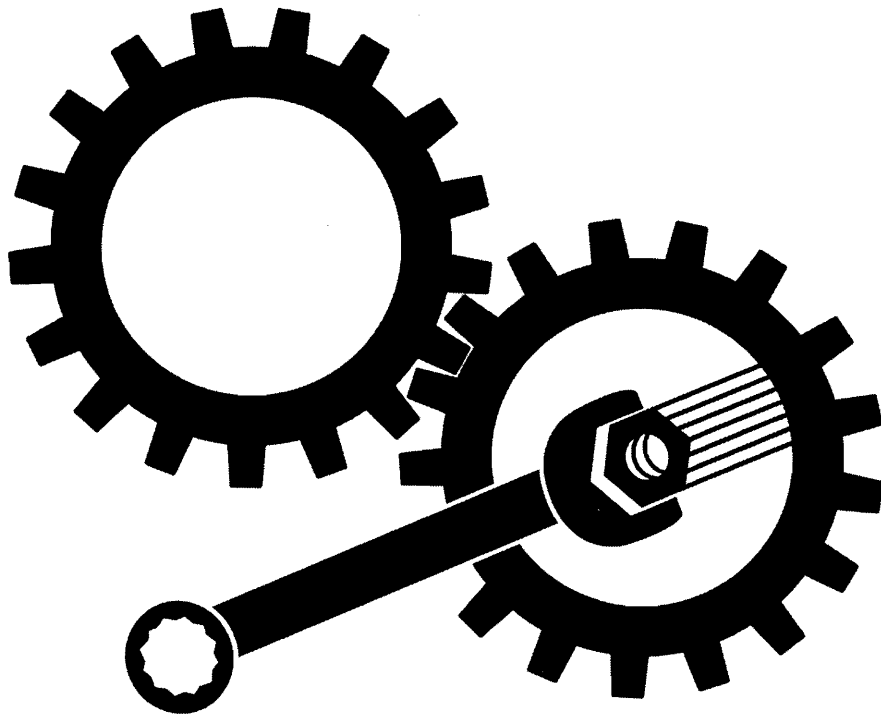




# Promaster 260Z & 250Z

## Service Manual

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# SECTION 1 - INTRODUCTION

## 1.1 THE MANUAL

The purpose of this manual is to provide complete instructions for service, maintenance, disassembly, repair, and installation of the mechanical components for the Promaster 260Z and 250Z.

Dealer trained service personnel should use this manual as a supplement to and reminder of the training sessions conducted by the company.

Read all information for servicing a part or system before repair work is started to avoid needless disassembly.

### Operation

Before operation of the unit, carefully and completely read manuals supplied with the unit. The contents will provide you with an understanding of safety instructions and controls during normal operation and maintenance.

### Safety Messages

For your safety and the safety of others always read, understand, and follow all DANGER, WARNING, and CAUTION messages found in manuals and on safety decals.

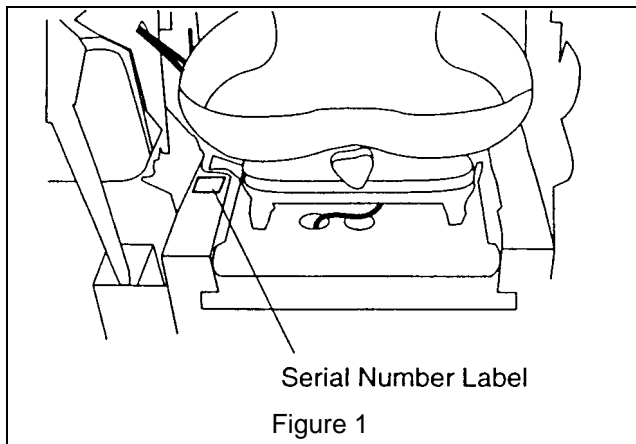
### Directional Reference

All reference to left, right, front, or rear are given from the operator in the operator position and facing the direction of forward travel.

## 1.2 SERVICE AND REPLACEMENT PARTS

When ordering publications, replacement parts, or making service inquiries, know the Model and Serial numbers of your unit and engine.

Numbers are located on the product registration form in the unit literature package. They are printed on a serial number label, located on the frame of your unit.



## 1.3 PRODUCT REGISTRATION

A warranty registration card must be filled out, signed, and returned at time of purchase. This card activates the warranty. Claims meeting requirements during limited warranty period will be honored.

## 1.4 UNAUTHORIZED REPLACEMENT PARTS

Use only Gravelly replacement parts. The replacement of any part on this vehicle with anything other than a Gravelly authorized replacement part may adversely affect the performance, durability, or safety of this unit and may void the warranty. Gravelly disclaims liability for any claims or damages, whether warranty, property damage, personal injury, or death arising out of the use of unauthorized replacement parts.

## 1.5 DISCLAIMER

Gravelly reserves the right to discontinue, make changes to, and add improvements upon its products at any time without public notice or obligation. The descriptions and specifications contained in this manual were in effect at printing. Equipment described within this manual may be optional. Some illustrations may not be applicable to your unit.

## 1.6 TECHNICAL SERVICE COMMUNICATIONS

Ariens Technical Service communicates information to the field using Service Letters, Service Bulletins, Product Notices, and Campaigns. Each communication signifies a type of information and priority. The dealer is responsible to carry out the directive provided in the communication. The types of communication are:

**Service Letter** - General technical information for the dealer. Technical information on how to service the product and product improvements.

**Service Bulletin** - Notification to update products to resolve certain issues or a notification of a policy change.

**Product Notices** - Notification of limited product located in a certain region. This is a limited distribution to only those who received the product involved.

**Campaigns** - Notification of a safety related issue. All products must be updated and are tracked by the factory until all units are corrected.

## 1.7 PREPARATION

Before starting any removal of parts, proper preparation is very important for efficient work. A clean work area at the start of each job will allow you to perform service repairs easily and quickly.

To reduce the incidence of misplaced tools or parts, place removed components with all attaching hardware in the disassembly order on a clean work surface. Organization is a key part of proper reassembly.

Tools, instruments, and parts needed for the job should be gathered before work is started. Interrupting a job to locate tools or parts is a needless delay.

## SECTION 2 - SAFETY

### 2.1 SAFETY ALERTS



Look for these symbols to point out important safety precautions. They mean:



**Attention!**  
**Personal Safety Is Involved!**  
**Become Alert!**  
**Obey The Message!**

### 2.2 SIGNAL WORDS

The safety alert symbol is used in decals on the unit and with proper operation procedures in this manual. They alert you to the existence and relative degree of hazards.

Understand the safety message. It contains important information about personal safety on or near the unit.



**DANGER: IMMINENTLY HAZARDOUS SITUATION!** If not avoided, WILL RESULT in death or serious injury.



**WARNING: POTENTIALLY HAZARDOUS SITUATION!** If not avoided, COULD RESULT in death or serious injury.



**CAUTION: POTENTIALLY HAZARDOUS SITUATION!** If not avoided, MAY RESULT in minor or moderate injury. It may also be used to alert against unsafe practices.

### 2.3 NOTATIONS

**NOTE:** General reference information for proper operation and maintenance practices.

**IMPORTANT:** Specific procedures or information required to prevent damage to unit or attachment.

### 2.4 PRACTICES AND LAWS

Practice usual and customary safe working precautions, for the benefit of yourself and others. Understand and follow all safety messages. Be alert to unsafe conditions and the possibility of minor, moderate, or serious injury or death. Learn applicable rules and laws in your area.

### 2.5 REQUIRED OPERATOR TRAINING

Original purchaser of this unit was instructed by the seller on safe and proper operation. If unit is to be used by someone other than original purchaser; loaned, rented or sold, ALWAYS provide the Operator's Manual and any needed safety training before operation.

### 2.6 SAFETY RULES

#### Walk Around Inspection

Complete a walk around inspection of unit and work area to understand:

- Work area.
- Your unit.
- All safety decals.

#### Work Area

ALWAYS check overhead and side clearances carefully before operation. ALWAYS be aware of traffic when operating along streets or curbs.

ALWAYS keep hands and feet within the limits of the unit.

Keep children, people, and animals away. Keep children out of work area and under watchful care of a responsible adult.

Keep area of operation clear of all toys, pets, and debris. Objects can cause vehicle instability and injury.

Check for weak spots on dock, ramps or floors. Avoid uneven work areas and rough terrain. Stay alert for hidden hazards.

DO NOT run engine in an enclosed area. Always provide good ventilation.

#### Unit

ALWAYS keep protective structures, guards, and panels in good condition, in place and securely fastened. NEVER modify or remove safety devices.

Check Safety Interlock System for proper operation daily (see Operation section). Do not operate unless system operates properly.

## Operation

Understand:

- How to operate all controls
- The functions of all controls
- How to STOP in an Emergency
- Speed ranges

Do not operate any of the control levers or power take-off unless both feet are resting on the platform.

DO NOT travel at too fast a rate. DO NOT change engine governor settings or over-speed engine.

Always back up slowly. Always look down and behind before and while backing.

Never leave a running unit unattended. ALWAYS shut off power take off, lower throttle setting, and stop engine before leaving unit. ALWAYS remove key to prevent unauthorized use.

Never carry passengers on any part of unit.

Avoid uneven and rough terrain. DO NOT operate near drop offs, ditches, or embankments. Unit can suddenly turn over if a wheel is over the edge of a cliff or ditch, or if an edge caves in.

If tires lose traction, turn off power take off and proceed slowly straight down slope. Avoid wet surfaces.

Avoid parking on a slope. If necessary, use wheel chocks.

DO NOT leave unit unattended on a slope. ALWAYS use wheel chocks when leaving unit.

ALWAYS operate unit in good visibility and light.

Fuel is highly flammable and its vapors can explode.

Use ONLY approved fuel containers.

NO Smoking!

NO Sparks!

NO Flames!

Allow engine to cool before servicing.

NEVER fill fuel tank when engine is running, hot, or unit is indoors.

Abnormal Vibrations are a warning of trouble. Striking a foreign object can damage unit. Immediately stop unit and engine. Remove key and wait for all moving parts to stop. Remove wire from spark plug. Inspect unit and make any necessary repairs before restart.

## Hazardous Slopes

DO NOT operate on steep slopes. Avoid operating on slopes. When you must operate on a slope, travel up and down the slope. Never operate across a slope. Never operate on a slope greater than 10 degrees.

## Child Safety

NEVER allow children to operate or play on or near unit. Be alert and shut off unit if children enter area.

## Personal Safety

Read and obey all warning, caution, and instructions on the unit and in provided manuals.

- Only trained adults may operate unit.
- Training includes actual operation.
- Clearly understand instructions.
- Be alert! Conditions can change.

NEVER operate unit after or during the use of medication, drugs or alcohol. Safe operation requires your complete and unimpaired attention at all times.

NEVER allow anyone to operate the unit when their alertness or coordination is impaired.

DO NOT operate unit without wearing adequate outer garments. Wear adequate safety gear and protective gloves. Wear proper footwear to improve footing on slippery surfaces.

Protect eyes, face, and head from objects that may be thrown from unit. Wear appropriate hearing protection.

Avoid Sharp Edges. Sharp edges can cut. Moving parts can cut or amputate fingers or a hand. Wear gloves to service unit when handling sharp edges.

ALWAYS keep hands away from any pinch points.

ALWAYS keep hands and feet away from all moving parts during operation. Moving parts can cut off body parts.

DO NOT touch unit parts which might be hot from operation. Allow parts to cool before attempting to maintain, adjust, or service.

## Controls

Come to a complete stop before reversing.

Never jerk the control levers. Always use a steady even action to achieve smooth control.

Always be aware of obstructions that may cause injury to operator or damage to the unit.

## Maintenance

ALWAYS maintain unit in safe operating condition. Damaged or worn out muffler can cause fire or explosion.

Check the conditions of the unit at the end of each day and repair any damage or defects.

ALWAYS block wheels and know all jack stands are strong and secure and will hold weight of unit during maintenance.

Keep nuts and bolts tight and keep equipment in safe operating conditions.

Before maintenance, adjustments, or service (except where specifically recommended), shut off engine.

Allow hot parts to cool.

Keep unit free of dirt, stones, and other debris. Clean up oil or fuel spills.

## **Storage**

DO NOT store unit inside a building with fuel in the fuel tank where any ignition sources are present. Allow unit to cool completely.

ALWAYS clean unit before extended storage. See Engine Manual for proper storage.

## **Battery**

Avoid Electric Shock. DO NOT reverse battery connections.

Explosive Gases! Poisonous battery fluid contains sulfuric acid and its contact with skin, eyes, or clothing can cause severe burns.

No flames. No sparks. No smoking near battery.

Always wear safety glasses and protective gear near battery.

DO NOT TIP battery beyond a 45° angle in any direction.

ALWAYS KEEP BATTERIES OUT OF REACH of children.

## **Transport**

Use extra care when loading or unloading unit onto trailer or truck. Secure unit chassis to transport vehicle. NEVER secure from rods or linkages that could be damaged.

DO NOT transport with attachment in raised position.

Lower attachment when unit is parked or stored unless a positive mechanical lock is used.

## **Attachments and Accessories**

Use only attachments or accessories designed for your unit.

