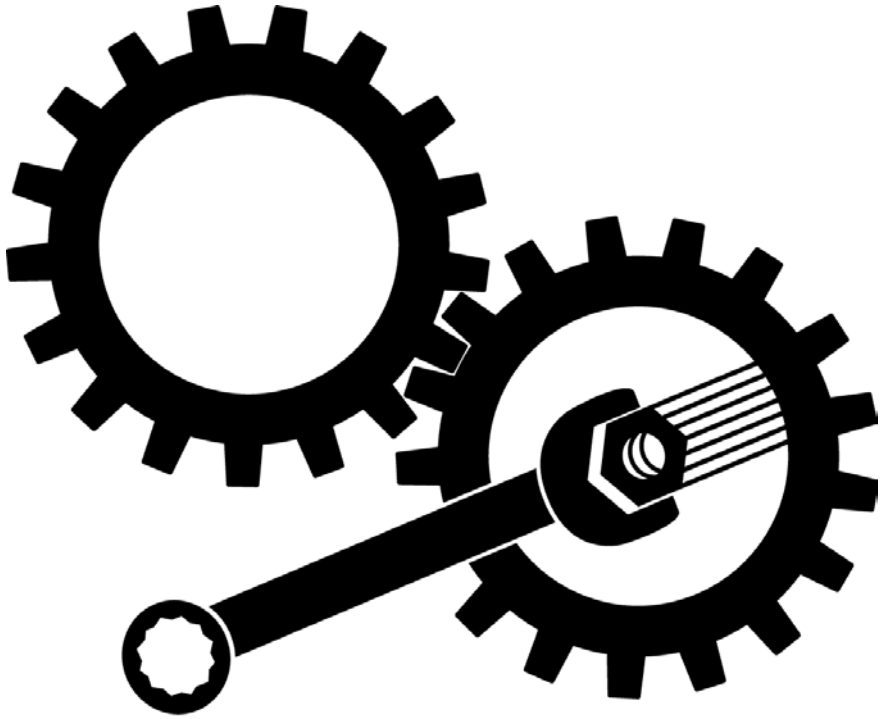
Zoom

Service Manual

Ariens Models 915035, 037, 039, 041, 313, 501
Gravely Models 915034, 036, 038, 040



00173200 09/03
Printed in USA

TABLE OF CONTENTS

Section 1 - Introduction 1-2
1.1 The Manual 1-2
1.2 Service And Replacement Parts 1-2
1.3 Product Registration 1-2
1.4 Unauthorized Replacement Parts 1-2
1.5 Disclaimer 1-2
1.6 Technical Service Communications 1-2

Section 2 - Safety 2-3
2.1 Safety Alerts 2-3
2.2 Signal Words 2-3
2.3 Notations 2-3
2.4 Practices And Laws 2-3
2.5 Required Operator Training 2-3
2.6 Preparation 2-3
2.7 Service Position 2-3
2.8 Cleaning And Storage 2-3
2.9 Safety Rules 2-4

Section 3 - Specifications 3-6

Section 4 - General Maintenance & Adjustments 4-8
4.1 Controls And Features 4-8
4.2 Fuel Level 4-9
4.3 Maintenance Schedule 4-9
4.4 Remove Mower Deck 4-12
4.5 Level and Adjust Pitch Of Mower Deck 4-12
4.6 Hydrostatic Transmission Neutral Adjustment . . 4-13
4.7 Adjusting Unit to Track Straight 4-13
4.8 Steering Lever Adjustments 4-14
4.9 Adjusting the Parking Brake 4-15

Section 5 - Engine 5-16
5.1 Engine Troubleshooting 5-16
5.2 Checking Engine Oil 5-17
5.3 Changing Oil 5-17
5.4 Checking Engine Cooling 5-17
5.5 Cleaning The Air Cleaner 5-17
5.6 Changing The Air Cleaner Element 5-17
5.7 Inspect Muffler/Spark Arrester 5-17
5.8 Replace Spark Plugs 5-17
5.9 Engine Removal 5-17
5.10 Engine Installation 5-18

Section 6 - Mower Deck 6-19
6.1 Clutch To Deck Drive Belt Replacement 6-19
6.2 Check Blades 6-19
6.3 Sharpening Mower Blade 6-20

Section 7 - Drive Train 7-21
7.1 Hydro Transmission Troubleshooting 7-21
7.2 Hydrostatic Belt Replacement 7-22
7.3 Hydro-Gear Fluid Recommendations 7-22
7.4 Hydro-gear Transmission Removal 7-22
7.5 Hydro-Gear Transmission Installation 7-23
7.6 Electric Clutch Adjustment 7-23

Section 8 - Lift System 8-25
8.1 Lift System 8-25

Section 9 - Fuel System 9-26
9.1 Fuel System Troubleshooting 9-26
9.2 Fuel Pump 9-27
9.3 Fuel System Contamination 9-27
9.4 Fuel Tank 9-27

Section 10 - Electrical 10-28
10.1 Tools 10-28
10.2 Electrical Measurements 10-28
10.3 Battery 10-29
10.4 Switches 10-32
10.5 Solenoid And Relays 10-33
10.6 Lighting Circuits 10-33
10.7 Fuses 10-34
10.8 Diodes And Rectifiers 10-34
10.9 Electric Clutch 10-34
10.10 Electrical 10-34
10.11 Wiring Diagrams 10-36
10.12 Continuity Diagram 10-40
10.13 Electrical System 10-41

Section 11 - Mower Attachment 11-42
11.1 Mower Spindle Removal 11-42

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 915 Zoom.

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.

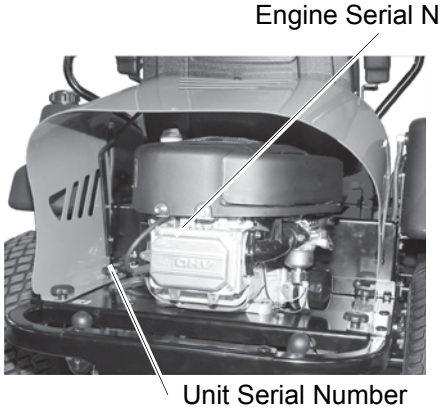


Figure 1

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 Ariens/Gravely replacement parts. The replacement of any part on this vehicle with anything other than a Ariens/Gravely authorized replacement part may adversely affect the performance, durability, or safety of this unit and may void the warranty. Ariens/Gravely 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

Ariens/Gravely 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/Gravely 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.

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 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. A list of required special tools has been included in this manual.

CAUTION: Remove enough fuel so that no spillage will occur. Remove battery to prevent spillage of electrolyte.

2.7 SERVICE POSITION

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 jack stands under rear transaxle only.
2. If jacks are not available, place support blocks under transaxle at the rear of unit.

2.8 CLEANING AND STORAGE

IMPORTANT: To help prevent sealed bearing rust or corrosion never spray unit with water or store unit outdoors. 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.

2. If a preservative fluid was used in fuel tank, drain and discard. Fill fuel tank with fresh new fuel.

2.9 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^{o} 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

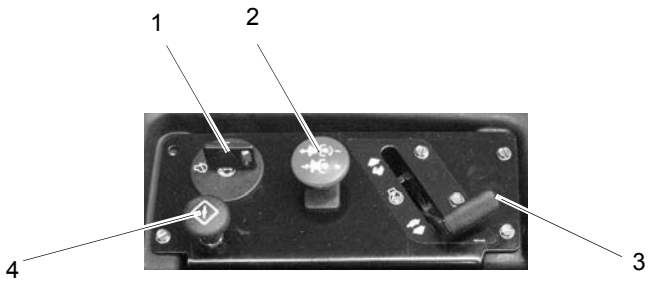
Ariens Models

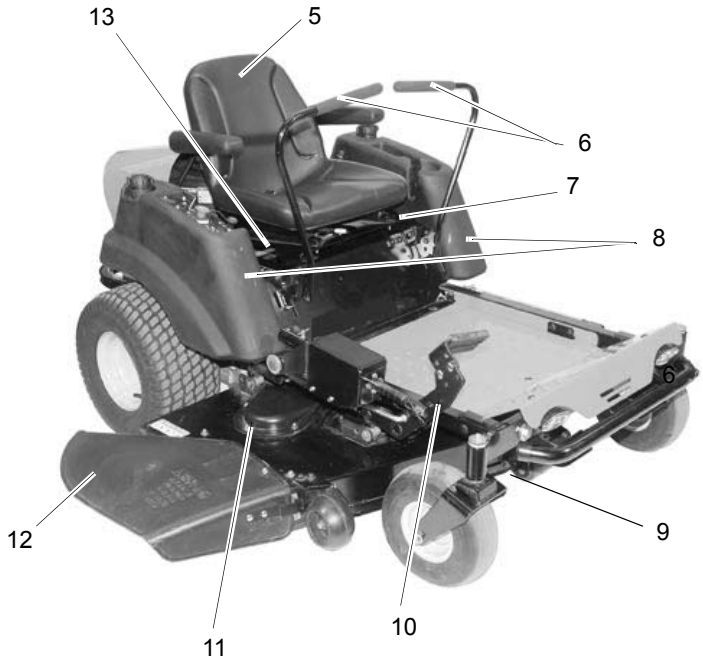
Model Number	**915035**	**915037**	**915039**	**915041**	**915501**	**915313**
Description	**1640**	**1844**	**2048**	**2252**	**1844**	**2252**
Engine	Single Cylinder Briggs & Stratton		Twin Cylinder Briggs & Stratton			
Engine Power - HP (kW) @ governed RPM	16 (11.9)	18 (13.4)	20 (14.9)	22 (16.4)	18 (12.8)	22 (13.5)
Max Governed RPM	3400				2900	3100
Fuel Tank Capacity - gal. (L)	8 (30.28)					
Starter	Electric					
Transmission	Hydrostatic					
Speed: Forward Max. - mph (km/h)	6.5 (10.5)					
Reverse Max. - mph (km/h)	3 (3.2)					
PTO	Electric Clutch/Brake					
Battery	12 Volt Maintenance Free					
Brakes	Internal Transmission					
Cutting Height - in. (cm)	1-1/2 - 4-1/2 (3.81 - 11.4)					
Cutting Width - in. (cm)	40 (102)	44 (112)	48 (122)	52 (132)	44 (112)	52 (132)
Tire Pressure: Front - psi (kPa)	46 (317)	46 (317)				
Rear - psi (kPa)	10 (69)	12 (83)				
Tire Size: Front - in. (cm)	11 x 4 (27.9 x 10.2)	11 x 4 (27.9 x 10.2)				
Rear - in. (cm)	18 x 8.5 (45.7 x 21.6)	18 x 9.5 (45.7 x 24.1)				
Turning Radius	Zero					
Weight - lbs (kg)	660 (299)	687 (312)	714 (324)	740 (336)	687 (312)	740 (336)
Height - in. (cm)	41 (104)					
Length - in. (cm)	76 (193)					
Width - in. (cm)	44 (112)	46.5 (118)				
Max. Towing Capacity - lbs (kg)	300 (136)					
Max. Tongue Weight - lbs (kg)	30 (13.6)					
CE Sound and Vibration						
Oper. Ear Sound Pressure (L_{pa}) in dB_A	NA				86	91
Vibration Measure (m/sec^2)						
At Operator Hands: X axis	NA				.76	2.6
Y axis					.59	1.1
Z axis					1.10	1.8
At Operator Feet: X axis	NA				.34	.34
Y axis					.42	.42
Z axis					1.19	1.2
At Operator Seat: X axis	NA				.35	.35
Y axis					.37	.37
Z axis					.87	.87

Gravely Models

Model Number	915034	915036	915038	915040
Description	**ZT1640**	**ZT1844**	**ZT2048**	**ZT2252**
Engine	Single Cylinder Briggs & Stratton		Twin Cylinder Briggs & Stratton	
Engine Power - HP (kW) @ governed RPM	16 (11.9)	18 (13.4)	20 (14.9)	22 (16.4)
Max Governed RPM	3400			
Fuel Tank Capacity - gal. (L)	8 (30.28)			
Starter	Electric			
Transmission	Hydrostatic			
Speed: Forward Max. - mph (km/h)	6.5 (10.5)			
Reverse Max. - mph (km/h)	3 (3.2)			
PTO	Electric Clutch/Brake			
Battery	12 Volt Maintenance Free			
Brakes	Internal Transmission			
Cutting Height - in. (cm)	1-1/2 - 4-1/2 (3.81 - 11.4)			
Cutting Width - in. (cm)	40 (102)	44 (112)	48 (122)	52 (132)
Tire Pressure: Front - psi (kPa)	46 (317)	46 (317)		
Rear - psi (kPa)	10 (69)	12 (83)		
Tire Size: Front - in. (cm)	11 x 4 (27.9 x 10.2)	11 x 4 (27.9 x 10.2)		
Rear - in. (cm)	18 x 8.5 (45.7 x 21.6)	18 x 9.5 (45.7 x 24.1)		
Turning Radius	Zero			
Weight - lbs (kg)	660 (299)	687 (312)	714 (324)	740 (336)
Height - in. (cm)	41 (104)			
Length - in. (cm)	76 (193)			
Width - in. (cm)	44 (112)	46.5 (118)		
Max. Towing Capacity - lbs (kg)	300 (136)			
Max. Tongue Weight - lbs (kg)	30 (13.6)			

4.1 CONTROLS AND FEATURES





1. Ignition Switch
2. PTO Switch
3. Throttle Lever
4. Choke Control (915038, 039, 040, 041, 313, 501)
5. Seat
6. Steering Lever
7. Parking Brake
8. Fuel Tank
9. Axle Lock
10. Mower Lift Pedal
11. Mower Deck
12. Discharge Chute
13. Fuel Shut-Off Valve

Figure 2

Safety Interlock System

WARNING: Safety interlock failure and improper operation of unit can result in death or serious injury. Check system before each use to make sure it is functioning properly.

