cylinder does not move, pressure is very low, or the steering wheel rotates easily, the internal seal may be bypassing in the cylinder.

Steering Valve Test

This test determines if the steering valve is working correctly. If this test is good and the first test is not, the problem is in the steering valve.

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.

2. Lower cutting unit, engage parking brake and stop the engine.

3. Disconnect the tee from the cylinder. Install a cap on the cylinder and a plug on the open tee port.

4. Start the engine and move the throttle control all the way forward. Gently rotate the steering wheel while observing the pressure gauge. If the pressure now increases to 1,100 PSI (76 Bar), the cylinder has a damaged internal seal. Repair or replace the cylinder. If the pressure does not increase by rotating in either direction, repair or replace the steering valve.



Figure 18

1. Right side steering cylinder fitting



Figure 19

Auxiliary Hydraulic Pump Efficiency Test (Model 30726 Hydraulic Kit)

A worn or damaged pump will by-pass oil and make the pump less efficient. Eventually, enough by-passing will occur to cause the cutting units to stall in heavy cutting conditions. Continued operation with a worn, inefficient pump can generate a lot of heat and cause damage to seals and other components in the hydraulic system.

Use a tester with pressure and flow capabilities.

Specification:

Minimum 12 GPM (45 liter/min.) at 2,500 PSI (173 Bar)

1. Make sure hydraulic oil is at normal operating temperature by operating the machine for approximately 10 minutes.

2. Lower cutting unit, engage parking brake and stop the engine.

3. Disconnect the large pressure hose from the coupler at the pump. Disconnect the large return hose from the coupler at the return filter. Install the tester between the pump outlet and filter inlet.

IMPORTANT: Make sure the oil flow indicator on the flow meter shows that the oil will flow from the pump, through the tester and into the return filter. Make sure the flow control valve is open before starting the engine.

4. Start the engine and move the throttle control all the way forward. Engage the PTO.

5. Slowly close the flow control valve until the gauge reads 2,500 PSI (173 Bar). Read the flow meter. Disengage the PTO, stop the engine and open the flow control valve on the tester. If flow is less than 12 GPM (45 liter/min.) the pump is inefficient and should be repaired or replaced.

NOTE: The pump has an integral relief valve that is set at 3,625 PSI (250 Bar). This relief valve protects the pump from shock stress. If you cannot reach 2,500 PSI (173 Bar) when closing the flow control valve on the tester, this relief valve may be stuck open. This could be caused by debris or contamination in the hydraulic system.

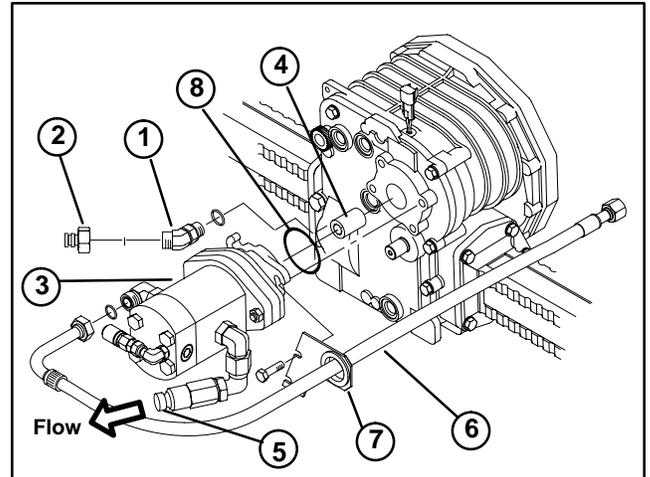


Figure 20

- | | |
|-------------------------|------------------------|
| 1. 45 degree fitting | 5. Flush faced coupler |
| 2. Quick coupler nipple | 6. Pump supply hose |
| 3. Pump | 7. Hose bracket |
| 4. Splined coupler | 8. Square O-ring |

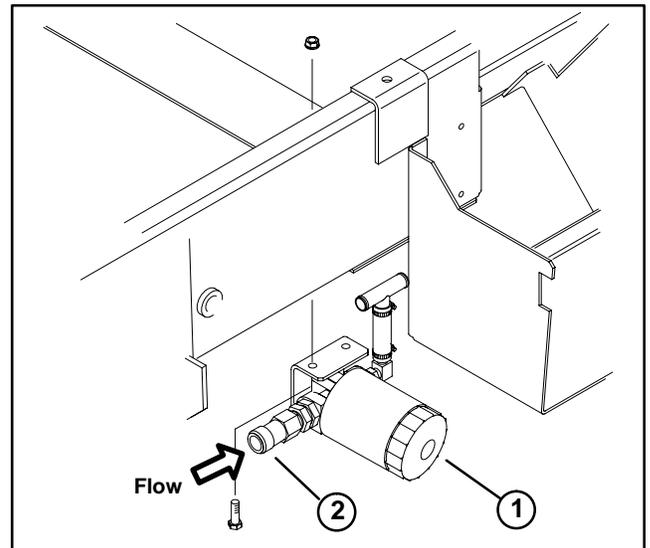


Figure 21

1. Oil filter assembly
2. Flush faced fitting

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Adjustments

Traction Pedal Linkage Adjustment

Traction pedal to reach full stroke prior to contact with stop.

1. Park machine on a level surface, shut engine off and lower cutting unit to the floor.
2. Check pedal stop adjustment. Distance from top of stand to top of stop must be 1.25 in. (32 mm). Loosen jam nuts and adjust stop if required.
3. Loosen jam nut securing hub to rod.
4. Remove hair pin cotter and washer securing traction rod hub to lever rod on side of axle assembly.
5. Adjust hub so traction pedal reaches full forward stroke just before pedal contacts stop.
6. Re-assemble linkage to lever after adjustment.

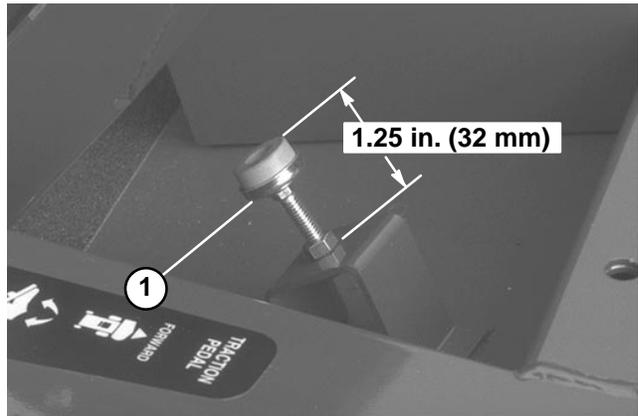


Figure 22
1. Traction Pedal Stop

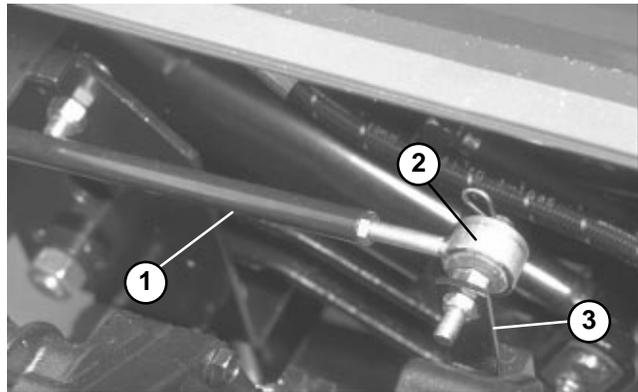


Figure 23
1. Traction Rod
2. Traction Rod Hub
3. Lever

Service Brake Adjustment

If excessive pedal travel is required to engage brake or as brake pads wear, an adjustment to the brake linkage may be required.

1. Jack up front of machine and support with jack stands.
2. Remove left front tire.
3. With brake linkage bellcrank against frame stop, loosen jam nut disconnect clevis from bellcrank and adjust linkage until there is a slight drag on rotor.
4. Back off clevis one full turn and reinstall to bellcrank.
5. Tighten jam nut.
6. Repeat procedure on opposite wheel.

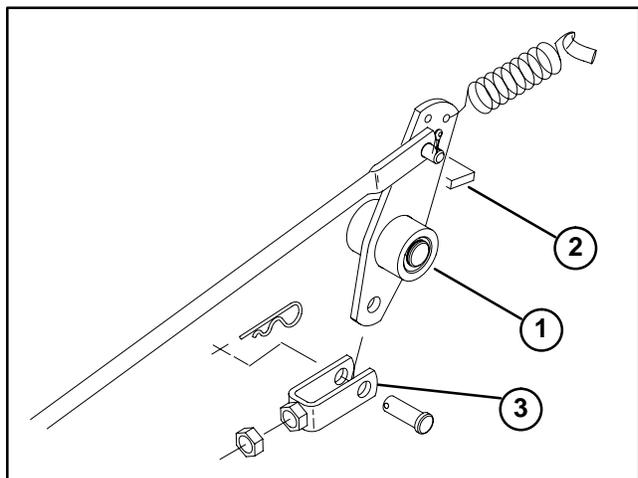


Figure 24
1. Bellcrank
2. Frame stop
3. Linkage Clevis

Service and Repairs

Wheel and Tires

Check Tire Pressure

The tires are over-inflated for shipping. Therefore, release some of the air to reduce the pressure. Correct air pressure in the front and rear tires is 15 psi (1 Bar).

IMPORTANT: Maintain even pressure in all tires to assure a good quality-of-cut and proper machine performance. **DO NOT UNDER INFLATE.**

Check Wheel Nut Torque



WARNING

Torque wheel nuts to 70–80 ft-lb (10–11 Kgm) after 1-4 hours of operation and again after 10 hours of operation and every 200 hours thereafter. Failure to maintain proper torque could result in failure or loss of wheel and may result in personal injury.

Lubrication

The machine 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 or immediately after every washing.

Intermediate Drive Shaft (3) (Fig. 25), 4WD Rear Drive Shaft (3) (Fig.26), Pedal Pivots (5) (In square tube under floor plate) (1) (Fig. 27) and Lift arm pivot (2) (Fig. 28).

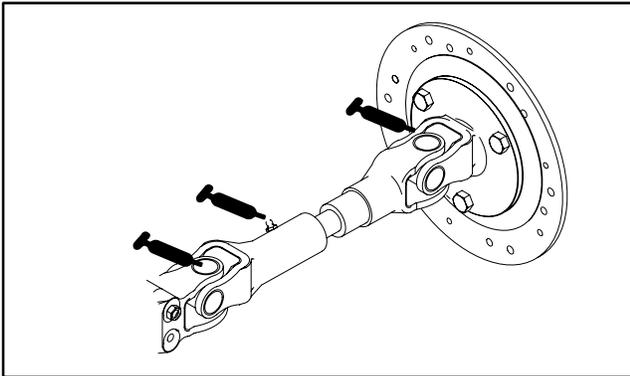


Figure 25

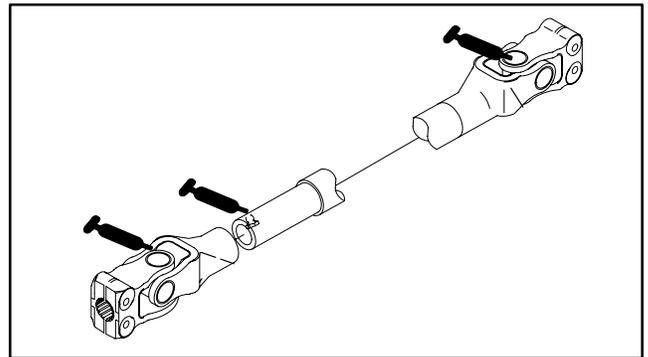


Figure 26

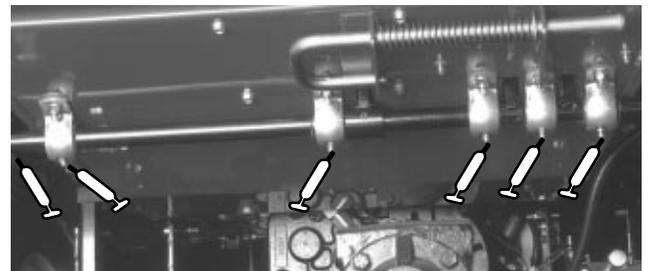


Figure 27



Figure 28

Check Hydraulic Fluid

The hydraulic system is designed to operate on anti-wear hydraulic fluid. The machine's reservoir is filled at the factory with approximately 12 U.S. quarts (11.4 liters) of Mobil 424 hydraulic fluid. **Check level of hydraulic fluid before engine is first started and daily thereafter.**

1. Position machine on a level surface, raise the implement, and stop the engine.
2. Unscrew dipstick cap from the filler neck and wipe it with a clean rag. Screw dipstick cap finger tight onto filler neck. Unscrew the dipstick and check level of oil. If level is not up to FULL mark on dipstick, add enough oil to raise level to mark. **DO NOT OVERFILL.**
3. Screw dipstick filler cap finger-tight onto filler neck.
4. Lower the implement.

The following fluids are recommended for use:

ISO type 46/68 anti-wear hydraulic fluid

Mobil	Mobil Fluid 424
Amoco	Amoco 1000
International Harvester	Hy-Tran
Texaco	TDH
Shell	Donax TD
Union Oil	Hydraulic/Tractor Fluid
Chevron	Tractor Hydraulic Fluid
BP Oil	BP HYD TF
Boron Oil	Eldoran UTH
Exxon	Torque Fluid
Conoco	Power-Tran 3
Kendall	Hyken 052
Phillips	HG Fluid

Note: The fluids within this group are interchangeable.

IMPORTANT: Do Not Use Biodegradable Hydraulic Fluid.

IMPORTANT: Use only types of hydraulic fluids specified. Other fluids could cause system damage.

Note: A red dye additive for detecting leaks in the hydraulic system is available in 2/3 oz. bottles. One bottle is sufficient for 4–6 gal. (15 – 23 liters) of hydraulic fluid. Order Part No. 44–2500 from your Authorized Toro Distributor

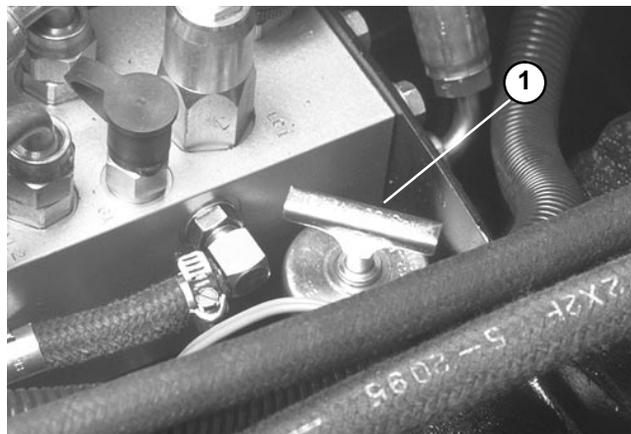


Figure 29
1. Dipstick cap

Change Hydraulic Oil and Filter

The hydraulic system oil and filter must be changed initially at 200 hours and thereafter every 800 hours of operation or seasonally, whichever comes first. **NOTE:** Change oil and filters every 400 hours if equipped with Model 30726 Hydraulic Kit. The hydraulic system is designed to operate on anti-wear hydraulic fluid. The machine's reservoir is filled at the factory with approximately 12 U.S. quarts (11.4 liters) of Mobil 424 hydraulic fluid (See Check Hydraulic Oil in this section for recommended fluids). **Check level of hydraulic fluid before engine is first started and daily thereafter.**

1. Start engine, park machine on a level surface, lower implement to the shop floor, set the parking brake, and shut engine off.
2. Clean area around dipstick cap and remove cap from axle filler tube.
3. To ease access to axle housing drain plug, implement may be removed from traction unit.
4. Remove drain plug from axle housing and allow oil to flow into drain pan.
5. Clean area around hydraulic oil filter and remove filter. **NOTE:** Also replace filter for Model 30726 Hydraulic Kit.
6. Lubricate new filter seal and install filter.
7. Install drain plug in axle housing.
8. Through axle filler tube, fill axle to proper level with Mobil 424 hydraulic fluid. Install dipstick cap.
9. Start and run the engine at idle speed for about two minutes, raise and lower implement and turn the steering wheel lock to lock to purge air trapped in the system. Shut the engine off.
10. Let machine set for two additional minutes, then remove dipstick and check oil level in axle. If level is low, add oil until level matches groove in dipstick. If level is too high, remove drain plug and drain oil until oil level matches Full mark on dipstick.

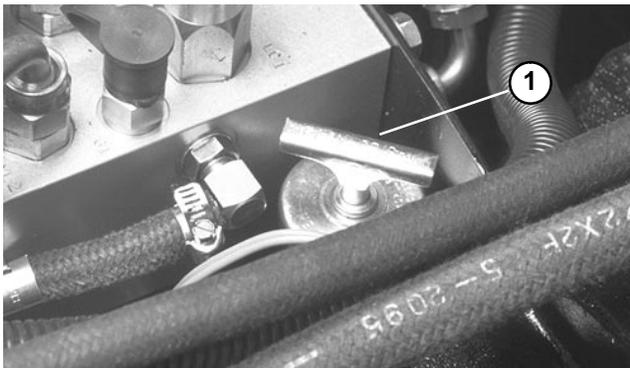


Figure 30
1. Dipstick cap

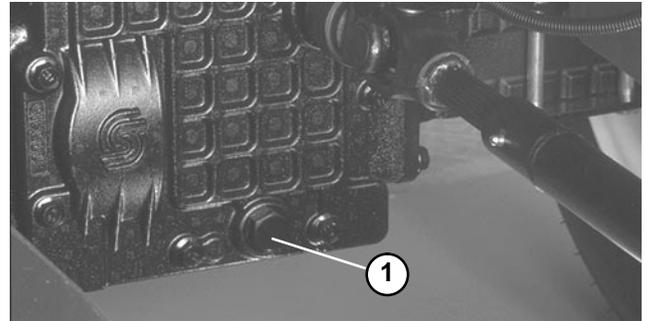


Figure 31
1. Drain plug



Figure 32
1. Hydraulic Filter

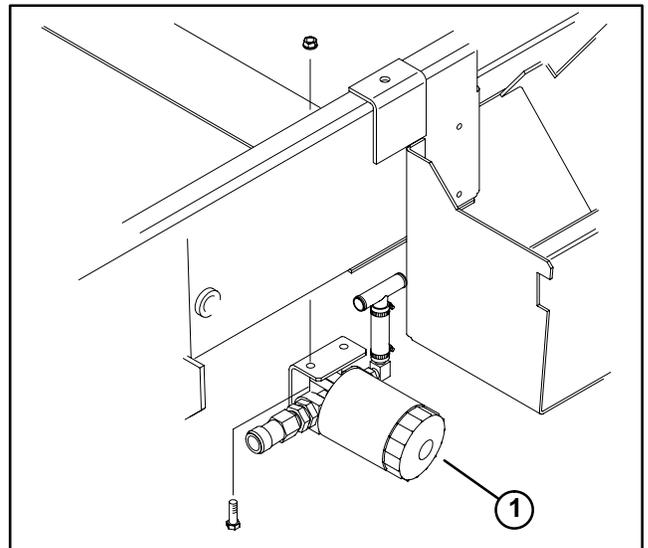


Figure 33
1. Hydraulic filter (Model 30726 Hydraulic Kit)

Traction Control Linkage

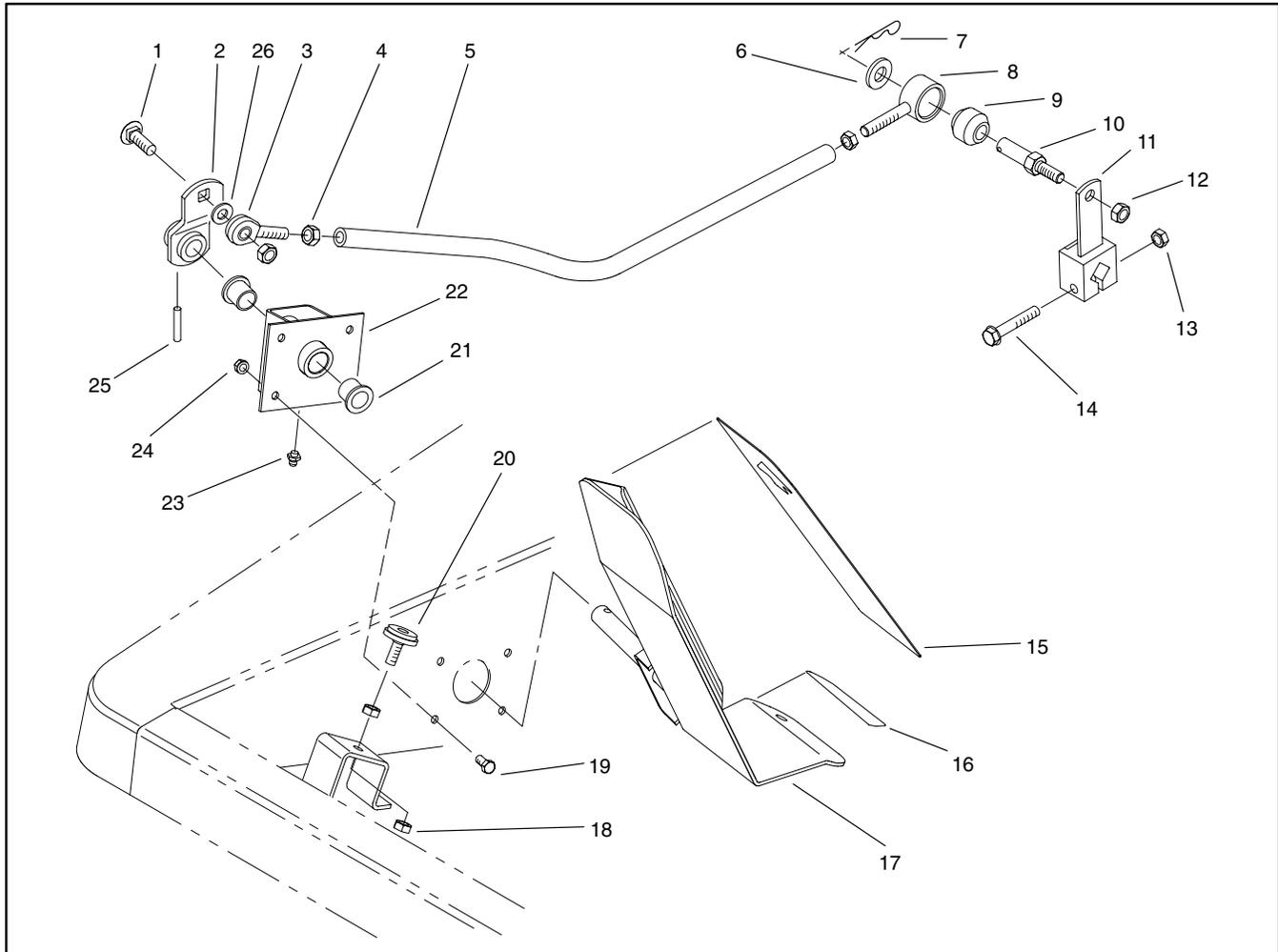


Figure 34

- | | | |
|--------------------|--------------------|--------------------|
| 1. Carriage bolt | 10. Hub post | 19. Screw |
| 2. Traction lever | 11. Lever | 20. Screw |
| 3. Rod end bearing | 12. Lock nut | 21. Flange bushing |
| 4. Jam nut | 13. Lock nut | 22. Pedal bracket |
| 5. Control tube | 14. Screw | 23. Grease fitting |
| 6. Flat washer | 15. Pedal abrasive | 24. Nut |
| 7. Hair pin cotter | 16. Pedal abrasive | 25. Roll pin |
| 8. Hub | 17. Traction pedal | 26. Flat washer |
| 9. Rubber bushing | 18. Nut | |

Brake Linkage

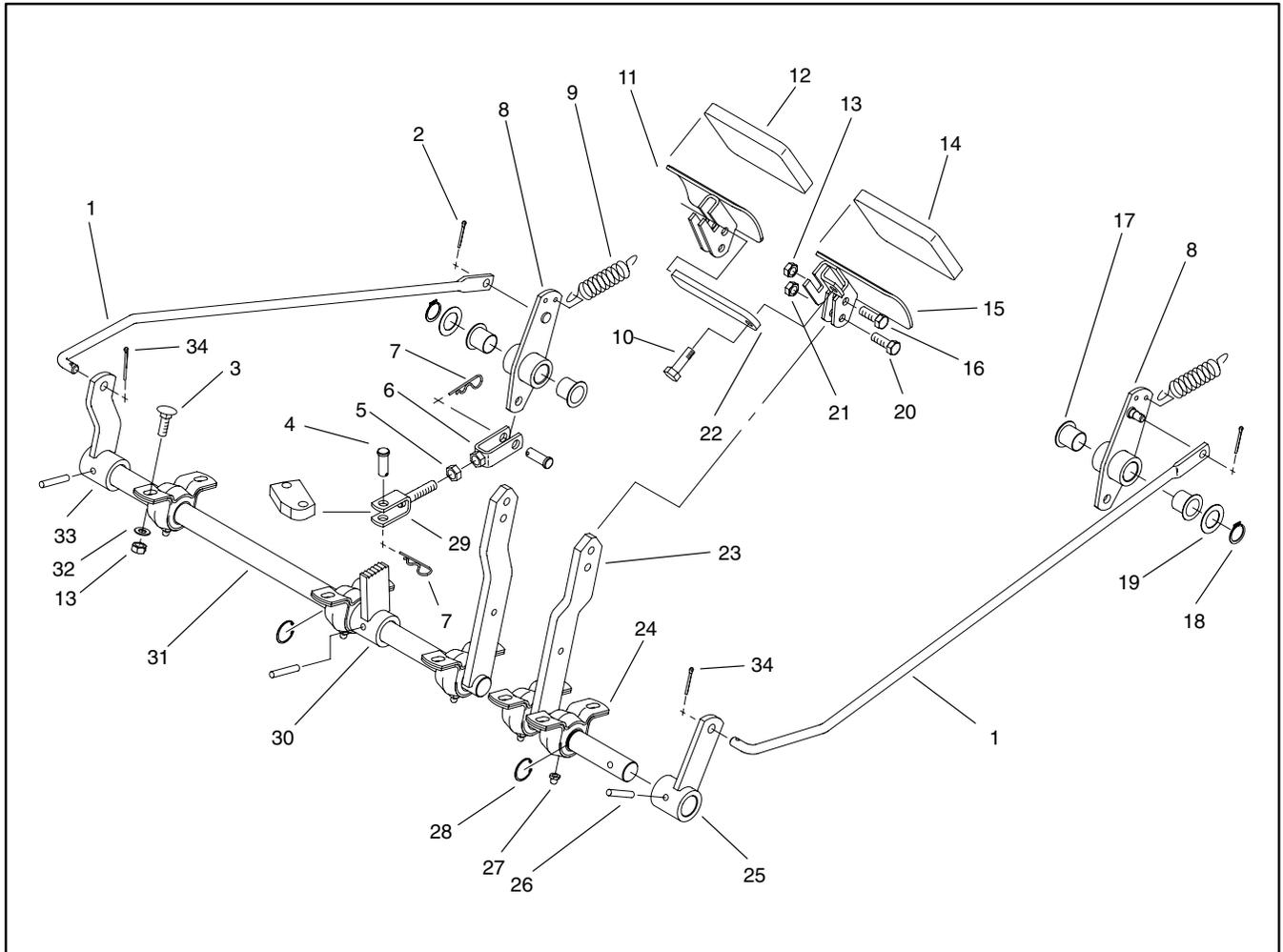


Figure 35

- | | | |
|---------------------|--------------------------|----------------------|
| 1. Control rod | 13. Lock nut | 25. L.H. brake lever |
| 2. Cotter pin | 14. Foot pad | 26. Roll pin |
| 3. Carriage screw | 15. L.H. pedal | 27. Grease fitting |
| 4. Clevis pin | 16. Screw | 28. Retaining ring |
| 5. Jam nut | 17. Nylon bushing | 29. Clevis |
| 6. Clevis | 18. Retaining ring | 30. Brake latch |
| 7. Hair pin cotter | 19. Thrust washer | 31. R.H. brake arm |
| 8. Bellcrank | 20. Screw | 32. Flat washer |
| 9. Extension spring | 21. Nut | 33. R.H. brake lever |
| 10. Screw | 22. Lock arm | 34. Cotter pin |
| 11. R.H. pedal | 23. L.H. brake arm | |
| 12. Foot pad | 24. Pillow block bearing | |

Driveshafts

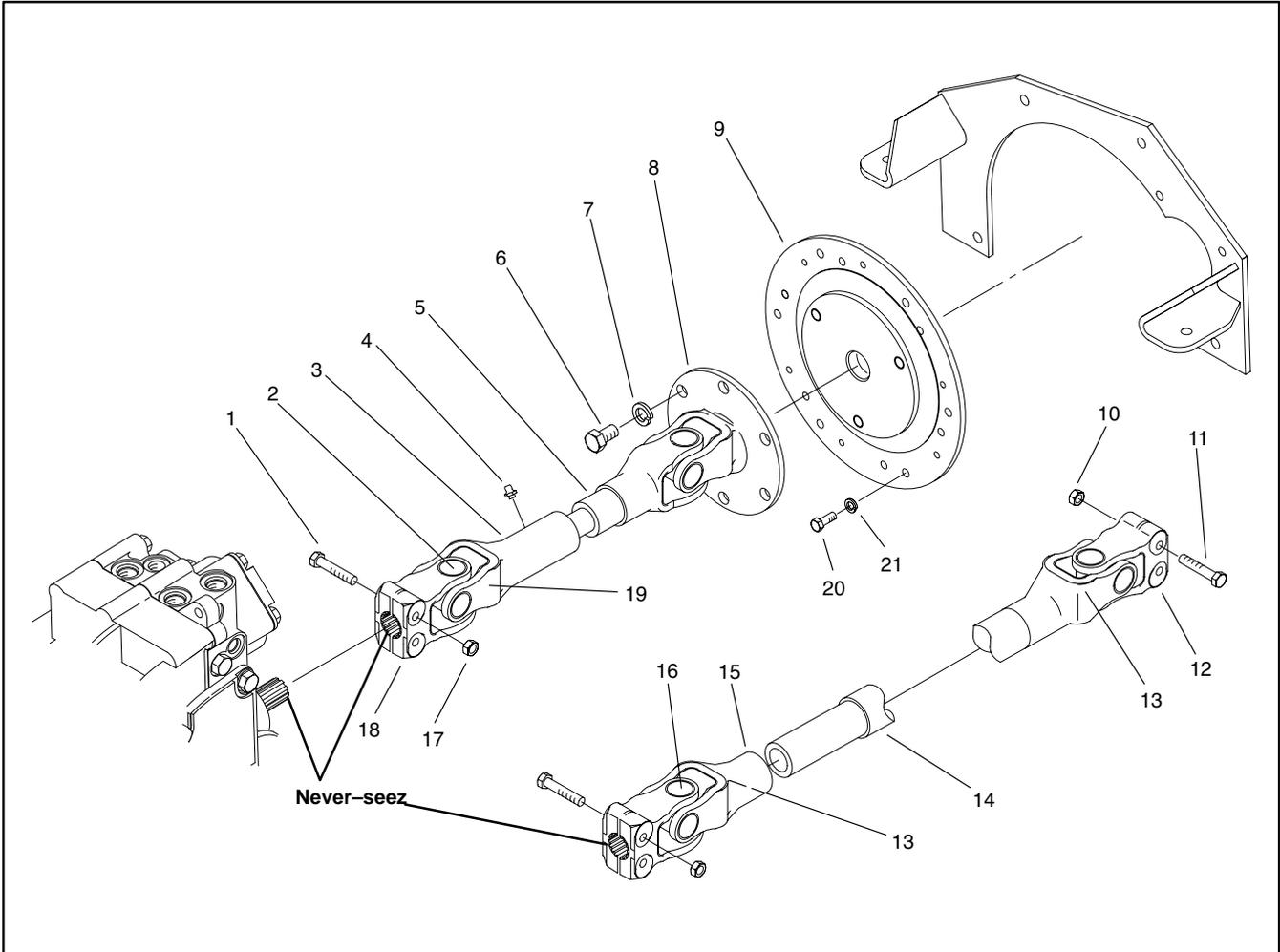


Figure 36

- 1. Screw
- 2. Cross and bearing kit
- 3. Slip yoke
- 4. Grease fitting
- 5. Yoke and shaft
- 6. Screw
- 7. Lock washer

- 8. Flange yoke
- 9. Engine adapter plate
- 10. Lock nut (Model 30302)
- 11. Screw (Model 30302)
- 12. Clamp yoke (Model 30302)
- 13. Grease fitting (Model 30302)
- 14. Yoke and sleeve (Model 30302)

- 15. Yoke and shaft (Model 30302)
- 16. Cross & bearing kit (Model 30302)
- 17. Lock nut
- 18. Yoke and clamp
- 19. Grease fitting
- 20. Screw
- 21. Lock washer

Lift Arms

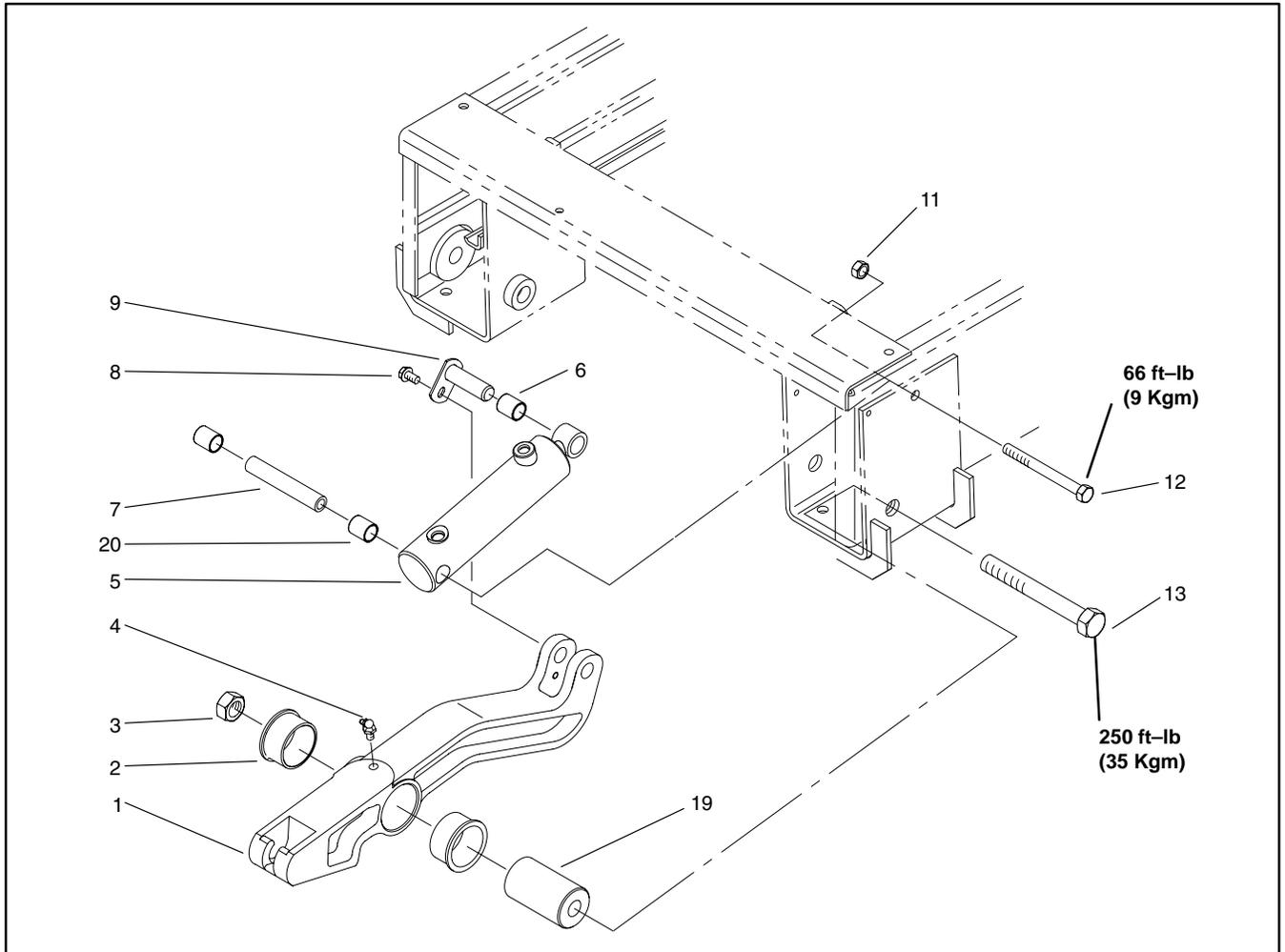


Figure 37

- 1. Lift arm (L.H. shown)
- 2. Flange bushing
- 3. Nut
- 4. Grease fitting
- 5. Hydraulic cylinder
- 6. Bushing

- 7. Cylinder spacer
- 8. Screw
- 9. Pin
- 11. Lock nut
- 12. Screw
- 13. Screw

- 14. Screw
- 19. Pivot spacer
- 20. Bushing

Hydraulic System and Transaxle

Steering Control

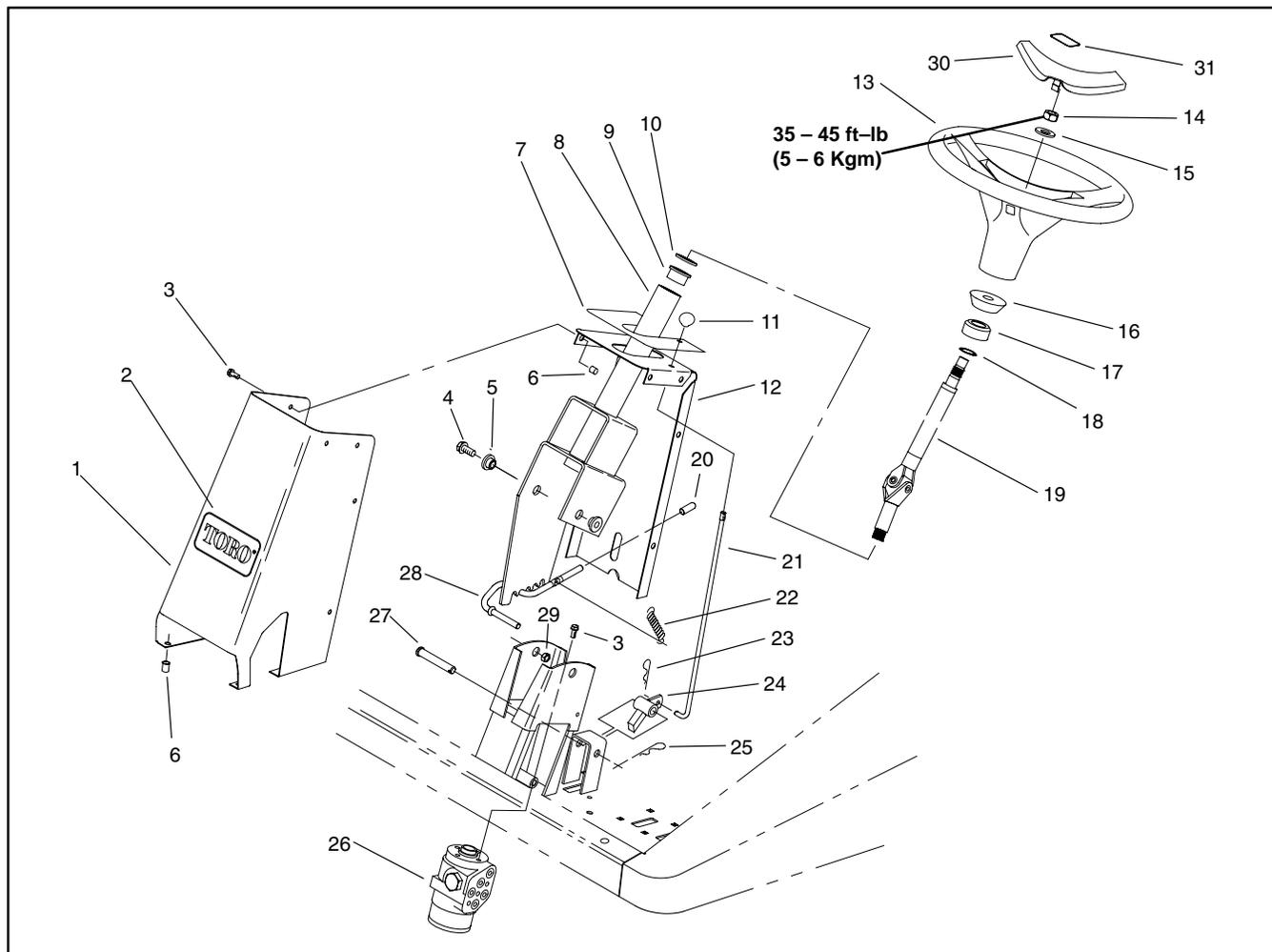


Figure 38

- | | | |
|--------------------|--------------------|---------------------------|
| 1. Tower housing | 11. Knob | 21. Parking brake rod |
| 2. Tower decal | 12. Tower cover | 22. Extension spring |
| 3. Screw | 13. Steering wheel | 23. Hair pin cotter |
| 4. Screw | 14. Nut | 24. Brake pawl |
| 5. Spacer | 15. Flat washer | 25. Hair pin cotter |
| 6. Clinch nut | 16. Foam collar | 26. Steering control unit |
| 7. Tower decal | 17. Steering seal | 27. Clevis pin |
| 8. Steering column | 18. Retaining ring | 28. Tilt rod |
| 9. Flange bushing | 19. Steering shaft | 29. Nut |
| 10. Washer | 20. Vinyl cap | 30. Cover |

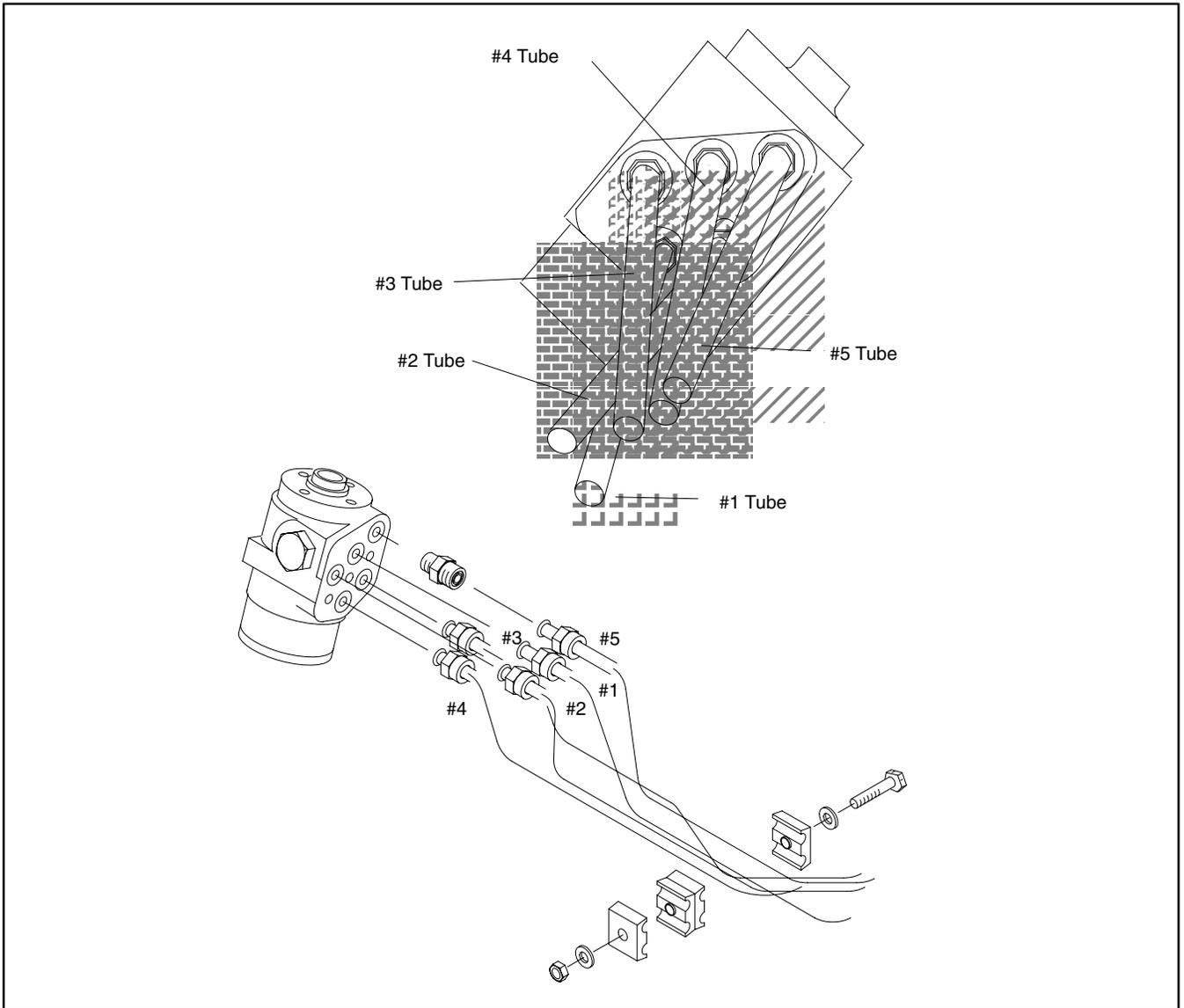


Figure 39

Removing Hydraulic System Components

1. Thoroughly clean the machine before disconnecting, removing or disassembling any hydraulic components. Always keep in mind the need for cleanliness when working on hydraulic equipment.
2. Put caps or plugs on any hydraulic lines or fittings left open or exposed.
3. Put labels on disconnected hydraulic lines and hoses for proper installation after repairs are completed.

After Repair or Replacement of Components

1. Check oil level in hydraulic reservoir and add correct oil if necessary. Drain and refill hydraulic system reservoir and change oil filter if component failure was severe or system is contaminated.

2. After repairs, check control linkage for proper adjustment, binding or broken parts.
3. After disconnecting or replacing any hydraulic components, operate machine functions slowly until air is out of system.
4. Check for hydraulic oil leaks. Shut off engine and correct leaks if necessary. Check oil level in hydraulic reservoir and add correct oil if necessary.

Manifold Block

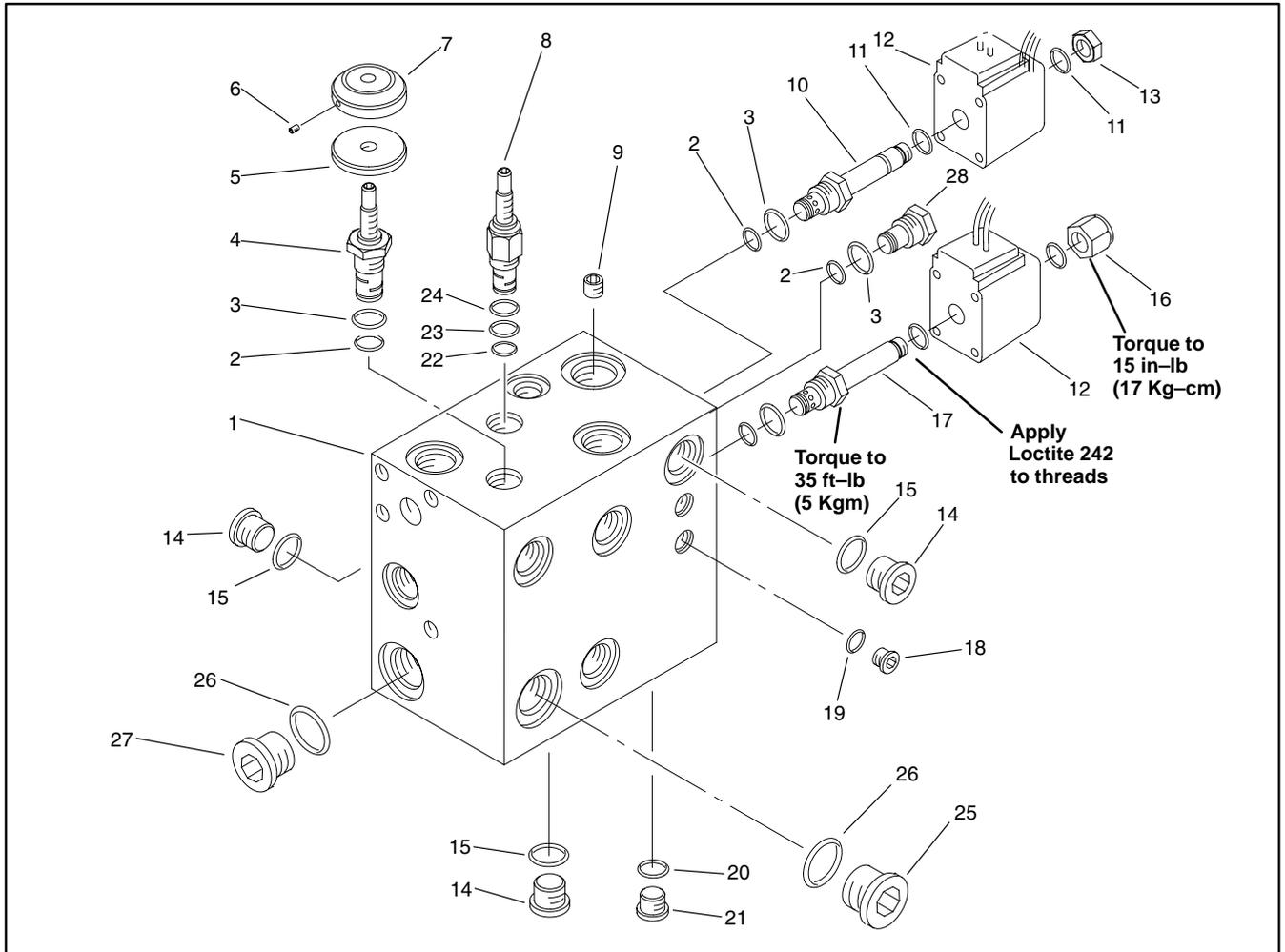


Figure 40

- | | | |
|-----------------------------|-----------------------------|-----------------|
| 1. Body | 11. O-ring | 21. Plug |
| 2. O-ring | 12. Solenoid coil | 22. O-ring |
| 3. O-ring | 13. Nut | 23. O-ring |
| 4. Needle valve | 14. Plug | 24. O-ring |
| 5. Wheel | 15. O-ring | 25. Plug |
| 6. Set screw | 16. Nut | 26. O-ring |
| 7. Knob | 17. Cartridge – N.O. poppet | 27. Plug |
| 8. Logic valve | 18. Plug | 28. Cavity plug |
| 9. Orifice plug (.187 dia.) | 19. O-ring | |
| 10. Cartridge – N.C. poppet | 20. O-ring | |

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.

Cartridge Valves

1. Clean valve block to prevent contamination when valve cartridge is removed.
2. Remove cartridge valve:
 - A. Remove nut from solenoid.
 - B. Remove solenoid coil and o-ring at each end of solenoid coil.
 - C. Use a deep socket to remove cartridge valve.
NOTE: Use care when handling valve cartridges, because slight bending or distortion of stem tube can cause binding and malfunction.
3. Visually inspect port in block for damage to sealing areas, damaged threads or contamination.
4. Visually inspect cartridge for damaged seals and contamination.
 - A. O-rings and backup rings must be arranged properly on the valve for proper operation and sealing. Replace any damaged seals.
 - B. Contamination may cause valves to stick or hang up. Contamination can become lodged in small valve orifices or seal areas on poppet type valves causing malfunction.
 - C. If cartridge valve seals appear pitted or damaged, the hydraulic system may be overheating or there may be water in the system.
5. Clean and check for proper valve operation:
 - A. Use clean mineral spirits to clean cartridge valve. Submerge the valve in clean mineral spirits and use a brass or plastic probe to push the internal spool in and out 20 to 30 times to flush out contamination. Mineral spirits does not affect the o-ring material. Particles as fine as talcum powder can affect the operation of high pressure hydraulic valves.

Cartridge Installation

1. Lubricate all o-rings with clean hydraulic oil.
2. Carefully thread cartridge into the port by hand. Valve cartridge should go in easily without binding.
3. Use a torque wrench and deep socket to tighten cartridge valves to a torque of 35 ft-lb (5 Kgm). Excessive torque may cause the spool to bind and malfunction.
NOTE: Use care when handling solenoid valve cartridges because slight bending or distortion of stem tube can cause binding and malfunction.
4. Install solenoid coil. Make sure there is an o-ring at each end of the coil. Apply "Loctite 242" or equivalent to threads of stem tube before installing nut. Tighten nut to a torque of 15 in-lb (17 Kg-cm).
5. If problem still exists, remove valve and clean again or replace valve.



Figure 41

Lift Cylinder

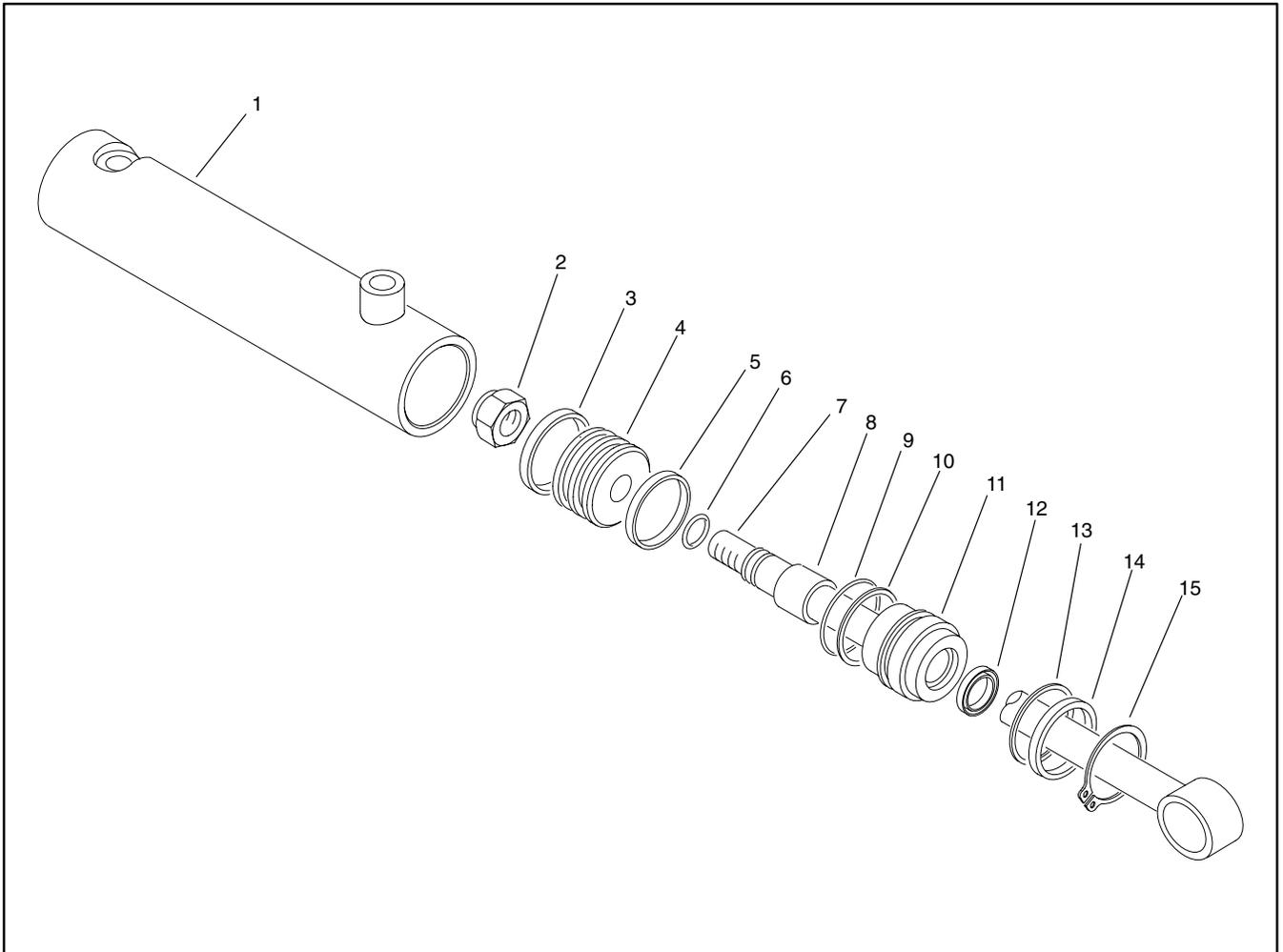


Figure 42

- 1. Tube
- 2. Lock nut
- 3. Piston seal
- 4. Piston
- 5. Wear ring

- 6. O-ring
- 7. Rod
- 8. Bushing
- 9. O-ring
- 10. Backup washer

- 11. Head
- 12. Wiper
- 13. Retaining ring
- 14. Spacer
- 15. Retaining ring

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.