## SECTION 3 - SPECIFICATIONS

Model Number	992020 and 022	992018	992021	992023	992024
Model	PM260Z 25 HP Kohler with 60" deck	PM260Z 25 HP Kohler with 50" deck	PM260Z 22 HP Robin with 50" deck	PM250Z 20HP Briggs & Stratton with 50" deck	PM260Z 22 HP Robin with 60" deck
Length - cm (in)	229 (90)*			221 (87)	229 (90)*
Height - cm (in)	127 (50)				
Width - cm (in)	185 (73)	160 (63)			185 (73)
Weight Actual - kg (lbs)	510 (1125)	499 (1100)	500 (1103)	490 (1080)	511 (1128)
Battery	12 volt				
Brakes	Hydro/Dynamic Disk - Parking				
Turning Radius	0				
Tire Size Front Rear	15 x 6 - 6 23 x 10.5 - 12			15 x 6 - 6 23 x 8.5 - 12	15 x 6 - 6 23 x 10.5 - 12
Engine - manufacturer	Kohler	Kohler	Robin	Briggs & Stratton	Robin
Model Number	CV25S	CV25S	EH65V	35177	EH65V
Cycle	4				
Engine Power - HP (KW/min <sup>-1</sup> )	25 HP (18.4 KW/min <sup>-1</sup> )	25 HP (18.4 KW/min <sup>-1</sup> )	22 HP (16.2 KW/min <sup>-1</sup> )	20 HP (14.7 KW/min <sup>-1</sup> )	22 HP (16.2 KW/min <sup>-1</sup> )
Starting System	Electric				
Fuel Tank Capacity	9 gals. US (34 liters)				
Fuel	See Engine Manual				
Idle RPM	1800				
Governed RPM	3600				
Air Cleaner	Large Capacity Dual Element				
Cooling Capacity	Air Cooled				
Engine Oil Type	See Engine Manual				
Spark Plug Gap	See Engine Manual				
Transmission	Hydrostatic Drive				
Speed - Forward Max. Reverse Max.	9 MPH 4.5 MPH				
Transmission Lube	Mobil 1 15W-50 Synthetic				
Drive Clutch	Hydrostatic				
Tire Pressure Front Rear	20-25 psi 12-15 psi				
Lift System	Hydraulic				
Power Take Off	Electric PTO Clutch/Brake				
Mower Deck	High Performance				
Cutting Width - cm (in)	152 (60)	127 (50)			152 (60)
Cutting Height - cm (in)	2.5 - 12.7 (1 - 5)				
Cut Increments - cm (in)	Infinite between 2.5 - 12.7 (1 - 5)				

## SECTION 4 - GENERAL MAINTENANCE & ADJUSTMENTS

### 4.1 CONTROLS AND FEATURES

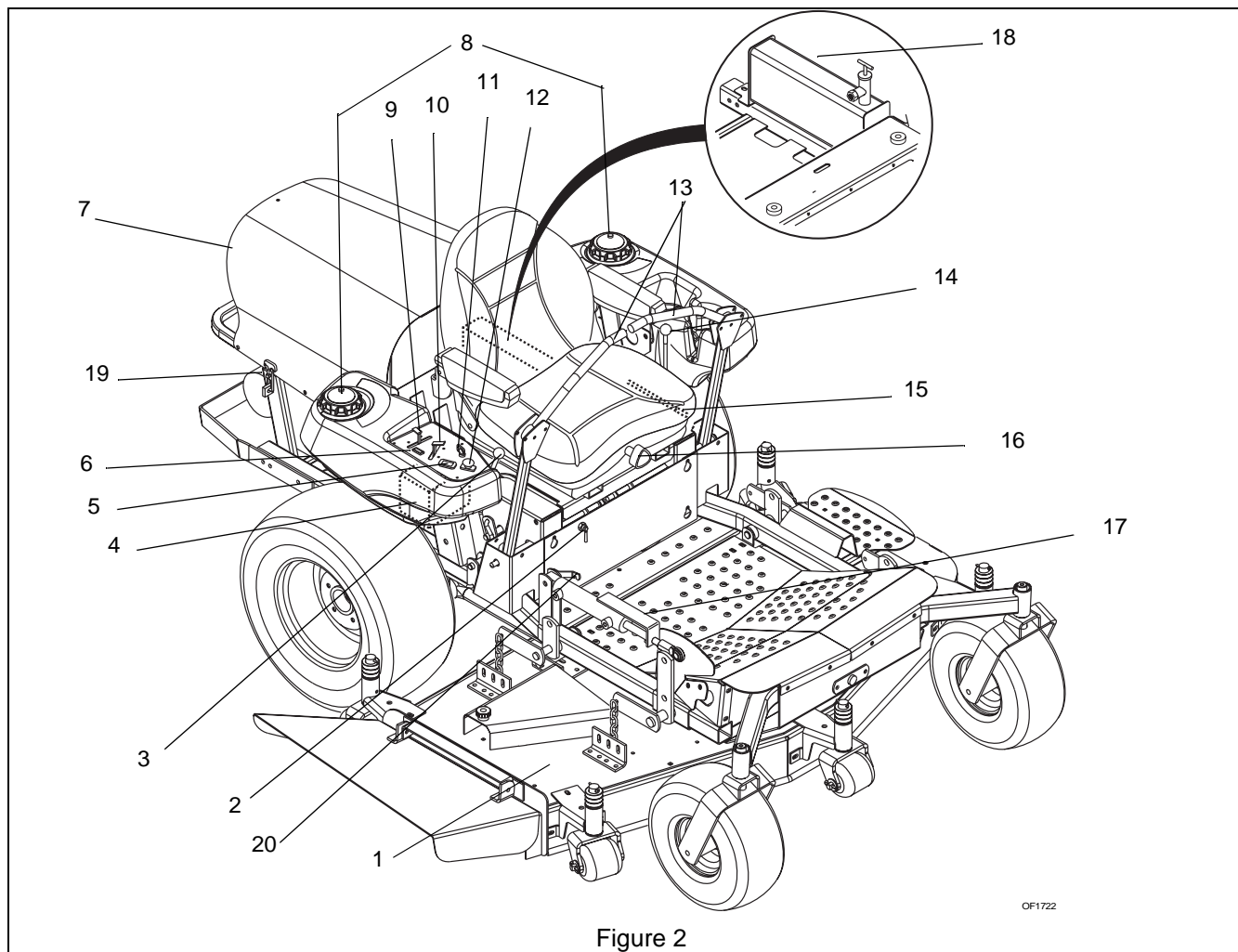


Figure 2

- |                                    |  |
|------------------------------------|--|
| 1. Mower Deck with Chute Deflector | 11. Ignition Switch                        |
| 2. Fuel Shut Off Valve             | 12. Power Take Off (PTO) Switch            |
| 3. Parking Brake                   | 13. Steering Levers                        |
| 4. Battery                         | 14. Mower Lift Lever                       |
| 5. Hour Meter                      | 15. Seat Adjustment Lever                  |
| 6. Oil Pressure Indicator          | 16. Seat Suspension Adjustment Knob (260Z) |
| 7. Engine Frame and Hood (260Z)    | 17. Height of Cut Indicator                |
| 8. Fuel Tanks and Caps             | 18. Hydraulic Oil Reservoir                |
| 9. Choke Control                   | 19. Engine Hood Latch (260Z)               |
| 10. Throttle Control               | 20. Foot Board Latch                       |

\* Serial No. 010000 and up are 221 (87)



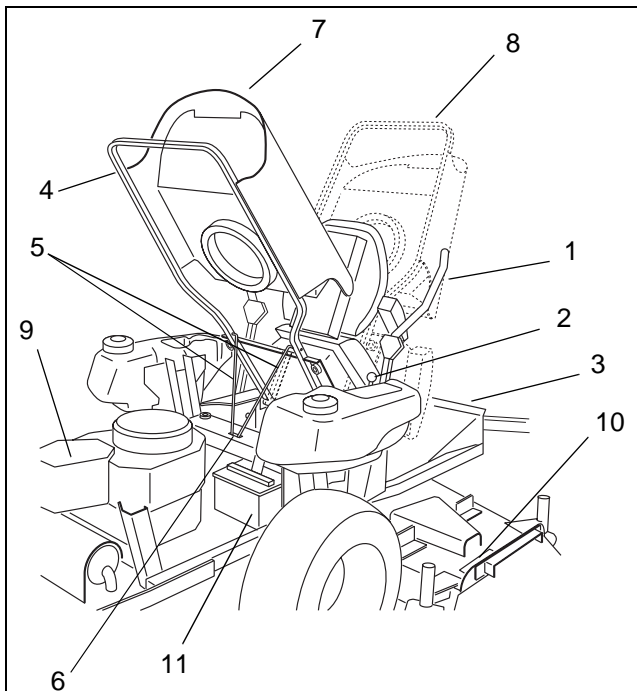
## 4.2 SERVICE POSITION - 260Z



**WARNING:** ALWAYS block wheels and know that jack stands or blocks used are stable, strong, or secure and will hold the weight of the unit during maintenance.

To ensure the unit is positioned in the proper service position:

1. Place unit on a flat level surface. ALWAYS stop engine. Assure unit is secure and will not tip over. Strap and clamp onto lift if used.
2. Place steering levers in neutral position and set parking brake.
3. Unhook hood latches.
4. Firmly grasp engine frame and cover. Lift to desired service position (Figure 3).



- |                         |                           |
|-------------------------|---------------------------|
| 1. Steering Levers      | 7. Daily Service Position |
| 2. Parking Brake        | 8. Full Service Position  |
| 3. Footboard            | 9. Engine                 |
| 4. Engine Hood & Frame  | 10. No Step Decal         |
| 5. Engine Hood Prop Rod | 11. Battery               |
| 6. Service Slot         |                           |

Figure 3

OF1811



**CAUTION:** WHEN OPENING ENGINE COVER, USE CARE TO PROPERLY ENGAGE PROP INTO SLOT. Be sure footing is secure to accommodate weight shift of hood when rotating to full service position.

**Daily Service Position:** Place engine hood prop rod into service slot. Assure rod is engaged in slot properly.

**Full Service Position:** Slowly release frame after seat contacts foot board. Use care and be sure of your footing. Do not step on mower deck.

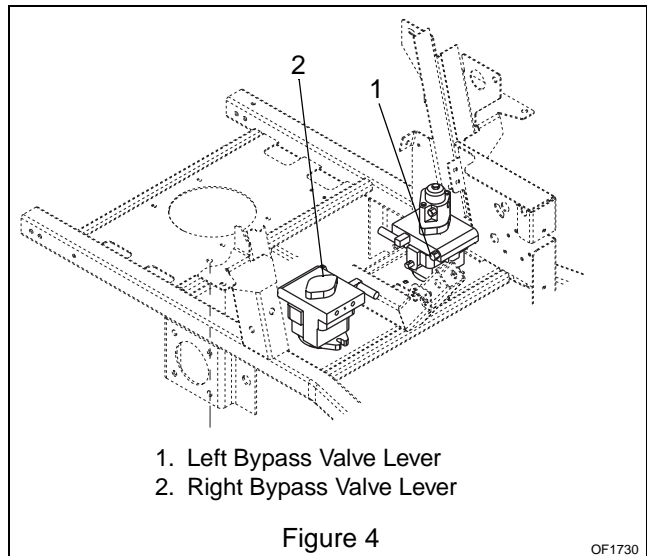
5. When service is complete, lower hood and secure with latches.

## 4.3 SERVICE POSITION - 250Z

Firmly grasp seat frame handle and lift past vertical. Lay inverted seat on foot rest. When service is complete, return seat to upright position.

## 4.4 MOVING THE UNIT-ENGINE NOT RUNNING

To move the unit without the engine running, rotate the bypass valve levers located on the pumps toward the center of the tractor approximately 1/2 turn using a wrench. Levers must be returned to their original position in order to operate the unit (Figure 4).



## 4.5 CLEANING AND STORAGE



**WARNING:** AVOID SHARP EDGES which can cut. Movement of parts can cut off fingers or a hand. Wrap blades, wear gloves, and use extreme caution when servicing.

**IMPORTANT:** Never spray unit with water or store unit outdoors to help prevent sealed bearing rust or corrosion. Water can seep into sealed bearings and reduce component life. Bearings are sealed against dirt and debris only.

A unit that is excessively dirty should be cleaned before work starts. Cleaning will occasionally uncover trouble sources. Dirt and abrasive dust reduce the efficient work life of parts and can lead to costly replacement.

When taking unit out of extended storage:

1. Check for any damage or loose parts. Repair, replace, or tighten hardware before operation, especially blade attachment bolts.
2. If a preservative fluid was used in fuel tank, drain and discard. Fill fuel tank with fresh new fuel.

#### 4.6 FILLING THE FUEL TANK



**EXPLOSIVE VAPORS and FLAMMABLE FUEL** can result in serious injury or death. Handle fuel with care. **ALWAYS** use an approved fuel container.

No Smoking!

No Lighted Materials!

No Open Flame!

Allow engine to cool.

Use caution with fuel. Fuel is very flammable. Keep fuel in a clean and tight container. Keep fuel away from fire or heat. Never put fuel in the fuel tank while the engine is running or hot. Clean up any spilled fuel before starting the engine.

Add fuel to the tank as needed. See your Engine Manual for correct type and grade of fuel.

To add fuel to the fuel tank:

1. Refuel the unit only in a well ventilated, open area.
2. Stop the engine.
3. Clean the fuel cap and the area around the fuel cap to prevent dirt from entering the fuel tank. Remove the cap from the fuel tank.
4. Fill the fuel tank. Be careful not to spill the fuel. Do not overfill, allow for fuel expansion. Stop filling when fuel is about 1" below the bottom of the neck.
5. Install the cap on the fuel tank and tighten.
6. Clean up any spilled fuel before starting the engine.



**WARNING: POTENTIAL HAZARDOUS!** Fuel is extremely flammable and highly explosive. Personal injury and property damage may result if not handled properly.

- Fill the fuel tank outdoors in an open area. Do not fill when the engine is hot. Wipe up any fuel spills.
- Never fill the fuel tank completely full. Empty space in tank allows fuel to expand.
- Never smoke when handling fuel. Stay away from open flames. Fuel fumes can be ignited by sparks.