Perform the following tests to ensure the safety interlock system is working properly. If the unit does not perform as stated contact your Ariens/Gravely dealer for repairs.

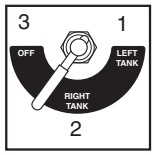
Test	Steering Lever	PTO	Parking Brake	Engine
1	Neutral Lockout Position	Off	Engaged	Starts
2	Forward	Off	Engaged	Doesn't Start
3	Neutral Lockout Position	On	Engaged	Doesn't Start
4	Out of Neutral Lockout Position	Off	Disengaged	Doesn't Start
5*+	Reverse	Off	Disengaged	Shuts Off
6*+	Neutral Lockout Position	On	Engaged	Shuts Off
7*+	Out of Neutral Lockout Position	Off	Disengaged	Shuts Off

*** Test with engine running.**

+ Operator lifts off seat.

4.2 FUEL LEVEL

Fuel Shut-Off Valve



OF1881

Figure 3

Use this valve to control fuel flow from left (1) or right (2) fuel tank (Figure 3).

Open the valve to operate the engine. Turn the valve to "Off" (3) when storing or transporting the unit.

WARNING: Fuel is highly flammable and its vapors are explosive. Handle with care. NO smoking, NO sparks, NO flames.

To add fuel to the fuel tank:

1. ALWAYS place unit in open or well ventilated area.
2. Stop engine and allow to cool for two minutes.
3. Clean fuel caps and surrounding area to prevent dust, dirt, and debris from entering fuel tanks.
4. Remove fuel caps.

IMPORTANT: See Engine Manual for correct type and grade of fuel.

5. Fill fuel tanks to 1/2 in. (1.3 cm) below bottom of filter neck. See *Specifications* for capacity of fuel tanks.
6. Replace fuel caps.
7. ALWAYS clean up any spilled fuel before starting the engine.

4.3 MAINTENANCE SCHEDULE

CAUTION: Before performing any service or adjustments:

- Turn PTO switch "OFF".
- Park mower on a hard, flat, level surface.
- Place steering control levers in neutral lock (fully outward) position.
- Set parking brake.
- Turn ignition switch "OFF" and remove key.
- Wait for blades and all moving parts to stop.

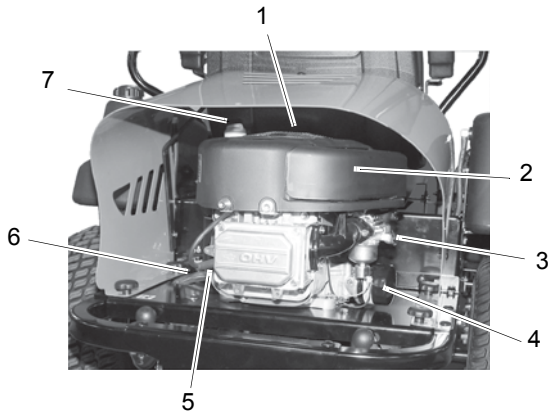
WARNING: AVOID INJURY. Read and understand the entire *Safety* section before proceeding.

IMPORTANT: Proper maintenance can prolong the life of unit. The following chart shows the recommended service schedule. Refer to the maintenance instructions in the Engine Manual for additional information.

NOTE: To access the cooling system, fuel filter, oil drain petcock, and oil fill/dipstick, the seat must be tipped forward.

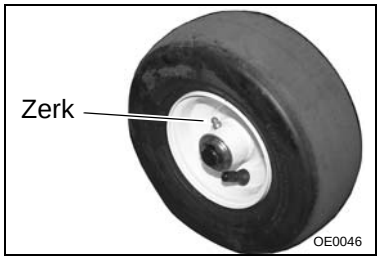
NOTE: To access the air filter, open the hood.

NOTE: Use Figure 4 to locate items called out in the maintenance schedule.



1. Cooling System
2. Air filter (precleaner and cartridge)
3. Fuel Filter
4. Oil Filter
5. Spark Plug
6. Oil Drain Petcock
7. Oil Fill/Dipstick

Figure 4

Interval	Task	Action
Each Use	Check Safety Interlock System	**WARNING:** Safety interlock system failure and improper operation of unit can result in death or serious injury. Test this system each time the unit is operated. If this system does not function as described, do not operate until repairs are made.
	Check Parking Brake	Engage parking brake and engage transmission bypass lever. Push unit. If unit rolls, contact your Ariens/Gravely Dealer.
	Clean Unit	Clean engine battery, seat, mower deck, etc. of all dirt and debris. Do not use solvents, hard cleaners, or abrasives. **NOTE:** Protect painted surfaces with automotive type wax.
	Check Tires	See *Specifications* for correct tire pressure.
	Check Mower Blades	Check for worn or damaged mower blades.
	Check Engine Oil	Use oil fill/dipstick to check engine oil level. Add engine oil if needed, refer to Engine Manual for detailed instructions.
25 Hours or Every Season	Check Battery	Keep battery and battery terminals clean.
	Lubricate Unit	Apply grease to the two front wheel zerks. 
	Clean Air Filter Precleaner[1]	Clean air filter precleaner. Refer to Engine Manual for detailed instructions.

Interval	Task	Action
50 Hours or Every Season	Change Engine OIl[2]	Drain engine oil by opening oil drain petcock. Refer to Engine Manual for detailed instructions.
	Check Fasteners	Check mower blade mounting hardware and all other fasteners. Replace fasteners that are missing or damaged. Tighten all nuts and bolts to the correct torque value.
	Inspect Muffler and Spark Arrestor	Replace muffler and (if equipped) spark arrestor if corroded. Contact your Ariens/Gravely Dealer.
100 Hours or Every Season	Clean Air Filter Cartridge[1]	Clean air filter cartridge. Refer to Engine Manual for detailed instructions.
	Change Oil Filter	Clean oil filter. Refer to Engine Manual for detailed instructions.
	Replace Spark Plug	Replace spark plug. Refer to Engine Manual for detailed instructions.
	Replace Fuel Filter	Replace fuel filter. Refer to Engine Manual for detailed instructions.
	Clean Cooling System[1]	Clean cooling system. Refer to Engine Manual for detailed instructions.
	Check All Belts	Replace worn or deteriorated belts. • Check hydrostatic belt (see *Hydrostatic Belt Replacement*). • Check PTO belt (see *PTO Belt Replacement*).
Yearly	Clean/Replace Spark Plugs	Clean/replace spark plugs. Refer to Engine Manual for detailed instructions.
	Clean/Replace Fuel Filter	Clean/replace fuel filter. Refer to Engine Manual for detailed instructions.

[1] Service more often when operating under heavy loads, high temperatures, or dusty conditions. Replace air filter precleaner and cartridge if very dirty.

[2] Change after first 5 to 8 hours of use. Change every 25 hours when operating under heavy loads or in high temperatures.

4.4 REMOVE MOWER DECK

Remove (Figure 5)

1. Remove PTO belt from electric clutch.

NOTE: Perform step 2 and 3 for the right and left side of unit.

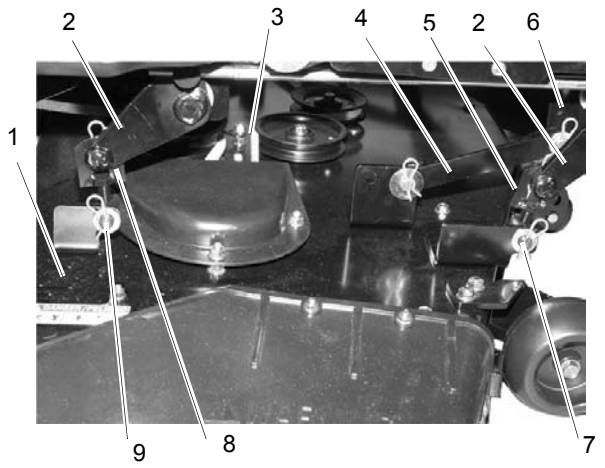
2. Remove guide arm from front mount bracket.
3. Remove rear lift link, rear trunnion, front lift link, and front trunnion from mower deck and mower lift.
4. Slide mower deck out from under unit.

Install (Figure 5)

1. Slide mower deck under unit.

NOTE: Perform step 2 and 3 for the right and left side of unit.

2. Install rear lift link, rear trunnion, front lift link, and front trunnion on mower deck and mower lift.
3. Install guide arm on front mount bracket.
4. Install PTO belt.



1. Mower Deck
2. Mower Lift
3. PTO Belt
4. Guide Arm
5. Front Lift Link
6. Front Mount Bracket
7. Front Trunnion
8. Rear Lift Link
9. Rear Trunnion

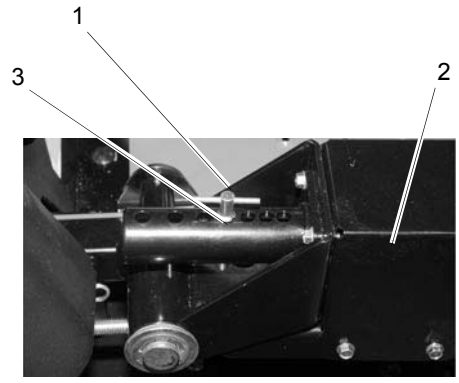
Figure 5

4.5 LEVEL AND ADJUST PITCH OF MOWER DECK

Adjust on a level surface, with the tires inflated to the correct air pressure.

Level Mower Deck

1. Install adjustment pin in the fourth adjustment hole (Figure 6).
2. Rotate the right and left mower blades until the ends of both mower blades are facing rearward (Figure 7).

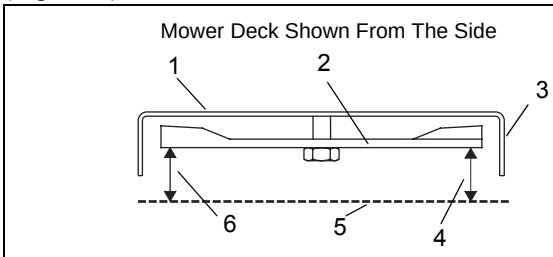


1. Adjustment Pin
2. Mower LIft Pedal
3. Fourth Adjustment Hole

Figure 6

NOTE: The rear blade cutting height should be 2-7/8 to 3 in. (7.3 to 7.6 cm) from rear edge of mower blades to the ground on both blades.

IMPORTANT: The distance from rear edge of mower blades to the ground MUST NOT exceed 3 in. (7.6 cm) (Figure 7).



1. Mower Deck
2. Mower Blade(s)
3. Front of Mower Deck
4. Front Blade Cutting Height
5. Ground
6. Rear Blade Cutting Height

Figure 7 OA0010

3. Measure from rear edge of mower blades to the ground.
4. Perform steps 5 through 7 if the measurement is too high or too low on either side of mower deck.
5. Remove rear lift link and rear trunnion from mower deck and mower lift.
   - TO RAISE the mower deck, turn rear trunnion clockwise several turns.
   - TO LOWER the mower deck, turn rear trunnion counterclockwise several turns.
6. Install rear trunnion and rear lift link on mower deck and mower lift.
7. Check that the mower deck is level:

   a. Rotate right and left mower blades to face side-to-side.

b. Measure outer edge of mower blades to ground. Measurement must be within 1/4 inch (6.35 mm).

- If mower deck is not level, repeat steps 5 and 6.
- If mower deck is level, record the distance from rear edge of mower blades to the ground and then adjust pitch of mower deck.

Adjust Pitch of Mower Deck

IMPORTANT: The mower blade end used to level the mower deck must be used to adjust the pitch of the mower deck.

1. Rotate the right and left mower blades 180 degrees until the end of the mower blade that was used to level the mower deck is facing forward (Figure 7).

NOTE: The front blade cutting height should be 1/16 - 1/4 in. (1.59 - 6.35 mm) lower than the rear blade cutting height (Figure 7).