Steering Cylinder

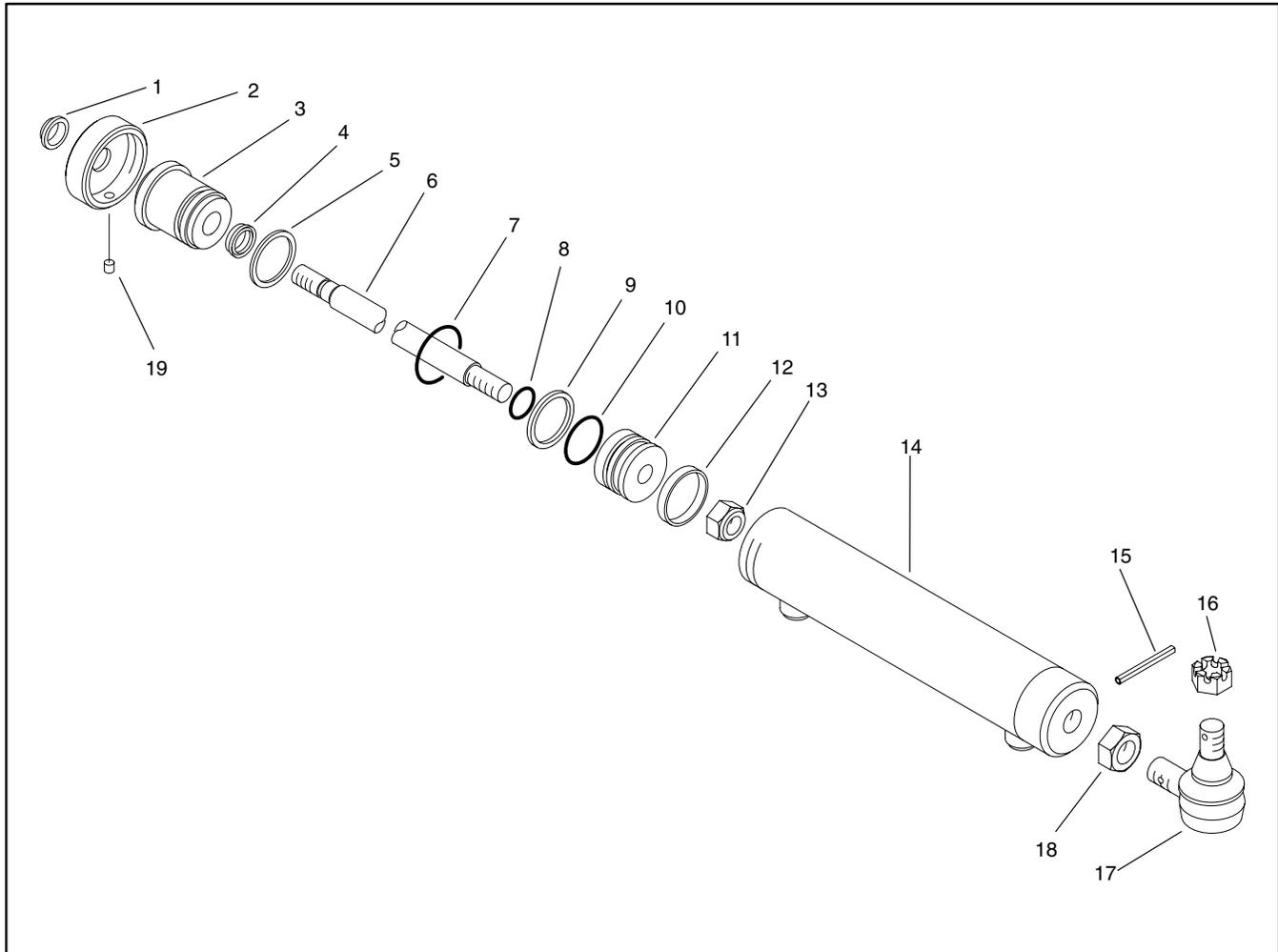


Figure 43

- 1. Rod wiper
- 2. Threaded cap
- 3. Head
- 4. U-cup
- 5. Backup ring
- 6. Rod
- 7. O-ring

- 8. O-ring
- 9. Piston ring
- 10. O-ring
- 11. Piston
- 12. Wear ring
- 13. Lock nut
- 14. Barrel

- 15. Roll pin
- 16. Slotted nut
- 17. Tie rod end
- 18. Jam nut
- 19. Set screw

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.

Auxiliary Hydraulic Pump (Model 30726 Hydraulic Kit)

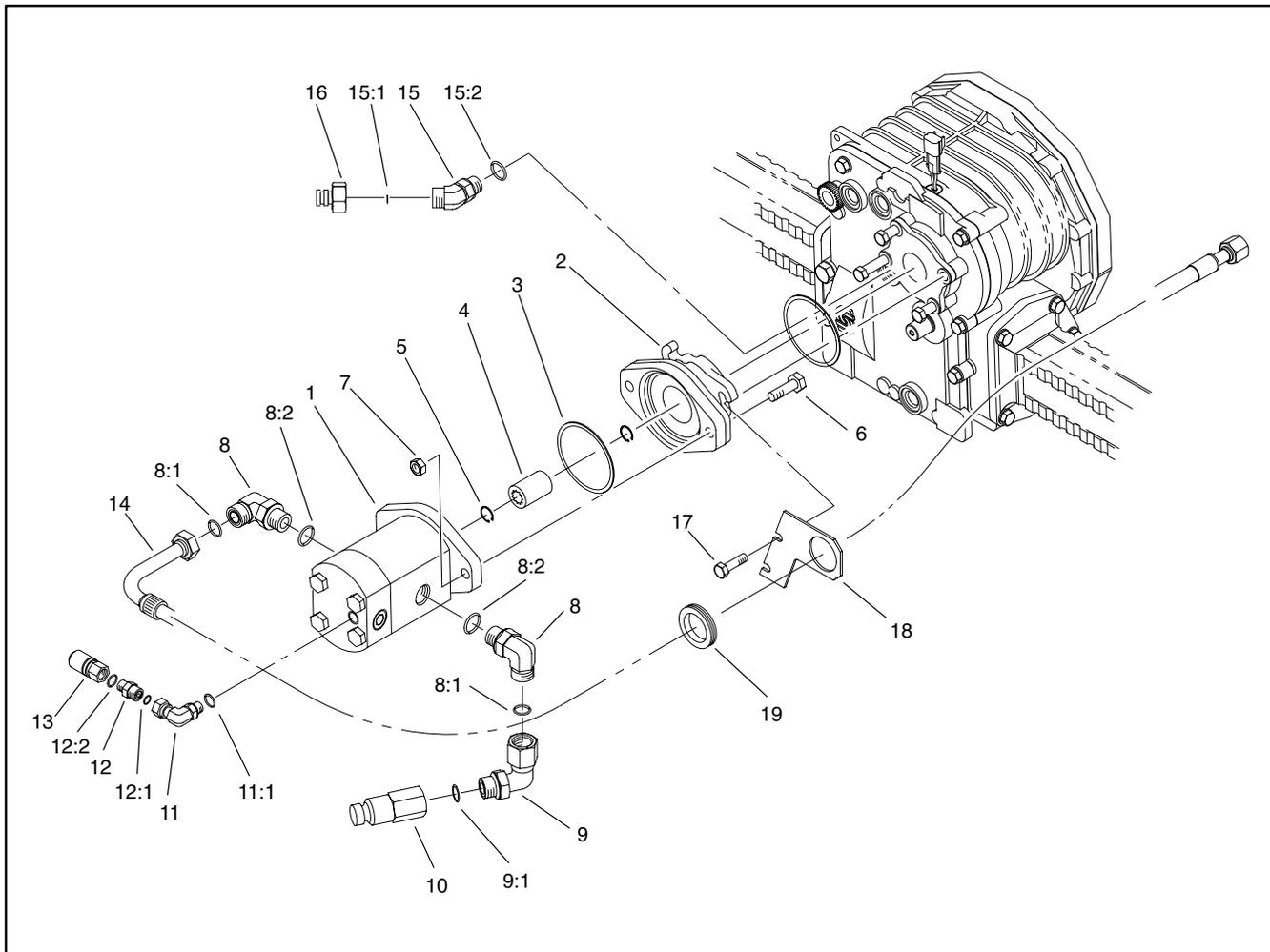


Figure 44

- | | | |
|-----------------------|------------------------|-----------------------|
| 1. Hydraulic pump | 8. Hydraulic fitting | 15. Hydraulic fitting |
| 2. Adapter | 9. Hydraulic fitting | 16. Nipple |
| 3. O-ring | 10. Flush face fitting | 17. Screw |
| 4. Splined coupler | 11. Elbow fitting | 18. Hose bracket |
| 5. Internal snap ring | 12. Adapter | 19. Grommet |
| 6. Screw | 13. Hydraulic coupler | |
| 7. Lock nut | 14. Hose | |

Hydraulic System and Transaxle

Transaxle Service

Toro recommended fluids and maintenance intervals may be different than those listed in the Sauer-Sunds-trand IHT Service Manual. When doing maintenance or service on the transaxle, use the Toro recommended fluids and maintenance intervals.

Some of the components shown in the Sauer-Sunds-trand IHT Service Manual may not be used on the Toro application. See your Toro Parts Catalog for more information.

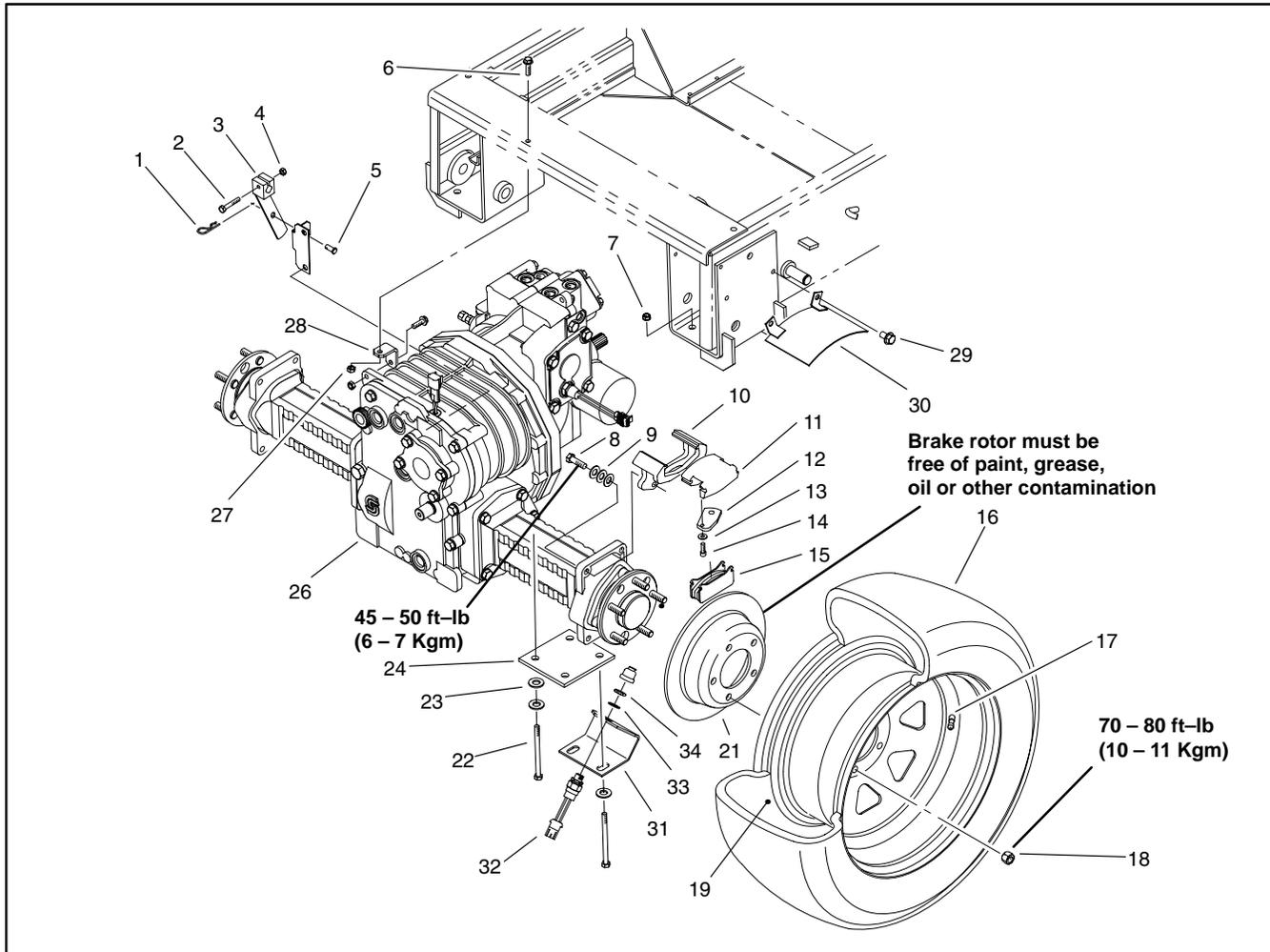


Figure 45

- | | | |
|----------------------|-----------------|-----------------------|
| 1. Hair pin cotter | 13. Washer | 27. Lock nut |
| 2. Screw | 14. Screw | 28. Transaxle bracket |
| 3. Lever | 15. Pad | 29. Screw |
| 4. Lock nut | 16. Tire | 30. Brake shield |
| 5. Clevis pin | 17. Valve stem | 31. Switch bracket |
| 6. Screw | 18. Lug nut | 32. Switch |
| 7. Nut | 19. Rim | 33. Lock washer |
| 8. Screw | 21. Brake rotor | 34. Jam nut |
| 9. Belleville washer | 22. Screw | |
| 10. Mounting bracket | 23. Flat washer | |
| 11. Housing | 24. Axle plate | |
| 12. Lever | 26. Axle | |

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.



Electrical System

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Electrical Schematics, Wiring Diagrams, and Harness Drawings

All electrical schematics, diagrams, and drawings for both the Groundsmaster 3000 and Groundsmaster 3000-D are located in Chapter 14 – Electrical Diagrams.

Special Tools

Order special tools from the *TORO SPECIAL TOOLS AND APPLICATIONS GUIDE (COMMERCIAL PRODUCTS)*.

Some tools may also be available from a local supplier.

Multimeter

The meter can test electrical components and circuits for current, resistance, or voltage.

NOTE: Toro recommends the use of a DIGITAL Volt-Ohm-Amp multimeter when testing electrical circuits. The high impedance (internal resistance) of a digital meter in the voltage mode will make sure that excess current is not allowed through the meter. This excess current can cause damage to circuits not designed to carry it.

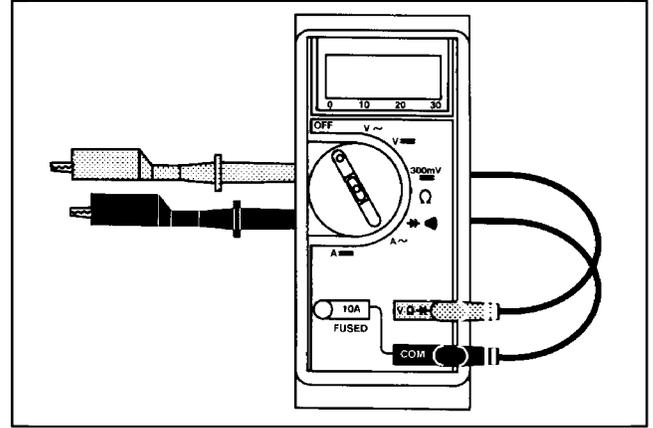


Figure 1

Skin-Over Grease

Special non-conductive grease which forms a light protective skin which helps waterproof electrical switches and contacts.

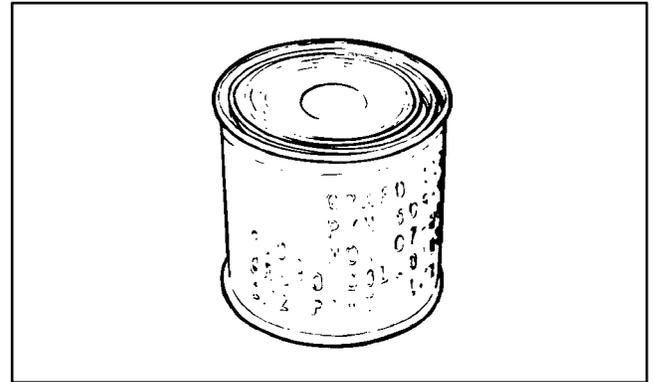


Figure 2

Troubleshooting (Groundsmaster 3000)



CAUTION

Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the battery cables unless the test requires battery voltage.

For effective troubleshooting and repairs, you must have a good understanding of the electrical circuits and components used on this machine (see Wiring Schematics section of this chapter).

If the machine has any interlock switches by-passed, they must be reconnected for proper troubleshooting and safety.

Starting Problems

Problem	Possible Causes
Starter solenoid clicks, but starter will not crank (if solenoid clicks, the problem is not with the Ignition module or its inputs).	Battery charge is low. Battery cables are loose or corroded. Battery ground to engine is loose or corroded. Wiring at starter is faulty. Starter solenoid is faulty. Starter mounting bolts are loose or not supplying a sufficient ground for solenoid. Starter is faulty causing incomplete circuit for solenoid.
Nothing happens when a start attempt is made.	Wiring to start circuits (see Wiring Schematics) is loose, corroded, or damaged. Battery is dead. 20 ampere fuse to start relay or 10 ampere fuse to ignition switch is blown. Neutral switch is faulty or traction pedal is depressed. Ignition switch is faulty. Start relay is faulty. Starter is faulty.
Engine cranks, but does not fire.	Wiring to start circuits (see Wiring Schematics) is loose, corroded, or damaged. Ignition switch is faulty. A high temperature condition exists, high temperature switch is shorted, or the high temperature relay is faulty. Fuel solenoid is faulty. Ignition module or components inputting into it are faulty (see Chapter 3 – Ford Gasoline Engine). Engine or fuel system is malfunctioning (see Chapter 3 – Ford Gasoline Engine).

General Run and Transport Problems (Groundsmaster 3000)

Problem	Possible Causes
Engine kills when the traction pedal is positioned to either forward or reverse.	<p>Operator is sitting too far forward on the seat (seat switch not depressed).</p> <p>Wiring to seat and shutdown delay circuits (see Wiring Schematics) is loose, corroded, or damaged.</p> <p>2 ampere fuse, seat switch, or seat relay is faulty.</p> <p>Diode (D1) or shutdown delay relay is faulty.</p> <p>20 ampere fuse to seat relay is blown.</p>
Battery does not charge.	<p>Wiring to the charging circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>Voltage regulator/alternator is faulty.</p> <p>50 ampere fuse is open.</p> <p>Battery is dead.</p>

Cutting Unit Operating Problems (Groundsmaster 3000)

Problem	Possible Causes
Cutting unit does not engage.	<p>Wiring to PTO circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>PTO switch, relay, or coil is faulty.</p>
Cutting unit does not lift.	<p>Wiring to lift/xbal switch circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>Lift/xbal switch or solenoid is faulty.</p> <p>The hydraulic system is malfunctioning.</p>
Cutting unit does not lower.	<p>Wiring to float/hold switch circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>Float/hold switch or solenoid is faulty.</p> <p>Hydraulic solenoid valve is malfunctioning.</p>

Troubleshooting (Groundsmaster 3000–D)



CAUTION

Remove all jewelry, especially rings and watches, before doing any electrical troubleshooting or testing. Disconnect the battery cables unless the test requires battery voltage.

For effective troubleshooting and repairs, you must have a good understanding of the electrical circuits and components used on this machine (see Wiring Schematics section of this chapter).

If the machine has any interlock switches by-passed, they must be reconnected for proper troubleshooting and safety.

Starting Problems

Problem	Possible Causes
Starter solenoid clicks, but starter will not crank (if solenoid clicks, the problem is not with the Ignition module or its inputs).	Battery charge is low. Battery cables are loose or corroded. Battery ground to frame is loose or corroded. Wiring at starter is faulty. Starter solenoid is faulty. Starter mounting bolts are loose or not supplying a sufficient ground for solenoid. Starter is faulty causing incomplete circuit for solenoid.
Nothing happens when a start attempt is made.	Wiring to start circuits (see Wiring Schematics) is loose, corroded, or damaged. Battery is dead. 20 ampere fuse to start relay or 10 ampere fuse to ignition switch is blown. Neutral switch is faulty or traction pedal is depressed. Ignition switch is faulty. Start relay is faulty. Starter is faulty.
Engine cranks, but does not fire.	Wiring to start circuits (see Wiring Schematics) is loose, corroded, or damaged. Ignition switch is faulty. A high temperature condition exists, high temperature switch is shorted, or the high temperature relay is faulty. Fuel stop solenoid is faulty. Preheating unit or components inputting into it are faulty. Engine or fuel system is malfunctioning (see Chapter 4 – Peugeot Diesel Engine).

General Run and Transport Problems (GM 3000–D)

Problem	Possible Causes
Engine kills when the traction pedal is positioned to either forward or reverse.	<p>Operator is sitting too far forward on the seat (seat switch not depressed).</p> <p>Wiring to seat and shutdown delay circuits (see Wiring Schematics) is loose, corroded, or damaged.</p> <p>7.5 ampere fuse, seat switch, or seat relay is faulty.</p> <p>Diode (D1) or shutdown delay relay is faulty.</p> <p>20 ampere fuse to seat relay is open.</p>
Battery does not charge.	<p>Wiring to the charging circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>Voltage regulator/alternator is faulty.</p> <p>80 ampere fuse is open.</p> <p>Battery is dead.</p>

Cutting Unit Operating Problems (GM 3000–D)

Problem	Possible Causes
Cutting unit do not engage.	<p>Wiring to PTO circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>PTO switch, relay, or coil is faulty.</p>
Cutting unit does not lift.	<p>Wiring to lift/xbal circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>Lift/xbal switch or solenoid is faulty.</p> <p>The hydraulic system is malfunctioning.</p>
Cutting unit does not lower.	<p>Wiring to float/hold circuit (see Wiring Schematics) components is loose, corroded, or damaged.</p> <p>Float/hold switch or solenoid is faulty.</p> <p>Hydraulic solenoid valve is malfunctioning.</p>

Electrical System Quick Checks

Battery Test (Open Circuit Test)

Note: This test provides a relative condition of the battery. Load testing of the battery will provide additional and more accurate information.

1. The battery temperature should be from 60° to 100° F. The ignition key should be off and all accessories turned off.
2. Set multimeter to the DC volts setting.
3. Connect positive (+) meter lead to the positive battery post and negative (–) meter lead to the the negative battery post.

Voltage Measured	Battery Charge Level
12.68 V (or higher)	Fully charged (100%)
12.45 V	75% charged
12.24 V	50% charged
12.06 V	25% charged
11.89 V	0% charged

4. Record voltage.

Glow Plug System Test (GM 3000–D)

This fast, simple test can help you determine a glow plug system's integrity and operation. Run this test anytime hard starting (cold) is encountered on the diesel engine.

Tool(s) required: Digital multimeter and/or AC/DC current transducer (Hall Effect).

1. Properly connect current transducer to the digital multimeter. Set multimeter on the **proper** volts scale (refer to manufacturer's instructions).
2. Make sure engine is off. Place current transducer around the orange wire connected to glow plugs (Fig. 3).
3. Read meter prior to activating glow plug system. Adjust the transducer to read zero (if applicable).
4. Turn ignition switch to RUN and record current. Repeat test.

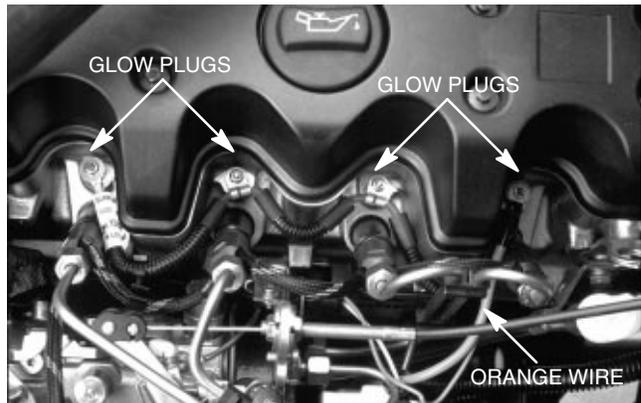


Figure 3

Note: The glow control unit will cause the glow plugs to time off after a determined amount of time. This condition should not be misinterpreted as a malfunctioning system.

5. The meter should read from **31 to 61 Amps**.

Component Identification and Testing

For accurate resistance and/or continuity checks, electrically disconnect the component being tested from the circuit (e.g. unplug the ignition switch connector before doing a continuity check).


CAUTION

When testing electrical components for continuity with a multimeter (ohms setting), make sure that power to the circuit has been disconnected.

Ignition Switch

The ignition (key) switch has three positions (OFF, START and RUN). The terminals are marked as shown. The circuitry of the ignition switch is shown in the chart. With the use of a continuity tester, the switch functions may be tested to determine whether all circuits are being completed while the key is moved to each position.

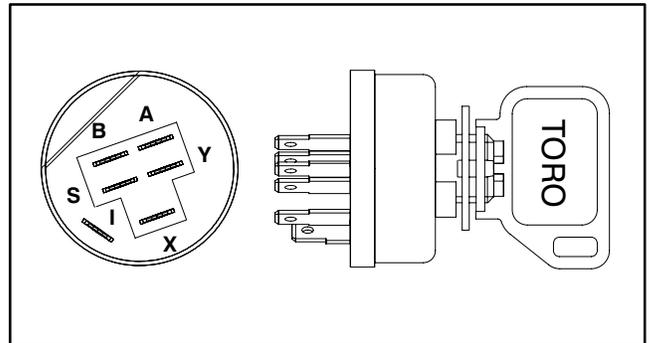


Figure 4

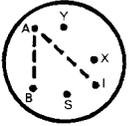
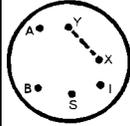
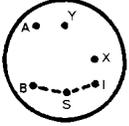
POSITION	CONTINUITY AMONG TERMINALS	OTHER CIRCUITS MADE
1. OFF	NONE	NONE
2. RUN	 B+I+A	 X+Y
3. START	 B+I+S	NONE

Figure 5

Electrical System

Diode Circuit Boards

Each circuit board contains four diodes. The diodes are used for circuit protection from inductive voltage spikes, battery charging indication, and for safety circuit logic. Diodes D4 and D8 are not used.

On the GM 3000 wiring diagram, the diode circuit cards are designated P3 and P5. On the GM 3000–D wiring diagrams, the diode circuit cards are designated P7 and P5.

Diode D1

Directs current flow from the deck capacitor to the deck relay when the seat relay is de-energized to provide a 1 second delay.

Diode D2

Provides current flow logic for the charging circuit light.

Diode D3

Prevents a negative spike from damaging the PTO switch by allowing a ground path for the PTO relay and PTO coil when they de-energize.

Diode D4

This component is not used.

Diode D5

Prevents a negative spike from damaging the Lift/Xbal switch by allowing a ground path for the Lift/Xbal solenoid (SV1) when it de-energizes.

Diode D6

Prevents a negative spike from damaging the Cruise switch by allowing a ground path for the Cruise relay and Cruise coil when they de-energize.

Diode D7

Prevents a negative spike from damaging the Transport switch by allowing a ground path for the Transport relay and Transport coil when they de-energize.

Diode D8

Prevents a negative spike from damaging the Float/ Hold switch by allowing a ground path for the Float/Hold solenoid (SV2) when it de-energizes.

Testing

The diodes can be individually tested using a digital multimeter (ohms setting) and the table to the right.

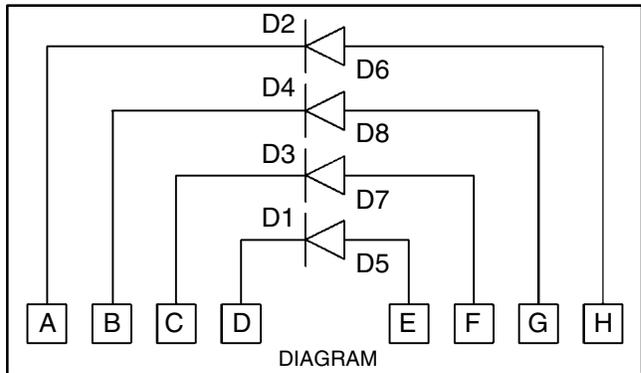


Figure 6

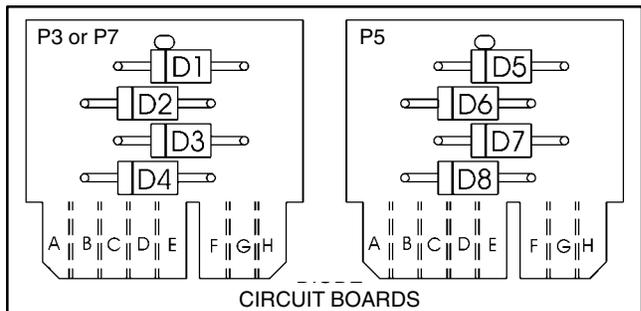


Figure 7

Red Lead (+) on Terminal	Black Lead (-) on Terminal	Continuity
H	A	YES
A	H	NO
G	B	YES
B	G	NO
F	C	YES
C	F	NO
E	D	YES
D	E	NO

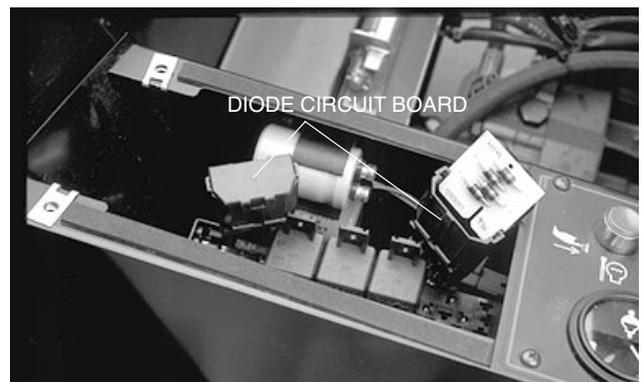


Figure 8

Neutral Switch

This switch is closed when the traction pedal is in the neutral position. The switch and its electrical connector are located under the seat on the side of the transaxle.

1. Make sure the engine is off.
2. Disconnect electrical connector from the switch.
3. Check the continuity of the switch by connecting a multimeter (ohms setting) across the connector terminals.
4. With the traction pedal in the neutral position, there should be continuity between the terminals.
5. With the traction pedal in the the forward or backward position, there should be **no** continuity between the terminals.

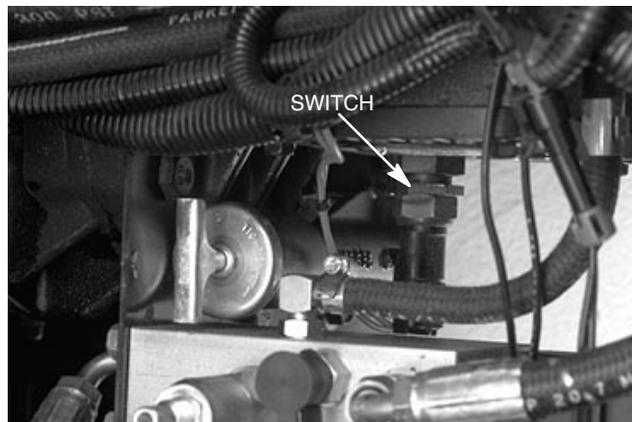


Figure 9

Seat Switch

This switch is closed when the operator is on the seat. The switch and its electrical connector are located on the bottom of the seat.

1. Make sure the engine is off. Remove seat from the support assembly by removing four lock nuts from the seat bolts.
2. Disconnect electrical connector from the switch.
3. Check the continuity of the switch by connecting a multimeter (ohms setting) across the connector terminals.
4. With no operator in the seat, there should be no continuity between the terminals.
5. Press directly onto the seat switch through the seat cushion. There should be continuity as the seat cushion approaches the bottom of its travel.
6. Connect switch electrical connector. Reinstall seat.

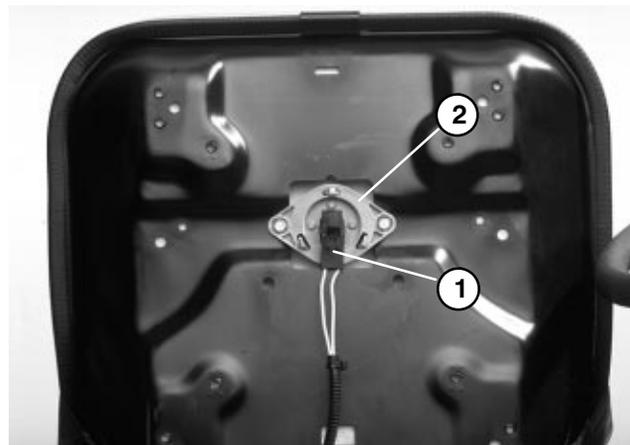


Figure 10

1. Electrical connector 2. Seat switch

Hydraulic Valve Solenoids

The hydraulic valve solenoids are located below the seat and on the hydraulic manifold block.

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Make sure engine is off. Disconnect solenoid valve electrical connector.
2. Apply 12VDC source directly to the solenoid. Listen for solenoid to switch on. Remove voltage source.
3. Measure resistance between the two connector terminals. The resistance should be approximately 7.2 ohms.

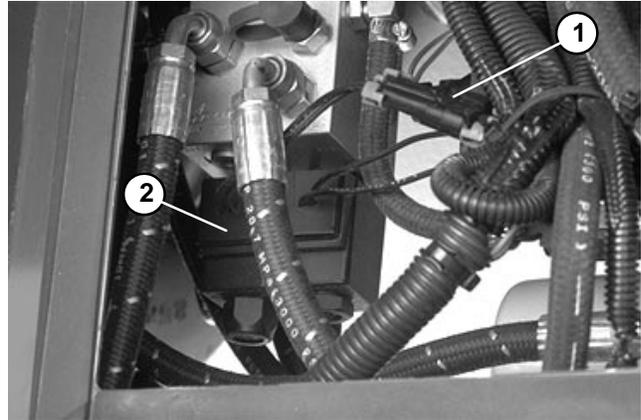


Figure 11

1. Electrical connector 2. Solenoid

Hour Meter

1. Remove electrical connections from meter.
2. Connect the positive (+) terminal of a 12 VDC source to the positive terminal of the hour meter.
3. Connect the negative (-) terminal of the voltage source to the other terminal of the hour meter.
4. The hour meter should move a 1/10 of an hour in six minutes.
5. Disconnect the voltage source from the hour meter.
6. Reconnect electrical connections to meter. Make sure to observe polarity.

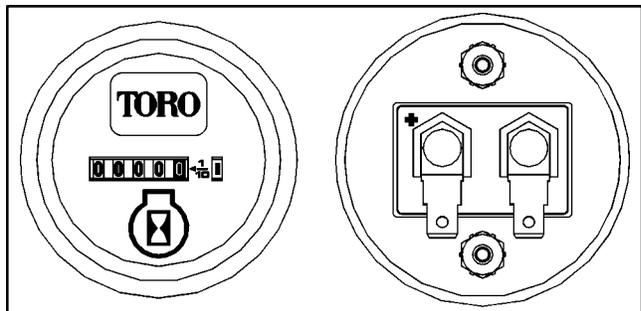


Figure 12

Cruise Control Coil (Optional)

The cruise control coil is located below the seat.

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). Subtract internal resistance of the meter and test leads from the measured value of the component you are testing.

1. Make sure engine is off. Disconnect blue and violet wires to the coil.
2. Apply 12 VDC source directly to the coil wires. Listen for coil to pull in clutch plate.
3. Measure resistance between the two coil wires. The resistance should be from 3.6 to 4.0 ohms.

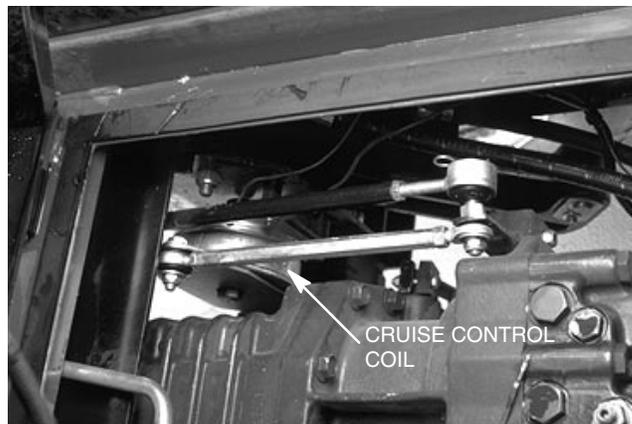


Figure 13

PTO (Clutch) Coil

The PTO (clutch) coil is located inside the IHT transmission. The electrical connector to the coil is below the seat.

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). Subtract internal resistance of the meter and test leads from the measured value of the component you are testing.

1. Make sure engine is off. Disconnect connector to the coil.
2. Apply 12 VDC source directly to the coil wires. Listen for PTO clutch to engage.
3. Measure resistance between the two coil wires. The resistance should be about 3.1 ohms.



Figure 14

Fuel Sender

The sender is located on top of the fuel tank inside the center shroud area.

1. Remove blue wire and black ground wire from the sender.
2. Remove remaining screws and lock washers from the sender and fuel tank.
3. Remove sender and gasket from the fuel tank. Clean any fuel from the sender.

Note: Before taking small resistance readings with a digital multimeter, short test leads together. The meter will display a small resistance value. This internal resistance of the meter and test leads should be subtract from the measured value of the component.

4. Check resistance of the sender with a multimeter. Resistance with the float in the full position should be 27.5 to 39.5 ohms. Resistance with the float in the empty position should be 240 to 260 ohms.

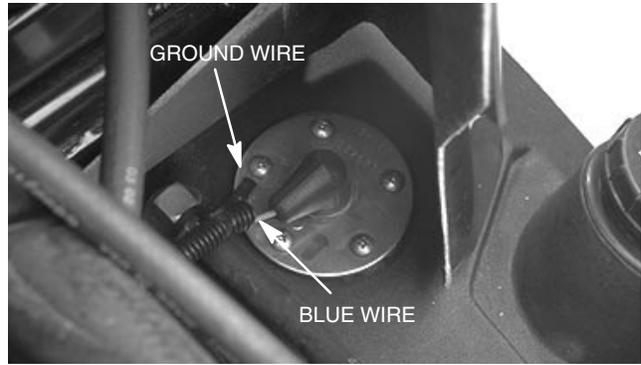


Figure 15

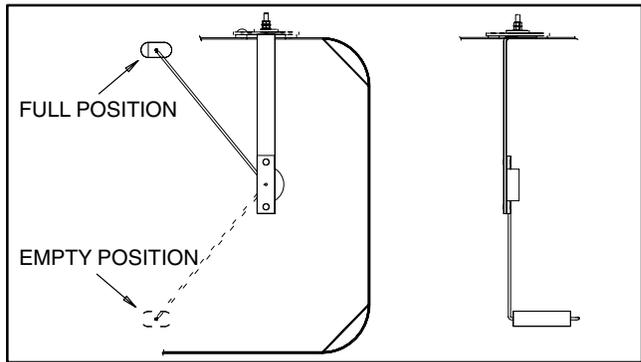


Figure 16

Fuel Gauge

The fuel gauge can be tested using a new gauge as a substitute or by the use of a DC voltage source and a variable resistance box.

Note: Before taking small resistance readings with a digital multimeter, short test leads together. The meter will display a small resistance value. This internal resistance of the meter and test leads should be subtract from the measured value of the component.

1. Connect the fuel gauge to the variable resistance and DC voltage source (Fig. 17).
2. Adjust resistance until the gauge needle points to following test points on the gauge (Fig. 17):
 - A. The left edge of the red area (empty); the resistance setting should be from 235 to 245 ohms.
 - B. The middle of the green area (half); the resistance setting should be from 98 to 108 ohms.
 - C. The right edge of the green area (full); the resistance setting should be from 30.5 to 40.0 ohms.
3. Disconnect the voltage source, gauge, and variable resistance.

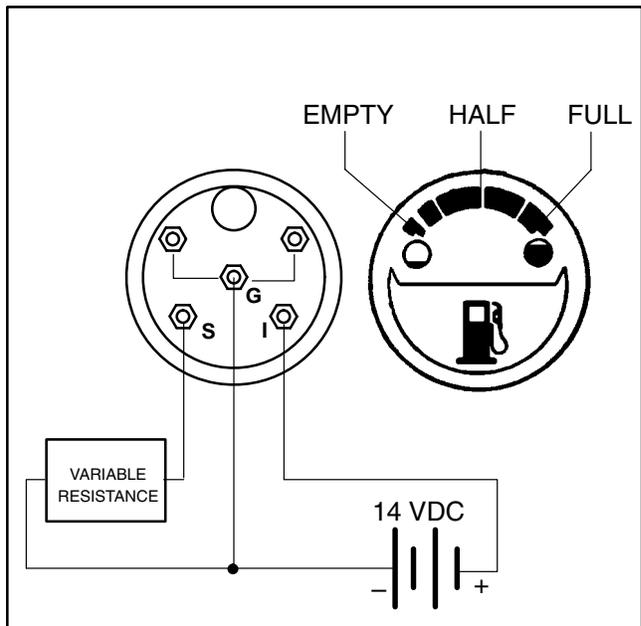


Figure 17

Relays and Fuses

The relays and fuses are located in the compartment that is rear of the control panel (Fig. 18). There is an 80 ampere fuse (50 ampere on the GM 3000) located by the alternator (Fig. 22).

Relay Testing

1. Verify coil resistance between terminals 86 and 85 with a multimeter (ohms setting). Resistance should be from 75 to 95 ohms. There should be continuity between terminals 87A and 30.
2. Connect multimeter (ohms setting) leads to relay terminals 30 and 87. Ground terminal 86 and apply +12 VDC to terminal 85. The relay should make and break continuity between terminals 30 and 87 as 12 VDC is applied and removed from terminal 85.
3. Disconnect voltage from terminal 85 and multimeter lead from terminal 87.
4. Connect multimeter (ohms setting) lead to relay terminal 30 and 87A. Apply +12 VDC to terminal 85. The relay should break and make continuity between terminals 30 and 87A as 12 VDC is applied and removed from terminal 85.
5. Disconnect voltage and multimeter leads from relay terminals.



Figure 18

Fuse Testing

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). Subtract internal resistance of the meter and test leads from the measured value of the component you are testing.

1. Use a digital multimeter and check continuity of fuse.
2. Resistance of fuse should be **less than 1 ohm**.

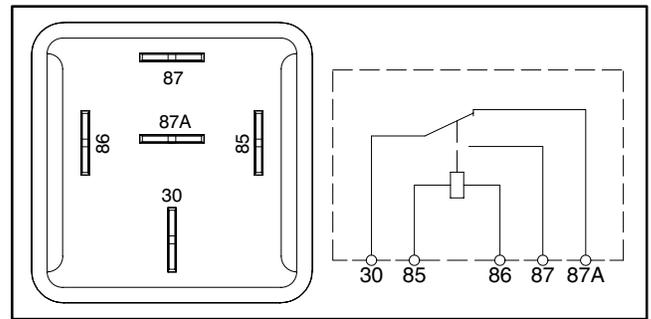


Figure 19

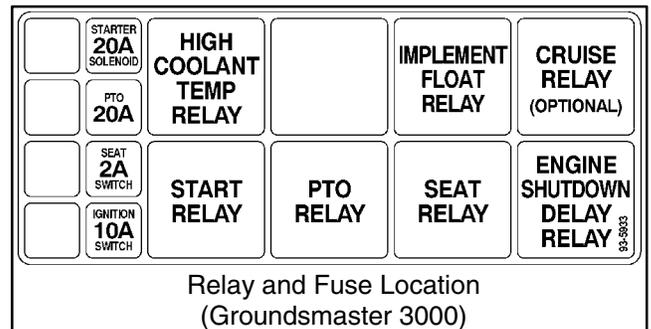


Figure 20

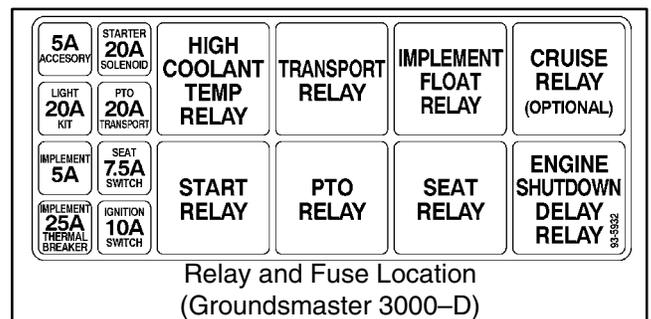


Figure 21

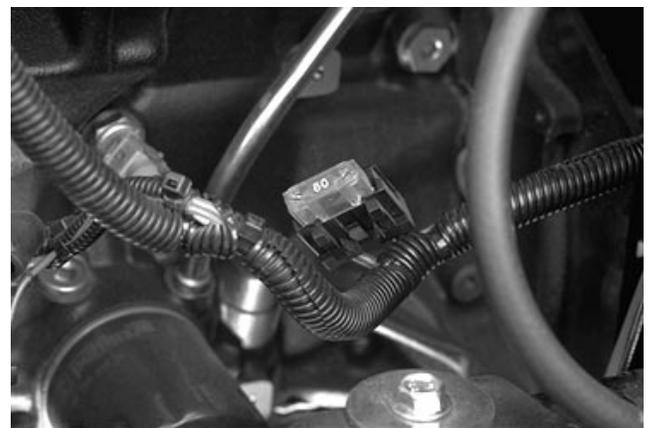


Figure 22

50 Ampere Thermal Breaker (GM 3000-D)

This device operates as a thermal overload. After the device trips, time should be allowed for it to cool and re-set. It is located near the starter.

1. Verify continuity between the two terminals. Continuity should be **less than 1 ohm**.

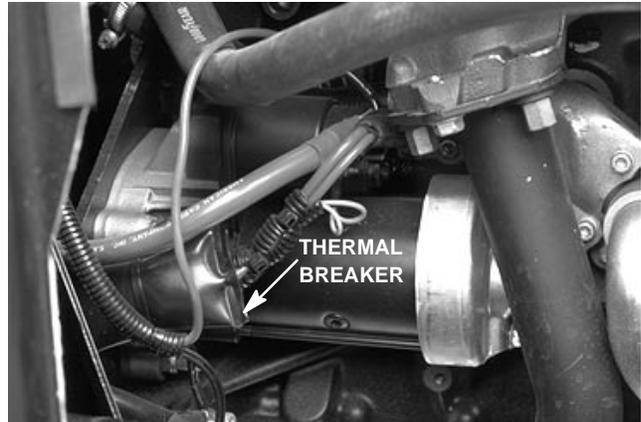


Figure 23



Figure 24

Fuel Stop Solenoid (GM 3000–D)

The fuel stop solenoid is located on the front end of the injection pump, which is on the right side of the engine. It has a black wire connected to it that leads to a connector with a white and orange wire. The solenoid is powered from the white wire (Fig. 25).

In Place Testing

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Disconnect black wire from the solenoid.
2. Using a digital multimeter, ground one lead to the base of the solenoid and connect the other to the solenoid terminal.
3. The resistance should be approximately **8.0 ohms**.

Live testing

1. Remove black wire from the solenoid.

Note: The solenoid may be removed from the engine or tested in place.

2. Connect a positive (+) test lead from a 12 VDC source to the solenoid terminal.
3. Touch a negative (–) test lead from the 12 VDC source to the solenoid body. The plunger should retract making an audible “click”.

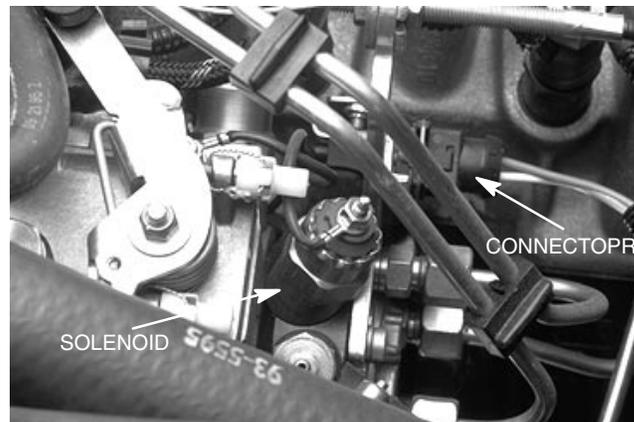


Figure 25

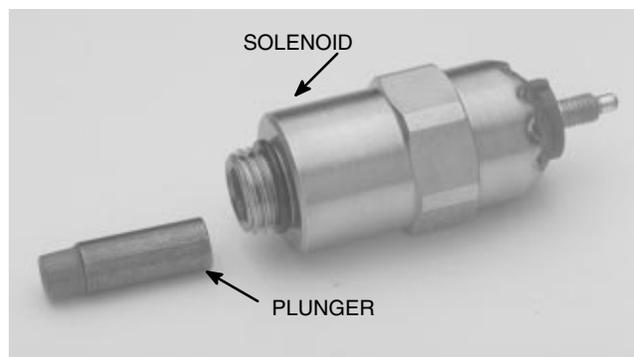


Figure 26

4. Disconnect the test leads from the solenoid.
5. Reconnect black wire to the solenoid if tested in place.

Injection Advance Solenoid (GM 3000–D)

The injection advance solenoid is located on top of the injector pump, which is on the right side of the engine. It has two black wires connected to it. One wire leads to a connector with orange and white wires. The other wire is grounded to the injector pump. The solenoid is powered from the orange (top) wire (Fig. 52).

In Place Testing

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Remove wire clip from the connector and disconnect connector.
2. Using a digital multimeter, attach one lead to the lug of the ground wire. Connect other lead to the pin in the connector that is attached to the injector pump. The orange wire on the harness connector powers the solenoid.
3. The resistance should be **about 14.6 ohms**.

Live testing

1. Remove wire clip from the connector and disconnect connector.
2. Connect a positive (+) test lead from a 12 VDC source to the pin in the connector that is attached to the injector pump. The orange wire on the harness connector powers the solenoid.
3. Touch a negative (–) test lead from the 12 VDC source to the solenoid body. The plunger should retract making an audible "click".
4. Disconnect the test leads from the solenoid and connector. Reconnect connector and wire clip.

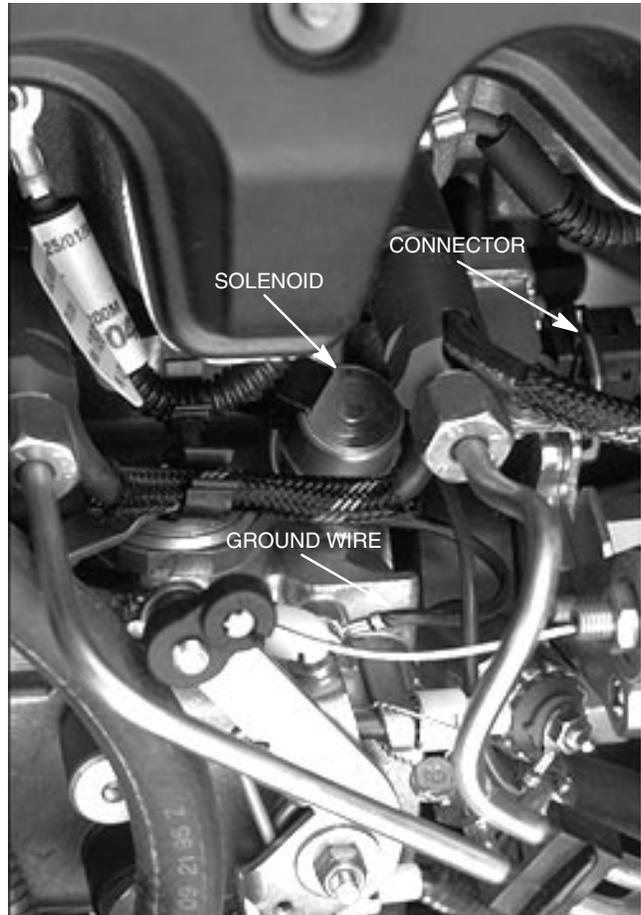


Figure 27

Alternator (GM 3000–D)

The alternator is belt driven with a internal regulator. It is located on the bottom right end of the engine. If either the alternator or the regulator is damaged, the entire unit must be replaced (Fig. 28).

Note: Prior to testing the charging system, make sure the poly V–belt to the alternator is in good operation condition and adjusted properly (see Belt Adjustment in Chapter 4 – Peugeot Diesel Engine).

Test Equipment

Use a shunt capable of handling at least 70 ampere. Also, a digital multimeter with a high impedance millivolt scale (with at least 300mv range) can be used in conjunction with the shunt (Fig. 29).

Testing for DC Current Output (Fig. 30)

Note: Follow the manufacturer’s instructions when using a DC shunt.

1. Make sure engine is off.

IMPORTANT: To perform this test properly, the battery must “not” be fully charged. See Battery Test in the Electrical Quick Checks section.

2. Install the DC shunt on the negative terminal of the battery. Make sure all connections are clean and tight for reliable amperage readings.

3. Attach RED meter test lead to the POSITIVE post of the shunt.

4. Attach BLACK meter test lead to the NEGATIVE post of the shunt.

5. Place multimeter to the millivolts scale.

6. Start the engine and run at **2000 rpm**. Determine current output. Current output should be from **1 to 45 ampere** depending upon battery voltage and/or current draw on the system.

7. Place multimeter to the volts scale, and verify that battery voltage is **13.5 VDC** while the alternatoer is charging.

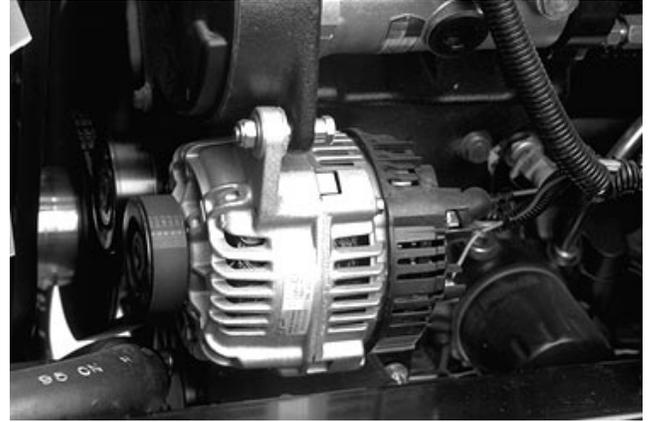


Figure 28

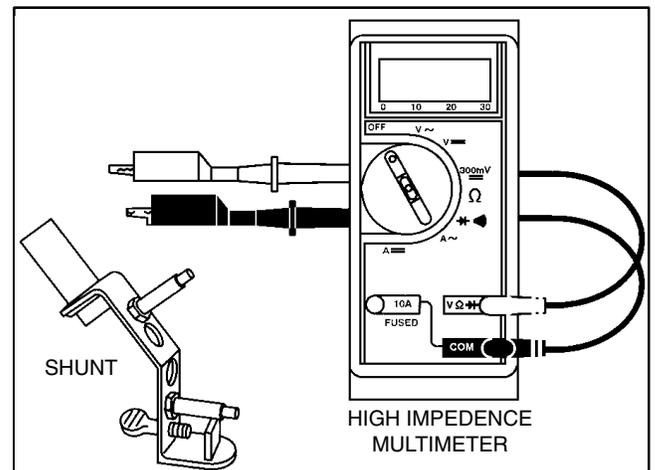


Figure 29

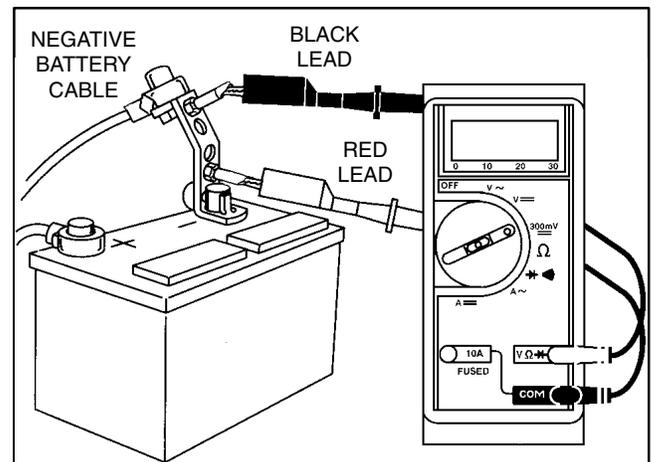


Figure 30

Temperature Sender (GM 3000-D)

The temperature sender is located on the top right side of the water outlet box. It has a green connector with blue and black wires. The sender supplies a signal to the glow control unit (Fig. 31).



CAUTION

Make sure engine is cool and coolant system is depressurized before removing the thermistor.

1. Lower the coolant level in the engine and remove the thermistor from the water pump.
2. Put the sender in a container of oil with a thermometer and slowly heat the oil (Fig. 33).



CAUTION

Handle the hot oil with extreme care to prevent personal injury or fire.

