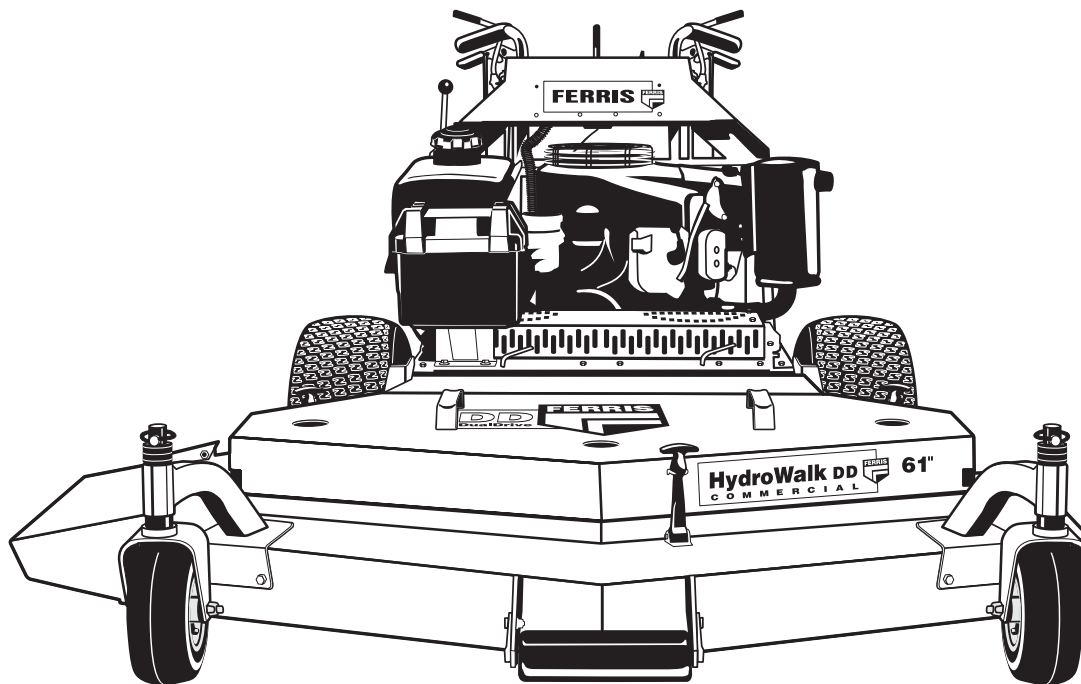




# ***OPERATOR'S MANUAL***

## ***HydroWalk Series***

### ***Dual Drive Walk-Behind Mowers***



<b>Powerhead</b>	<b>Mower Deck</b>
<b>Model Number</b>	<b>Model Number</b>
DDSKAV15	DDS48
DDSKAV15CE	DDS48R
DDSKAV17	DDS52
DDSKAV17CE	DDS52R
DDSKAV23	DDSH52
DDSKAV23CE	DDS61
	DDSH61

THIS PAGE INTENTIONALLY BLANK

<b>Safety Rules &amp; Information .....</b>	<b>2</b>	<b>Troubleshooting, Adjustments &amp; Service</b>	
<b>Identification Tags .....</b>	<b>5</b>	Troubleshooting the Mower .....	19
<b>Safety Decals .....</b>	<b>6</b>	Troubleshooting the Mower Deck.....	20
<b>Safety Interlock System.....</b>	<b>7</b>	Mowing Height Adjustment .....	21
<b>Features &amp; Controls .....</b>	<b>8</b>	Idler Pulley Height Adjustment (48" models) .....	21
Control Functions.....	8	Deck Leveling Adjustment (DDSH models) .....	22
Safety Interlock System .....	9	Mowing Height Adjustment (DDSH models).....	23
<b>Operating the Dual Drive Walk-Behind</b>		Mower Belt Replacement.....	24
General Operating Safety .....	10	Mower Belt Replacement (DDSH models) .....	25
Checks Before Starting.....	10	Transmission Drive Belt Replacement.....	26
Starting the Engine .....	11	Transmission Neutral & Tracking Adjustments .....	27
Stopping the Mower .....	11	Neutral Adjustment .....	27
Driving the Mower .....	11	Tracking Adjustment.....	27
Mowing.....	12	Transmission Maintenance & Service.....	28
Pushing the Mower by Hand.....	12	Changing Oil & Filters .....	28
Storage.....	13	PTO Clutch Adjustment .....	29
Starting After Long Term Storage .....	13	Battery Service .....	30
<b>Regular Maintenance</b>		Checking the Battery Voltage .....	30
Maintenance Schedule .....	14	Charging A Completely Discharged Battery.....	30
Checking Tire Pressures.....	14	Jump Starting with	
Checking/Adding Fuel.....	15	Auxiliary (Booster) Battery .....	30
Fuel Filter .....	15	<b>Replacement Parts &amp; Accessories .....</b>	<b>32</b>
Oil & Filter Change .....	15	<b>Lawn Care &amp; Mowing Information .....</b>	<b>LC-1</b>
Check / Change Air Filter .....	15	<b>International Symbols.....</b>	<b>LC-8</b>
Check Hydraulic Oil Level.....	15	<b>Technical Manuals.....</b>	<b>LC-8</b>
Lubrication .....	16		
Battery Maintenance.....	17		
Checking Battery Fluid .....	17		
Cleaning the Battery and Cables.....	17		
Servicing the Mower Blades .....	18		

*NOTE: In this manual, "left" and "right" are referred to as seen from the operating position.*



## WARNING

You must read, understand and comply with all safety and operating instructions in this manual before attempting to set-up and operate your machine.

Failure to comply with all safety and operating instructions can result in loss of machine control, serious personal injury to you and / or bystanders, and risk of equipment and property damage. The triangle in the text signifies important cautions or warnings which must be followed.



## WARNING

**Engine exhaust from this product contains chemicals known, in certain quantities, to cause cancer, birth defects, or other reproductive harm.**




# Safety Rules & Information



Read these safety rules and follow them closely. Failure to obey these rules could result in loss of control of unit, severe personal injury or death to you, or bystanders, or damage to property or equipment.

**This mowing deck is capable of amputating hands and feet and throwing objects.**

The triangle  in text signifies important cautions or warnings which must be followed.

## TRAINING

1. Read, understand, and follow all instructions in the manual and on the unit before starting. If the operator(s) or mechanic(s) can not read English it is the owner's responsibility to explain this material to them.
2. Become familiar with the safe operation of the equipment, operator controls, and safety signs.
3. All operators and mechanics should be trained. The owner is responsible for training the users.
4. Only allow responsible adults, who are familiar with the instructions, to operate the unit.
5. Never let children or untrained people operate or service the equipment. Local regulations may restrict the age of the operator.
6. The owner/user can prevent and is responsible for accidents or injuries occurring to themselves, other people or property.
7. Data indicates that operators, age 60 years and above, are involved in a large percentage of riding mower-related injuries. These operators should evaluate their ability to operate the riding mower safely enough to protect themselves and others from serious injury.

## PREPARATION

1. Evaluate the terrain to determine what accessories and attachments are needed to properly and safely perform the job. Use only accessories and attachments approved by the manufacturer.
2. Wear appropriate clothing including safety shoes, safety glasses and ear protection. Long hair, loose clothing or jewelry may get tangled in moving parts.
3. Inspect the area where the equipment is to be used and remove all objects such as rocks, toys and wire, which can be thrown by the machine.
4. Use extra care when handling gasoline and other fuels. They are flammable and vapors are explosive.
  - a) Use only an approved container.
  - b) Never remove fuel cap or add fuel with the engine running. Allow engine to cool before refueling. Do not smoke.
  - c) Never refuel or drain the machine indoors.
5. Check that operator's presence controls, safety switches and shields are attached and functioning properly. Do not operate unless they are functioning properly.

## OPERATION

1. Never run an engine in an enclosed area.
2. Mow only in the daylight or with good artificial light, keeping away from holes and hidden hazards.
3. Be sure all drives are in neutral and parking brake is engaged before starting engine. Only start engine from the operator's position. Use seat belts if provided.
4. Be sure of your footing while using pedestrian controlled equipment, especially when backing up. Walk, don't run. Reduced footing could cause slipping.
5. Slow down and use extra care on hillsides. Be sure to travel in the recommended direction on hillsides. Turf conditions can affect the machines stability. Use caution when operating near drop-offs.
6. Do not mow in reverse unless absolutely necessary. Always look down and behind before and while traveling in reverse.
7. Be aware of the mower discharge direction and do not point it at anyone. Do not operate the mower without either the entire grass catcher or the deflector in place.
8. Slow down and use caution when making turns and when changing directions on slopes.
9. Never raise deck with the blades running.
10. Never leave a running unit unattended. Always disengage the PTO, set parking brake, stop engine, and remove keys before dismounting. Keep hands and feet away from the cutting units.
11. Turn off the PTO switch to disengage the blades when not mowing.
12. Never operate with guards not securely in place. Be sure all interlocks are attached, adjusted properly and functioning properly.
13. Never operate with the discharge deflector raised, removed or altered, unless using a grass catcher.
14. Do not change the engine governor setting or over-speed the engine.
15. Stop on level ground, lower implements, disengage drives, engage parking brake, shut off engine before leaving the operator's position for any reason including emptying the grass catchers or unclogging the chute.
16. Stop equipment and inspect blades after striking objects or abnormal vibration occurs. Make necessary repairs before resuming operations.
17. Keep hands and feet away from the cutting units.
18. Look behind and down before backing up to be sure of a clear path.
19. Never carry passengers and keep pets and bystanders away.
20. Do not operate the unit while under the influence of alcohol or drugs.
21. Slow down and use caution when making turns and crossing roads and sidewalks. Stop blades if not mowing.
22. Use care when loading or unloading the machine into a trailer or truck.

23. Use care when approaching blind corners, shrubs, trees or other objects that may obscure vision.
24. To reduce fire hazard, keep unit free of grass, leaves & excess oil. Do not stop or park over dry leaves, grass or combustible materials.
25. The engine in this unit is not factory equipped with a spark arrester. It is a violation of California Public Resource Code Section 4442 to use or operate the engine on or near any forest-covered, brush-covered, or grass-covered land unless the exhaust system is equipped with a spark arrester meeting any applicable local or state laws. Other states or federal area may have similar laws.
26. OSHA regulations may require the use of hearing protection when exposed to sound levels greater than 85 dBA for an 8 hour time period.

## CAUTION



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

**Wear hearing protection when operating this machine.**

## SLOPE OPERATION

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

## WARNING

**Never operate on slopes greater than 17.6 percent (10°) which is a rise of 3-1/2 feet (106 cm) vertically in 20 feet (607 cm) horizontally.**

**Select slow ground speed before driving onto slope. Use extra caution when operating on slopes with rear-mounted grass catchers.**

**Mow across the face of slopes, not up and down, use caution when changing directions and DO NOT START OR STOP ON SLOPE.**

### Do

1. Mow across slopes, not up and down.
2. Remove obstacles such as rocks, tree limbs, etc.
3. Watch for holes, ruts, or bumps. Uneven terrain could overturn the unit. Tall grass can hide obstacles.
4. Use slow speed. Choose a slow speed so that you will not have to stop or change speed while on the slope.
5. Use extra care with grass catchers or other attachments. These can change the stability of the unit.
6. Keep all movement on the slopes slow and gradual. Do not make sudden changes in speed or direction.
7. See your authorized dealer for recommendations of available weights to improve stability.

### Do Not

1. Avoid starting, stopping, or turning on a slope. If tires lose traction (i.e. machine stops forward motion on a slope), disengage the blade(s) (PTO) and drive slow off the slope.
2. Do not turn on slopes unless necessary, and then, turn slowly and gradually uphill, if possible. Never mow down slopes.
3. Do not mow near drop-offs, ditches, or embankments. The operator could lose footing or balance or mower could suddenly turn over if a wheel is over the edge of a cliff or ditch, or if an edge caves in.
4. Do not mow on wet grass. Reduced footing or traction could cause sliding.
5. Do not try to stabilize the unit by putting your foot on the ground. (ride-on units)
6. Do not mow excessively steep slopes.
7. Do not use grass catcher on steep slopes.
8. Do not mow slopes if you cannot back up them.

## TOWED EQUIPMENT (RIDE-ON UNITS)

1. Tow only with a machine that has a hitch designed for towing. Do not attach towed equipment except at the hitch point.
2. Follow the manufacturer's recommendations for weight limit for towed equipment and towing on slopes. See attaching a trailer under OPERATION.
3. Never allow children or others in or on towed equipment.
4. On slopes, the weight of the towed equipment may cause loss of traction and loss of control.
5. Travel slowly and allow extra distance to stop.
6. Do not shift to neutral and coast down hill.

## CHILDREN

Tragic accidents can occur if the operator is not alert to the presence of children. Children are often attracted to the unit and the mowing activity. Never assume that children will remain where you last saw them.

1. Keep children out of the mowing area and under the watchful care of another responsible adult.
2. Be alert and turn unit off if children enter the area.
3. Before and during reverse operation, look behind and down for small children.
4. Never carry children, even with the blade(s) off. They may fall off and be seriously injured or interfere with safe unit operation. Children who have been given rides in the past may suddenly appear in the mowing area for another ride and be run over or backed over by the machine.
5. Never allow children to operate the unit.
6. Use extra care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.

## EMISSIONS

1. Engine exhaust from this product contains chemicals known, in certain quantities, to cause cancer, birth defects, or other reproductive harm.
2. Look for the relevant Emissions Durability Period and Air Index information on the engine emissions label.

# Safety Rules & Information

---

## SERVICE AND MAINTENANCE

**To avoid personal injury or property damage, use extreme care in handling gasoline. Gasoline is extremely flammable and the vapors are explosive.**

### Safe Handling of Gasoline

1. Extinguish all cigarettes, cigars, pipes, and other sources of ignition.
2. Use only approved gasoline containers.
3. Never remove the gas cap or add fuel with the engine running. Allow the engine to cool before refueling.
4. Never fuel the machine indoors.
5. Never store the machine or fuel container where there is an open flame, spark, or pilot light such as near a water heater or other appliance.
6. Never fill containers inside a vehicle or on a truck bed with a plastic bed liner. Always place containers on the ground away from your vehicle before filling.
7. Remove gas-powered equipment from the truck or trailer and refuel it on the ground. If this is not possible, then refuel such equipment on a trailer with a portable container, rather than from a gasoline dispenser nozzle.
8. Keep nozzle in contact with the rim of the fuel tank or container opening at all times until fueling is complete. Do not use a nozzle lock-open device.
9. If fuel is spilled on clothing, change clothing immediately.
10. Never over-fill the fuel tank. Replace gas cap and tighten securely.
11. Use extra care in handling gasoline and other fuels. They are flammable and vapors are explosive.
12. If fuel is spilled, do not attempt to start the engine but move the machine away from the area of spillage and avoid creating any source of ignition until fuel vapors have dissipated.
13. Replace all fuel tank caps and fuel container caps securely.

### Maintenance and Storage

1. Always observe safe refueling and fuel handling practices when refueling the unit after transportation or storage.
2. Always follow the engine manual instructions for storage preparations before storing the unit for both short and long term periods.
3. Always follow the engine manual instructions for proper start-up procedures when returning the unit to service.
4. Never store the machine or fuel container inside where there is an open flame, such as in a water heater. Allow unit to cool before storing.
5. Shut off fuel while storing or transporting. Do not store fuel near flames or drain indoors.
6. Keep all hardware, especially blade attachment bolts, tight and keep all parts in good working condition. Replace all worn or damaged decals.
7. Never tamper with safety devices. Check their proper operation regularly.
8. Disengage drives, lower implement, set parking brake, stop engine and remove key or disconnect spark plug wire. Wait for all movement to stop before adjusting, cleaning or repairing.
9. Clean grass and debris from cutting units, drives, mufflers, and engine to prevent fires. Clean up oil or fuel spillage.

10. Let engine cool before storing and do not store near flame.
11. Stop and inspect the equipment if you strike an object. Repair, if necessary, before restarting.
12. Park machine on level ground. Never allow untrained personnel to service machine.
13. Use jack stands to support components when required.
14. Carefully release pressure from components with stored energy.
15. Disconnect battery or remove spark plug wire before making any repairs. Disconnect the negative terminal first and the positive last. Reconnect positive first and negative last.
16. Use care when checking blades. Wrap the blade(s) or wear gloves, and use caution when servicing them. Only replace blades. Never straighten or weld them.
17. Keep hands and feet away from moving parts. If possible, do not make adjustments with the engine running.
18. Charge batteries in an open well ventilated area, away from spark and flames. Unplug charger before connecting or disconnecting from battery. Wear protective clothes and use insulated tools.
19. Grass catcher components are subject to wear, damage, and deterioration, which could expose moving parts or allow objects to be thrown. Frequently check components and replace with manufacturer's recommended parts, when necessary.
20. Check brake operation frequently. Adjust and service as required.
21. Use only factory authorized replacement parts when making repairs.
22. Always comply with factory specifications on all settings and adjustments.
23. Only authorized service locations should be utilized for major service and repair requirements.
24. Never attempt to make major repairs on this unit unless you have been properly trained. Improper service procedures can result in hazardous operation, equipment damage and voiding of manufacturer's warranty.
25. Units with hydraulic pumps, hoses, or motors: **WARNING:** Hydraulic fluid escaping under pressure may have sufficient force to penetrate skin and cause serious injury. If foreign fluid is injected into the skin it must be surgically removed within a few hours by a doctor familiar with this form of injury or gangrene may result. Keep body and hands away from pin holes or nozzles that eject hydraulic fluid under high pressure. Use paper or cardboard, and not hands, to search for leaks. Make sure all hydraulic fluid connections are tight and all hydraulic hoses and lines are in good condition before applying pressure to the system. If leaks occur, have the unit serviced immediately by your authorized dealer.
26. **WARNING:** Stored energy device. Improper release of springs can result in serious personal injury. Springs should be removed by an authorized technician.
27. Models equipped with an engine radiator: **WARNING:** Stored energy device. To prevent serious bodily injury from hot coolant or steam blow-out, never attempt to remove the radiator cap while the engine is running. Stop the engine and wait until it is cool. Even then, use extreme care when removing the cap.