2. Measure from front edge of right and left mower blades to the ground.
3. Subtract front blade cutting height measurement from rear blade cutting height measurement (Figure 7).
4. Perform steps 5 though 7 if the front blade cutting height is too high or too low on either side on either side of mower deck.
5. Remove front lift link and front trunnion from mower deck and mower lift (Figure 5).

- TO RAISE the mower deck, turn front trunnion clockwise several turns.
- TO LOWER the mower deck, turn front trunnion counterclockwise several turns.

6. Install front trunnion and front lift link on mower deck and mower lift.
7. Check mower deck pitch.

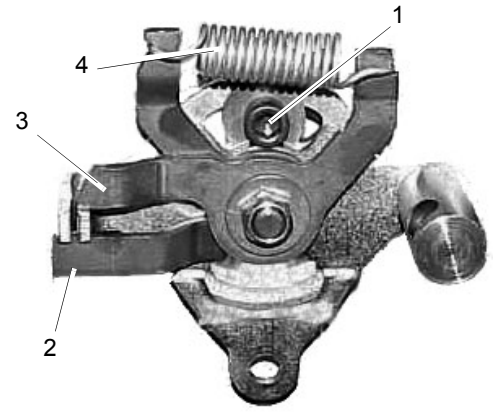
- If mower deck pitch is not correct, repeat steps 2 through 6.
- If mower deck pitch is correct, the adjustment is complete.

4.6 HYDROSTATIC TRANSMISSION NEUTRAL ADJUSTMENT

1. Shut off engine.
2. Position rear wheels off the ground. Be careful to secure the unit to the lift or position the unit to face a wall for safety. Disconnect the rods from the handlebars to the linkage.
3. Engage seat switch and start the engine. Disengage the parking brake. The drive wheels should not be rotating. If the wheels are not driven to rotate, proceed to *Steering Control Neutral Adjustment*.

To adjust the neutral setting for no wheel rotation:

4. Use a hex wrench to loosen the locking bolt (Figure 8) until the linkage can be rotated by hand.
5. With the engine running and the drive wheels off the ground, rotate the linkage in either direction. The correct linkage position is obtained when the wheel is not being driven (under power).
6. Hold the linkage in place and tighten the locking bolt.
7. Shut off engine and reconnect steering rods.
8. Check parking brake linkage for proper movement.



1. Locking Bolt
2. Reverse Arm
3. Forward Arm
4. Return Spring

Figure 8

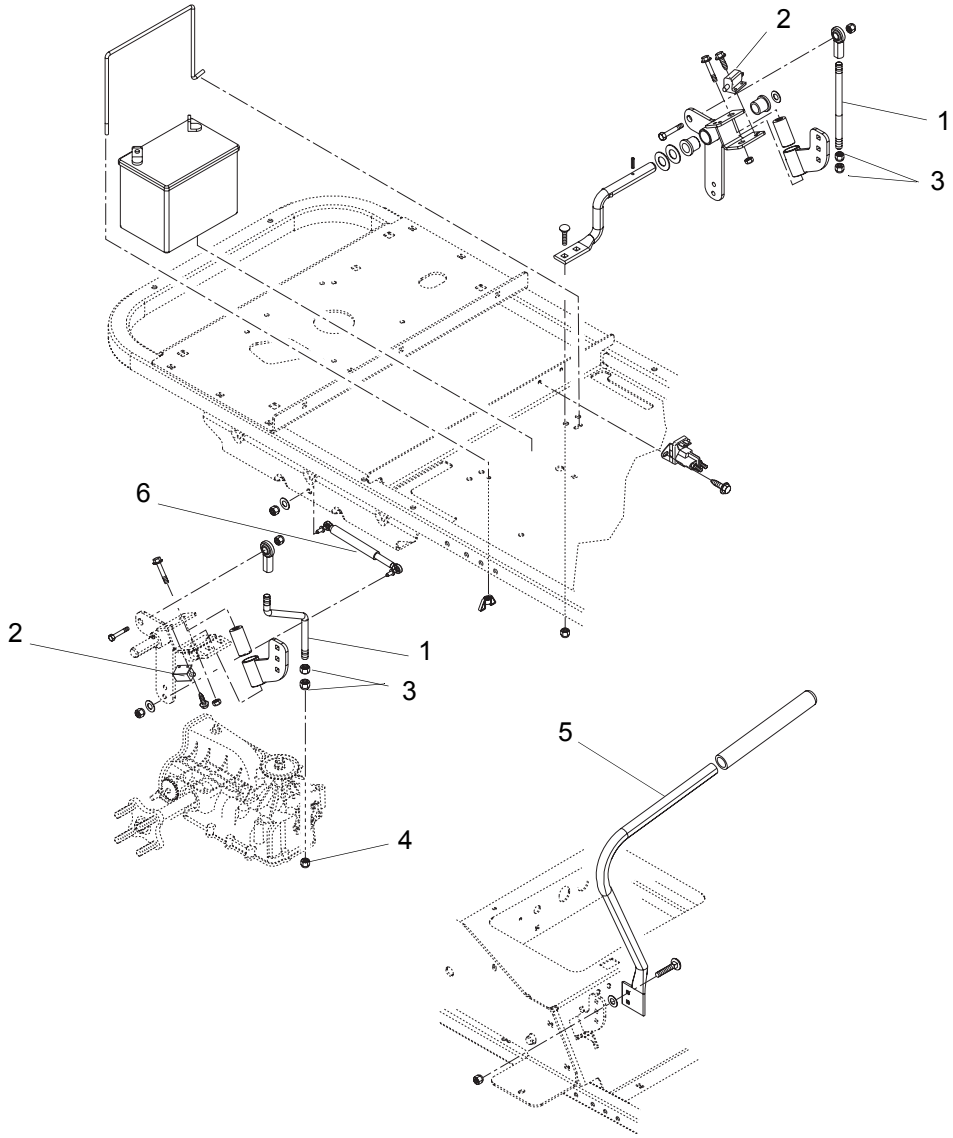
4.7 ADJUSTING UNIT TO TRACK STRAIGHT

Tires must be inflated to specifications, drive units should be adjusted for neutral.

NOTE: Before making the following adjustments; check the dampener on each of the steering handles. It is possible that the fixed position of the dampener is limiting the travel of the steering arm. To adjust the dampener arm; loosen the dampener anchor nut to allow movement. Tighten when done.

1. Start engine and warm up hydraulics.
2. Operate the unit and position it with adequate running space.
3. Push both handles to full forward. The unit should travel in a straight line. If the unit steers to one side, adjustment is needed. Make note of which way the unit is turning. Adjustment will be made to the drive unit on the opposite side off the direction of the turn. This is the faster wheel.
4. Loosen the jam nuts on the transaxle rod.
5. Screw the nyloc jam nut further down one or two turns (depending on the amount of turning that needs correction).

6. Move top jam nuts down to tighten on the nyloc jam nut. Tighten the jam nuts against each other.
7. Return to step one and repeat until the unit tracks straight.



1. Rod Transaxle
2. Switch
3. Jam Nuts
4. Nyloc Jam Nut
5. Handlebar
6. Dampener

Figure 9

4.8 STEERING LEVER ADJUSTMENTS

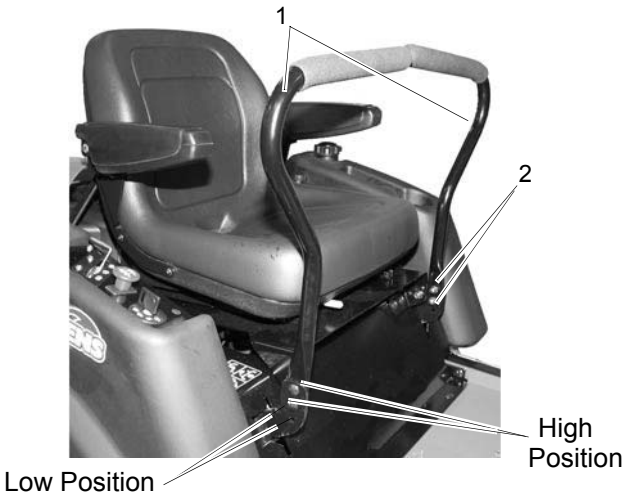
Adjusting Steering Levers to Match (Figure 10)

NOTE: Each steering lever can be positioned further forward or further backward.

1. Loosen mounting hardware.
2. Position steering levers to match.
3. Tighten mounting hardware.

Adjusting Height of Steering Levers (Figure 10)

There is a low and a high position for steering levers. Remove mounting hardware and place steering levers in the low or high position.Tighten mounting hardware.



1. Steering Lever
2. Mounting Hardware

Figure 10

4.9 ADJUSTING THE PARKING BRAKE

When properly adjusted the parking brake will lock the linkage on both drives and activate the safety switch (Figure 11).

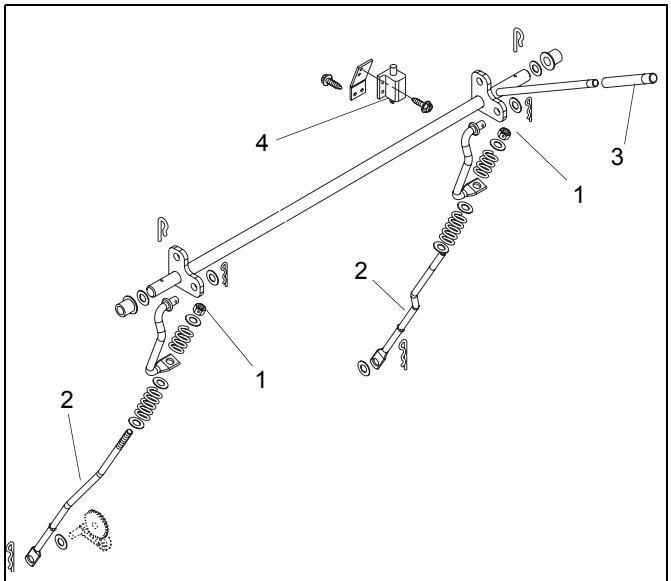
The drive units should be properly adjusted for neutral.

Engage the parking brake handle. The brake rod should be positioned to lock the drive. The safety switch should be disengaged.

To adjust the linkage:

Move the adjusting nut clockwise/counterclockwise as needed to properly position the brake shaft.

NOTE: The safety switch can be loosened for minor adjustments.



1. Nyloc Adjusting Nut
2. Parking Brake Rod
3. Handle
4. Safety Switch

Figure 11

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, 29, 31, 32, 33	repair or replace
Excessive Crankcase Pressure	25, 31, 33, 34, 45, 55	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 CHECKING ENGINE OIL

Check the engine oil daily prior to use.

IMPORTANT: Never operate the engine with the oil below the low mark on the dipstick.

See the engine manual for oil specifications and oil filter service instructions.

To check oil level:

1. Move the unit to level location.
2. Clean around the dipstick and filler tube to prevent dirt from entering the engine.
3. Remove the dipstick and wipe off the oil on the dipstick.
4. Put the dipstick back into the engine and tighten the place and remove again.
5. When the dipstick is removed, note the oil level. Oil should be between the full and add mark.
6. Replace dipstick.
7. If required, add 5W30 below 40^{o} or 30W above 40^{o}. Do not overfill.
8. Clean up any spillage that may have occurred.

5.3 CHANGING OIL

WARNING: Do NOT touch parts which are hot. Allow parts to cool before servicing.

Engine muffler and other parts will be hot if unit has been running.

1. Engine oil should be changed after the first five hours of operation and every 25 hours there after.
2. Move the unit to a level and well ventilated area and set the parking brake.
3. If the engine is cold, let the unit run for five minutes.
4. When the engine is warm, stop the engine.
5. Clean the area around the dipstick and (drain hose).
6. Put an open container that will hold one gallon of oil under the drain hose.
7. Open the drain valve.
8. Allow the engine oil to drain completely into the one gallon container. Remove container and contents for future recycling as required.
9. Close the oil drain valve.
10. If used; remove the oil filter.
11. Clean the oil filter port and install a new oil filter according to the instructions on the oil filter. Fill with new oil to the "full" mark on the dipstick.
12. Start and run the engine for one minute. Stop the engine and recheck the oil level and add as necessary.
13. Check for leakage at the drain plug and oil filter if used. Tighten the fittings as necessary if leakage occurs.
14. Release the parking brake.
15. Return the unit into service.

5.4 CHECKING ENGINE COOLING

IMPORTANT: To prevent severe damage to the engine, proper cooling will need to be maintained.

1. Check the air intake screen on the engine each day.
2. The air intake screen must be kept clean. Remove any grass, dirt, or debris that may have accumulated.
3. Check the engine cooling yearly.

5.5 CLEANING THE AIR CLEANER

1. Check the air cleaner element every day.
2. Clean the air cleaner precleaner every 25 hours. See your engine manual for instructions.
3. Apply oil and reinstall over the paper air filter element.
4. Wipe out the air cleaner cover to remove any dirt build up in the cover.
5. Reinstall the cover over the air cleaner prior to operating the engine. See your Engine Manual.