3. Check resistance of the sender with a multimeter. Check resistance between pin 1 and the sender casing (Fig. 33).

A. The resistance should be from 1088.8 to 1225.4 OHMS at 104°F (40°C).

B. As the temperature increases, the resistance should be from 166.2 to 185.2 OHMS at 212°F (100°C).

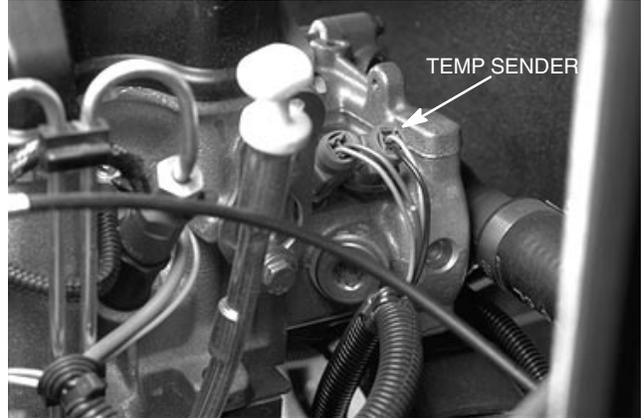


Figure 31

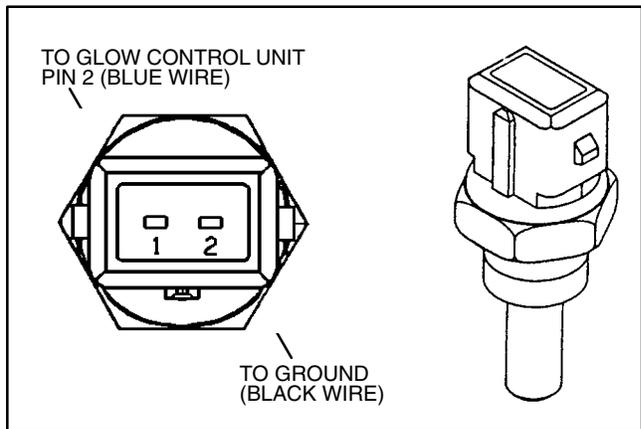


Figure 32

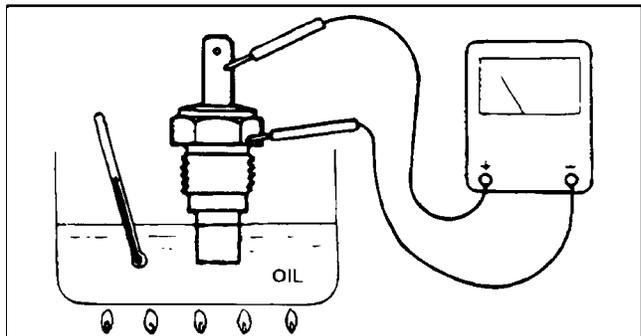


Figure 33

Temperature Gauge (GM 3000–D)

The temperature gauge can be tested using a new gauge as a substitute or by the use of a DC voltage source and a variable resistance box.

1. Connect the temperature gauge to the variable resistance and DC voltage source (Fig. 34).
2. Adjust resistance until the gauge needle points to following test points on the gauge (Fig. 34):
 - A. At 220°F the resistance setting should be from 125.2 to 138.4 ohms.
 - B. At 150°F the resistance setting should be from 475 to 525 ohms.
3. Disconnect the voltage source, gauge, and variable resistance.

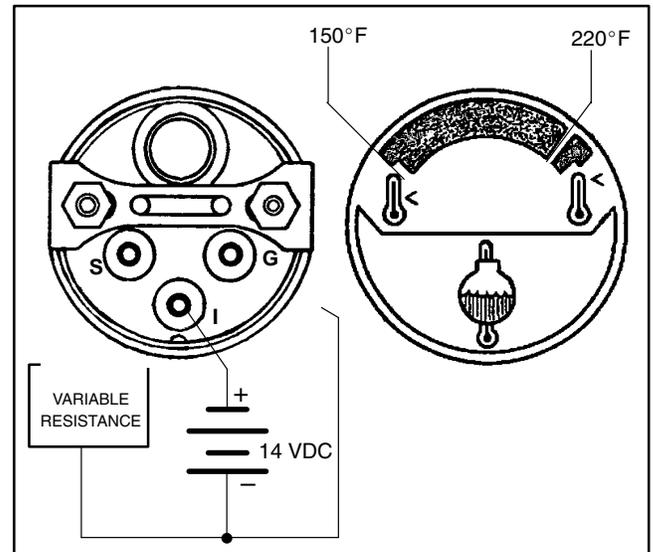


Figure 34

Oil Pressure Switch (GM 3000–D)

The switch is located on the left side of the engine block above the oil filter. It is a normally closed switch and opens with increasing oil pressure. The operating range for the switch is 6.1 to 8.4 PSI (0.42 to 0.58 Bar).

Testing with the Engine Off

1. Turn the ignition switch to ON. The oil pressure lamp should be on.
2. If the lamp does not come on in step 1 above no, disconnect the gray wire from the switch and ground it to the engine block.
 - A. If the lamp comes on the switch is bad.
 - B. If the lamp does not come on in step 2, check the indicating circuit (see Electrical Schematic (GM3000–D)).

Testing with the Engine On

1. If the lamp is on with the engine running, shut off the engine **immediately**.
2. Disconnect the gray wire from the switch.



Figure 35

3. Turn the ignition switch to ON. The oil pressure lamp should be out.
4. If the light is still on, check for short circuiting in the indication circuit (see Indicating and Safety Circuits).
5. Return ignition switch to OFF.
6. Test engine oil pressure (see Peugeot Citroen Moteurs TUD5 Overhaul Checking Tuning manual).

Temperature Sending Unit (GM 3000-D)

The temperature sending unit is located on the top right side of the water outlet box, which is located on the front end of the engine block. It has a blue connector with gray and violet wires. The violet wire supplies a signal to the high coolant temperature relay from the switch component of the sending unit. The gray wire supplies a signal to the temperature gauge from the thermistor component of the sending unit (Fig. 36).



CAUTION

Make sure engine is cool and coolant system is depressurized before removing the temperature sending unit.

1. Lower the coolant level in the engine and remove the temperature sending unit from the engine.
2. Put the switch in a container of oil with a thermometer and slowly heat the oil (Fig. 38).



CAUTION

Handle the hot oil with extreme care to prevent personal injury or fire.

3. Check continuity of the switch component with a multimeter (ohms setting). Check continuity between post 2 and the sender casing. The switch is normally open and should close between 226 to 234°F (108 to 112°C) (Fig. 37).
4. Allow the oil to cool. The switch should open below 226°F (108°C).
5. After oil has cooled below 158°F (70°C), slowly heat oil and switch again (Fig. 38).
6. Check resistance of the thermistor component with a multimeter. Check resistance between post 1 and the sender casing (Fig. 37).
 - A. The resistance should be **about 390 ohms** at 158°F (70°C).
 - B. As the temperature increases, the resistance should be **about 143 ohms** at 212°F (100°C).

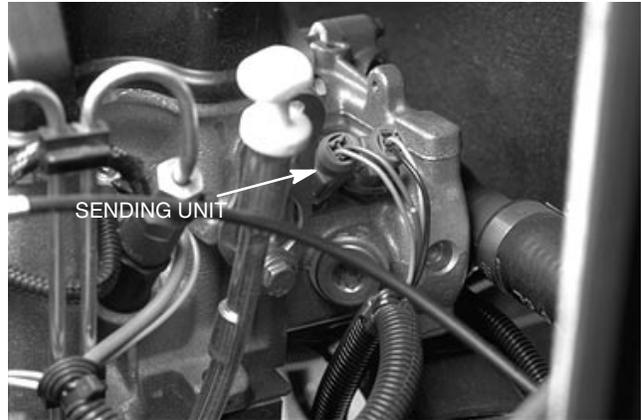


Figure 36

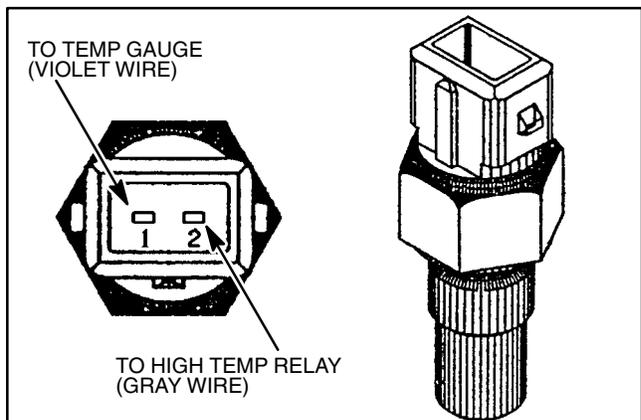


Figure 37

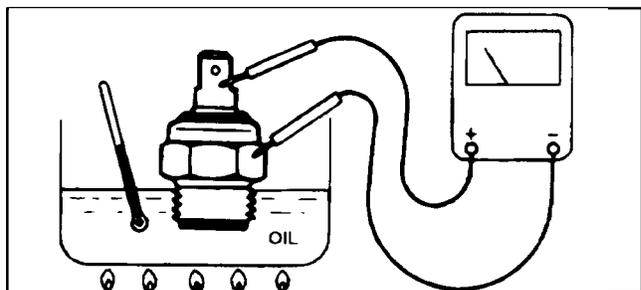


Figure 38

Transport Solenoid (GM 3000-D)

The transport solenoid is located below the seat and on the front right side of the hydraulic housing.

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Make sure engine is off. Disconnect solenoid electrical connector.
2. Apply 12 VDC source directly to the solenoid. Listen for solenoid to switch on.
3. Measure resistance between the two connector terminals. The resistance should be **about 9.0 ohms**.

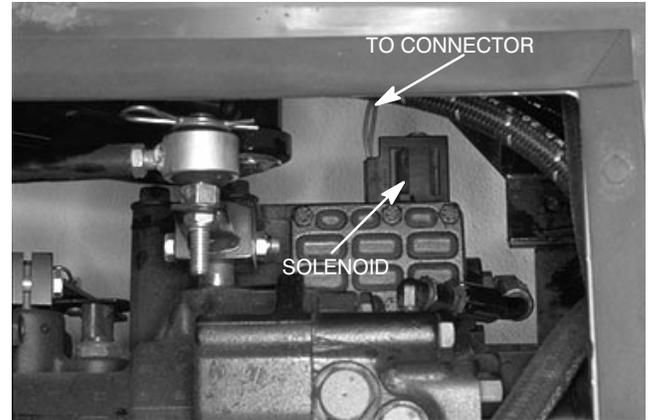


Figure 39

Glow Plugs (GM 3000-D)

The glow plugs are located on the top of the cylinder block and on the right side of the engine. They are connected in parallel with black wires to an orange lead wire (Fig. 40).

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Disconnect black wire from the glow plug.
2. Using a digital multimeter, connect one lead to the post of the terminal and connect the other to the cylinder block near the plug.
3. The resistance should be **about 0.6 to 1.5 ohms**.

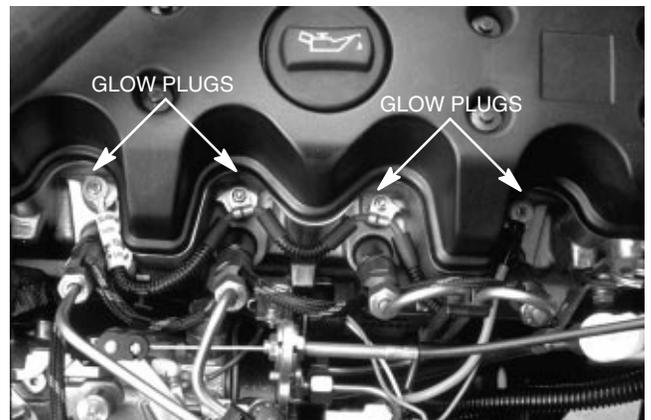


Figure 40



Figure 41

H₂O in Fuel Sensor (GM 3000-D)

The sensor is located on the fuel filter assembly, which is inside the center shroud area to the left side of the engine. It energizes a red warning light when too much water has collected in the fuel filter bowl (Fig. 42).

1. Make sure engine is OFF. Remove start relay from the control center.
2. Disconnect connector from the sensor. Verify circuitry to the sensor at the connector using a multimeter and the following steps:
 - A. Place ignition switch in RUN. Battery voltage from the pin for the blue wire to chassis ground should be indicated and the red warning light should come on. Turn switch OFF.
 - B. Hold ignition switch in START. Battery voltage from the pin for the white wire to chassis ground should be indicated. Turn switch OFF.
 - C. Check continuity from the pin for the black wire to chassis ground. Continuity should be **1 ohm or less**.
 - D. Correct any problem circuitry if necessary.
3. Drain fuel filter assembly into a suitable container.
4. Unscrew fuel filter bowl from the assembly. Remove filter element, gaskets, and O-ring from the assembly. Store seals in a clean place (Fig. 43).
5. Reconnect connector to the sensor. Fill fuel filter bowl with tap water.
6. Test sensor using the following steps:
 - A. Place ignition switch in RUN. The red warning light should come on. Turn switch OFF.
 - B. Hold ignition switch in START. The red warning light should come on. Turn switch OFF.
7. Drain water from the fuel filter bowl. Test sensor using the following steps:
 - A. Place ignition switch in RUN. The red warning light should stay off. Turn switch OFF.
 - B. Hold ignition switch in START. The red warning light should stay off. Turn switch OFF.

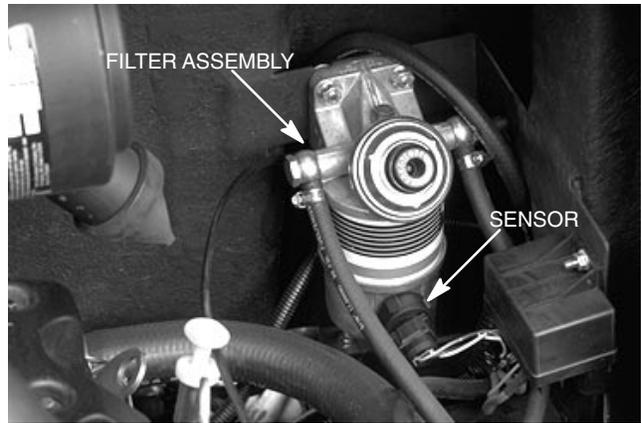


Figure 42

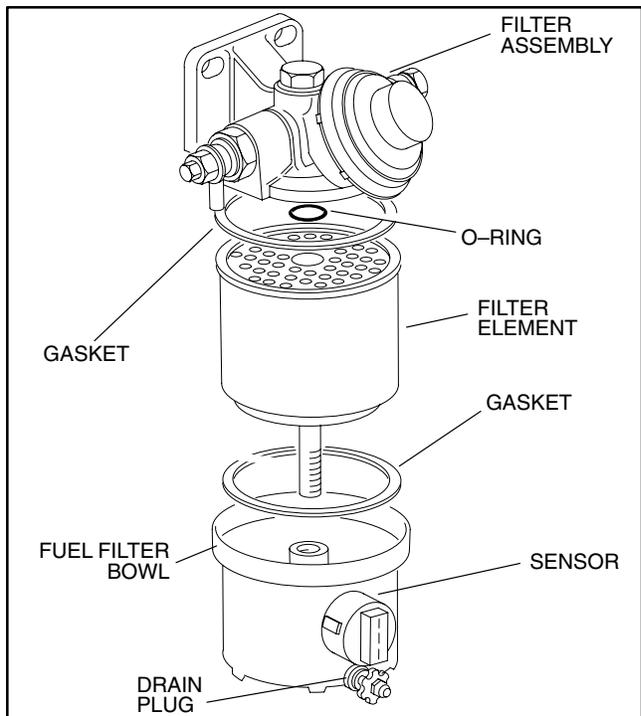


Figure 43

8. Disconnect connector from sensor. Reassemble fuel filter assembly. Reconnect connector to sensor.
9. Replace sensor with new one if necessary.
10. Reinstall start relay to the control center.

Coolant Level Sensor (GM 3000–D)

The sensor is located on the degassing box, which is on the upper left end of the engine. It energizes a red warning light when coolant level in the degassing box and radiator is to low (Fig. 44).

1. Make sure engine is OFF. Remove start relay from the control center.

	DANGER
Make sure engine and cooling system have cooled down prior to checking coolant system levels. Possible steam burns may occur when removing the pressure plug.	

2. Make sure cooling system is full (see Check Cooling System in Chapter 4 – Peugeot Diesel Engine).

3. Disconnect connector from the sensor. Verify circuitry to the sensor at the connector using a jumper and multimeter.

A. Place ignition switch in RUN. Jumper from the pin for the tan wire to chassis ground, the red warning light should come on. Turn switch OFF.

B. Hold ignition switch in START. Battery voltage from the pin for the white wire to chassis ground should be indicated. Turn switch OFF.

C. Check continuity (1 ohm or less) from the pin for the black wire to chassis ground..

D. Replace light bulb or correct any problem circuitry if necessary.

4. Reconnect connector to the sensor. Test sensor using the following steps:

A. Place ignition switch in RUN. The red warning light should be off. Turn switch OFF.

B. Hold ignition switch in START. The red warning light should be off. Turn switch OFF.

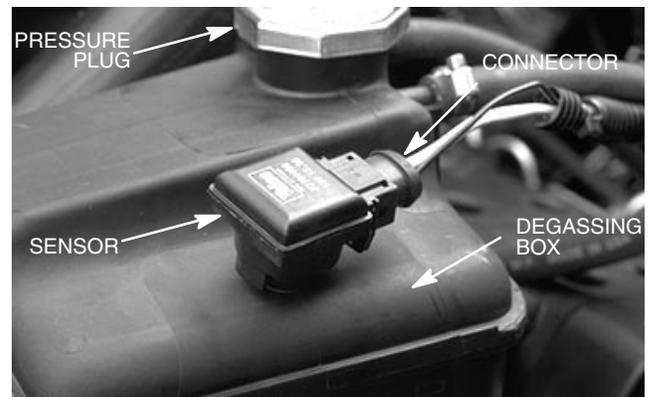


Figure 44



Figure 45

5. Disconnect connector from the sensor. Unscrew sensor from box and dry electrodes. Reconnect connector to sensor. Test sensor using the following steps (Fig. 45):

A. Place ignition switch in RUN. The red warning light should come on. Turn switch OFF.

B. Hold ignition switch in START. The red warning light should come on. Turn switch OFF.

6. Reinstall start relay to the control center.

7. Replace sensor with new one if necessary.

8. Disconnect connector from sensor. Install sensor to box. Reconnect connector to sensor.

Indicator Lights and Circuits (GM 3000-D)

Note: Individual light bulbs can be tested by removing them from the lighting cluster and applying 12 VDC to their wiring terminals (Fig 46).

Low Oil Pressure Light

The oil pressure light should come on when the ignition switch is in the ON position with the engine not running. Also, it should light with the engine running when the oil pressure drops below 7 PSI (0.48 Bar).

1. Disconnect gray wire from the oil pressure switch.
2. Ground gray wire to the engine block.
3. Turn the ignition switch to ON; the light should come on.
4. Turn the ignition switch to OFF and connect gray wire to the oil pressure switch.

High Coolant Temperature Light

The temperature light should come on only if the high temperature shutdown switch and relay have stopped the engine when the coolant temperature is from 226 to 234°F (108 to 112°C). The ignition switch must be in either the ON or START position for the light to come on.

1. Disconnect gray wire from the high temperature shutdown switch.
2. Ground the gray wire to the engine block.
3. Turn the ignition switch to ON; the light should come on and the high temperature shutdown relay should click.
4. Turn the ignition switch to OFF and connect gray wire to the high temperature shutdown switch.

Low Water Level Light

This light comes on to warn that the coolant level in the radiator is low enough to cause over heating of the engine.

1. Disconnect electrical connector from the wire from the coolant level sensor.
2. Ground tan wire of the connector to the vehicle frame.
3. Turn ignition switch to ON; the light should come on.
4. Turn ignition switch to OFF and connect electrical connector to the coolant level sensor.

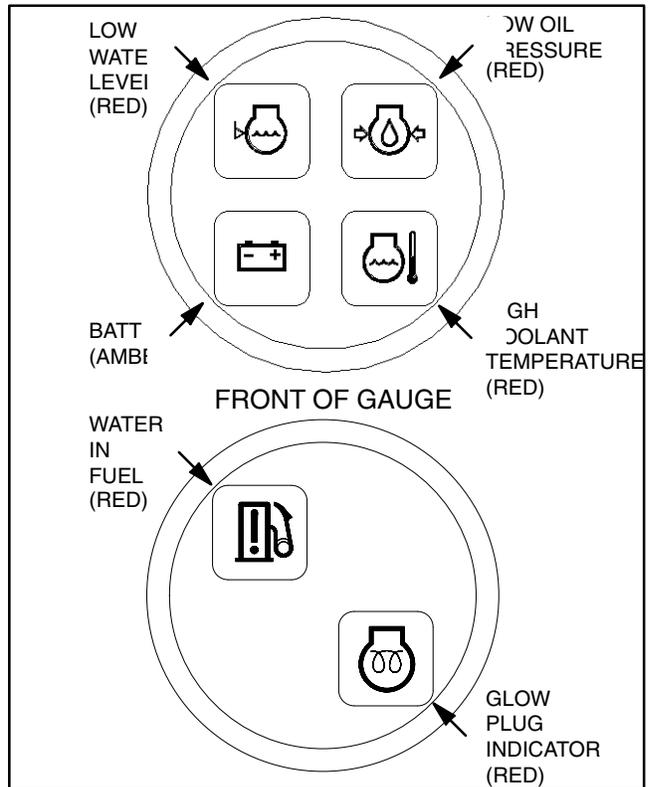


Figure 46

Battery Light

The battery light should come on when the ignition switch is in ON with the engine **not** running or with an improperly operating charging circuit while the engine is running.

1. Turn ignition switch to ON; the light should come on.
2. Turn ignition switch to OFF.

Water in Fuel Light

This light comes on to warn that there is sufficient water in the fuel system to cause engine problems..

1. Disconnect electrical connector from the wire from the water in fuel sensor.
2. Ground blue wire of the connector to the vehicle frame.
3. Turn ignition switch to ON; the light should come on.
4. Turn ignition switch to OFF and connect electrical connector to the water in fuel sensor.

Glow Plug Indicator Light

This light comes on when the glow control relay supplies power to the glow plugs.

1. Disconnect wire clip and pin connector (pins 1 to 7) from the pre/post heat relay.
2. Jumper from post # 8 (brass) on the glow control relay to female receptor # 5 (green wire) on the pin connector.
3. The light should come on. Remove jumper from relay post and pin connector.
4. Connect pin connector and wire clip to the glow control relay.

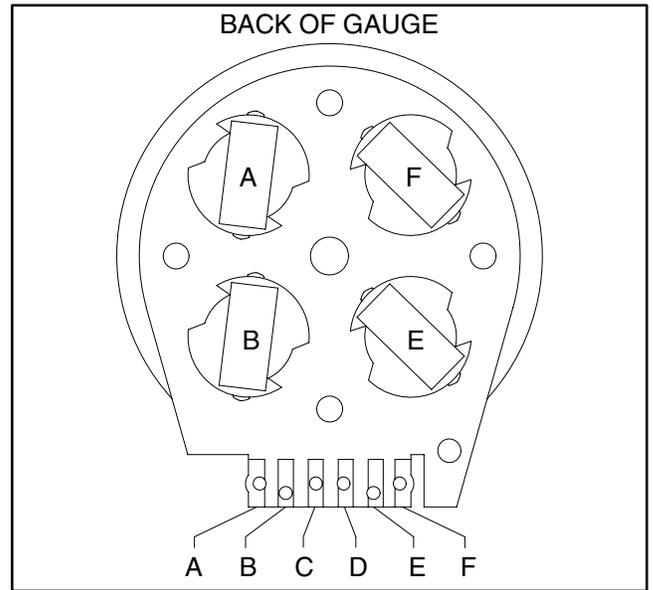


Figure 47

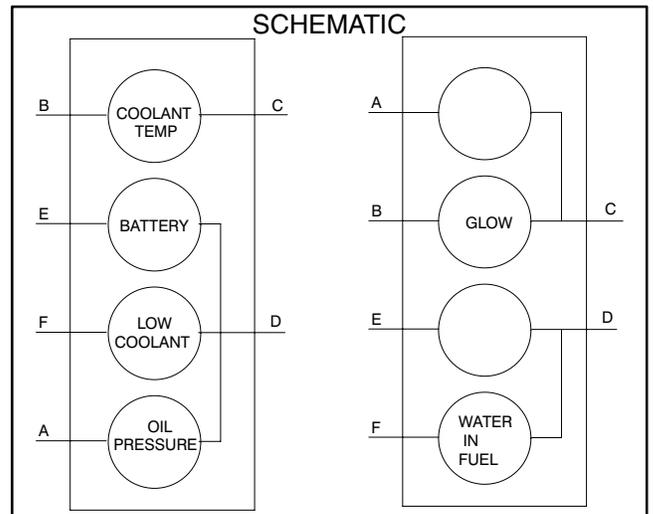


Figure 48

Ford Engine (VSG-411) Electrical Component Locations (GM3000)

Note: See the **Ford VSG-411/413 Engine Service Manual** for component testing information.

The **starter** is located on the front end and lower right side of the engine block (Fig. 49).



Figure 49

The **alternator** is located on the lower right side of the engine block and just forward of the radiator (Fig. 50).

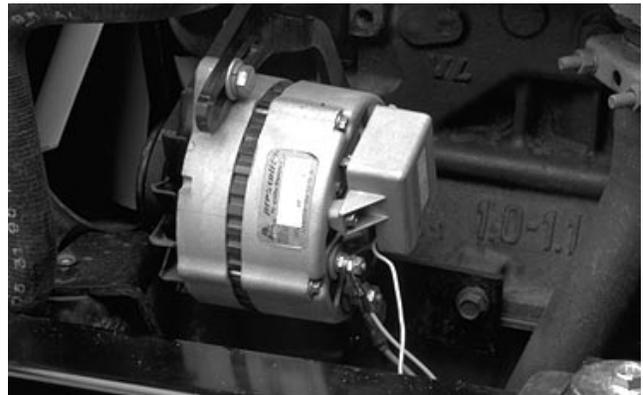


Figure 50

The **distributorless ignition coil** is located the left side of the engine block just forward of the oil dip stick and below the intake manifold (Fig. 51).

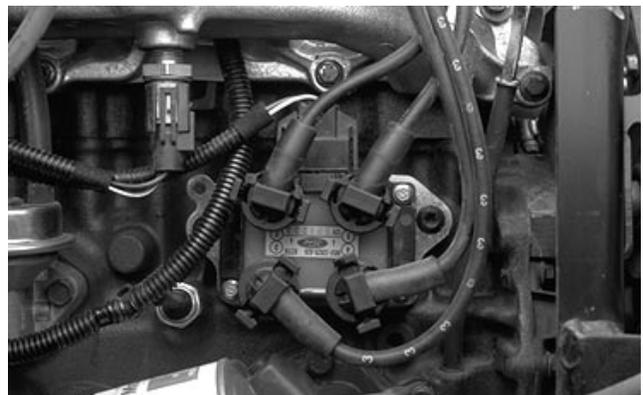


Figure 51

The **engine coolant temperature (ECT)** sensor is located on the bottom of the intake manifold, which is located on the left side of the engine. It has a connector with green/white and gray/white wires (Fig. 52).

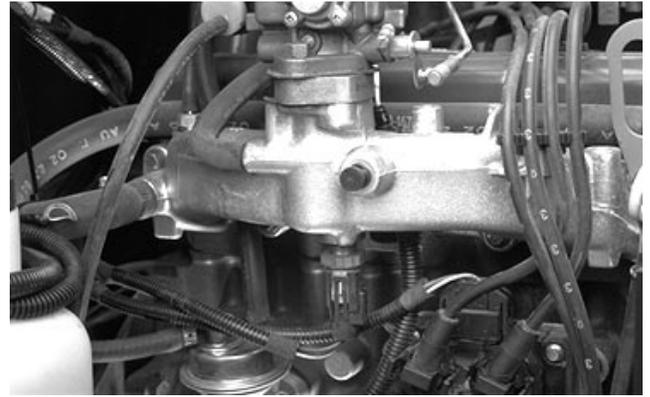


Figure 52

The **universal electronic spark control** is located inside the black center shroud in the upper left corner (Fig. 53).

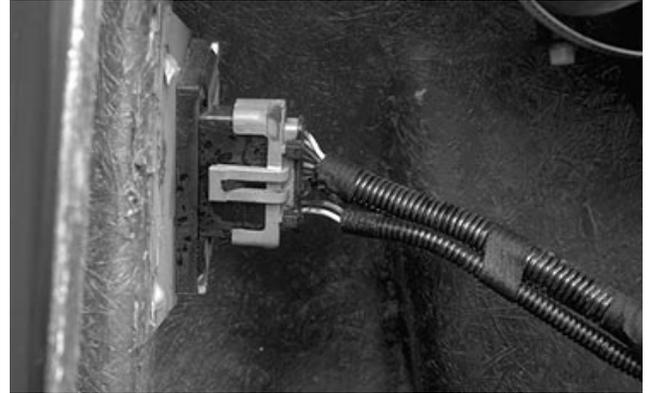


Figure 53

The **variable reluctance sensor (VRS)** is located on the front right end of the engine block behind the fly wheel and front engine plate. It has a connector with green and white wires (Fig. 54).

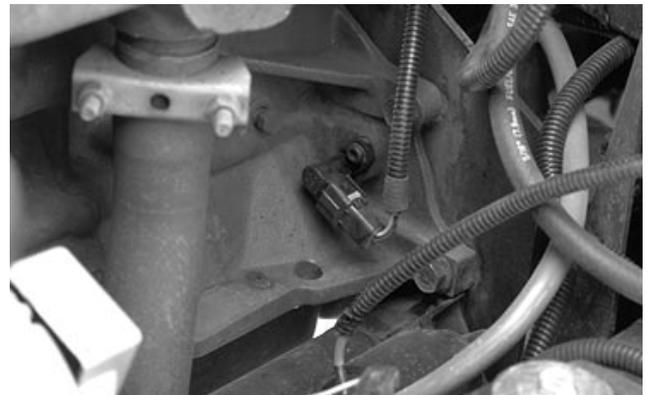


Figure 54

Temperature Gauge (GM 3000)

The temperature gauge can be tested using a new gauge as a substitute or by the use of a DC voltage source and a variable resistance box.

1. Connect the temperature gauge to the variable resistance and DC voltage source (Fig. 34).
2. Adjust resistance until the gauge needle points to following test points on the gauge (Fig. NO TAG):
 - A. At 150°F the resistance setting should be from 113 to 123 ohms.
 - B. At 180°F the resistance setting should be from 68 to 73 ohms.
 - C. At 240°F the resistance setting should be from 24 to 37 ohms.
3. Disconnect the voltage source, gauge, and variable resistance.

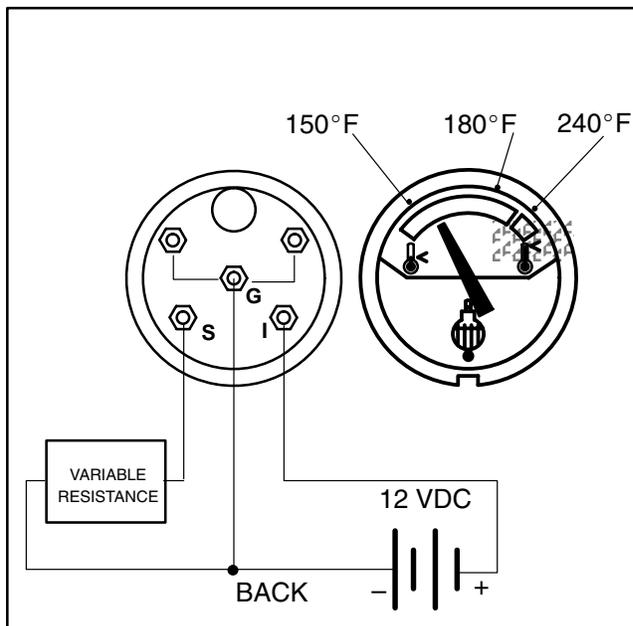


Figure 55

Thermistor (GM 3000)

The thermistor is located on the bottom right side of the water pump, which is located on the rear end of the engine block. It has a connector which a tan wire (Fig. 56).

1. Lower the coolant level in the engine and remove the thermistor from the water pump.
2. Put the thermistor in a container of oil with a thermometer and slowly heat the oil (Fig. 57).

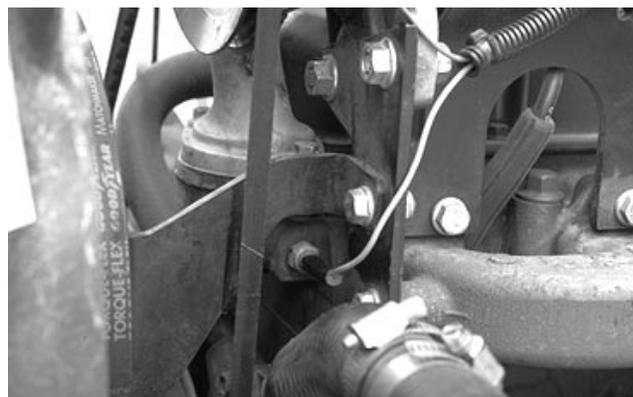


Figure 56

	CAUTION
Handle the hot oil with extreme care to prevent personal injury or fire.	

3. Check the resistance of the thermistor with a multimeter (ohms setting) as the temperature increases. The following resistance readings should be indicated:

108 to 78 OHMS at 140°F (60°C)

59 to 51 OHMS at 212°F (99°C)

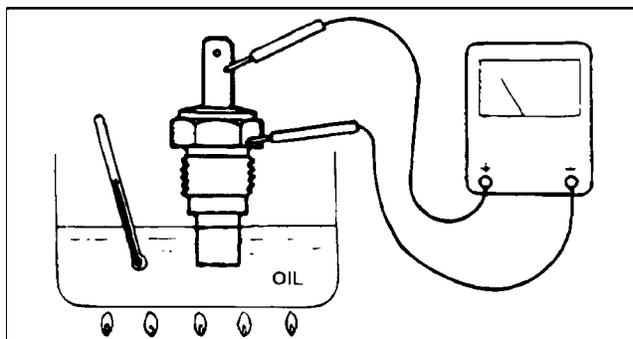


Figure 57

Oil Pressure Switch (GM 3000)

The switch is located on the left side of the engine block above the oil filter. It is a normally closed switch when the engine is not running and opens with increasing oil pressure.

Testing with the Engine Off

1. Turn the ignition switch to ON. The oil pressure lamp should be on.
2. If the lamp does not come on in step 1 above no, disconnect the gray wire from the switch and ground it to the engine block.
 - A. If the lamp comes on the switch is bad.
 - B. If the lamp does not come on in step 2, check the indicating circuit (see Electrical Schematic (GM3000)).

Testing with the Engine On

1. If the lamp is on with the engine running, shut off the engine **immediately**.
2. Disconnect the gray wire from the switch.
3. Turn the ignition switch to ON. The oil pressure lamp should be out.
4. If the light is still on, check for short circuiting in the indication circuit (see Indicating and Safety Circuits).



Figure 58

5. Remove switch and install test gauge in the oil pressure switch port.
6. Return ignition switch to OFF and connect the gray wire to the switch.
7. Start the engine and check for a **minimum** of 21.7 psi (1.5 Bar) at 2000 RPM (with engine hot). If the engine oil pressure is low, shut off the engine **immediately**.
8. Shut off the engine and remove the test gauge.
9. If engine oil pressure is good, replace the switch.

High Temperature Switch

The high temperature switch is located on the top right side of the water pump, which is located on the rear end of the engine block. It has a connector which a gray wire (Fig. 59).



Figure 59



CAUTION

Make sure engine is cool before removing the temperature switch.

1. Lower the coolant level in the engine and remove the high temperature switch.
2. Put the switch in a container of oil with a thermometer and slowly heat the oil (Fig. 60).



CAUTION

Handle the hot oil with extreme care to prevent personal injury or fire.

3. Check the continuity of the switch with a multimeter (ohms setting). The switch is normally open and should close between 245 to 255°F (118 to 124°C).

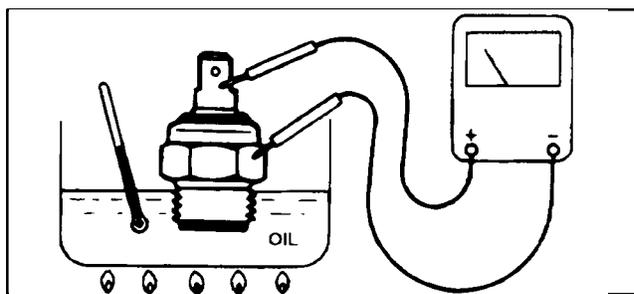


Figure 60

4. Allow the oil to cool. The switch should open below 245°F (118°C).

Anti-Dieseling Valve Solenoid (GM 3000)

The anti-dieseling valve solenoid is located on the right side of the carburetor, which is on the top rear end of the engine. It has two white wires (Fig. 61 and 62).

In Place Testing

Note: Prior to taking small resistance readings with a digital multimeter, short the test leads together. The meter will display a small resistance value (usually 0.5 ohms or less). This resistance is due to the internal resistance of the meter and test leads. Subtract this value from the measured value of the component you are testing.

1. Disconnect connector from the solenoid.
2. Using a digital multimeter, ground one lead to the engine block and connect the other to the solenoid terminal.
3. The resistance should be **about 25.0 ohms**.
4. Connect the wire back to the solenoid.

Live testing

1. Remove the connector from the solenoid.

Note: The solenoid may be removed from the engine or tested in place.

2. Connect a positive (+) test lead from a 12 VDC source to the solenoid terminal.
3. Touch a negative (-) test lead from the 12 VDC source to the solenoid body. The plunger should retract making an audible "click".

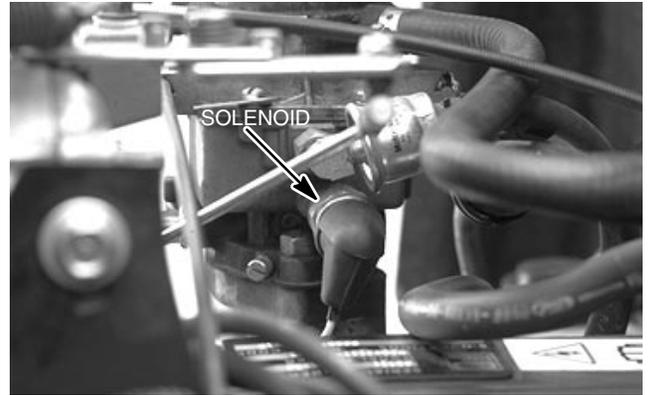


Figure 61

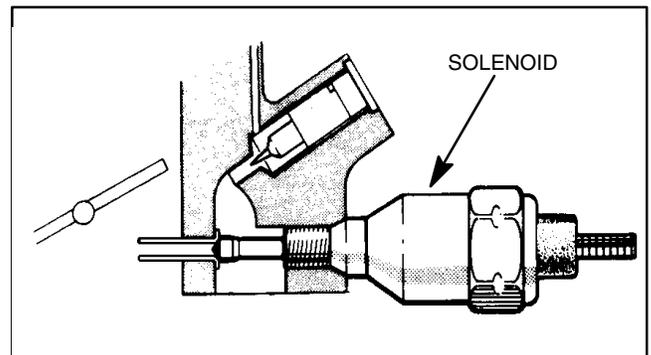


Figure 62

4. Disconnect the test leads from the solenoid.
5. Reinstall the connector to the solenoid if tested in place.

Indicator Lights and Circuits (GM 3000)

Note: Individual light bulbs can be tested by removing them from the lighting cluster and applying 12 VDC to their wiring terminals (Fig 63).

Low Oil Pressure Light

The oil pressure light should come on when the ignition switch is in the ON position with the engine not running. Also, it should light with the engine running when the oil pressure drops below 7 PSI (0.48 Bar).

1. Disconnect gray wire from the oil pressure switch.
2. Ground gray wire to the engine block.
3. Turn the ignition switch to ON; the light should come on.
4. Turn the ignition switch to OFF and connect gray wire to the oil pressure switch.

High Coolant Temperature Light

The temperature light should come on only if the high temperature shutdown switch and relay have stopped the engine when the coolant temperature is from 245 to 255°F (118 to 124°C). The ignition switch must be in either the ON or START position for the light to come on.

1. Disconnect gray wire from the high temperature shutdown switch.
2. Ground the gray wire to the engine block.
3. Turn the ignition switch to ON; the light should come on and the high temperature shutdown relay should click.
4. Turn the ignition switch to OFF and connect gray wire to the high temperature shutdown switch.

Battery Light

The battery light should come on when the ignition switch is in ON with the engine not running or with an improperly operating charging circuit while the engine is running.

1. Turn ignition switch to ON; the light should come on.
2. Turn ignition switch to OFF.

Low Water Level Light

This light is not used on models with the Ford VSG-411 gasoline engine.

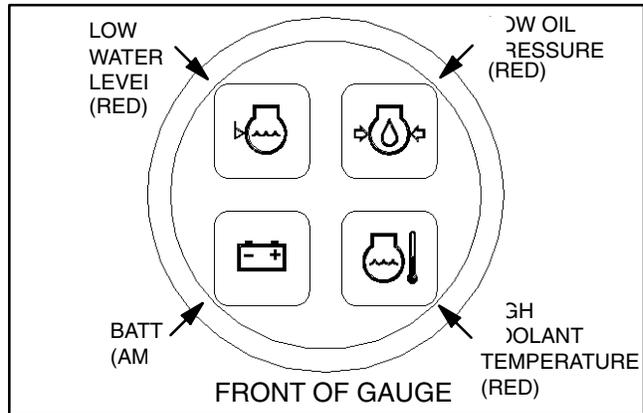


Figure 63

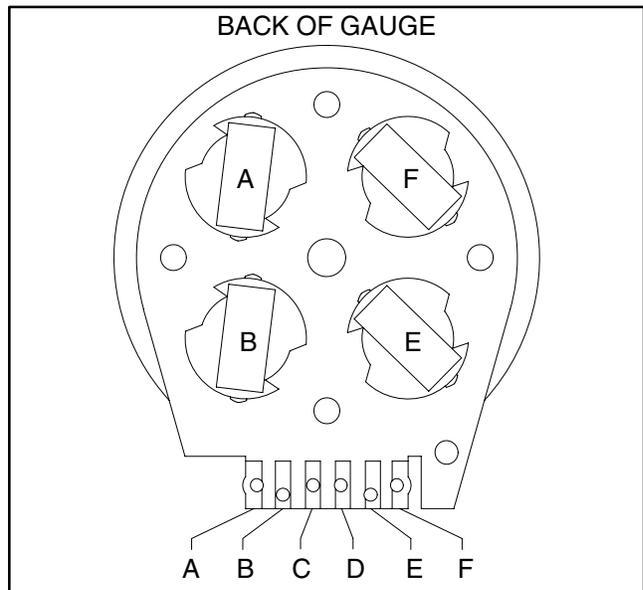


Figure 64

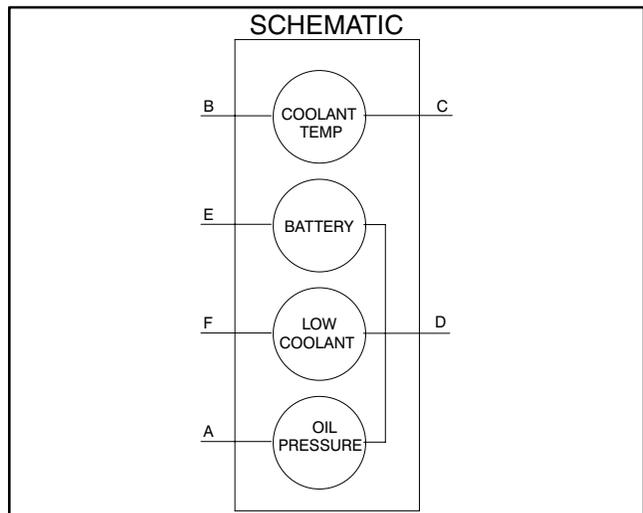


Figure 65

Service and Repairs

NOTE: See the Peugeot TUD5 Repair Manual or Ford VSG-411/413 Engine Service Manual for more component repair information.

Verify Interlock System Operation

The machine has interlock switches in the electrical system. These switches are designed to stop the engine when operator gets off the seat when traction pedal is depressed. However, operator may get off the seat while engine is running. Although engine will continue to run if PTO switch is disengaged and traction pedal is released, it is strongly recommended that the engine be stopped before dismounting from the seat.



CAUTION

Do not disconnect the interlock switches. Check operation of switches daily to assure interlock system is operating correctly. If a switch is malfunctioning, replace it before operating the machine. To ensure maximum safety, replace all switches after every two years or 1000 hours, whichever comes first.

To check operation of interlock switches:

1. Drive the machine slowly to a large, relatively open area. Lower cutting unit, stop the engine and apply parking brake.
2. Sit on seat. Depress the traction pedal. Try to start the engine. The engine should not crank. If the engine cranks, there is a malfunction in the interlock system that should be corrected before beginning operation.



WARNING

Do not operate machine without implement unless the PTO driveshaft is also removed.

3. Sit on seat and start the engine. Raise off the seat and move the PTO lever to ON. The PTO should not engage. If the PTO engages, there is a malfunction in the interlock system that should be corrected before beginning operation.

Battery Maintenance

Check battery condition weekly or after every 50 hours of operation. Keep terminals and entire battery case clean because a dirty battery will discharge slowly. 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 connectors with Grafo 112X (skin-over) grease (Toro Part No. 505-47) or petroleum jelly to prevent corrosion.

IMPORTANT: Before welding on the machine, disconnect both cables from the battery and the terminal connector from the alternator to prevent damage to the electrical system.

1. Loosen knobs securing battery cover to machine.



CAUTION

Wear safety goggles and rubber gloves when working with electrolyte. Charge the battery in a well ventilated so gases produced while charging can dissipate. Since the gases are explosive, keep open flame and electrical spark away from the battery; do not smoke. Nausea may result if the gases are inhaled. Unplug charger from electrical outlet before connecting to, or disconnecting charger leads from battery posts.

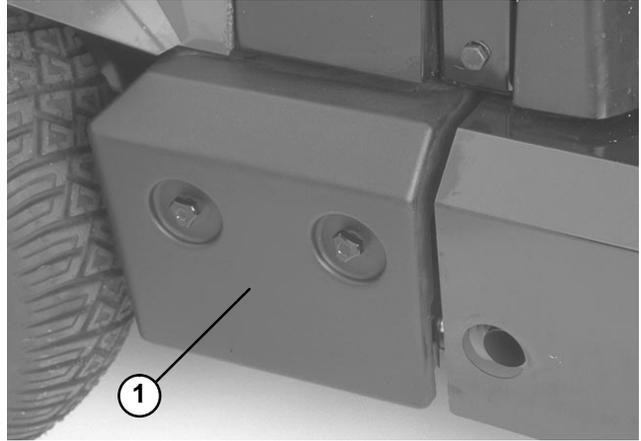


Figure 66
1. Battery Cover



Figure 67
1. Battery

Battery Service

The battery is the heart of the electrical system. With regular and proper service, battery life can be extended. Additionally, battery and electrical component failure can be prevented.



WARNING

When working with batteries, use extreme caution to avoid slashing or spilling electrolyte. Electrolyte can destroy clothing and burn skin or eyes. Always wear safety goggles and a face shield when working with batteries.

Electrolyte Specific Gravity

Fully charged: 1.265 corrected to 80°F (26.7°C)
Discharged: less than 1.240

Battery Specifications

Groundsmaster 3000
BCI Group 24 Battery
370 Amp Cranking Performance at 0°F (-17.8°C)
45 Minute Reserve Capacity at 80°F (26.7°C)

Groundsmaster 3000-D (U.S.)
BCI Group 24 Battery
650 Amp Cranking Performance at 0°F (-17.8°C)
130 Minute Reserve Capacity at 80°F (26.7°C)

Groundsmaster 3000-D (International)
BCI Group 24 Battery
630 Amp Cranking Performance at 0°F (-17.8°C)
105 Minute Reserve Capacity at 80°F (26.7°C)

Removal (Fig. 68 and 69)

IMPORTANT: Be careful not to damage terminal posts or cable connectors when removing the battery cables.

1. Remove lock nuts, washer, threaded rod, and battery bracket from the battery rod and frame.
2. Disconnect the ground cable (-) first to prevent short circuiting the battery, other components, or the operator's hands. Disconnect the positive (+) cable.
3. Make sure that the filler caps are on tightly.
4. Remove battery from the battery compartment to a service area. This will minimize possible battery damage and allow better access for inspection and service.

Inspection, Maintenance, and Testing

1. Perform following inspections and maintenance:
 - A. Check for cracks caused by overly tight or loose hold-down clamp. Replace battery if cracked and leaking.

Groundsmaster 3000/3000-D

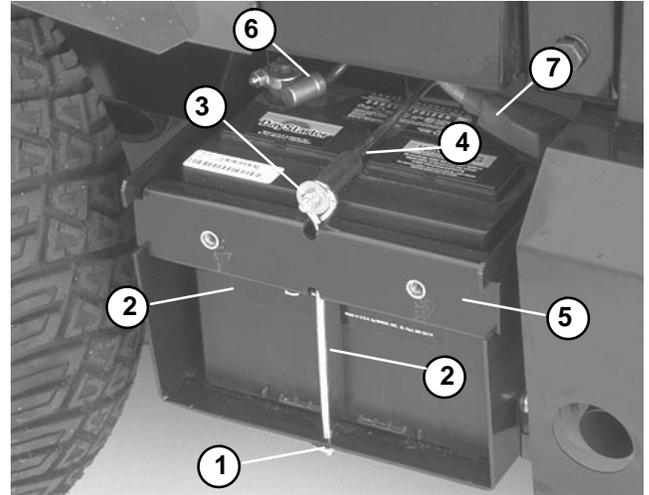


Figure 68

- | | |
|----------------------|--------------------|
| 1. Lock nut | 5. Battery bracket |
| 2. Threaded rod | 6. Ground cable |
| 3. Lock nut & washer | 7. Positive cable |
| 4. Battery rod | |

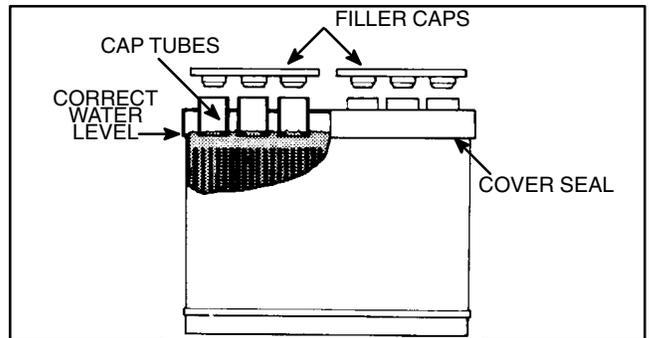


Figure 69

B. Check battery terminal posts for corrosion. Use a terminal brush or steel wool to clean corrosion from the battery terminal posts.

IMPORTANT: Before cleaning the battery, tape or block the vent holes to the filler caps and make sure the caps are on tightly.

C. Check for signs of wetness or leakage on the top of the battery which might indicate a loose or missing filler cap, overcharging, loose terminal post, or overfilling. Also, check the battery case for dirt and oil. Clean the battery with a solution of baking soda and water, then rinse it with clean water.

D. Check that the cover seal is not broken away. Replace the battery if the seal is broken or leaking.

E. Check the electrolyte level in each cell. If the level is below the tops of the plates in any cell, fill all cells with **distilled** water to the bottom of the cap tubes. Charge at 15 to 25 amps for 15 minutes to allow sufficient mixing of the electrolyte.

2. Conduct a hydrometer test of the battery electrolyte.

IMPORTANT: Make sure the area around the cells is clean before opening the battery caps.

A. Measure the specific gravity of each cell with a hydrometer. Draw electrolyte in and out of the hydrometer barrel prior to taking a reading to warm-up the hydrometer. At the same time take the temperature of the cell.

B. Temperature correct each cell reading. For each 10°F (5.5°C) above 80°F (26.7°C) add 0.004 to the specific gravity reading. For each 10°F (5.5°C) below 80°F (26.7°C) subtract 0.004 from the specific gravity reading.

Example: Cell Temperature 100°F
 Cell Gravity 1.245
 ADD (20° above 80°F) 0.008
 Correction to 80°F 1.253

C. If the difference between the highest and lowest cell specific gravity is 0.050 or greater or the lowest cell specific gravity is less than 1.225, charge the battery. Charge at the recommended rate and time given in **Charging** or until all cells specific gravity is 1.225 or greater with the difference in specific gravity between the highest and lowest cell less than 0.050. If these charging conditions can not be met, replace the battery.

3. Perform a high-discharge test with an adjustable load tester.

This is one of the most reliable means of testing a battery as it simulates the cold-cranking test. A commercial battery load tester is **required** to perform this test.

	CAUTION
Follow the manufacturer's instructions when using a battery tester.	

A. Check the voltage across the battery terminals prior to testing the battery. If the voltage is less than 12.0 VDC, recharge the battery.

B. If the battery has been charged, apply a 150 amp load for 15 seconds to remove the surface charge. Use a battery load tester following the manufacturer's instructions.

C. Make sure the battery terminals are free of corrosion.

D. Measure the temperature of the center cell.

E. Connect a battery load tester to the battery terminals **following the manufacturer's instructions**. Connect a digital multimeter to the battery terminals.

F. Apply a test load of one half the Cranking Performance (see Battery Specifications) rating of the battery for 15 seconds.

G. Take a voltage reading at 15 seconds, then remove the load.

H. Using the table below, determine the minimum voltage for the cell temperature reading.

Minimum Voltage	Battery Electrolyte Temperature	
	9.6	70°F (and up)
9.5	60°F	15.6°C
9.4	50°F	10.0°C
9.3	40°F	4.4°C
9.1	30°F	-1.1°C
8.9	20°F	-6.7°C
8.7	10°F	-12.2°C
8.5	0°F	-17.8°C

I. If the test voltage is below the minimum, replace the battery. If the test voltage is at or above the minimum, return the battery to service.

Installation

IMPORTANT: To prevent possible electrical problems, install only a fully charged battery.

1. Make sure the ignition switch and all accessories are off.

2. Make sure the battery compartment is clean and repainted if necessary.

3. Make sure all battery cables and connection are in good condition and that the battery bracket has been repaired or replaced.

4. Place battery in its compartment. Make sure battery is level and flat. Push the positive cable connector onto positive battery post. Do not hammer; this will damage the battery. Tighten bolts with two wrenches.

5. Install battery bracket and threaded rod to the battery rod and frame. Install lock nut and washer to battery rod. Install lock nut to threaded rod (Fig. 68).

6. Apply a light coat of grease on all battery posts and cable connectors to reduce corrosion after connections are made.

7. Connect a digital multimeter (set to amps) between the negative battery post and the negative (ground) cable connector. The reading should be less than 0.1 amp. If the reading is 0.1 amp or more, the unit's electrical system should be tested and repaired.

8. Connect the negative (ground) cable connector to the negative battery post.

Charging

To minimize possible damage to the battery and allow the battery to be fully charged, the slow charging method is presented here. This charging method can be accomplished with a constant current battery charger which is available in most shops.

	CAUTION
Follow the manufacturer's instructions when using a battery charger.	

Note: Using specific gravity of the battery cells is the most accurate method of determining battery condition.

1. Determine the battery charge level from either its open specific gravity or circuit voltage.

Battery Charge Level	Specific Gravity	Open Circuit Voltage
100%	1.265	12.68
75%	1.225	12.45
50%	1.190	12.24
25%	1.155	12.06
0%	1.120	11.89

2. Determine the charging time and rate **using the manufacturer's battery charger instructions** or the following table.

Battery Reserve Capacity (Minutes)	Battery Charge Level (Percent of Fully Charged)			
	75%	50%	25%	0%
80 or less	3.8 hrs @ 3 amps	7.5 hrs @ 3 amps	11.3 hrs @ 3 amps	15 hrs @ 3 amps
81 to 125	5.3 hrs @ 4 amps	10.5 hrs @ 4 amps	15.8 hrs @ 4 amps	21 hrs @ 4 amps
126 to 170	5.5 hrs @ 5 amps	11 hrs @ 5 amps	16.5 hrs @ 5 amps	22 hrs @ 5 amps
171 to 250	5.8 hrs @ 6 amps	11.5 hrs @ 6 amps	17.3 hrs @ 6 amps	23 hrs @ 6 amps
above 250	6 hrs @ 10 amps	12 hrs @ 10 amps	18 hrs @ 10 amps	24 hrs @ 10 amps

	CAUTION
Do not charge a frozen battery because it can explode and cause injury. Let the battery warm to 60° F (15.5° C) before connecting to a charger.	
Charge the battery in a well-ventilated place to dissipate gases produced from charging. These gases are explosive; keep open flame and electrical spark away from the battery. Do not smoke. Nausea may result if the gases are inhaled. Unplug the charger from the electrical outlet before connecting or disconnecting the charger leads from the battery posts.	

3. **Following the manufacturer's instructions**, connect the charger cables to the battery. Make sure a good connection is made.

4. Charge the battery **following the manufacturer's instructions**.

5. Occasionally check the temperature of the battery electrolyte. If the temperature exceeds 125°F (51.6°C) or the electrolyte is violently gassing or spewing, the charging rate must be lowered or temporarily stopped.

6. Three hours prior to the end of the charging, measure the specific gravity of a battery cell once per hour. The battery is fully charged when the cells are gassing freely at a low charging rate and there is less than a 0.003 change in specific gravity for three consecutive readings.



2WD Rear Axle

Table of Contents

ADJUSTMENTS	2	Wheel Lug Nut Torque	3
Rear Wheel Toe-in	2	Lubrication	3
SERVICE AND REPAIRS	3	Wheel Bearing Service	4
Check Tire Pressure	3	Rear Axle	5

2WD Rear Axle

Adjustments

Rear Wheel Toe-In

After every 800 operating hours or annually, check rear wheel toe-in.

1. Measure center-to-center distance (at axle height) at front and rear of steering tires. Front measurement must be 1/8 in. (3 mm) less than rear measurement.
2. To adjust toe-in:
 - A. Remove cotter pins and nuts securing ball joints to steering arms. Separate ball joint from arm.
 - B. Loosen clamps at both ends of tie rod.
 - C. Rotate ball joints to move front of tire inward or outward.
 - D. Tighten tie rod clamps when adjustment is correct.