## ROLL BAR INSTRUCTIONS

For models equipped with factory-installed Roll Over Protection System (ROPS).

### **WARNING**

**In order to avoid serious injury or death from roll over, it is important to follow the warnings listed below.**

#### OPERATIONAL WARNINGS

- Always use the seat belt when the roll bar is in the raised position.
- Never use the seat belt when the roll bar is in the down position.
- Remember there is no roll over protection when the roll bar is in the down position so it is very important to always keep the roll bar in the raised position whenever possible.
- Lower the roll bar to the down position only when it is absolutely necessary.
- Check for overhead clearances before driving under any objects. Do not allow roll bar to contact low overhanging obstacles such as tree branches and guide wires.
- Never remove the roll bar from the vehicle.
- Do not exceed the machine weight rating of the roll bar.
- Read and follow all of the instructions shown below regarding the inspection and maintenance of the roll bar structure and the seat belt.

### **WARNING**

**Failure to properly inspect and maintain the ROLL BAR protective structure can cause serious injury or death.**

#### INSPECTION OF THE ROLL BAR PROTECTIVE STRUCTURE

A ROLL BAR, like any other safety device, needs to be periodically inspected to verify that the integrity of the device has not been compromised through normal machine use, misuse, age degradation, modifications, or a roll over.

To maintain operator roll over protection and roll bar effectiveness:

- If a ROLL BAR becomes damaged for any reason, such as a collision, roll over or impact, the ROLL BAR must be replaced. Small undetectable cracks can reduce the effectiveness of the ROLL BAR. Never weld, straighten, or repair the ROLL BAR.
- Never alter the ROLL BAR by welding anything to it or by drilling additional holes.

- **BEFORE FIRST TIME USE** - Inspect the ROLL BAR structure and mounting hardware for:
  - 1) Check to make sure the machine GVW (Gross Vehicle Weight), including attachments, restrained payload, fuel and operator, is not in excess of the maximum weight specified on the ROLL BAR label.
  - 2) Make sure there isn't any missing, damaged, or loose mounting hardware.
  - 3) Make sure the ROLL BAR has been correctly and completely installed.
- **EVERY 100 HOURS** - Inspect the ROLL BAR structure and mounting hardware for:
  - 1) Any cracks in the structure (structural members and/or welds).
  - 2) Significant corrosion on any part of the ROLL BAR structure or hardware.
  - 3) Missing, damaged, or loose mounting hardware
  - 4) Mounting hardware that is of a grade lesser than specified.
  - 5) Machine GVW (Gross Vehicle Weight), including attachments, restrained payload, fuel and operator, in excess of the maximum weight specified on the ROLL BAR label.
  - 6) Any modifications that have been made, such as unauthorized welds and holes.
  - 7) Any permanent deformation or twisting of the ROLL BAR structure.
  - 8) That the ROLL BAR label is still in place and is readable.
  - 9) That the ROLL BAR on-product warning labels are still on the ROLL BAR and are readable.
- If there is any doubt as to the condition of the ROLL BAR, remove the machine from service and contact your dealer for assistance.

## Safety Rules & Information

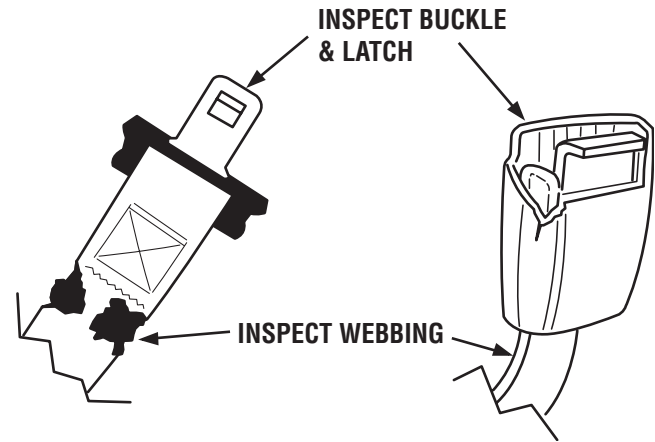
---

### **! WARNING**

Failure to properly inspect and maintain the seat belt can cause serious injury or death.

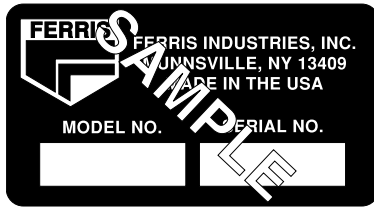
### **INSPECTION AND MAINTENANCE OF THE ROLL BAR SEAT BELT**

- The seat belt like the ROLL BAR, needs to be periodically inspected to verify that the integrity has not been compromised through normal machine use, misuse, age degradation, modifications, or a roll over. If the seat belt does not pass all of the following tests, it should be replaced.
- **BEFORE EACH USE** – Conduct the following inspections/maintenance of the seat belt and retraction mechanism:
  - 1) Check for dirt or debris in the retraction mechanism. If dirt or debris is found, it should be removed.
  - 2) Check to make sure the retraction mechanism retracts easily and completely.
  - 3) Check for damage to any part of the seat belt such as nicks, cuts, loose stitching, or fraying.
  - 4) Check that the buckle and latch operate properly and that the latch plate is not excessively worn, deformed, or the buckle is damaged or cracked. The seat belt should latch and release easily.

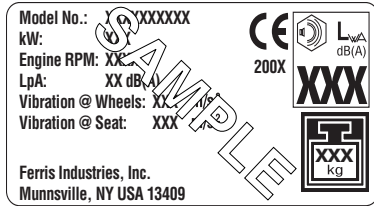




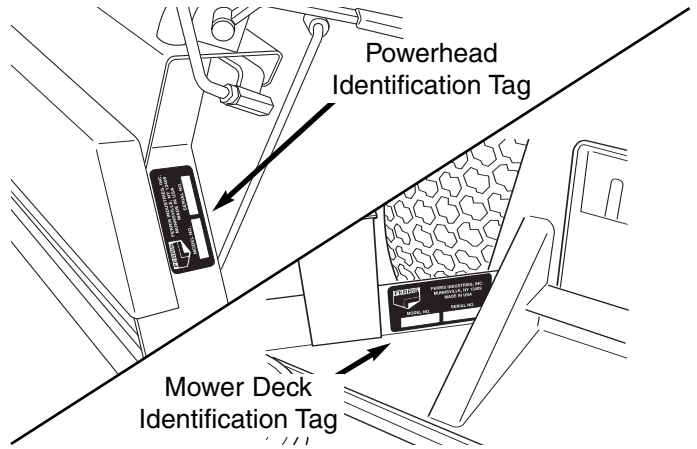
## Identification Numbers



North American Models



CE Models



When contacting your authorized dealer for replacement parts, service, or information you **MUST** have these numbers.

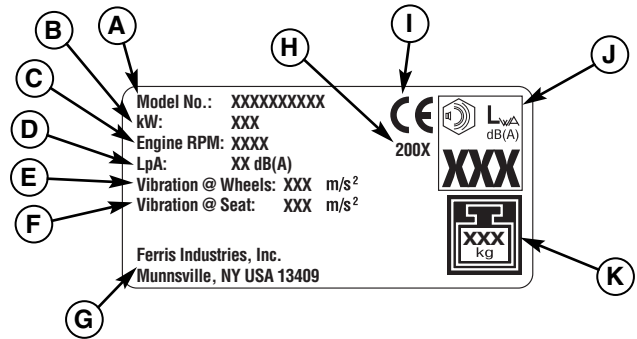
Record your model/serial number and engine serial numbers on the space provided for easy access. These numbers can be found in the locations shown.

*NOTE: For location of engine identification numbers, refer to the engine owner's manual.*

PRODUCT REFERENCE DATA	
Unit Model Number	Unit SERIAL Number
Mower Deck Model Number	Mower Deck SERIAL Number
Dealer Name	Date Purchased
ENGINE REFERENCE DATA	
Engine Make	Engine Model
Engine Type/Spec.	Engine Code/Serial Number

## CE IDENTIFICATION TAG MARKINGS

- A. Manufacturer's Identification Number
- B. Power Rating in Kilowatts
- C. Maximum Engine Speed in Rotations per Minute
- D. Sound Pressure at Operator's Position in Decibels \*\*
- E. Vibration at the Wheels \*
- F. Vibration at the Seat \*
- G. Manufacturer's Address
- H. Year of Manufacture
- I. CE Compliance Logo
- J. Sound Power in Decibels \*\*\*
- K. Mass of Unit in Kilograms



This unit complies with European Harmonized Lawn Mower Standard EN 836, European Machinery Directive 98/37/EC, and European EMC Directive 89/336/EC

\* Tested according to EN 836:1997/A2:2001, EN 1032:1996, EN 1033:1995

\*\* Tested according to EN836:1997/A2:2001

\*\*\* Tested according to 2000/14/EC

*CE Models:  
Place copy of  
Identification Tag here.*

# Safety Decals

## GENERAL

This unit has been designed and manufactured to provide you with the safety and reliability you would expect from an industry leader in outdoor power equipment manufacturing.

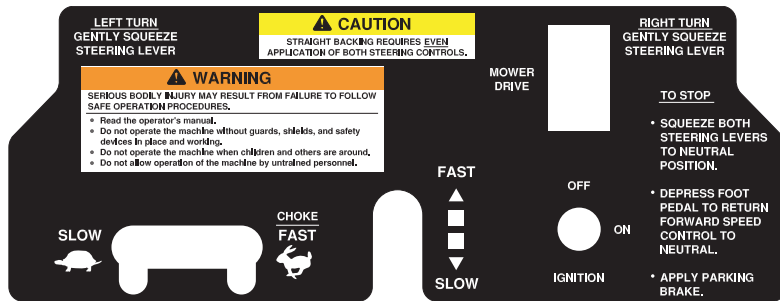
Although reading this manual and the safety instructions it contains will provide you with the necessary basic knowledge to operate this equipment safely and effectively, we have placed several safety labels on the unit to remind you of this important information while you are operating your unit.

All DANGER, WARNING, CAUTION and instructional messages on your rider and mower should be carefully read and obeyed. Personal bodily injury can result when these instructions are not followed. The information is for your safety and it is important!

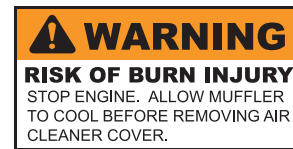
The safety decals below are on your rider and mower.

If any of these decals are lost or damaged, replace them at once. See your local dealer for replacements.

These labels are easily applied and will act as a constant visual reminder to you, and others who may use the equipment, to follow the safety instructions necessary for safe, effective operation.



**Dash Panel Decal**  
Part No. 22325



**Warning Decal**  
Part No. 22189



**Danger Decal**  
Part No. 1704276



**Danger Decal**  
Part No. 1704277



**Warning Decal**  
Part No. 21818



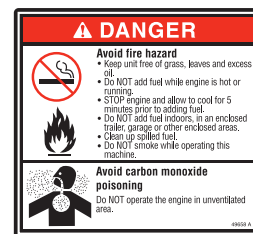
**Warning Decal**  
Part No. 20037



**Warning Decal**  
Part No. 21159



**Danger Decal**  
Part No. 21411



**Danger Decal**  
Part No. 49658



## SAFETY INTERLOCK SYSTEM

This unit is equipped with safety interlock switches. These safety systems are present for your safety, do not attempt to bypass safety switches, and never tamper with safety devices. Check their operation regularly.

### Operational SAFETY Checks

#### Test 1 — Engine should NOT crank if:

- PTO switch is engaged, OR
- Parking brake is not engaged, OR
- Motion control handle is not in the NEUTRAL position

#### Test 2 — Engine SHOULD crank if:

- PTO switch is NOT engaged, AND
- Parking brake is engaged, AND
- Motion control handle is in the NEUTRAL position

#### Test 3 — Engine should SHUT OFF if:

- Operator releases the operator presence handles with PTO engaged, OR
- Operator releases the operator presence handles with parking brake disengaged.

#### Test 4 — Blade Brake Check

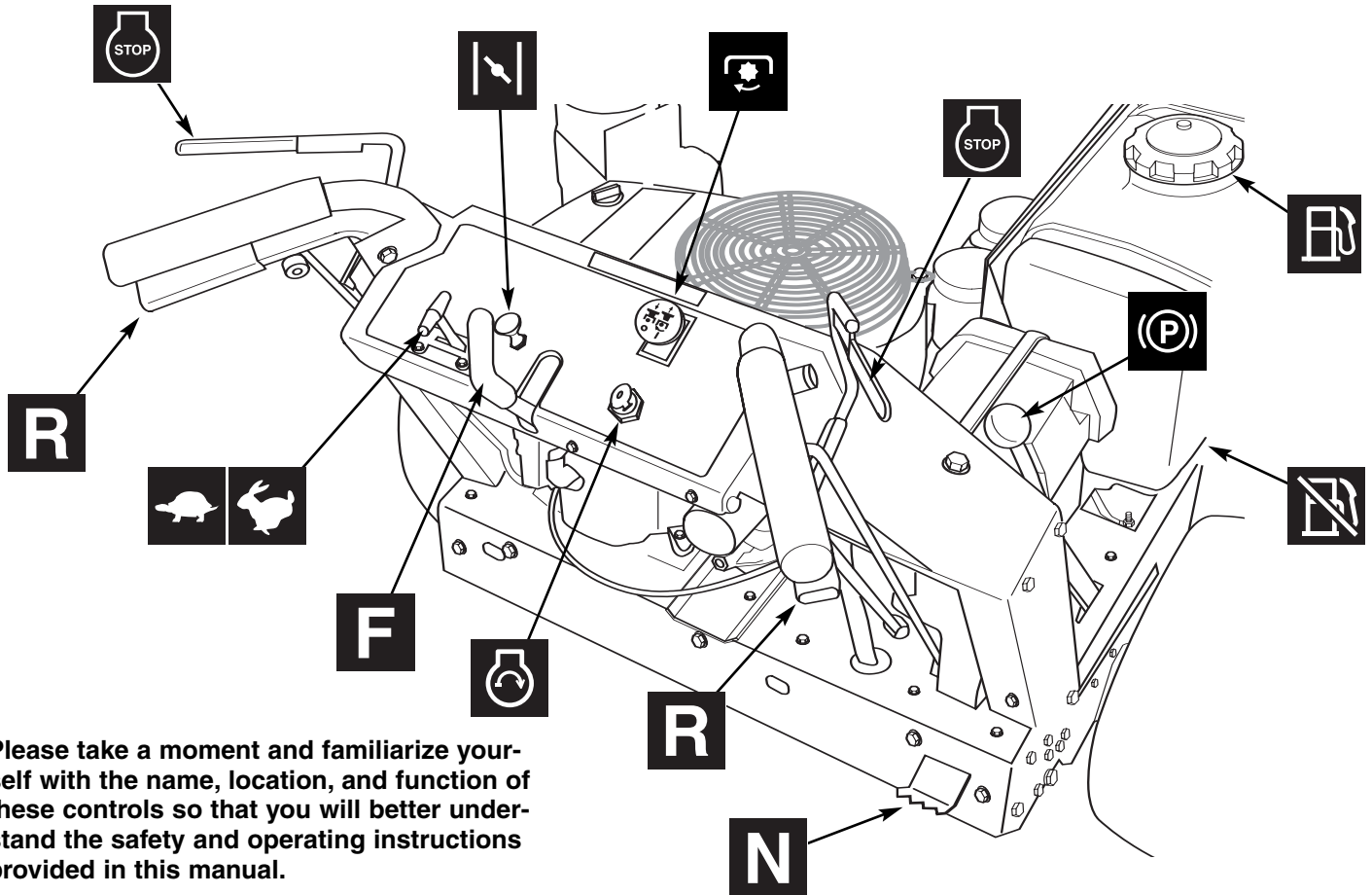
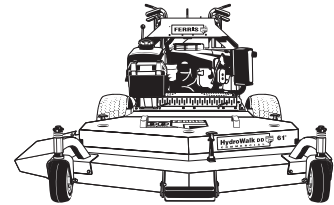
Mower blades and mower drive belt should come to a complete stop within seven seconds after electric PTO switch is turned off (or operator releases the operator presence handles). If mower drive belt does not stop within seven seconds, see your dealer.

*NOTE: Once the engine has stopped, PTO switch must be turned off, parking brake must be engaged, and the motion control handle must be returned to the NEUTRAL position in order to start the engine.*

## WARNING

**If the unit does not pass a safety test, do not operate it. See your authorized dealer. Under no circumstance should you attempt to defeat the purpose of the safety interlock system.**

# Features & Controls



Please take a moment and familiarize yourself with the name, location, and function of these controls so that you will better understand the safety and operating instructions provided in this manual.

## CONTROL FUNCTIONS

The information below briefly describes the function of individual controls. Starting, stopping, driving, and mowing require the combined use of several controls applied in specific sequences. To learn what combination and sequence of controls to use for various tasks see the OPERATION section.

### **F** Forward Speed Control Lever

### **R** Reverse Speed Control Levers

These levers control the ground speed of the mower.

The forward lever control the forward ground speed of both drive wheels.