#### 4.7 FASTENERS

Each day before operating, check mower blade mounting hardware and all other fasteners. Replace fasteners that are missing or damaged. Tighten all nuts and bolts to their correct torque value.

#### 4.8 GENERAL LUBRICATION

**IMPORTANT:** Wipe each fitting clean before and after lubrication.

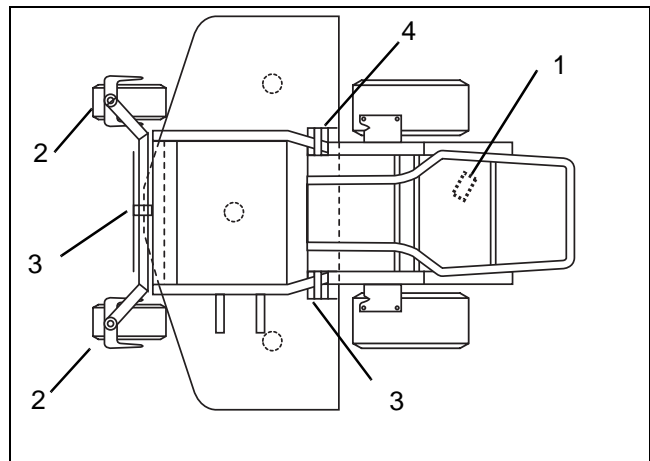
Lube fitting locations are:

- each deck push arm (2)
- Hydro Idler (1)
- front axle pivot (1)

Apply Sten Mix Hi-Temp Grease or equivalent to the lube fittings. Order P/N: 00036700- ten pack of 14 oz. cartridges.

When using Sten Mix Hi-Temp Grease for the first time, all components should be thoroughly cleaned prior to lubricating.

Apply oil at all pivot points and pin connections.



REF	LUBRICATION	QTY	DESCRIPTION-LOCATION	INTERVAL	REF
1	GREASE	2	CASTER PIVOT	50 Hrs.	1
2	GREASE	1	AXLE PIVOT	400 Hrs	2
3	GREASE	2	PUSH ARM PIVOT	50 Hrs	3
4	GREASE	1	PUSH ARM PIVOT	50 Hrs	4
	OIL		ALL PIVOT POINTS, PIN CONNECTIONS	50 Hrs	

Figure 5

OF1791

Description	Use	Interval
Grease fittings	Sten Mix Hi-Temp grease or equivalent	50 hrs. running time
Hydraulic system	Mobil 15W50 synthetic oil	500 hrs running time

## 4.9 BASIC ENGINE MAINTENANCE

See your engine manual and Section 5 of this manual for detailed information on the operation and maintenance of your engine.

1. Each day before operating, check the level of the oil in the engine. Never operate the engine when the oil level is below the add mark.
2. Each day before operating, check the air cleaner element. Dirt can decrease the flow of air to the engine.
3. Each day before operating, check the air cooling system on the engine. Debris can decrease the flow of air cooling the engine.
4. Follow the maintenance instructions in your engine manual concerning oil and filter changes.

## 4.10 BELTS



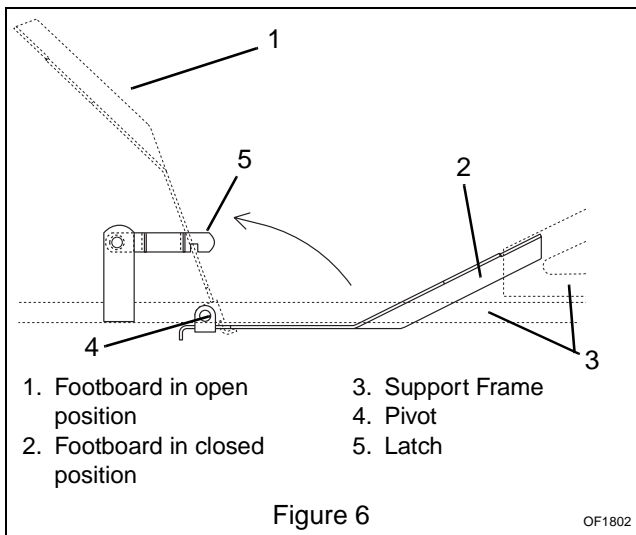
**WARNING:** MOVING PARTS can cut or amputate body parts. ALWAYS wait for moving parts to stop before performing maintenance or service.



**CAUTION:** DAMAGED OR WORN BELTS may result in injury and/or damage to the unit. Check belts for excessive wear or cracks often.

### Belt Access

1. Properly stop and park unit (refer to Owner's Manual).
2. Lower the mower.
3. Place seat in most rearward position.
4. Remove belt covers.
5. Place foot board in open position (Figure 6).
6. Secure raised footboard with latch.



## Replacing Mower Belts

**NOTE:** Long belt must be removed to remove short belt.

1. Roll long belt off left blade spindle and remove from deck.
2. Roll short belt off right blade spindle and remove from deck. Idler pivot bolt must be loosened slightly to gain clearance to remove belt from under idler pulley (Figure 7).

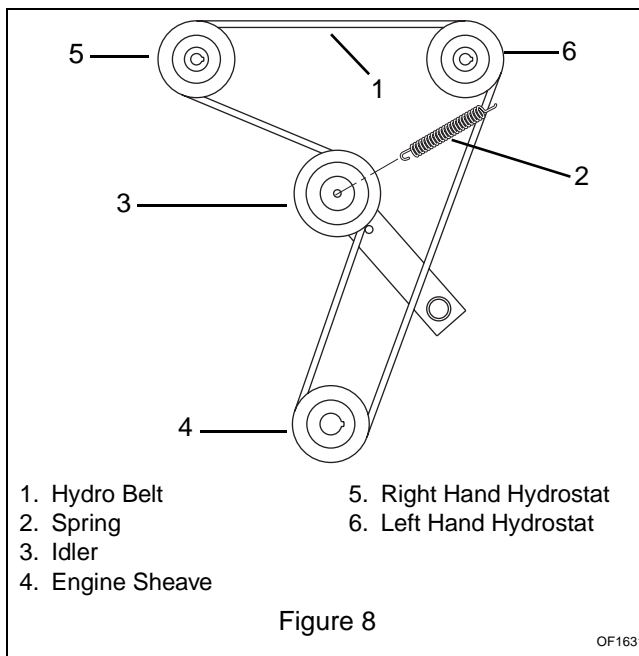
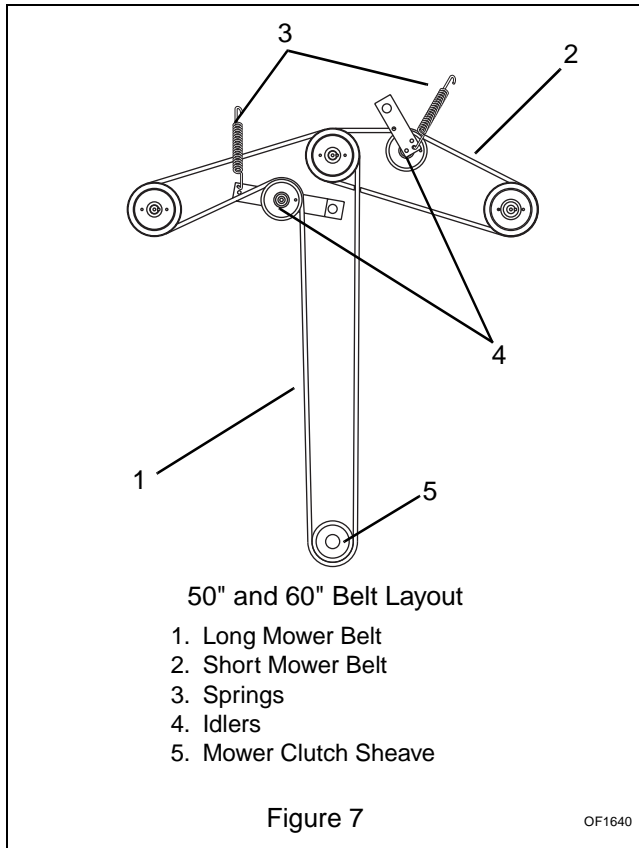


**CAUTION:** Use care when releasing idler spring tension. Keep body parts well away from idlers when performing this operation.

3. Arrange new mower belt(s) on deck (short belt first). Retighten short belt idler pivot bolt. Install belts on sheaves. Roll belts onto blade sheave last.
4. Replace belt covers and return foot board to closed position.

## Replacing the Hydro Pump Belt

1. Properly stop and park unit (refer to unit Owner's Manual).
2. Remove the mower belt from the mower clutch sheave. See *Replacing Mower Belts*.
3. Remove old hydro pump belt by rolling belt off right hand hydrostat sheave first (Figure 8).
4. Install new pump belt by positioning belt on sheaves. Roll belt onto right hand hydrostat sheave last.
5. Put the mower belt back on mower clutch sheave. See *Replacing Mower Belts*.

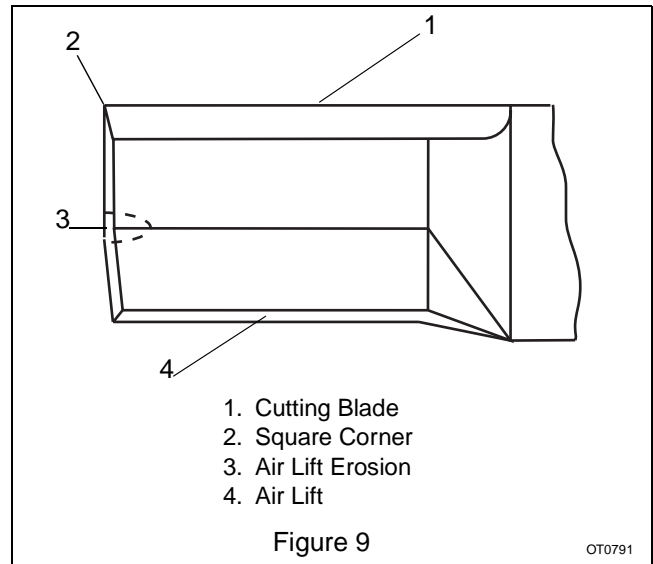


## 4.11 TIRES

Before each use, make a visual check of tires. The correct air pressure is 12-15 psi (83-103 kn/m<sup>2</sup>) for the rear tires, and 20-25 psi (138-172 kn/m<sup>2</sup>) for the front tires.

## 4.12 MOWER BLADES

**NOTE:** If mower is used under sandy soil conditions, replace blades when air lifts become eroded through at ends (Figure 9).



## Sharpen The Mower Blades

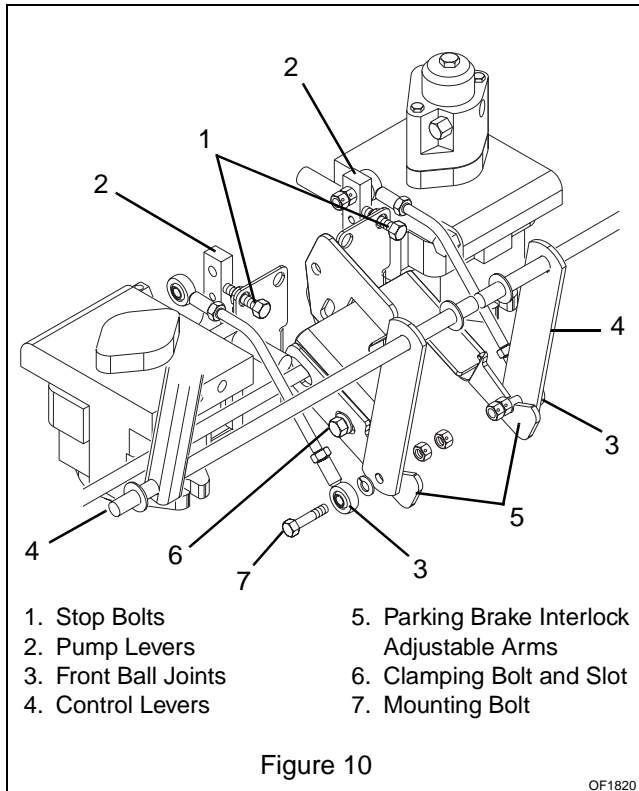


**CAUTION:** Use sturdy gloves or padding to protect hands when working with mower blades.

1. Turn the engine off. Remove the ignition key. Remove the ignition wires from the spark plugs.
2. Remove the bolts, lock washer, the flat washers, and the blades from the spindle shafts.
3. Sharpen the beveled edges of the blades in a straight line at a 25 degree angle. Do not change the angle of the beveled edge. If more than 0.5 inches (12.7mm) are removed from the width of a blade, discard the blade. Make sure the sharpened blades are balanced. Balance must be held within 1.3 inch ounces.
4. Put the blades, the flat washers, lock washers, and the bolts back on the spindle shafts.
5. Tighten the bolts to a torque of 70 ft. lbs.
6. Put the ignition wires back on the spark plugs.

## 4.13 STEERING CONTROL NEUTRAL ADJUSTMENT

If the unit has excessive creep when the control levers are in neutral, adjust as follows: (Figure 10)



**WARNING:** This adjustment requires operation of the engine and opening of hood. Use extreme care to avoid contact with moving parts and hot surfaces. Be sure rear of unit is well supported and secure before starting engine.

1. If hydraulic system is cold, run unit for a minimum of five minutes, then shut off unit.
2. Make sure both control levers are in neutral. Raise hood (260Z).
3. With the unit up to and facing a wall, jack the unit up so that both drive wheels are off the ground.
4. Have someone depress center of seat to activate seat switch.
5. Start the engine and run at about half throttle or faster. Release parking brake.
6. Move the control levers from Forward to Reverse several times to make sure controls are free and check Neutral adjustment. If binding is found, correct it.
7. Minor adjustments may be made by simply adjusting the stop screw which contacts the lever

on the pump. The screw may be turned in or out to bring the unit into neutral.