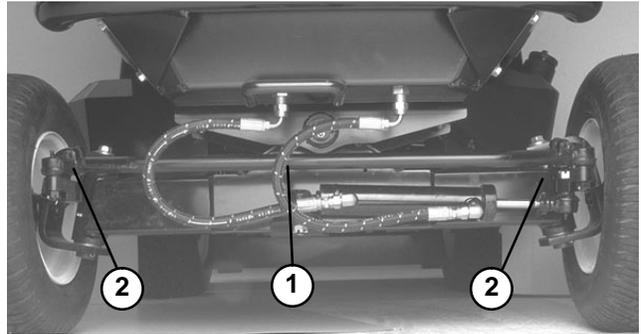


Figure 1

1. Tie Rod
2. Tie Rod Clamps

Service and Repairs

Wheel and Tire Service

Check Tire Pressure

The tires are over-inflated for shipping. Therefore, release some of the air to reduce the pressure. Correct air pressure in the front and rear tires is 15 psi (1 Bar).

IMPORTANT: Maintain even pressure in all tires to assure a good quality-of-cut and proper machine performance. **DO NOT UNDER INFLATE.**

Check Wheel Nut Torque



Torque wheel nuts to 70–80 ft-lb (10–11 Kgm) after 1-4 hours of operation and again after 10 hours of operation and every 200 hours thereafter. Failure to maintain proper torque could result in failure or loss of wheel and may result in personal injury.



Figure 2
1. Rear wheel and tire

Lubrication

The machine 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 or immediately after every washing.

Steering cylinder ball joint, Rear axle tie rod (2), Rear axle pivot (1) Rear Spindle Shafts (2).

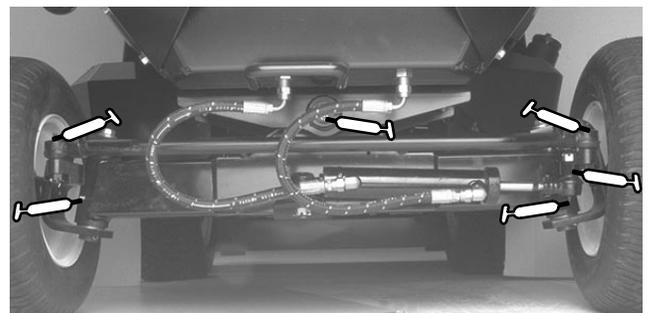


Figure 3

Wheel Bearing Service

Disassemble, clean, repack and adjust the rear wheel bearings after each 800 hours of operation. Use No. 2 general purpose lithium base grease containing E.P. additive. If operating conditions are extremely dusty and dirty, it may be necessary to perform this maintenance more often.

1. Slightly loosen the wheel lug nuts. Jack up the rear of the machine until the tire is off the floor. Support the machine with jack stands or blocks to prevent it from falling. Remove the wheel.

2. Remove the hubcap from the end of the wheel spindle.

3. Remove the cotter pin, retainer, jam nut, and washer. Slide the hub off of the spindle shaft.

4. Pull the seal out of the hub.

5. Remove the bearing cones from both sides of the hub assembly. Clean the bearings in solvent. Make sure the bearings are in good operating condition. Clean the inside of the wheel hub. Check the bearing cups for wear, pitting or other noticeable damage. Replace worn or damaged parts.

6. If bearing cups were removed from the hub assembly, press new ones into the hub until they seat against the shoulder.

7. Pack bearing cones with grease. Install one bearing cone into the cup on inboard side of the hub assembly. Lubricate the inside of the new lip seal and press it into the hub assembly.

IMPORTANT: The lip seal must be pressed in so it is flush with the end of the hub.

8. Pack inside of hub assembly with some grease (not full). Install remaining bearing cone into the bearing cup.

9. Slide the hub onto the spindle shaft and secure it in place with the tab washer, jam nut, and retainer. DO NOT tighten the nut or install the cotter pin.

10. Adjust preload on the wheel bearings.

A. Tighten the jam nut to 75 – 80 in-lb (86 – 270 Kg-cm) while turning the hub to seat the bearings and remove all end play.

B. Loosen the jam nut until it is away from the tab washer and the hub has end play. Tighten the jam nut to 15 – 20 in-lb (17 – 23 Kg-cm) while rotating the hub.

C. Put the retainer over the jam nut. If the cotter pin hole is not aligned with a retainer slot, remove the retainer and re-orient it until alignment occurs.

D. Insert the cotter pin. Bend both legs of the cotter pin and tap out of the way. Install the cap.

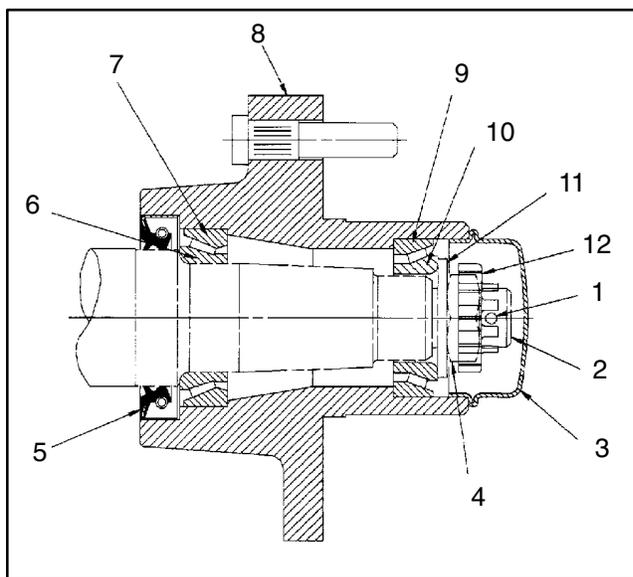


Figure 4

- | | |
|-----------------------|------------------------|
| 1. Cotter pin | 7. Inner bearing cup |
| 2. Spindle | 8. Wheel hub |
| 3. Cap | 9. Outer bearing cup |
| 4. Washer | 10. Outer bearing cone |
| 5. Seal | 11. Washer |
| 6. Inner bearing cone | 12. Retainer |
| | 13. Jam nut |



4WD Rear Axle

Table of Contents

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Check Tire Pressure	3	Rear Axle	5
Check Wheel Lug Nut Torque	3		

4WD Rear Axle

Adjustments

Rear Wheel Toe-In

After every 800 operating hours or annually, check rear wheel toe-in.

1. Measure center-to-center distance (at axle height) at front and rear of steering tires. Front measurement must be 1/8 in. (3 mm) less than rear measurement.
2. To adjust toe-in:
 - A. Remove cotter pins and nuts securing ball joints to steering arms. Separate ball joint from arm.
 - B. Loosen clamps at both ends of tie rod.
 - C. Rotate ball joints to move front of tire inward or outward.
 - D. Tighten tie rod clamps when adjustment is correct.

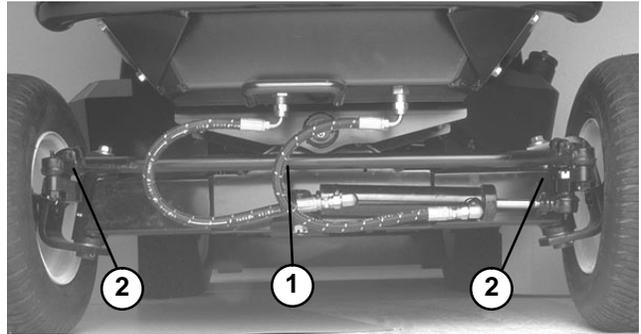


Figure 1

1. Tie Rod
2. Tie Rod Clamps

Service and Repairs

Wheel and Tire Service

Check Tire Pressure

The tires are over-inflated for shipping. Therefore, release some of the air to reduce the pressure. Correct air pressure in the front and rear tires is 15 psi (1 Bar).

IMPORTANT: Maintain even pressure in all tires to assure a good quality-of-cut and proper machine performance. **DO NOT UNDER INFLATE.**

Check Wheel Nut Torque



WARNING

Torque wheel nuts to 70–80 ft-lb (10–11 Kgm) after 1-4 hours of operation and again after 10 hours of operation and every 200 hours thereafter. Failure to maintain proper torque could result in failure or loss of wheel and may result in personal injury.



Figure 2
1. Rear wheel and tire

Lubrication

The machine 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 or immediately after every washing.

Steering cylinder ball joints, Rear axle tie rod (2), Rear axle pivot (1) and Double Cardan joints (2 ea. side).

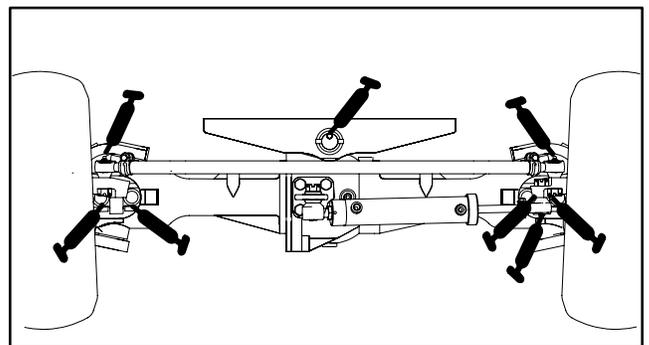


Figure 3

Check Rear Axle Lubricant

The rear axle reservoir uses Mobil 424 hydraulic fluid. 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 plug from axle and make sure lubricant is up to bottom of hole. If level is low, add enough lubricant to bring the level up to the bottom of the check hole (Fig. 4).

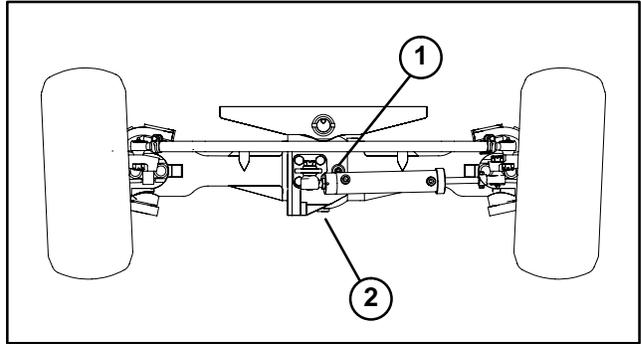


Figure 4

1. Check Plug
2. Drain Plug

Change Rear Axle Lubricant

Initially, change oil in rear axle after 200 hours, thereafter change every 400 hours of operation.

1. Position machine on a level surface.
2. Clean area around drain plug on rear axle.
3. Remove check plug to ease draining of oil.
4. Remove drain plug allowing oil to drain into pan.
5. Install drain plug.
6. Fill axle with approximately 16 oz. (473 ml) of Mobil 424 or until lubricant is up to bottom of check hole.
7. Install check plug.

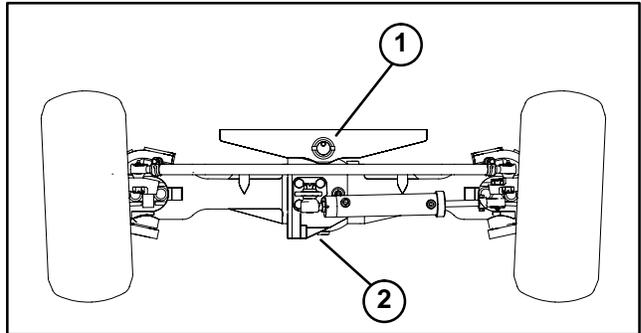


Figure 5

1. Check Plug
2. Drain Plug

4WD Axle

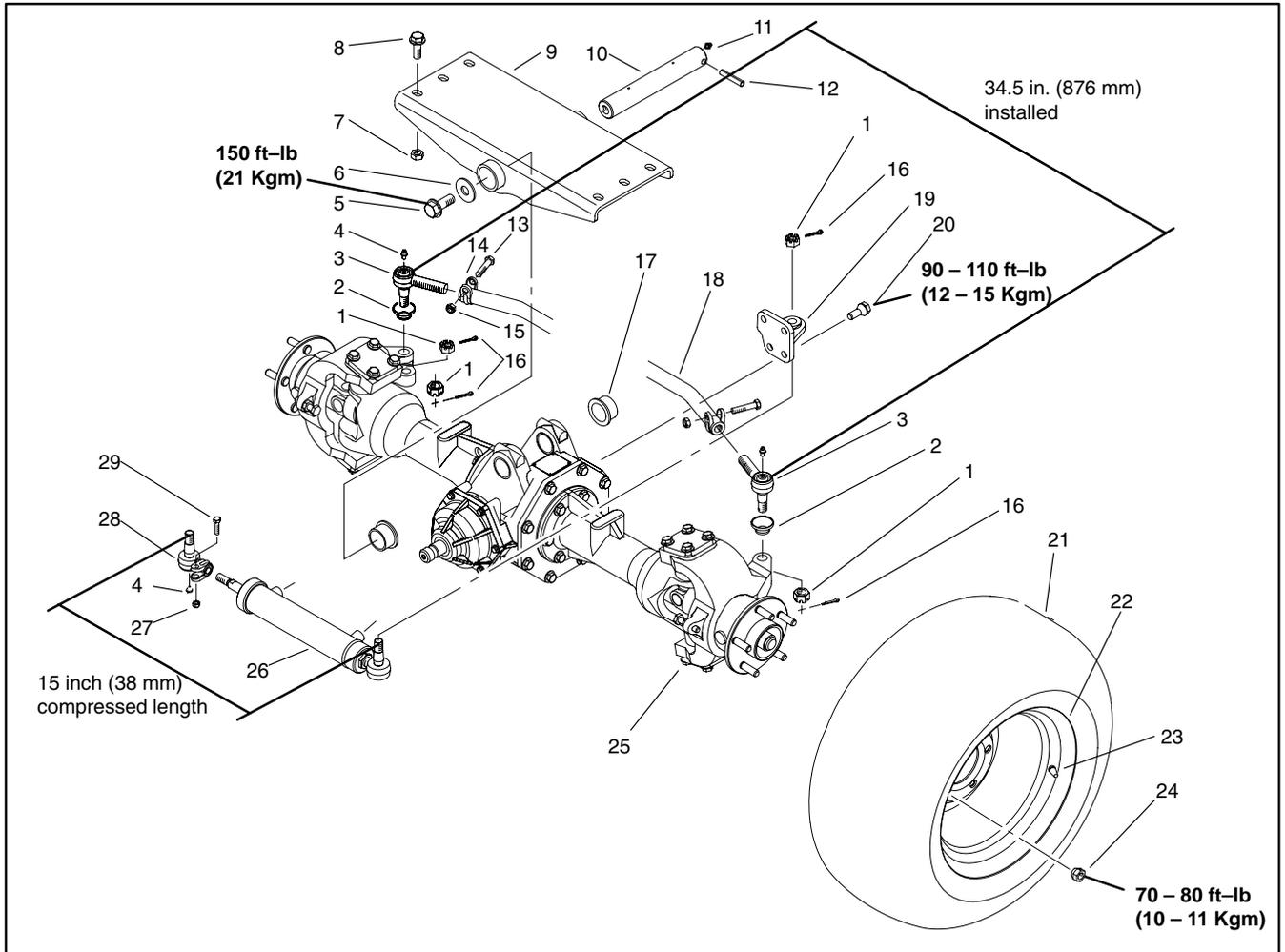


Figure 6

- | | | |
|--------------------|-------------------------|------------------------|
| 1. Nut | 11. Grease fitting | 21. Tire |
| 2. Seal | 12. Spring pin | 22. Rim |
| 3. Rod end | 13. Screw | 23. Valve stem |
| 4. Grease fitting | 14. Clamp and tube assy | 24. Lug nut |
| 5. Screw | 15. Lock nut | 25. Axle |
| 6. Flat washer | 16. Cotter pin | 26. Steering cylinder |
| 7. Lock nut | 17. Castor bushing | 27. Lock nut |
| 8. Screw | 18. Tie rod assy | 28. Rod end ball joint |
| 9. Axle pivot | 19. Cylinder anchor | 29. Screw |
| 10. Axle pivot pin | 20. Tapered screw | |

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.

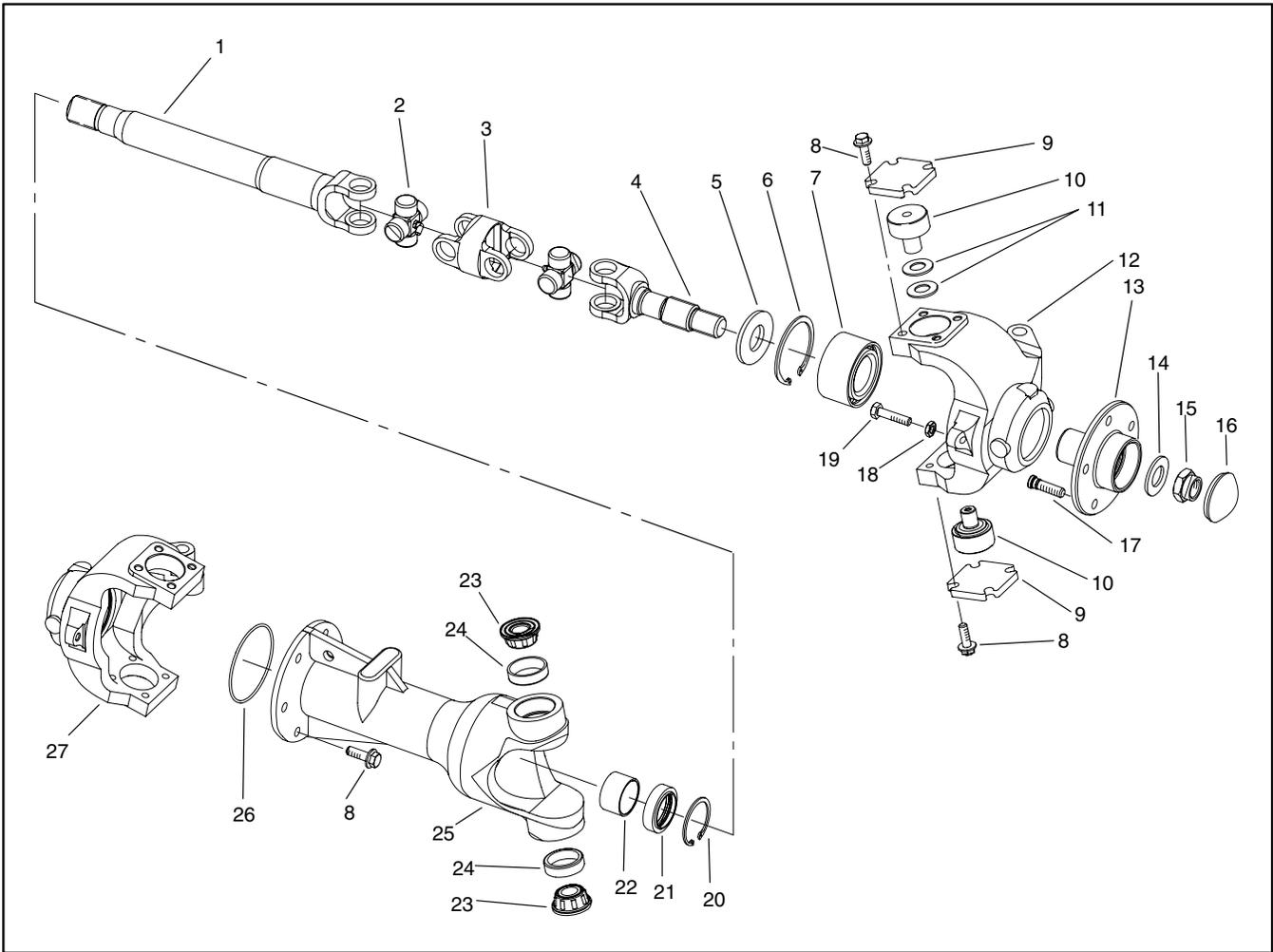


Figure 7

- 1. Inboard yoke shaft
- 2. Cross and bearing kit
- 3. Double pivot yoke
- 4. Outboard yoke shaft
- 5. Washer
- 6. Retaining ring
- 7. Tapered bearing
- 8. Screw
- 9. Kingpin cover

- 10. Kingpin trunnion
- 11. Belleville washer
- 12. L.H. spindle flange
- 13. Wheel hub
- 14. Washer
- 15. Nut
- 16. Dust cap
- 17. Wheel stud
- 18. Nut

- 19. Screw
- 20. Retaining ring
- 21. Lip seal
- 22. Journal bearing
- 23. Bearing cone
- 24. Bearing cup
- 25. Kingpin housing
- 26. O-ring
- 27. R.H. spindle flange

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.

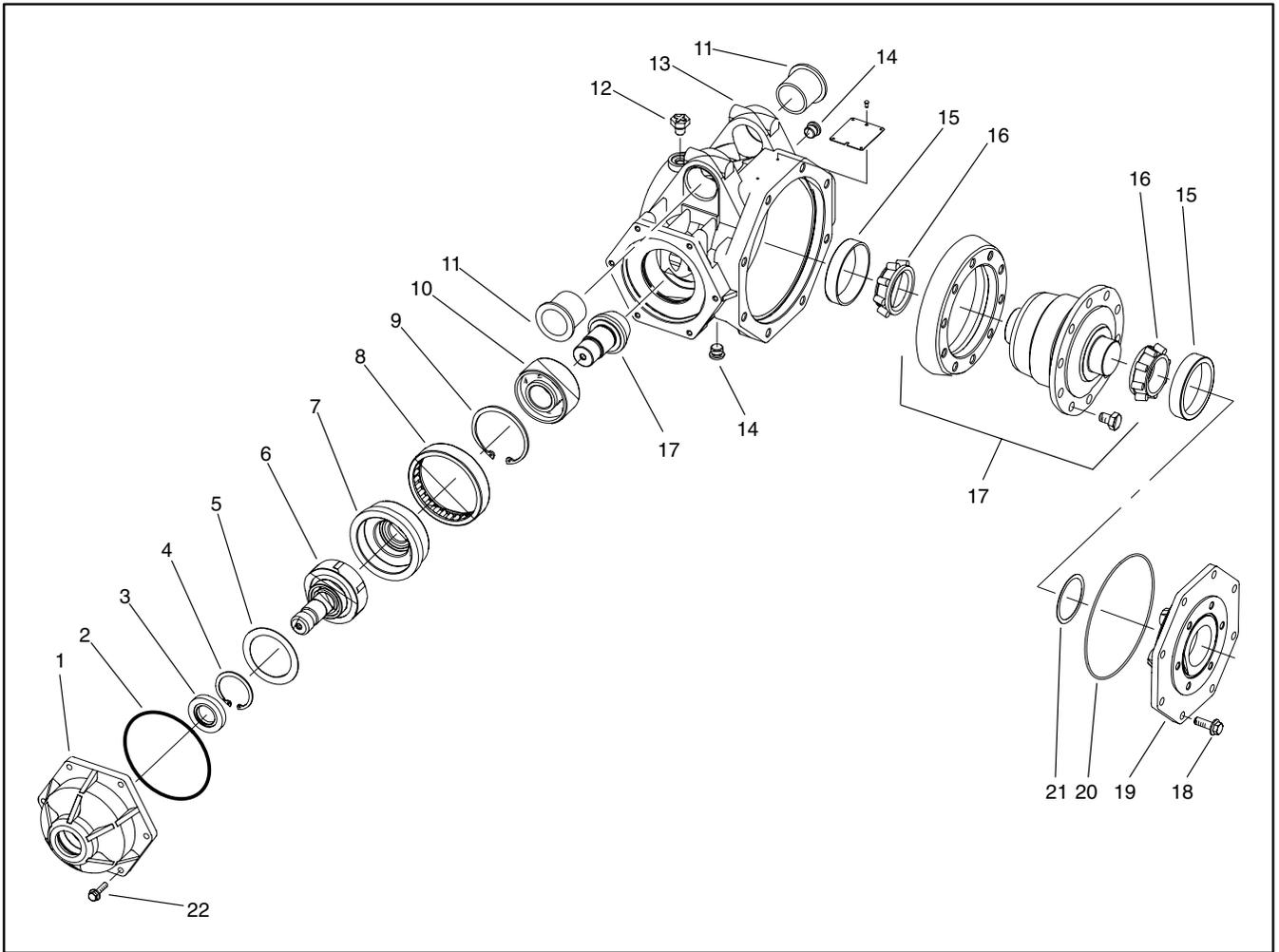


Figure 8

- | | | |
|----------------------------|-------------------|---------------------------|
| 1. Clutch housing | 9. Retaining ring | 17. Differential |
| 2. O-ring | 10. Ball bearing | 18. Screw |
| 3. Lip seal | 11. Bushing | 19. Side cover |
| 4. Internal retaining ring | 12. Breather vent | 20. O-ring |
| 5. Thrust washer | 13. Axle housing | 21. Differential shim kit |
| 6. Clutch | 14. Plug | 22. Screw |
| 7. Clutch race | 15. Bearing cup | |
| 8. Needle bearing | 16. Bearing cone | |

NOTE: Assembly kits are available for servicing this component. See the Parts Catalog for more information.



84" Cutting Units

84 inch
Cutting Units

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Specifications

Type: 84 inch (2.1 m) width of cut, 5 blades, 3 blade center section, and 2 one blade wings. Toro Recycler technology on Guardian Recycler.

Mowing Rate: Mows up to 4.7 acres/hr (1.9 hectares/hr) at 5.5 mph (8.8 km/hr).

Trimming Ability: Deck is centered on tractor with 15 inches (38 mm) of over hang on each side. Uncut circle is 24.0 inches (610 mm) on both left and right with no brakes.

Height Of Cut: 1–5 inches (25 to 127 mm) adjustable in 1/2 inch (13 mm) increments. Front adjustment is with snapper pin and grooves in castor shaft. Rear adjustment is with hanger brackets and pin.

Construction: 12 gauge steel, 4.25 inches (108 mm) deep, welded construction and reinforced with 10 gauge steel channels. Bolt-in 12 gauge steel chambers.

Cutter Drive: Isolation mount PTO driven gearbox with 1:1.35 spiral bevel gears. One "BB" section belt on center section. One "B" section belt on each wing. Fixed idler on main deck with spring adjustment. Self-tensioning idler pulleys on each wing. 1.25 inch diameter (32

mm) spindle shafts, turn on two greaseable tapered roller bearings (greaseable from top of deck). A positive splined connection attaches pulleys to spindle shafts for high torque capacity.

Blades: Five 19 inch (483 mm) long, .25 inch (6 mm) thick, heat-treated steel.

Suspension & Castor Wheels: Two front castors, consisting of 10 inch (254 mm) pneumatic wheel and tire assembly with sealed ball bearings. Rear of deck is suspended from lift arms with adjustable deck rake. Hydraulic counter balance and lift system designed integral with deck for maximum flotation.

Anti-scalp Features: Anti-scalp cup located on each blade. Three anti-scalp rollers on center deck. Anti-scalp wheel and adjustable skid on each wing. Wings flex 0–15 degrees up.

Deck Covers: High impact plastic covers.

Quick Attach System: Tapered joint with over center adjustable tensioning latch.

Weight: Guardian Recycler 660 lbs (299 Kg), Rear Discharge 665 lbs (302 Kg).

Specifications and design subject to change without notice.

Adjustments

Transport Latch Adjustment

1. Start tractor and raise deck to highest possible position and turn off engine.
2. Loosen (2) flange head capscrews securing latch plate to side of gearbox.
3. Rotate latch rod downward from front of traction unit.
4. Insert latch rod into rear hole (transport position) in latch plate.
5. Tighten flange head capscrews securing latch plate to gearbox.
6. Remove hair pin cotters and clevis pins securing height-of-cut straps to rear of deck.
7. Remove latch rod from rear hole in latch plate.
8. Rotate front of deck upward and insert latch rod into front hole (service position) in latch plate.
9. Loosen latch plate flange head capscrews and adjust latch plate position if required.

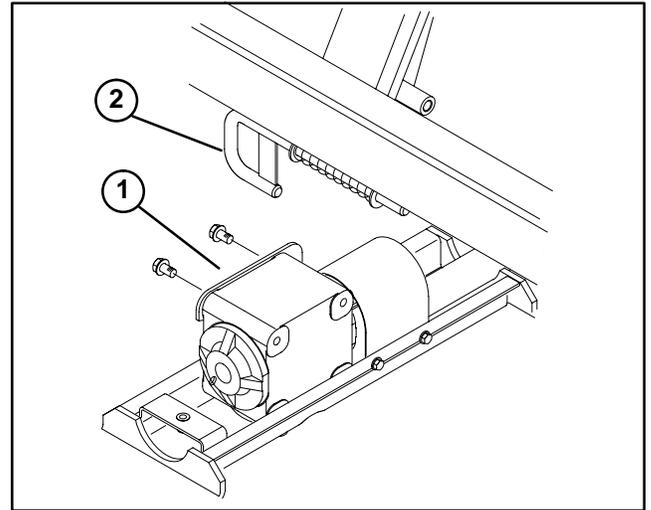


Figure 1
1. Latch Plate
2. Latch Rod

Height of Cut Adjustment

The height-of-cut is adjustable from 1 to 5 inches (25 to 127 mm) in 1/2 inch (13 mm) increments.

1. Start engine and raise cutting unit. Stop engine after cutting unit is raised.
2. Remove front snapper pins from castor arms and slide castor wheel assembly up or down.
3. Insert snapper pin into castor arm and through groove in castor shaft to get desired height-of-cut.
4. Remove hair pin cotter and clevis pin securing height-of-cut chain to rear of deck.
5. Mount height-of-cut chain to desired height-of-cut hole with clevis pin and hair pin cotter.
6. When using 1 inch (25 mm) height-of-cut, move skids, anti-scalp rollers, and wings wheels to the highest holes.

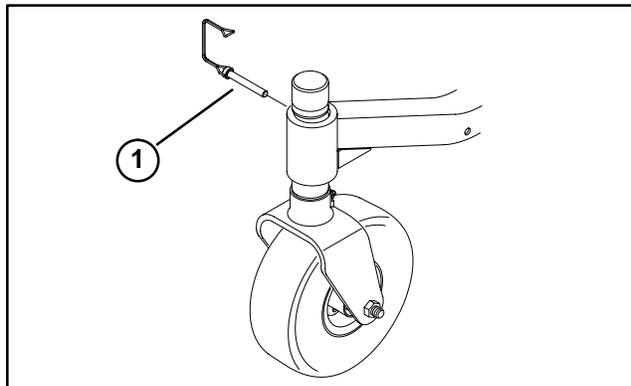


Figure 2
1. Snapper Pin

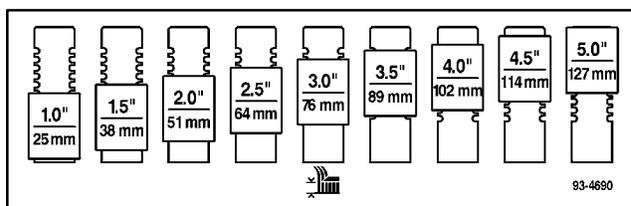


Figure 3

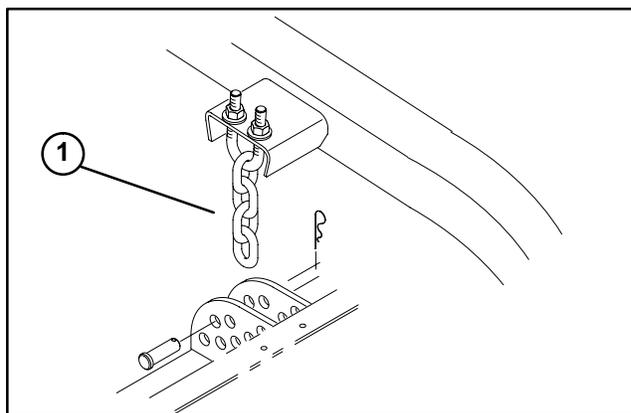


Figure 4
1. Height-of-Cut chain

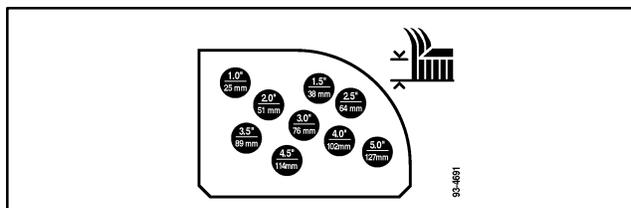


Figure 5

Skid Adjustment

Skids should be located in upper holes for 1 (25 mm) and 1-1/2 inch (38 mm) heights-of-cut and lower holes for 2 (51 mm) to 5 inch (127 mm) heights-of-cut.

1. Adjust skids by removing flange nuts, positioning as desired and re-installing flange nuts.

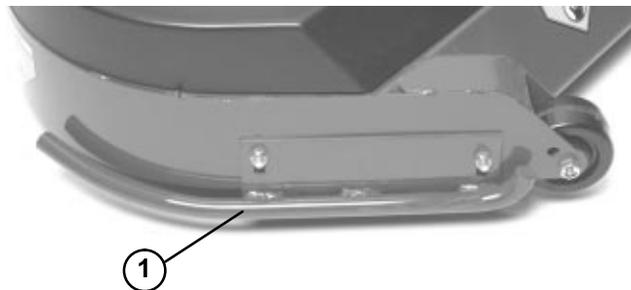


Figure 6

1. Skid

Anti-Scalp Roller Adjustment

Anti-scalp rollers should be located in upper holes for 1 (25 mm) and 1-1/2 inch (38 mm) heights-of-cut and lower holes for 2 (51 mm) to 5 inch (127 mm) heights-of-cut. Five rollers are located on the deck, three under the main deck and one on each wing.

1. Adjust anti-scalp rollers by removing lock nut and bolt, positioning as desired and reinstalling lock nut and bolt.



Figure 7

1. Anti-scalp roller

Deck Pitch Adjustment

Deck pitch is the difference in height-of-cut from the front of the blade plane to the back of the blade plane. TORO recommends a blade pitch of .25 inches (6 mm). That is the back of the blade plane is .25 inches (6 mm) higher than the front.

1. Position machine on a level surface on shop floor.
2. Set deck to the desired height-of-cut.
3. Rotate one blade so it points straight forward.
4. Using a short ruler, measure from floor to front tip of blade. Then, measure from floor to rear tip of blade.
5. Subtract the front dimension from rear dimension to calculate your pitch.
6. To adjust pitch, start tractor and raise deck to highest possible position and turn off engine.
7. Loosen jam nuts on top or bottom of height of cut chain u-bolts.
8. Adjust other set of nuts to raise or lower rear of deck and get correct deck pitch.
9. Tighten jam nuts.
10. Lower deck.

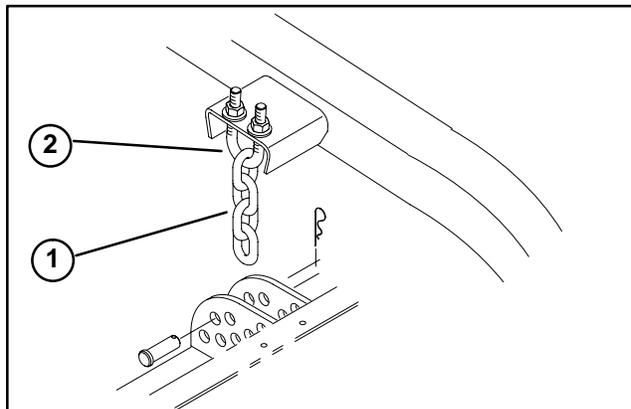


Figure 8

1. Height-of-Cut chain
2. U-bolt

Service and Repairs



CAUTION

To prevent accidental starting of the engine, while performing maintenance, shut engine off and remove key from ignition switch.

Check Gear Box Lubricant

The gear box is designed to operate with SAE 80–90 wt. gear lube. Although the gear box is shipped with lubricant from the factory, check the level before operating the cutting unit.

1. Position the machine and cutting unit on a level surface.
2. Remove check plug from side of gear box and make sure lubricant is up to bottom of hole. If level of lubricant is low, remove fill plug on top of gear case and add enough lubricant to bring it up to bottom of hole in side.

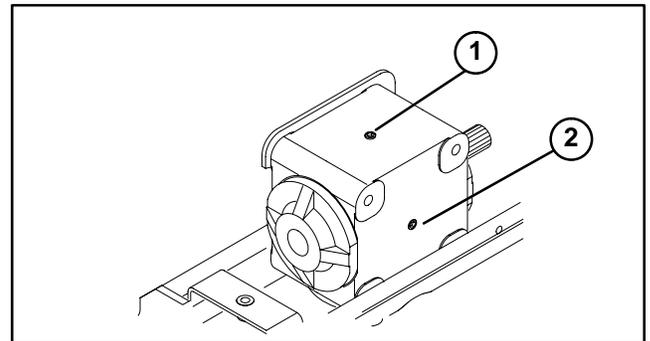


Figure 9

1. Filler Plug
2. Check Plug

Replace Gear Box Lubricant

The gear box lubricant must be changed initially, after the first 400 hours of operation, and thereafter every 1600 hours of operation.

1. Position the machine and cutting unit on a level surface.
2. Loosen fixed idler pulley locking nut.
3. Loosen spring tensioning nut as required and remove belt.
4. Remove (4) locknuts securing gearbox mount to deck.
5. Remove belt from pulley.
6. Remove check plug from side of gear box and tip gear box assembly allowing lubricant to drain from gear box.
7. Reinstall belt to pulley.
8. Reinstall gear box assembly to deck
9. Remove fill plug on top of gear case and add SAE 80–90 wt. gear lube until level is up to bottom of hole in side.
10. Reinstall check plug to side of gear box and fill plug to top of gear case.
11. Re-tension belt. Refer to Replacing Drive Belts.

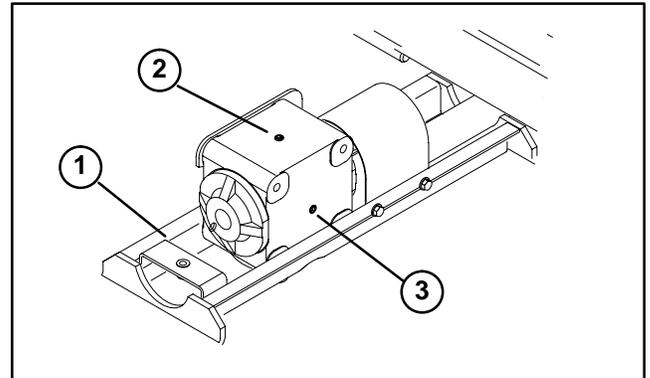


Figure 10

1. Gear Box Mount
2. Filler Plug
3. Check Plug

Lubricate Bearings, Bushings and Gear Box

The cutting unit must be lubricated regularly. If machine is operated under normal conditions, lubricate castor bearings and bushings with No. 2 general purpose lithium base grease or molybdenum base grease, after every 8 hours of operation or daily, whichever comes first. Lubricate fittings immediately after every washing, regardless of the interval listed.

1. The cutting unit has bearings and bushings that must be lubricated, and these lubrication points are:

front castor shaft bushings (2), blade spindle bearings (5), idler arm pivots (2), drive shaft (3), Wing deck pivots (2) and right and left push arm ball joints (Fig. 11).

2. Position the machine and cutting unit on a level surface and lower cutting unit. Remove check plug from side of gear box and make sure lubricant is up to bottom of hole. If level of lubricant is low, remove fill plug on top of gear case and add SAE 80–90 wt. gear lube until level is up to bottom of hole in side.

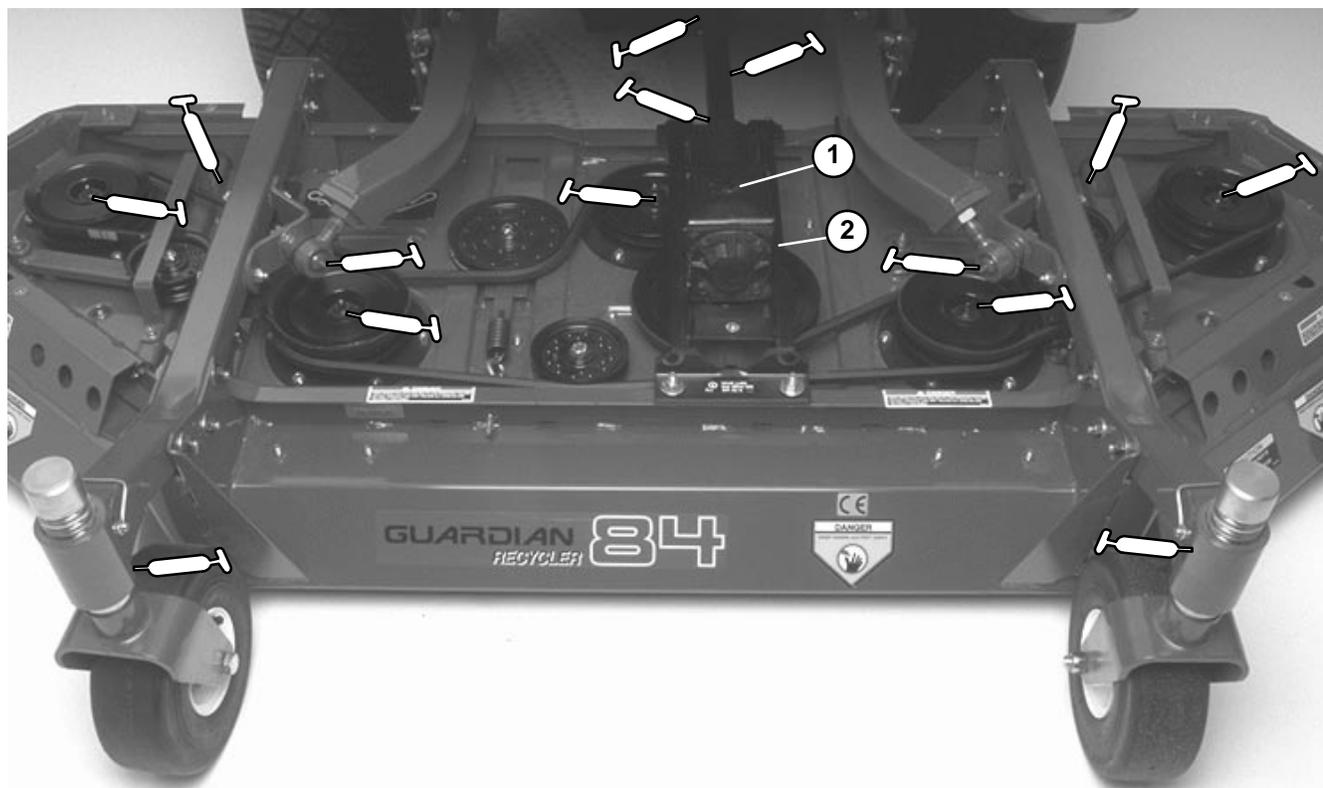


Figure 11
1. Filler Plug
2. Check/Drain Plug

Disconnect Cutting Unit From Traction Unit

Note: Implements are heavy and may require two people to handle.

1. Start tractor and raise deck to highest possible position and turn off engine.
2. Remove hair pin cotter and clevis pin securing height-of-cut chains to rear height-of-cut brackets.
3. Rotate ignition key to run position and move lift lever forward to lower cutting unit.
4. Raise seat and open needle valve. This allows lift arms to float freely.
5. Remove hair pin cotter and clevis pin securing latch cover to lift arm .
6. Loosen release lever by rotating it counterclockwise.
7. Pivot release lever upward and remove shaft latch from slot in traction unit lift arm.
8. Pull rearward on lock collar to release drive shaft coupler from tractor.
9. Stay clear of lift arms and move deck away from tractor allowing lift arms to fall.
10. Secure hair pin cotter and clevis pin to height-of-cut chains for storage.
11. Close needle valve

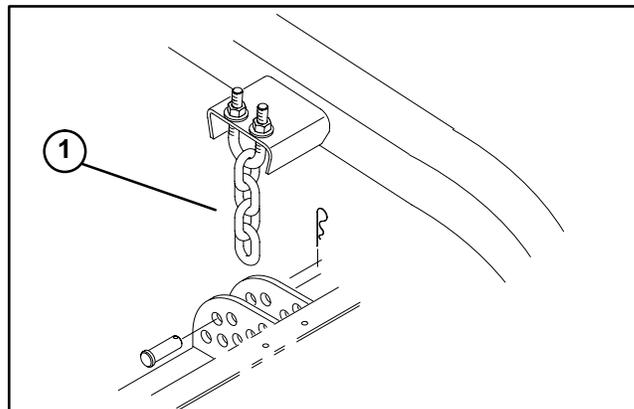


Figure 12
1. Height-of-Cut chain

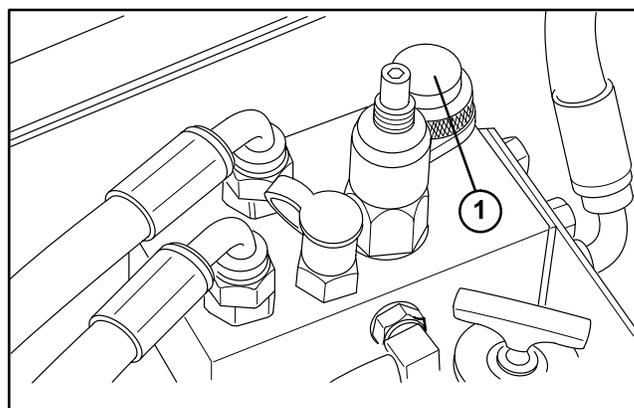


Figure 13
1. Needle Valve

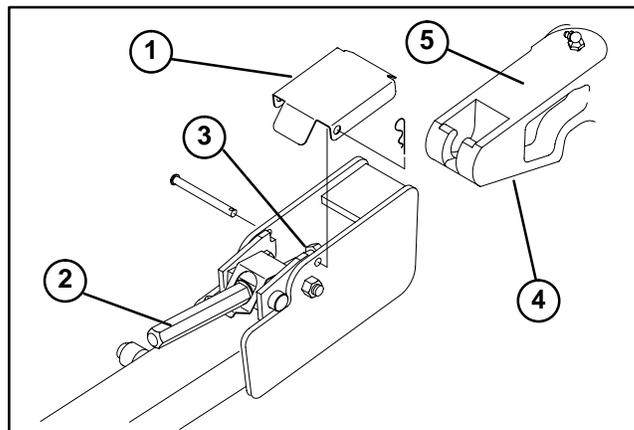


Figure 14
1. Latch Cover 4. Traction Unit Lift Arm
2. Release Lever 5. Machined Surface
3. Shaft latch

Connect Cutting Unit to Traction Unit

1. Center traction unit in front of cutting unit on any flat hard surface.
2. Raise seat and open needle valve. This allows lift arms to float freely.
3. Adjust lift arms heights making sure that the machined surface on top of each traction unit lift arm is parallel to ground. (Raise or lower lift arm casting by pushing up or down from behind the front tires or using wrench in front of tractor)
4. Check for dirt and debris on mating parts and clean as required.
5. Turn castor wheels so they point straight forward.
6. Secure first lift arm assembly to traction unit as follows:

- A. Remove hair pin cotter and clevis pin securing latch cover to lift arm.
 - B. Pivot release lever upward.
 - C. Slide cutting unit lift arm onto traction unit lift arm, inserting shaft latch into slot in traction unit lift arm.
- Note:** If latch does not fall into slot in traction unit lift arm, raise or lower lift arm casting by pushing up or down from behind the front tires.
- D. Pivot release lever downward and tighten securely by rotating clockwise.

7. Install other lift arm on tractor by rotating deck towards tractor, aligning lift arm to tractor arm and repeating step 5. If latch does not fall into slot in traction unit lift arm the arms are not lined up.

- A. If lift arms on traction unit are not at the correct height for deck arms to slide on, push up or down on lift arm castings from behind the front tires until deck arm line up and slide on.
- B. If lift arms on deck do not line up side to side. Rotate castor wheels side ways so deck moves side to side easier. Move deck side to side until lift arms line up and slide on.

8. Move deck from side to side to check for tightness and re-tighten latches, if required.
9. Install latch covers to lift arms and secure with clevis pins and hair pin cotters.
10. Connect drive shaft to traction unit.
11. Close needle valve and lower seat.
12. Start tractor and raise deck to highest possible position and turn off engine.
13. Align height-of-cut chains with hole for desired height-of-cut, install clevis pin and secure with hair pin cotter.

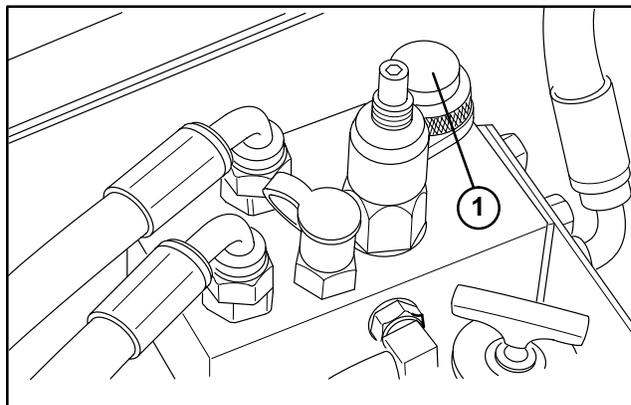


Figure 15
1. Needle Valve

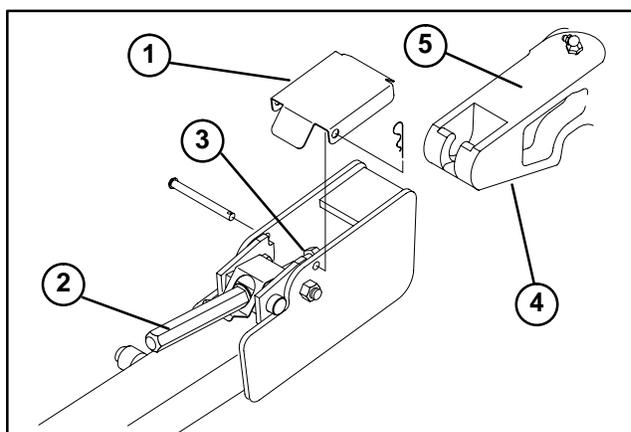


Figure 16
1. Latch Cover 4. Traction Unit Lift Arm
2. Release Lever 5. Machined Surface
3. Shaft latch

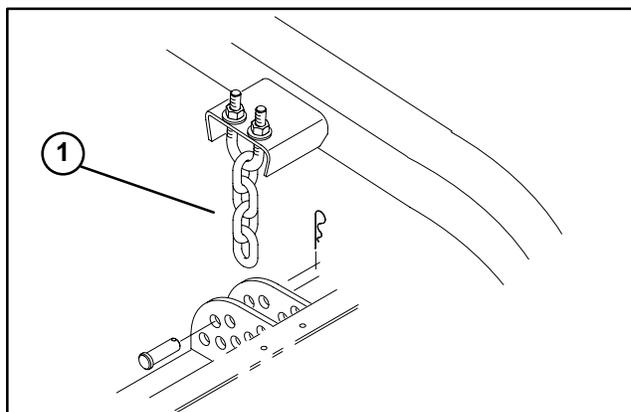


Figure 17
1. Height-of-Cut chain

Install Lift Arm Ball Joints

1. Adjust ball joint in each lift arm assembly until a dimension of 2.75 inches (70 mm) from end of lift arm to center of ball joint is attained.

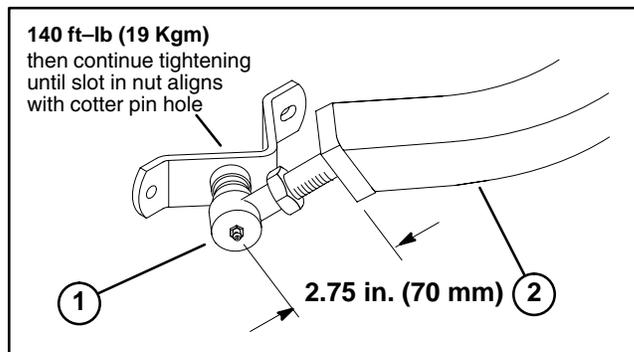


Figure 18

1. Ball Joint
2. Lift Arm

Drive Belt Replacement

The blade drive consists of three belts, one main drive belt and two wing belts. The main drive belt is tensioned by a fixed idler with a spring adjustment. The wing belts have spring loaded idlers. All belts are very durable but after many hours of use, the belt will show signs of wear. Signs of a worn belt are: squealing when belt is rotating, blades slipping when cutting grass, frayed edges, burn marks and cracks. Replace any belt if any of these conditions are evident. Adjust belt tension on main belt after first 5 hours of operation to assure maximum durability and thereafter, check tension every 50 hours.

1. Lower cutting unit to the shop floor. Remove belt covers from top of cutting unit and set covers aside.
2. Pull on spring loaded idlers and remove wing belts.
3. Loosen fixed idler pulley locking nut.
4. Loosen spring tensioning nut as required and remove belt.
5. Tighten spring tensioning nut until spring length is 4.35 inches (111 mm) inside spring loops.
6. Tighten idler pulley locking nut.
7. Pull on spring loaded idlers and install wing belts.
8. Install belt covers to top of cutting unit.

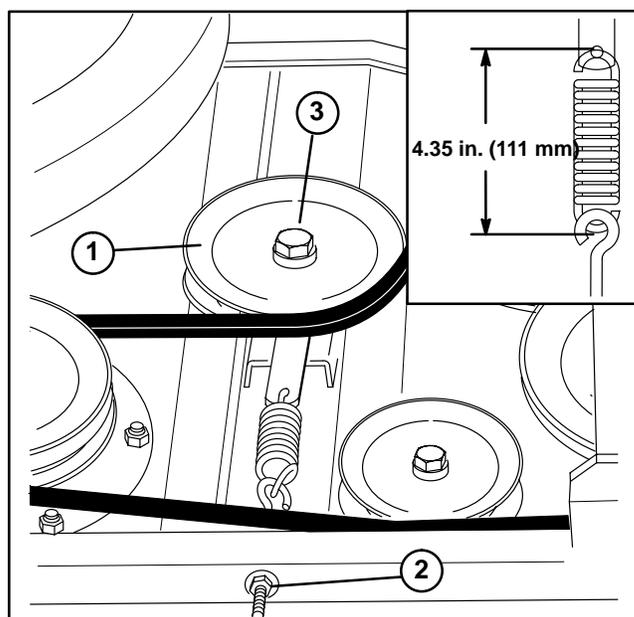


Figure 19

1. Idler Pulley
2. Spring Tensioning Nut
3. Idler Pulley Locking Nut

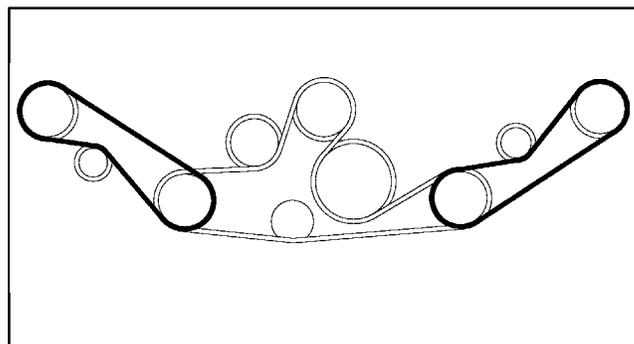


Figure 20

Front Castor Fork Bushing Service

The castor forks have bushings pressed into the top and bottom of the casting and after many hours of operation, the bushings will wear. To check the bushings, move castor fork back and forth and from side to side. If castor spindle is loose around the bushings, bushings are worn and must be replaced.

1. Start tractor and raise deck to highest possible position and turn off engine.
2. Remove front snapper pins from castor arms and slide castor wheel assembly out of castor arm tube.
3. Remove locknut from capscrew holding castor wheel assembly between castor fork. Grasp castor wheel and slide capscrew out of fork.
4. Remove retaining ring, washer and wave washer securing castor shaft to castor fork. Remove shaft from fork.
5. Insert pin punch into top or bottom of castor fork and drive bushing out of fork. Repeat for other bushing. Clean inside of forks to remove dirt.
6. Apply grease to inside and outside of new bushings. Using a hammer and flat plate, drive bushings into fork.
7. Inspect castor shaft and fork for wear and replace if damaged.
8. Push castor shaft through bushings and fork and secure with wave washer, washer and retaining ring.
9. Insert snapper pin into castor arm and through groove in castor shaft at desired height-of-cut.

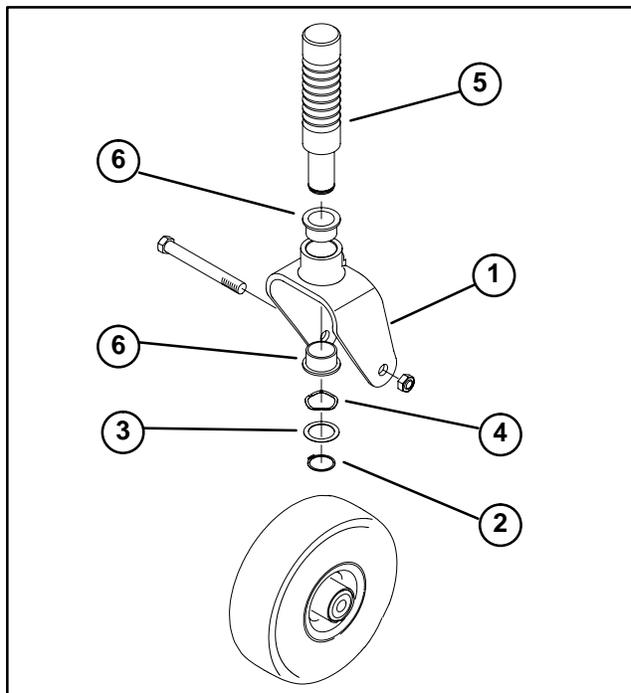


Figure 21

- | | |
|----------------------|-----------------|
| 1. Front Castor Fork | 4. Wave Washer |
| 2. Retaining Ring | 5. Castor Shaft |
| 3. Washer | 6. Bushings |

Castor Wheel and Bearing Service

The castor wheel rotates on a high-quality roller bearing. Even after many hours of use, provided that the bearing was kept well-lubricated, bearing wear will be minimal. However, failure to keep bearing lubricated will cause rapid wear. A wobbly castor wheel usually indicates a worn bearing.