The left reverse lever controls the steering and reverse ground speed of the left drive wheel and the right reverse lever controls the steering and reverse ground speed of the right drive wheel.

*NOTE: The further a lever is moved away from the neutral position the faster the drive wheel will turn.*

See the Operation section for steering instructions.

### **Ignition Switch**

The ignition switch starts and stops the engine, it has three positions:

-  **OFF** Stops the engine and shuts off the electrical system.
-  **RUN** Allows the engine to run and powers the electrical system.
-  **START** Cranks the engine for starting.

*NOTE: Never leave the ignition switch in the RUN position with the engine stopped—this drains the battery.*

## **Parking Brake Handle**

The parking brake is applied by pushing DOWN on the parking brake handle until it stops. To release the parking brake, pull UP on the handle until it locks over center.

## **PTO (Power Take Off) Switch**

The PTO switch engages and disengages the mower. Pull UP on the switch to engage, and push DOWN to disengage.

## **Engine Kill/Operator Presence Handles**

These handles are a major factor in the safety interlock system of the mower. Both handles are tied together so depressing one handle depresses both. The operator must depress the handles in order to deactivate the engine kill system. Handles must be depressed to disengage the parking brake and engage the PTO switch.

## **Throttle Control**

The throttle controls engine speed. Move the throttle forward to increase engine speed and back to decrease engine speed. Always operate at FULL throttle.

## **Choke**

Close the choke for cold starting. Open the choke once the engine starts. A warm engine may not require choking. Pull the knob UP to close the choke. Push to knob DOWN to open the choke.

## **Neutral Return Pedal**

The neutral return pedal provides a hands-free return to neutral. This is used in conjunction with the Reverse Speed Control Levers (B) to properly stop the machine. *See the Operating the Dual Drive Walk-Behind Mower section for steering instructions.*

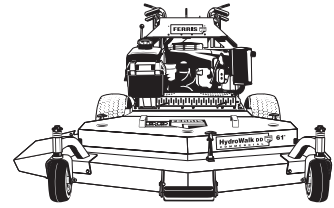
## **Fuel Tank Cap**

To remove the cap, turn counterclockwise.

## **Fuel Shut Off Valve (not shown)**

The fuel shut off valve is located under the fuel tank. Turning the handle until it is VERTICAL will allow fuel to be supplied to the engine. Turning the handle until it is HORIZONTAL shuts off the fuel supply to the engine.

# Operation



## GENERAL OPERATING SAFETY

Before first time operation:

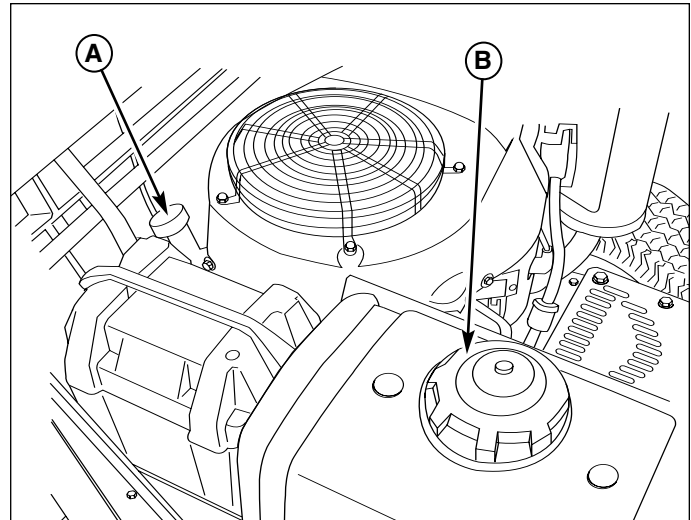
- Be sure to read all information in the Safety and Operation sections before attempting to operate this tractor and mower.
- Become familiar with all of the controls and how to stop the unit.
- Drive in an open area without mowing to become accustomed to the unit.

## **!** WARNING

Before leaving the operator's position for any reason, engage the parking brake, disengage the PTO, stop the engine and remove the key. To reduce fire hazard, keep the engine, tractor and mower free of grass, leaves and excess grease. Do not stop or park tractor over dry leaves, grass or combustible materials. Gasoline is highly flammable and must be handled with care. Never fill the tank when the engine is still hot from recent operation. Do not allow open flame, smoking or matches in the area. Avoid over-filling and wipe up any spills.

## CHECKS BEFORE STARTING

- Check that crankcase is filled to full mark on dipstick. See the engine Operator's Manual for instructions and oil recommendations.
- Make sure all nuts, bolts, screws and pins are in place and tight.
- Fill the fuel tank with fresh fuel. Refer to engine manual for fuel recommendations.



**Figure 2. Pre-start Checks**

- A. Crankcase Oil Fill
- B. Fuel Tank Filler Neck

## WARNING

**If you do not understand how a specific control functions, or have not yet thoroughly read the FEATURES & CONTROLS section, do so now. Do NOT attempt to operate the tractor without first becoming familiar with the location and function of ALL controls.**

## STARTING THE ENGINE

1. Engage the parking brake and make sure the PTO switch is disengaged and the motion control lever is in the NEUTRAL position.
2. Set the engine throttle control to FAST throttle position. Then fully close the choke by pulling the knob OUT fully.

**NOTE: A warm engine may not require choking.**

- 3A. Insert the key into the ignition switch and turn it to the RUN position (15hp & 17hp models). Firmly and sharply pull the recoil until the engine starts.
- 3B. Insert the key into the ignition switch and turn it to the START position (23hp model).
4. After the engine starts, gradually open the choke (push knob down fully).

*Warm up the engine by running it for at least a minute before engaging the PTO switch or driving the mower.*

5. **After warming the engine, ALWAYS operate the unit at FULL THROTTLE when mowing.**

***In the event of an emergency the engine can be stopped by simply turning the ignition switch to STOP. Use this method only in emergency situations. For normal engine shut down follow the procedure given in STOPPING THE MOWER***

## STOPPING THE MOWER

1. Gently squeeze both steering control levers evenly to stop the machine.
3. Once the machine is stopped, firmly depress the neutral return pedal to place the transmissions in neutral.
2. Disengage the PTO by pushing down on the PTO switch.
3. Engage the parking brake by pushing the handle forward until it stops.
4. Move the throttle control to mid-throttle position and turn the ignition key to OFF. Remove the key.

## DRIVING THE MOWER

The hydrostatic transmission has an infinite number of speeds between full speed forward and reverse, with the faster speeds being achieved by moving the speed control lever and steering control levers farthest in the direction of travel.

### TO MOVE FORWARD

1. Disengage the parking brake.
2. Gently move the speed control lever forward until desired speed is achieved.

### TO MOVE BACKWARD

1. Disengage the parking brake.
2. Gently squeeze both steering control levers evenly, until desired speed is achieved.

### TO SLOW OR STOP MACHINE

1. Gently squeeze both steering control levers evenly to slow the machine.
2. Continuing to squeeze the steering control levers will stop the machine.
3. Once the machine is stopped, firmly depress the neutral return pedal to place the transmissions in neutral.

### TO TURN MACHINE

#### To make a left-hand turn:

Gently squeeze the left-hand steering control lever. A sharp or gentle turn is determined by the amount of force applied to the steering control lever.

#### To make a right-hand turn:

Gently squeeze the right-hand steering control lever. A sharp or gentle turn is determined by the amount of force applied to the steering control lever.

**NOTE: ALWAYS REDUCE SPEED IN A TURN**

For normal use, the throttle should be kept fully open and the ground speed of the machine determined by the speed control lever. When transporting the machine or when loading or unloading from a truck or trailer, partial throttle should be used to slow the reaction time of the controls and reduce noise.

Practice maneuvering the machine at a slow engine speed on level ground with the blade engagement switch in the "OFF" position until you are familiar with the controls.

## MOWING

Before mowing, set the cutting height as described in the *Troubleshooting, Adjustments & Service* section.

1. Engage the parking brake. Make sure the PTO switch is disengaged and the motion control lever is in the NEUTRAL position.
2. Start the engine (see STARTING THE ENGINE).
3. Set the throttle to FULL.
4. Engage the PTO by pulling up on the PTO switch (E, Figure 1).
5. Begin mowing. See *Lawn Care* section for tips on mowing patterns, lawn care, and trouble shooting information.
6. When finished, shut off the PTO.
7. Stop the engine (see STOPPING THE TRACTOR AND ENGINE).

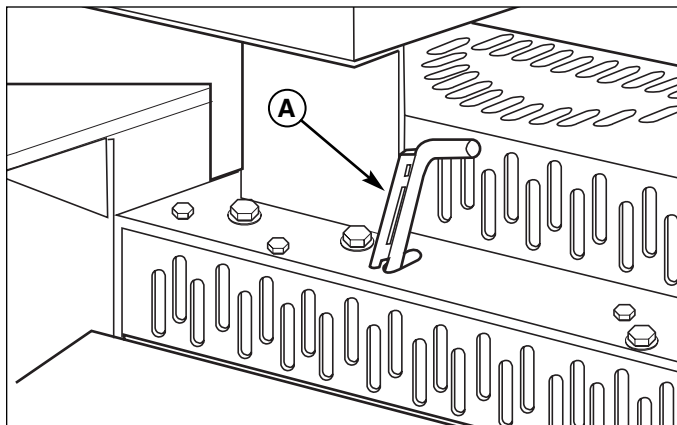
## PUSHING THE MOWER BY HAND



### DO NOT TOW MACHINE

Towing the machine will cause hydraulic transaxle damage. Do not use another vehicle to push or pull this unit.

1. Disengage the PTO, engage the parking brake, turn the ignition OFF, and remove the key.
2. To disengage the transmissions (free-wheel position), lift the hydraulic release levers (A, Figure 3) located in front of the transmission fan screen. Lock into position shown in Figure 3.
3. Disengage the parking brake.  
The mower can now be pushed by hand.
4. After moving the mower, re-engage the transmissions (drive position) by unlocking the levers and returning them to the down position. If the levers are not completely down, a partial by-pass may potentially damage the transmissions.



**Figure 3. Hydraulic System By-Pass**

A. Hydraulic Release Lever (right-hand side shown)



## STORAGE

### Temporary Storage (30 Days Or Less)

Remember, the fuel tank will still contain some gasoline, so never store the unit indoors or in any other area where fuel vapor could travel to any ignition source. Fuel vapor is also toxic if inhaled, so never store the unit in any structure used for human or animal habitation.

Here is a checklist of things to do when storing your unit temporarily or in between uses:

- Keep the unit in an area away from where children may come into contact with it. If there's any chance of unauthorized use, remove the spark plug (s) and put in a safe place. Be sure the spark plug opening is protected from foreign objects with a suitable cover.
- If the unit can't be stored on a reasonable level surface, chock the wheels.
- Clean all grass and dirt from the mower.

### Long Term Storage (Longer Than 30 Days)

Before you store your unit for the off-season, read the Maintenance and Storage instructions in the Safety Rules section, then perform the following steps:

1. Drain crankcase oil while engine is hot and refill with a grade of oil that will be required when unit is used again.
2. Prepare the mower deck for storage as follows:
  - a. Remove mower deck from the unit.
  - b. Clean underside of mower deck.
  - c. Coat all bare metal surfaces with paint or light coat of oil to prevent rusting.
3. Clean external surfaces and engine.
4. Prepare engine for storage. See engine owner's manual.
5. Clean any dirt or grass from cylinder head cooling fins, engine housing and air cleaner element.
6. Cover air cleaner and exhaust outlet tightly with plastic or other waterproof material to keep out moisture, dirt and insects.
7. Completely grease and oil unit as outlined in the Normal Care section.
8. Clean up unit and apply paint or rust preventative to any areas where paint is chipped or damaged.
9. Be sure the battery is filled to the proper level with water and is fully charged. Battery life will be increased if it is removed, put in a cool, dry place and fully charged about once a month. If battery is left in unit, disconnect the negative cable.

## WARNING

**Never store the unit, with gasoline in engine or fuel tank, in a heated shelter or in enclosed, poorly ventilated enclosures. Gasoline fumes may reach an open flame, spark or pilot light (such as a furnace, water heater, clothes dryer, etc.) and cause an explosion.**

**Handle gasoline carefully. It is highly flammable and careless use could result in serious fire damage to your person or property.**

**Drain fuel into an approved container outdoors away from open flame or sparks.**

10. Drain fuel system completely or add a gasoline stabilizer to the fuel system. If you have chosen to use a fuel stabilizer and have not drained the fuel system, follow all safety instructions and storage precautions in this manual to prevent the possibility of fire from the ignition of gasoline fumes. Remember, gasoline fumes can travel to distant sources of ignition and ignite, causing risk of explosion and fire.

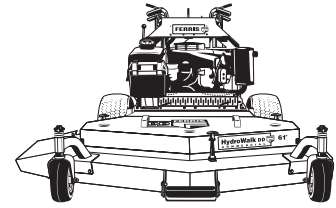
*NOTE: Gasoline, if permitted to stand unused for extended periods (30 days or more), may develop gummy deposits which can adversely affect the engine carburetor and cause engine malfunction. To avoid this condition, add a gasoline stabilizer to the fuel tank and run the engine a few minutes, or drain all fuel from the unit before placing it in storage.*

## STARTING AFTER LONG TERM STORAGE

Before starting the unit after it has been stored for a long period of time, perform the following steps.

1. Remove any blocks from under the unit.
2. Install the battery if it was removed.
3. Unplug the exhaust outlet and air cleaner.
4. Fill the fuel tank with fresh gasoline. See engine manual for recommendations.
5. See engine owner's manual and follow all instructions for preparing engine after storage.
6. Check crankcase oil level and add proper oil if necessary. If any condensation has developed during storage, drain crankcase oil and refill.
7. Inflate tires to proper pressure. Check fluid levels.
8. Start the engine and let it run slowly. DO NOT run at high speed immediately after starting. Be sure to run engine only outdoors or in well ventilated area.

# Regular Maintenance



## MAINTENANCE SCHEDULE & PROCEDURES

The following schedule should be followed for normal care of your mower. You will need to keep a record of your operating time.

SAFETY ITEMS	See Page	Before First Use	Before Each Use	Every 5 Hours	Every 25 Hours	Every 100 Hours	Spring & Fall
Check Safety Interlock System	9	●	●				●
Check Mower Blade Stopping Time	29	●				●	
NORMAL CARE ITEMS	See Page	Before First Use	Before Each Use	Every 5 Hours	Every 25 Hours	Every 100 Hours	Spring & Fall
Check Rider/Mower for loose hardware	—		●	●			
Check Engine Oil Level	15*	●	●	●			●
Check Engine Air Filter	15*		●			****●	
Check / Adjust PTO Clutch	29					*****●	
Change Engine Oil & Filter **	15*				****● Every 50 Hours		****●
Change Transmission Oil & Filters	28					****● Every 500 Hours	
Lubricate Mower & Mower Deck	16	●				****●	
Check Mower Deck Belt Tension***	24/25				●		
Check Tire Pressure	14	●				****●	
Check Hydraulic Fluid	15	●				****●	
Check Fuel Filter	15					●	
Clean Battery & Cables	17					●	
Clean & Sharpen Mower Blades	18					●	
Inspect Spark Plug	15*					●	

\* See the engine manufacturer's owner's manual.

\*\* Change original engine oil after first 5 hours of operation.

\*\*\* Check belt tension after first 5 hours of operation.

\*\*\*\* More often in hot (over 85° F: 30° C) weather or dusty operating conditions.

\*\*\*\*\* Service after the first 25 hours, then after every 100 hours.

## CHECK TIRE PRESSURES

Tire pressure should be checked periodically, and maintained at the levels shown in the chart. Note that these pressures may differ slightly from the “Max Inflation” stamped on the side-wall of the tires. The pressures shown provide proper traction, improve cut quality, and extend tire life.

Tire	Pressure
Front	25 psi (172 kPa)
Rear	15 psi (103 kPa)

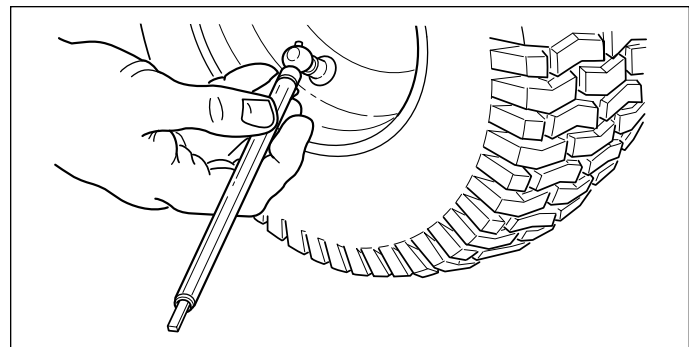


Figure 4. Checking Tire Pressure

## CHECKING / ADDING FUEL

To add fuel:

1. Remove the fuel cap (see A, Figure 2).
2. Fill the tank to the bottom of the filler neck. This will allow for fuel expansion.

*NOTE: Do not overfill. Refer to your engine manual for specific fuel recommendations.*

3. Install and hand tighten the fuel cap.
4. Repeat same process for opposite tank.

## FUEL FILTER

The fuel filter (D, Figure 2) is located in the fuel line between fuel shut off valve and carburetor, near the fuel pump. If filter is dirty or clogged, replace as follows:

1. Shut off the fuel tank selection valve.
2. Disconnect the negative battery cable.
3. Place a container below the filter to catch spilled fuel.
4. Using a pliers, open and slide hose clamps from fuel filter.
5. Remove hoses from filter.
6. Install new filter in proper flow direction in fuel line.
7. Secure with hose clamps.
8. Reconnect the negative battery cable when finished.