8. If major adjustment is needed, it is best to remove the front ball joint from the bottom of the control levers and turn the stop screw in or out until neutral is found.
  9. Then, with the adjustable arms of the parking brake interlock positioned so the clamping bolt is in the middle of the slot, adjust the ball joint on or off the control link rod so that their mounting bolts fit into the slot at the end of the adjustable interlock.
  10. Reinstall the front ball joint(s).
- NOTE:** When properly adjusted, the parking brake interlock will move upward when the parking brake is set and hold the steering control levers in neutral. The parking brake starting interlock switch will not be depressed unless the steering control levers are in neutral. The interlock holds the levers in neutral until the parking brake is released.
11. Move the control levers, from forward to reverse several times to make sure it is adjusted to neutral. Readjust if necessary.
  12. Stop the engine.

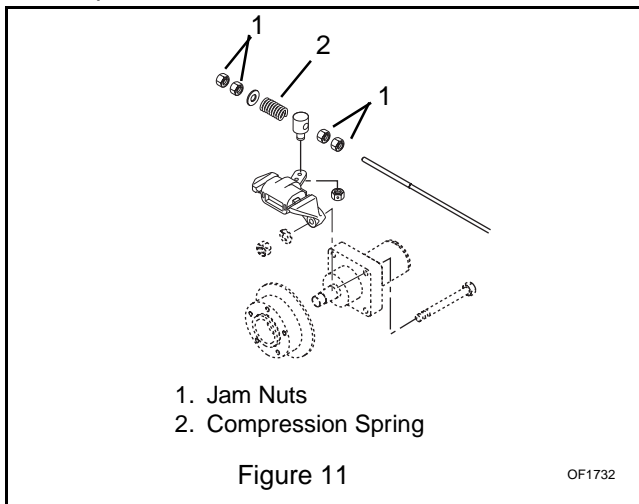
## 4.14 ADJUSTING CONTROL LEVERS

To be done after neutral has been set. (Figure 10).

1. If desired the steering control levers can be set to match (be in line) when in neutral.
2. Remove front ball joint from bottom of steering control lever on side which is going to be adjusted. Screw ball joint on or off link rod to hydrostat so that control levers align. Replace rod end on lower part of steering control lever.
3. If needed, adjust parking brake interlock so that interlock is able to move up when both steering control levers are in neutral. To do this, loosen the clamping bolt on the adjustable member of the interlock and slide it in either direction until the interlock moves up and latches the ball joint mounting bolts.

#### 4.15 ADJUSTING THE PARKING BRAKE

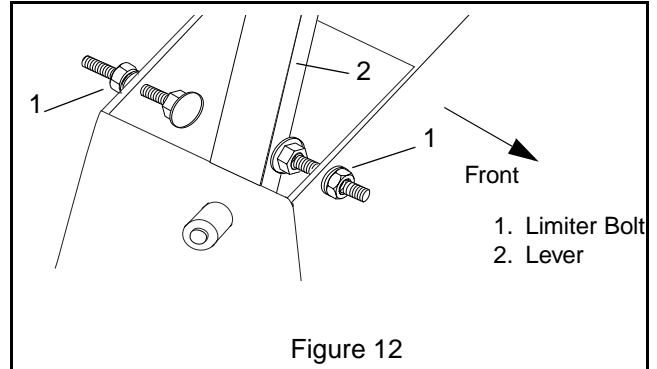
1. The Parking Brake may be adjusted through the use of the jam nuts on the brake rod which push against the compression spring which pushes on the caliper arm. See Figure 11.
2. Turn the nuts further on the rod (clockwise) to tighten the brake and further off the rod (counterclockwise) to loosen the brake.
3. Ensure when the brake is applied, the caliper arms do not contact the return nuts on the rods in front of the caliper arms. If they do, back them off slightly.
4. When installing new pads in the calipers, they must be burnished by driving for a short distance (about 200 feet) with the brake on. To do this, bring the parking brake lever part way up, while driving normally (in a straight line). This quickly breaks-in the pads for maximum effectiveness.



#### 4.16 ADJUSTING THE UNIT TO TRACK STRAIGHT

Check and adjust tire pressure. Increase pressure on side unit tracks toward. DO NOT exceed maximum recommended tire pressure (refer to Specifications).

If tire pressure adjustment does not solve tracking problem, the limiter bolts at base of handles can be adjusted. See Figure 12. Front bolts are for forward and rear bolts are for reverse. Lengthen bolts (move closer to lever) on side which is too fast.



## 4.17 LEVELING THE MOWER DECK

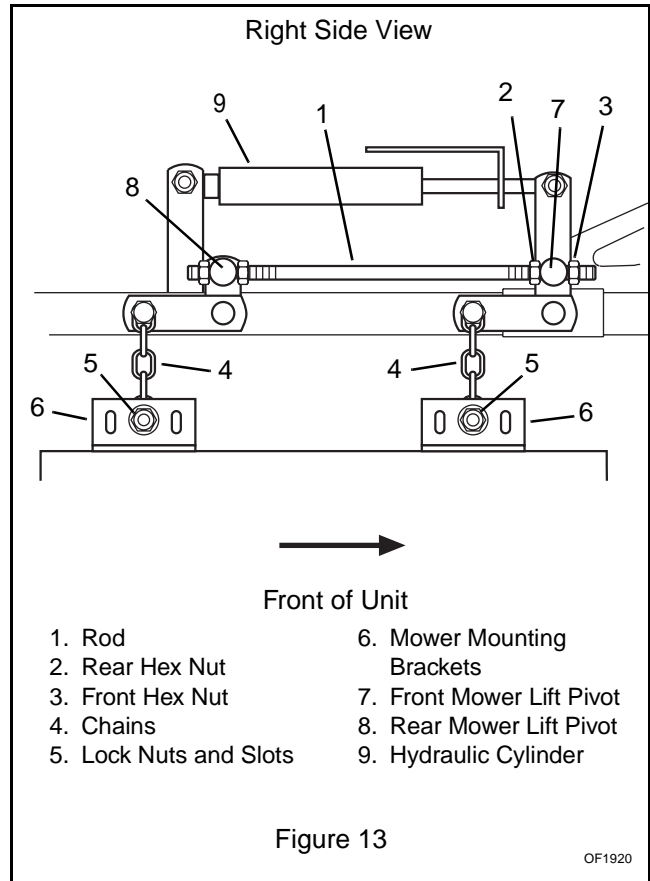
These adjustments should be made on a level surface with the tires inflated to the correct air pressure.

The mower is leveled from side to side with the slots where 4 chains fasten to the mower mounting brackets. The mower is leveled from front to rear by adjusting the rod running down each side of the frame (Figure 13).

1. Raise mower deck and insert 3" (7.6 cm) tall blocks to support deck.
2. Lower deck onto blocks so chains are slack.
3. Measure from bottom of mower blade end to ground.
4. Set hydraulic lift cylinder so cut of height reads the same as blade height measurement.
5. Loosen the locknuts on the side where the chains are slack and slide the bolt down the slot until the chain is tight.
6. Tighten bolt and nuts in mower mounting brackets.
7. Lift mower and remove blocks.
8. Measure height of deck at each side. Measurements must be within 1/16" (1.5mm) of each other.
9. If measurements are out of range, fix by adjusting chains on low side of deck.
10. Once deck is level side to side, measure height of deck at middle of front and on both sides of rear. Front of deck should be 1/8" (3mm) lower than rear.
11. To adjust, loosen rear hex nut of the front mower lift pivot on each rod.
12. Turn the front hex nut on each rod until mower is 1/8" (3mm) lower in front.

**NOTE:** If mower cannot be leveled, it may be necessary to loosen the rear nut of the rear mower lift pivot to get more threads at the front of rod for adjustment. After loosening rear nut and adjusting level, tighten front nut on rear mower lift pivot.

13. Tighten rear hex nut on each rod that was loosened in step 11.



## SECTION 5 - ENGINE

### 5.1 ENGINE TROUBLESHOOTING

The following troubleshooting chart is to be used to isolate engine problems and give possible causes and corrective action responses.

The troubleshooting key is generic and can be used for several types of engines. Use only those possible causes and corrective actions that apply to the unit.

TROUBLE	POSSIBLE CAUSES (Refer to Key Below)	CORRECTIVE ACTION
Black Exhaust	1, 20, 22, 25, 29, 31, 32, 33	repair or replace
Blue/White Exhaust	4, 20, 25, 31, 33, 34	repair or replace
Difficult Starting	1, 5, 7, 8, 9, 10, 20, 21, 22, 29, 31, 32, 33	repair or replace
Erratic Running	1, 7, 8, 9, 10, 20, 21, 23, 26, 29, 33, 59, 62	repair or replace
Excessive Fuel Consumption	1, 20, 22, 23, 25, 39, 31, 32, 33	repair or replace
High Oil Pressure	4, 41	repair or replace
Knocking	22, 26, 29, 31, 33, 36, 46, 59	repair or replace
Loss of Power or System	1, 8, 10, 20, 21, 22, 23, 25, 26, 31, 32, 33	repair or replace
Low Cranking Power	2, 3, 4, 11	repair or replace
Low Oil Pressure	4, 36, 37, 39	repair or replace
Misfiring	10, 20, 25, 26, 28, 29, 32	repair or replace
Overheating	1, 19, 25,	repair or replace
Poor Compression	25, 28, 29, 31, 32, 33, 34, 59,	repair or replace
Starts and Stops	1, 6, 10, 62	repair or replace see electrical systems see engine service manual
Vibration	20, 23, 25, 26, 29, 33, 45, 49	repair or replace
Will Not Crank	2, 11, 45	charge battery or replace
Will Not Start	1, 10, 62	repair or replace see electrical systems see engine service manual

TROUBLESHOOTING KEY					
1	Restriction in air cleaner	22	Incorrect grade of fuel	43	Faulty suction pipe
2	Bad electrical connection	23	Sticking throttle/restricted movement	44	Choked oil filter
3	Faulty starter motor	24	Exhaust pipe restriction	45	Bad solenoid switch
4	Incorrect grade of lubricating oil	25	Leaking cylinder head gasket	46	Incorrect piston height
5	Low cranking speed	26	Overheating	47	Damaged fan
6	Fuel tank empty	27	Cold running	48	Faulty engine mounting
7	Controls not in correct operation position	28	Incorrect tappet adjustment	49	Incorrectly aligned flywheel and/or flywheel housing
8	Blocked fuel feed line	29	Sticking valves	50	Faulty thermostat
9	Faulty fuel lift pump	30	Incorrect high pressure pipes	51	Restriction in water jacket
10	Choked fuel filter	31	Worn cylinder bores	52	Loose fan belt
11	Battery capacity low	32	Pitted valves and seats	53	Choked radiator
12	Air in fuel system	33	Broken, worn or sticking piston ring(s)	54	Faulty water pump
13	Faulty fuel injection pump	34	Worn valve stems and guides	55	Choked breather pipe
14	Faulty fuel injectors or incorrect type	35	Restriction in air cleaner	56	Damaged valve stem oil deflector (if fitted)
15	Incorrect use of cold start equipment	36	Worn or damaged bearings	57	Coolant level too low
16	Faulty cold start equipment	37	Insufficient oil in sump	58	Blocked sump strainer
17	Broken fuel injection pump drive	38	Bad/defective oil temperature switch	59	Broken valve spring
18	Incorrect fuel pump timing	39	Oil pump worn	60	Exhaust or vacuum pipe leak
19	Incorrect valve timing	40	Pressure relief valve sticking open	61	Bad or defective water temperature switch
20	Poor compression	41	Pressure relief valve sticking closed	62	Bad spark plug(s)
21	Blocked fuel tank vent	42	Broken relief valve spring		



## 5.2 REMOVING THE ENGINE

1. Place the mower in the full service position.
2. Disconnect the battery cables, negative first.
3. Disconnect ignition wires using the connectors.
4. Remove the belts from the pulley and clutch.
5. Unscrew the bolt from the center of the output shaft and remove clutch. Refer to "Replacing the Clutch".
6. Remove the square key and the pulley.
7. Unclamp and remove the fuel line. Plug the fuel line and wipe up any spills.
8. Remove the engine mounting bolts and lift engine out the top.

## 5.3 INSTALLING THE ENGINE

1. Position the new engine in the chassis, insert mounting bolts and tighten.
2. Install pulley and then the clutch on the output shaft.

**NOTE:** Check condition of square key and replace if needed.

3. Place belts on pulley and clutch. Check for proper routing of belts.
4. Connect fuel line and ignition wires.
5. Connect battery, positive first.
6. Check oil level and add as needed.

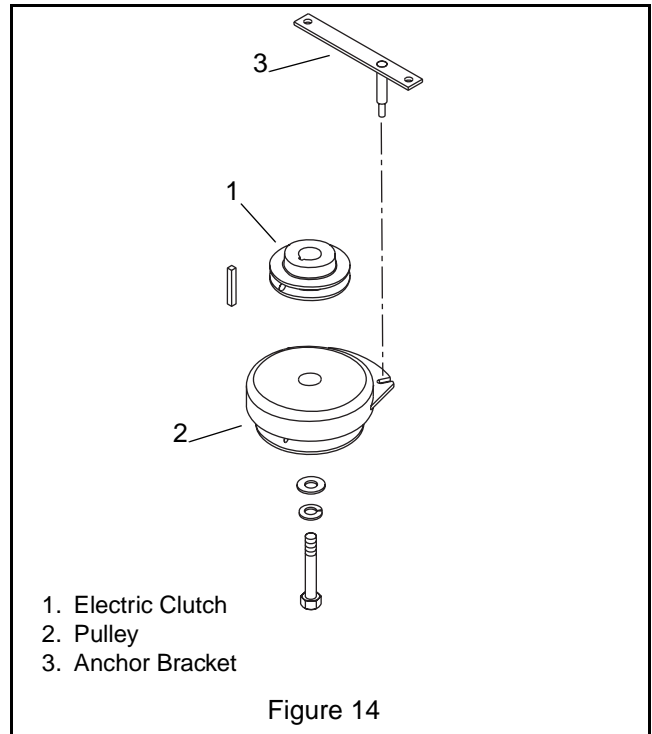
## 5.4 ELECTRIC CLUTCH

The motor output shaft has two pulley mechanisms. The top pulley is direct drive and powers the hydraulic system. The lower pulley is engaged by an electric clutch and supplies power to the mower blades. See Figure 14.