1. Remove locknut from capscrew holding castor wheel assembly between castor fork. Grasp castor wheel and slide capscrew out of fork.
3. Remove bearing from wheel hub and allow spacer to fall out. Remove bearing from opposite side of wheel hub.
4. Check the bearings, spacer and inside of wheel hub for wear. Replace defective parts as required.
5. To assemble the castor wheel, push bearing into wheel hub. Slide spacer into wheel hub. Push other bearing into open end of wheel hub to captivate the spacer inside the wheel hub.
7. Install castor wheel assembly between castor forks and secure in place with capscrew and locknut.

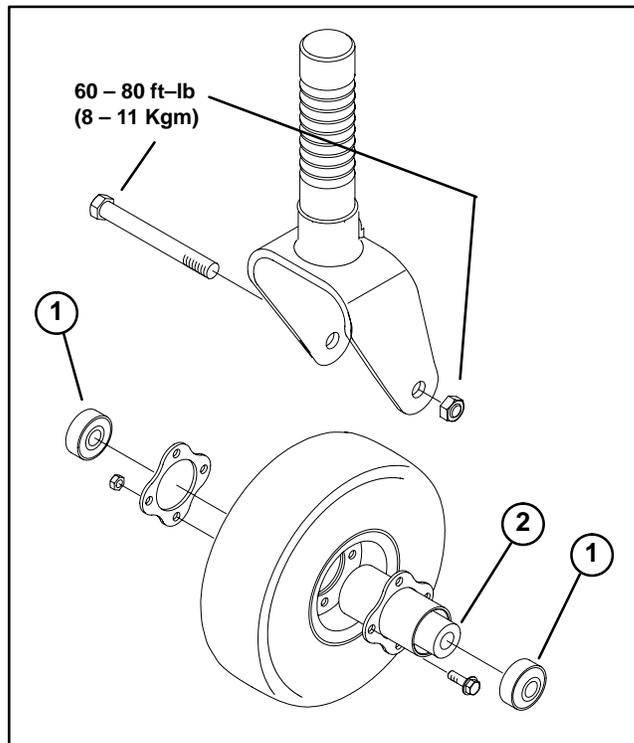


Figure 22
1. Bearing
2. Spacer

Cutter Blade Removal and Installation

The blade must be replaced if a solid object is hit, the blade is out-of-balance or if the blade is bent. Always use genuine TORO replacement blades to be sure of safety and optimum performance. Never use replacement blades made by other manufacturers because they could be dangerous.

1. Raise cutting unit to highest position, shut the engine off and engage the parking brake.
2. Remove hair pin cotters and clevis pins securing height-of-cut straps to rear of deck.
3. Rotate front of deck upward and insert latch rod into front hole (service position) in latch plate.
4. Grasp end of blade using a rag or thickly padded glove. Remove blade bolt, anti-scalp cup and blade from spindle shaft.
5. Install blade-sail facing (up) toward cutting unit-with anti-scalp cup and blade bolt. Tighten blade bolt to 85-110 ft-lb (12 - 15 Kgm).



WARNING

Do not try to straighten a blade that is bent, and never weld a broken or cracked blade. Always use a new blade to assure continued safety certification of the product.

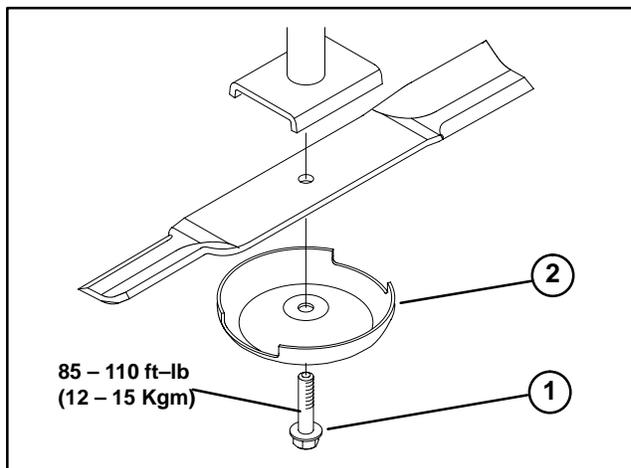


Figure 23

1. Blade bolt
2. Anti-Scalp Cup

Inspecting and Sharpening Blade

1. Raise cutting unit to highest position, shut the engine off and engage the parking brake.
2. Remove hair pin cotters and clevis pins securing height-of-cut straps to rear of deck.
3. Rotate front of deck upward and insert latch rod into front hole (service position) in latch plate.
4. Examine cutting ends of the blade carefully, especially where the flat and curved parts of the blade meet (Fig. 24-A). Since sand and abrasive material can wear away the metal that connects the flat and curved parts of the blade, check the blade before using the machine. If wear is noticed (Fig. 24-B), replace the blade: refer to Removing Cutter Blade.


DANGER

If blade is allowed to wear, a slot will form between the sail and flat part of the blade (Fig. 24-C). Eventually a piece of the blade may break off and be thrown from under the housing, possibly resulting in serious injury to yourself or bystander.

5. Inspect cutting edges of all blades. Sharpen the cutting edges if they are dull or nicked. Sharpen only the top of the cutting edge and maintain the original cutting angle for best performance (Fig. 25). The blade will remain balanced if same amount of metal is removed from both cutting edges.
6. To check blade for being straight and parallel, lay blade on a level surface and check its ends. Ends of blade must be slightly lower than the center, and cutting edge must be lower than the heel of the blade. This blade will produce good quality of cut and require minimal power from the engine. By contrast a blade that is higher at the ends than the center, or if cutting edge is higher than the heel, the blade is bent or warped and must be replaced.
7. Install blade—sail facing (up) toward cutting unit—with anti-scalp cup and blade bolt. Tighten blade bolt to 85–110 ft-lb (12 – 15 Kgm).

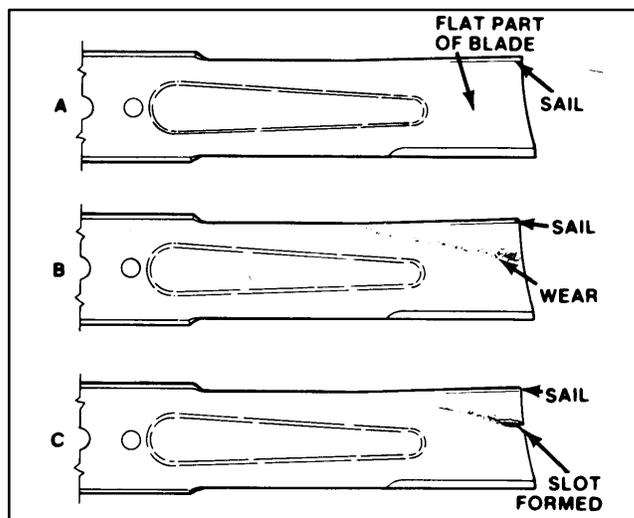


Figure 24

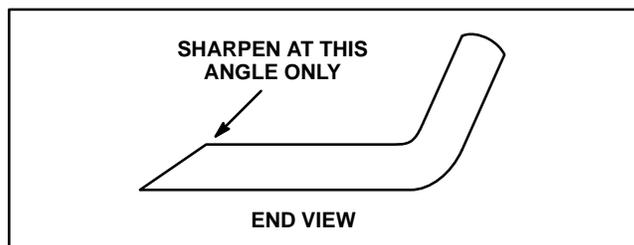


Figure 25

Blade Spindle Service

Removing Spindle Housing Assembly

1. Lower the cutting unit, shut the engine off and engage the parking brake.
2. Remove deck covers from top of cutting unit. Release belt tension. Remove belt from spindle to be serviced.
3. Start the engine and raise the cutting unit. Turn the engine OFF and remove the key from the key switch. Block up the cutting unit so it cannot fall accidentally.
4. Remove blade screw, flat washer, anti-scalp cup and blade from spindle assembly.
5. Remove flange nuts and carriage bolts securing spindle housing to deck. Slide spindle housing assembly out the bottom of the cutting unit.

Disassembly

1. Remove lock nut retaining the spindle pulley on spindle shaft. Slide pulley off of shaft.
2. Press the spindle shaft out of the spindle housing using an arbor press. The bearing spacer remains on the spindle shaft as the shaft is being removed.
3. Remove seals from spindle housing.
4. Allow the bearings and small thick spacer to fall out of the spindle housing.
5. Using a punch and hammer, drive both of the bearing cups out of the spindle housing. Also drive the large spacer out of the housing.
6. A large snap ring is still inside the spindle housing and it should remain there because it cannot be easily removed.

IMPORTANT: If new bearings will be installed into a used spindle housing that has the original snap ring installed, discard the large snap ring that came with the bearings because it is not needed. However, new bearings with their matched spacer and snap ring must always be installed when the spindle housing is being replaced. Replacement bearings are sold only with a matched snap ring and spacer set. These parts cannot be purchased separately.

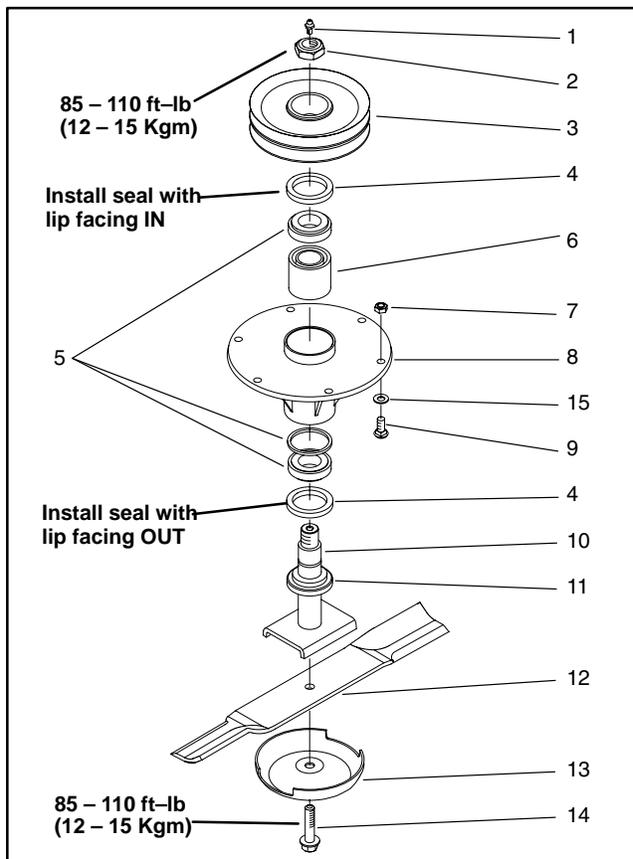


Figure 26

- | | |
|----------------------------|--------------------------|
| 1. Grease fitting | 9. Screw |
| 2. Lock nut | 10. Spindle shaft |
| 3. Pulley | 11. Spindle shaft spacer |
| 4. Oil seal | 12. Blade |
| 5. Spacer and bearing assy | 13. Anti-scalp cup |
| 6. Spacers – matched set | 14. Blade screw |
| 7. Lock nut | 15. Flat washer |
| 8. Spindle housing | |

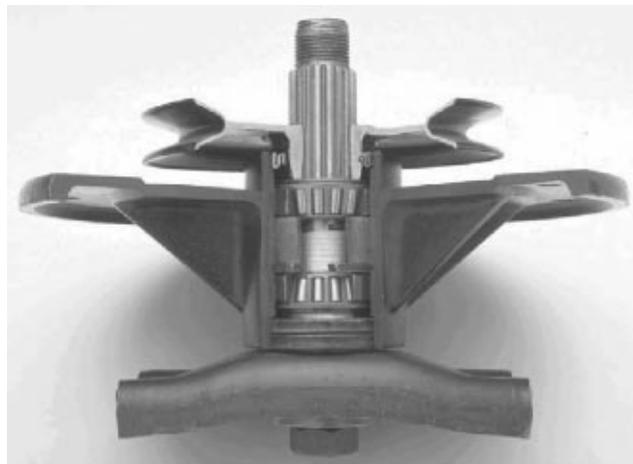


Figure 27

Installing Spindle, Bearings and Seals Into Spindle Housing

IMPORTANT: If a new spindle housing is being used, new bearings and matched snap ring set must be installed; see step 1 below. Never use old bearings, spacer, and snap ring with a new spindle housing. If installing bearings into a used spindle housing that still has a snap ring installed, use only new bearings with cups and spacer – not the large snap ring because it is not required; see step 2 below.

1. Install large snap ring into groove in bore of spindle housing. Make sure snap ring is seated in groove.

2. Using an arbor press, push large spacer into top of spindle housing; tightly against snap ring. The spacer must contact the snap ring to be sure of the correct assembly of the parts.

3. Thoroughly oil the bearing cups. Use an arbor press to push the bearing cups into the top and bottom of the spindle housing. The top bearing cup must contact the spacer that was installed in step 2, and the bottom bearing cup must contact the snap ring. Make that the assembly is correct by supporting the first cup and pressing the second against it.

4. Apply a film of grease on lips of both seals. Pack the bearing cones with grease.

5. Install bearing and seal into bottom of spindle housing. **BOTTOM SEAL MUST HAVE THE LIP FACING OUT.**

6. Check the spindle shaft to make sure it is free of burrs and nicks that could possibly cut the seals. Thoroughly lubricate both the shaft and seal lips.

7. Slide small, thick spacer into spindle housing, then install bearing and seal into top of spindle housing. **LIP OF UPPER SEAL MUST FACE IN.**

8. Slide bearing spacer onto spindle shaft. Carefully slide spindle shaft through spindle housing. The bottom seal and bearing spacer fit together when the spindle is installed.

9. Attach a hand pump grease gun to grease fitting and fill cavity with grease until grease starts to come out of lower seal. **NOTE: Pneumatic grease guns can produce air pockets when filling large cavities.**

10. Push pulley onto splines of spindle shaft and retain the parts together with the large flat washer and nut. Tighten the nut to 85 – 110 ft–lb (12 – 15 Kgm). Rotate

the spindle shaft to be sure that the shaft rotates freely.

11. Slide pulley end of spindle assembly through hole in cutting unit. Mount the spindle assembly in place with the carriage bolts and flange nuts.

12. Install the belt and adjust belt tension.

13. Reinstall the belt covers.

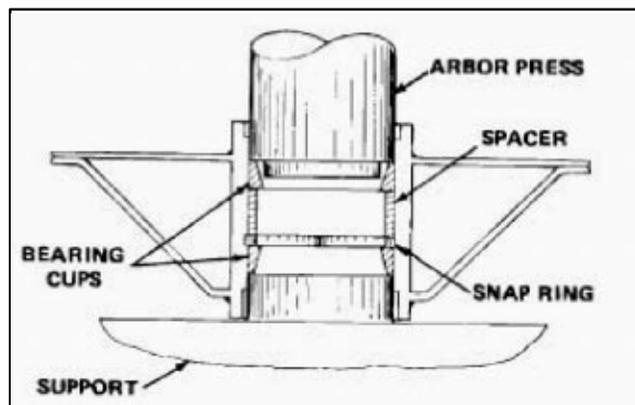


Figure 28

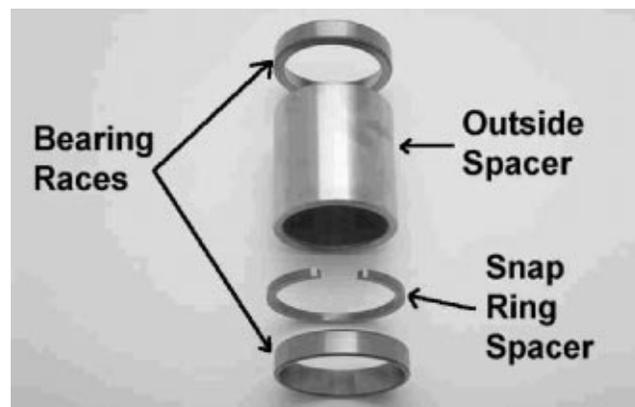


Figure 29

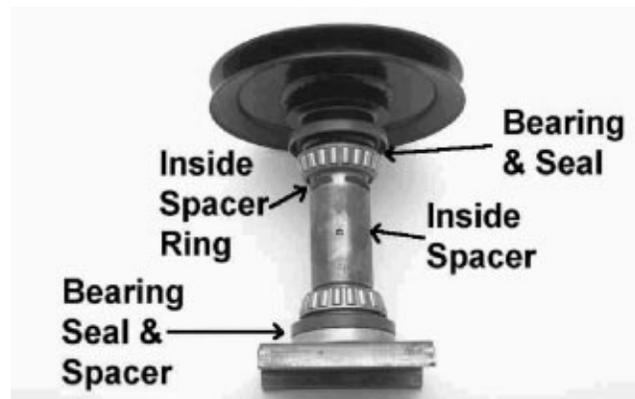


Figure 30

Correcting Cutting Unit Mismatch

If there is mismatch between the blades, the grass will appear streaked when it is cut. This problem can be corrected by making sure the blades are straight and all blades are cutting on the same plane.

1. Position machine on a level surface on the shop floor.
2. Release belt tension on belts.
3. Raise deck to transport position and lock transport latch.
4. Position the tip of an outer blade and adjacent blade tip as close together as possible at the intersection of the two cutting chambers. Note the height of the outer blade tip with respect to the adjacent blade tip.
5. Rotate outer blade 180° and note the height of the outer blade tip with respect to the adjacent blade tip. If the relative height changed by more than 1/8 inch (3 mm) after rotating blade, then outer blade is bent and should be replaced.
6. Repeat steps 4 and 5 until all pairs of adjacent blades have been checked at both blade tips. Note the relative difference in blade height at each blade intersection after replacing any bent blades. This height difference should be less than 1/8 inch (3 mm) for all adjacent blades.

7. Raise the height-of-cut to the highest position and lower deck to the floor.

8. Rotate an outer blade until the tip is positioned nearest to the skid on the side of the deck housing. Measure the distance from the bottom of the blade to the floor. Repeat the measurement on the opposite side of the deck. If the two distances differ by more than 1/4 inch (6 mm) proceed to step 9 and add shims as instructed.

9. Remove capscrews, flatwashers, lockwashers and nuts from outer spindle in the area where shims must be added. To raise or lower the blade, add a shim, Part No. 3256-24, between spindle housing and bottom of cutting unit. Continue to check alignment of blades and add shims until tips of blades are within the required dimension.

IMPORTANT: Do not use more than three shims at any one hole location. Use decreasing numbers of shims in adjacent holes if more than one shim is added to any one hole location.

10. Re-tension belts. Re-install belt covers.

Gearbox

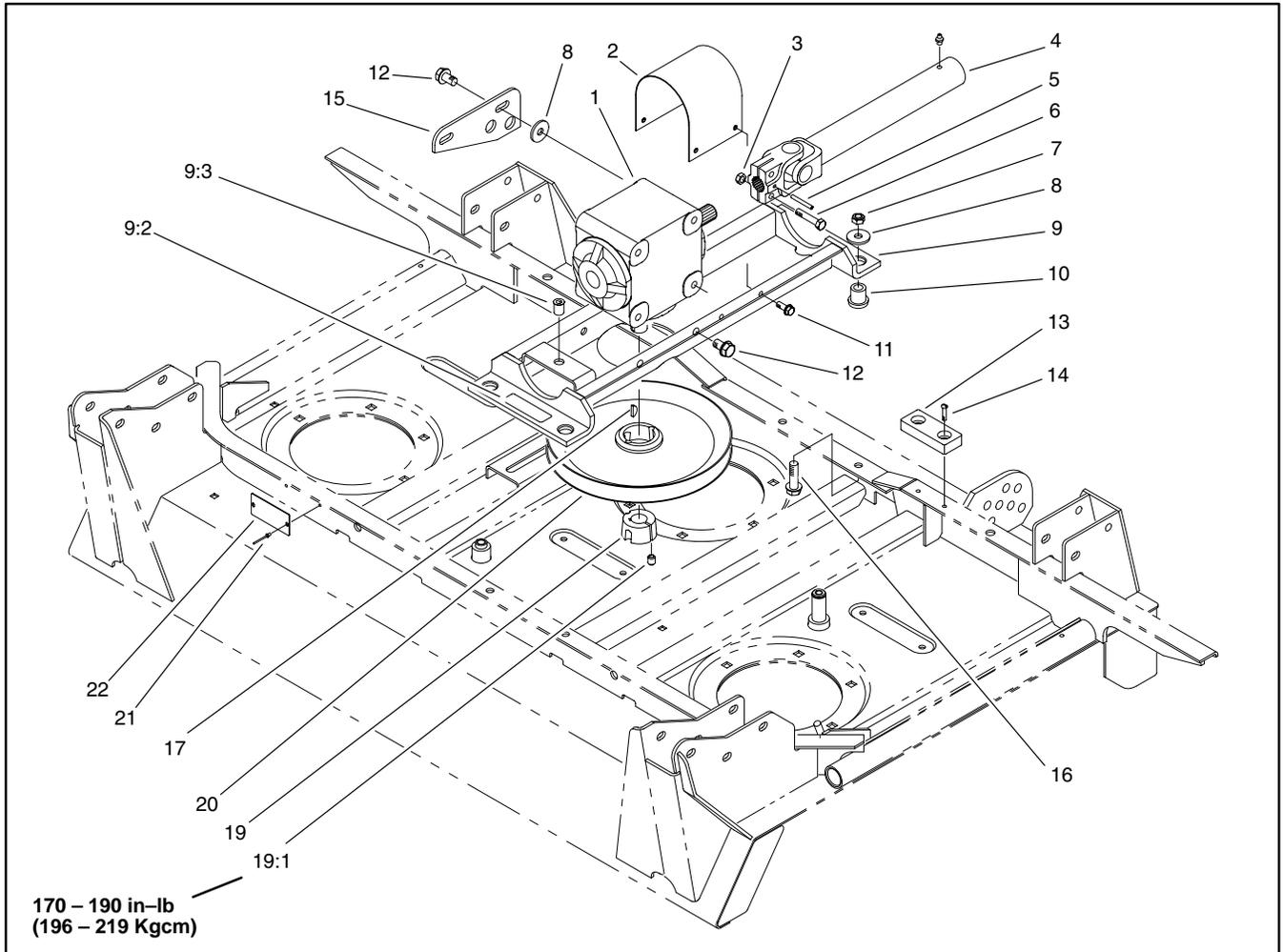


Figure 31

- | | | |
|----------------|----------------------|------------------------|
| 1. Gearbox | 9. Gearbox mount | 15. Latch plate |
| 2. Shroud | 9:2. Lube decal | 16. Screw |
| 3. Lock nut | 9:3. Threaded insert | 17. Woodruff key |
| 4. Drive shaft | 10. Rubber mount | 19. Taper lock bushing |
| 5. Roll pin | 11. Screw | 19:1. Set screw |
| 6. Screw | 12. Screw | 20. Gearbox pulley |
| 7. Lock nut | 13. Rubber bumper | 21. Pop rivet |
| 8. Flat washer | 14. Rivet | 22. Serial plate |

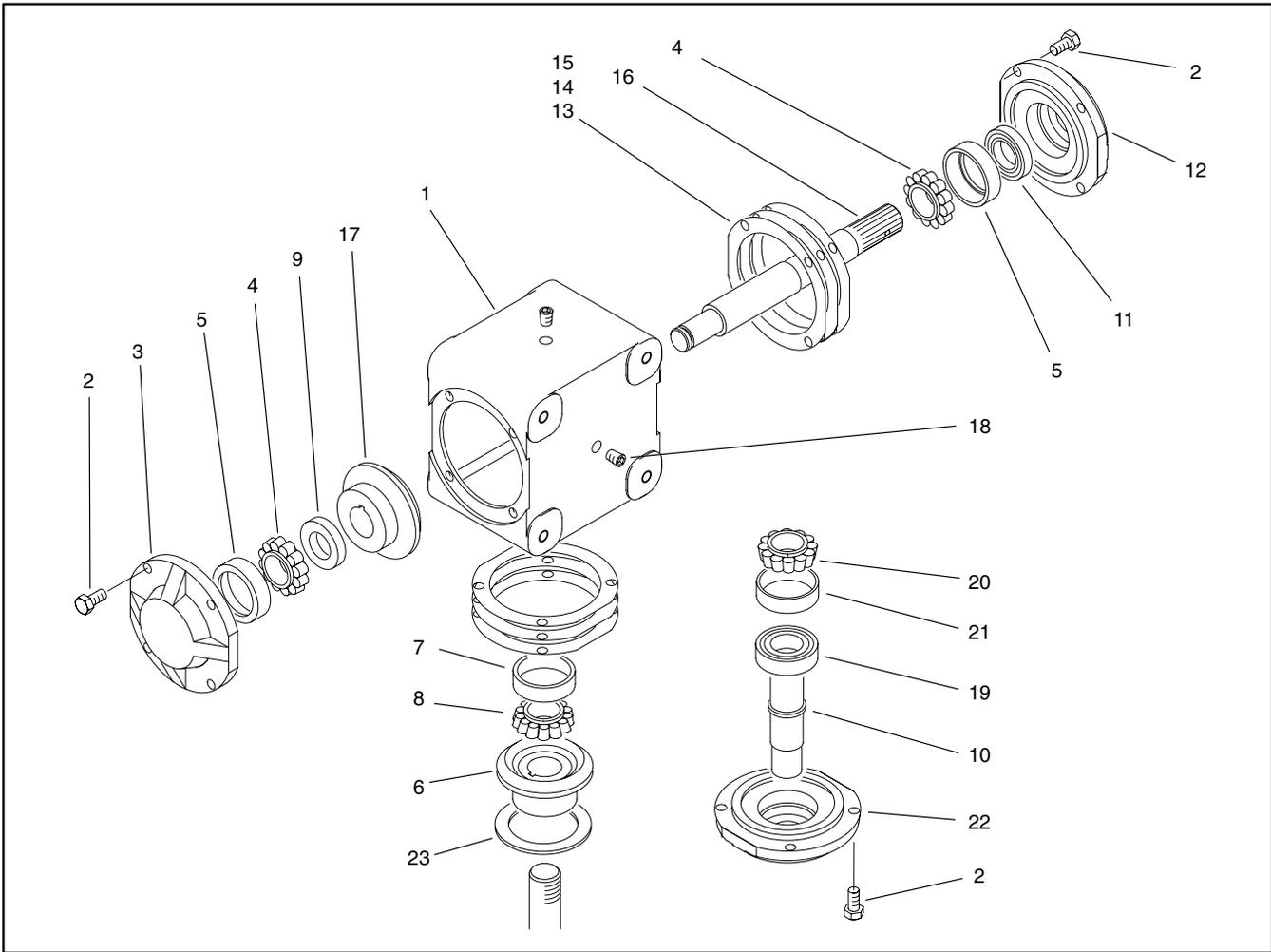


Figure 32

- | | | |
|-----------------|-------------------|------------------|
| 1. Housing | 9. Spacer | 17. L.H. gear |
| 2. Capscrew | 10. Lower shaft | 18. Plug |
| 3. Cap | 11. Upper seal | 19. Lower seal |
| 4. Bearing cone | 12. Cap | 20. Bearing cone |
| 5. Bearing cup | 13. Gasket (.015) | 21. Bearing cup |
| 6. R.H. gear | 14. Gasket (.005) | 22. Cap |
| 7. Bearing cup | 15. Gasket (.003) | 23. Washer |
| 8. Bearing cone | 16. Upper shaft | |

Shaft End Play Adjustment

The lower shaft (Fig. 28, Item 10) and upper shaft (16) should have a very small amount of bearing drag. If the shaft turns hard, the cap (12) or (22) must be removed and gaskets (13, 14, or 15) need to be added. If the shaft has no bearing drag, or has end play, the cap must be removed and gaskets taken out. The cap must be adjusted so the shaft has no end play and only a slight amount of bearing drag.

Drive Shaft

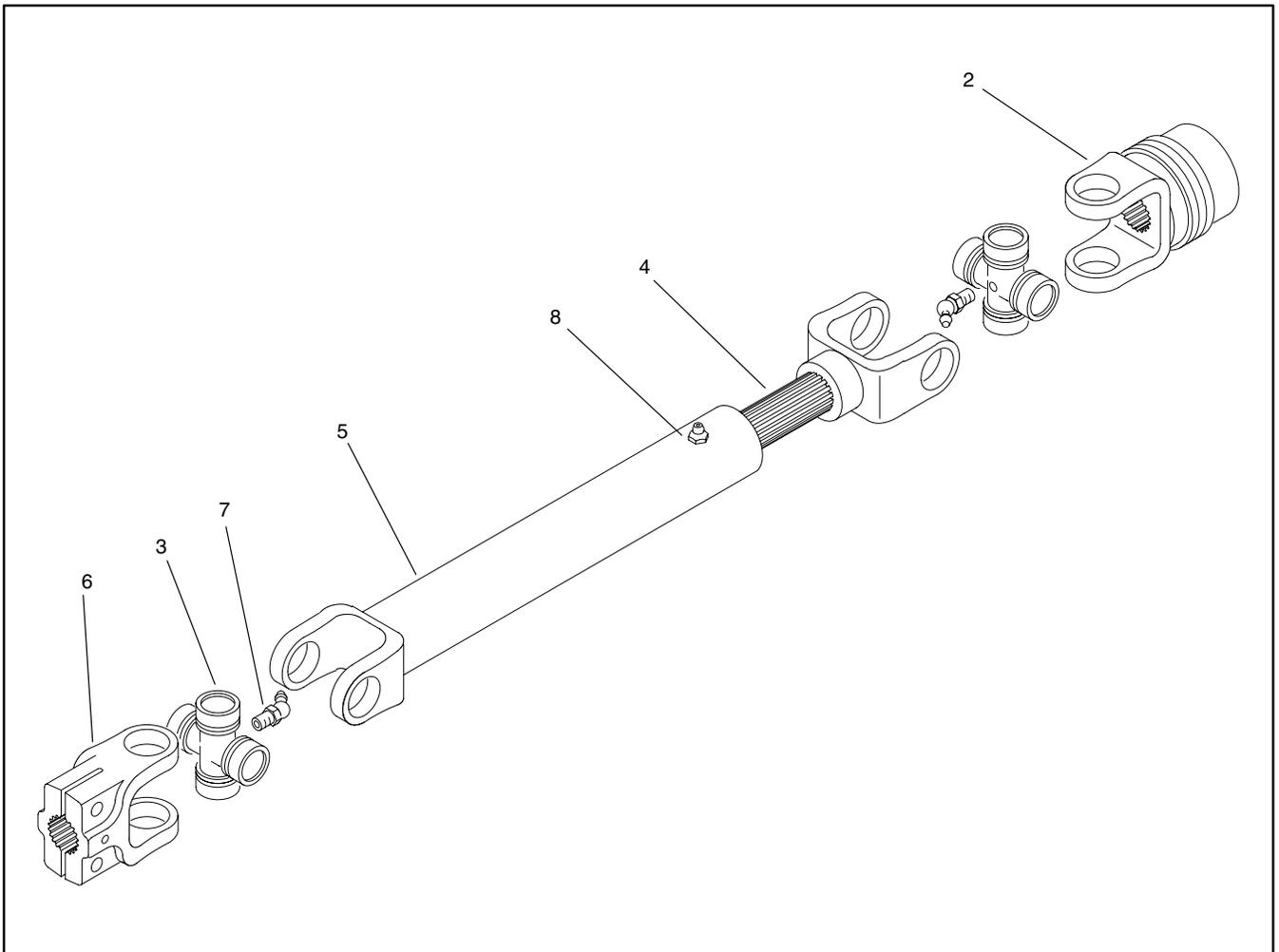


Figure 33

- 2. Yoke
- 3. U-joint kit
- 4. Slip yoke shaft

- 5. Slip yoke tube
- 6. Yoke

- 7. Grease fitting
- 8. Grease fitting



Contour 82" Cutting Unit

Contour 82
Cutting Unit

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Figure 1

Specifications

Deck Configuration: Out front deck with a right hand trim offset. Four individual chambers jointed for articulation. One blade per chamber.

Cutting Width: 82 inches (2.1 m).

Chamber Housing: 12 GA. steel, 4.5 inch (114 mm) deep, welded construction and reinforced with 10 GA high strength formed plates.

Height-of-Cut (HOC): 1 inch (25 mm) to 4 inch (102 mm) by 1/4 inch (6 mm) increments.

Blade Size: Four 22 inch (559 mm) long by 2.50 inch (64 mm) wide by .25 inch (6 mm) thick heat treated steel with formed parallel sails.

Blade Overlap: 2 inch (51 mm) in the flat configuration.

Blade Drive: Hydraulic drive via a PTO driven high efficiency gear pump on the traction unit integrated hydrostatic transaxle (IHT). Four integrated spindle motors operated in a series configuration through SAE-10 (.625) high pressure wear resistant hoses with high density polyethylene protective tubing. Spindle motor is a high efficiency pressure balanced gear motor with a direct drive to the spindle shaft operating in a constant wet lubrication on two Teflon coated journal bearings. Welded blade retainers mounted through a tapered joint with a 2 inch (51 mm) high outer shield to protect spindle seals. Hydraulic braking valve set to 600 PSI (41 Bar) to achieve a complete blade stopping time of 5 seconds from full engine (PTO) speed.

Blade Speed: 15,724 feet (4,793 m) per minute tip speed (2730 rpm spindle speed) at 2795 rpm on diesel models and 3275 on gas models.

Suspension & Castor Wheels: Five front castors and three rear castors, consisting of 8 inch (203 mm) pneumatic wheels with sealed ball bearings. One rear link suspended from the right lift arm. Hydraulic counter balance and lift system designed integral with deck for maximum floatation.

Anti-Scalp Features: 11 inch (279 mm) diameter anti scalp cups located .75 inch (19 mm) below each blade. Adjacent chambers pivot freely about two independent 60° opposed hinges down -20° and up +20°. 1 inch (25 mm) diameter anti-scalp/wear skids located on each outside chamber.

Discharge: Evenly dispersed rear discharge between the outside width of the deck with partial recycling rear baffles.

Lift/Transport: Stainless steel cables from outside chambers to nearest lift arm actuated via a lever on the lift arms. Complete deck is lifted via the traction unit lift system.

Counter-Balance: Recommended operating counter balance pressure of 125 PSI (9 Bar) set by an adjustable counter balance valve on the traction unit.

Overhang/Trim: Deck is offset to the right of the traction unit to provide overhang of 21 inch (533 mm) on the right and 8.25 inch (210 mm) on the left with deck in a flat configuration. Uncut circle is 16 inch (406 mm) on right with no brakes.

Covers: No complete deck covers required. Hydraulic hoses to be covered per ANSI/ISO standards.

Connect/Disconnect: Use existing GM 3000 style of quick attach lift arm system. For ease of cleaning and maintaining oil cleanliness, the hydraulic lines use flush face quick couplers for pressure supply line, return line, braking sense line, and motor case drain line.

Sound Levels: Operator ear to be \leq 90 dBA per SAE measuring standards.

Safety: Deck and traction unit to comply with ANSI B71.4-1990 and CE compliance.

Productivity: Mows up to 4.6 acre (1.86 hectare) per hour at 5.5 mph (9 km/hr)

Approach Angle: Minimum approach angle (for trailer-ing) of 11.5 at highest HOC setting.

Weight: 745 lbs (338 Kg).

Specifications and design subject to change without notice.

Adjustments

Height of Cut Adjustment

The height-of-cut is adjustable from 1 to 4 inches (25 to 102 mm) in 1/4 inch (6 mm) increments.

1. Start the engine and raise the cutting unit so height-of-cut can be changed. Stop engine after cutting unit is raised.

Front Castor Wheels

1. Remove H.O.C. cap from spindle shaft and slide spindle out of front castor arm. Slide spacers onto spindle shaft to get desired height-of-cut.
2. Push castor spindle through front castor arm install remaining spacers onto spindle and install HOC cap to secure assembly.

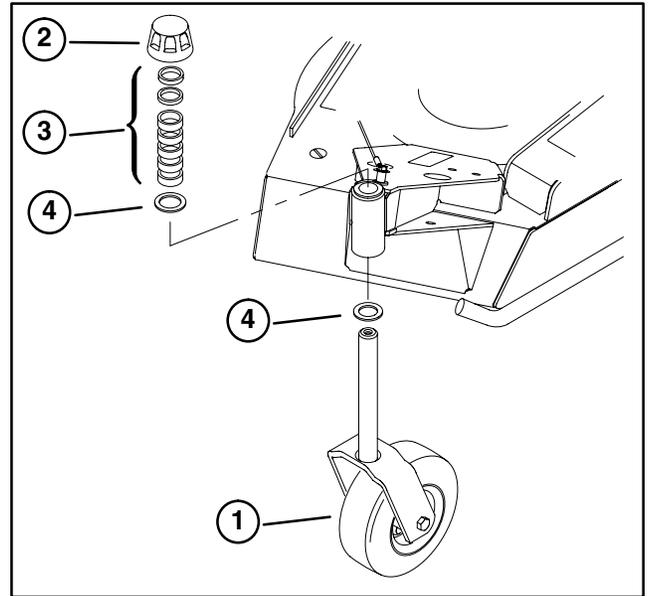


Figure 2

1. Front castor wheel
2. H.O.C. Cap
3. Spacer
4. Washer

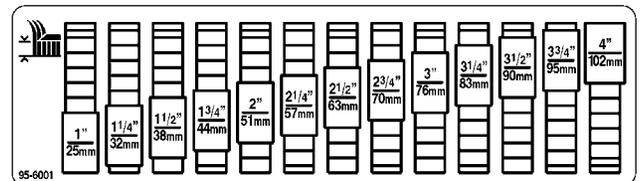


Figure 3

Rear Castor Wheels

1. Remove hairpin cotter and cotter pin securing rear castor pivot arm to deck bracket.
2. Align the pivot arm holes with selected height-of-cut bracket holes in the deck frame, install cotter pin and secure with hairpin cotter.

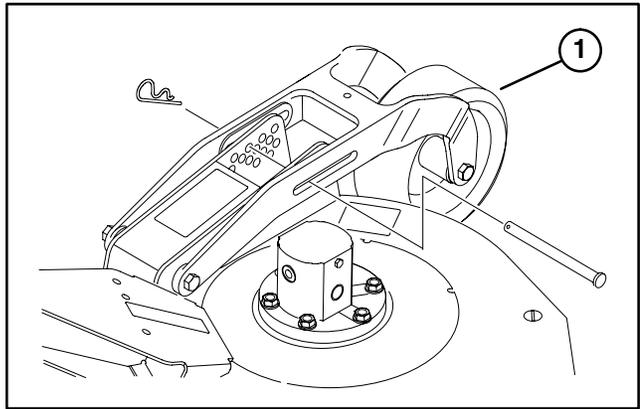


Figure 4

1. Rear Castor Pivot

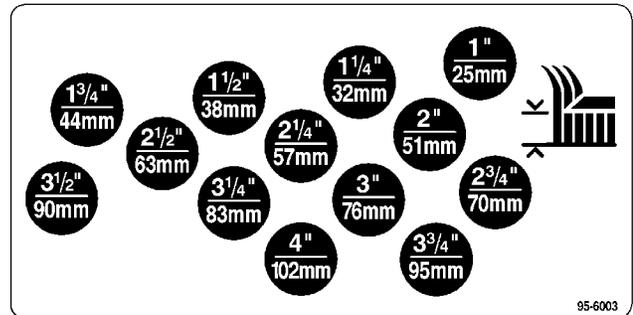


Figure 5

Rear Deck Chain

1. Remove hair pin cotter and clevis pin securing height-of-cut chain to chamber bracket.
2. Mount height-of-cut chain to desired height-of-cut hole with clevis pin and hair pin cotter.
3. Verify deck pitch on No. 3 chamber. Refer to Adjusting Deck Pitch.

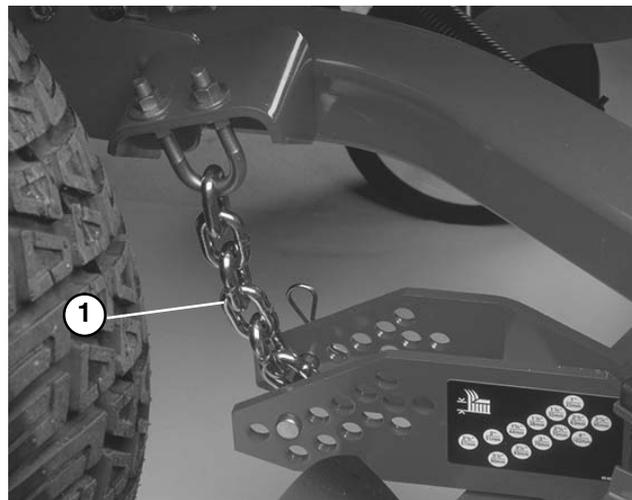


Figure 6
1. Height-of-Cut chain

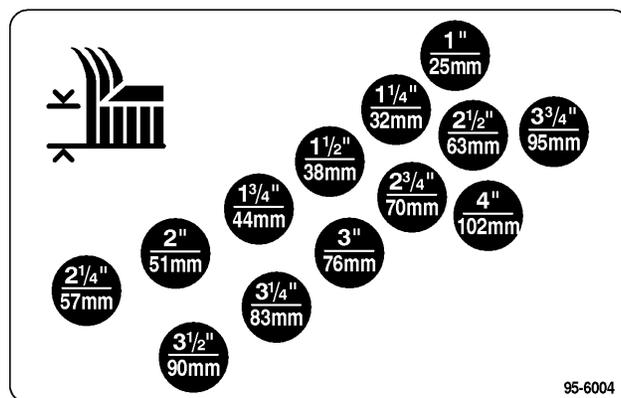


Figure 7

Deck Pitch Adjustment

Deck pitch is the difference in height-of-cut from the front of the blade plane to the back of the blade plane. For the Contour 82, TORO recommends a blade pitch of 7/16 inch (11 mm). That is the back of the blade plane is 7/16 inch (11 mm) higher than the front.

1. Position machine on a level surface on shop floor.
2. Set deck to the desired height-of-cut.
3. Rotate No. 3 chamber blade so it points straight forward.
4. Using a short ruler, measure from floor to front tip of blade. Then, measure from floor to rear tip of blade.
5. Subtract the front dimension from rear dimension to calculate your pitch.
6. To adjust pitch, start traction unit and raise deck to highest possible position and turn off engine.
7. Loosen jam nuts on top or bottom of Height-of-Cut chain U-bolt.
8. Adjust other set of nuts to raise or lower rear of No. 3 chamber and attain correct deck pitch.
9. Tighten jam nuts.
10. Lower deck.

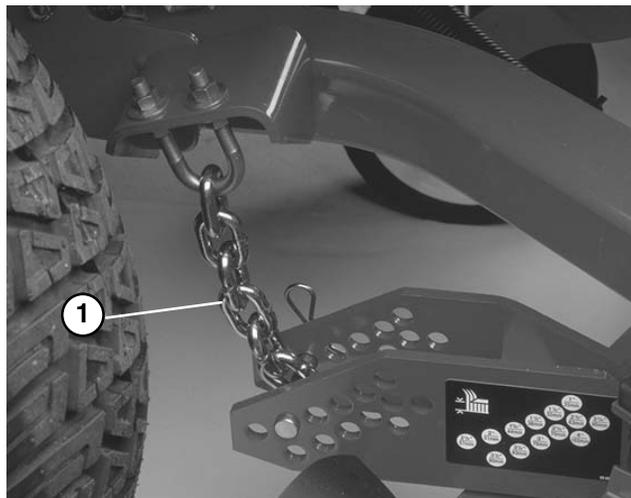


Figure 8
1. Height-of-Cut chain

Service and Repairs



CAUTION

To prevent accidental starting of the engine, while performing maintenance, shut engine off and remove key from ignition switch.

Grease Bearings and Bushings

The cutting unit must be lubricated regularly. If machine is operated under normal conditions, lubricate castor bearings and bushings with No. 2 general purpose lithium base grease or molybdenum base grease, after every 50 hours of operation. Lubricate fittings immediately after every washing, regardless of the interval listed.

1. The cutting unit has (19) bearings and bushings that must be lubricated, and these lubrication points are: front castor shaft bushings (5), chamber pivots (12) and right and left push arm ball joints (2).

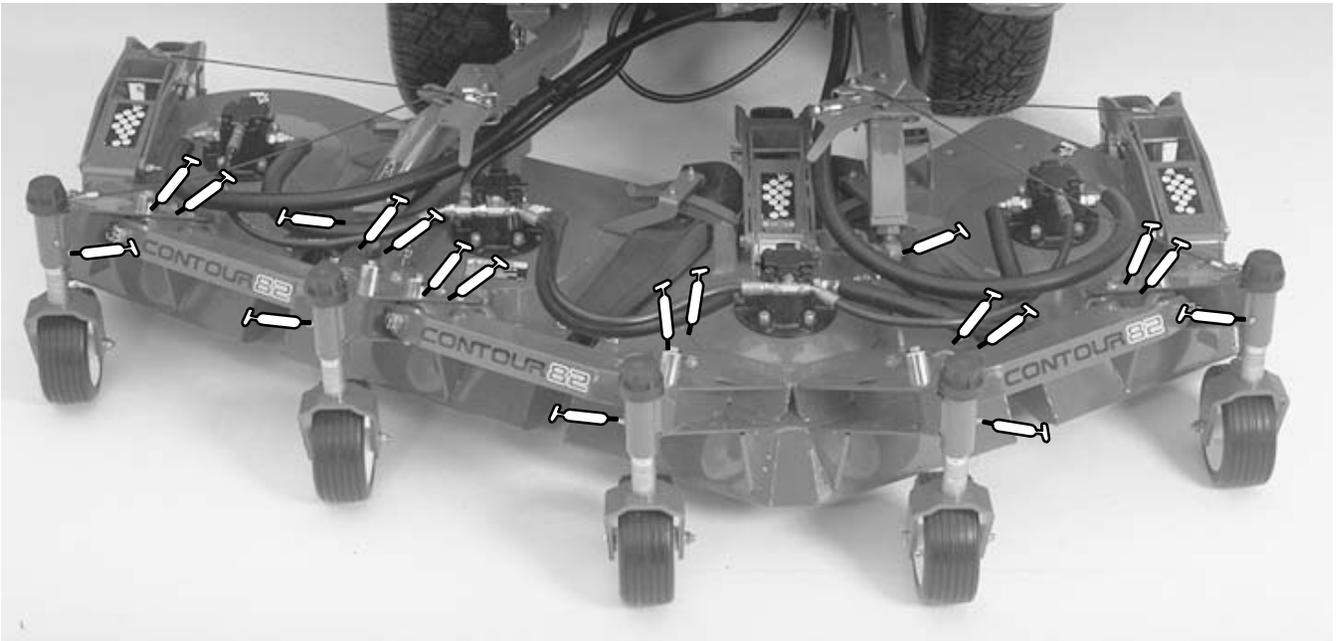


Figure 9

Disconnect Cutting Unit from Traction Unit

Note: Implements are heavy and may require two people to handle.

1. Start traction unit and raise deck to highest possible position and turn off engine.
2. Remove hair pin cotter and clevis pin securing height-of-cut chain to rear height-of-cut brackets on chamber 3.
3. Rotate ignition key to run position and move lift lever forward to lower cutting unit.
4. Raise seat and open needle valve. This allows lift arms to float freely.
5. Remove hair pin cotter and clevis pin securing latch cover to lift arm .
6. Loosen release lever by rotating it counterclockwise.
7. Pivot release lever upward and remove shaft latch from slot in traction unit lift arm.
8. Disconnect hydraulic line quick couplers from traction unit.
9. Stay clear of lift arms and move deck away from traction unit allowing lift arms to fall.
10. Secure hair pin cotter and clevis pin to height-of-cut chain for storage.
11. Close needle valve

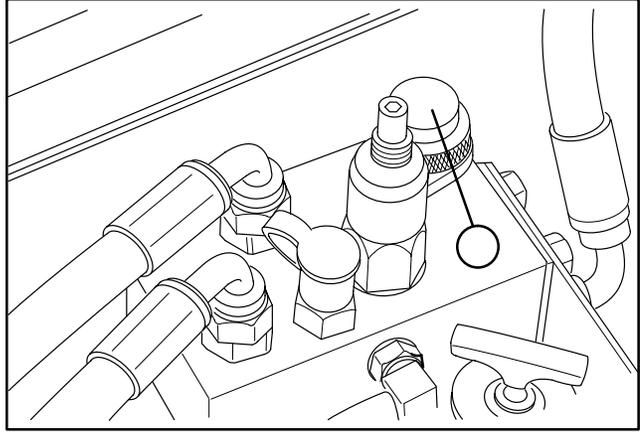


Figure 11
1. Needle Valve

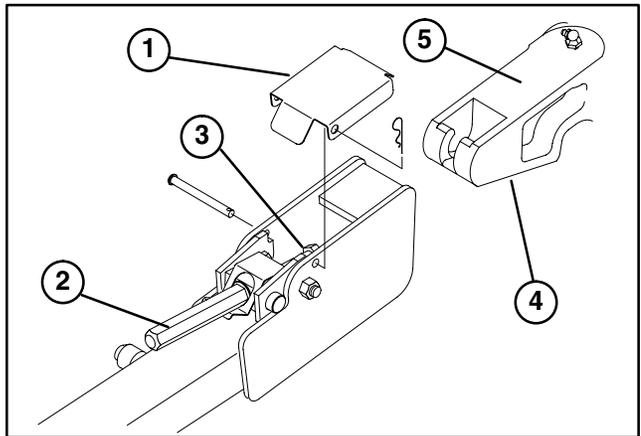


Figure 12
1. Latch Cover 4. Traction Unit Lift Arm
2. Release Lever 5. Machined Surface
3. Shaft latch

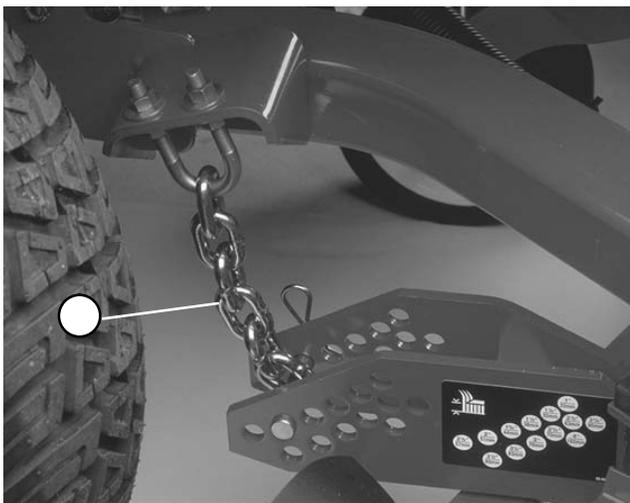


Figure 10
1. Height-of-Cut chain

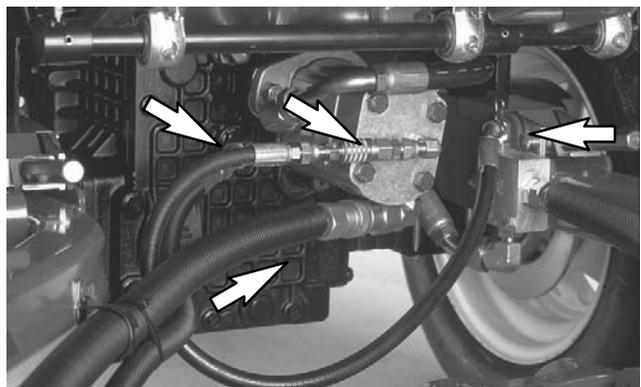


Figure 13

Connect Cutting Unit to Traction Unit

1. Center traction unit in front of cutting unit on any flat hard surface.
2. Raise seat and open needle valve. This allows lift arms to float freely.
3. Adjust lift arms heights making sure that the machined surface on top of each traction unit lift arm is parallel to ground (Fig. 12). (Raise or lower lift arm casting by pushing up or down from behind the front tires or using wrench in front of traction unit)
4. Check for dirt and debris on mating parts and clean as required.
5. Turn castor wheels so they point straight forward.
6. Secure first lift arm assembly to traction unit as follows:

- A. Remove hair pin cotter and clevis pin securing latch cover to lift arm.
 - B. Pivot release lever upward.
 - C. Slide cutting unit lift arm onto traction unit lift arm, inserting shaft latch into slot in traction unit lift arm.
- Note:** If latch does not fall into slot in traction unit lift arm, raise or lower lift arm casting by pushing up or down from behind the front tires.
- D. Pivot release lever downward and tighten securely by rotating clockwise.

7. Install other lift arm on traction unit by rotating deck towards traction unit, aligning lift arm to traction unit arm and repeating step 5. If latch does not fall into slot in traction unit lift arm the arms are not lined up.

- A. If lift arms on traction unit are not at the correct height for deck arms to slide on, push up or down on lift arm castings from behind the front tires until deck arm line up and slide on.

- B. If lift arms on deck do not line up side to side. Rotate castor wheels side ways so deck moves side to side easier. Move deck side to side until lift arms line up and slide on.

8. Move deck from side to side to check for tightness and re-tighten latches, if required.

9. Install latch covers to lift arms and secure with clevis pins and hair pin cotters.

10. Clean hydraulic coupler with a clean rag and connect hydraulic lines to traction unit.

11. Close needle valve and lower seat.

12. Start traction unit and raise deck to highest possible position and turn off engine.

13. Align height-of-cut chain on chamber 3 with hole for desired height-of-cut, install clevis pin and secure with hair pin cotter.

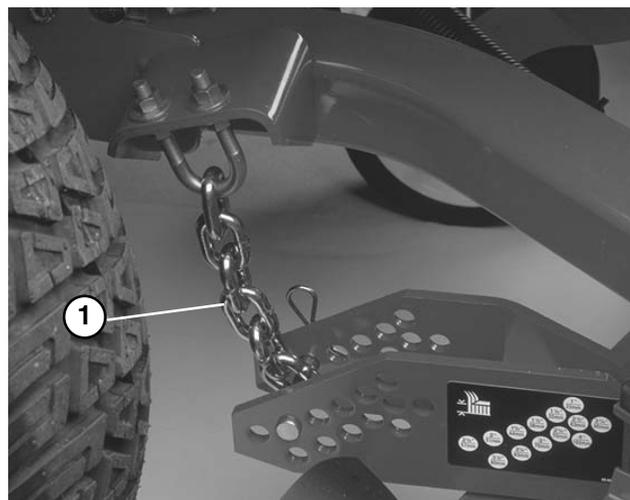


Figure 14
1. Height-of-Cut chain

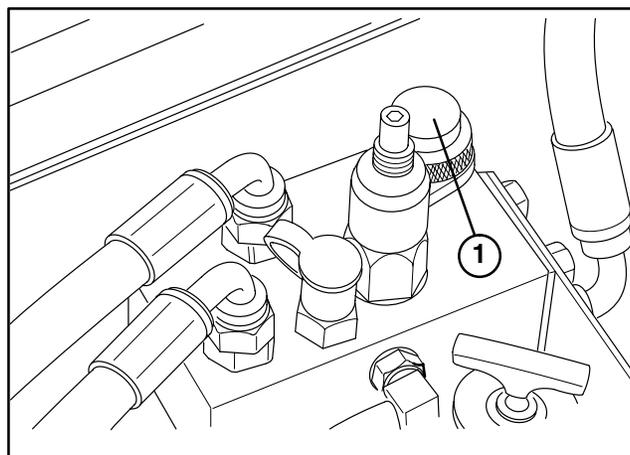


Figure 15
1. Needle Valve

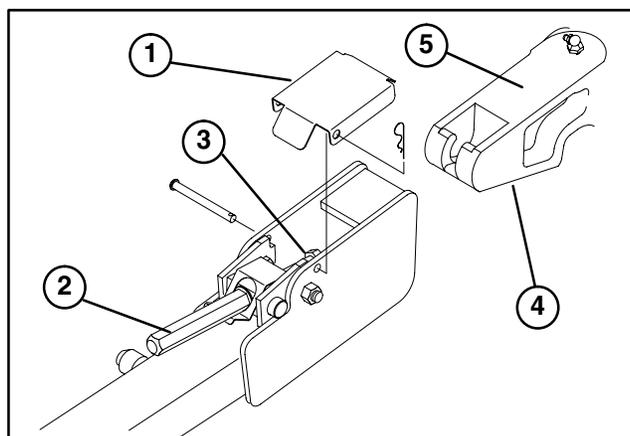


Figure 16
1. Latch Cover 4. Traction Unit Lift Arm
2. Release Lever 5. Machined Surface
3. Shaft latch

Front Castor Fork Bushing Service

The castor forks have bushings pressed into the top and bottom of the chamber and after many hours of operation, the bushings will wear. To check the bushings, move castor fork back and forth and from side to side. If castor spindle is loose around the bushings, bushings are worn and must be replaced.

1. Lock transport levers, raise cutting unit to highest position, shut the engine off and engage the parking brake.
2. Remove front height-of-cut caps from castor forks and slide castor wheel assembly out of castor arm tube.
3. Insert pin punch into top or bottom of chamber and drive bushing out. Repeat for other bushing. Clean inside of bushing hubs to remove dirt.
4. Apply grease to inside and outside of new bushings. Using a hammer and flat plate, drive bushings into chamber housing.
5. Inspect castor shaft and fork for wear and replace if damaged.
6. Push castor shaft through bushings and secure with height-of-cut caps

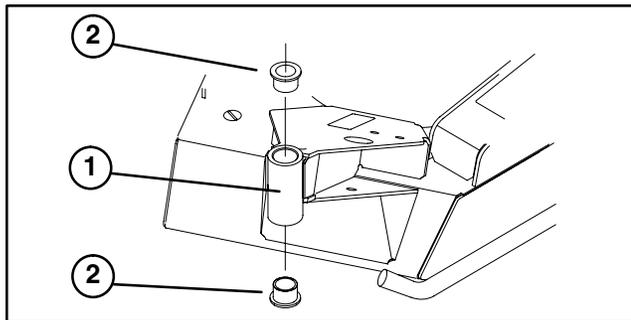


Figure 17

1. Castor arm tube
2. Bushing

Castor Wheel and Bearing Service

1. Lock transport levers, raise cutting unit to highest position, shut the engine off and engage the parking brake.

2. Remove locknut from capscrew holding castor wheel assembly between front castor fork (Fig. 18) or rear castor pivot arm (Fig. 19) Grasp castor wheel and slide capscrew out of fork or pivot arm.