5.6 CHANGING THE AIR CLEANER ELEMENT

Replace the air cleaner element when clogged or every 100 hours. Do not attempt to clean. See your Engine Manual for instructions.

5.7 INSPECT MUFFLER/SPARK ARRESTER

Inspect muffler and (if equipped) spark arrester. Replace muffler if corroded, as it could create a fire hazard and/or damage.

5.8 REPLACE SPARK PLUGS

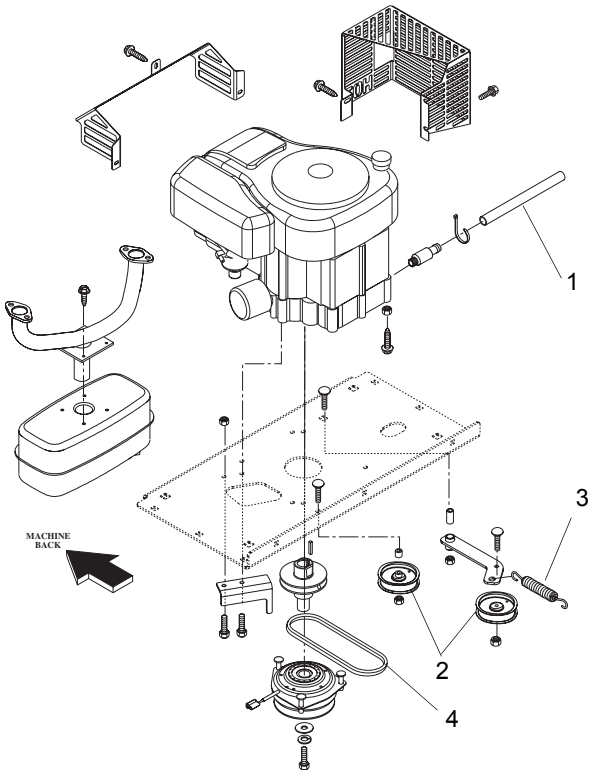
Spark plug type and gap setting are shown in *Specifications*. See Engine Manual for detailed instructions.

5.9 ENGINE REMOVAL

1. Remove deck.
2. Remove the hood from the units engine.
3. Remove the negative cable from the battery.
4. Remove the main drive belt from the engine sheave by releasing the idler tension spring.

5. Remove the throttle and choke control from the engine.
6. Remove the electrical wiring from the engine (charge lead, starter cable, fuel solenoid lead, and magneto kill wire).
7. Remove fuel line from engine first. Drain fuel from line back into fuel tank.
8. Disengage the idler spring and remove the drive belt.
9. Remove the electric clutch and the anti-rotation bolt.
10. Remove the engine bolts.
11. Lift engine out of the unit and off the frame with a hoist (engine).
12. Service, overhaul, or replace engine as required.
13. If replacing engine with a new engine, the following items will have to be removed (if used) from the old engine. These items will not be included with a new engine.

    Engine sheave and key, mounting hardware, and engine wiring harness.



1. Oil Drain Tube
2. Idler Pulleys
3. Spring
4. Drive Belt

PE0760

Figure 12

5.10 ENGINE INSTALLATION

1. Check the engine base and unit frame for damage before installing the engine.
2. Place the throttle and choke controls, fuel line, and electrical wires out of the way prior to installing the engine.
3. Once the engine is bolted onto the frame, tighten the mounting hardware.
4. Install the engine sheave, belts, springs, electrical wiring, throttle, and choke controls.
5. Place the drive belt in position and replace the tension spring.
6. Install the negative battery cable onto the battery.
7. Install the fuel line.
8. Fill engine with 30W above 32^{o}F (0^{o}C) or 5W30 below 32^{o}F (0^{o}C).
9. Install the engine cover, then test operation and function of the engine.

WARNING: AVOID EXHAUST FUMES! DO NOT run engine in an enclosed area. ALWAYS provide good ventilation and wait until hazard has been removed.

10. Check the fluid levels as follows:

    a) Start the engine and allow it to reach to operating temperature. DO NOT operate engine for more than two minutes.

    b) Shut the engine off, wait for engine to cool, and be sure the engine oil level is between the full and add marks on the dipstick. If it is below the ad mark, add recommended oil. DO NOT overfill.

CAUTION: Before performing any service or adjustments:

- Turn PTO switch "OFF".
- Park mower on a hard, flat, level surface.
- Place steering control levers in neutral lock (fully outward) position.
- Set parking brake.
- Turn ignition switch "OFF" and remove key.
- Wait for blades and all moving parts to stop.
- Disconnect spark plug wire(s) from spark plug(s) and place wire(s) away from plug.

WARNING: AVOID injury from stored energy in lift assist spring. DO NOT unlock attachment lift lever with mower deck removed. ALWAYS engage attachment lift lever lock when removing mower deck.

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

6.1 CLUTCH TO DECK DRIVE BELT REPLACEMENT

Remove (Figure 13)

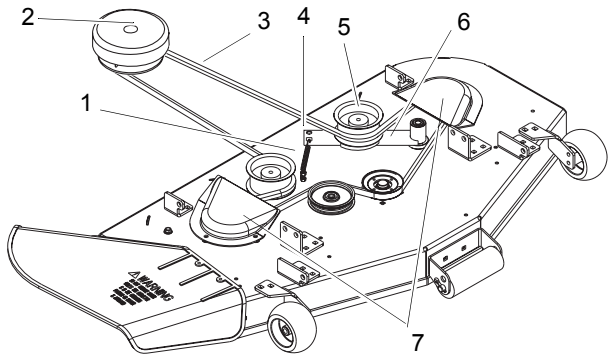
1. Lower mower deck to the ground.
2. Remove belt covers from mower deck.

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

3. Hook a puller into idler hole and pull idler arm towards outside of unit until tension is removed from PTO belt.
4. Remove PTO belt from left mower deck pulley.

Install

Install in reverse order.



1. Idler Spring
2. Electric Clutch
3. PTO Belt
4. Idler Hole
5. Idler Pulley
6. Idler Arm
7. Belt Cover

Figure 13 OE0080

6.2 CHECK BLADES

For best results mower blades must be kept sharp. Replace bent, worn or damaged blades.

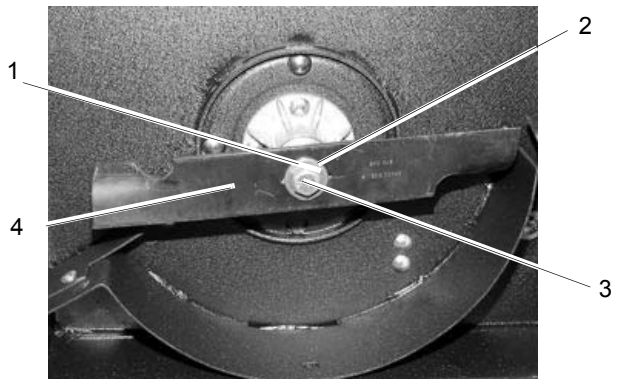
Removal (Figure 14)

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

1. Block mower blades to prevent rotation.
2. Remove mounting hardware and mower blades from mower deck.

Install (Figure 14)

1. Install mower blades on mower deck with mounting hardware.
2. Torque 5/8" hex bolt to 80 to 120 lb-ft (108 to 163 Nm).



1. Flat Washer
2. Bevel Washer
3. 5/8" Hex Bolt
4. Mower Blade

Figure 14 OE0039

6.3 SHARPENING MOWER BLADE

CAUTION: DO NOT sharpen mower blade while on unit. An unbalanced mower blade will cause excessive vibration and eventual damage to unit. Check mower blade balance prior to reinstalling mower blades. NEVER weld or straighten mower blades.

1. Remove mower blade from unit.

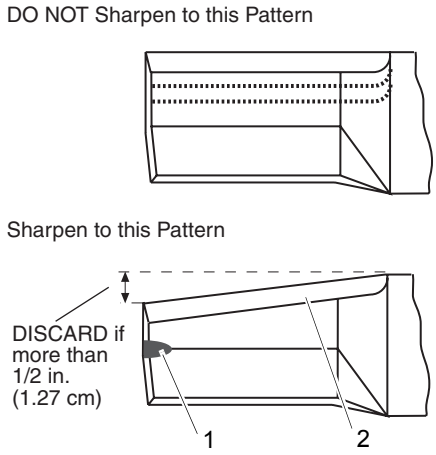
Ariens recommends having mower blades sharpened by a professional. Contact your Ariens/Gravely dealer.

Discard mower blade if (Figure 15):

- more than 1/2 in. (1.27 cm) of metal is removed.
- the air lift erosion area is eroded.
- the mower blade is bent or broken.

Do not change angle of cutting edge or round the corner at the end of mower blade.

2. Sharpen mower blade by removing an equal amount of material from each end of mower blade.
3. Check mower blade balance by sliding mower blade on an unthreaded bolt. If blade is balanced, it should remain in a horizontal position. If either end of mower blade moves downward, sharpen the heavy end until mower blade is balanced.
4. Install mower blade on unit.



1. Air Lift Erosion Area
2. Cutting Edge

Figure15

7.1 HYDRO TRANSMISSION TROUBLESHOOTING

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

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

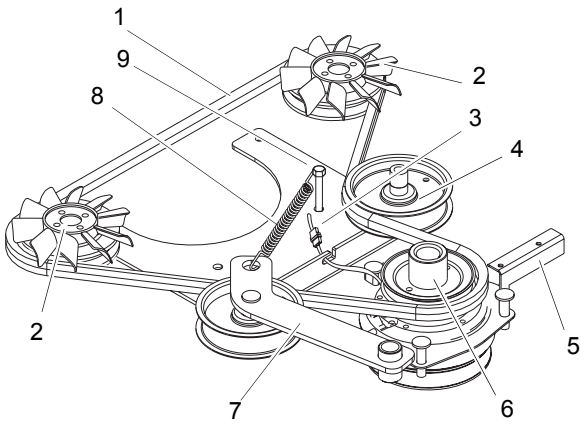
TROUBLE	POSSIBLE CAUSES (Refer to Key Below)	CORRECTIVE ACTION
Axles Will Not Turn	1, 7, 8, 12, 16, 18, 28, 32, 38, 42, 46	repair or replace
Difficult Starting	1, 6, 7, 8, 12, 16, 25, 26, 28, 38, 42, 46	repair or replace
Erratic Running	1, 4, 6, 7, 8, 12, 18, 25, 26, 28, 42, 46, 55	repair or replace
Jerky When Starting	1, 4, 7, 8, 12, 18, 28, 38, 46	
Jumps Out of Gear	N/A	repair or replace
Knocking	4, 8, 12, 18, 28, 37, 42	repair or replace
Loss of Power or System	4, 12, 18, 28, 37, 42, 46	
Noisy	4, 12, 18, 26, 28, 32, 37, 42	repair or replace
Oil Leakage	4, 22, 51, 16	repair or replace
Operates Hot	4, 16, 28, 32, 35, 42	
Operates in One Direction Only	1, 8, 12, 30, 46	
Pump Failure	4, 12, 37	repair or replace
Speed Loss Under Load	1, 6, 11, 28, 37, 46, 51	repair or replace
Speed Loss Under Load	1, 4, 7, 12, 18, 28, 26	repair or replace
Will Not Drive	1, 7, 8, 18, 28, 37, 38, 46, 48	
Will Not Shift		repair or replace

TROUBLESHOOTING KEY

1	Inspect control linkage	22	Inspect hoses and lines for wear	43	Burrs on gearing
2	Inspect acceleration valves	23	Inspect implement relief valve	44	Gears improperly installed
3	Inspect charge check valves	24	Inspect charge pump	47	Shifting washer in backwards
4	Incorrect grade of lubricating oil	25	Bad transmission pump	48	Shifter/Brake shaft keyways damaged
5	Low cranking speed	26	Overheating	49	Unit clutch not disengaging
6	Controls not in correct operation position	27	Cold running	50	Shifter stop assembled backwards
7	Belts are missing, to tight, loose or glazed	28	Bad transmission motor	51	Improper fit of case to cover
8	Overload of vehicle	29	Check system pressure	52	Dowel pins not installed
9	Replacement parts damaged	30	Shift rod grooves worn	53	Differential bevel gears broken
10	Replacement parts improperly installed	31	Reverse chain broken	54	Spring in shifter weak or broken
11	Improperly torqued attaching screws	32	Damaged cooling fan	55	Worn or stripped gear teeth
12	Air in hydraulic system	33	Inspect auxiliary relief valve		
13	Broken shifter stop	34	Inspect cooling fan		
14	Inspect charge check valves	35	Inspect transmission cooling fins		
15	Inspect acceleration valves	36	Worn or damaged bearings		
16	Check oil level-gear box sump or reservoir	37	Metallic pieces or foreign objects in unit		
17	Inspect heat exchanger	38	Inspect for loosely mounted components		
18	Inspect by-pass valve	39	Steering column loose or binding		
19	Inspect charge pressure	40	Pressure relief valve sticking open		
20	Inspect inlet filter	41	Pressure relief sticking closed		
21	Inspect charge relief valve	42	Broken relief valve spring		

7.2 HYDROSTATIC BELT REPLACEMENT

Remove (Figure 16)



1. Hydrostatic Belt
2. Hydrostatic Transmission Pulley
3. Electric Clutch Connector
4. Pulley
5. Bracket
6. Electric Clutch
7. Idler
8. Idler Spring
9. Anchor Bolt

Figure16

1. Remove PTO belt.
2. Disconnect electric clutch connector.
3. Remove bracket.

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

4. Disconnect idler spring from anchor bolt.
5. Remove hydrostatic belt from hydrostatic transmission pulleys, pulley, electric clutch, and idler.