The clutch has no repairable parts.

If clutch does not operate, before replacing clutch:

1. Check the deck for debris that may be blocking blades.
2. Check PTO switch and wire harness for proper operation.



### To Replace the Clutch

1. Remove the belt by relaxing the idler pulley.
2. Remove the center bolt.



**CAUTION:** DO NOT ALLOW the engine crankshaft to rotate. Damage to the engine may occur.

3. Disconnect electrical wires.
4. Remove nut from the anchor bracket.
5. Pull clutch from shaft.
6. Position new clutch on the shaft by aligning the square key on the shaft with the keyway of the clutch.
7. Clutch should be rotated to position the anchor bracket with the slot in the stationary shell. Replace nut and tighten.
8. Replace bolt and washers. Torque to 55 foot pounds.

## SECTION 6 - DRIVE TRAIN



**WARNING:** Hydraulic Fluid can result in severe burns. Fluid in hydraulic system can penetrate skin and result in serious injury or death.

Be sure to stop the engine before doing any work on hydraulic parts.

Keep body and hands away from pin holes or nozzles which expel hydraulic fluid when under pressure. Use paper or cardboard, not hands, to search for leaks.

Insure all hydraulic fluid connections are tight and all hydraulic hoses and lines are in good condition before applying pressure to system.



**WARNING:** FOREIGN FLUID INJECTED INTO BODY can result in gangrene. Fluid must be surgically removed within a few hours by a doctor familiar with this form of injury.

### 6.1 CHECKING THE HYDRAULIC FLUID LEVEL

A check of the hydraulic fluid level should be made daily.

**NOTE:** The oil level should be centered between the two marks on the dipstick.

**To Check:** First, remove any dirt that may be around the cap on the tank. Remove the dipstick and check the oil level. If required, add Mobil 15W50 synthetic oil through the dipstick tube. Do not overfill.

### 6.2 CHANGING HYDRAULIC FLUID AND FILTER

The hydraulic fluid and filter should be changed every 500 hours of operation. To drain the hydraulic oil reservoir, remove the filter and catch the hydraulic oil in a pan.

The filter for the hydraulic system is located under the chassis behind the left rear wheel. It is accessed from the rear of the unit.

#### To Replace the Filter

1. Unscrew the filter and dispose of properly. Allow tank to drain into container.
2. Place a film of oil on the new filter's gasket.
3. Screw the filter on until it makes contact with the sealing surface of the filter head.
4. Turn the filter by hand, an additional 1/2 to 3/4 turn.
5. Fill the hydraulic oil reservoir to the top mark on the dipstick. It will take about 5 quarts. Use Mobil

15W50 synthetic oil. Start the engine and run for 1 - 2 minutes.

6. After shutting off the engine, check the fluid level. The dipstick should read the fluid level between the high and low markings.
7. Properly dispose of waste oil.

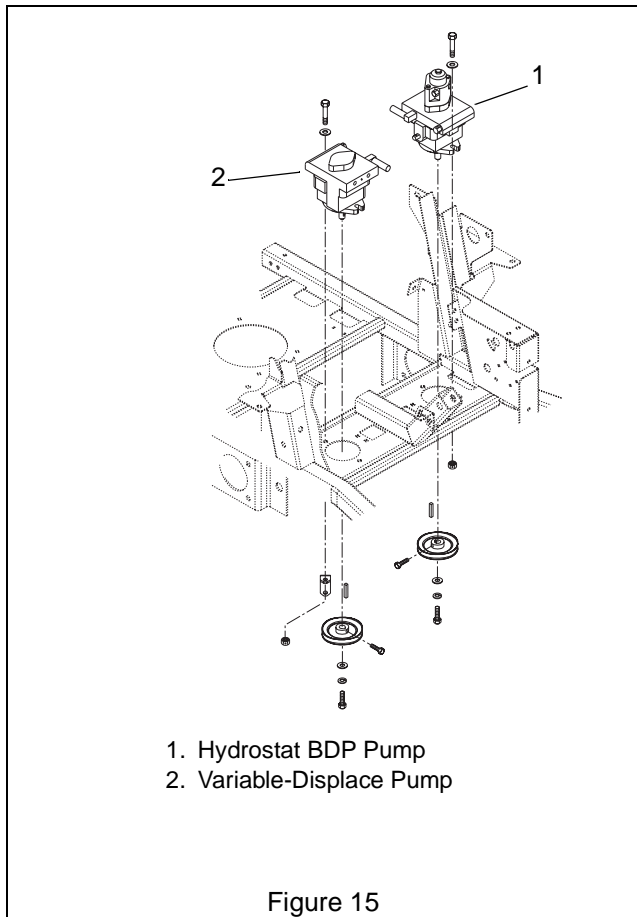
### 6.3 HYDRAULIC DRIVE FLOW TEST

Use this procedure for trouble shooting the drive system if the unit becomes sluggish or loss of drive becomes apparent. This test is to be performed one side at a time.

1. Block and jack the unit up so that both drive wheels are off the ground.
2. Place hood into the full service position.
3. Verify that the by-pass valves are closed and there is no binding in the steering control linkage. If binding occurs, you will need to correct the problem before proceeding to the next steps.
4. Make sure hydraulic fluid level is correct.
5. Clean hydraulic hoses at the wheel motor.
6. Disconnect the hydraulic hoses at the wheel motor, note the proper orientation of hoses.
7. Install a bi-directional flow gauge.
8. Have someone depress center of seat to activate seat switch.
9. Start the engine and run at about 3/4 throttle or faster. Release parking brake.
10. Stroke the appropriate control lever full stroke forward and hold.
11. Set the hydraulic system pressure to 200-400 PSI by using the restriction valve. Note the GPM (gallon per minute) flow on the meter. While keeping the pump in full stroke, increase the hydraulic system pressure to 1000-1200 PSI by using the restriction valve. Note the GPM flow on the meter. Do not keep hydraulic system under pressure for an extended period of time to prevent damaging the hydraulic system by inducing too much heat to the system.
12. Open the restriction valve and move the control lever back to neutral. Idle unit down for a few seconds and shut off engine.
13. The acceptable flow drop would be less than 1 GPM difference between the low and high pressure settings. If flow drop is greater than 1 GPM, the hydro-pump will need to be repaired or replaced. If the flow drop is less than 1 GPM you will need to replace the wheel motor.

## 6.4 REPLACING THE HYDRAULIC PUMP

The two hydraulic pumps are located inside the chassis in front of the engine. The pumps are maintenance free and should be replaced in the event of a failure. See Figure 15.



## To Replace a Hydraulic Pump

1. Lift cover to full service position.
2. Remove the cross channel.
3. Clean hoses and fittings and mark for location.
4. Disconnect hoses from pump.



**CAUTION:** Some fluid will leak out. Clean up any spills.

5. Loosen belt from pulley.
6. Remove bolt and washers from end of shaft.
7. Loosen pulley lock bolt and slide pulley from shaft. Remove and inspect square key. Replace key if damaged.
8. Remove back bolt on pump and loosen front bolt.
9. Remove pump.
10. Insert the new pump into position with the front bolt in the mounting flange slot.
11. Insert rear bolt and tighten both bolts.
12. Attach hydraulic hoses to correct ports and tighten.
13. Position square key in shaft keyway and slide pulley into position.
14. Screw the bolt, washer and lock washer into the end of the shaft. Tighten securely.
15. Tighten pulley lock bolt.
16. Place belt on pulley.
17. Replace cross channel.
18. Lower the cover and start the engine. Run the engine for 1 - 2 minutes. After shutting off the engine, check the hydraulic fluid level. The dipstick should read between the high and low markings.

## 6.5 REPLACE WHEEL MOTOR

Each drive wheel is mounted to a hydraulic drive motor. The drive motors are maintenance free. In the event of a failure, the drive motors should be replaced.

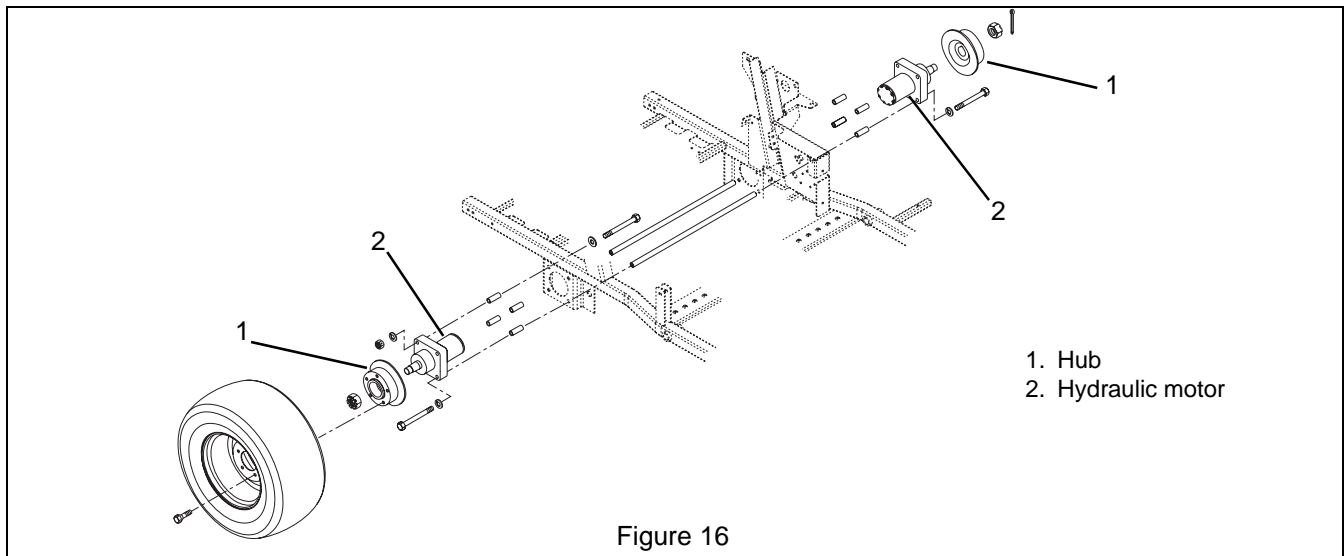


Figure 16

### To Replace a Drive Motor

1. Loosen the wheel lugs 1/4 turn.
2. Jack the drive wheels off the ground and securely support the unit.
3. Remove the wheel.
4. Remove the brake caliper assembly by removing the two bolts.
5. Unscrew the axle bolt at the center of the hub and remove the hub. The hub is a taper fit on the axle. Use a wheel puller to assist in removal.
6. Mark the hydraulic lines and remove.



**CAUTION:** Some fluid will leak out. Clean up any spills.

7. Unscrew the two bottom bolts and pull the hydraulic motor out.
8. Remove the four bolt sleeves.
9. Insert the sleeves into the four bolt holes in the new hydraulic motor.
10. Slide the motor into place and secure with two bottom bolts. Apply Loctite to bolts.
11. Reattach hydraulic lines to proper ports and tighten.
12. Clean the axle and the inside of the hub. Place hub over axle and lightly tap into position. Screw the axle nut onto the axle and tighten to 300-400 ft. lbs.
13. Place the brake caliper into position and insert bolts from the inside of the frame outward. Use lock washer and nut and tighten.
14. Position wheel on hub and insert lug nuts finger tight.

15. Tight lug nuts using the pattern shown in Figure 17.
16. Lower the unit to the ground and start the engine. Drive forward twenty feet and stop the engine. Check the hydraulic fluid level. The dipstick should read between the high and low markings.

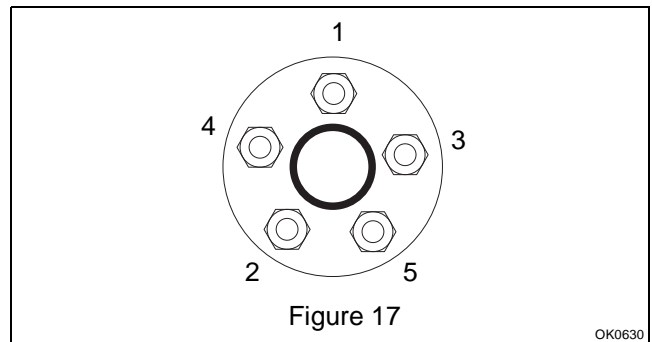


Figure 17

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## 6.6 HYDRAULIC DECK LIFT PRESSURE TEST

Use this test for trouble shooting the hydraulic lift system if the lift becomes sluggish or loss of lift occurs.

1. Place unit into the service position.
2. Clean and disconnect the hydraulic hose at the lower side of hydraulic lift valve and install a 1500 psi minimum hydraulic pressure gauge using a tee fitting.
3. Have someone depress center of seat to activate seat switch.
4. Start the engine and run at about 3/4 throttle or faster.
5. Move the deck lift lever to the raise position and hold. Relief pressure should be 650 PSI minimum from the Hydro-Gear auxiliary pump.
6. If the mower deck height creeps down during operation, the hydraulic valve, cylinder or hydraulic hose is faulty. You will need to check the condition of the hoses and verify that there are no hydraulic leaks and the fittings are tight.
7. Remove the valve.