2. Remove bearing from wheel hub and allow bearing spacer to fall out. Remove bearing from opposite side of wheel hub.

3. Check the bearings, spacer and inside of wheel hub for wear. Replace defective parts.

4. To assemble the castor wheel, push bearing into wheel hub. Slide bearing spacer into wheel hub. Push other bearing into open end of wheel hub to captivate the bearing spacer inside the wheel hub.

5. Install castor wheel assembly between castor fork and secure in place with capscrew and locknut. Torque to 60 – 80 ft-lb (8 – 11 Kgm).

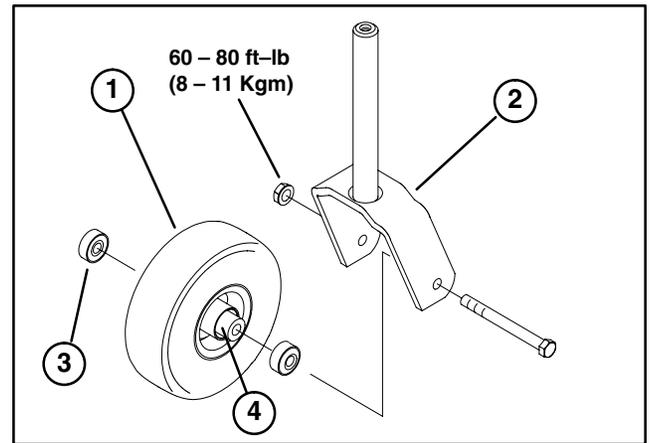


Figure 18

- | | |
|----------------------|-------------------|
| 1. Castor wheel | 3. Bearing (2) |
| 2. Front Caster Fork | 4. Bearing spacer |

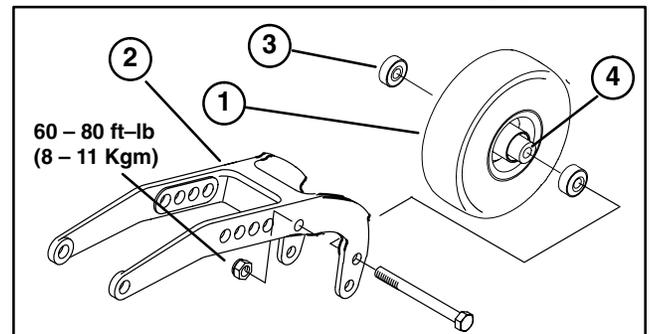


Figure 19

- | | |
|--------------------------|-------------------|
| 1. Castor wheel | 3. Bearing (2) |
| 2. Rear Caster Pivot Arm | 4. Bearing Spacer |

Cutting Blade Removal and Installation

The blade must be replaced if a solid object is hit, the blade is out-of-balance or if the blade is bent. Always use genuine TORO replacement blades to be sure of safety and optimum performance. Never use replacement blades made by other manufacturers because they could be dangerous.

1. Lock transport levers, raise cutting unit to highest position, shut the engine off and engage the parking brake.
2. Grasp end of blade using a rag or thickly padded glove. Remove blade bolt, anti-scalp cup and blade from spindle shaft.
3. Install blade (sail facing (up) toward cutting unit) with anti-scalp cup and blade bolt. Tighten blade bolt to 85–110 ft-lb (12 – 15 Kgm).

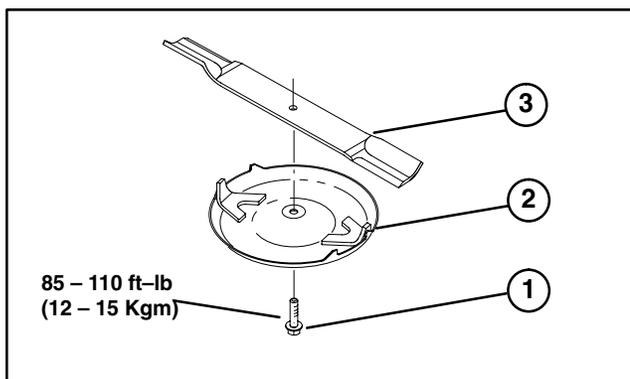


Figure 20

1. Blade bolt
2. Anti-Scalp Cup
3. Blade



WARNING

Do not try to straighten a blade that is bent, and never weld a broken or cracked blade. Always use a new blade to assure continued safety certification of the product.

Inspecting and Sharpening Blade

1. Lock transport levers, raise cutting unit to highest position, shut the engine off and engage the parking brake.

2. Examine cutting ends of the blade carefully, especially where the flat and curved parts of the blade meet (Fig. 21-A). Since sand and abrasive material can wear away the metal that connects the flat and curved parts of the blade, check the blade before using the machine. If wear is noticed (Fig. 21-B), replace the blade: refer to Removing Cutter Blade.


DANGER

If blade is allowed to wear, a slot will form between the sail and flat part of the blade (Fig. 21-C). Eventually a piece of the blade may break off and be thrown from under the housing, possibly resulting in serious injury to yourself or bystander.

3. Inspect cutting edges of all blades. Sharpen the cutting edges if they are dull or nicked. Sharpen only the top of the cutting edge and maintain the original cutting angle for best performance (Fig. 22). The blade will remain balanced if same amount of metal is removed from both cutting edges.

4. To check blade for being straight and parallel, lay blade on a level surface and check its ends. Ends of blade must be slightly lower than the center, and cutting edge must be lower than the heel of the blade. This blade will produce good quality of cut and require minimal power from the engine. By contrast a blade that is higher at the ends than the center, or if cutting edge is higher than the heel, the blade is bent or warped and must be replaced.

5. Install blade retainer, blade (sail facing (up) toward cutting unit) with anti-scalp cup and blade bolt. Tighten blade bolt to 85–110 ft-lb (12 – 15 Kgm).

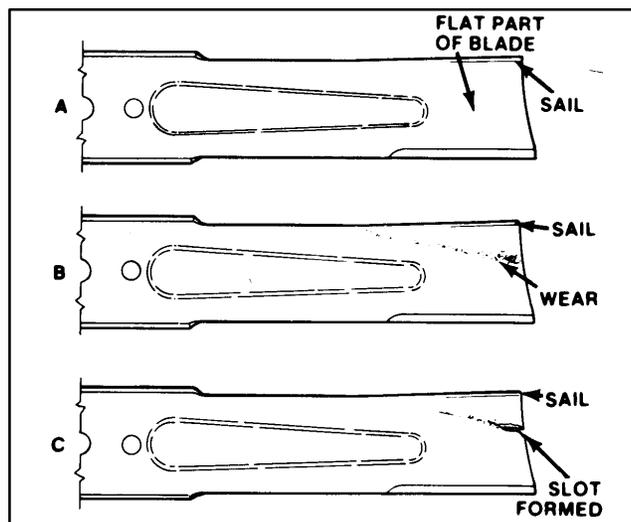


Figure 21

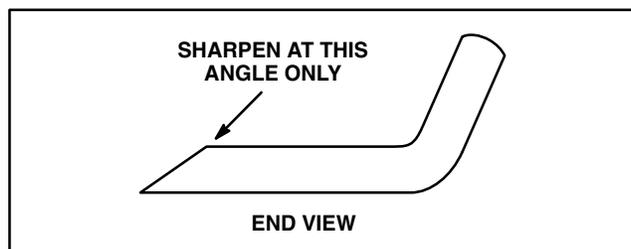


Figure 22

Correcting Cutting Unit Mismatch

If there is mismatch between the blades, the grass will appear streaked when it is cut. This problem can be corrected by making sure the blades are straight and all blades are cutting on the same plane.

1. Raise the height-of-cut to the highest position and lower deck to the floor.
2. Position machine on a level surface on the shop floor.
3. Shut engine off and engage the parking brake. Unlock transport levers.
4. Position the tip of an outer blade and adjacent blade tip as close together as possible at the intersection of the two cutting chambers. Note the height of the outer blade tip with respect to the adjacent blade tip.
5. Rotate outer blade 180° and note the height of the outer blade tip with respect to the adjacent blade tip. If the relative height changed by more than 1/8 inch (3 mm) after rotating blade, then outer blade is bent and should be replaced.

Note: When the blade cutting tips are rotated to their closest point, the blade in the forward chamber should be .20 ± .13 inch (5 ± 3 mm) above the blade of the more rearward chamber. This is caused by the tilting of each motor spindle in each individual chamber. The blade rake is accomplished by titling each spindle rather than tilting the entire deck. Even with this “apparent mismatch”, the after cut appearance will not show a mismatch because each chamber overlaps the adjacent chamber by 2 inch (51 mm).

6. Repeat steps 3 and 4 until all pairs of adjacent blades have been checked at both blade tips. Note the relative difference in blade height at each blade intersection after replacing any bent blades. This height difference should be less than 1/8 inch (3 mm) for all adjacent blades.

7. Rotate an outer blade until the tip is positioned toward the side of the deck housing. Measure the distance from the bottom of the blade to the floor. Repeat the measurement on the opposite side of the deck. If the two distances differ by more than 1/4 inch (6 mm) proceed to step 8 and add shims as instructed.

8. Remove capscrews, flatwashers, lockwashers and nuts from outer spindle in the area where shims must be added. To raise or lower the blade, add a shim, Part No. 3256–24, between spindle housing and bottom of cutting unit. Continue to check alignment of blades and add shims until tips of blades are within the required dimension.

IMPORTANT: Do not use more than three shims at any one hole location. Use decreasing numbers of shims in adjacent holes if more than one shim is added to any one hole location.

Chamber Pivot Service

If cutting unit chamber pivot assemblies should ever have to be separated for service or repair, use the following procedure.

1. Pivot assembly dis-assembly.
 - A. Remove capscrews and nut from pivot casting.
 - B. Loosen capscrew locking eccentric cam in place.
 - C. Using a 1/2 inch (13 mm) diameter drive pin, drive pilot pin 3/8 inch (10 mm) to 1/2 inch (13 mm) into pivot casting.
 - D. Slide pivot assembly out of chamber housing.
2. Ball joint removal from pivot assembly
 - A. Remove the lock nuts from the ball joint studs.
 - B. Separate span casting from ball joints, Using an expansion fork and soft (lead) hammer.
 - C. Slide tapered sleeve out of span casting, and save this part.
 - D. Remove retaining rings from back side of ball joints.
 - E. Using a press, push ball joints out of pivot casting. The front (top) ball joint should be removed first.

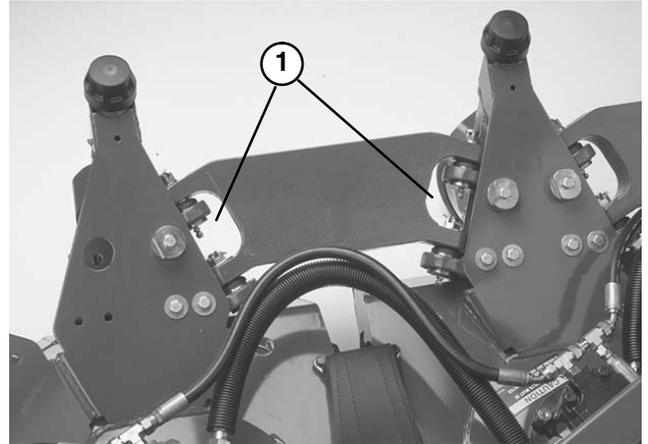


Figure 23
1. Chamber pivots

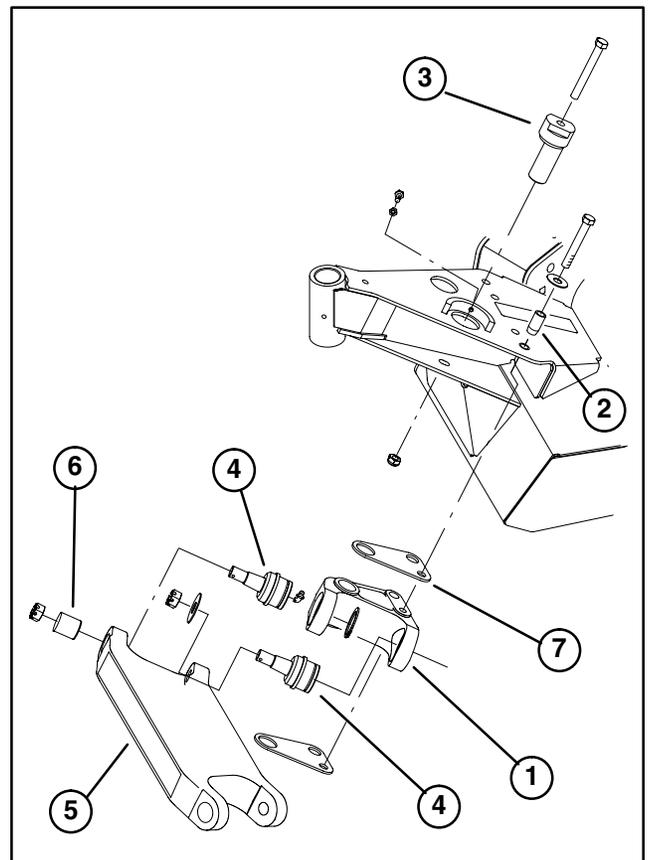


Figure 24

1. Pivot casting	5. Span casting
2. Pivot pin	6. Tapered sleeve
3. Eccentric cam	7. Pivot spacer (2)
4. Ball joint	

3. Pivot assembly re-assemble.

A. Press ball joints into pivot casting. Bottom ball joint first.

B. Insert and orientate grease fittings to face upward.

C. Install retaining rings on back side of ball joints.

D. Clean any debris, oil, or dirt from tapered joints on span casting and tapered sleeve. Any nicks should be filed off.

E. Install pivot casting into chamber housing with spacer plate on top and bottom of pivot casting.

F. Install pilot pin into 5/8 inch (16 mm) diameter "pivot" hole and drive flush with top surface of chamber housing.

G. Install eccentric cam through assembly with identification mark facing forward. Use a small amount of anti-seize compound on the diameter interface between eccentric cam and pivot casting.

H. Install 7/16 inch grade 8 fasteners (and thick washers) and tighten assembly such that eccentric cam can still rotate pivot casting in chamber housing.

I. Install span casting over ball joints in pivot casting.

J. Use a soft mallet, tap tapered sleeve into place in top ball joint position.

K. Torque ball joints as follows:

IMPORTANT: Failure to torque ball joints as follows can result in premature wear of ball joints due to pre-load applied to ball joint sockets.

Bottom ball joint nut	50 ft-lbs (7 Kgm)
Top ball joint nut	50 ft-lbs (7 Kgm)
Bottom ball joint nut	125 ft-lbs (17 Kgm)
Top ball joint nut	125 ft-lbs. (17 Kgm)

NOTE: It is NOT recommended to use slotted nuts on ball joints due to the need to over tighten or back-off slotted nuts and to align cross holes for use with a cotter pin.

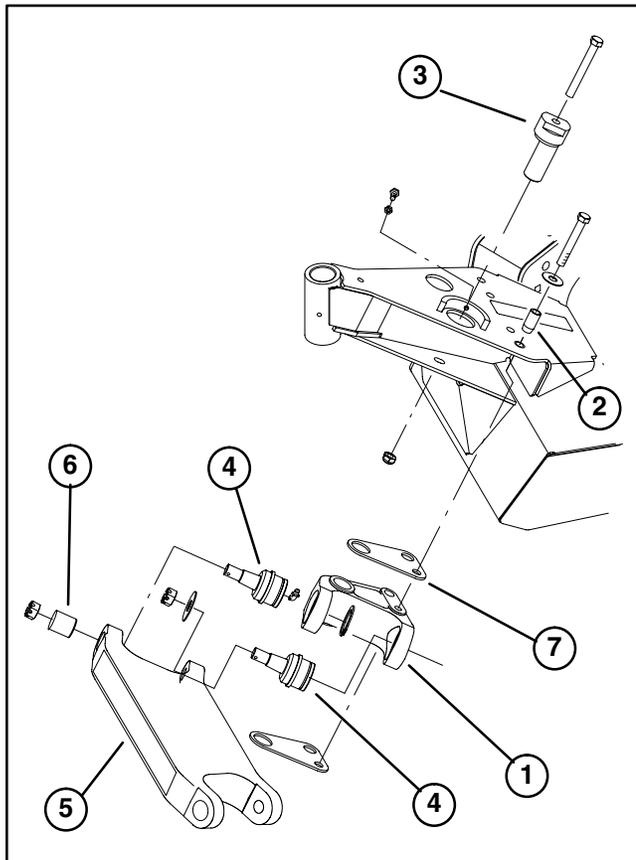


Figure 25

- | | |
|------------------|---------------------|
| 1. Pivot casting | 5. Span casting |
| 2. Pivot pin | 6. Tapered sleeve |
| 3. Eccentric cam | 7. Pivot spacer (2) |
| 4. Ball joint | |

4. Adjustment of Chamber Pivots.

- A. Set deck to its maximum height of cut: 4 inches (102 mm).
- B. Place the deck on a level surface with the lock and lift cables in the unlocked position.
- C. Tighten capscrew against the eccentric cam, then, back off 1/2 turn.
- D. Use two 1–1/4 inch wrenches on the eccentric cam to rotate simultaneously. Verify that identification mark on top of each eccentric cam is facing forward.
- E. Rotate adjacent blades until cutting edge tips are aligned directly across from each other as shown in figure 27.
- F. Rotation of outboard eccentric cam will primarily effect blade gap and inboard eccentric cam will primarily effect chamber front alignment.
- G. Rotate eccentric cam's until blade tips are **touching** each other and chamber fronts are aligned parallel.
- H. Apply a small force (10–15 lbs / 5–7 Kg) to back of chambers. Be sure non-rotating rear castors are free to slide along floor. This will remove any back-lash in system.
- I. Rotate outboard eccentric cam until blade tips are $.25 \pm .03$ inches (6 ± 1 mm) apart.
- J. Tighten capscrew against eccentric cam's. Secure jam nut against the threaded "C" shaped wall.
- K. Secure 7/16 grade 8 capscrews and nut on pivot casting and tighten to a torque of 80 ft-lbs (11 Kgm). in the following order:
 - 1. Capscrew and nut through the eccentric cam.
 - 2. Capscrew without pilot pin.
 - 3. Capscrew with pilot pin (pivot point of casting).

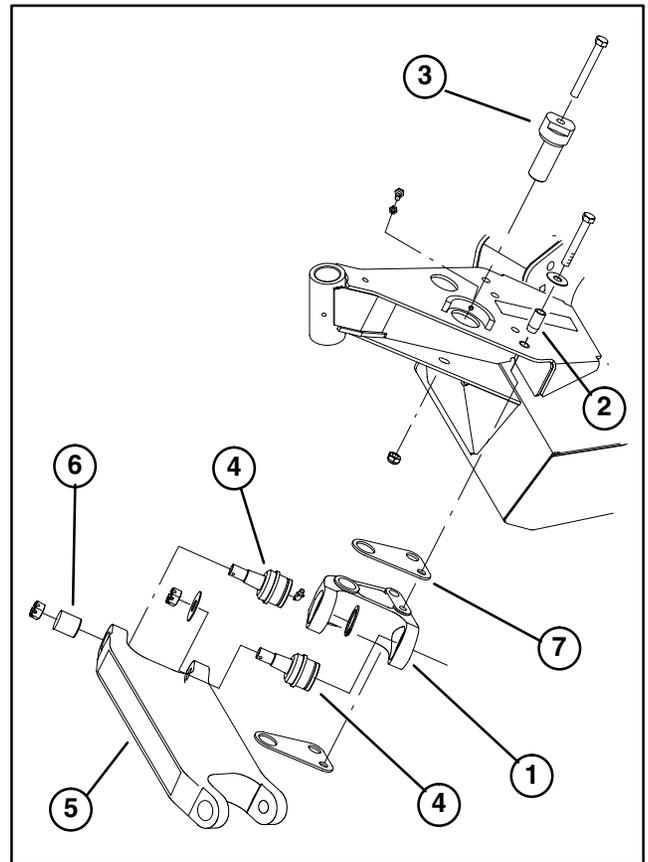


Figure 26

- | | |
|------------------|---------------------|
| 1. Pivot casting | 5. Span casting |
| 2. Pivot pin | 6. Tapered sleeve |
| 3. Eccentric cam | 7. Pivot spacer (2) |
| 4. Ball joint | |

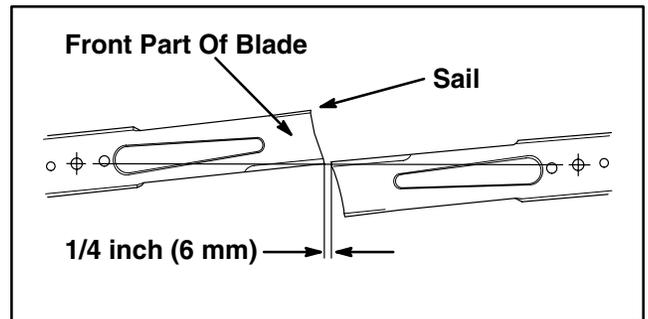


Figure 27

Lift Arm Ball Joint Installation

Lift arm ball joints have been adjusted at the factory. The proper setting of left hand ball joint is 1.75 inch (45 mm) from end of lift arm to center of tapered stud (Fig. 28). The proper setting of right hand ball joint is 2.09 inch (53 mm) from end of lift arm to center of tapered stud (Fig. 29). These distances can be adjusted if deck alignment to traction unit is off or if the deck rubs against traction tires.

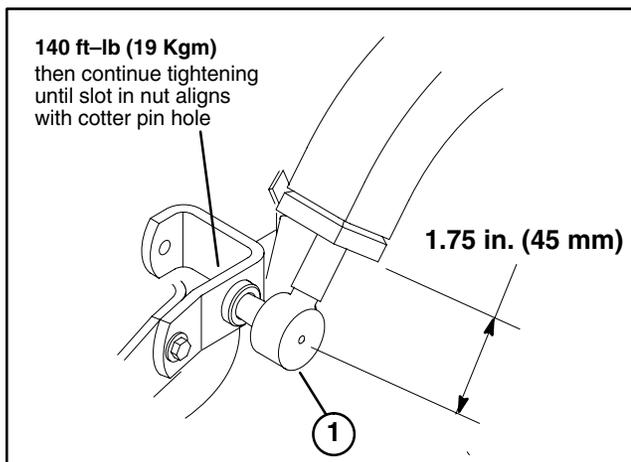


Figure 28
1. Left ball joint

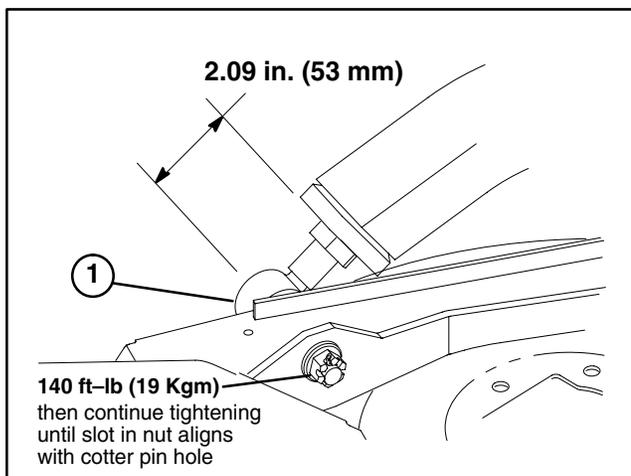
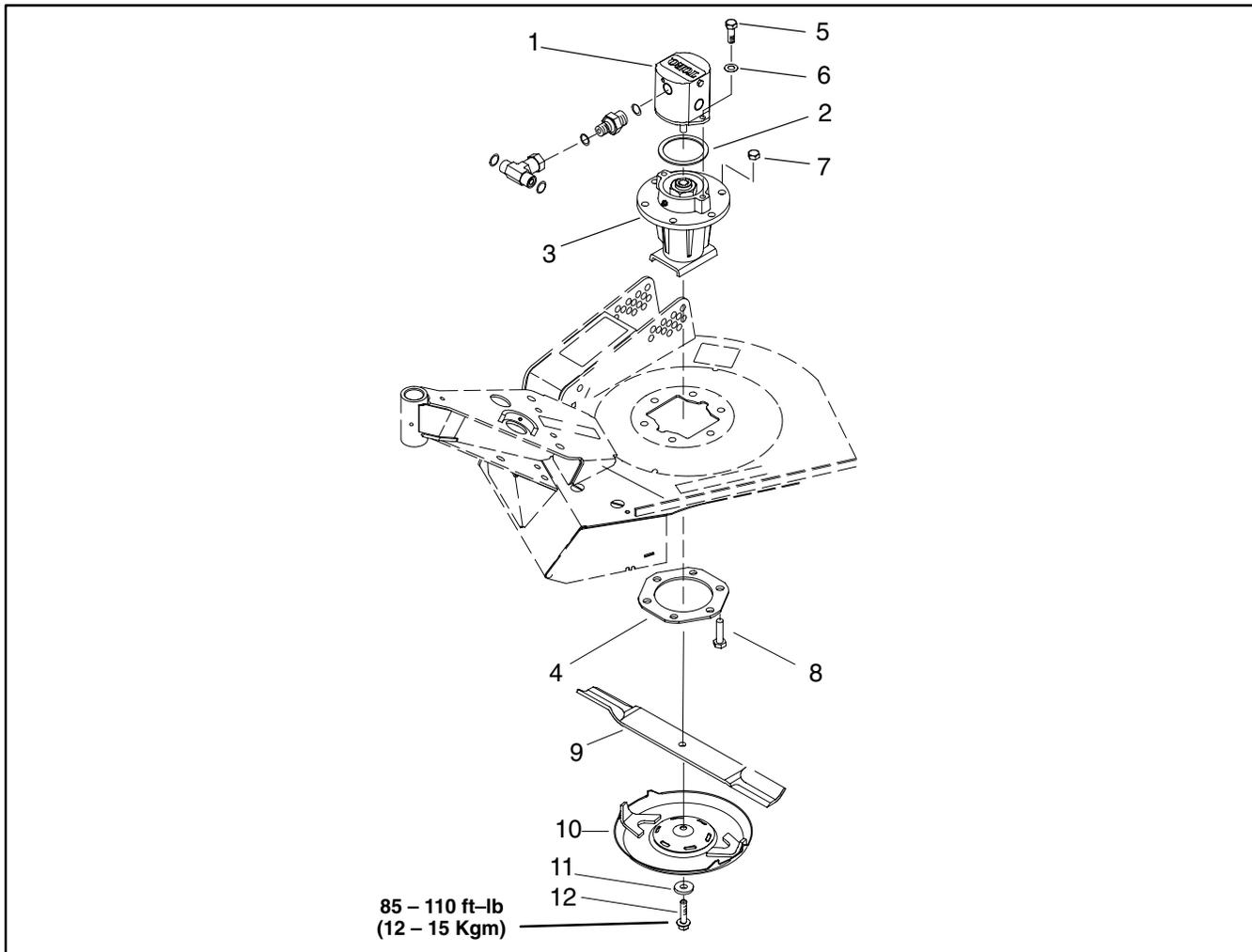


Figure 29
1. Right ball joint

Hydraulic Motor and Blade



Contour 82
Cutting Unit

Figure 30

- 1. Motor
- 2. O-ring
- 3. Spindle Assy
- 4. Support plate

- 5. Screw
- 6. Washer
- 7. Locknut
- 8. Screw

- 9. Blade
- 10. Anti scalp cup
- 11. Hardened washer
- 12. Blade screw

Blade Spindle Service

Disassembly

1. Park machine on a level surface, lower cutting units, stop engine, engage parking brake, and remove key from the ignition switch.

2. Remove two cap screws that secure hydraulic motor to the cutting unit. Remove hydraulic motor and O-ring from deck (Fig. 30).

3. Start the engine and raise the cutting unit. Stop engine and remove key from the ignition switch. Block up the cutting unit so it cannot fall accidentally. If required for easier service, remove cutting unit (see Disconnect Cutting Unit From Traction Unit).

4. Remove cutting blade, anti-scalp cup and bolt (see Cutting Blade Removal and Installation).

5. Remove cap screws and lock nuts securing spindle housing to deck. Remove spindle assembly. Remove spindle plate from under deck (Fig. 30).

6. Loosen and remove spindle nut from top of spindle shaft (Fig. 31).

7. Press the spindle shaft out of the spindle housing using an arbor press. The shaft spacer remains on the spindle shaft as the shaft is being removed.

8. Remove seals from spindle housing.

9. Allow the bearings, inside spacer and spacer ring to fall out of the spindle housing.

10. Using a punch and hammer, drive both of the bearing cups out of the spindle housing. Also drive the large spacer out of the housing.

11. The large snap ring should remain inside the spindle housing because it is difficult to remove.

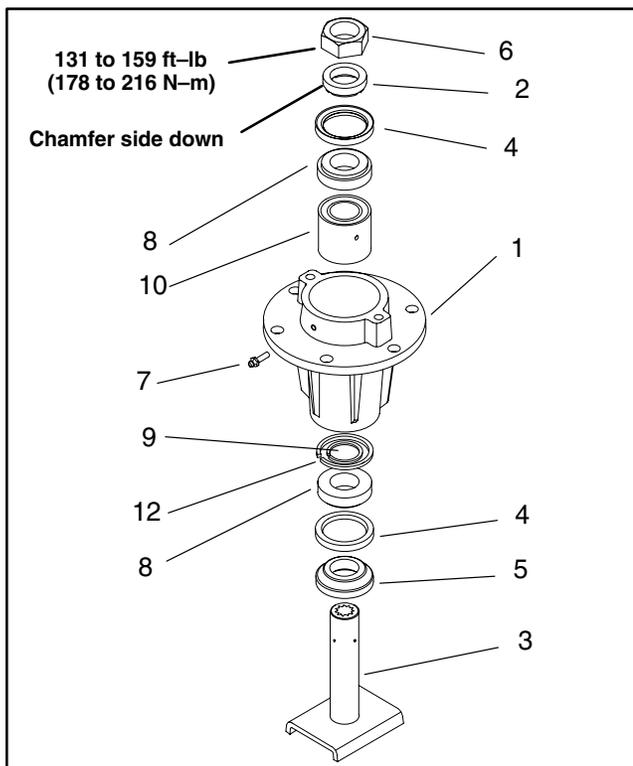


Figure 31

- | | |
|--------------------|--------------------------|
| 1. Spindle housing | 7. Grease fitting |
| 2. Seal spacer | 8. Bearing |
| 3. Spindle shaft | 9. Spacer ring |
| 4. Oil seal | 10. Spacer set (2 piece) |
| 5. Shaft spacer | 11. Bearing |
| 6. Spindle nut | 12. Large snap ring |

Assembly

IMPORTANT: If new bearings will be installed into a used spindle housing that has the original large snap ring installed, discard the snap ring that came with the new bearings because it is not necessary to replace the original snap ring. However, new bearings with their matched spacer set and snap ring must always be installed when the spindle housing is being replaced. Replacement bearings are sold only with a matched snap ring and spacer set. These parts cannot be purchased separately.

1. If large snap ring was removed, or if replacing the spindle housing, install snap ring into spindle housing groove. Make sure snap ring is seated in groove.

IMPORTANT: If bearings are being replaced, make sure to use the large spacer, inside spacer, and spacer ring that are included in new bearing set.

2. Using an arbor press, push large spacer into top of spindle housing. The spacer should fit tightly against the snap ring.

3. Thoroughly oil the bearing cups. Using an arbor press, push the bearing cups into the top and bottom of the spindle housing. The top bearing cup must contact the spacer previously installed, and the bottom bearing cup must contact the snap ring. Make sure that the assembly is correct by supporting the first bearing cup and pressing the second against it (Fig 32).

4. Pack the bearing cones with grease. Apply a film of grease on lips of seals.

5. Install lower bearing and seal into bottom of spindle housing. **Note:** The bottom seal must have the lip facing out (down) (Fig. 33).

6. Slide spacer ring and inside spacer into spindle housing, then install upper bearing and seal into top of housing. **Note:** The upper seal must have the lip facing out (up) (Fig. 33).

7. Inspect the spindle shaft to make sure it is free of burrs or nicks that could possibly damage the seals. Also, make sure that lubrication hole in shaft is clean. Lubricate the shaft with grease.

8. Install spindle spacer onto shaft. Carefully slide spindle shaft through spindle housing. The bottom seal and spindle spacer fit together when the spindle is installed fully.

9. Install seal spacer with chamfer side down (Fig. 32).

10. Thread spindle nut onto shaft and tighten nut from 131 to 159 ft-lb (178 to 216 N-m).

11. Install spindle housing and spindle plate to deck with cap screws and lock nuts. Notches on housing and plate should be aligned to front of deck.

12. Install cutting blade, anti-scalp cup and bolt (see Cutting Blade Removal and Installation). Tighten blade bolt from 85 to 110 ft-lb (115 to 149 N-m).

13. Position O-ring to top of spindle housing. Install hydraulic motor to the cutting unit with two cap screws.

IMPORTANT: When greasing spindles, grease passes into the center of the shaft and out to fill the bearing cavity of the housing. If grease does not come out of lower seal when greasing, check lubrication hole in spindle shaft for obstruction.

14. Attach a hand pump grease gun to either grease fitting and fill housing cavity with grease until grease starts to come out of lower seal. **NOTE:** Pneumatic grease guns can produce air pockets when filling large cavities.

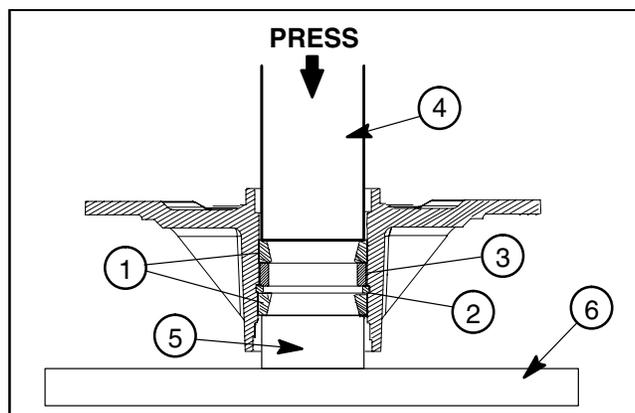


Figure 32

- | | |
|--------------------|---------------------|
| 1. Bearing cups | 4. Arbor press |
| 2. Large snap ring | 5. Support |
| 3. Large spacer | 6. Arbor press base |

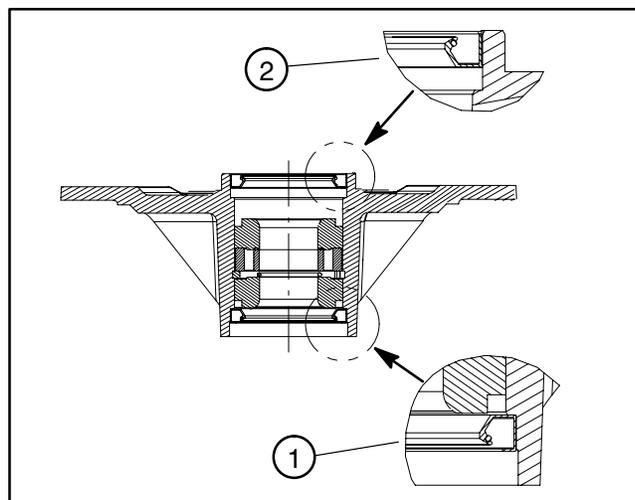


Figure 33

- | | |
|-----------------------------|----------------------------|
| 1. Bottom seal installation | 2. Upper seal installation |
|-----------------------------|----------------------------|

Hydraulic Assembly

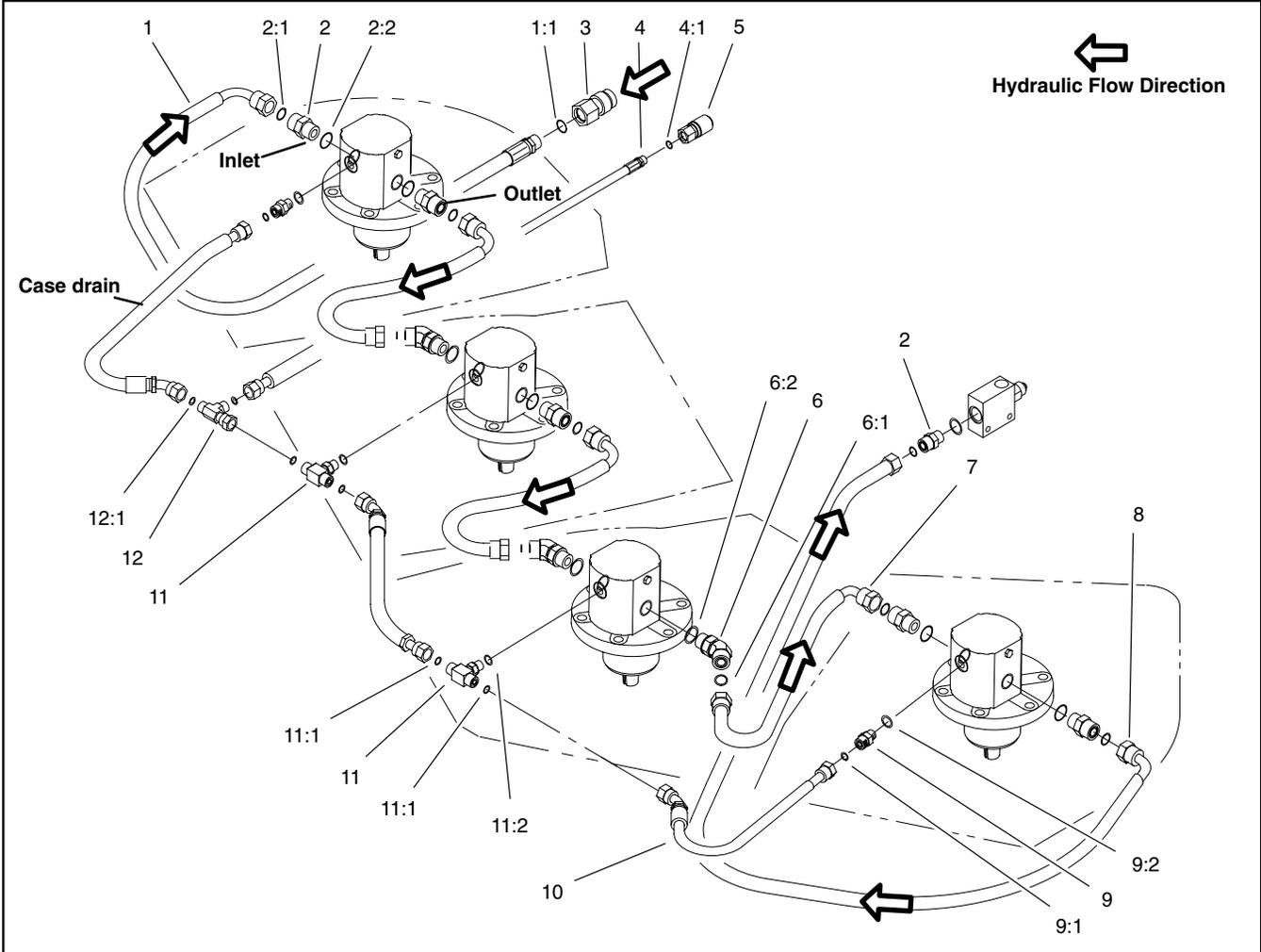


Figure 34

- | | | |
|----------------------|----------------------|-----------------------|
| 1. Hose | 6. Hydraulic fitting | 11. Tee |
| 1:1 O-ring | 6:1. O-ring | 11:1. O-ring |
| 2. Hydraulic fitting | 6:2. O-ring | 11:2. O-ring |
| 2:1. O-ring | 7. Hose | 12. Hydraulic fitting |
| 2:2. O-ring | 8. Hose | 12:1. O-ring |
| 3. Coupler | 9. Hydraulic fitting | |
| 4. Hose | 10. Hose | |
| 5. Coupler | | |

NOTE: See Chapter 5 – Hydraulic System for hydraulic test information.



72" Cutting Units

72 inch
Cutting Units

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Figure 1

Specifications

Type: 72 inch (1.8 m) width of cut, 3 blades.

Height Of Cut: 1 to 5 inches (25 to 127 mm) adjustable in 1/2 inch (13 mm) increments. Front adjustment is with snapper pin and grooves in castor shaft. Rear adjustment is with hanger brackets and pin.

Construction: Housing is made of 12 gauge steel and reinforced with 2-1/2 inch x 10 gauge angle.

Cutter Drive: Gear box mounted on cutting unit is driven by PTO shaft. Power is transmitted to the blades by one hex B section belt. Spindle shafts are 1-1/4 inch (32 mm) diameter and supported by two externally sealed, greaseable, tapered roller bearings.

Blades: Three 25.18 in. (716 mm) long, .25 in. (6 mm) thick, heat-treated steel. Patent Pending.

Suspension & Castor Wheels: Two front castors, consisting of 10 in. (254 mm) pneumatic wheel and tire assembly with sealed ball bearings. Rear of deck is suspended from lift arms with adjustable deck rake. Hydraulic counter balance and lift system designed integral with deck for maximum flotation.

Anti-scalp Features: Anti-scalp cup located on each blade. Two gauge wheels. Adjustable skid on each end of deck.

Deck Covers: 16 gauge steel covers.

Quick Attach System: Tapered joint with over center adjustable tensioning latch.

Weight: Rear Discharge 545 lbs. (247 Kg). Guardian Recycler 555 lbs. (252 Kg).

Specifications and design subject to change without notice.

Adjustments

Transport Latch Adjustment

1. Start tractor and raise deck to highest possible position and turn off engine.
2. Loosen (2) flange head capscrews securing latch plate to side of gearbox.
3. Rotate latch rod downward from front of traction unit.
4. Insert latch rod into rear hole (transport position) in latch plate.
5. Rotate front of deck upward and insert latch rod into front hole (service position) in latch plate.
6. Loosen latch plate flange head capscrews and adjust latch plate position if required.
7. Tighten flange head capscrews securing latch plate to gearbox.
8. Remove hair pin cotters and clevis pins securing height-of-cut chains to rear of deck.
9. Remove latch rod from rear hole in latch plate.

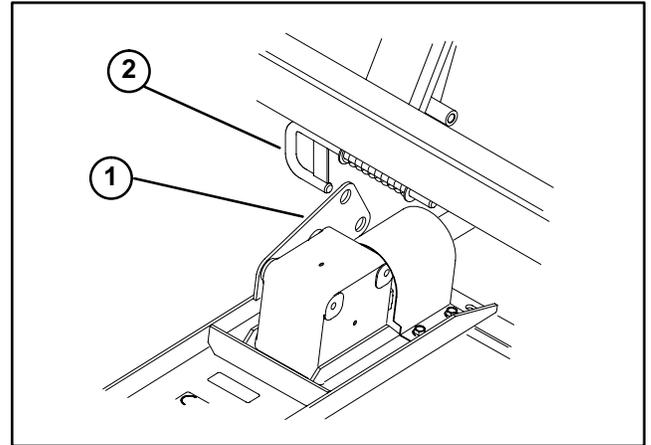


Figure 2
(Rear Discharge)

1. Latch Plate
2. Latch Rod

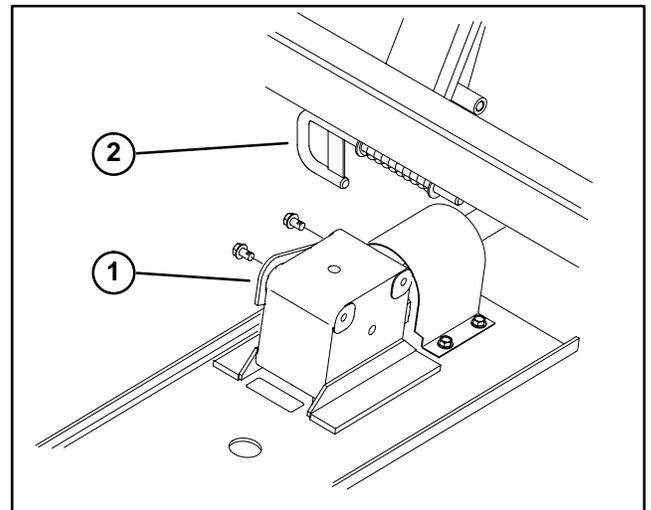


Figure 3
(Guardian Recycler)

1. Latch Plate
2. Latch Rod

Height of Cut Adjustment

The height-of-cut is adjustable from 1 to 5 inches (25 to 127 mm) in 1/2 inch (13 mm) increments.

1. Start engine and raise cutting. Stop engine after cutting unit is raised.
2. Remove front snapper pins from castor arms and slide castor wheel assembly up or down.
3. Insert snapper pin into castor arm and through groove in castor shaft to get desired height-of-cut.
4. Remove hair pin cotter and clevis pin securing height-of-cut chain to rear of deck.
5. Mount height-of-cut chain to desired height-of-cut hole with clevis pin and hair pin cotter.
6. When using 1 inch (25 mm) height-of-cut, move skids and gage wheels to the highest holes.

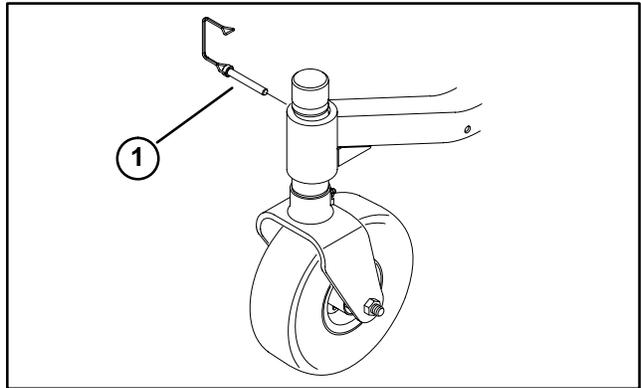


Figure 4
1. Snapper Pin

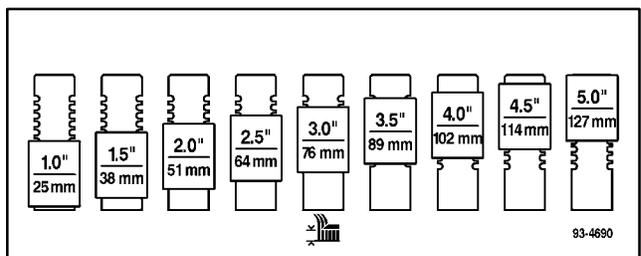


Figure 5

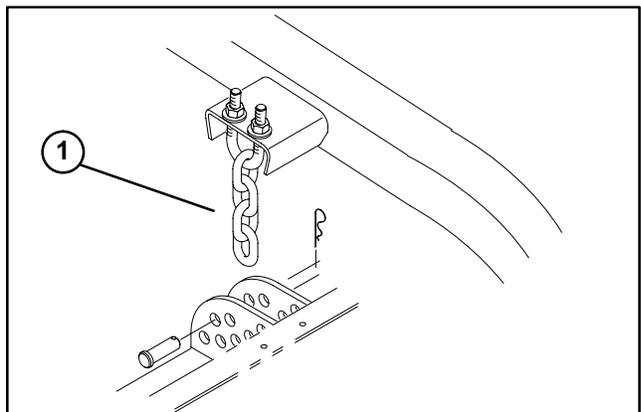


Figure 6
1. Height-of-Cut chain

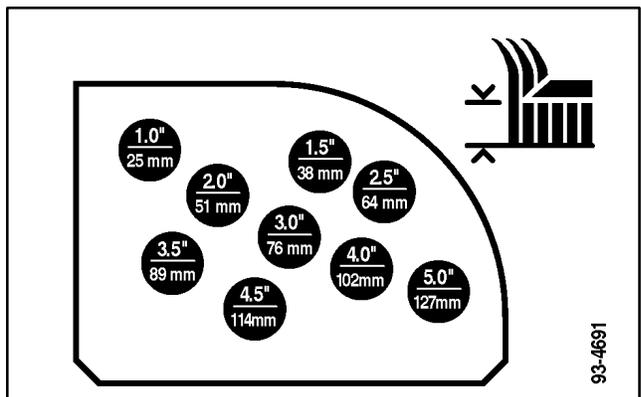


Figure 7

Skid Adjustment

1. Adjust skids by loosening flange nuts, positioning as desired and re-tightening flange nuts.

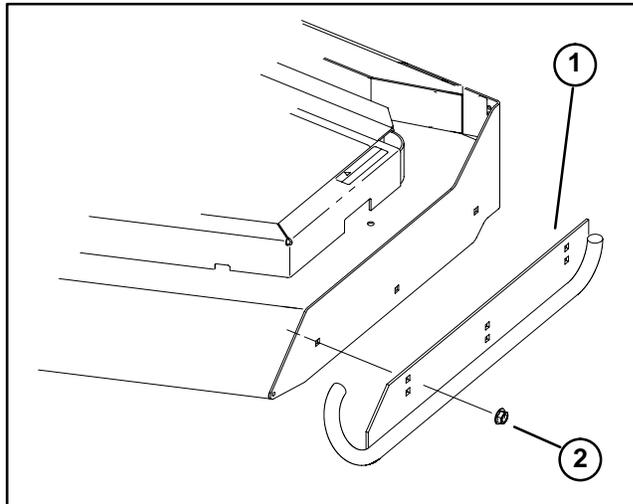


Figure 8
(Rear Discharge)

1. Skid
2. Flange nut

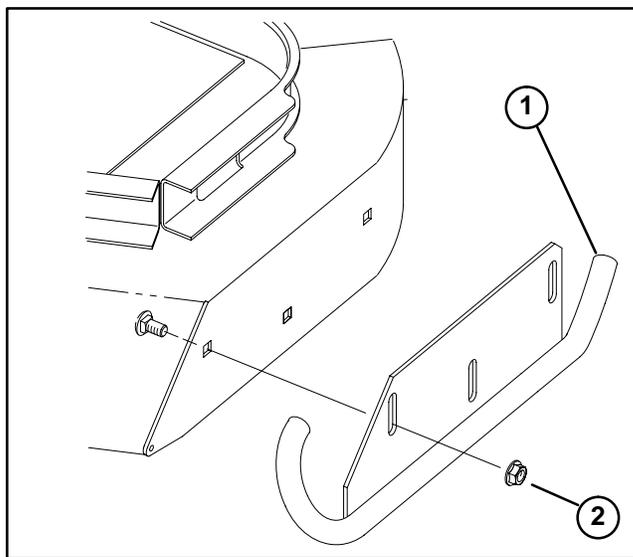


Figure 9
(Guardian Recycler)

1. Skid
2. Flange nut

Gage Wheel Adjustment (Rear Discharge Cutting Unit)

Note: If cutting unit is to be used in the 1 inch (25 mm) height-of-cut setting, cutting unit gage wheels must be positioned in highest position.

1. Adjust gage wheels by loosening locking hub, positioning gage wheel support at desired height and re-tightening locking hub. Make sure gage wheel support pins are positioned in holes in deck.

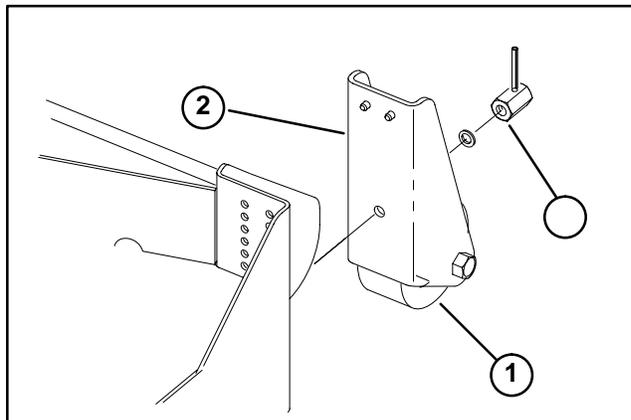


Figure 10

1. Gage wheel
2. Gage wheel support
3. Locking hub

Anti-scalp Roller Adjustment (Guardian Recycler Cutting Unit)

Note: If cutting unit is to be used in the 1 or 1-1/2 inch (25 or 38 mm) height-of-cut setting, cutting unit rollers must be repositioned in the top bracket holes.

To adjust front and rear rollers:

1. Remove cotter pins securing roller shafts to underside of deck.
2. Slide shafts out of lower bracket holes, align rollers with top holes and install shafts.
3. Install cotter pins to secure assemblies.

Deck Pitch Adjustment

Deck pitch is the difference in height-of-cut from the front of the blade plane to the back of the blade plane. TORO recommends a blade pitch of .25 inches (6 mm). That is the back of the blade plane is .25 inches (6 mm) higher than the front.

1. Position machine on a level surface on shop floor.
2. Set deck to the desired height-of-cut.
3. Rotate (1) blade so it points straight forward.
4. Using a short ruler, measure from floor to front tip of blade. Then, measure from floor to rear tip of blade.
5. Subtract the front dimension from rear dimension to calculate your pitch.
6. To adjust pitch, start tractor and raise deck to highest possible position and turn off engine.
7. Loosen jam nuts on top or bottom of Height-of-Cut chain U-bolt.
8. Adjust other set of nuts to raise or lower rear of deck and attain correct deck pitch.
9. Tighten jam nuts.
10. Lower deck.

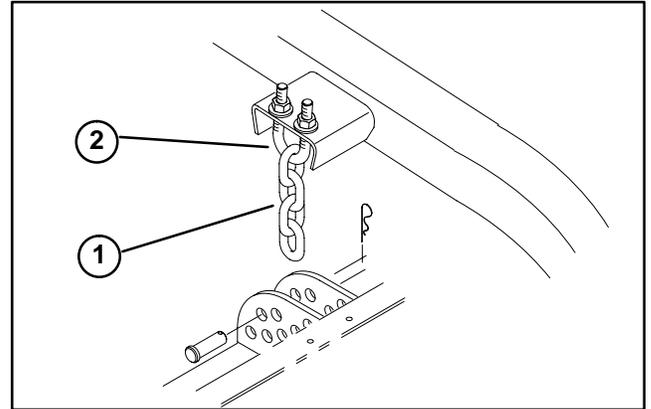


Figure 11

1. Height-of-Cut chain
2. U-bolt

Service and Repairs



CAUTION

To prevent accidental starting of the engine, while performing maintenance, shut engine off and remove key from ignition switch.

Check Gear Box Lubricant

The gear box is designed to operate with SAE 80–90 wt. gear lube. Although the gear box is shipped with lubricant from the factory, check the level before operating the cutting unit. **Change lubricant in gear box initially after 50 hours of operation.**

1. Position the machine and cutting unit on a level surface.
2. Remove check plug from side of gear box and make sure lubricant is up to bottom of hole. If level of lubricant is low, remove fill plug on top of gear case and add enough lubricant to bring it up to bottom of hole in side.

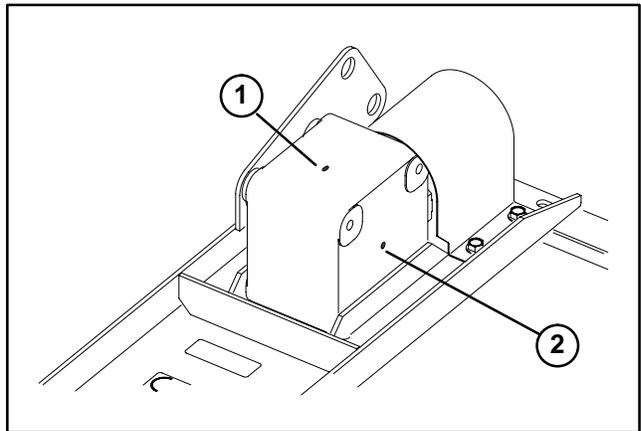


Figure 12

1. Filler Plug
2. Check Plug

Replace Gear Box Lubricant

The gear box lubricant must be changed initially, after the first 400 hours of operation, and thereafter every 1600 hours of operation.

1. Position the machine and cutting unit on a level surface.
2. Loosen fixed idler pulley locking nut.
3. Loosen spring tensioning nut as required and remove belt.
4. Remove (4) locknuts securing gearbox mount to deck.
5. Remove belt from pulley.
6. Remove check plug from side of gear box and tip gear box assembly allowing lubricant to drain from gear box.
7. Reinstall belt to pulley.
8. Reinstall gear box assembly to deck
9. Remove fill plug on top of gear case and add SAE 80–90 wt. gear lube until level is up to bottom of hole in side.
10. Reinstall check plug to side of gear box and fill plug to top of gear case.
11. Re-tension belt. Refer to Replacing Drive Belts.

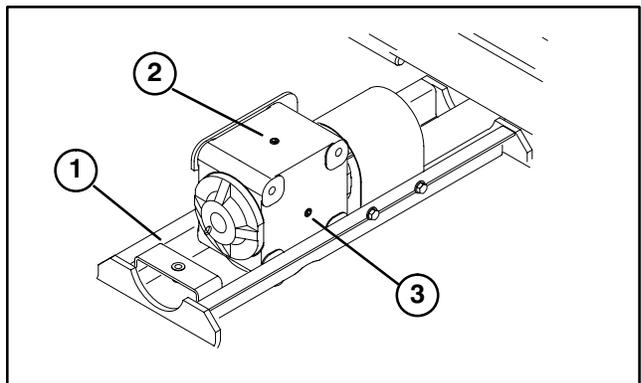


Figure 13

1. Gear Box Mount
2. Filler Plug
3. Check Plug

Grease Bearings, Bushings and Gear Box

The cutting unit must be lubricated regularly. If machine is operated under normal conditions, lubricate castor bearings and bushings with No. 2 general purpose lithium base grease or molybdenum base grease, after every 8 hours of operation or daily, whichever comes first. Lubricate fittings immediately after every washing, regardless of the interval listed.