Install (Figure 16)

1. Install hydrostatic belt on idler, electric clutch, pulley, and hydrostatic transmission pulleys.
2. Connect idler spring to anchor bolt.
3. Install bracket.
4. Connect electric clutch connector.
5. Install PTO belt.

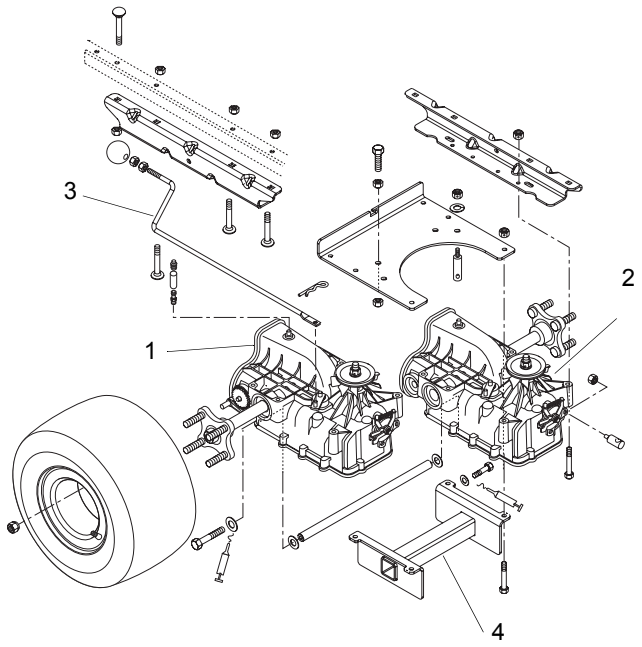
7.3 HYDRO-GEAR FLUID RECOMMENDATIONS

The fluids used in Hydro-Gear transaxles have been carefully selected, and only equivalent or better products should be used.

Typically, an engine oil with a minimum rating of 55 sus at 210^{o}F and an API classification of SH/CD is recommended. A 20W-50 engine oil has been selected for use by the factory.

7.4 HYDRO-GEAR TRANSMISSION REMOVAL

1. Place the unit on a flat surface and remove the negative lead from the battery and the spark plug lead from the spark plug.
2. Remove key and spark plug wire.
3. Raise and block the unit frame on jack stands behind of the transaxle in the frame.
4. Remove the rear wheels by removing the lug nuts holding the wheels to the axle hub.
5. Release the transmission belt tension spring and remove the transmission belt from the input sheave on top of the transaxles.
6. Release the parking brake control rod by pulling the hair pin and releasing the tension spring at locking gear.
7. Remove the single locknut on the shift rod and remove the shift rod from the transaxle arm. Do not move the two jam nuts.
8. Take knob off of dump valve arm.
9. Do not remove or loosen the hardware on the transaxle subframe at this point.
10. Support the transaxles subframe with a floor jack from the rear of the tractor.
11. Remove the right and left anchor bolts holding the transaxle subframe to the tractor frame and lower jack.
12. With the transaxle assembly removed from the units frame, place the axle assembly on a flat work surface.



1. Transaxle, Right Hand
2. Transaxle, Left Hand
3. Dump Rod
4. Axle Brace

Figure17

7.5 HYDRO-GEAR TRANSMISSION INSTALLATION

Install the transaxle assembly into the tractor frame with the axle subassembly installed.

1. Make sure the brake rod has two flat washers and a heavy coil spring installed on it before inserting the transaxle into the tractor frame.
2. Lift transaxle assembly up into the frame.

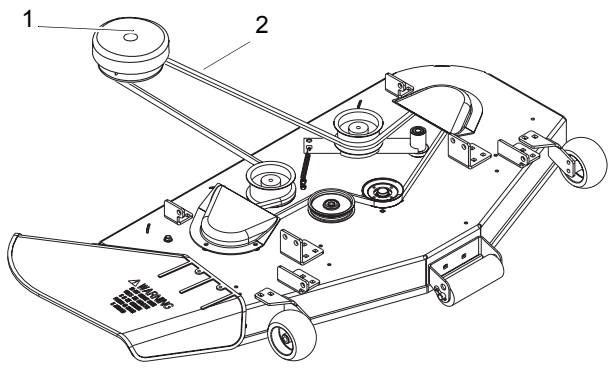
Do not tighten any hardware until all the support hardware is installed.

3. When all the hardware is in place, tighten.
4. With the two flat washers, compression spring and hair pin on the rear of the brake rod, put rod through transaxle linkage and tighten bottom nut up the rod.
5. Install the transmission drive belt on the transaxle input sheave and check the belt routing on the idler arm and engine pulley and install idler arm tension spring.
6. Install the dump valve rod and attach the ball knob.
7. Install the rear wheels with the lug nuts removed earlier.
8. Check for neutral adjustment and parking brake engagement.

7.6 ELECTRIC CLUTCH ADJUSTMENT

WARNING: The mower blades MUST STOP in 5 seconds or less when the PTO is disengaged. Adjust or replace electric clutch as required.

Test Mower Blade Stopping Time (Figure 18)



1. Electric Clutch
2. PTO Belt

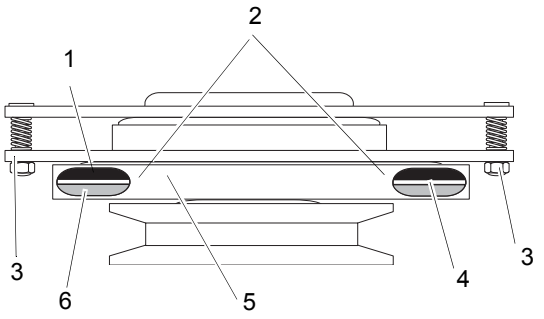
Figure 18 OE0080

To determine if the PTO stops the mower blades within 5 seconds or less, measure the amount of time from when the PTO is shut off to when the PTO belt stops rotating.

1. Lower mower deck to the lowest position.
2. Start engine and set throttle lever to FAST.
3. Engage PTO to start mower blades.
4. Shut off PTO and simultaneously start measuring the amount of time it takes for the PTO belt to stop rotating.

- If the PTO belt stops rotating in 5 seconds or less, the electric clutch does not need to be adjusted.
- If the PTO belt does not stop in 5 seconds or less, adjust the electric clutch.

Adjust Electric Clutch (Figure 19)



1. Armature
2. Inspection Slot
3. Gap Adjustment Nut
4. Air Gap
5. Electric Clutch
6. Rotor

Figure 19 OE0070

NOTE: Ariens/Gravely recommends having the electric clutch adjusted by a professional. Contact your Ariens/Gravely dealer.

If the electric clutch fails to engage or disengage properly, begins to make an abnormal noise, or if the mower blade stopping time is too high, check the air gap at the three inspection slots.

Inspect air gap:

1. Stop engine, set parking brake, remove ignition key, and wait for all hot parts to cool.
2. Measure air gap between armature and rotor.
   - Minimum: A 0.005 in. feeler gauge should slide between armature and rotor with slight contact.
   - Maximum: A 0.023 in. feeler gauge should slide between armature and rotor with slight contact.

Adjust air gap:

NOTE: Adjust air gap as evenly as possible.

1. Loosen gap adjustment nut closest to inspection slot.
2. Slide a 0.012 in. feeler gauge between armature and rotor.
3. Tighten gap adjustment nut until there is a slight contact on feeler gauge.
4. Repeat steps 1 through 3 for each inspection slot.

Be certain to adjust all three locations.

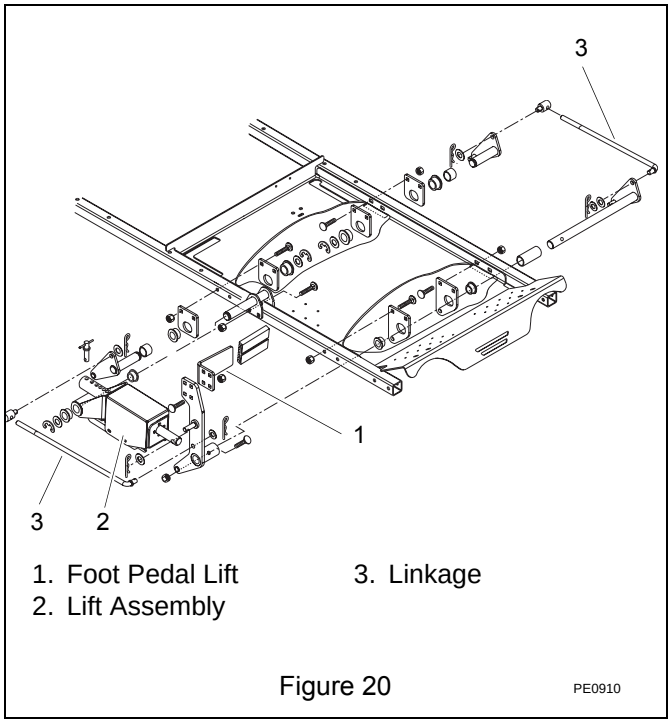
Test Electric Clutch

1. Start unit, engage and disengage PTO two or three times.
2. Stop engine, set parking brake, remove ignition key, and wait for all hot parts to cool.
3. Recheck air gap between armature and rotor. Adjust air gap if needed.
4. Retest mower blade stopping time:
   - If mower blades stop in 5 seconds or less, the electric clutch is functioning correctly.
   - If mower blades DO NOT stop in 5 seconds or less, the electric clutch MUST be replaced. Contact your Ariens/Gravely dealer.

8.1 LIFT SYSTEM

Refer to Figure 20.

The mower pan lift system is a manual lift system controlled by the operator.



1. Foot Pedal Lift
2. Lift Assembly
3. Linkage

Figure 20 PE0910

Lower deck onto blocks to remove weight from lift system.

Check snap rings, bushings, and cotter pins for wear.

Replace worn and defective parts as needed.

SECTION 9 - FUEL SYSTEM

9.1 FUEL SYSTEM TROUBLESHOOTING

The following troubleshooting chart is to be used to isolate fuel system problems and give possible causes are corrective action responses

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

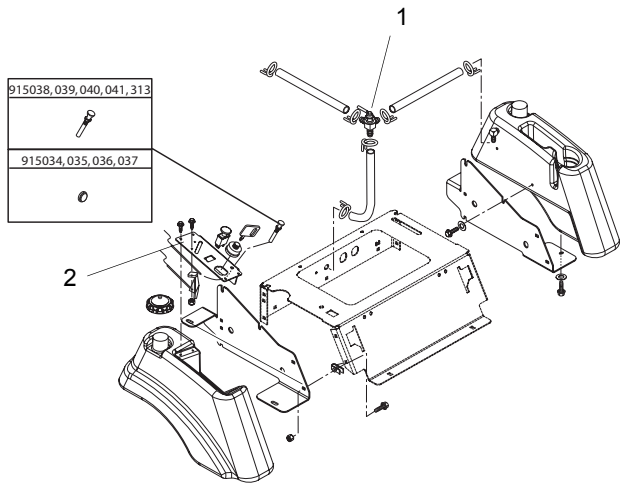
TROUBLE	POSSIBLE CAUSES (Refer to Key Below)	CORRECTIVE ACTION
Hard Starting	1, 3, 4, 6, 11, 12, 14, 16, 17, 18	clean, repair or replace
Fuel Leak at Carburetor	5, 7, 17	repair or replace
Engine Floods	5, 15, 17	repair or replace
Will not idle	1, 2, 3, 6	repair or replace
Rich idle	1, 6, 14	repair or replace
idles with Needle Closed	14	repair or replace
Hunts Erratic Idle	2, 3, 6, 7, 12, 13, 14, 15, 18	repair or replace
Idles Fast Lean	2, 3, 7	repair or replace
Will Not Accelerate	1, 6, 11, 12, 14, 15, 16	repair or replace
Over Rich Acceleration	1, 15	repair or replace
Hesitates	2, 6, 11, 12, 16	repair or replace
Will Not Run at High Speed	1, 11, 12, 14, 16	repair or replace
Low Power	1, 3, 11, 14, 15, 16, 17, 18	repair or replace
Hunts at High Speed	3, 6, 7, 12, 14, 15, 16, 18	repair or replace
Runs With Needle Closed	14	repair or replace
Engine Overspeeds	2, 3, 7, 14	repair or replace

TROUBLESHOOTING KEY	
1	Plugged Air Filter
2	Leaky Carburetor Gasket
3	Throttle or Choke Shaft Worn
4	Choke Not Functioning Properly
5	Plugged Atmospheric Vent
6	Air Bleed Restricted
7	Damaged or Leaky "O" Rings
8	Damaged Diaphragm
9	Stuck or Dirty Ball Check
10	Diaphragm Upside Down
11	Plugged Tank or Vent
12	Fuel Pick-up Restricted
13	Idler Port Restricted
14	Damaged Adjustment Needle and Seat
15	Incorrect Float Height
16	Main Nozzle Restricted
17	Dirty, Stuck Needle and Seat
18	Fuel Inlet Plugged

9.2 FUEL PUMP

The impulse style fuel pump is the most commonly used fuel pump. Impulse fuel pumps may either be mounted externally onto the carburetor fuel inlet or remotely mounted. These pumps are connected in the fuel line between the fuel supply and the carburetor or directly to the fuel inlet.