## 6.7 REPLACE LIFT VALVE

The lift valve is located inside the chassis on the left side. See Figure 18.

1. Place hood in full service position.
2. Clean hose fittings, mark hoses for position and disconnect from valve.



**CAUTION:** Some hydraulic fluid will leak out of the hoses. Clean up any spills.

3. Loosen mounting bolts and remove valve.
4. Mount new valve and tighten bolts.
5. Connect hoses to proper ports.
6. The hydraulic system is self-bleeding. Check hydraulic fluid level after running the engine. The dipstick should read between the high and low markings.

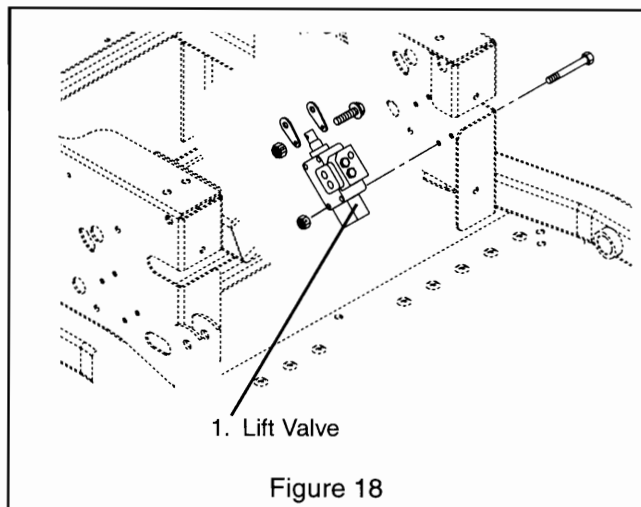
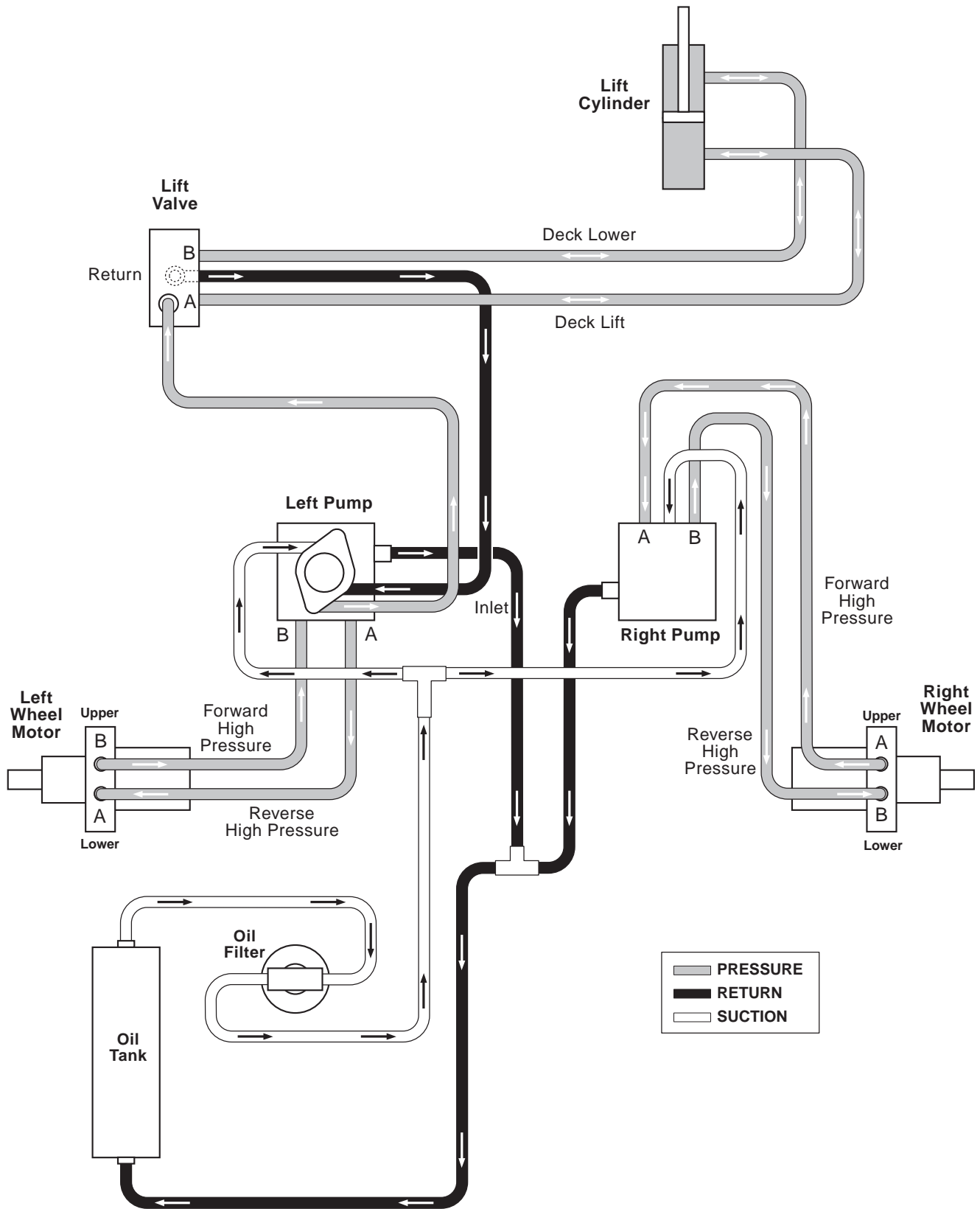


Figure 18

# 6.8 HYDRAULIC DIAGRAM



## SECTION 7 - MOWER DECK

### 7.1 MOWER DECK

#### Mower Spindles

This unit utilizes a maintenance free extended life spindle. No routine maintenance is required. In the event of bearing failure or a bent shaft the spindle should be replaced.

#### To Remove the Spindle

1. Place the unit in service position. Turn key off and remove the spark plug wire from contact with the spark plug.
2. Remove cutting blade by unscrewing bolt.



**CAUTION:** Use sturdy gloves or padding to protect hands when working with mower blades.

3. Remove belt from pulley (see *Replacing Mower Belts*).
4. Remove pulley by unscrewing bolt. Lift pulley off the shaft and check placement and condition of key.
5. Unbolt spindle from deck.

#### To Install Spindle

6. Bolt new spindle to mower deck.
7. Place square key in position and slide pulley down the shaft. Tighten bolt and washer.
8. Replace belts.
9. Install blade using flat washer, lock washer and bolt. Torque to 70 ft. lbs.

### 7.2 ANTI-SCALP ROLLERS

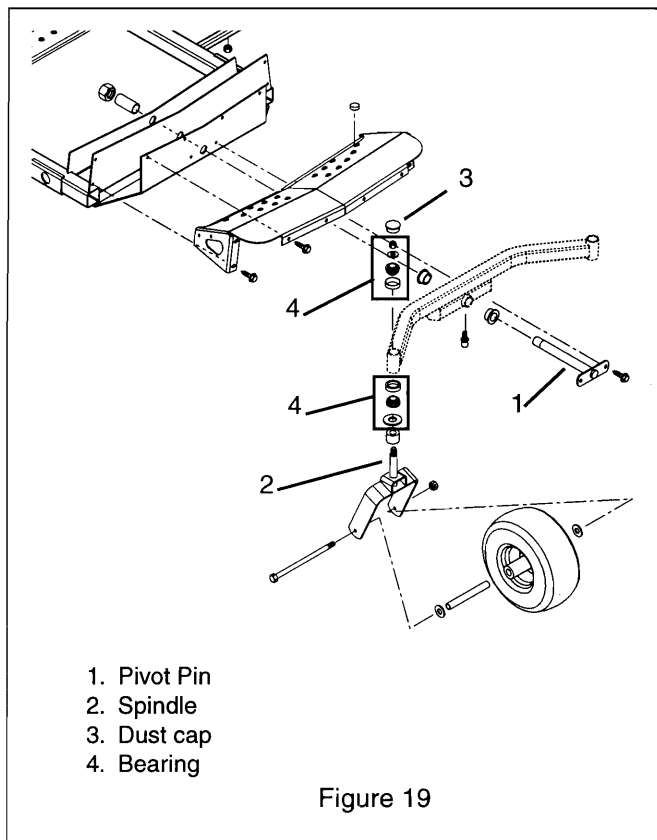
All of the anti-scalp rollers are maintenance free. If any roller, shaft, or weldment shows excessive wear it should be replaced.

The caster-type rollers are replaced by removing the top pin and dropping the weldment with roller out the bottom. Note the position of spacers and bushings for installation.

The rollers are replaced by removing the shaft. Note the position of spacers for installation.

## SECTION 8 - FRONT SUSPENSION

The front suspension consists of a weldment that is a square tube (Figure 19). A pivot pin holds the axle to the chassis. Two caster wheels are attached. The front axle is maintenance free except for one grease fitting at the chassis for the pivot pin. This fitting is greased as needed with Sten Mix Hi-Temp grease or equivalent.



### To Replace the Caster Wheel

1. Support the axle to keep the wheel off the ground.
2. Remove dust cap and spindle nut at top of spindle.
3. Lift axle to allow caster spindle to drop out of sleeve. check washers, bearings, and spacers for position.
4. Place washers bearings, and spacers onto the new caster spindle.
5. Insert spindle into the axle sleeve.
6. Place washer and nut onto the spindle and tighten. Fork should pivot freely with no end play.
7. Replace dust cap.



## SECTION 9 - ELECTRICAL

### 9.1 TOOLS

There are some specialized tools and test equipment that are needed for electrical repair work. A brief description of these follows.

**Long or needle nose pliers** - used to connect or bend wires and connectors in close quarters.

**Diagonal cutters** - used to cut wires or trim connections.

**Wire stripper/crimping tool** - available separately or as a combination tool. Used to strip insulation from wires of various sizes, crimp terminals and connector or wires.

**Soldering gun or soldering iron** - used to solder all splices and connections to terminals, connector, etc. A soldering gun is faster and more convenient than waiting for a soldering iron to heat.

**Multimeter** - analog or digital, to measure voltage, amperage and ohms.

**Tachometer** - used to measure engine speed.

Required to properly test alternator and charging circuits where output is dependent upon engine speed.

**Heat gun** - used to shrink insulated tubing in place. Used to replace electrical tape or insulated sleeving. To use, place a piece of shrink tubing over a wire joint, heat with the heat gun, until it shrinks slightly around the joint.

**Supplies** - electrical tape, rosin core solder (never use acid or acid core solder on electrical joints), an assortment of various size terminals, connectors, insulated or heat shrink tubing (for use on joints and connections), and an assortment of automotive type wire (in several colors).

Ariens Company recommends that all work be done in a professional manner. The use of the tubing to cover joints and the soldering of connections contribute to a professional looking job. In addition to a pleasing appearance, repairs made in this manner are more likely to withstand vibration. (The weakest points in an electrical system are the joints where wires are attached.)

Replace all defective components with Ariens replacement parts only. Engine parts, such as rectifiers or alternator components should be secured through the nearest engine service center.

Ariens Company does not recommend attempting to repair electrical components. Most do not lend themselves to repair and you would have more money invested in "time of repair" than the part would cost and the results may not be as good.

### 9.2 ELECTRICAL MEASUREMENTS

In many electrical circuits, there is some visible effect which indicates that the circuit is functioning properly. A switch is turned "ON" and a lamp lights. A key is turned, a starter motor runs and cranks the engine. If the lamp does not light, or the starter motor does not run, some means of measuring voltage, current flow, resistance and continuity is needed, (continuity means there is a complete electrical path through the circuit or component.)

To know exactly what conditions exist in an electrical circuit requires AC and DC Voltmeter, AC and DC Ammeter, and an Ohmmeter.

#### Multimeter

A single combination meter that does all of these things is available. Such a meter is called a Multimeter or Volt-Ohm-multitester (VOM). Meters of this kind are available in many forms and all change functions and ranges with switches, or by plugging test leads into different jacks. Multimeters are available in two basic types, Analog and Digital.

#### Analog Meters

Analog Meters have a needle that moves across a scale to give a reading. The longer the scale, the easier it is to read and more accurate the reading will be. A jeweled movement is used in this type of meter is more likely to be damaged through rough handling (except for overloaded Protected Meters) or by measuring high values that exceed the range set on the meter than a digital meter. They provide excellent service for the money as long as they are used with care.

#### Digital Meters

Digital Meters do not have a movement and are therefore more rugged. The reading shows up directly on a display window of some type. Since they read direct, no skill in reading the scale is required, nor is it necessary to set the range. The meter switches the ranges automatically. One has only to select the function DC Volts, AC Ampere, Ohms, etc.,) connect the test leads, and the reading is shown on the display. Because of the internal circuitry and the lack of a movement, these meters are not likely to be damaged by overloads. In the discussions that follow, either type of meter may be used. Test procedures are the same. It is best to learn proper procedures, even though some meters may be more forgiving of mistakes. Where differences in use may occur, they will be covered in the discussion.

## Voltage Measurement

There are two basic rules to be remembered when using a voltmeter. A voltmeter measures the voltage difference between the test leads and the voltmeter is always connected across the circuit under test.

## Current Measurement

The two rules to remember when measuring current with an ammeter are; an ammeter measures the current that flows through the meter, and to measure current an ammeter must be connected into the circuit. The latter rule means that the circuit must be opened, and the ammeter wired into it. Because this procedure is usually difficult, an ammeter is seldom used for troubleshooting.

## Resistance Measurement

An Ohmmeter is used to make resistance measurements and to check continuity through wires and electrical components.

There is one rule to keep in mind when using an ohmmeter. The ohmmeter has a self contained battery and requires no electrical power. Using the ohmmeter on a circuit that has power applied may result in damage to the meter.