## OIL & FILTER CHANGE

Refer to engine owners manual.

## CHECK / CHANGE AIR FILTER

Refer to engine owners manual.

## REPLACE SPARK PLUG

Refer to engine owners manual.

## CHECK HYDRAULIC OIL LEVEL

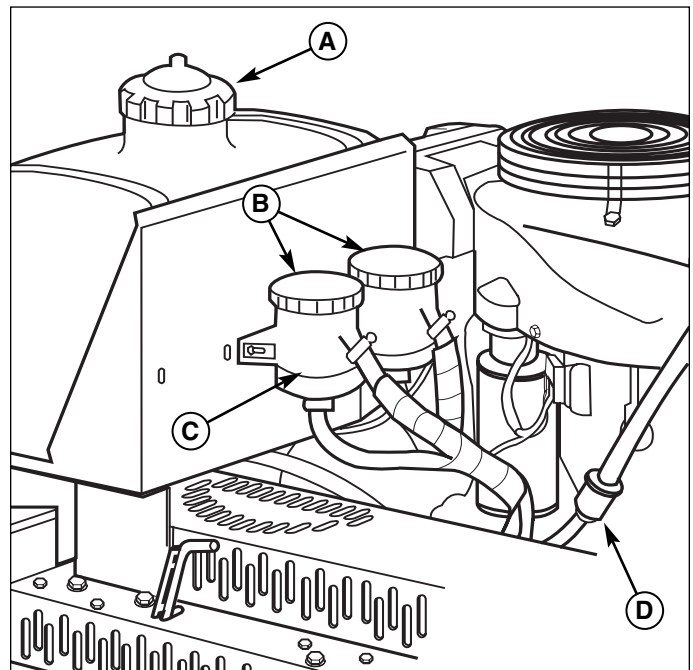
1. Observe the oil reservoirs (B, Figure 2). The oil level should be at the "FULL" line (C, figure 2).
2. Before removing the reservoir caps, make sure the area around the reservoir cap is free of dust, dirt, or other debris.
3. If necessary, unscrew the reservoir cap and add SAE straight 20 or 30 weight motor oil. **DO NOT** use multi-grade oils. Fill until oil level reaches "FULL" line.
4. Reinstall oil reservoir caps.

## ! WARNING

**Gasoline is highly flammable and must be handled with care. Never fill the tank when the engine is still hot from recent operation. Do not allow open flame, smoking or matches in the area. Avoid over-filling and wipe up any spills. Do not remove fuel filter when engine is hot, as spilled gasoline may ignite. DO NOT spread hose clamps further than necessary. Ensure clamps grip hoses firmly over filter after installation.**



*Do not use gasoline containing METHANOL, gasohol containing more than 10% ethanol, gasoline additives, premium gasoline, or white gas because engine/fuel system damage could result.*



**Figure 5. Fuel Tank, Oil Reservoir & Fuel Filter**

- A. Fuel Cap
- B. Oil Reservoirs
- C. "FULL" Line
- D. Fuel Filter

# Regular Maintenance

## LUBRICATION

Lubricate the machine at the lubrication points shown in Figures 6 - 11.

Use grease fittings when present. Disassemble parts to apply grease to moving parts when grease fittings are not installed.

Not all greases are compatible. Ferris Red Grease (P/N 22285) is strongly recommended. Automotive-type high-temperature, lithium grease may be used when this is not available.

Generally, all moving metal parts should be oiled where contact is made with other parts. Keep oil and grease off belts and pulleys. Remember to wipe fittings and surfaces clean both before and after lubrication.

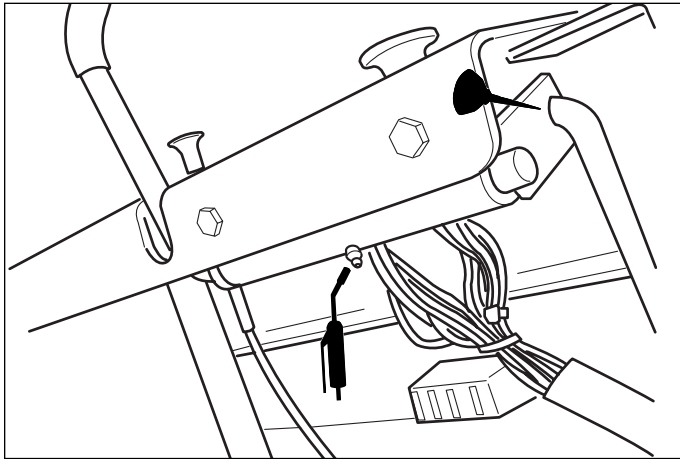


Figure 6. Motion Control Pivot & Rod Pivot

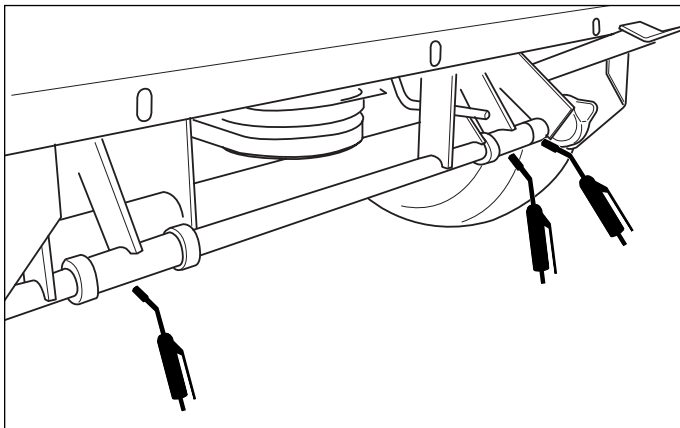


Figure 7. Lower Motion Control Pivots & Neutral Return Pedal Pivot

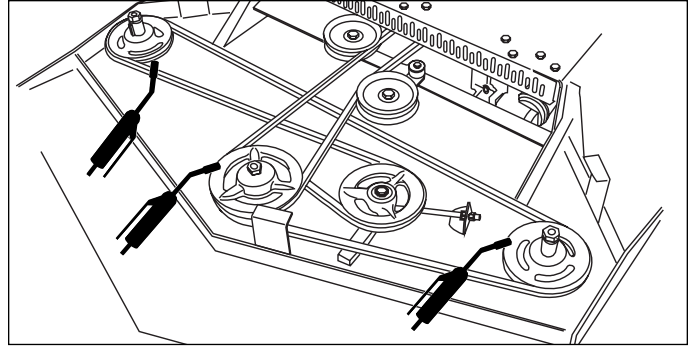


Figure 8. Blade Spindles

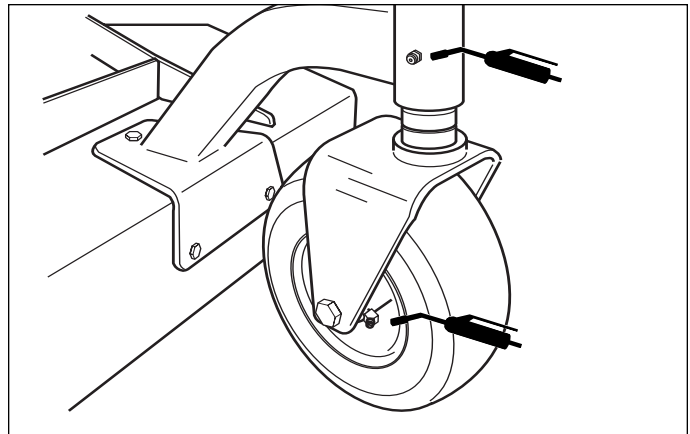


Figure 9. Caster Tire Pivots & Axles

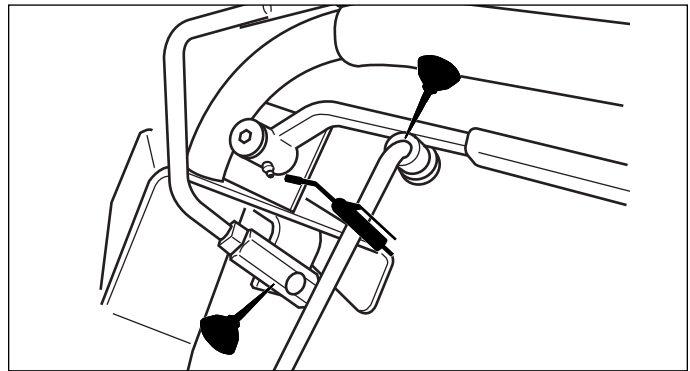


Figure 10. Steering Lever Pivots & Operator Presence Pivots

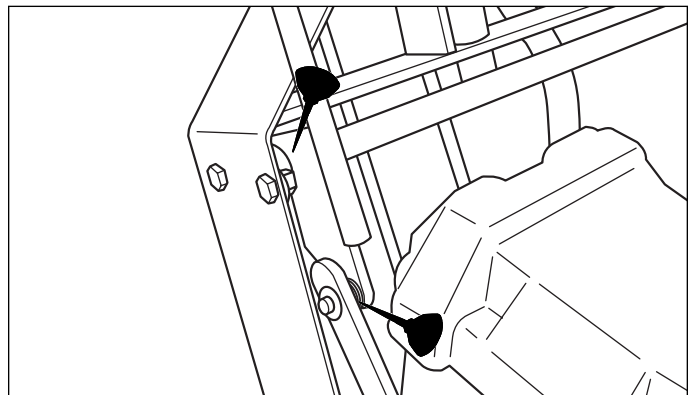


Figure 11. Parking Brake Lever Pivot & Link Pivot

## BATTERY MAINTENANCE

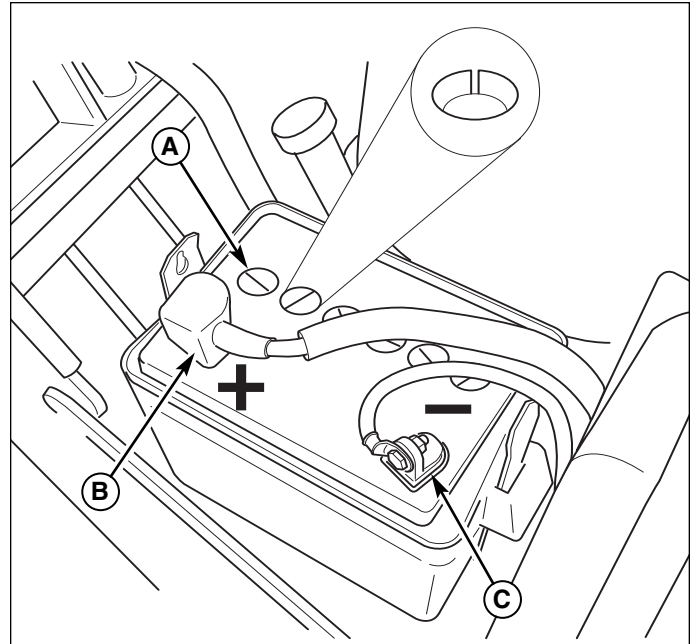
### Checking the Battery Fluid

*NOTE: It is not necessary to check the battery fluid level if machine is equipped with a maintenance-free battery.*

1. Remove the battery box cover to access the battery.
2. Remove the battery filler cap(s) (A, Figure 12). Fluid must be even with the split ring full mark. If not, add distilled water.
3. Reinstall the filler cap(s).

### Cleaning the Battery and Cables

1. Disconnect the cables from the battery, negative cable first (C, Figure 12).
2. Clean the battery terminals and cable ends with a wire brush until shiny.
3. Reinstall the battery and reattach the battery cables, positive cable first (see B, Figure 12)
4. Coat the cable ends and battery terminals with petroleum jelly or non-conducting grease.



**Figure 12. Battery Compartment**

- A. Vent Cap(s)
- B. Positive (+) Cable & Terminal
- C. Negative (-) Cable & Terminal

## **WARNING**

**Be careful when handling the battery. Avoid spilling electrolyte. Keep flames and sparks away from the battery.**

**When removing or installing battery cables, disconnect the negative cable FIRST and reconnect it LAST. If not done in this order, the positive terminal can be shorted to the frame by a tool.**

# Regular Maintenance

## SERVICING THE MOWER BLADES

1. Blades should be sharp and free of nicks and dents. If not, sharpen blades as described in following steps.
2. Remove the deck guard.
3. Raise the mower deck and secure with jackstands.
4. To remove blade for sharpening, use two (2) 15/16" wrenches to remove the nut from the top of the blade bolt. (Figure 13).
5. Use a file or hand-held grinder, sharpen blade to fine edge. Remove all nicks and dents in blade edge. If blade is severely damaged, it should be replaced.
6. Balance the blade as shown in Figure 14. Center the blade's hole on a nail lubricated with a drop of oil. A balanced blade will remain level.
7. Reinstall each blade with the tabs pointing up toward deck as shown in Figure 15. The blade spacers, blade, washer and bolt must be reinstalled in the exact same order in which they were removed. Torque bolts to 70-90 ft.lbs. (94-120 N.m.).

### **!** WARNING

Mower blades are sharp. For your personal safety, do not handle mower blades with bare hands. Careless or improper handling of blades may result in serious injury. For your personal safety, blade mounting bolts must each be installed with a flat washer then securely tightened. Torque blade mounting bolts to 70-90 ft.lbs. (94-120 N.m.)

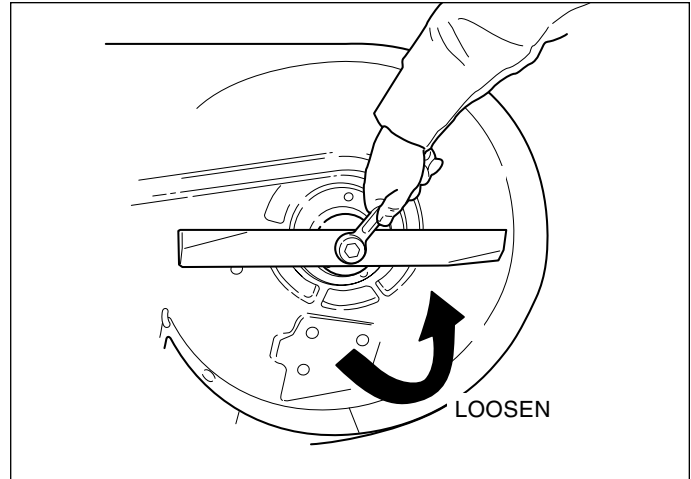


Figure 13. Removing the Blade

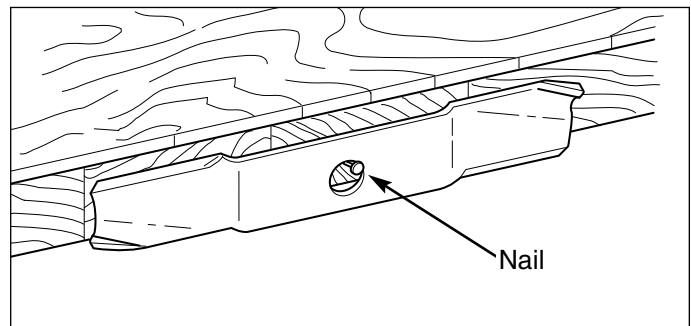


Figure 14. Balancing the Blade

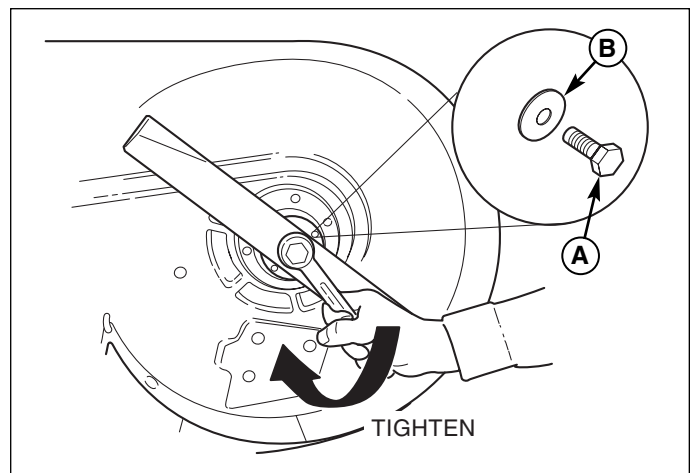
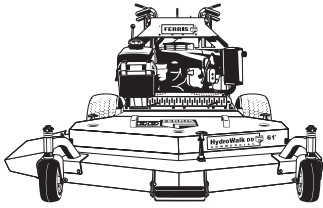


Figure 15. Installing the Blade

- A. Bolt
- B. Flat Washer



# Troubleshooting Adjustments & Service

## TROUBLESHOOTING

While normal care and regular maintenance will extend the life of your equipment, prolonged or constant use may eventually require that service be performed to allow it to continue operating properly.

The troubleshooting guide below lists the most common problems, their causes and remedies.

See the information on the following pages for instructions on how to perform most of these minor adjustments and service repairs yourself. If you prefer, all of these procedures can be performed for you by your local authorized dealer.