Impulse fuel pumps are operated by crankcase impulses created by the up and down movement of the piston. A hose called a pulse line connects the fuel pump diaphragm chamber and transmits the impulses to the pump diaphragm. The impulses actuate the diaphragm and the flap valves to lift the fuel from the fuel tank to the carburetor.



1. Fuel Valve
2. Control Panel

Figure 21

PE0820

9.3 FUEL SYSTEM CONTAMINATION

Any time fuel contamination is found in the fuel system (dirt, water algae, etc.) replace the fuel, fuel filter and flush the fuel lines. Remove the carburetor bowl and clean. Replace all items that cannot be cleaned. Reassemble the fuel system and check for proper operation.

9.4 FUEL TANK

The fuel tank is made of composite material for long life without breaking down from the additive used in today's blended fuels.

To Remove (Figure 21)

1. Shut off fuel.
2. Remove control panel.
3. Disconnect fuel line.
4. Loosen top bolts.
5. Remove bottom bolts.

To Install

The fuel tanks are installed in reverse order.

10.1 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 that 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/Gravely 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/Gravely replacement parts only. Engine parts, such as rectifiers or alternator components should be secured through the nearest engine service center.

Ariens/Gravely 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.

10.2 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.

10.3 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.

Set-Up

The new battery is dry charged. The dealer or customer must add electrolyte (sulfuric acid and water).

1. Remove the battery from the unit.
2. Remove all the vent caps from the battery and set the caps to one side.
3. Take the electrolyte which should be 1.265 specific gravity at 80^{o}F, and fill each cell so that the electrolyte is level with the bottom of the fill ring.
4. The battery should stand for 1/2 hour. Now check electrolyte level in each cell again. If necessary add more electrolyte to bring the level up to the bottom of the ring.
5. Charge until all cells are gassing freely, and the specific gravity is constant over three successive readings taken at 30 minute intervals.
6. Immediately after charging check level of electrolyte. If the level is low add distilled water to bring it up to the required level.
7. Replace the vent caps. It is not necessary to tighten more than finger tight.
8. Wash off the battery to remove electrolyte which may have spilled.

Battery Electrolyte First Aid

External contact: Flush with water.

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

I**nternal 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!

NOTE: Unit comes equipped with a maintenance-free battery that requires no regular maintenance except cleaning the terminals.

WARNING: Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

Clean Battery

Corrosion and dirt on the battery and terminals can cause the battery to "leak" power.

- Remove battery. (See *Battery Removal and Installation*)
- Rinse the battery with plain water and dry.
- Clean terminals and battery cable ends with wire brush until bright.
- Coat terminals with grease or petroleum jelly.
- Reinstall battery.

Battery Removal and Installation

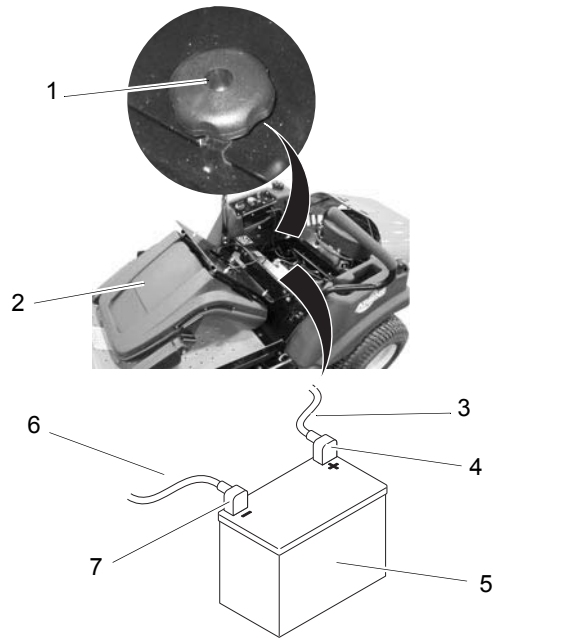
Remove battery before service (Figure 22).

Remove

1. Remove clamping knob or nut and tip seat forward.
2. Disconnect negative (-) cable first, then positive (+) cable.
3. Remove battery hold-down bracket and battery from unit.

Install

1. Install battery on the unit with battery hold-down bracket.
2. Connect positive (+) cable first, than negative (-) cable.
3. Apply petroleum jelly or dielectric grease to battery cable ends and terminals.
4. Tip seat back and secure to unit with clamping knob or nut.



1. Clamping Knob or Nut
2. Seat
3. Positive (+) Cable
4. Positive (+) Terminal
5. Battery
6. Negative (-) Cable
7. Negative (-) Terminal

Figure 22 OE0120

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.

Charging

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

Place unit on a level surface, shut off engine and open battery compartment to gain access to battery.

Disconnect negative (-) cable first, then positive (+) cable.

To charge battery:

1. Loosen strap and remove battery from unit.
2. Place battery on bench or other well ventilated place where electrolyte spill will not create damage.
3. Remove caps and fill each cell to level indicated with electrolyte at 1.230 specific gravity and 80^{o}F (27^{o}C).
4. Let battery stand for one half hour.
5. Check electrolyte level and add more if necessary.
6. Connect positive (+) lead of charger to positive (+) terminal, and negative (-) lead to negative (-) terminal.
7. 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.

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^{o}F below 80^{o}F (27^{o}C) or add .004 to 1.265 for each 10^{o}F above 80^{o}F (27^{o}C).

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^{o}F (27^{o}C).

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.

Battery Charger

Under normal conditions the engine alternator will keep the 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.

Jump Starting

Jump starting, battery charging, or replacement is required when the starter motor will not crank the engine.

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

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.
UNIT MOVEMENT can result in death or serious injury. NEVER jump start unit directly to the starter or starter solenoid. Unit can move forward or backward and injure the person jump starting unit.

To jump start the battery:

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.

10.4 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 (Continuity Diagram) 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 four positions: OFF, RUN, RUN/LIGHT 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, L 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 L. These connections supply power to the rest of the wiring harness. Connections G and M open to each other. RUN/LIGHT in addition to B and L, A and Y should have continuity

START Position - Hold switch in START position while testing. There should be continuity between contacts B, L and S. 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 that those described.

10.5 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/Gravely 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 starter 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.

10.6 LIGHTING CIRCUITS

Lighting circuits are simple circuits and easiest to trouble shoot in most equipment. They consist of the lights connected in parallel; a normally open switch, a protective fuse and a source of power (battery or engine alternator).

If only one light is out, check the connector, then check the bulb for continuity (high resistance indicates a defective or burned out bulb).

If all the lights are out, check the fuse for continuity (high resistance indicates a defective or blown fuse). Refer to *Fuses*. If the fuse is blown, check for a short in the wiring and correct before replacing the fuse.

If the fuse and lamps are good, check the circuit with an AC/DC voltmeter.

10.7 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 defect 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.

10.8 DIODES AND RECTIFIERS

Diodes are solid state, semiconductor devices. They contain no moving parts and conduct current better in one direction than 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 if from the circuit by disconnecting one end. With a multitester 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.

10.9 ELECTRIC CLUTCH

The electric clutch is used to turn on and off the attachment used on the unit by use of a switch. The clutch is also designed so that a brake is applied to the output shaft when the clutch is disengaged (off).

The field coil is mounted to a bearing support and does not rotate. The rotor is attached to the power output shaft and rotates around the field assembly. The armature is attached to the output pulley. The armature assembly is held close to the rotor by the brake assembly. The clutch is engaged by applying current to the coil connection. This results in a current flowing through the coil, magnetizing the coil pulling the armature onto the rotor with sufficient force to hold the two pieces together, effectively connecting the output and the input shafts together. Pulling the armature against the rotor pulls it away from the brake, releasing the brake.

Engine Electrical Components

Engine servicing and repair should be referred to local engine manufactures service centers that have the service information and parts available to properly service the engine. Ariens/Gravely dealers should be able to test engines and engine components to pinpoint troubles and narrow them down to properly advise the engine serviceman.

10.10 ELECTRICAL

Initial check out: Make sure that all switches are in their proper position for starting: (A) PTO off. (B) transaxle in neutral position. (C) operator on the seat. If no battery voltage to start the engine. Start the checklist.

STEP 1

Check out the battery. Using a hydrometer on all the battery cells to see if one or more is bad. Also use a voltmeter to check for proper voltage. Replace the battery if necessary and/or charge to proper level. Refer to *Battery*.

STEP 2

Use a voltmeter to make sure you have battery voltage to terminal (B) on the back side of the ignition switch in the off position. If you don’t have battery voltage to terminal (B) check the battery connection and the fuse in the red lead.

STEP 3

With the ignition switch in the "run" position, check to see if the battery voltage is being transferred from

terminal (B) to terminal (A). Terminal (A) on the ignition switch supplies battery voltage to the back of the PTO switch on the purple lead and on to the neutral switches on the red/violet lead to terminal S2 on the ignition switch and to terminal 85 on solenoid #2. Terminal (A) also supplies battery voltage to terminal 30 and 85 on solenoid #1 and on to the hour meter. When the operator is in the seat, battery voltage will transfer from terminal 30 to terminal 87 and on to the front terminal of the PTO switch and on to terminal 85 on solenoid #2 in the yellow/red lead. Battery voltage is supplied to the fuel shut off solenoid from terminal 85 on solenoid #2.

STEP 4

With ignition switch in the start position, battery voltage is transferred from terminal S2 to S1. Terminal S1 Transfers battery voltage to the one small terminal on the starter solenoid and goes to ground through the base of the starter solenoid.

PTO clutch check out: Remove the wiring harness PTO clutch leads from the clutch. With a multimeter check the clutch coil for resistance to see if the coil is good.

The clutch used on models 915013, 015, 307 should have a coil resistance of (5.87-7.87) ohms. If the coil is bad the resistance will be higher or not at all.

.

Normally open contacts manually activated. contact resistance is 0.1-0.3 ohms when correct.

The clutch used on models 915014, 016, 306 should have a coil resistance of (1.98-3.98) ohms. If the coil is bad the resistance will be higher or not at all.

Ignition switch check out: Battery voltage check in the "off" position, check for voltage at terminal "B". It should not be present on terminals A, S1, S2.

With the ignition switch in the "run" position, check for battery voltage at terminal B, A, S2. It should not be present at terminal S1.