**IMPORTANT:** Disconnect the equipment battery when making Ohmmeter test or damage to the Ohmmeter may result.

**IMPORTANT:** An ohmmeter reads the resistance of whatever component is connected between the test leads. It can be used to check wires, coils, light bulbs, or any item that conducts current.

## 9.3 BATTERY

When charging battery, remove it from unit first. Keep batteries out of reach of children. ALWAYS follow information provided on battery by battery manufacturer. Lead acid batteries generate explosive gases. Severe chemical burns can result from improper handling of battery electrolyte. Wear safety glasses and proper protective gear when handling batteries to prevent electrolyte from coming in contact with eyes, skin or clothing.



**WARNING:** ELECTRIC SHOCK may result in injury and/or damage to unit.

DO NOT allow tools or other objects to come into contact with both terminal at the same time. ALWAYS remove Negative (-) Cable first to reduce risk of sparks when removing battery. ALWAYS connect Positive (+) Cable first, then connect Negative (-) Cable when installing battery.



**WARNING:** EXPLOSIVE GASES can result in serious injury or death. ALWAYS keep open flames, sparks, or smoking materials away from battery.

POISONOUS BATTERY FLUID contains sulfuric acid and its contact with skin, eyes or clothing can cause severe chemical burns. ALWAYS wear safety glasses and protective gear near battery. DO NOT TIP any battery beyond 45 degree angle in any direction. ALWAYS KEEP BATTERIES OUT OF REACH of children.



**WARNING:** REVERSE CONNECTIONS may result in sparks which may result in injury. ALWAYS connect/disconnect cables in proper order.

## Battery Electrolyte First Aid

-External contact: Flush with water.

-Eyes: Flush with water for at least 15 minutes and get medical attention immediately!

-Internal contact: Drink large quantities of water. Follow with Milk of Magnesia, beaten egg or vegetable oil. Get medical attention immediately!

**IMPORTANT:** In case of internal contact, DO NOT induce vomiting!

## Inspection, Cleaning, Drying, and Maintenance

Inspect the top of battery, terminals, cables, terminal posts, and case for any accumulation of dirt, corrosion cracks or loose or broken parts. Keep battery and its terminals clean. Inspect monthly to maintain best performance. Replace battery if damaged.

Remove hold down and bolt and lift battery out. Clean or service battery away from unit. Remove corrosion from battery terminals and cable connections with wire brush, then wash with a weak baking soda solution.

Scrub the exterior of the battery and cable terminals with a nonmetallic brush which has been dipped into a mixture of baking soda and water.

After cleaning, apply a thin coat of grease or petroleum jelly to terminals and cable ends to retard corrosion. Reinstall battery.

Check the alternator voltage regulator output (if used) at every periodic maintenance inspection. Over charging is a common cause of battery failure.

## Electrolyte Level

Every 25 hours of operation, check electrolyte level of each cell by removing caps one at a time. The electrolyte level should be at level indicated. Use distilled water to fill each cell if needed. Install and tighten each cap after checking.


**IMPORTANT:** When distilled water is added to battery during freezing weather, battery must be charged to mix water with electrolyte, or water will remain at top and freeze.

### Battery Charger

Under normal conditions, the engine alternator will have no problem keeping battery charged. When unit has set for an extended period of time without operation and the battery has been completely discharged, a battery charger will be required for recharging.

Before using a charger, an attempt can be made to recharge the battery using the engine alternator by jump starting the unit and allowing the engine to run.

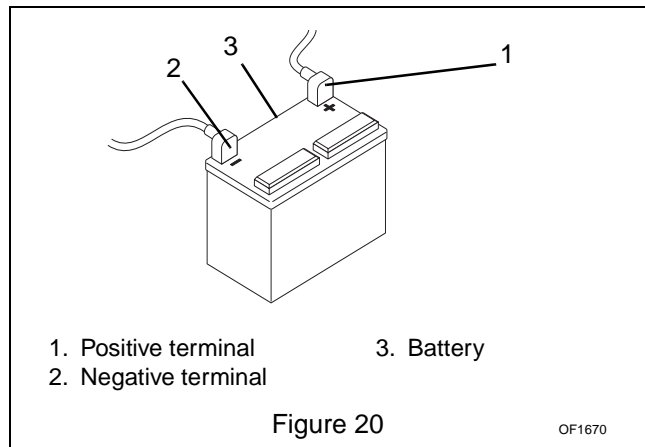
### Charging A New Battery



**WARNING: FROZEN BATTERIES CAN EXPLODE** and result in death or serious injury.  
DO NOT charge a frozen battery. Let the battery thaw out before putting on a charger.

**IMPORTANT:** DO NOT fast charge. Charging at a higher rate will damage or destroy battery.

ALWAYS follow information provided on battery by battery manufacturer. Contact battery manufacturer for extensive instructions to charge battery.



1. Put unit into service position to gain access to battery.
2. Disconnect negative (-) cable first, then positive (+) cable.
3. Remove hold down and remove battery.
4. Place battery on bench or other well ventilated place where electrolyte spill will not create damage.
5. Remove caps and fill each cell to level indicated with electrolyte at 1.230 ± specific gravity and 80 degrees F (27 degrees C).
6. Let battery stand for one half hour.
7. Check electrolyte level and add more if necessary.

8. Connect positive (+) lead of charger to positive (+) terminal, and negative (-) lead to negative (-) terminal.
9. Charge the battery at two and a half amps for ten hours or until all cells are gassing freely and the specific gravity is constant over three 30 minute intervals.
10. Immediately after charging, check the electrolyte level. If low, add distilled water to bring cell up to required level.
11. Replace caps finger tight, wash off and dry battery.
12. Reinstall battery into unit and connect positive (+) cable first, then negative (-) cable.

### Specific Gravity Check

The specific gravity should be checked with a hydrometer.

**NOTE:** The specific gravity should be checked in each cell and should be the same for all cells. A variation in a cell reading could be an indication of a problem. Subtract .004 from 1.265 for each 10°F below 80°F or add .004 to 1.265 for each 10°F above 80°F.

A special temperature compensated hydrometer is used to read the battery's state of charge.

The reading on the hydrometer gauge should be above 1.225. If the reading falls below 1.225 specific gravity there will be an insufficient charge.

ALWAYS charge the battery until the specific gravity of 1.265 is reached over 3 successive readings. Check monthly to ensure charge is maintained. The approximate state of charge can be determined by the cell specific gravity of the rested open circuit voltage at room temperature and the charging time can be estimated. For example:

OCV	Specific Gravity	% of Charge	Charging Time
12.60	1.265	100%	---
12.4	1.225	75%	3 hours
12.20	1.180	50%	7 hours
12.00	1.130	25%	10 hours
11.80	1.100	0%	12 hours

If using an automatic tapering 12 volt charger, choosing a good quality 5 to 10 amps 15VDC minimum output charger and charge for 3 to 12 hours according to the battery state of charge (see table above) or until the specific gravity in each cell reaches 1.255 - 1.265 specific gravity at 80 degrees F.

If using a constant current charger, charge at 1 to 2 amperes for the time given on the table above or until full specific gravity is reached.

**IMPORTANT:** Charging at higher rates will damage the battery and cause excessive gassing and acid spewing.

### Jump Starting

The unit used for jump starting should have a 12 volt battery with at least 500 cold cranking amperes, and a negatively grounded system.

1. Ensure battery is not frozen. If the fluid is frozen, remove battery from unit and allow to thaw before charging.
2. Connect the positive (+) jumper cable to the positive (+) terminal of the discharged battery.
3. Connect the other end of the same jumper cable to the positive (+) terminal of the booster battery.
4. Connect one end of the second jumper cable to the negative (-) terminal of the booster battery.
5. Make the final jumper cable connection to the engine block or the furthest ground point away from the discharged battery.



**WARNING:** Make sure cables are clear of any moving engine parts before starting engine.

6. Start engine (refer to Owner's Manual). If engine will not start after several tries, unit or battery may need service.
7. After engine starts, leave cables connected for one to two minutes.
8. Disconnect cables in reverse order.
9. Operate unit as normal to charge battery.

### Storage

The battery is a perishable item and it should be stored properly to obtain a long, useful life. Batteries not in use will self discharge.

If the battery will not be used for more than three months, it should be removed and stored in a cool, dry place.

Any collection of dirt, grease, or electrolyte should be removed from the top of the battery.

The battery must be recharged monthly or when the cell specific gravity reads less than 1.255 specific gravity. Before reinstalling the battery in the spring, it should always be fully recharged.

## 9.4 SWITCHES

Switches either open a circuit to stop current flow or close and allow current to flow through.

A normally open (N.O.) switch prevents current flow until the switch is actuated, completing the circuit and allowing current to flow through it. An example is a light switch - the lights are off until the switch is actuated and the lights go on.

A normally closed (N.C.) switch allows current to flow until the switch is actuated, breaking the circuit and stopping current flow through it. An example is an ignition switch that grounds the magneto when in the off position (completing the circuit) but opens the circuit when in the ON position allowing the engine to operate.

Switches are selected with regard to Current rating (contacts must be of sufficient size to carry the required current), Voltage rating (switches insulated for specific voltages), Case or housing (switches that are exposed to moisture and must be sealed to prevent moisture from entering), and Actuating type (push, pull, rotary, momentary contact, or micro switches).

**NOTE:** Check that the connections to the switches are secure and that a switch is being activated properly before performing electrical test on switches. (Safety switches on speed selector and clutch levers may be out of adjustment and not activating.)

**IMPORTANT:** When checking switches, remove them from their respective circuit by disconnecting the wires from the switch at the connector(s). Damage could result to the meter or machine components if switches are left in.

### Normally Open Switch

To test a normally open switch (key, headlight, safety, or seat) connect the ohmmeter across the switch terminals. Meter should indicate open circuit (infinite resistance). Activate the switch. The ohmmeter should read up scale to zero resistance (Close Circuit). This indicates the switch is operating properly. Also check from each terminal to the switch case (if case is metal). reading should show infinite resistance indicating no short to ground.

Variation from test results described indicates a defective switch.

### Normally Closed Switch

To test a normally closed switch connect the ohmmeter across the switch terminals. Meter should indicate a closed circuit (zero resistance). Activate the switch and the meter should move to open circuit (infinite resistance). Check from each terminal to ground (switch case). Meter should show open circuit (infinite resistance).

Variation from test results described indicates a defective switch.

## Ignition Switch

**NOTE:** Refer to the wiring diagram of the unit involved to determine switch functions and test using the methods described.

The ignition switch incorporates a number of functions, although not all functions are used on all equipment. The switch has three positions: OFF, RUN, and a momentary contact START position. Use an ohmmeter to check the continuity of the switch in each position.

**OFF Position** - Should be continuity between contacts G and M. These connections ground the engine magneto and stop the engine in the OFF position.

**RUN Position** - Should be continuity between contacts B and A. These connections supply power to the rest of the wiring harness. Connections G and M open to each other.

**START Position** - Hold switch in START position while testing. There should be continuity between contacts S1 and S2. These connections apply power to close the solenoid contacts and operate the starter motor.

In addition to the above test, place the switch in the run position and check between each contact and ground (metal case) to be sure no terminals are grounded. If the switch is operating properly, there will be no continuity between contacts other than those described.

## 9.5 SOLENOID AND RELAYS

Solenoid and relays are both magnetically operated devices. Both devices operate on the principle that passing a current of electricity through a coil of wire will create a magnetic field strong enough to attract a piece of iron or steel. Each device uses this principle in a slightly different manner.

**Relay** - A basic relay consists of a coil of wire wound around a soft iron (magnetic) core. When current is passed through the coil, the core is magnetized and pulls down on a magnetic lever. The lever in turn is attached to several switch contacts which open or close other electrical circuits. In this fashion, a small current can control one or more larger electrical currents and actuate several other devices. In most cases a relay contact moves only a fraction of an inch and the magnetic pull is small.

**Solenoid** - A basic solenoid consists of a coil of wire wound around a hollow tube. A magnetic core slides inside the tube. When current is passed through the coil, the core is pulled into the solenoid with considerable force. With proper design, a solenoid can exert considerable force over a distance of several inches. A solenoid can therefore, pull a lever, close a heavy contact, or perform other jobs that require a straight line pull.

If a relay or solenoid fails to operate, the cause may be either electrical or mechanical.

To check electrically, connect a voltmeter across the coil of the device and activate the circuit that operates the relay or solenoid. If the meter indicates no voltage is applied, the cause is in the control circuit.

If the meter indicates proper voltage across the coil but the device does not function, remove the power, disconnect the wiring and check the continuity of the coil with an ohmmeter. The meter should indicate resistance, in the order of 3 to 5 ohms, if the coil is intact. A high resistance indicates an open coil and a defective device.

There are also a number of mechanical problems that may cause the problem.

The starter solenoid in the Ariens equipment is a sealed unit used to actuate the starter motor on the engines. These solenoids may have three or four connections. The two large connections carry high current to operate the starter motor. The small connections are connected to the coil and carry the control current.

To check the solenoid, disconnect the cables to the starter motor, turn the ignition switch to the start position, and listen for the solenoid to snap inside contacts closed.

If no snap is heard, check across the coils with a voltmeter. The voltage should read 12 volts with the ignition switch in the start position. If no voltage appears, the defect is in the start circuit.

If the voltage is correct, turn off the power and check continuity of the coil with an ohmmeter. If the coil is open, the solenoid is defective and must be replaced.

If the coil has the proper voltage applied, and the continuity check indicates the coil is intact, the solenoid plunger is stuck or the contacts are welded shut and the solenoid must be replaced.

If the solenoid snaps shut, but the start does not operate, check across the large contacts with an ohmmeter. If there is no continuity when the solenoid snaps shut, the contacts are defective and the solenoid must be replaced.