1. The cutting unit has bearings and bushings that must be lubricated, and these lubrication points are:

front castor shaft bushings (2), blade spindle bearings (3), gage wheels (2), idler arm pivot and right and left push arm ball joints (Fig. 14).

2. Position the machine and cutting unit on a level surface and lower cutting unit. Remove check plug from side of gear box and make sure lubricant is up to bottom of hole. If level of lubricant is low, remove fill plug on top of gear case and add SAE 80–90 wt. gear lube until level is up to bottom of hole in side.

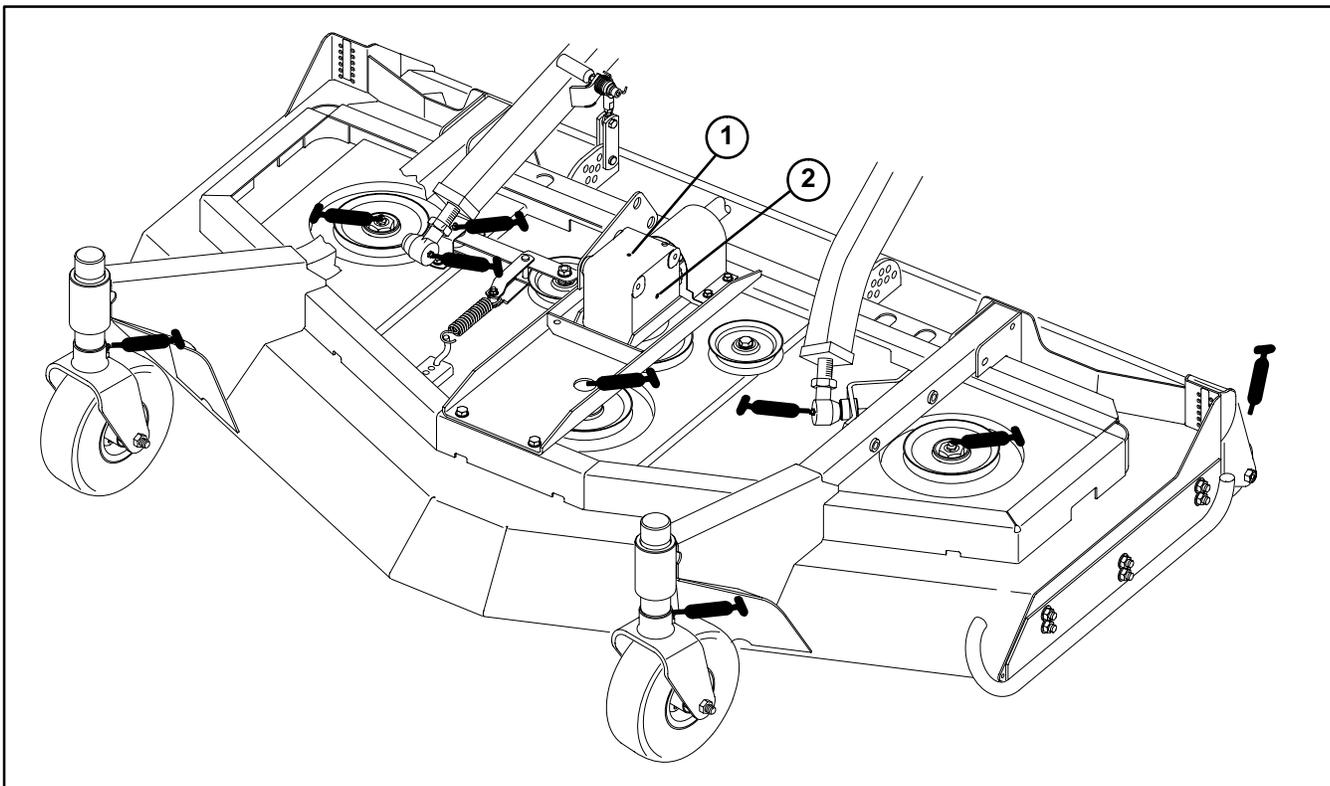


Figure 14
1. Filler Plug
2. Check/Drain Plug

72 inch
Cutting Units

Disconnect Cutting Unit From Traction Unit

Note: Implements are heavy and may require two people to handle.

1. Start tractor and raise deck to highest possible position and turn off engine.
2. Rotate ignition key to run position and move lift lever forward to lower cutting unit.
3. Remove hair pin cotters and clevis pins securing height-of-cut chains to rear height-of-cut brackets.
4. Raise seat and open needle valve. This allows lift arms to float freely.
5. Remove hair pin cotter and clevis pin securing latch cover to lift arm .
6. Loosen release lever by rotating it counterclockwise.
7. Pivot release lever upward and remove shaft latch from slot in traction unit lift arm.
8. Pull rearward on lock collar to release drive shaft coupler from tractor.
9. Stay clear of lift arms and move deck away from tractor allowing lift arms to fall.
10. Secure hair pin cotter and clevis pin to height-of-cut chains for storage.
11. Close needle valve

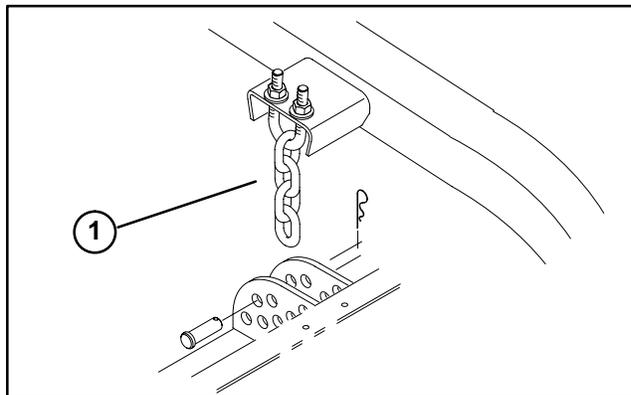


Figure 15

1. Height-of-Cut Chain

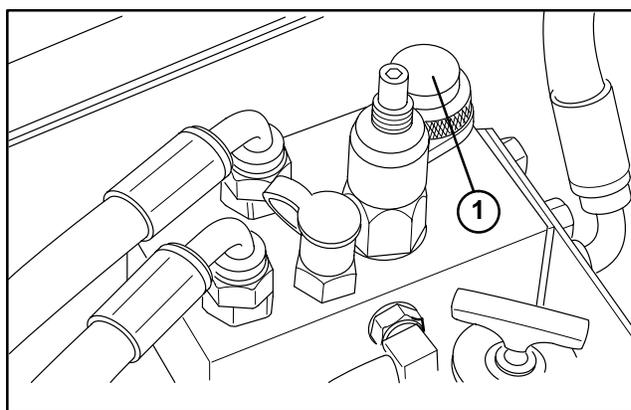


Figure 16

1. Needle Valve

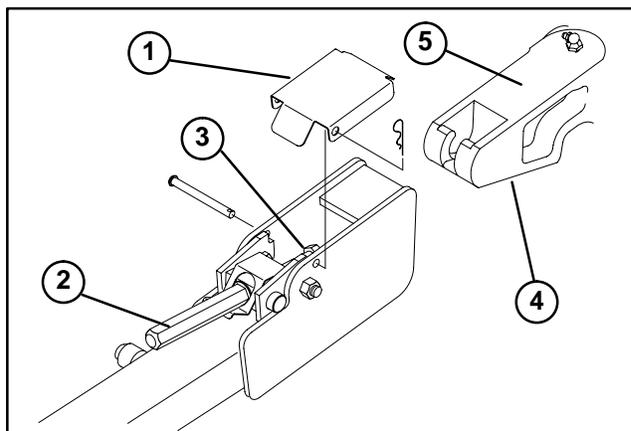


Figure 17

- | | |
|------------------|---------------------------|
| 1. Latch Cover | 4. Traction Unit Lift Arm |
| 2. Release Lever | 5. Machined Surface |
| 3. Shaft latch | |

Connect Cutting Unit to Traction Unit

1. Center traction unit in front of cutting unit on any flat hard surface.
2. Raise seat and open needle valve. This allows lift arms to float freely.
3. Adjust lift arms heights making sure that the machined surface on top of each traction unit lift arm is parallel to ground (Fig. 17). (Raise or lower lift arm casting by pushing up or down from behind the front tires or using wrench in front of tractor)
4. Check for dirt and debris on mating parts and clean as required.
5. Turn castor wheels so they point straight forward.
6. Secure first lift arm assembly to traction unit as follows:
 - A. Remove hair pin cotter and clevis pin securing latch cover to lift arm.
 - B. Pivot release lever upward.
 - C. Slide cutting unit lift arm onto traction unit lift arm, inserting shaft latch into slot in traction unit lift arm.

Note: If latch does not fall into slot in traction unit lift arm, raise or lower lift arm casting by pushing up or down from behind the front tires.

 - D. Pivot release lever downward and tighten securely by rotating clockwise.
7. Install other lift arm on tractor by rotating deck towards tractor, aligning lift arm to tractor arm and repeating step 5. If latch does not fall into slot in traction unit lift arm the arms are not lined up.
 - A. If lift arms on traction unit are not at the correct height for deck arms to slide on, push up or down on lift arm castings from behind the front tires until deck arm lines up and slides on.
 - B. If lift arms on deck do not line up side to side. Rotate castor wheels side ways so deck moves side to side easier. Move deck side to side until lift arms line up and slide on.
8. Move deck from side to side to check for tightness and re-tighten latches, if required.
9. Install latch covers to lift arms and secure with clevis pins and hair pin cotters.
10. Connect drive shaft to traction unit.
11. Close needle valve and lower seat.
12. Start tractor and raise deck to highest possible position and turn off engine.
13. Align height-of-cut chains with hole for desired height-of-cut, install clevis pin and secure with hair pin cotter.

Install Lift Arm Ball Joints

1. Adjust ball joint in each lift arm assembly until a dimension of 2.75 inches (70 mm) from end of lift arm to center of ball joint is attained.

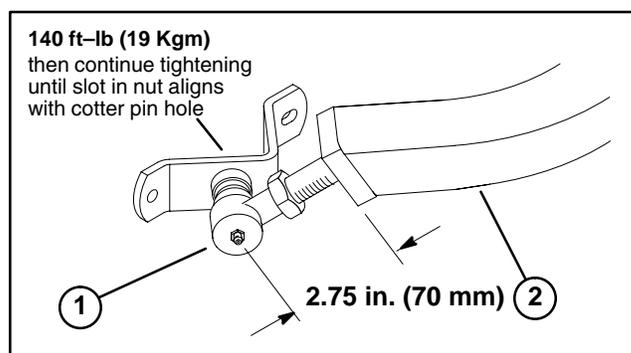


Figure 18

1. Ball Joint
2. Lift Arm

Drive Belt Replacement

The blade drive belt, tensioned by the spring loaded idler, is very durable. However, after many hours of use, the belt will show signs of wear. Signs of a worn belt are: squealing when belt is rotating, blades slipping when cutting grass, frayed edges, burn marks and cracks. Replace the belt if any of these conditions are evident.

1. Lower cutting unit to the shop floor. Remove belt covers from top of cutting unit and set covers aside.
2. Unhook spring from idler arm bracket to release belt tension. Remove cotter pin and clevis pin securing idler arm bracket to idler arm.
3. Remove (2) capscrews and nuts securing front of gear box plate to deck channels.
4. Loosen (2) capscrews and nuts securing rear of gear box plate to deck channels and raise front of gear box plate to access belt.
5. Remove old belt from around spindle pulleys and thru idler pulley assembly.
6. Route new belt around spindle pulleys and thru idler pulley assembly, as shown in figure 21.
7. Reposition gear box plate on deck channels while routing belt around gear box pulley. Mount gear box plate to deck channels with capscrews and nuts previously removed.
8. Reinstall idler arm bracket to idler arm with cotter pin and clevis pin. Hook spring onto idler arm bracket. To assure there is proper tension on drive belt, spring should be extended to a length of approximately 7.00 inch (178 mm). If spring is not extended to this length, relocate spring rod to a new mounting holes further away from from belt.
9. Reinstall belt covers.

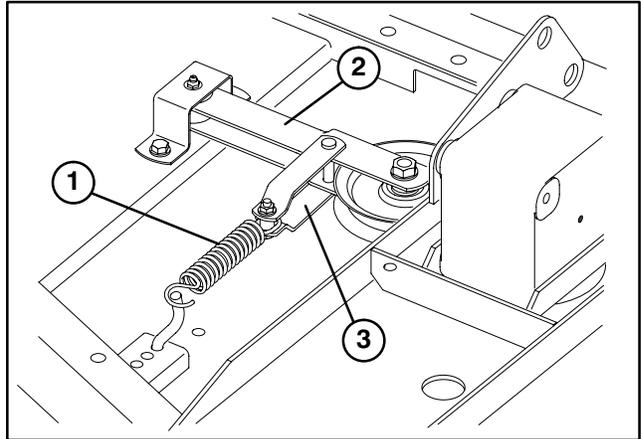


Figure 19

1. Spring
2. Idler Arm
3. Idler Arm Bracket

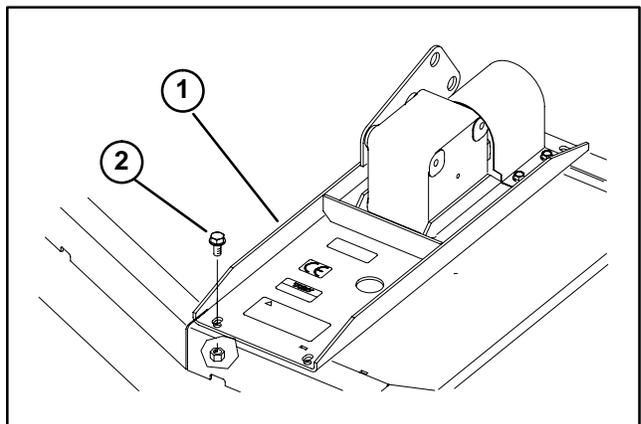


Figure 20

1. Gear Box Plate
2. Capscrews & Nuts

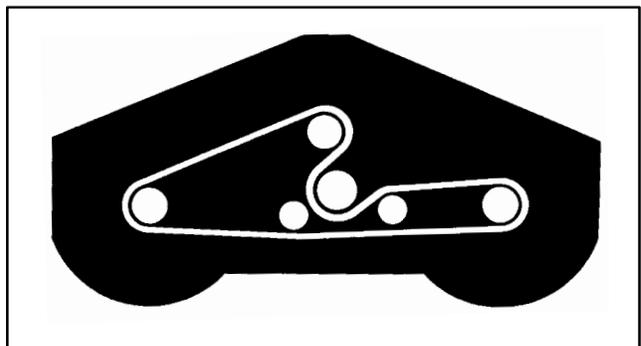


Figure 21

Front Castor Fork Bushing Service

The castor forks have bushings pressed into the top and bottom of the casting and after many hours of operation, the bushings will wear. To check the bushings, move castor fork back and forth and from side to side. If castor spindle is loose around the bushings, bushings are worn and must be replaced.

1. Start tractor and raise deck to highest possible position and turn off engine.
2. Remove front snapper pins from castor arms and slide castor wheel assembly out of castor arm tube.
3. Remove locknut from capscrew holding castor wheel assembly between castor fork. Grasp castor wheel and slide capscrew out of fork.
4. Remove retaining ring, washer and wavey washer securing castor shaft to castor fork. Remove shaft from fork.
5. Insert pin punch into top or bottom of castor fork and drive bushing out of fork. Repeat for other bushing. Clean inside of forks to remove dirt.
6. Apply grease to inside and outside of new bushings. Using a hammer and flat plate, drive bushings into fork.
7. Inspect castor shaft and fork for wear and replace if damaged.
8. Push castor shaft through bushings and fork and secure with wavey washer, washer and retaining ring.
9. Insert snapper pin into castor arm and through groove in castor shaft at desired height-of-cut.

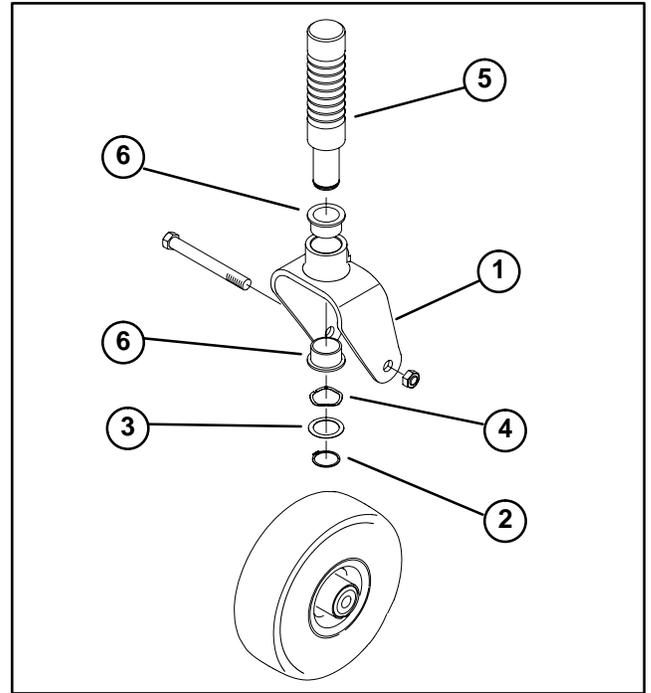


Figure 22

- | | |
|----------------------|-----------------|
| 1. Front Castor Fork | 4. Wavey Washer |
| 2. Retaining Ring | 5. Castor Shaft |
| 3. Washer | 6. Bushings |

Castor Wheel and Bearing Service

The castor wheel rotates on a high-quality roller bearing. Even after many hours of use, provided that the bearing was kept well-lubricated, bearing wear will be minimal. However, failure to keep bearing lubricated will cause rapid wear. A wobbly castor wheel usually indicates a worn bearing.

1. Remove locknut from capscrew holding castor wheel assembly between castor fork. Grasp castor wheel and slide capscrew out of fork.
2. Remove bearing from wheel hub and allow spacer to fall out. Remove bearing from opposite side of wheel hub.
3. Check the bearings, spacer and inside of wheel hub for wear. Replace defective parts as required.
4. To assemble the castor wheel, push bearing into wheel hub. Slide spacer into wheel hub. Push other bearing into open end of wheel hub to captivate the spacer inside the wheel hub.
5. Install castor wheel assembly between castor forks and secure in place with capscrew and locknut.

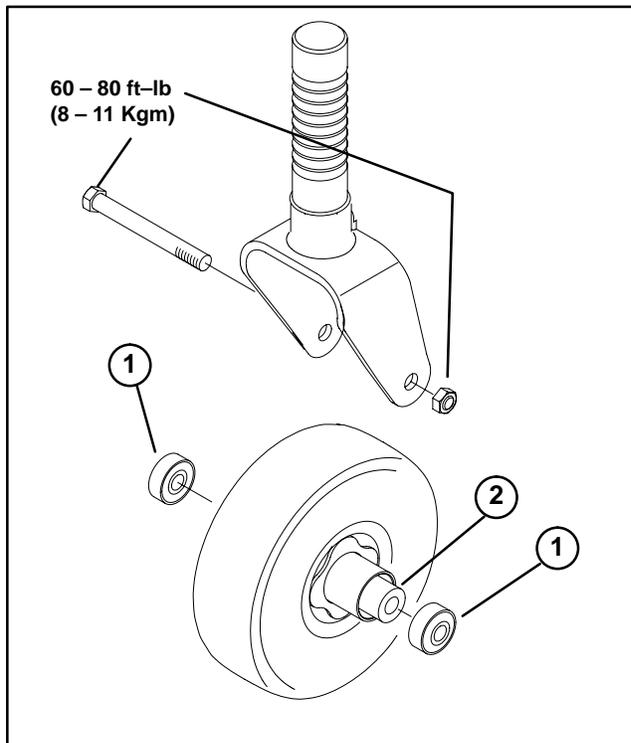


Figure 23

1. Bearing
2. Spacer

Cutter Blade Removal

The blade must be replaced if a solid object is hit, the blade is out-of-balance or if the blade is bent. Always use genuine TORO replacement blades to be sure of safety and optimum performance. Never use replacement blades made by other manufacturers because they could be dangerous.

1. Raise cutting unit to highest position, shut the engine off and engage the parking brake.
2. Remove hair pin cotters and clevis pins securing height-of-cut chains to rear of deck.
3. Rotate front of deck upward and insert latch rod into front hole (service position) in latch plate.
4. Grasp end of blade using a rag or thickly padded glove. Remove blade bolt, anti-scalp cup and blade from spindle shaft.
5. Install blade-sail facing (up) toward cutting unit—with anti-scalp cup and blade bolt. Tighten blade bolt to 85–110 ft-lb (12 – 15 Kgm).

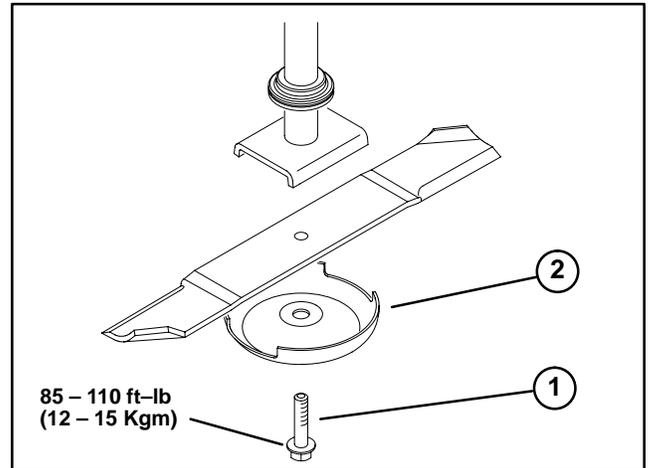


Figure 24

1. Blade bolt
2. Anti-Scalp Cup



WARNING

Do not try to straighten a blade that is bent, and never weld a broken or cracked blade. Always use a new blade to assure continued safety certification of the product.

Inspecting and Sharpening Blade

1. Raise cutting unit to highest position, shut the engine off and engage the parking brake.
2. Remove hair pin cotters and clevis pins securing height-of-cut chains to rear of deck.
3. Rotate front of deck upward and insert latch rod into front hole (service position) in latch plate.
4. Examine cutting ends of the blade carefully, especially where the flat and curved parts of the blade meet (Fig. 25-A). Since sand and abrasive material can wear away the metal that connects the flat and curved parts of the blade, check the blade before using the machine. If wear is noticed (Fig. 25-B), replace the blade: refer to Removing Cutter Blade.

**DANGER**

If blade is allowed to wear, a slot will form between the sail and flat part of the blade (Fig. 25-C). Eventually a piece of the blade may break off and be thrown from under the housing, possibly resulting in serious injury to yourself or bystander.

5. Inspect cutting edges of all blades. Sharpen the cutting edges if they are dull or nicked. Sharpen only the top of the cutting edge and maintain the original cutting angle for best performance (Fig. 26). Make sure blade is balanced after sharpening.
6. To check blade for being straight and parallel, lay blade on a level surface and check its ends. Ends of blade must be slightly lower than the center, and cutting edge must be lower than the heel of the blade. This blade will produce good quality of cut and require minimal power from the engine. By contrast a blade that is higher at the ends than the center, or if cutting edge is higher than the heel, the blade is bent or warped and must be replaced.
7. Install blade—sail facing (up) toward cutting unit—with anti-scalp cup and blade bolt. Tighten blade bolt to 85–110 ft-lb (12 – 15 Kgm).

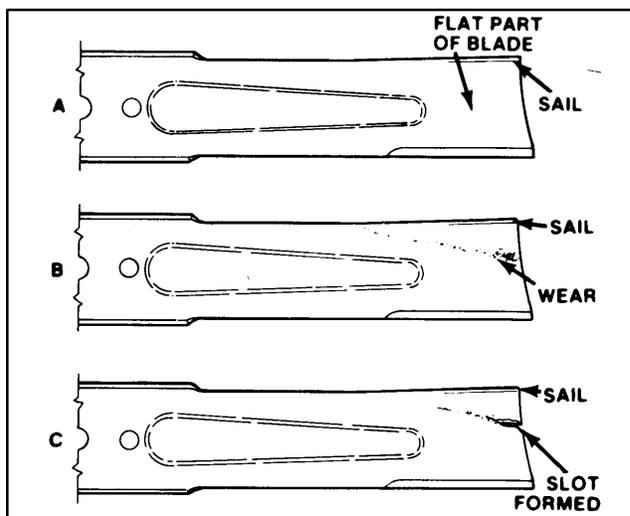


Figure 25

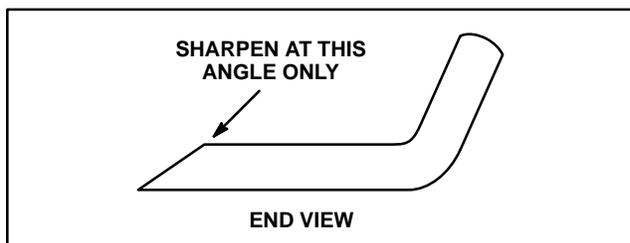


Figure 26

Blade Spindle Service

Removing Spindle Housing Assembly

1. Lower the cutting unit, shut the engine off and engage the parking brake.
2. Remove deck covers from top of cutting unit. Release belt tension. Remove belt from spindle to be serviced.
3. Start the engine and raise the cutting unit. Turn the engine OFF and remove the key from the key switch. Block up the cutting unit so it cannot fall accidentally.
4. Remove blade screw, flat washer, anti-scalp cup and blade from spindle assembly.
5. Remove flange nuts and carriage bolts securing spindle housing to deck. Slide spindle housing assembly out the bottom of the cutting unit.

Disassembly

1. Remove lock nut retaining the spindle pulley on spindle shaft. Slide pulley off of shaft.
2. Press the spindle shaft out of the spindle housing using an arbor press. The bearing spacer remains on the spindle shaft as the shaft is being removed.
3. Remove seals from spindle housing.
4. Allow the bearings and small thick spacer to fall out of the spindle housing.
5. Using a punch and hammer, drive both of the bearing cups out of the spindle housing. Also drive the large spacer out of the housing.
6. A large snap ring is still inside the spindle housing and it should remain there because it cannot be easily removed.

IMPORTANT: If new bearings will be installed into a used spindle housing that has the original snap ring installed, discard the large snap ring that came with the bearings because it is not needed. However, new bearings with their matched spacer and snap ring must always be installed when the spindle housing is being replaced. Replacement bearings are sold only with a matched snap ring and spacer set. These parts cannot be purchased separately.

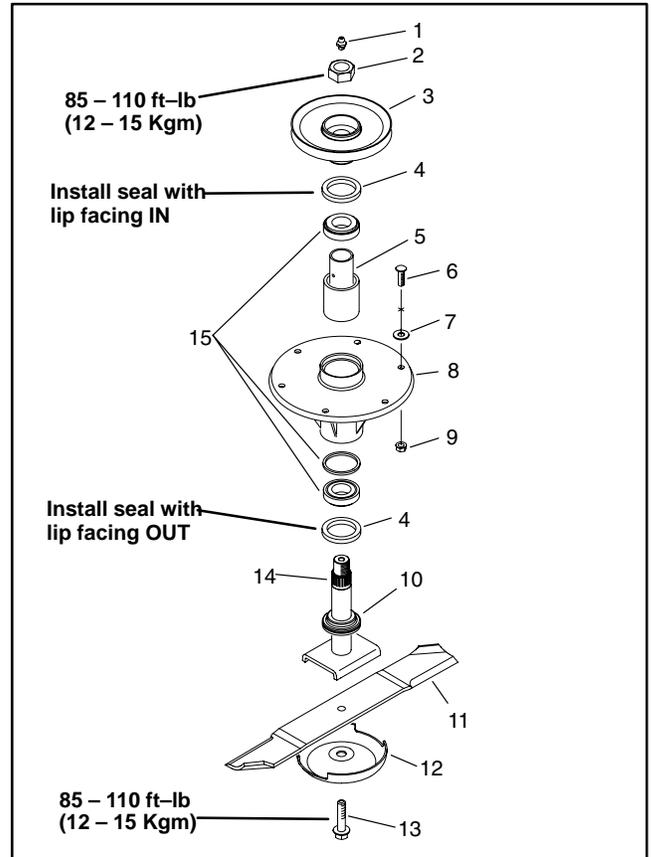


Figure 27

- | | |
|--------------------------|--|
| 1. Grease fitting | 9. Nut |
| 2. Lock nut | 10. Spacer |
| 3. Pulley | 11. Blade |
| 4. Oil seal | 12. Anti-scalp cup |
| 5. Spacers – matched set | 13. Blade screw |
| 6. Screw | 14. Spindle bearing |
| 7. Flat washer | 15. Spindle bearing assy (includes item 5) |
| 8. Spindle housing | |

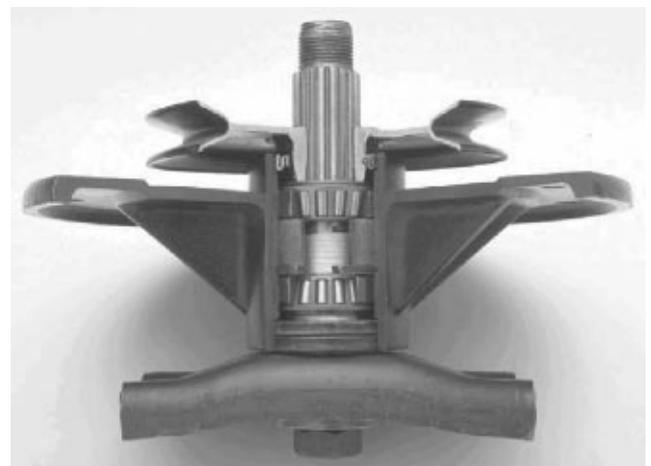


Figure 28

Installing Spindle, Bearings and Seals Into Spindle Housing

IMPORTANT: If a new spindle housing is being used, new bearings and matched snap ring set must be installed; see step 1 below. Never use old bearings, spacer, and snap ring with a new spindle housing. If installing bearings into a used spindle housing that still has a snap ring installed, use only new bearings with cups and spacer – not the large snap ring because it is not required; see step 2 below.

1. Install large snap ring into groove in bore of spindle housing. Make sure snap ring is seated in groove.

2. Using an arbor press, push large spacer into top of spindle housing; tightly against snap ring. The spacer must contact the snap ring to be sure of the correct assembly of the parts.

3. Thoroughly oil the bearing cups. Use an arbor press to push the bearing cups into the top and bottom of the spindle housing. The top bearing cup must contact the spacer that was installed in step 2, and the bottom bearing cup must contact the snap ring. Make that the assembly is correct by supporting the first cup and pressing the second against it.

4. Apply a film of grease on lips of both seals. Pack the bearing cones with grease.

5. Install bearing and seal into bottom of spindle housing. **BOTTOM SEAL MUST HAVE THE LIP FACING OUT.**

6. Check the spindle shaft to make sure it is free of burrs and nicks that could possibly cut the seals. Thoroughly lubricate both the shaft and seal lips.

7. Slide small, thick spacer into spindle housing, then install bearing and seal into top of spindle housing. **LIP OF UPPER SEAL MUST FACE IN.**

8. Slide bearing spacer onto spindle shaft. Carefully slide spindle shaft through spindle housing. The bottom seal and bearing spacer fit together when the spindle is installed.

9. Attach a hand grease gun to grease fitting and fill cavity with grease until grease starts to come out of lower seal. **NOTE: Pneumatic grease guns can cause air pockets when filling large cavities with grease.**

10. Push pulley onto splines of spindle shaft and retain the parts together with the large flat washer and nut. Tighten the nut to 85 – 110 ft–lb (12 – 15 Kgm). Rotate

the spindle shaft to be sure that the shaft rotates freely.

11. Slide pulley end of spindle assembly through hole in cutting unit. Mount the spindle assembly in place with the carriage bolts and flange nuts.

12. Install the belt and adjust belt tension.

13. Reinstall the belt covers.

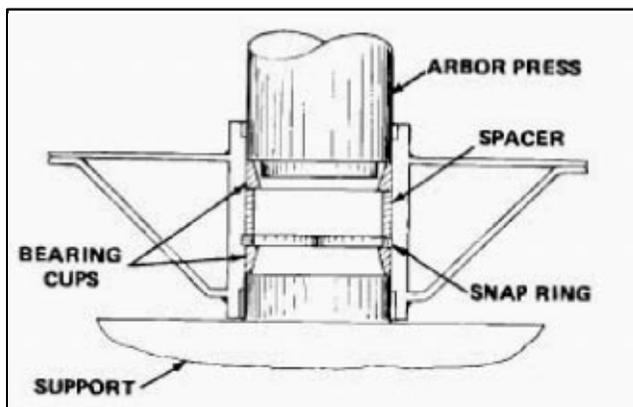


Figure 29

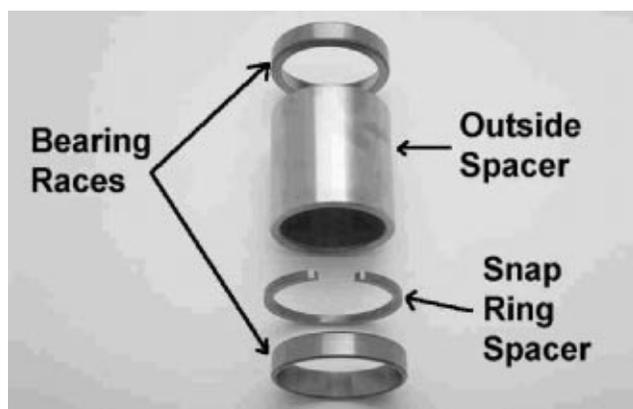


Figure 30

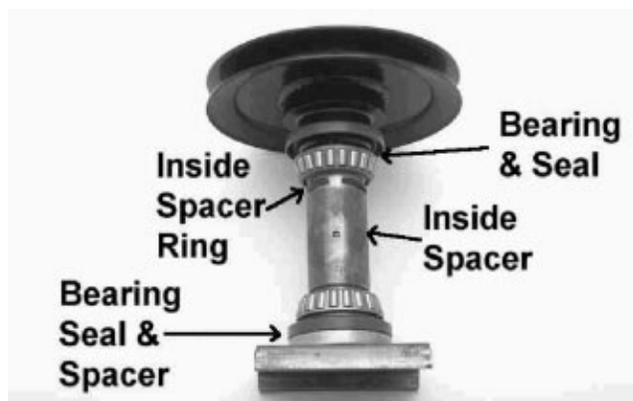


Figure 31

Correcting Cutting Unit Mismatch

If there is mismatch between the blades, the grass will appear streaked when it is cut. This problem can be corrected by making sure the blades are straight and all blades are cutting on the same plane.

1. Using a 3 foot (1 m) long carpenters level, find a level surface on the shop floor.
2. Raise height-of-cut to the highest position: refer to Adjusting Height-Of-Cut.
3. Lower cutting unit onto flat surface. Remove covers from top of cutting unit.
4. Unhook spring from idler arm bracket to release belt tension.
5. Rotate blades until the ends face forward and backward. Measure from floor to front tip of cutting edge and remember this dimension. Then rotate same blade so opposite end is forward and measure again. The difference between dimensions must not exceed 1/8 of an inch (3 mm). If dimension exceeds 1/8 of an inch (3 mm), replace the blade because it is bent. Make sure to measure all blades.

6. Compare measurements of outer blades with the center blade. Center blade must not be more than 3/8 of an inch lower than the outer blades. If center blade is more than 3/8 of an inch (9 mm) lower than the outer blades, proceed to step 7 and add shims between spindle housing and bottom of cutting unit.

7. Remove capscrews, flatwashers, lockwashers and nuts from outer spindle in the area where shims must be added. To raise or lower the blade, add a shim, Part No. 3256-24, between spindle housing and bottom of cutting unit. Continue to check alignment of blades and add shims until tips of blades are within the required dimension.

IMPORTANT: Do not use more than three shims at any one hole location. Use decreasing numbers of shims in adjacent holes if more than one shim is added to any one hole location.

8. Hook spring onto idler arm bracket. Reinstall belt covers.

If there is mismatch between the blades, the grass will appear streaked when it is cut. This problem can be corrected by making sure the blades are straight and all blades are cutting on the same plane.

Gearbox

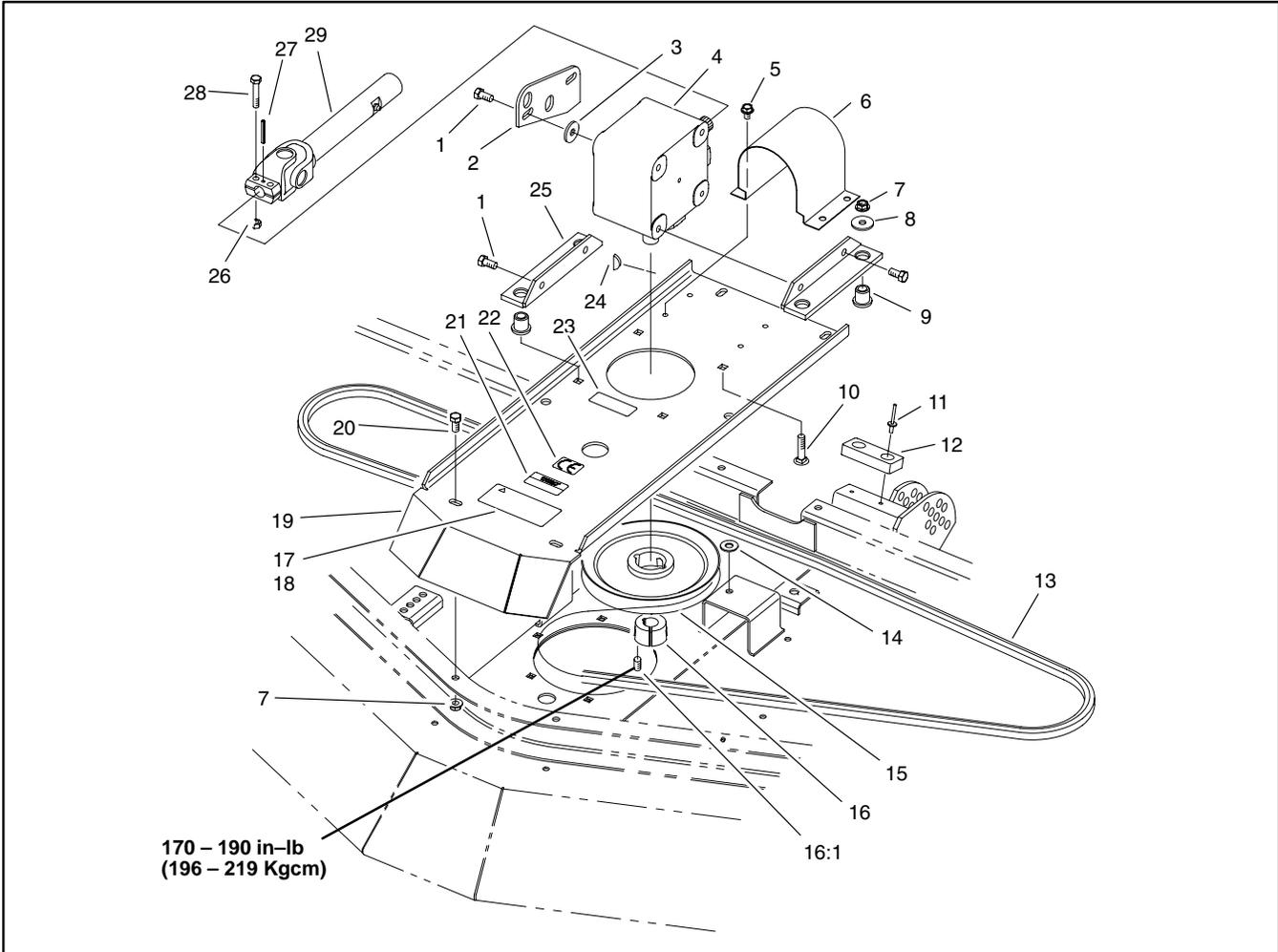


Figure 32

- | | | |
|-----------------|-------------------------------|----------------------|
| 1. Screw | 11. Rivet | 20. Screw |
| 2. Latch plate | 12. Rubber bumper | 21. Safety decal |
| 3. Flat washer | 13. Belt | 22. CE decal |
| 4. Gear box | 14. Flat washer | 23. Lube decal |
| 5. Screw | 15. Gear box pulley | 24. Woodruff key |
| 6. Shield | 16. Taper lock bushing | 25. Gear box bracket |
| 7. Nut | 16:1. Screw | 26. Lock nut |
| 8. Flat washer | 17. Torque decal | 27. Roll pin |
| 9. Rubber mount | 18. Blade bolt decal (Europe) | 28. Screw |
| 10. Screw | 19. Gearbox mount | 29. Drive shaft |

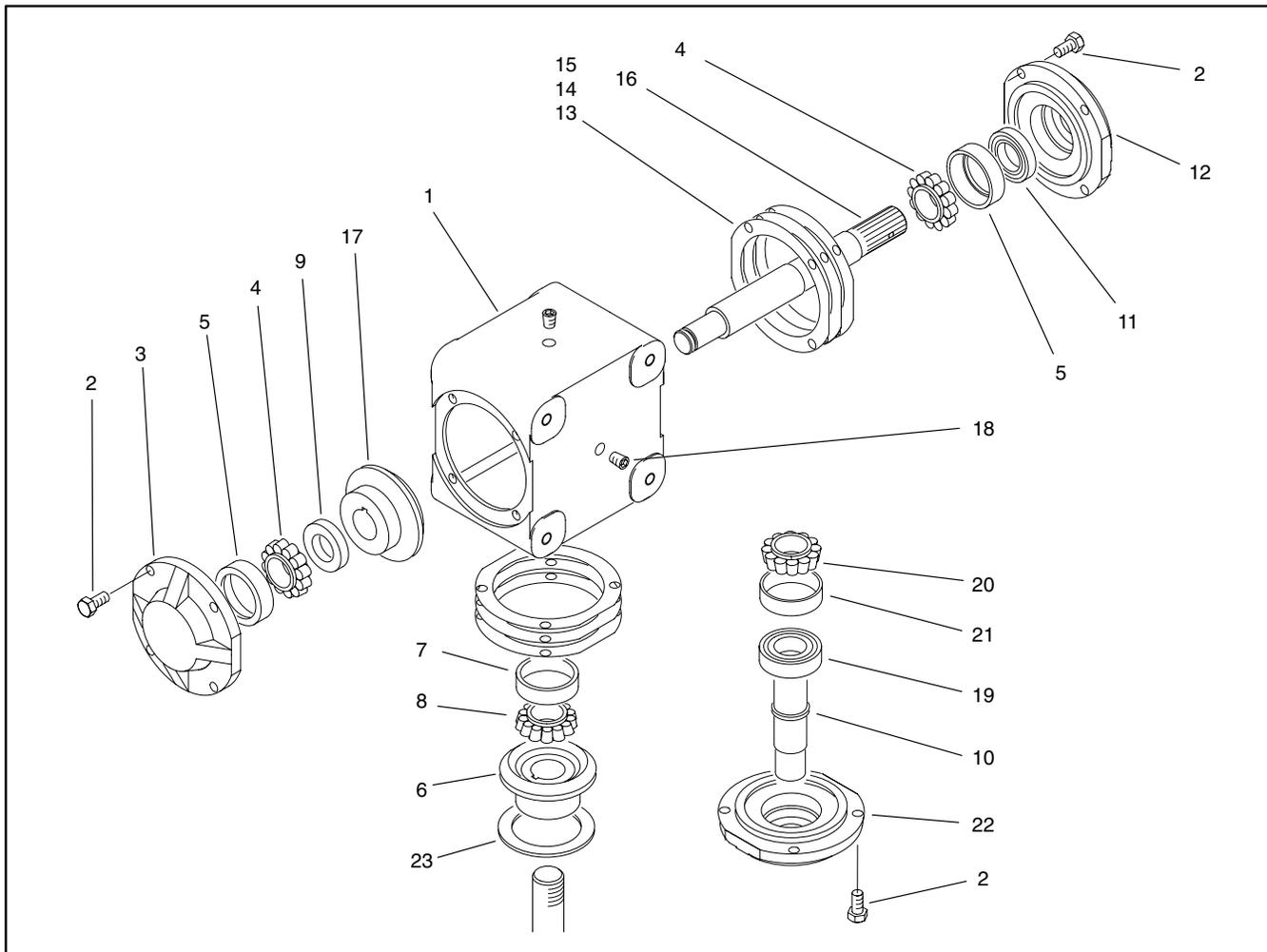


Figure 33

- | | | |
|-----------------|-------------------|------------------|
| 1. Housing | 9. Spacer | 17. L.H. gear |
| 2. Capscrew | 10. Lower shaft | 18. Plug |
| 3. Cap | 11. Upper seal | 19. Lower seal |
| 4. Bearing cone | 12. Cap | 20. Bearing cone |
| 5. Bearing cup | 13. Gasket (.015) | 21. Bearing cup |
| 6. R.H. gear | 14. Gasket (.005) | 22. Cap |
| 7. Bearing cup | 15. Gasket (.003) | 23. Washer |
| 8. Bearing cone | 16. Upper shaft | |

Shaft End Play Adjustment

The lower shaft (Fig. 28, Item 10) and upper shaft (16) should have a very small amount of bearing drag. If the shaft turns hard, the cap (12) or (22) must be removed and gaskets (13, 14, or 15) need to be added. If the shaft has no bearing drag, or has end play, the cap must be removed and gaskets taken out. The cap must be adjusted so the shaft has no end play and only a slight amount of bearing drag.

Drive Shaft

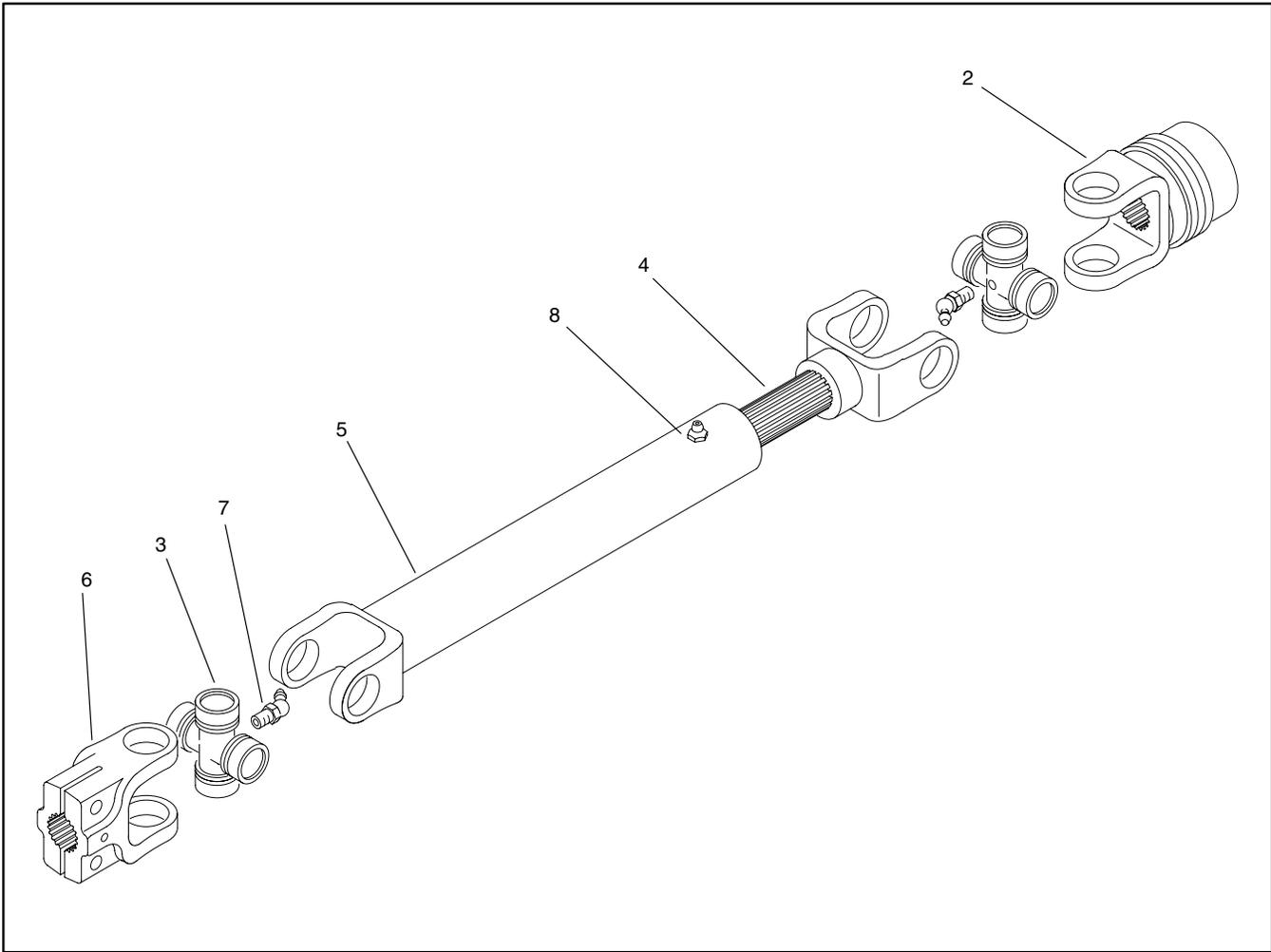


Figure 34

- 2. Yoke
- 3. U-joint kit
- 4. Slip yoke shaft

- 5. Slip yoke tube
- 6. Yoke

- 7. Grease fitting
- 8. Grease fitting

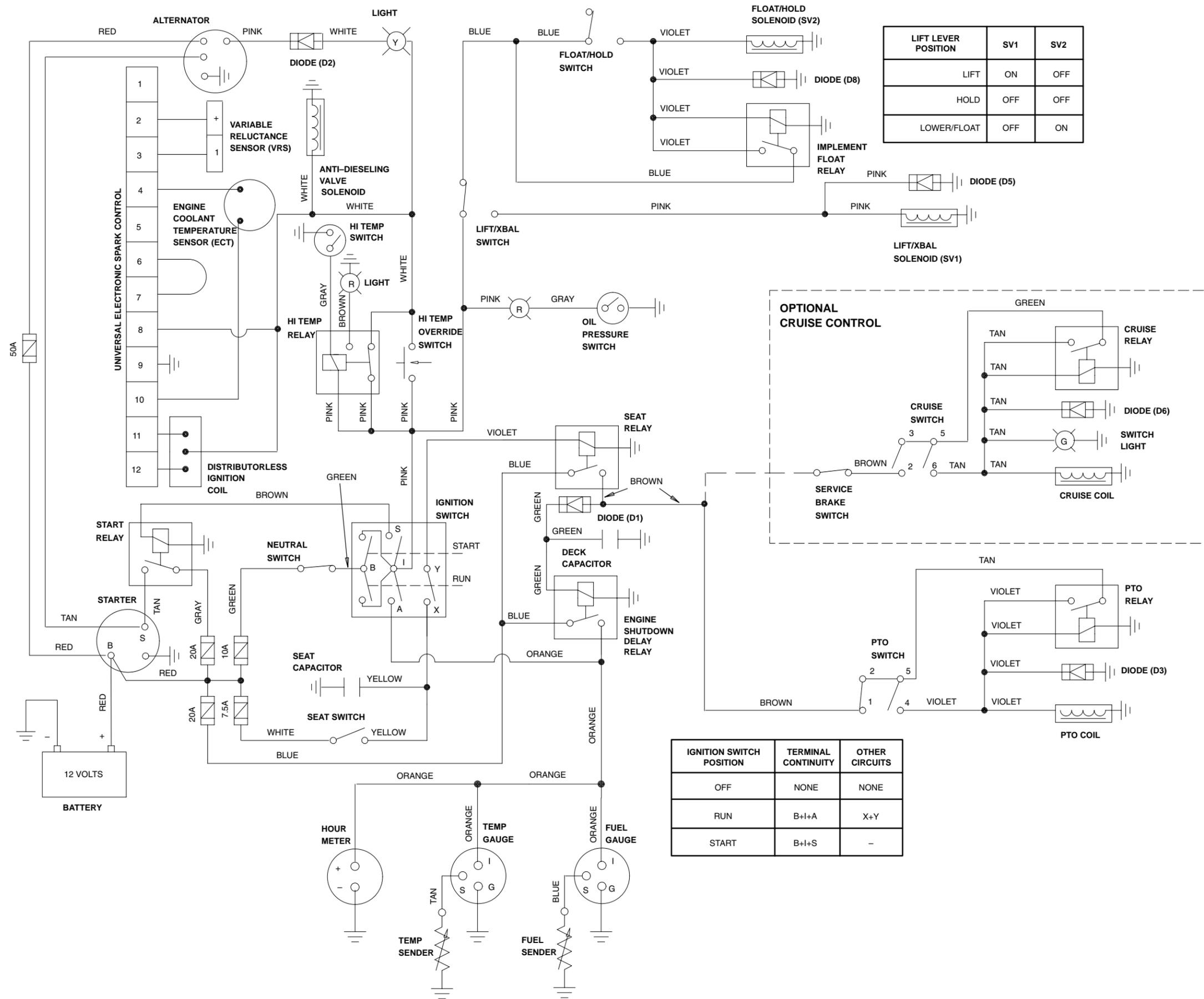


Electrical Diagrams

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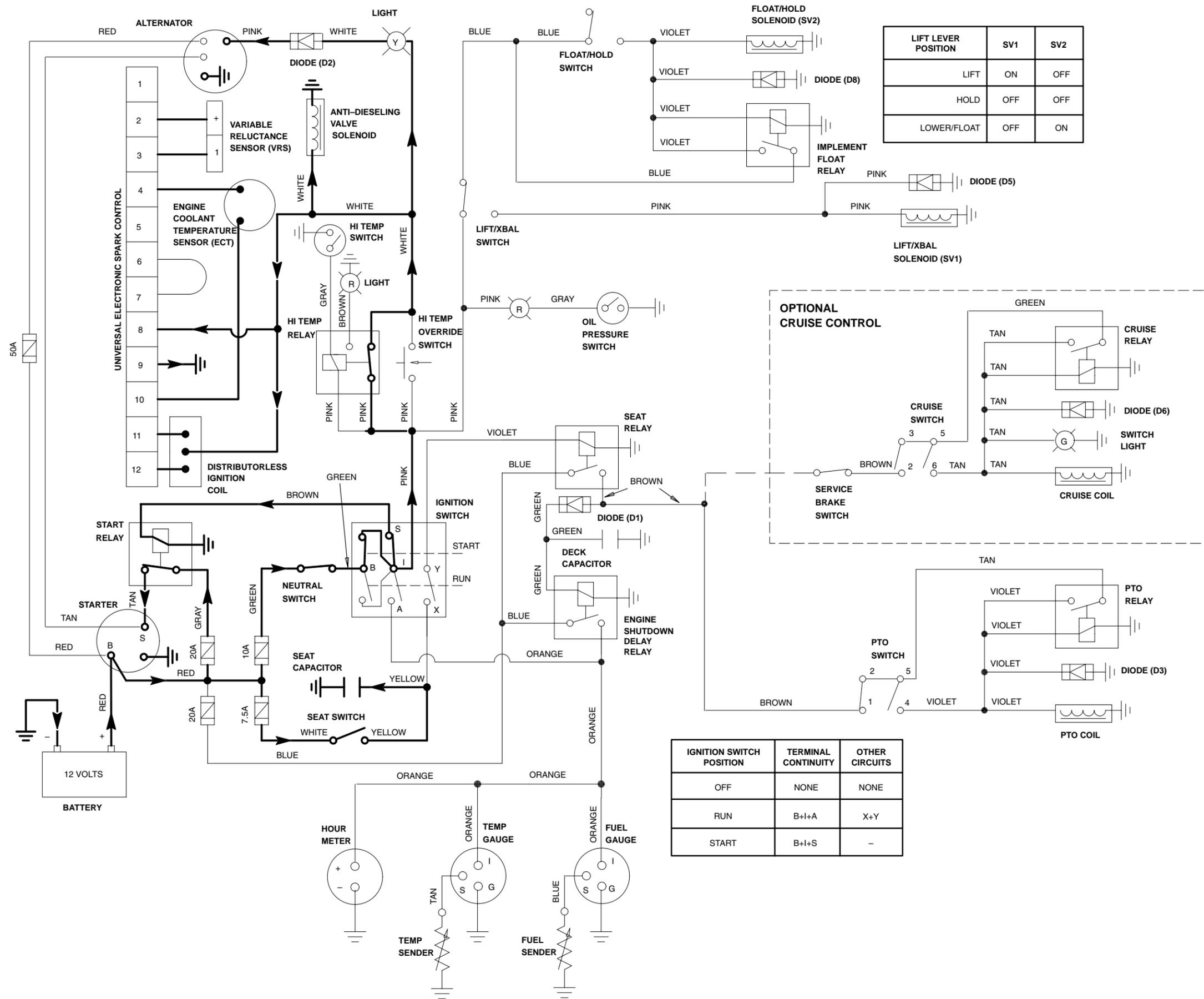
Groundsmaster 3000 Electrical Schematics, Wiring Diagrams, and Harness Drawings	3	Groundsmaster 3000–D Electrical Schematics, Wiring Diagrams, and Harness Drawings	10
Electrical Schematic	3	Electrical Schematic	10
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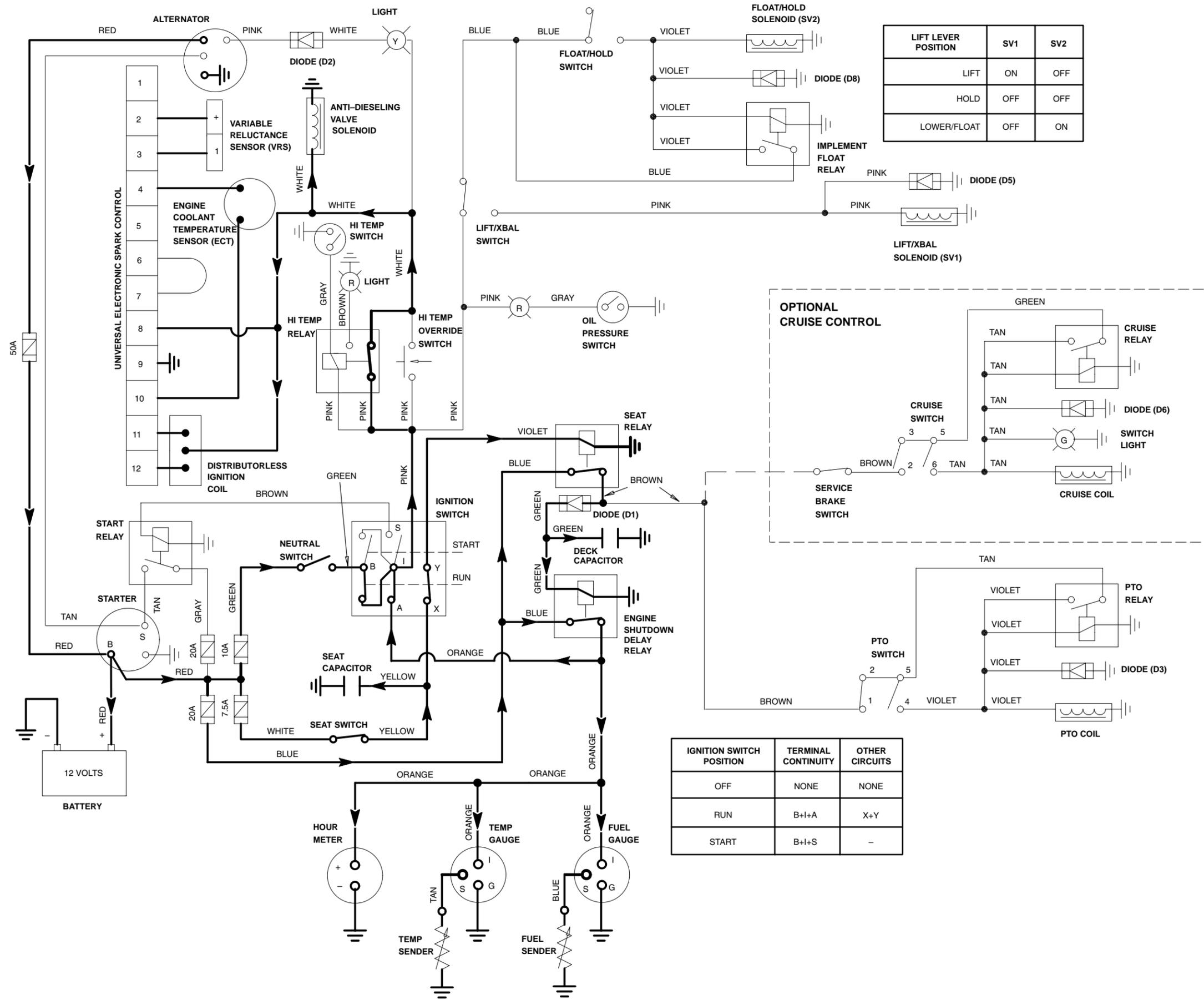
Electrical
Diagrams



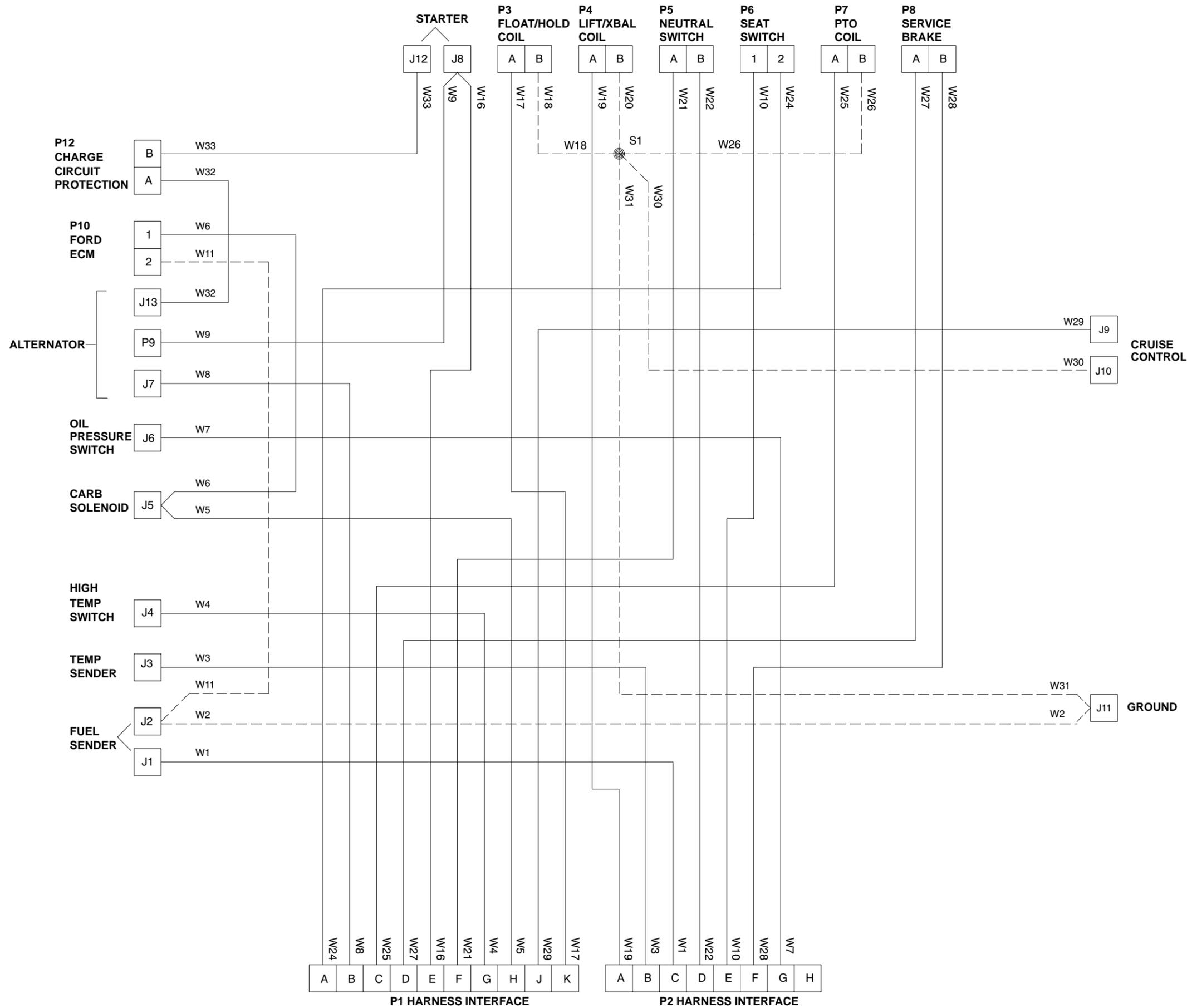
Groundsmaster 3000
Electrical Schematic

All relays and solenoids are shown as de-energized.
All ground wires are black.