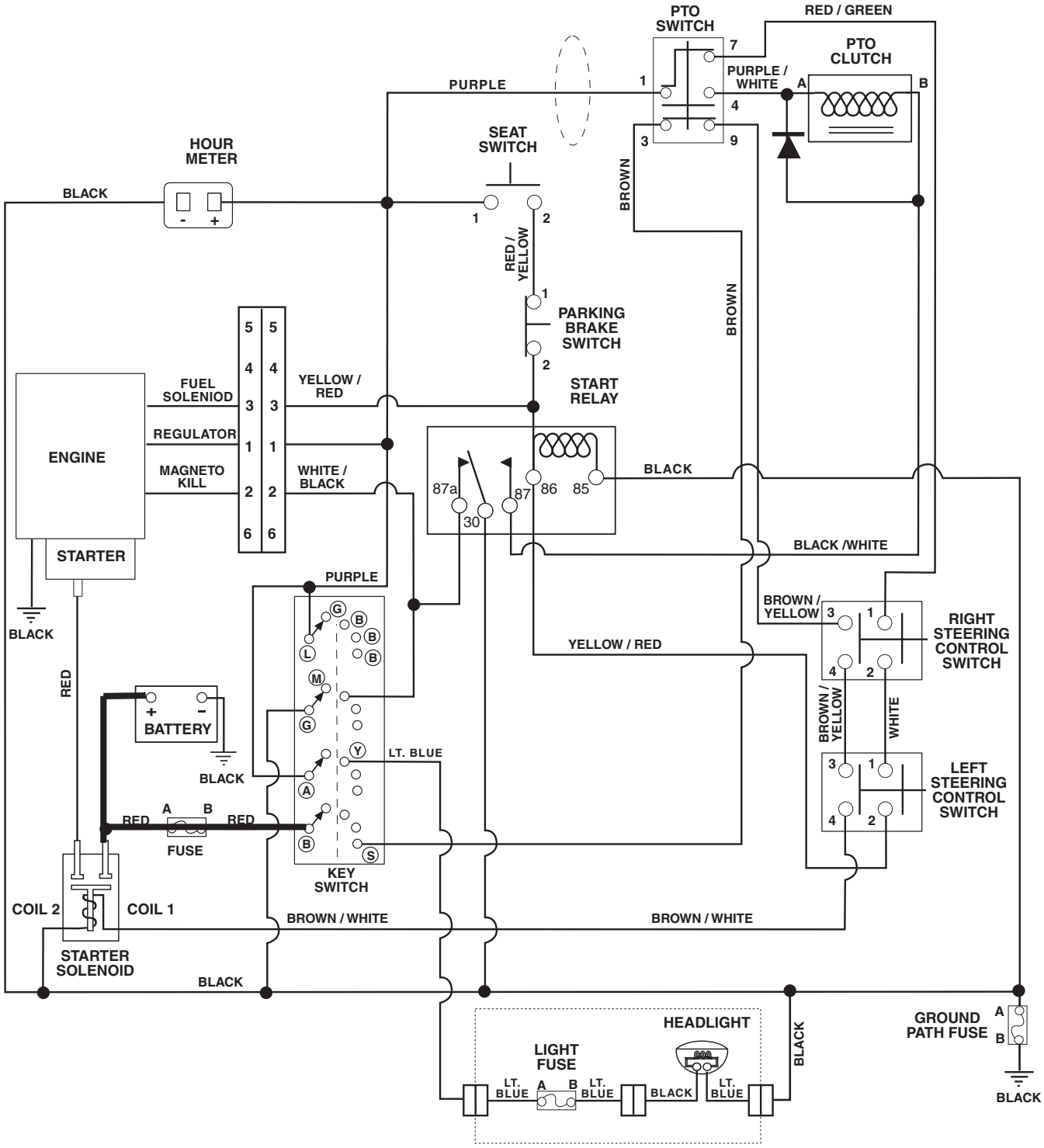
With the ignition switch in the "start" position, check for battery voltage at terminals B, A, S2, S1.

PTO switch check out: The PTO switch is a push/pull switch with normal open and closed contacts. Power transfer should be checked with a voltmeter. The switch contacts should be checked with an ohm meter with the wire harness plug removed. The light switch is similar to the PTO switch with only one set of contacts.

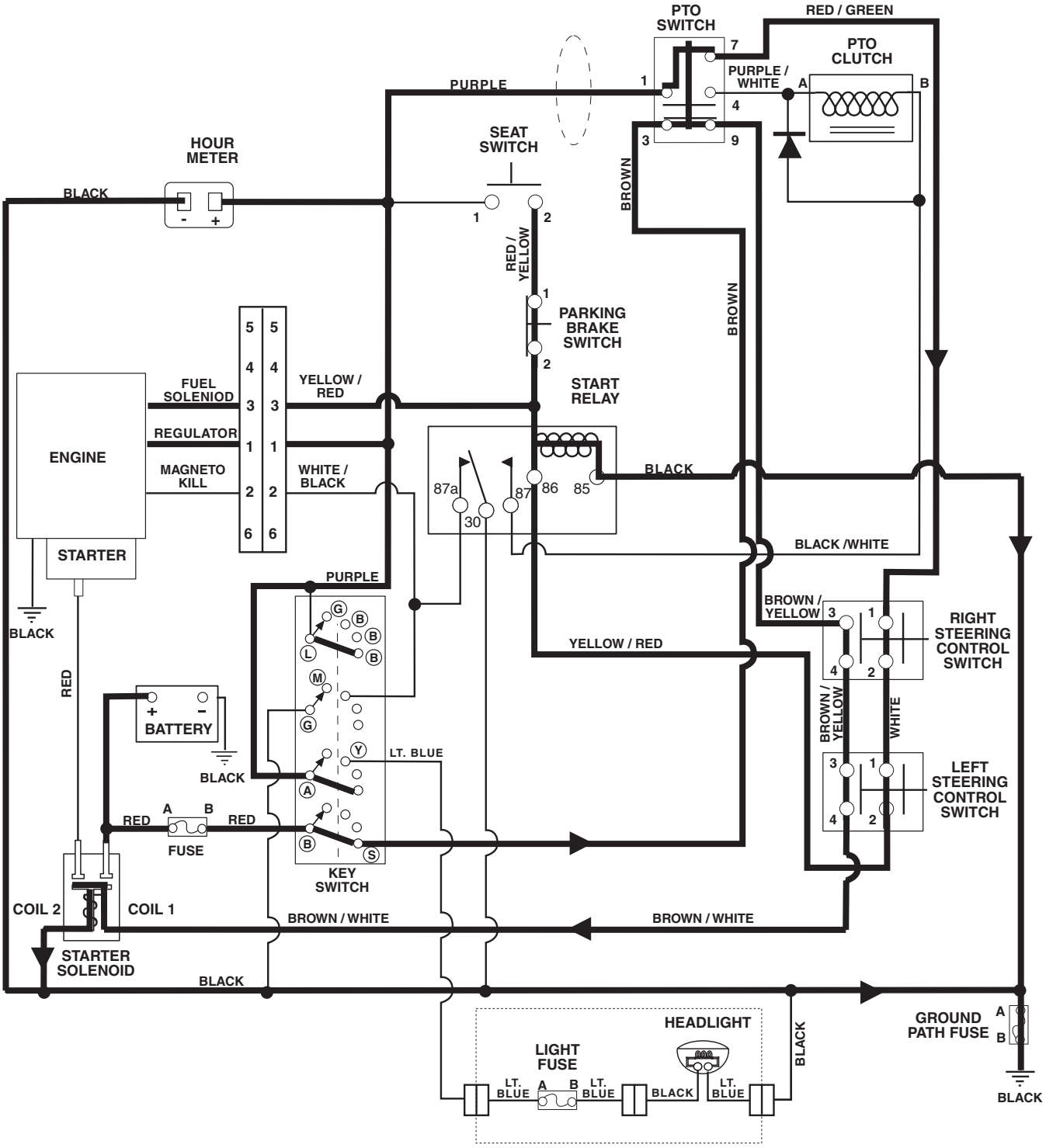
Diode check out: Diodes are checked with an ohm meter set on the diode check, and should only pass voltage in one direction. If it passes voltage in both directions or not at all the diode is bad and needs to be replaced.