### WARNING

**To avoid serious injury, perform maintenance on the mower only when the engine is stopped and the parking brake engaged.**

**Always remove the ignition key, disconnect the spark plug wire and fasten it away from the plug before beginning the maintenance, to prevent accidental starting of the engine.**

## TROUBLESHOOTING THE MOWER

PROBLEM	CAUSE	REMEDY
<b>Engine will not turnover or start.</b>	<ol style="list-style-type: none"> <li>1. Parking brake not engaged.</li> <li>2. PTO (electric clutch) switch in ON position.</li> <li>3. Out of fuel.</li> <li>4. Engine flooded.</li> <li>5. Fuse blown.</li> <li>6. Battery terminals require cleaning.</li> <li>7. Battery discharged or dead.</li> <li>8. Wiring loose or broken.</li> <li>9. Solenoid or starter motor faulty.</li> <li>10. Safety interlock switch faulty.</li> <li>11. Spark plug(s) faulty, fouled or incorrectly gapped.</li> <li>12. Water in fuel.</li> <li>13. Gas is old or stale.</li> </ol>	<ol style="list-style-type: none"> <li>1. Engage parking brake.</li> <li>2. Place in OFF position.</li> <li>3. If engine is hot, allow it to cool, then refill the fuel tank.</li> <li>4. Move throttle control out of CHOKE position.</li> <li>5. Replace fuse.</li> <li>6. Clean the battery terminals</li> <li>7. Recharge or replace.</li> <li>8. Visually check wiring &amp; replace broken or frayed wires. Tighten loose connections.</li> <li>9. Repair or replace. See authorized service dealer</li> <li>10. Replace as needed. See authorized service dealer.</li> <li>11. Clean and gap or replace. See engine manual.</li> <li>12. Drain fuel &amp; refill with fresh fuel.</li> <li>13. Drain fuel &amp; replace with fresh fuel.</li> </ol>
<b>Engine starts hard or runs poorly.</b>	<ol style="list-style-type: none"> <li>1. Fuel mixture too rich.</li> <li>2. Spark plug faulty, fouled, or incorrectly gapped.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean air filter. Check choke adjustment (throttle control).</li> <li>2. Clean and gap or replace. (See engine manual.)</li> </ol>
<b>Engine knocks.</b>	<ol style="list-style-type: none"> <li>1. Low oil level.</li> <li>2. Using wrong grade oil.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check/add oil as required.</li> <li>2. See engine manual.</li> </ol>
<b>Excessive oil consumption.</b>	<ol style="list-style-type: none"> <li>1. Engine running too hot.</li> <li>2. Using wrong weight oil.</li> <li>3. Too much oil in crankcase.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean engine fins, blower screen and air cleaner.</li> <li>2. See engine manual.</li> <li>3. Drain excess oil.</li> </ol>
<b>Engine exhaust is black.</b>	<ol style="list-style-type: none"> <li>1. Dirty air filter.</li> <li>2. Engine choke control is in closed position.</li> </ol>	<ol style="list-style-type: none"> <li>1. Replace air filter. See engine manual.</li> <li>2. Open choke control.</li> </ol>

# Troubleshooting, Adjustment & Service

## *Rider Troubleshooting Continued.*

<b>PROBLEM</b>	<b>CAUSE</b>	<b>REMEDY</b>
<b>Engine runs, but mower will not drive.</b>	<ol style="list-style-type: none"> <li>1. Transmission release lever(s) in "neutral" position.</li> <li>2. Belt is broken.</li> <li>3. Drive belt slips.</li> <li>4. Brake is not fully released.</li> </ol>	<ol style="list-style-type: none"> <li>1. Move into drive position.</li> <li>2. See Drive Belt Replacement.</li> <li>3. See problem and cause below.</li> <li>4. See authorized service dealer</li> </ol>
<b>Transmission drive belt slips.</b>	<ol style="list-style-type: none"> <li>1. Pulleys or belt greasy or oily.</li> <li>2. Belt stretched or worn.</li> </ol>	<ol style="list-style-type: none"> <li>1. Clean as required.</li> <li>2. Replace belt.</li> </ol>
<b>Brake will not hold.</b>	<ol style="list-style-type: none"> <li>1. Internal brake disc on transaxle worn.</li> </ol>	<ol style="list-style-type: none"> <li>1. See authorized service dealer</li> </ol>
<b>Mower steers hard or handles poorly.</b>	<ol style="list-style-type: none"> <li>1. Steering linkage is loose.</li> <li>2. Improper tire inflation.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check and tighten any loose connections.</li> <li>2. See Regular Maintenance Section.</li> </ol>

## **TROUBLESHOOTING THE MOWER DECK**

<b>PROBLEM</b>	<b>CAUSE</b>	<b>REMEDY</b>
<b>Mower cut is uneven.</b>	<ol style="list-style-type: none"> <li>1. Mower not leveled properly.</li> <li>2. Drive tires not inflated equally or properly.</li> </ol>	<ol style="list-style-type: none"> <li>1. See Mower Adjustment.</li> <li>2. See Regular Maintenance Section.</li> </ol>
<b>Mower cut is rough looking.</b>	<ol style="list-style-type: none"> <li>1. Engine speed too slow.</li> <li>2. Ground speed too fast.</li> <li>3. Blades are dull.</li> <li>4. Mower drive belt slipping because it is oily or worn.</li> <li>5. Blades not properly fastened to arbors.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set throttle to full.</li> <li>2. Decrease Ground Speed.</li> <li>3. Sharpen or replace blades. See Mower Blade Service.</li> <li>4. Clean or replace belt as necessary.</li> <li>5. See Servicing the Mower Blades.</li> </ol>
<b>Engine stalls easily with mower engaged.</b>	<ol style="list-style-type: none"> <li>1. Engine speed too slow.</li> <li>2. Ground speed too fast.</li> <li>3. Cutting height set too low.</li> <li>4. Discharge chute jamming with cut grass.</li> </ol>	<ol style="list-style-type: none"> <li>1. Set to full throttle.</li> <li>2. Decrease Ground Speed.</li> <li>3. Cut tall grass at maximum cutting height during first pass.</li> <li>4. Cut grass with discharge pointing toward previously cut area.</li> </ol>
<b>Excessive mower vibration.</b>	<ol style="list-style-type: none"> <li>1. Blade mounting screws are loose.</li> <li>2. Mower blades, arbors, or pulleys are bent.</li> <li>3. Mower blades are out of balance.</li> <li>4. Belt installed incorrectly.</li> </ol>	<ol style="list-style-type: none"> <li>1. Tighten to 70-90 ft.lbs. (94-120 N.m.).</li> <li>2. Check and replace as necessary.</li> <li>3. Remove, sharpen, and balance blades. See Maintenance Section.</li> <li>4. Reinstall Correctly.</li> </ol>
<b>Excessive belt wear or breakage.</b>	<ol style="list-style-type: none"> <li>1. Bent or rough pulleys.</li> <li>2. Using incorrect belt.</li> </ol>	<ol style="list-style-type: none"> <li>1. Repair or replace.</li> <li>2. Replace with correct belt.</li> </ol>
<b>Mower drive belt slips or fails to drive.</b>	<ol style="list-style-type: none"> <li>1. Belt tension improperly adjusted.</li> <li>1. Idler pulley spring broken or not properly adjusted.</li> <li>2. Mower drive belt broken.</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust belt tension. See Belt Replacement</li> <li>1. Repair or adjust as needed.</li> <li>2. Replace drive belt.</li> </ol>

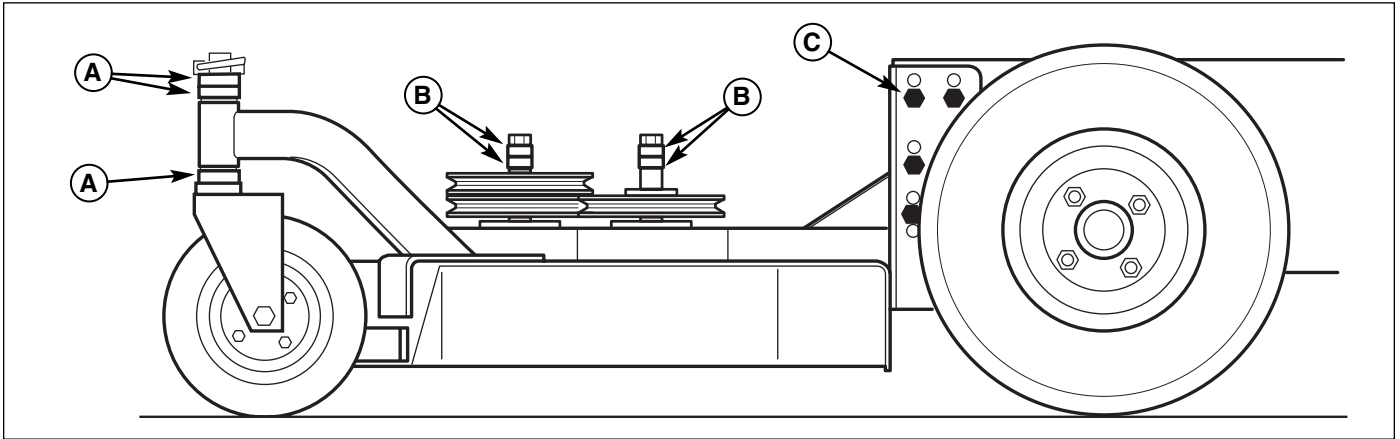


## MOWING HEIGHT ADJUSTMENT

The mowing height is determined by three factors: the mount position of the mower deck, the number of blade spacers above the spindle and the number of caster spacers above the caster arm.

Refer to the *Height Of Cut* chart to the right for the correct settings to obtain the desired height of cut. Remember, the “Blade Spacers” and “Caster Spacers” columns refer to the number ABOVE the spindle and caster arm. See Figure 16.

Height Of Cut	Mount Position (C, Fig. 16)	Blade Spacers (B, Fig. 16)	Caster Spacers (A, Fig. 16)
1-3/4"	U	1	3
2"	U	2	3
2-1/4"	U	3	3
2-1/2"	U	3	2
2-3/4"	L	4	2
3"	L	2	1
3-1/4"	L	3	1
3-1/2"	L	3	0
3-3/4"	L	4	0
4"	L	5	0



**Figure 16. Mowing Height Adjustment Points**

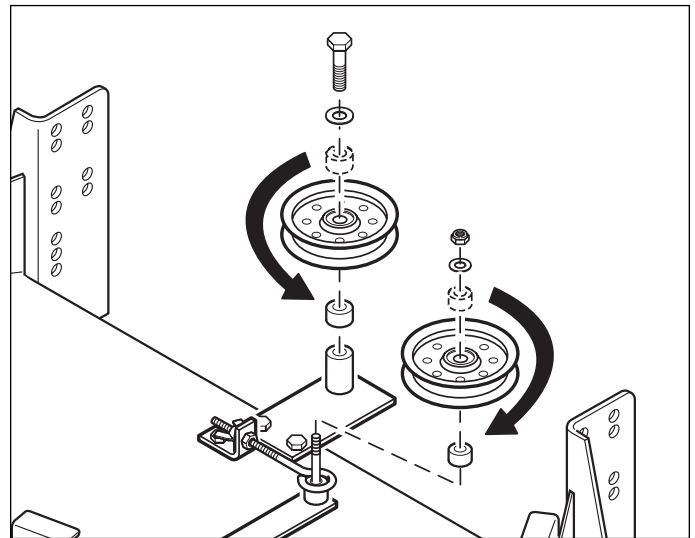
- A. Caster Spacers
- B. Blade Spacers
- C. Deck Mount Position (shown in “L”)

## IDLER PULLEY HEIGHT ADJUSTMENT

### DDS48 & DDS48R ONLY

If a mowing height of 2-1/2" or lower is desired, the deck drive belt idler pulley height needs to be adjusted.

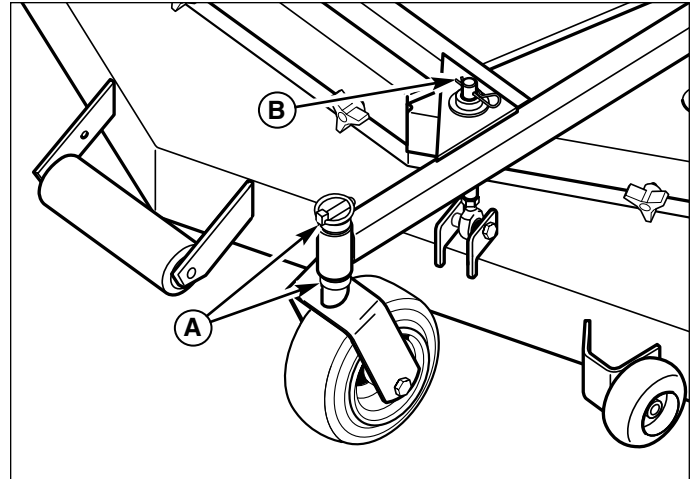
1. Remove the deck drive belt. See *MOWER BELT REPLACEMENT AND ADJUSTMENT* section on page 24.
2. Move the idler pulley spacers from the top of the pulley to the bottom of the pulley. See Figure 17.
3. Reinstall the deck drive belt. See *MOWER BELT REPLACEMENT AND ADJUSTMENT* section on page 24.



**Figure 17. Adjust Idler Pulley Spacer Position**

## DECK LEVELING ADJUSTMENT (DDSH Models only)

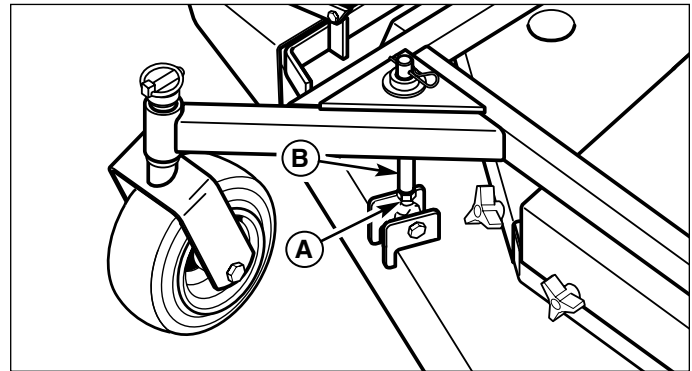
1. Make sure there is one spacer above and below the frame on the front caster shafts and place hairpin clips in the 2" cutting height position (see Figure 18).
2. Rotate the blade on the RIGHT-HAND side (discharge side) until the tip faces the front of the machine.



**Figure 18. Caster Spacers & Hairpin Clip**

- A. Caster Spacer
- B. Hairpin Clip

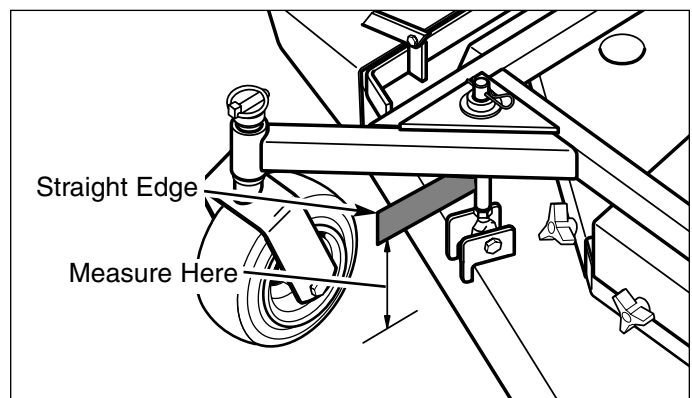
3. Loosen the jam nuts (A, Figure 19) located on the front deck hanger shafts (B). Turn the right side shaft until a cutting height of 2" is obtained at the very tip of the blade towards the front of the machine.



**Figure 19. Front Hanger Shaft Adjustment**

- A. Jam Nut
- B. Front Hanger Shaft

4. Now place a straight edge on top of the cutter deck approximately 1" to the outside of the front deck mount on the right side and measure to the floor (see Figure 20). Record your measurement.
5. Repeat the measuring procedure listed in Step 4 for the left-hand side of the mower deck.
6. Compare the measurements taken in Step 4 & 5. If they differ by more than 1/16", the front deck hanger shaft on the LEFT side (non-discharge side) must be adjusted.
7. Adjust the two front hanger shafts as needed until the tip of the blade is 2" from the floor and the measurements taken from the top of the deck to the floor are within 1/16" of each other.
8. Once the level of the deck has been adjusted, there should be no slack in the front hanger shafts. If one shaft moves, a shim (P/N 20928) is required.



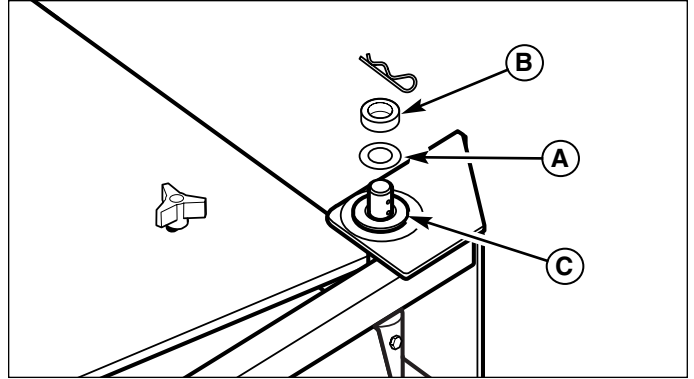
**Figure 20. Mowing Height Measurement**

## Shimming the Hanger Shafts

Once it has been determined that a shim (P/N 20928) is required, you first must determine which rear hanger shaft requires the shim.

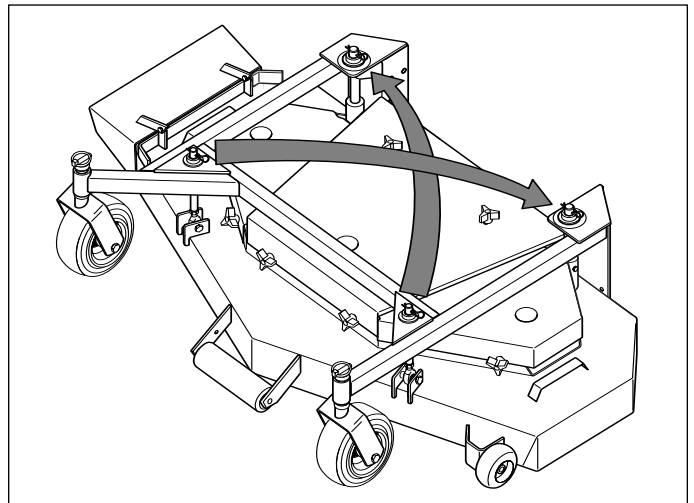
The shim (A, Figure 21) must be placed in between the spacer (B) and the retaining collar (C) on the OPPOSITE side from which the front shaft has movement or slack (see Figure 22).