## 9.6 FUSES

Fuses are connected in electrical circuits to protect the circuits from damage due to overload or short circuits. Fuses are a "weak link" in the circuit. They contain a metal link designed to melt when a certain current value is exceeded thus opening or disconnecting the wiring. Once a fuse blows or melts it must be discarded and replaced with a new fuse of the same value.

Since the function of the fuse is to protect the circuit, NEVER attempt to defeat the protective device by bridging or replacing with a device of a higher current rating.

Electrical testing of these devices is simple. Since the device either conducts current (and is therefore

functioning) or the device is open and is therefore defective. Use an ohmmeter to check for continuity.

## 9.7 DIODES AND RECTIFIERS

Diodes are solid state, semiconductor devices. They contain no moving parts and conduct current better in one direction than the other. They are electrical "check valves" and permit current flow in one direction, but not in the other.

Diodes allow current to flow through one circuit without "backing up" into another. In engine alternator circuits, a diode is used to convert current which flows back and forth (AC) in a circuit to current which flows only in one direction (DC). A device which converts alternating current to a direct current is called a RECTIFIER. A diode is one type of rectifier.

To check a diode, isolate it from the circuit by disconnecting one end. With a multimeter set on the lowest ohms scale setting, measure the resistance in one direction, reverse the test leads, and measure in the other direction. Readings should be high in one direction and low in the other. (If the readings are low in both directions, the diode is shorted, and if the readings are high, the diode is open.) If the readings are the same in both directions, the diode is defective and must be replaced.

**IMPORTANT:** Diodes are marked to indicate polarity (a band on one end, an arrow on the side, or they fit on a holder only one way).

### Rectifiers

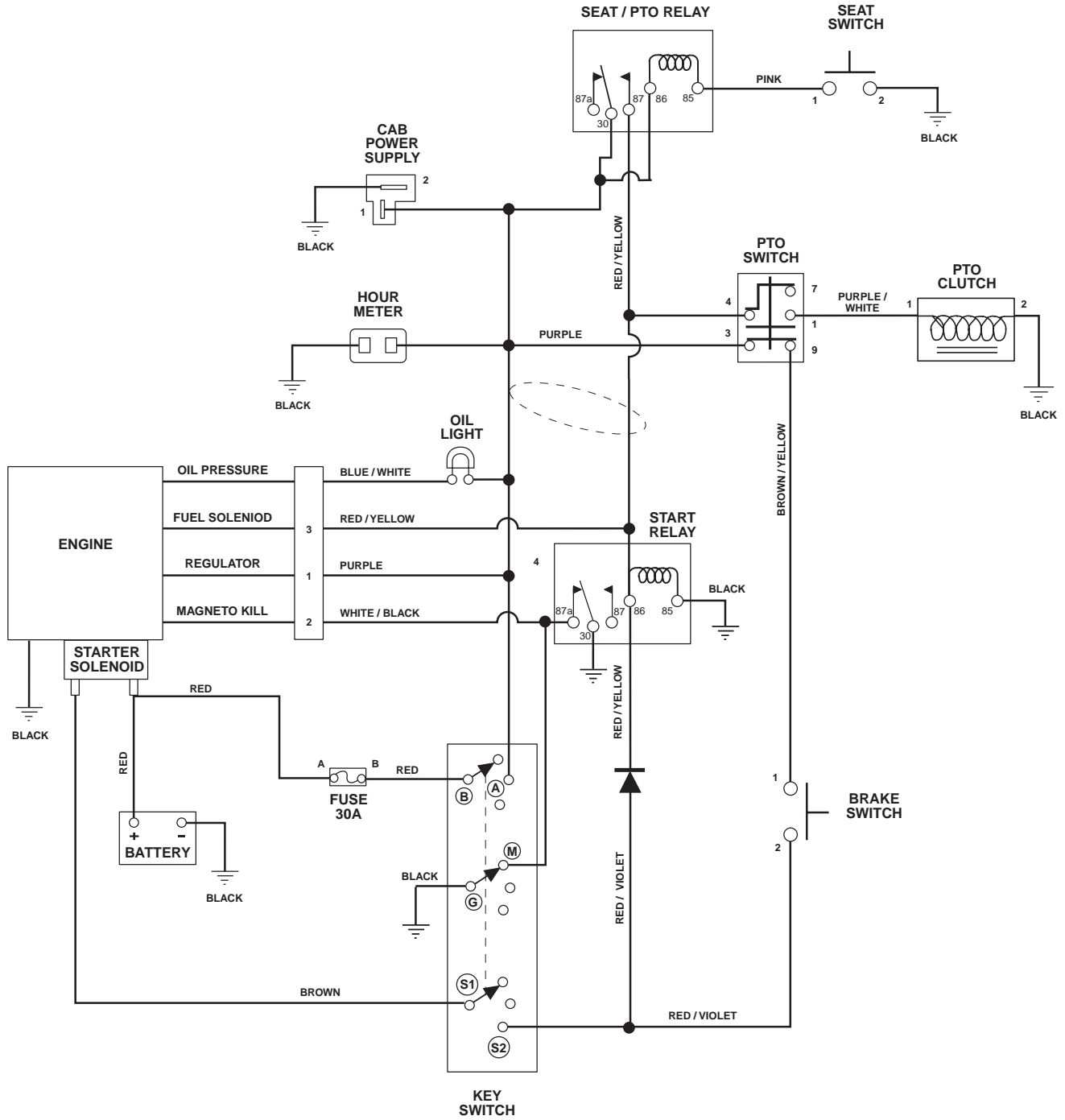
A battery is charged through the use of an alternator located in or on the engine. A charging circuit contains a rectifier because alternators produce alternating current (AC) and batteries require direct current (DC) for charging.

The rectifier may be built into the engine or it may be an external part. It may also contain a regulator to prevent overcharging the battery. (Servicing of rectifiers built into the engine should be done by an approved engine manufacturer's service center. Such a service center has access to the information and parts required to test and repair or replace engine components, including rectifiers and regulators.)

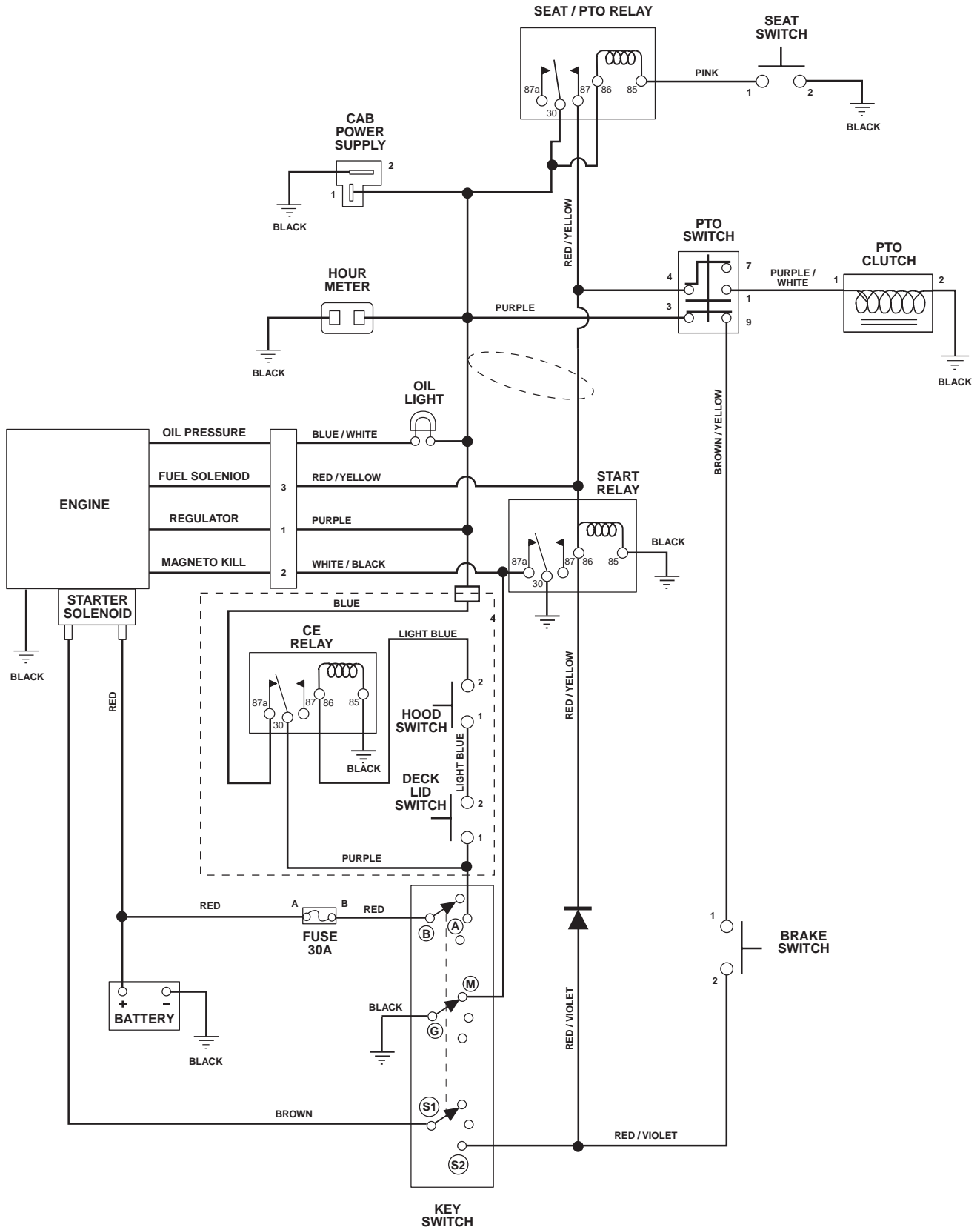
Units that contain both a rectifier and regulator are tested in a working circuit to make sure the regulator portion of the device is operating.

# 9.8 WIRING DIAGRAMS

Models 992018, 020, 021, 022, 024

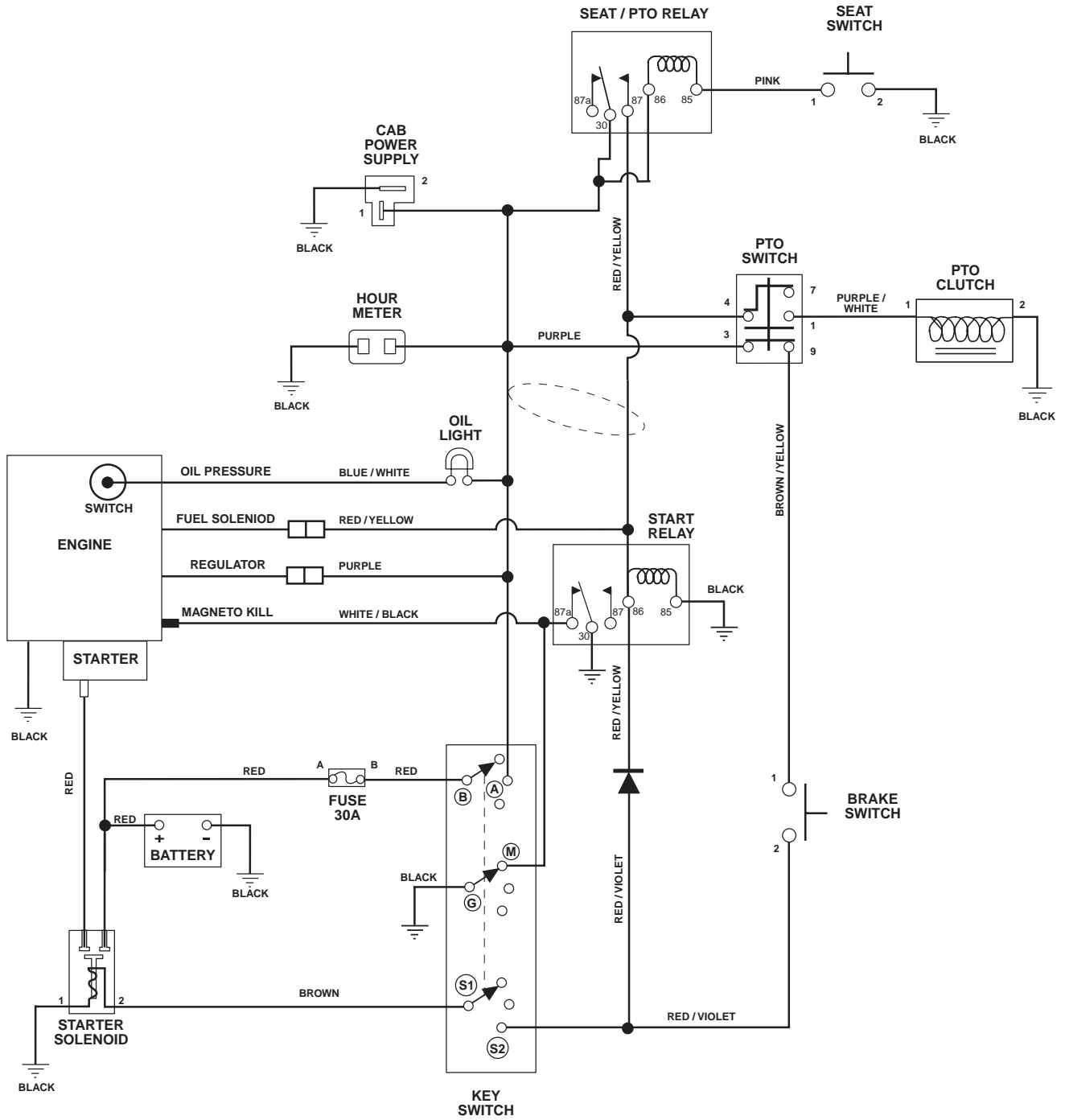


# Model 992305





# Model 992023





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