10.11 WIRING DIAGRAMS

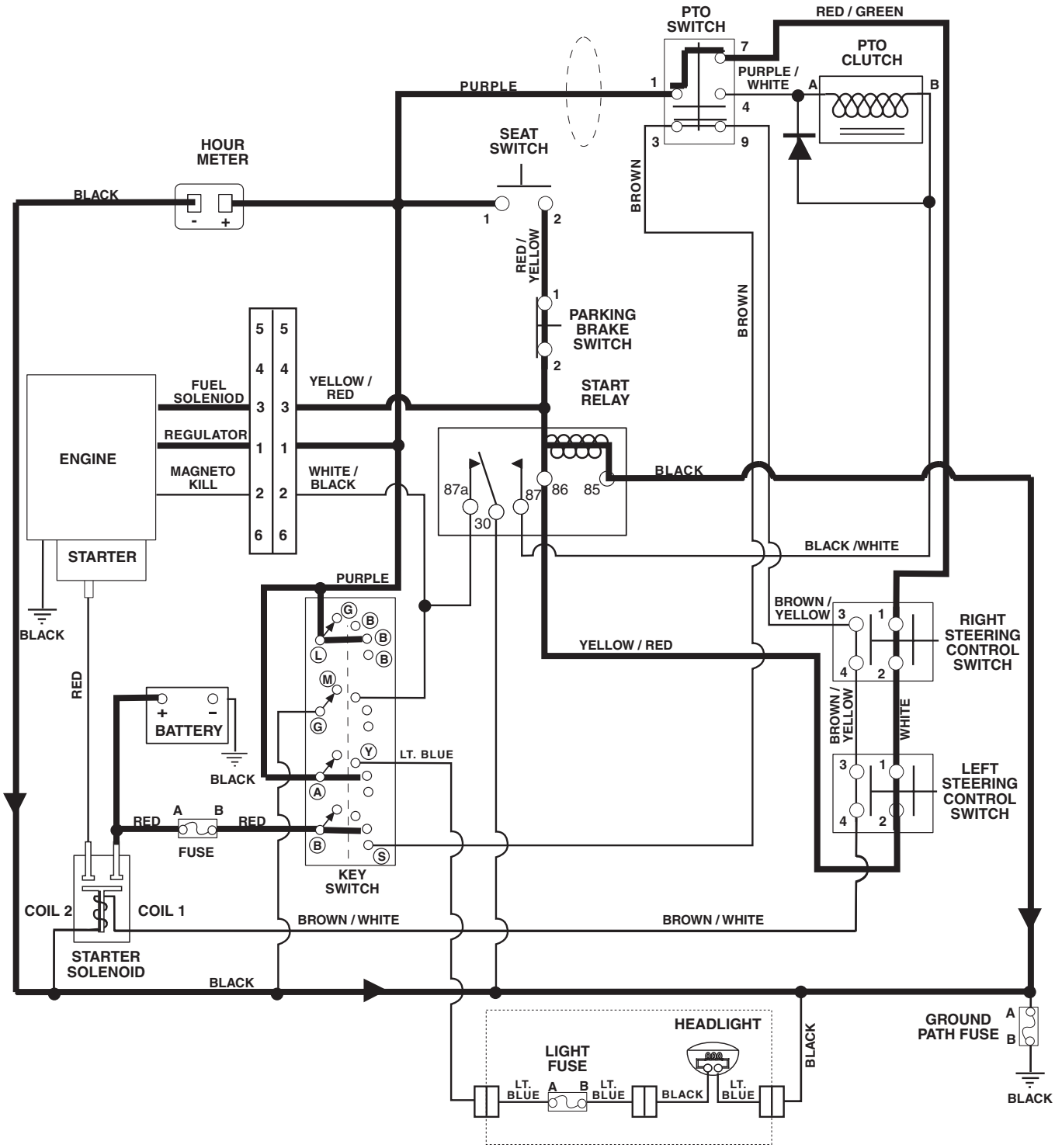
Off



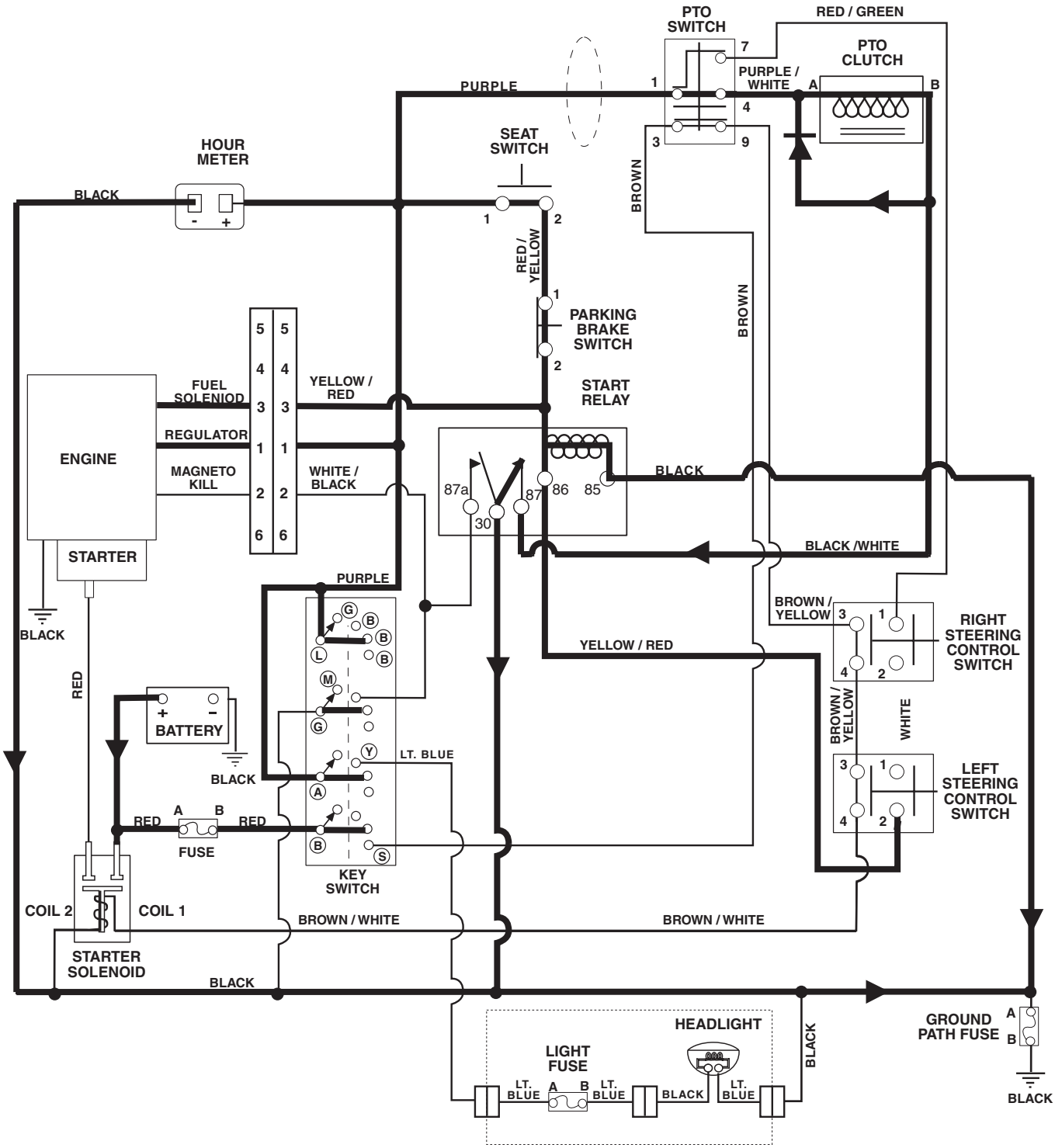
Operator Off Seat, Start, PTO Off



Operator Off Seat, Run, PTO Off



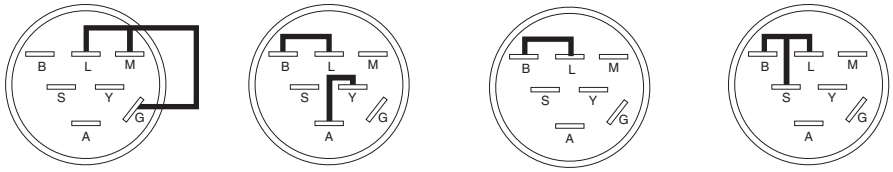
Operator On Seat, Run, PTO On, Driving



10.12 CONTINUITY DIAGRAM

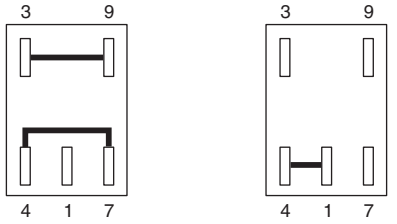
The diagrams below show the various states of connection for electrical components.
The solid lines on switches show continuity.
NOTE: All switches are viewed from the rear.

Key Switch



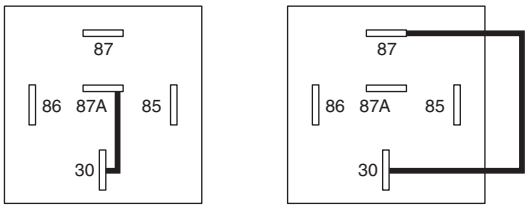
OFF | RUN / LIGHT | RUN | START

PTO Switch



DISENGAGED (down position) | ENGAGED (up position)

Relay

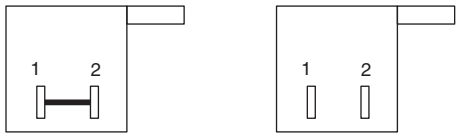


NOT ENERGIZED | ENERGIZED

Seat Switch

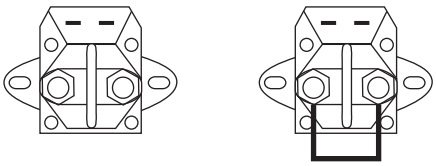
OPERATOR OFF SEAT | OPERATOR ON SEAT

Brake Switch



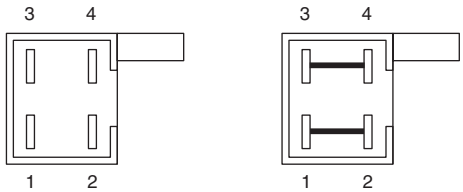
BUTTON UP | BUTTON DOWN

Solenoid



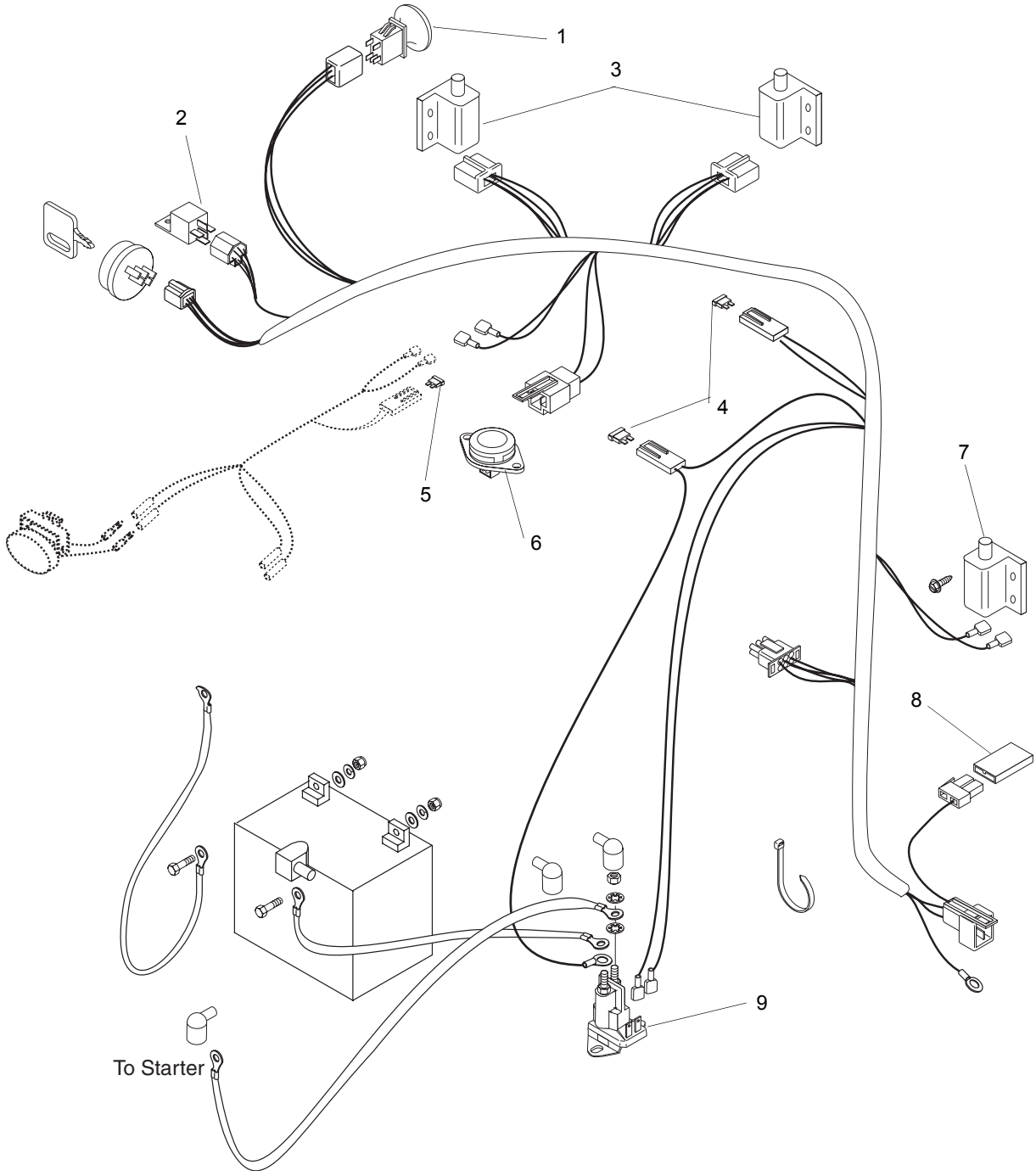
NOT ENERGIZED | ENERGIZED

Neutral Switch



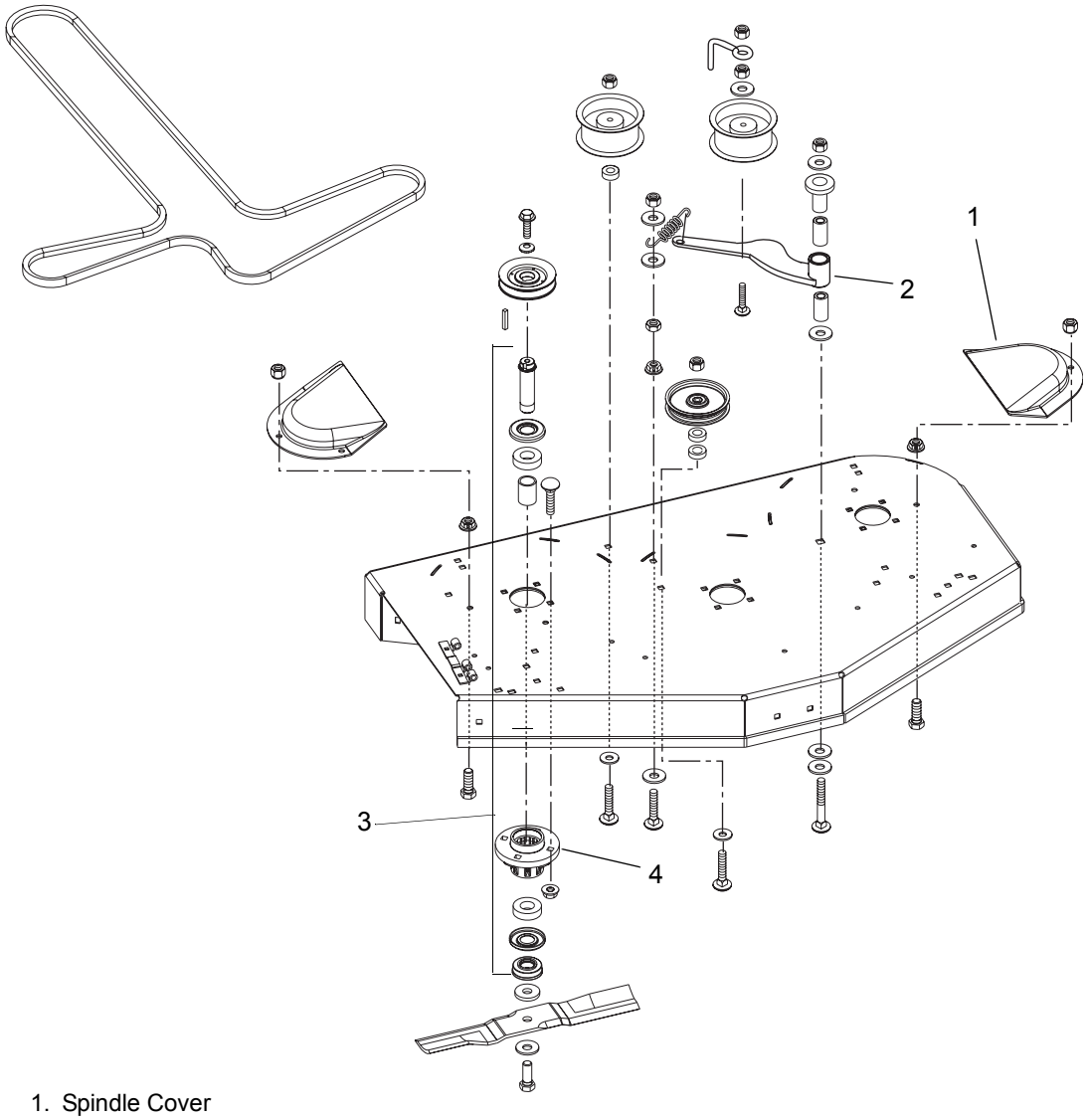
BUTTON OUT | BUTTON IN

10.13 ELECTRICAL SYSTEM



1. Clutch Switch
2. Relay
3. Double Pole Switch N.O./N.O.
4. 25 Amp Fuse
5. 10 Amp Fuse
6. Switch N.O.
7. Interlock Switch N.C.
8. Diode
9. Solenoid

11.1 MOWER SPINDLE REMOVAL



1. Spindle Cover
2. Idler Arm
3. Spindle Assembly
4. Hub

Figure 23

PE0550

1. Remove the mower deck from the unit for disassembly of the mower.
2. Remove the mower spindle covers.
3. Remove the mower deck blades, retainer hub, spindle key and bearing slinger.
4. Reduce belt tension on the belt by releasing the idler pulley compression spring.
5. Remove the spindle sheaves and shaft assemblies
6. Remove the mower spindle housings from the mower deck stamping.
7. Assemble in reverse order.

Spindle Repair

Spindles should be replaced as a unit.

Ariens Company
655 West Ryan Street
P.O. Box 157
Brillion, WI 54110-0157
920-756-2141
Fax 920-756-2407
www.ariens.com