Once the shim has been assembled in the proper location, repeat Step 2 - 8 in the *DECK LEVELING ADJUSTMENT* section. This adjustment may need to be repeated more than once until the proper number of shims has been installed to obtain the proper cutting height, equal measurements from side to side and no movement of the front hanger shafts.



**Figure 21. Shim Assembly Position**

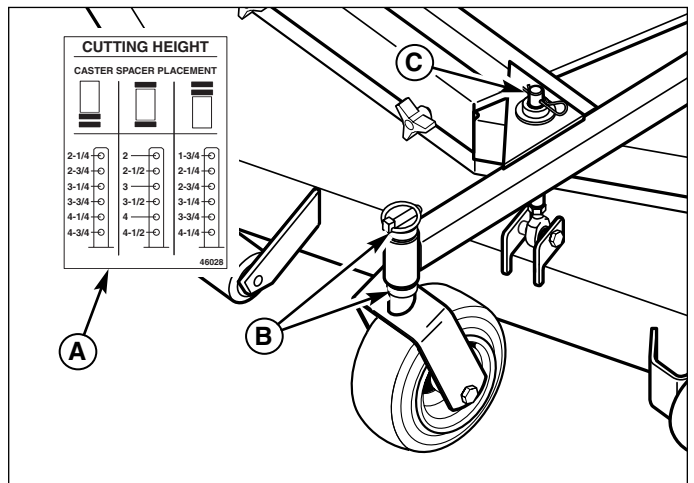
- A. Shim
- B. Spacer
- C. Retaining Collar



**Figure 22. Proper Shim Location**

## MOWING HEIGHT ADJUSTMENT (DDSH Models only)

Refer to the Height Selection decal (A, Figure 23) located on the deck hanger frame and adjust the positions of the caster spacers and hairpins to obtain the desired mowing height. Perform adjustment to all four shafts.



**Figure 23. Mowing Height Adjustment**

- A. Height Selection Decal
- B. Caster Spacer
- C. Hairpin Clip

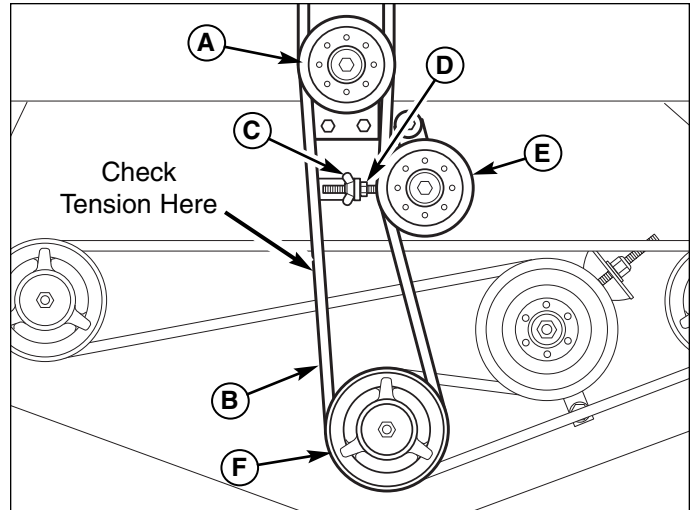
## MOWER BELT REPLACEMENT AND ADJUSTMENT



To avoid damaging belts, DO NOT PRY BELTS OVER PULLEYS.

### PTO Clutch to Deck Belt

1. Park the machine on a smooth, level surface such as a concrete floor. Disengage the PTO, engage the parking brake, turn off the engine, and remove the ignition key.
2. Remove the mower deck guard.
3. Remove the rear engine deck guard.
4. Loosen the wing nut (C, Figure 24) to release the belt tension on the deck drive belt (B).
5. Slide the drive belt over the edge of the spindle pulley and then slide the belt around the idler pulley. Drop the belt from the PTO clutch pulley groove.
6. Remove the old belt and replace with a new one. Make sure the V-side of the belt runs in the pulley grooves.
7. Install the drive belt on the PTO pulley, the idler pulley and center spindle pulley. Tighten the wing nut (C, Figure 24) until a 10 lb. (44.5 newton) force is required to deflect the belt 1/2" (1,27cm) between the idler pulley and center spindle pulley. Jam hex nut (D) against anchor. See Figure 23.
8. Run the mower under no-load condition for about 5 minutes to break-in the new belt and re-check belt tension. Adjust if necessary.

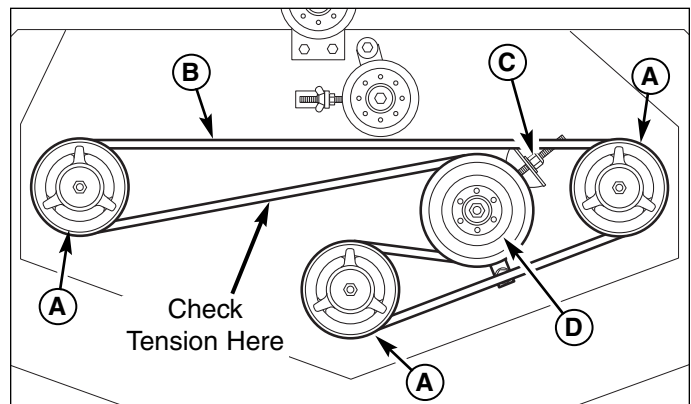


**Figure 24. PTO Clutch to Deck Belt**

- |                            |                            |
|----------------------------|----------------------------|
| A. Stationary Idler Pulley | D. Hex Nut                 |
| B. Deck Drive Belt         | E. Adjustable Idler Pulley |
| C. Wing Nut                | F. Center Spindle Pulley   |

### Spindle Belt

1. Remove PTO clutch to Deck belt. See instructions above.
2. Loosen the nylon nut (C, Figure 25) to release the belt tension on the spindle drive belt (B).
3. Slide the drive belt over the edge of one of the spindle pulleys and then slide the belt around the idler pulley and remaining spindle pulleys.
4. Remove the old belt and replace with a new one. Make sure the V-side of the belt runs in the pulley grooves (for single v-section belts).
5. Install the spindle drive belt on the spindle pulleys and the idler pulley. Tighten the nylon nut (C, Figure 25) until a 10 lb. (44.5 newton) force is required to deflect the belt 1/2" (1,27cm) between the idler pulley and right-hand spindle pulley. See Figure 25.
6. Run the mower under no-load condition for about 5 minutes to break-in the new belt and re-check belt tension. Adjust if necessary.



**Figure 25. Spindle Drive Belt**

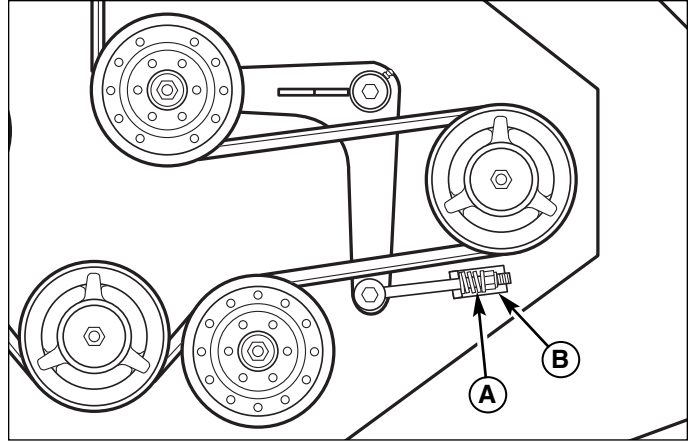
- |                       |                 |
|-----------------------|-----------------|
| A. Spindle Pulley     | D. Idler Pulley |
| B. Spindle Drive Belt |                 |
| C. Nylon Lock Nut     |                 |

## MOWER BELT REPLACEMENT AND ADJUSTMENT (DDSH Models only)



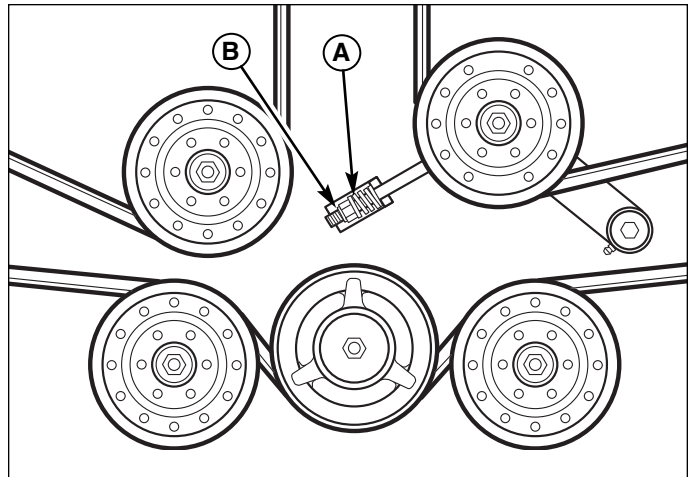
To avoid damaging belts, DO NOT PRY BELTS OVER PULLEYS.

1. Park the machine on a smooth, level surface such as a concrete floor. Disengage the PTO, engage the parking brake, turn off the engine, and remove the ignition key.
2. Remove the mower deck guard.
3. Remove the rear engine deck guard.
4. Loosen the spring compression nut (B, Figure 26 & 27) to release the belt tension.
5. Slide the drive belt over the edge of the idler pulley and then slide the belt under the idler pulley. Drop the belt from the PTO clutch pulley groove.
6. Remove the old belt and replace with a new one. Make sure the V-side of the belt runs in the pulley grooves (Figure 28).
7. Install the drive belt on the PTO pulley, the spindle pulleys and idler pulleys. Tighten the spring compression nut (B, Figure 26 & 27) until the belt tension spring (A, Figure 26 & 27) is 3/4" (1,90cm) long.
8. Run the mower under no-load condition for about 5 minutes to break-in the new belt and re-check spring length. Adjust if necessary.



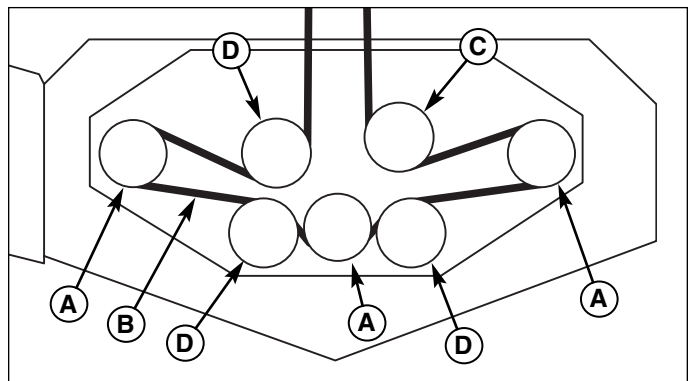
**Figure 26. 52" Mower PTO Belt**

- A. Belt Tension Spring
- B. Spring Compression Nut



**Figure 27. 61" Mower PTO Belt**

- A. Belt Tension Spring
- B. Spring Compression Nut



**Figure 28. Mower PTO Belt Routing**

- A. Spindle Pulley
- B. PTO Drive Belt
- C. Spring-loaded Idler Pulley
- D. Stationary Idler Pulley

## TRANSMISSION DRIVE BELT REPLACEMENT



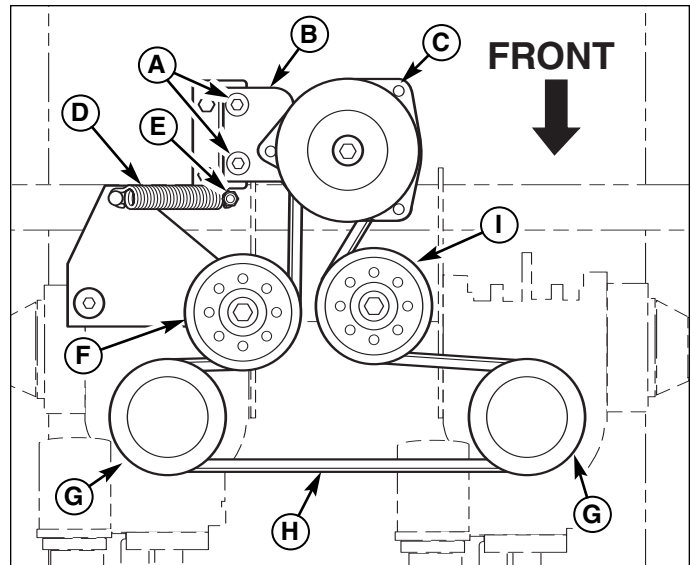
To avoid damaging belts, DO NOT PRY BELTS OVER PULLEYS.

1. Remove the deck drive belt. See *MOWER BELT REPLACEMENT AND ADJUSTMENT* sections.
2. Remove the grass screen that covers the transmission cooling fans.
3. Remove the clutch anchor bolts (A, Figure 29) that fasten the clutch anchor pad to the anchor.
4. Unplug the PTO clutch from the wire harness.
5. Remove the spring anchor nut (E) and remove the belt tension spring (D).

### **WARNING**

**STORED ENERGY DEVICE:** Improper release of the belt tension spring can result in personal injury.

Use extreme caution when removing this spring.



**Figure 29. Transmission Drive Belt**

- |                              |                               |
|------------------------------|-------------------------------|
| A. Anchor Hardware           | F. Spring-loaded Idler Pulley |
| B. Clutch Anchor Pad         | G. Transmission Input Pulley  |
| C. PTO Clutch & Drive Pulley | H. Belt                       |
| D. Belt Tension Spring       | I. Stationary Idler Pulley    |
| E. Spring Anchor Nut         |                               |

6. Drop the belt (H) from the crankshaft pulley and around the PTO clutch.
7. From the front of the machine, pull the belt towards the front while sliding it up and over the transmission cooling fans.
8. Remove the old belt and replace with a new one. Make sure the V-side of the belt runs in the pulley grooves.
9. Install belt over the transmission cooling fans and on the transmission input pulleys (G), around the idler pulleys (F & I) and on the crankshaft pulley.
10. Reinstall the belt tension spring (D) onto the anchor bolt and reinstall the nylon nut (E).
11. Plug the PTO clutch into the wire harness.
12. Reinstall the clutch anchor pad and hardware (B & A). Tighten securely.
13. Reinstall grass screen and fasten securely.
14. Reinstall the deck drive belt. See *MOWER BELT REPLACEMENT AND ADJUSTMENT* sections.

### TRANSMISSION NEUTRAL & TRACKING ADJUSTMENTS

#### Neutral Adjustment

1. Park the machine on a smooth, level surface such as a concrete floor, away from bystanders and preferably facing a wall. Disengage the PTO, engage the parking brake, turn off the engine, and remove the ignition key.
2. Chock the front caster wheels. Raise the drive wheels off the ground and secure the machine with jack stands.
3. Start the engine and adjust throttle control to SLOW (lowest setting). See the *STARTING THE ENGINE* section for proper starting instructions.
4. Disengage the parking brake.
5. Using a 1/2" deep socket, SLOWLY turn the adjustment nut COUNTER-CLOCKWISE until the drive tire begins to rotate forward.
6. SLOWLY turn the adjustment nut CLOCKWISE until the drive tire begins to rotate backwards.
7. Set the adjustment half way in between where the forward and backwards rotations began.
8. Adjust the throttle control to FULL (highest setting). Cycle the speed control lever and neutral return pedal several times to insure and accurate adjustment has been made.

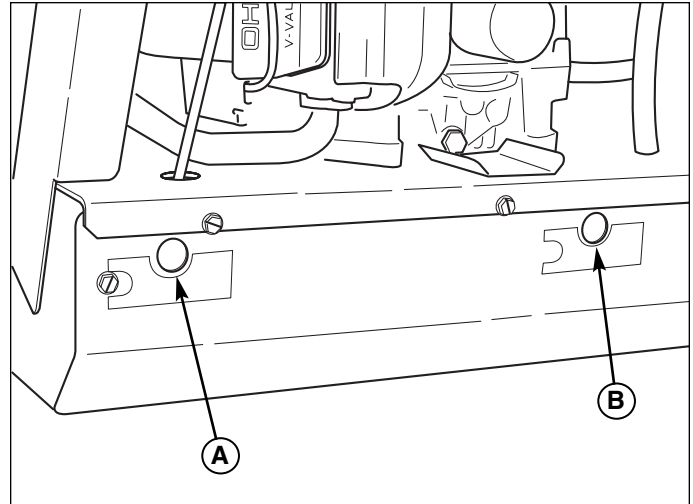
#### Tracking Adjustment

Before making a tracking adjustment, be sure to check the following:

- Drive tires are inflated to 15 psi (103 kPa).
- Caster tires are inflated to 25 psi (172 kPa), are greased and turn freely.
- All controls are free from damage and operate freely.
- Machine is at full operating temperature.
- Make sure the machine is in neutral when the foot pedal is depressed. If not, adjust neutral as described above.

#### If Machine Veers to the LEFT:

1. Turn the LEFT adjustment nut 1/8 - 1/4 turn COUNTER-CLOCKWISE.
2. Turn the RIGHT adjustment nut 1/8 - 1/4 turn CLOCKWISE.
3. Drive machine on a flat, level surface to test and repeat steps 1 & 2 as necessary.