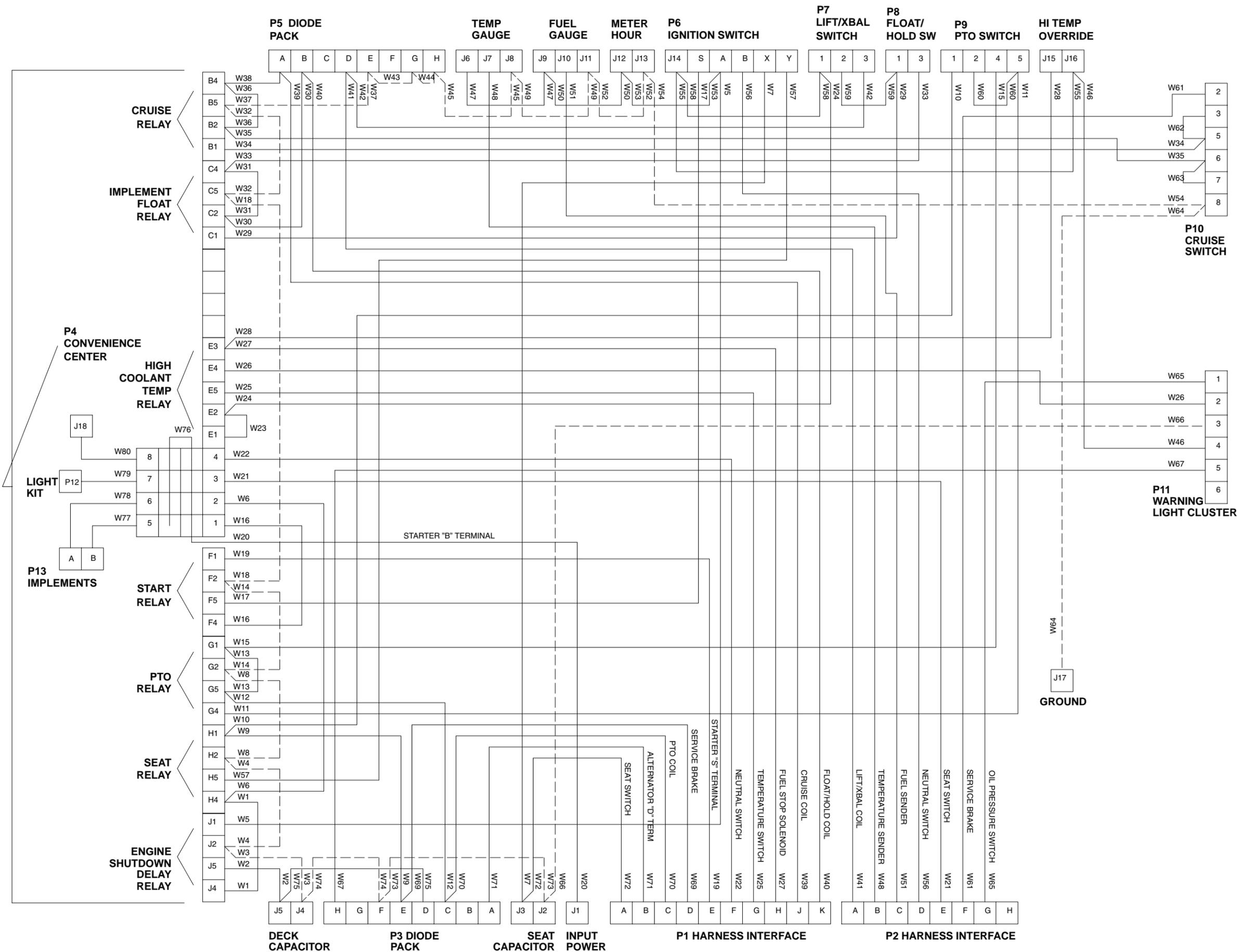


Groundsmaster 3000
Run Circuits
 — Circuit Current
 ➤ Logic Direction
 All ground wires are black.



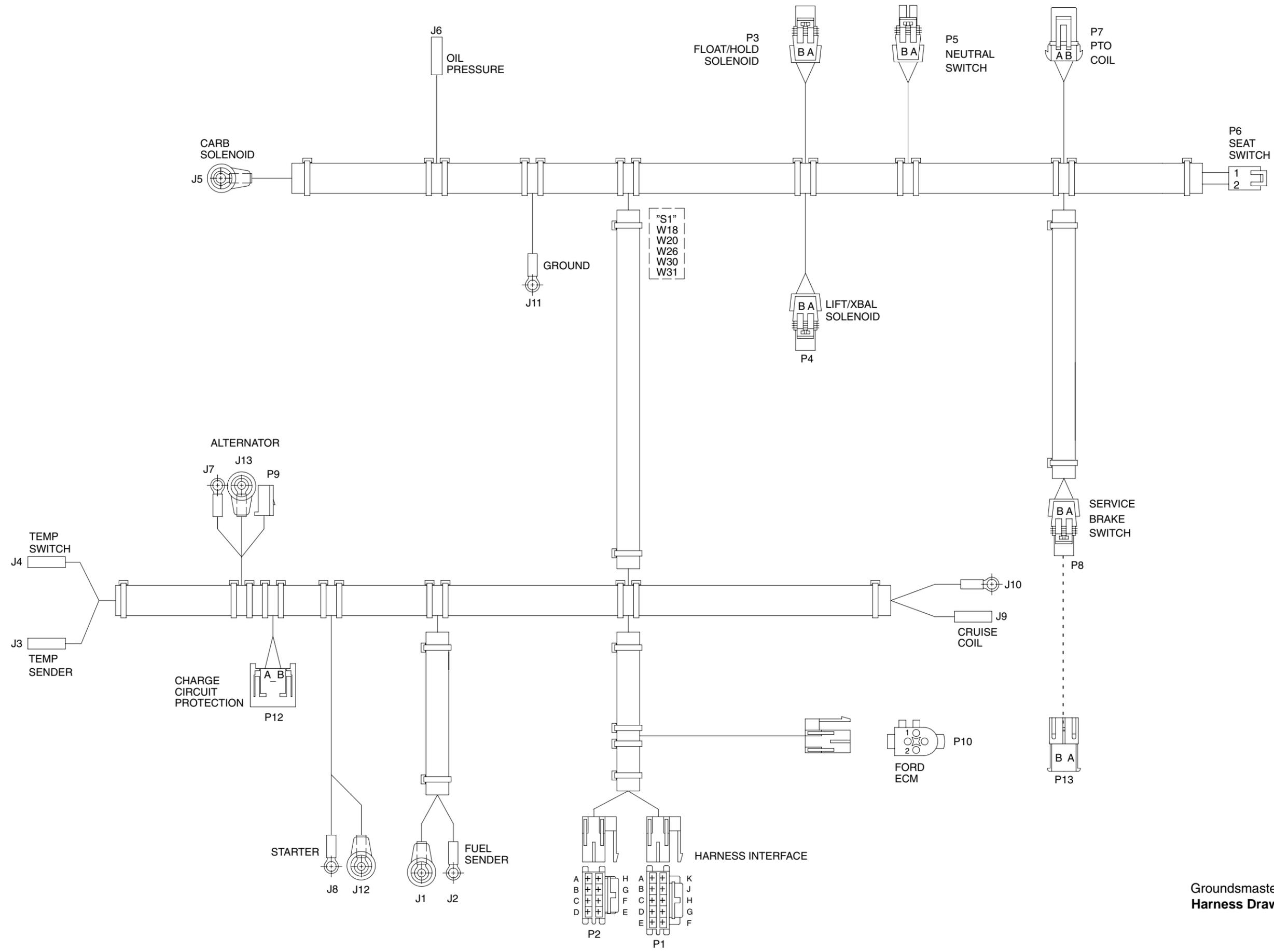
WIRE IDENTIFICATION				
LABEL	COLOR	AWG	TYPE	ROUTE
W1	BLU	18	GPT	J1, P2—C
W2	BLK	16	GPT	J2, J11
W3	TAN	18	GPT	J3, P2—B
W4	GRY	18	GPT	J4, P1—G
W5	WHT	16	GPT	J5, P1—H
W6	WHT	16	GPT	J5, P10—1
W7	GRY	18	GPT	J6, P2—G
W8	PNK	18	GPT	J7, P1—B
W9	TAN	18	GPT	P9, J8
W10	WHT	18	GPT	P6—1, P2—E
W11	BLK	16	GPT	J2, P10—2
W16	TAN	16	GPT	J8, P1—E
W17	VIO	18	GPT	P3—A, P1—K
W18	BLK	18	GPT	P3—B, S1
W19	PNK	18	GPT	P4—A, P2—A
W20	BLK	18	GPT	P4—B, S1
W21	GRN	16	GPT	P5—A, P1—F
W22	GRN	16	GPT	P5—B, P2—D
W24	YEL	18	GPT	P6—2, P1—A
W25	VIO	18	GPT	P7—A, P1—C
W26	BLK	18	GPT	P7—B, S1
W27	BRN	18	GPT	P8—A, P1—D
W28	BRN	18	GPT	P8—B, P2—F
W29	TAN	18	GPT	J9, P1—J
W30	BLK	18	GPT	J10, S1
W31	BLK	14	GPT	J11, S1
W32	RED	10	GPT	J13, P12—A
W33	RED	10	GPT	J12, P12—B

Groundsmaster 3000
Wiring Diagram (Rear Section)

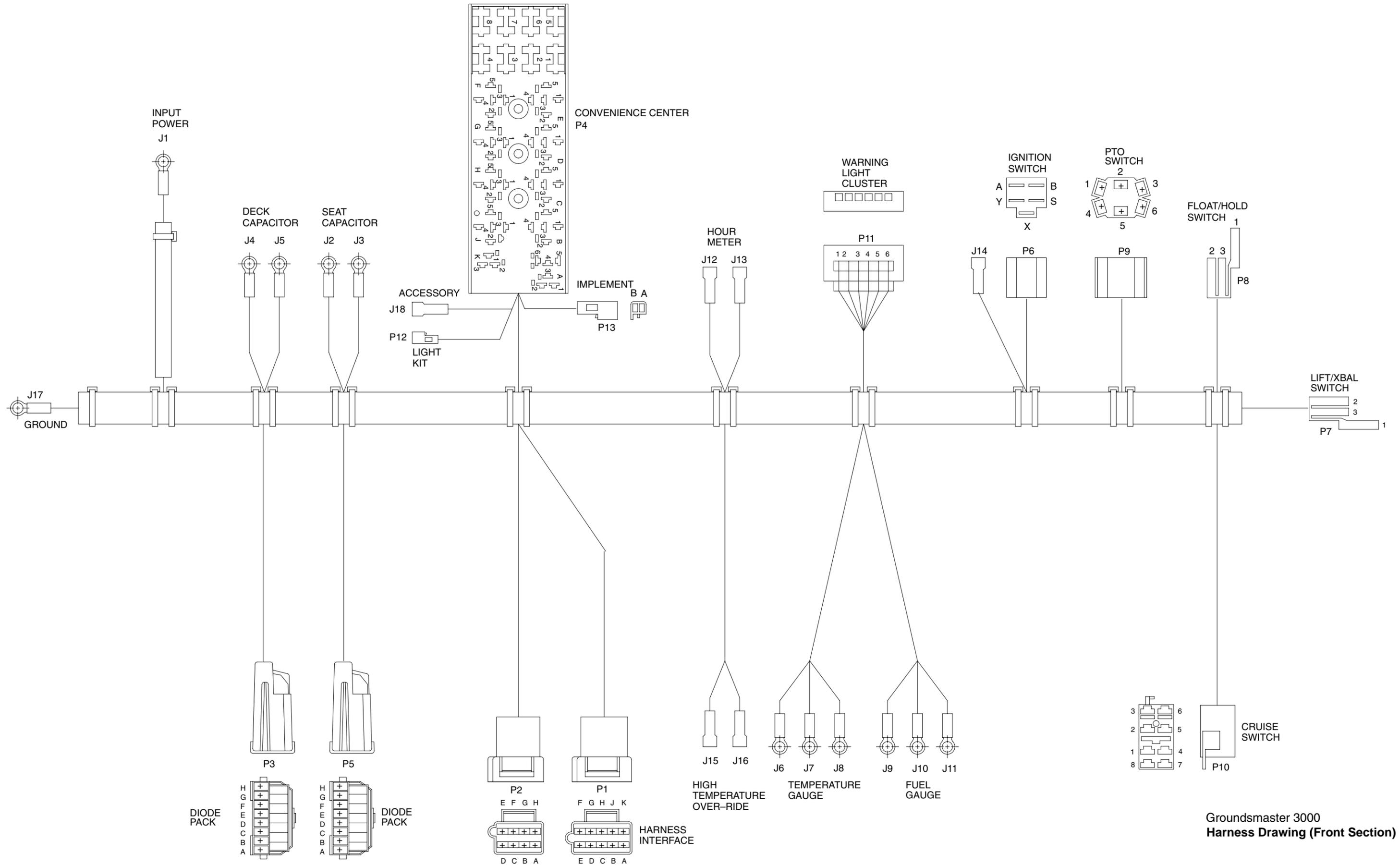


WIRE IDENTIFICATION				
LABEL	COLOR	AWG	TYPE	ROUTE
W1	BLU	16	GPT	P4—J4, P4—H4
W2	GRN	18	GPT	P4—J5, J5
W3	BLK	18	GPT	P4—J2, J4
W4	BLK	18	GPT	P4—J2, P4—H2
W5	ORN	18	GPT	P4—J1, P6—A
W6	BLU	16	GPT	P4—H4, P4—2
W7	YEL	18	GPT	P6—X, J3
W8	BLK	18	GPT	P4—H2, P4—G2
W9	BRN	18	GPT	P4—H1, P3—E
W10	BRN	18	GPT	P4—H1, P9—1
W11	TAN	18	GPT	P4—G4, P9—5
W12	VIO	18	GPT	P4—G5, P3—C
W13	VIO	18	GPT	P4—G5, P4—G1
W14	BLK	18	GPT	P4—G2, P4—F2
W15	VIO	18	GPT	P4—G1, P9—4
W16	GRY	16	GPT	P4—F4, P4—1
W17	BRN	18	GPT	P4—F5, P6—S
W18	BLK	18	GPT	P4—F2, P4—C5
W19	TAN	16	GPT	P4—F1, P1—E
W20	RED	10	GPT	P4—1234, J1
W21	WHT	18	GPT	P4—3, P2—E
W22	GRN	16	GPT	P4—4, P1—F
W23	PNK	18	GPT	P4—E1, P4—E2
W24	PNK	18	GPT	P4—E2, P7—1
W25	GRY	18	GPT	P4—E5, P1—G
W26	BRN	18	GPT	P4—E4, P11—2
W27	WHT	18	GPT	P4—E3, P1—H
W28	WHT	18	GPT	P4—E3, J15
W29	BLU	18	GPT	P4—C1, P8—1
W30	VIO	18	GPT	P4—C2, P5—B
W31	VIO	18	GPT	P4—C2, P4—C4
W32	BLK	18	GPT	P4—C5, P4—B5
W33	VIO	18	GPT	P4—C4, P8—3
W34	GRN	18	GPT	P4—B1, P10—5
W35	TAN	18	GPT	P4—B2, P10—6
W36	TAN	18	GPT	P4—B2, P4—B4
W37	BLK	18	GPT	P4—B5, P5—E
W38	TAN	18	GPT	P4—B4, P5—A
W39	TAN	18	GPT	P5—A, P1—J
W40	VIO	18	GPT	P5—B, P1—K
W41	PNK	18	GPT	P5—D, P2—A
W42	PNK	18	GPT	P5—D, P7—3
W43	BLK	18	GPT	P5—E, P5—G
W44	BLK	18	GPT	P5—G, P5—H
W45	BLK	18	GPT	P5—H, J8
W46	PNK	18	GPT	J16, P11—4
W47	ORN	18	GPT	J6, J9
W48	TAN	18	GPT	J7, P2—B
W49	BLK	18	GPT	J8, J11
W50	ORN	18	GPT	J9, J12
W51	BLU	18	GPT	J10, P2—C
W52	BLK	18	GPT	J11, J13
W53	ORN	18	GPT	J12, P6—A
W54	BLK	18	GPT	J13, P10—8
W55	PNK	18	GPT	J14, J16
W56	GRN	16	GPT	P6—B, P2—D
W57	VIO	18	GPT	P6—Y, P4—H5
W58	PNK	18	GPT	J14, P7—1
W59	BLU	18	GPT	P7—2, P8—1
W60	TAN	18	GPT	P9—2, P9—5
W61	BRN	18	GPT	P10—2, P2—F
W62	GRN	18	GPT	P10—3, P10—5
W63	TAN	18	GPT	P10—6, P10—7
W64	BLK	16	GPT	P10—8, J17
W65	GRY	18	GPT	P11—1, P2—G
W66	BLK	18	GPT	P11—3, J2
W67	WHT	18	GPT	P11—5, P3—H
W69	BRN	18	GPT	P1—D, P3—E
W70	VIO	18	GPT	P1—C, P3—C
W71	PNK	18	GPT	P1—B, P3—A
W72	YEL	18	GPT	P1—A, J3
W73	BLK	18	GPT	J2, P3—F
W74	BLK	18	GPT	P3—F, J4
W75	GRN	18	GPT	P3—D, J5
W76	RED	10	GPT	P4—1234, P4—5678
W77	RED	16	GPT	P4—5, P13—B
W78	ORN	16	GPT	P4—6, P13—A
W79	RED	16	GPT	P4—7, P12
W80	RED	16	GPT	P4—8, J18

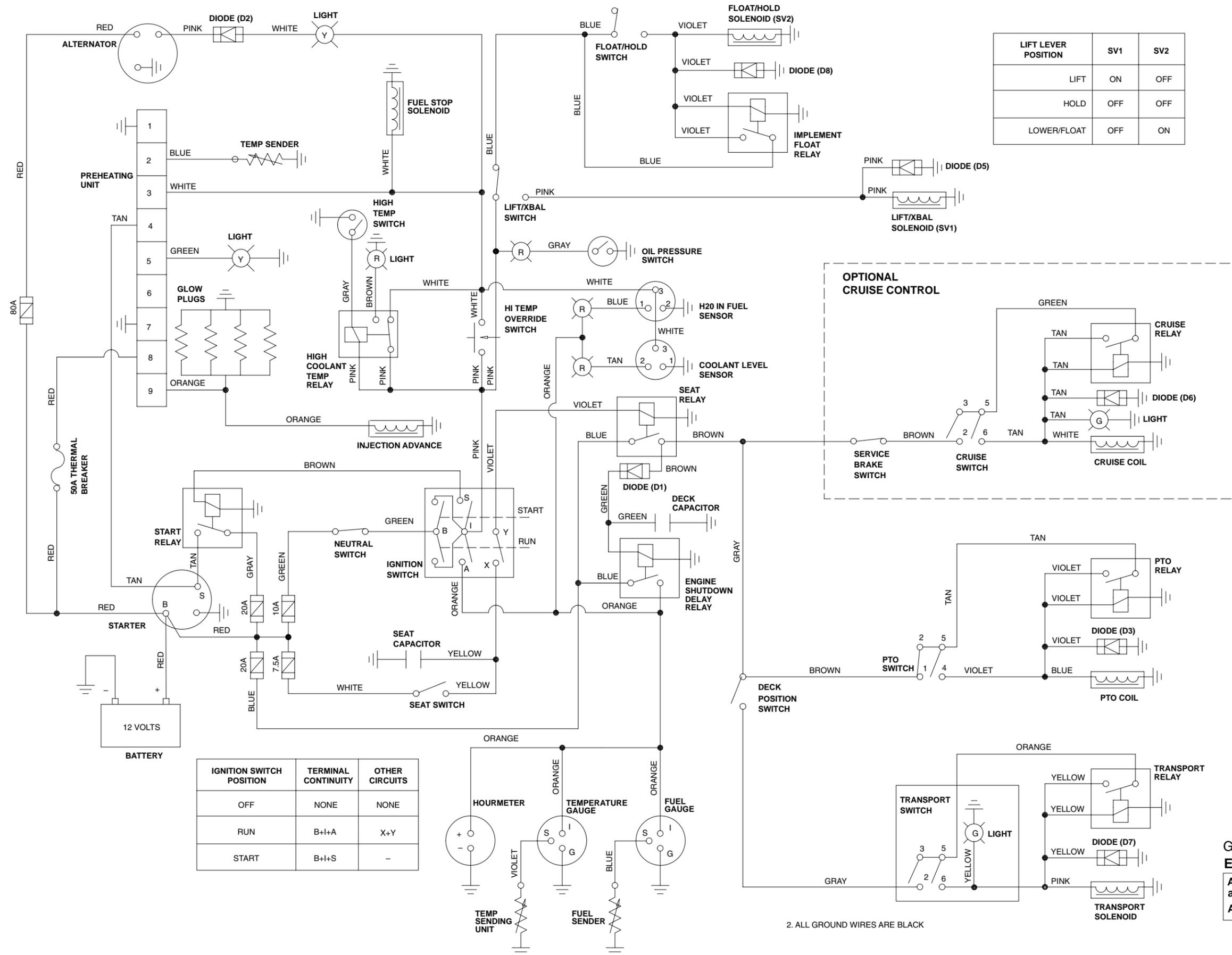
Groundsmaster 3000
Wiring Diagram (Front Section)



Groundsmaster 3000
 Harness Drawing (Rear Section)



Groundsmaster 3000
 Harness Drawing (Front Section)

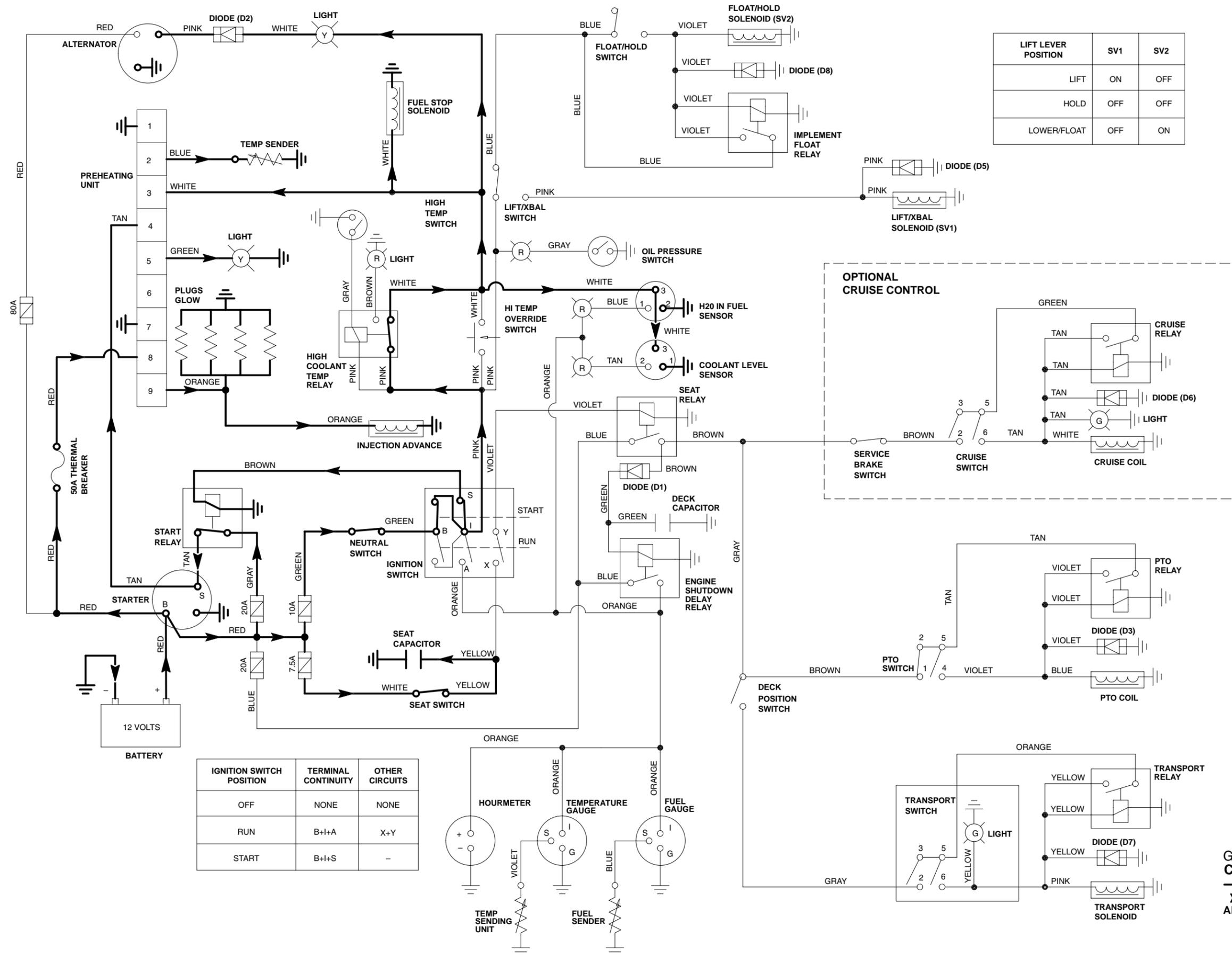


LIFT LEVER POSITION	SV1	SV2
LIFT	ON	OFF
HOLD	OFF	OFF
LOWER/FLOAT	OFF	ON

IGNITION SWITCH POSITION	TERMINAL CONTINUITY	OTHER CIRCUITS
OFF	NONE	NONE
RUN	B+I+A	X+Y
START	B+I+S	-

**Groundsmaster 3000-D
Electrical Schematic**
All relays and solenoids
are shown as de-energized.
All ground wires are black.

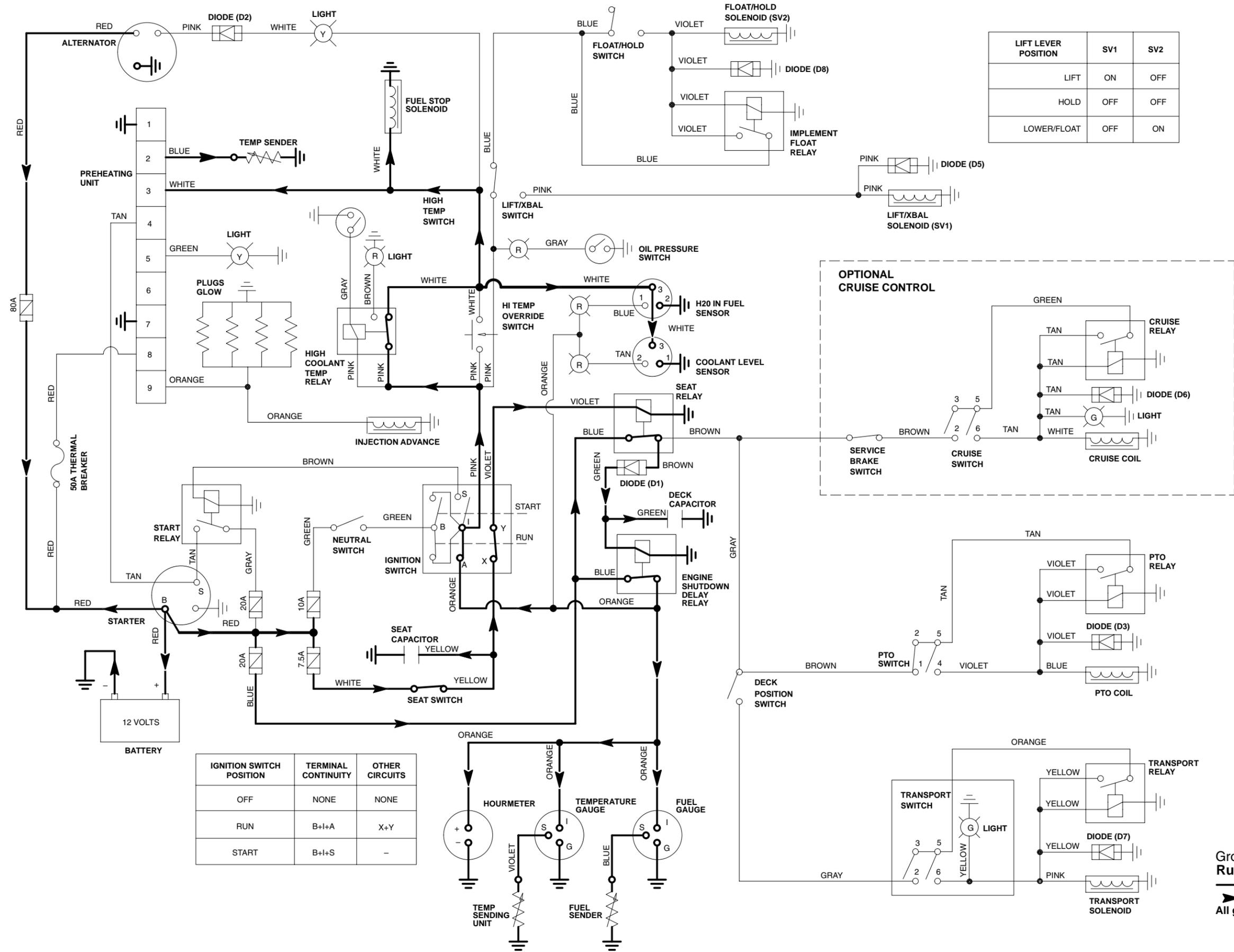
2. ALL GROUND WIRES ARE BLACK



LIFT LEVER POSITION	SV1	SV2
LIFT	ON	OFF
HOLD	OFF	OFF
LOWER/FLOAT	OFF	ON

IGNITION SWITCH POSITION	TERMINAL CONTINUITY	OTHER CIRCUITS
OFF	NONE	NONE
RUN	B+I+A	X+Y
START	B+I+S	-

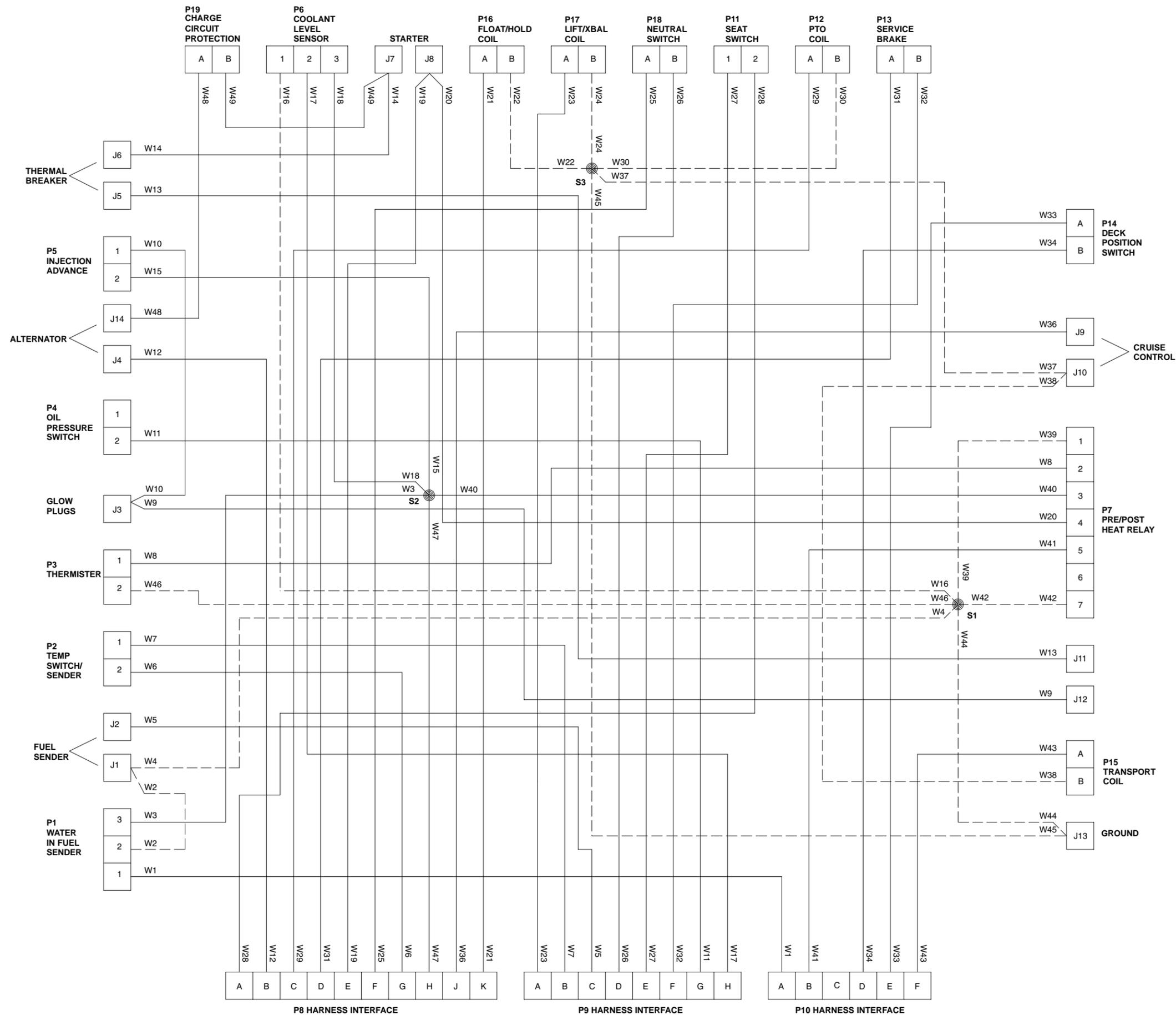
Groundsmaster 3000-D Crank Circuits
 — Circuit Current
 ➤ Logic Direction
 All ground wires are black.



LIFT LEVER POSITION	SV1	SV2
LIFT	ON	OFF
HOLD	OFF	OFF
LOWER/FLOAT	OFF	ON

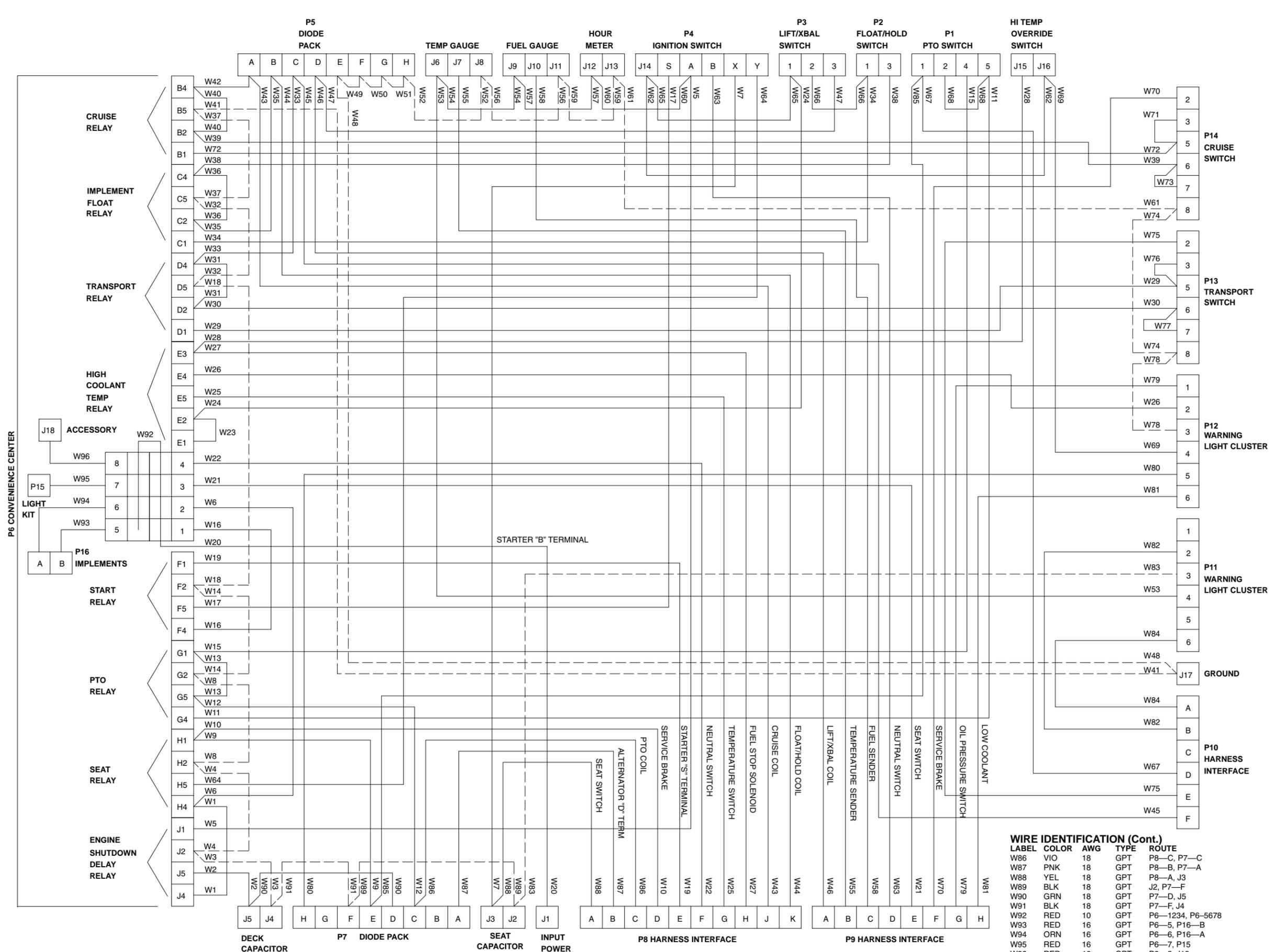
IGNITION SWITCH POSITION	TERMINAL CONTINUITY	OTHER CIRCUITS
OFF	NONE	NONE
RUN	B+I+A	X+Y
START	B+I+S	-

Groundmaster 3000-D
Run Circuits
 — Circuit Current
 ► Logic Direction
 All ground wires are black.



WIRE IDENTIFICATION				
LABEL	COLOR	AWG	TYPE	ROUTE
W1	BLU	18	GPT	P1-1, P10-A
W2	BLK	18	GPT	P1-2, J1
W3	WHT	18	GPT	P1-3, S2
W4	BLK	18	GPT	J1, S1
W5	BLU	18	GPT	J2, P9-C
W6	GRY	18	GPT	P2-2, P8-G
W7	VIO	18	GPT	P2-1, P9-B
W8	BLU	18	GPT	P3-1, P7-2
W9	ORN	8	GPT	J3, J12
W10	ORN	16	GPT	J3, P5-1
W11	GRY	18	GPT	P4-2, P9-G
W12	PNK	18	GPT	J4, P8-B
W13	RED	8	GPT	J5, J11
W14	RED	8	GPT	J6, J7
W15	WHT	16	GPT	P5-2, S2
W16	BLK	18	GPT	P6-1, S1
W17	TAN	18	GPT	P6-2, P9-H
W18	WHT	18	GPT	P6-3, S2
W19	TAN	16	GPT	J8, P8-E
W20	TAN	18	GPT	J8, P7-4
W21	VIO	18	GPT	P16-A, P8-K
W22	BLK	18	GPT	P16-B, S3
W23	PNK	18	GPT	P17-A, P9-A
W24	BLK	18	GPT	P17-B, S3
W25	GRN	16	GPT	P18-A, P8-F
W26	GRN	16	GPT	P18-B, P9-D
W27	WHT	18	GPT	P11-1, P9-E
W28	YEL	18	GPT	P11-2, P8-A
W29	BLU	18	GPT	P12-A, P8-C
W30	BLK	18	GPT	P12-B, S3
W31	BRN	18	GPT	P13-A, P8-D
W32	BRN	18	GPT	P13-B, P9-F
W33	GRY	18	GPT	P14-A, P10-E
W34	BRN	18	GPT	P14-B, P10-D
W36	WHT	18	GPT	J9, P8-J
W37	BLK	18	GPT	J10, S3
W38	BLK	18	GPT	J10, P15-B
W39	BLK	18	GPT	P7-1, S1
W40	WHT	18	GPT	P7-3, S2
W41	GRN	18	GPT	P7-5, P10-B
W42	BLK	18	GPT	P7-7, S1
W43	PNK	18	GPT	P15-A, P10-F
W44	BLK	14	GPT	J13, S1
W45	BLK	14	GPT	J13, S3
W46	BLK	18	GPT	P3-2, S1
W47	WHT	16	GPT	S2, P8-H
W48	RED	10	GPT	J14, P19-A
W49	RED	10	GPT	J7, P19-B

Groundsmaster 3000-D
Wiring Diagram (Rear Section)

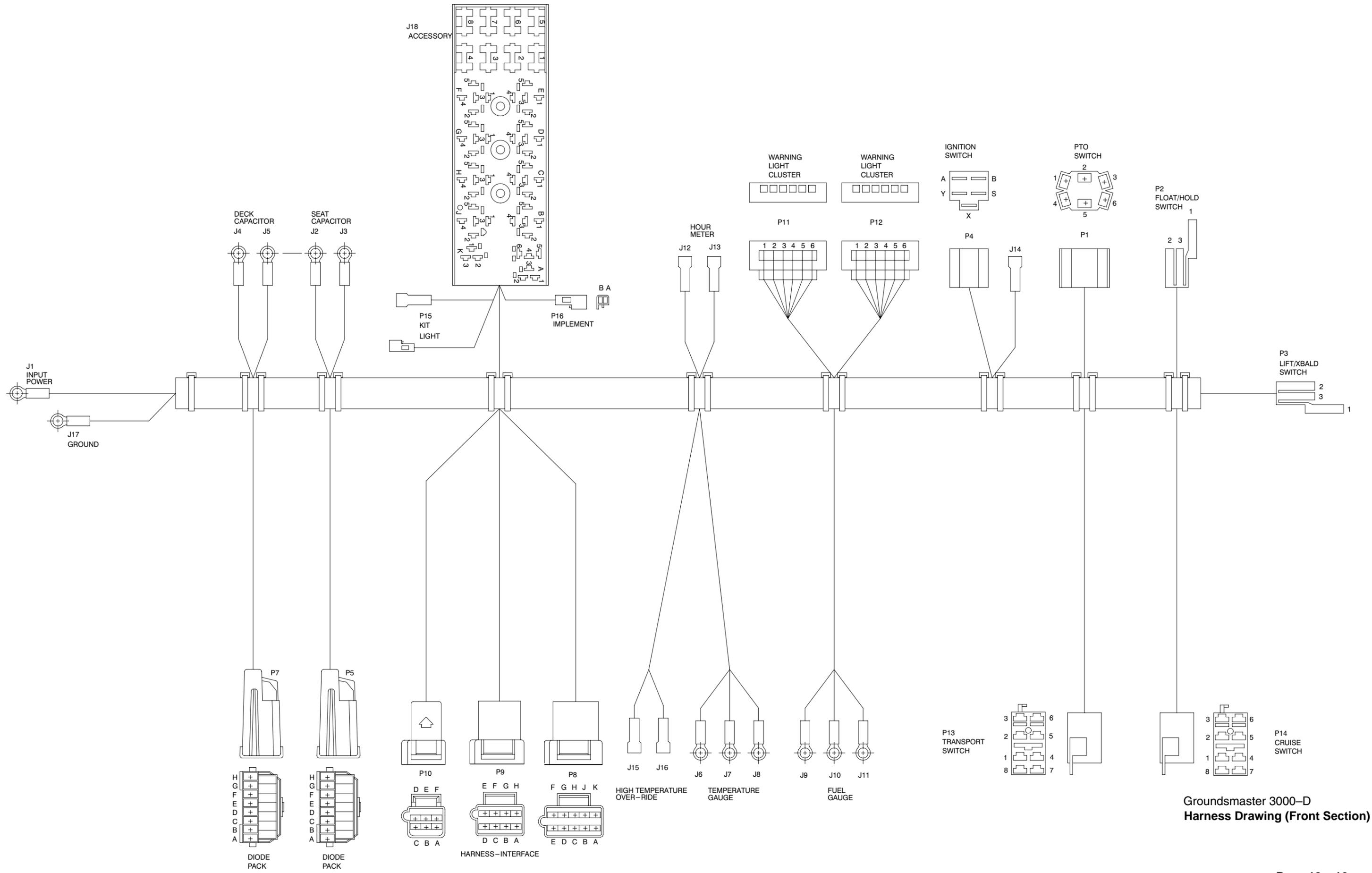


WIRE IDENTIFICATION				
LABEL	COLOR	AWG	TYPE	ROUTE
W1	BLU	16	GPT	P6-J4, P6-H4
W2	GRN	18	GPT	P6-J5, J5
W3	BLK	18	GPT	P6-J2, J4
W4	BLK	18	GPT	P6-J2, P6-H2
W5	ORN	18	GPT	P6-J1, P4-A
W6	BLU	16	GPT	P6-H4, P6-2
W7	YEL	18	GPT	P4-X, J3
W8	BLK	18	GPT	P6-H2, P6-G2
W9	BRN	18	GPT	P6-H1, P7-E
W10	BRN	18	GPT	P6-H1, P8-D
W11	TAN	18	GPT	P6-G4, P1-5
W12	VIO	18	GPT	P6-G5, P7-C
W13	VIO	18	GPT	P6-G5, P6-G1
W14	BLK	18	GPT	P6-G2, P6-F2
W15	VIO	18	GPT	P6-G1, P1-4
W16	GRY	16	GPT	P6-F4, P6-1
W17	BRN	18	GPT	P6-F5, P4-S
W18	BLK	18	GPT	P6-F2, P6-D5
W19	TAN	16	GPT	P6-F1, P8-E
W20	RED	10	GPT	P6-1234, J1
W21	WHT	18	GPT	P6-3, P9-E
W22	GRN	16	GPT	P6-4, P8-F
W23	PNK	18	GPT	P6-E1, P6-E2
W24	PNK	18	GPT	P6-E2, P3-1
W25	GRY	18	GPT	P6-E5, P8-G
W26	BRN	18	GPT	P6-E4, P12-2
W27	WHT	18	GPT	P6-E3, P8-H
W28	WHT	18	GPT	P6-E3, J15
W29	ORN	18	GPT	P6-D1, P13-5
W30	YEL	18	GPT	P6-D2, P13-6
W31	YEL	18	GPT	P6-D2, P6-D4
W32	BLK	18	GPT	P6-D5, P6-C5
W33	YEL	18	GPT	P6-D4, P5-C
W34	BLU	18	GPT	P6-C1, P2-1
W35	VIO	18	GPT	P6-C2, P5-B
W36	VIO	18	GPT	P6-C2, P6-C4
W37	BLK	18	GPT	P6-CS, P6-B5
W38	VIO	18	GPT	P6-C4, P2-3
W39	TAN	18	GPT	P6-B2, P14-6
W40	TAN	18	GPT	P6-B2, P6-B4
W41	BLK	18	GPT	P6-B5, J17
W42	TAN	18	GPT	P6-B4, P5-A
W43	TAN	18	GPT	P5-A, P8-J
W44	VIO	18	GPT	P5-B, P8-K
W45	YEL	18	GPT	P5-C, P10-F
W46	PNK	18	GPT	P5-D, P9-A
W47	PNK	18	GPT	P5-D, P3-3
W48	BLK	16	GPT	P5-E, J17
W49	BLK	18	GPT	P5-E, P5-F
W50	BLK	18	GPT	P5-F, P5-G
W51	BLK	18	GPT	P5-G, P5-H
W52	BLK	18	GPT	P5-H, J8
W53	ORN	18	GPT	J6, P11-4
W54	ORN	18	GPT	J6, J9
W55	VIO	18	GPT	J7, P9-B
W56	BLK	18	GPT	J8, J11
W57	ORN	18	GPT	J9, J12
W58	BLU	18	GPT	J10, P9-C
W59	BLK	18	GPT	J11, J13
W60	ORN	18	GPT	J12, P4-A
W61	BLK	18	GPT	J13, P14-8
W62	PNK	18	GPT	J14, J16
W63	GRN	16	GPT	P4-B, P9-D
W64	VIO	18	GPT	P4-Y, P6-H5
W65	PNK	18	GPT	J14, P3-1
W66	BLU	18	GPT	P3-2, P2-1
W67	BRN	18	GPT	P1-1, P10-D
W68	TAN	18	GPT	P1-2, P1-5
W69	PNK	18	GPT	J16, P12-4
W70	BRN	18	GPT	P14-2, P9-F
W71	GRN	18	GPT	P14-3, P14-5
W72	GRN	18	GPT	P14-5, P6-B1
W73	TAN	18	GPT	P14-6, P14-7
W74	BLK	18	GPT	P14-8, P13-8
W75	GRY	18	GPT	P13-2, P10-E
W76	ORN	18	GPT	P13-3, P13-5
W77	YEL	18	GPT	P13-6, P13-7
W78	BLK	18	GPT	P13-8, P12-3
W79	GRY	18	GPT	P12-1, P9-G
W80	WHT	18	GPT	P12-5, P7-H
W81	TAN	18	GPT	P12-6, P9-H
W82	GRN	18	GPT	P11-2, P10-B
W83	BLK	18	GPT	P11-3, J2
W84	BLU	18	GPT	P11-6, P10-A
W85	BRN	18	GPT	P1-1, P7-E

WIRE IDENTIFICATION (Cont.)

LABEL	COLOR	AWG	TYPE	ROUTE
W86	VIO	18	GPT	P8-C, P7-C
W87	PNK	18	GPT	P8-B, P7-A
W88	YEL	18	GPT	P8-A, J3
W89	BLK	18	GPT	J2, P7-F
W90	GRN	18	GPT	P7-D, J5
W91	BLK	18	GPT	P7-F, J4
W92	RED	10	GPT	P6-1234, P6-5678
W93	RED	16	GPT	P6-5, P16-B
W94	ORN	16	GPT	P6-6, P16-A
W95	RED	16	GPT	P6-7, P15
W96	RED	16	GPT	P6-8, J18

Groundsmaster 3000-D
Wiring Diagram (Front Section)



Groundsmaster 3000-D
 Harness Drawing (Front Section)