**Figure 30. Neutral & Tracking Adjustment Points**

- A. Left-Hand Adjustment
- B. Right-Hand Adjustment

#### If Machine Veers to the RIGHT:

1. Turn the RIGHT adjustment nut 1/8 - 1/4 turn COUNTER-CLOCKWISE.
2. Turn the LEFT adjustment nut 1/8 - 1/4 turn CLOCKWISE.
3. Drive machine on a flat, level surface to test and repeat steps 1 & 2 as necessary.

## TRANSMISSION MAINTENANCE AND SERVICE

The hydrostatic transmissions are sealed units that require no maintenance other than the following.

- Keep the grass screen and transmission cooling fins clear of grass, leaves and debris.
- Keep oil level in the reservoirs (A, Figure 31) at the "FULL" line (B). Extra oil in the reservoir will not benefit the machine.
- If it is necessary to add oil to the reservoirs, use SAE straight 20 or 30 weight motor oil. **DO NOT** use a multi-grade oils. Make sure the area around the oil reservoirs is free from dust, dirt and debris before opening the reservoirs.
- Make sure the oil reservoirs caps are tight.
- Keep water, dirt and debris from entering the oil reservoirs. A small amount of a contaminant could damage the transmissions.



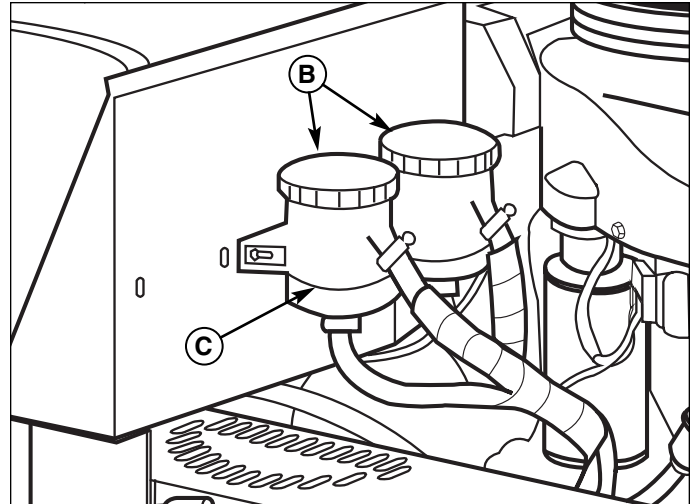
**Make sure transmissions and immediate surrounding areas are free from dirt and debris before changing the oil and filters. Cleanliness while performing this operation is extremely important.**

### Changing Oil & Filters

1. Park the machine on a smooth, level surface such as a concrete floor. Disengage the PTO, engage the parking brake, turn off the engine, and remove the ignition key.
2. Place a drain pan under each transmission and remove the filters to drain the oil. See Figure 32.
3. Once oil has drained from transmissions, replace with new filters (P/N 5021068X1), placing a light film on the seal of the filter before installing. Hand-tighten filter only.
4. Fill oil reservoirs 3/4 full with SAE straight 20 or 30 weight motor oil.

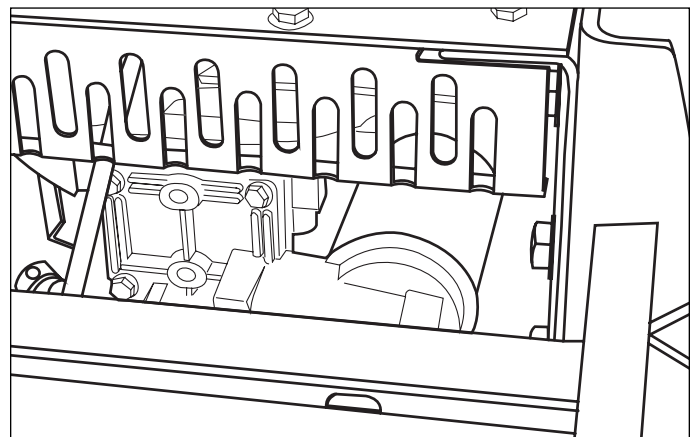
### To Bleed Air From Transmissions

1. Locate the machine in a secure area, away from bystanders and preferably facing a wall. Raise the drive tires off the ground and secure with jackstands.
2. Continue to fill reservoirs to the full line until the oil level stops going down.
3. Start the engine and adjust throttle control to just above idle. See the *STARTING THE ENGINE* section for proper starting instructions.
4. Run engine for 5 minutes. Watch the oil level in the reservoirs. Add oil to the "FULL" line (B, Figure 31) as necessary.
5. With engine running, cycle controls forward and reverse until positive response to the drive is achieved. Do not attempt to move the unit until bleeding is complete or serious damage may occur.
6. Watch oil levels for the next few days and add oil to the reservoirs as necessary.



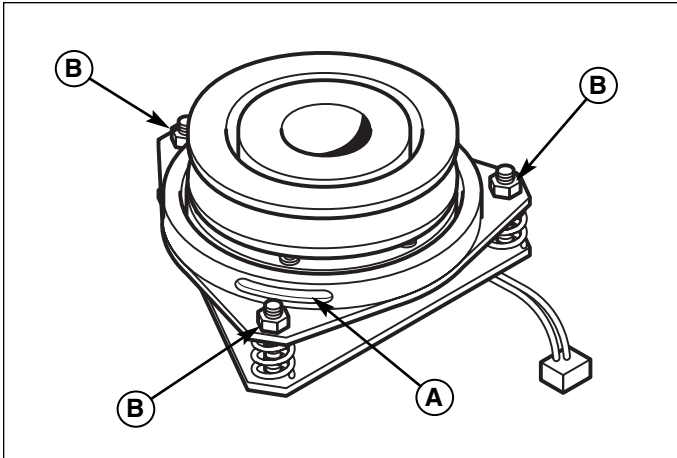
**Figure 31. Oil Reservoirs**

- A. Oil Reservoirs
- B. "FULL" Line



**Figure 32. Transmission Oil Filter Location**  
(left-hand side shown)





**Figure 33. PTO Clutch Adjustment**

- A. Adjustment Window (Qty. 3, one shown)
- B. Adjustment Nut

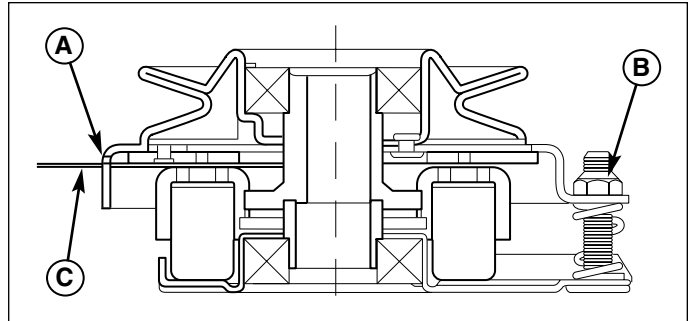
## PTO CLUTCH ADJUSTMENT

Check the PTO clutch adjustment after the initial 25 hour break-in period and then after every 100 hours of operation. Also perform the following procedure if the clutch is slipping or will not engage, or if a new clutch has been installed.

1. Remove key from ignition switch and disconnect spark plug wires to prevent the possibility of accidental starting while the PTO is being adjusted.
2. See Figure 33. Note the position of the 3 adjustment windows (A) in the side of the brake plate and the nylock adjustment nuts (B).
3. Insert a .016"-.018" (0,40-0,45mm) feeler gauge (C) through each window, positioning the gauge between the rotor face and the armature face as shown in Figure 34.
4. Alternately tighten the adjustment nuts (B, Figure 33) until the rotor face and armature face just contacts the gauge.
5. Check the windows for an equal amount of tension when the gauge is inserted and removed, and make any necessary adjustments by tightening or loosening the adjustment nuts.

*NOTE: The actual air gap between the rotor and armature may vary even after performing the adjustment procedure. This is due to dimensional variations on component parts, and is an acceptable condition.*

6. Check the mower blade stopping time. The mower blades and mower drive belt should come to a complete stop within seven seconds after the electric PTO switch is turned off.



**Figure 34. Adjust PTO Clutch**

- A. Window
- B. Adjustment Nut
- C. .016"-.018" (0,40-0,45mm) Feeler Gauge

## **!** WARNING

**To avoid serious injury, perform adjustments only with engine stopped, key removed and machine on level ground.**

### Blade Brake Check

Mower blades and mower drive belts should come to a complete stop within seven seconds after electric PTO switch is turned off.

1. Remove deck guard(s) for checking blade brake stop time **ONLY**. **NEVER OPERATE** the machine without guard(s) in place.
1. With parking brake engaged and PTO disengage, start the engine engine.
2. Observe the mower drive belt. Engage the PTO and wait several seconds. Disengage the PTO and check the amount of time it takes for the mower drive belt to stop.
3. If the mower drive belt does not stop within seven seconds, perform the PTO Clutch Adjustment. If the belt still does not stop within seven seconds, see your dealer.

## BATTERY SERVICE

### **WARNING**

Keep open flames and sparks away from the battery; the gasses coming from it are highly explosive. Ventilate the battery well during charging.

### Checking Battery Voltage

A voltmeter can be used to determine condition of battery. When engine is off, the voltmeter shows battery voltage, which should be 12 volts. When engine is running, the voltmeter shows voltage of charging circuit which normally is 13 to 14 volts.

A dead battery or one too weak to start the engine may not mean the battery needs to be replaced. For example, it may mean that the alternator is not charging the battery properly. If there is any doubt about the cause of the problem, see your dealer. If you need to replace the battery, follow the steps under Cleaning the Battery & Cables in the Regular Maintenance Section.

### Charging a Completely Discharged Battery

1. Be aware of all the safety precautions you should observe during the charging operation. If you are unfamiliar with the use of a battery charger and hydrometer, have the battery serviced by your dealer.
2. Add distilled water sufficient to cover the plate (fill to the proper level near the end of the charge). If the battery is extremely cold, allow it to warm before adding water because the water level will rise as it warms. Also, an extremely cold battery will not accept a normal charge until it becomes warm.
3. Always unplug or turn the charger off before attaching or removing the clamp connections.
4. Carefully attach the clamps to the battery in proper polarity (usually red to [+] positive and black to [-] negative).
5. While charging, periodically measure the temperature of the electrolyte. If the temperature exceeds 125° F (51.6° C), or if violent gassing or spewing of electrolyte occurs, the charging rate must be reduced or temporarily halted to prevent battery damage.
6. Charge the battery until fully charged (until the specific gravity of the electrolyte is 1.250 or higher and the electrolyte temperature is at least 60° F). The best method of making certain a battery is fully charged, but not over charged, is to measure the specific gravity of a cell once per hour. The battery is fully charged when the cells are gassing freely at low charging rate and less than 0.003 change in specific gravity occurs over a three hour period.

### Jump Starting With Auxiliary (Booster) Battery

Jump starting is not recommended. However, if it must be done, follow these directions. Both booster and discharged batteries should be treated carefully when using jumper cables. Follow the steps below EXACTLY, being careful not to cause sparks. Refer to Figure 35.

1. Both batteries must be of the same voltage.
2. Position the vehicle with the booster battery adjacent to the vehicle with the discharged battery so that booster cables can be connected easily to the batteries in both vehicles. Make certain vehicles do not touch each other.
3. Wear safety glasses and shield eyes and face from batteries at all times. Be sure vent caps are tight. Place damp cloth over vent caps on both batteries.
4. Connect positive (+) cable to positive post of discharged battery (wired to starter or solenoid).
5. Connect the other end of same cable to same post marked positive (+) on booster battery.
6. Connect the second cable negative (-) to other post of booster battery.
7. Make final connection on engine block of stalled vehicle away from battery. Do not lean over batteries.
8. Start the engine of the vehicle with the booster battery. Wait a few minutes, then attempt to start the engine of the vehicle with the discharged battery.
9. If the vehicle does not start after cranking for thirty seconds, STOP PROCEDURE. More than thirty seconds seldom starts the engine unless some mechanical adjustment is made.
10. After starting, allow the engine to return to idle speed. Remove the cable connection at the engine or frame. Then remove the other end of the same cable from the booster battery.
11. Remove the other cable by disconnecting at the discharged battery first and then disconnect the opposite end from the booster battery.
12. Discard the damp cloths that were placed over the battery vent caps.

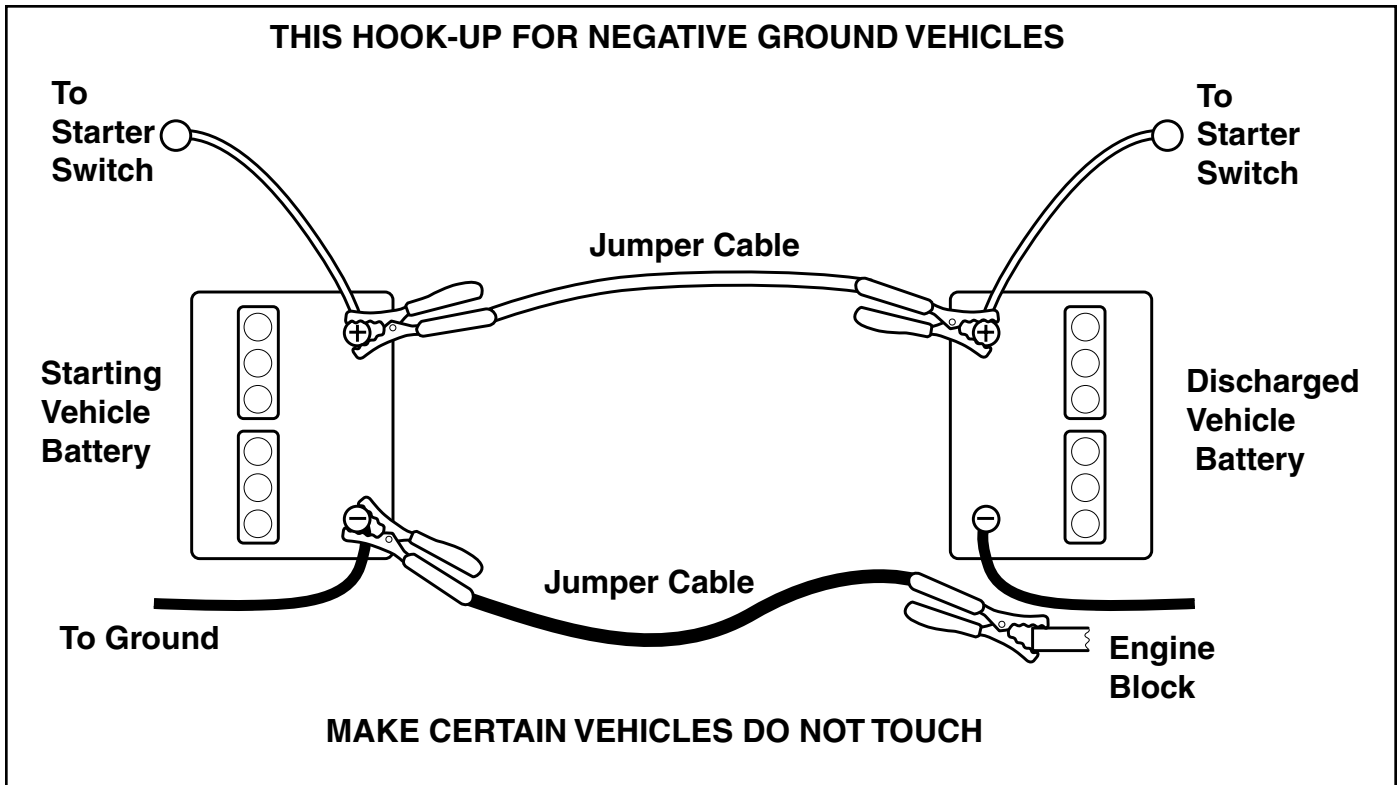


Figure 35. Jump Starting

## **! WARNING**

Any procedure other than the preceding could result in:

- (1) personal injury caused by electrolyte squirting out the battery vents,
- (2) personal injury or property damage due to battery explosion,
- (3) damage to the charging system of the booster vehicle or of the immobilized vehicle.

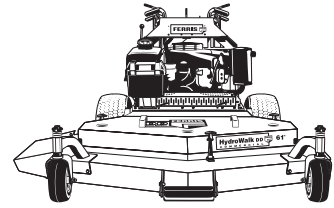
Do not attempt to jump start a vehicle having a frozen battery because the battery may rupture or explode. If a frozen battery is suspected, examine all fill vents on the battery. If ice can be seen or if the electrolyte fluid cannot be seen, do not attempt to start with jumper cables as long as the battery remains frozen.

## **! WARNING**

For your personal safety, use extreme care when jump starting. Never expose battery to open flame or electric spark – battery action generates hydrogen gas which is flammable and explosive. Do not allow battery acid to contact skin, eyes, fabrics, or painted surfaces. Batteries contain a sulfuric acid solution which can cause serious personal injury or property damage. When removing or installing battery cables, disconnect the negative cable **FIRST** and reconnect it **LAST**. If not done in this order, the positive terminal can be shorted to the frame by a tool.

To avoid engine damage, do not disconnect battery while engine is running. Be sure terminal connections are tight before starting.

# Specifications



*NOTE: Specifications are correct at time of printing and are subject to change without notice.*

*\* Actual sustained equipment horsepower will likely be lower due to operating limitations and environmental factors.*

## ENGINE:

### 15 HP\* Kawasaki Manual Start

<b>Make</b>	Kawasaki
<b>Model</b>	FH451V
<b>Horsepower</b>	15 @ 3600 rpm
<b>Displacement</b>	26.30 Cu. in (431 cc)
<b>Electrical System</b>	12 Volt Clutch Coil, 13 amp
<b>Oil Capacity</b>	3.8 pt. (1.8L) w/ Filter

### 17 HP\* Kawasaki Manual Start

<b>Make</b>	Kawasaki
<b>Model</b>	FH500V
<b>Horsepower</b>	17 @ 3600 rpm
<b>Displacement</b>	30.15 Cu. in (494 cc)
<b>Electrical System</b>	12 Volt Clutch Coil, 13 amp
<b>Oil Capacity</b>	3.8 pt. (1.8L) w/ Filter

### 23 HP\* Kawasaki Electric Start

<b>Make</b>	Kawasaki
<b>Model</b>	FH680V
<b>Horsepower</b>	23 @ 3600 rpm
<b>Displacement</b>	41.19 Cu. in (675 cc)
<b>Electrical System</b>	12 Volt, 13 amp. Alternator, Battery: 340 CCA
<b>Oil Capacity</b>	4.0 pt. (1.9L) w/ Filter

## CHASSIS:

<b>Fuel Tanks</b>	Capacity: 5 Gallons (18.9 L)
<b>Rear Wheels</b>	Tire Size: 17 x 7.50 -12 Inflation Pressure: 15 psi (1,03 bar)
<b>Front Wheels</b>	Tire Size: 9 x 3.5 - 6 Inflation Pressure: 25 psi (1,72 bar)

## TRANSMISSION:

### Eaton 771-101 & 771-102

<b>Type</b>	Unitized Drive Transaxles
<b>Hydraulic Fluid</b>	Mobil DTE26 Hydraulic Oil OR SAE 20W-20 Motor Oil OR SAE 30 Motor Oil
<b>Speeds</b>	Forward: 0-6 MPH (0-9.65 km/h) Reverse: 0-2 MPH (0-3.22 km/h)
<b>Continuous Torque Output</b>	162 ft. lbs. (219 N.m.)
<b>Maximum Weight on Axle</b>	900 lbs. (408 Kg)

## DIMENSIONS:

<b>Overall Length</b>	
<b>48" Model</b>	72" (183 cm)
<b>52" Model</b>	72" (183 cm)
<b>61" Model</b>	76" (193 cm)
<b>Overall Width</b>	
<b>48" Model</b>	57" (145 cm)
<b>52" Model</b>	61" (155 cm)
<b>61" Model</b>	70" (118 cm)
<b>Height</b>	42" (107 cm)
<b>Weight (apx.)</b>	
<b>48" Model</b>	665 lbs. (302 kg)
<b>52" Model</b>	700 lbs. (318 kg)
<b>61" Model</b>	730 lbs. (331 kg)



# Lawn Care & Mowing Information

## GENERAL INFORMATION

Proper mowing is an important part of maintaining your lawn in the best possible condition. A healthy and well maintained lawn is better able to resist drought, weeds, and other stresses. But too much maintenance is as detrimental to your lawn as neglect. Proper care for your lawn involves more than just “cutting the grass.” To have a healthy lawn, you need to know:

- Types of Grass, Climate and Conditions
- How and When to Water, Fertilize & Aerate
- How High to Mow the Grass
- When and How Often to Mow
- What Mowing Patterns to Use
- Proper Mowing Methods
- How to Solve Common Mowing Problems

## TYPES OF GRASS, CLIMATE AND CONDITIONS

A variety of grasses are commonly grown in household lawns, but two main groups known as cool-season grasses (varieties of bluegrass, ryegrass, and fescue), and warm-season grasses (typically bermuda, buffalo grass, and zoysia varieties) are the most common.

The cool-season grasses are better suited to cooler climates, and do not endure hot and dry weather as well as warm-season grasses, but conversely, the warm-season grasses do not grow as well in cooler climates. Most residential lawns are typically seeded with a mixture of these grasses. (A local nursery or lawn center may help you to identify what kind of grass your lawn contains from a sample.)

Knowing your climate and conditions is also important to proper lawn care. Drier climates or conditions will require additional watering, while wetter climates may require more frequent mowing.

## HOW AND WHEN TO WATER, FERTILIZE & AERATE

Every lawn’s watering needs are unique and are dependent upon the type of grass and soil, the amount of local rainfall, and other conditions. **Most lawns are watered too often, but with too little water.** However too much water can allow development of diseases with your lawn. **It is best to water the lawn only when necessary, and then to water it slowly, evenly, and deeply—imitating a slow, soaking rain.**

### WHEN TO WATER YOUR LAWN

When the lawn begins to wilt, the grass’s color dulls, or footprints stay compressed for more than a few seconds, the lawn is beginning to dry out, and needs additional moisture. The best time to water is early morning to allow the water to soak deeply into the lawn and reduce the amount that evaporates in the hot afternoon sun.



### HOW TO WATER YOUR LAWN

The best method of watering a lawn is to imitate a slow, soaking rain, applying about 1 inch of water. A method of verifying the amount that you have watered, is to place several empty tin cans (low shallow cans work best) in various spots around the lawn, and check the depth of water in the can during the watering process.

### HOW TO FERTILIZE YOUR LAWN

Fertilizing with a slow-release fertilizer provides missing nutrients which help create slow, even growth. While opinions vary on the need for fertilizing, when and how much to fertilize will be more a factor of the condition of the lawn and soil than any routine. Remember that over-fertilizing can cause harm, and that most fertilizing should be applied in the spring so that it will release into the lawn through the summer. For more information, check with a local nursery or lawn care specialist, and read and follow the fertilizer manufacturer’s instructions.

### AERATING YOUR LAWN

Consider aerating your lawn in spring. Using an aerator to remove cores of soil from the lawn increases the speed of clipping decomposition and encourages deeper root growth by opening up the soil and permitting greater movement of water, fertilizer and air.

# Lawn Care & Mowing Information

## HOW HIGH TO MOW THE GRASS

Often cutting height is a matter of personal preference. Typically, you should mow the grass when it is between three and five inches high. The proper cutting height range for a specific lawn will depend upon several factors, including the type of grass, the amount of rainfall, the prevailing temperature, and the lawn's overall condition.

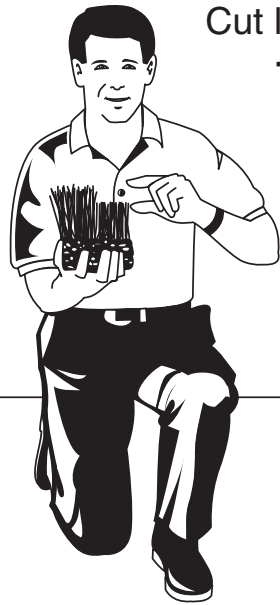
Cutting the grass too short causes weak, thin grass plants, which are easily damaged by dry periods and pests. Cutting too short is often more damaging than allowing the grass to be slightly higher.

Letting grass grow a bit longer—especially when it is hot and dry—reduces heat build-up, preserves needed moisture and protects the grass from heat damage and other problems. However, allowing grass to grow too high can cause thin turf and additional problems.

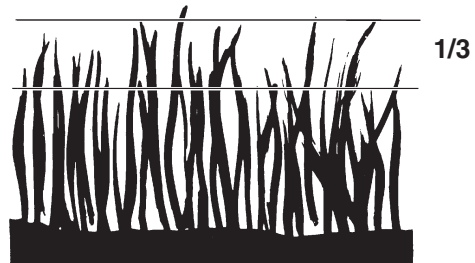
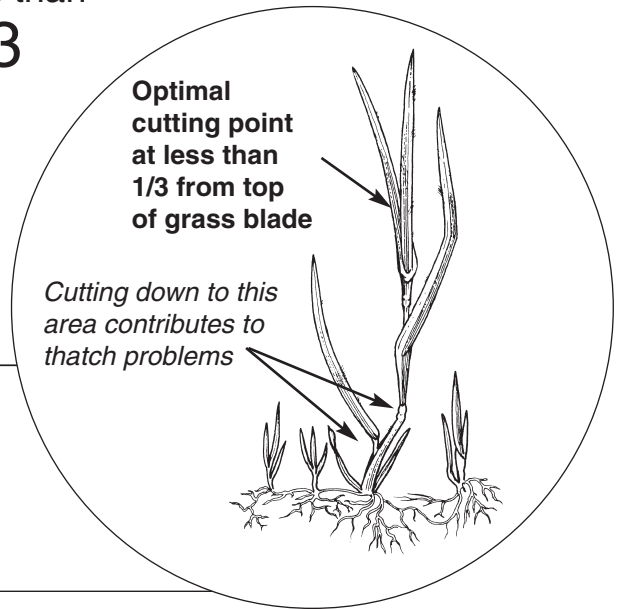
Cutting off too much at one time shocks the plant's growth system and weakens the grass plants. **A good rule of thumb is the 1/3 rule: to cut no more than one third of the grass height, and never more than 1 inch at a time.**

The amount of grass you are able to cut in one pass is also effected by the type of mowing system you are using (for example, broadcasting with side discharge decks can process a much larger volume of grass than mulching does).

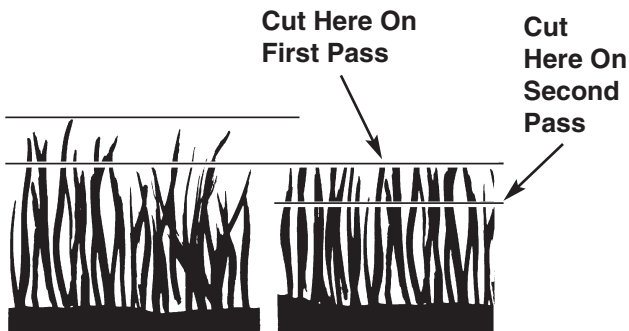
*NOTE: We cover some specific mowing instructions for mulching and broadcasting later in this Lawn Care section.*



Cut less than  
**1/3**



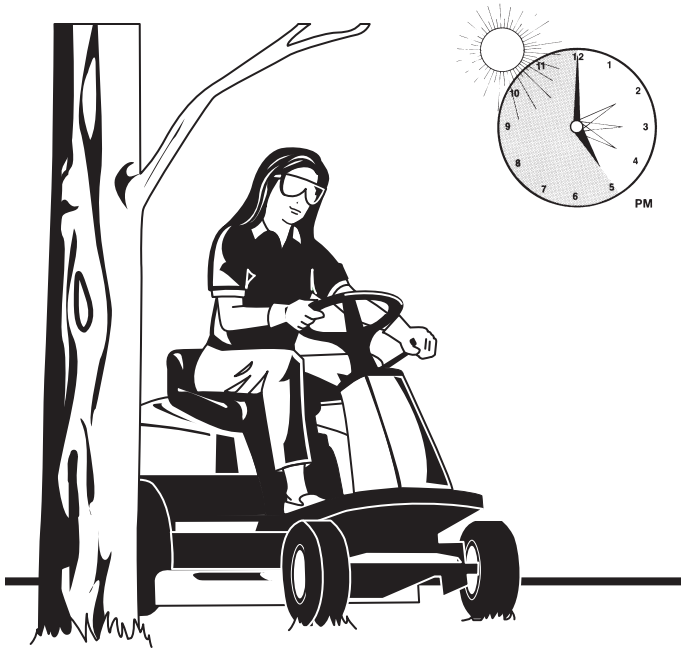
**Proper Cutting Height**



### Tall Grass Requires Incremental Cutting

For extremely tall grass, set the cutting height at maximum for the first pass, and then reset it to the desired height and mow a second or third time.

Don't cover the grass surface with a heavy layer of clippings. Consider using a grass collection system and starting a compost pile.



## WHEN AND HOW OFTEN TO MOW

The time of day and condition of the grass greatly affect the results you'll get when mowing. For the best results, follow these guidelines:

- I Mow when the grass is between three and five inches high.
- I Mow with sharp blades. Short clippings of grass one inch or shorter decompose more quickly than longer blades. Sharp mower blades cut grass cleanly and efficiently, preventing frayed edges which harm the grass.
- I Mow at time of day when the grass is cool and dry. Late afternoon or early evening often provide these ideal mowing conditions.
- I Avoid mowing after rain or even heavy dew, and never mulch when the grass is wet (moist grass does not mulch well, and clumps beneath the mower deck).

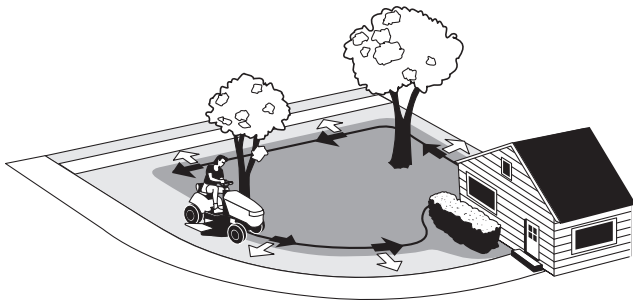
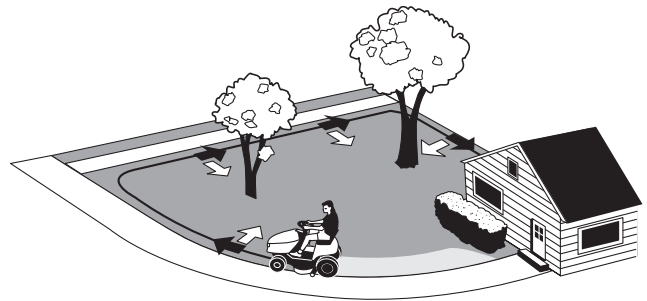
## WHAT MOWING PATTERNS TO USE

Always start mowing on a smooth, level area.

The size and type of area to be mowed will determine the best mowing pattern to use. Obstructions such as trees, fences and buildings, and conditions such as slopes and grades must also be considered.

- I Cut long straight strips overlapping slightly.
- I Where possible, change patterns occasionally to eliminate matting, graining or a corrugated appearance.
- I For a truly professional cut, mow across the lawn in one direction, then recut the lawn by mowing perpendicular to the previous cut.

*Where possible, make one or two passes around the outside of the area discharging the grass INTO the lawn to keep the cut grass off fences and walks.*



*The remainder of the mowing should be done in the opposite direction so that the clippings are dispersed OUT onto the area of lawn previously cut.*

**Note: Always operate the engine at full throttle when mowing.**

If you hear the engine slowing down, you are mowing too fast—using a slower ground speed will improve the cutting efficiency of the blades and prevents many common cutting problems. Use an appropriate ground speed for the thickness and height of the grass you are cutting (3rd gear or slower for manual gear models). If you hear the engine slowing down you are mowing too fast, use a slower ground speed.

# Lawn Care & Mowing Information

---

## MOWING METHODS

---

### Proper Broadcast Mowing

Broadcasting, or side-discharging, disperses fine clippings evenly over the entire lawn. Many golf courses use this method. Your mower has a deep dish deck to allow freer circulation of clippings so they are broadcast evenly over the lawn.

#### ENGINE SPEED & GROUND SPEED FOR BROADCASTING

Always operate the engine at full throttle when mowing. If you hear the engine slowing down, you are mowing too fast—using a slower ground speed will improve the cutting efficiency of the blades and prevents many common cutting problems.

ALWAYS use an appropriate ground speed for the thickness and height of the grass you are cutting (3rd gear or slower for manual gear models). If you hear the engine



slowing down you are mowing too fast, use a slower ground speed.

#### HOW MUCH GRASS TO CUT OFF WHEN BROADCASTING

Mow when the grass is 3-5 inches long. Do not cut the grass shorter than 2 to 2-1/2 inches. Do not cut off more than 1 inch of grass in a single pass.

---

### Proper Mulching

Mulching consists of a mower deck which cuts and recuts clippings into tiny particles and which then blows them down INTO the lawn. These tiny particles decompose rapidly into by-products your lawn can use.

#### UNDER PROPER CONDI-

TIONS, your mulching mower will virtually eliminate noticeable clippings on the lawn surface.

NOTE: When mulching under heavy cutting conditions, a rumbling sound may be present and is normal.

#### MULCHING REQUIRES EXCELLENT MOWING CONDITIONS

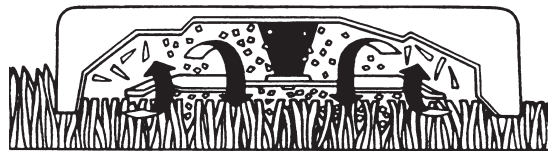
Mulching mowers cannot function properly if the grass is wet, or if the grass is simply high to cut. Even more than normal mowing, mulching requires that the grass be dry and the appropriate amount is cut.

Do not use the mower as a mulching mower during the first two or three mowings in the spring. The long grass blades, quick growth, and often wetter conditions are more suitable for broadcasting (side-discharging) or grass bagging operation.

#### ENGINE SPEED & GROUND SPEED FOR BROADCASTING

Use full engine throttle matched with a slow ground speed so that clippings will be finely cut. Ground speed while mulching should be HALF of the speed that would be used when broadcasting (side discharging) under similar conditions. Since mulching requires more horsepower than broadcasting, using a slower ground speed is vitally important for proper mulching operation.

Mulching Action



#### HOW MUCH GRASS TO MULCH

The best mulching action typically results from cutting only the top 1/2 inch to 3/4 inch of grass blade. This provides short clippings which decompose properly (much more quickly than longer clippings). The ideal cutting

height will vary with climate, time of year, and quality of your lawn. We recommend that you experiment with both the cutting height and ground speed until you achieve the best cut. Start with a high cutting height and using progressively lower settings until you find a cutting height that is matched to your mowing conditions and preferences.



### TIPS On Dealing With Clippings

Clippings are **beneficial** to your lawn. A common misconception about clippings is that they automatically lead to thatch—this is untrue. Short clippings produced by broadcasting and clippings produced by mulching methods actually **contribute to a healthy lawn** because they:

- Reduce the evaporation of water from your lawn.
- Provide a cushioning layer to reduce lawn wear.
- Moderate soil temperature.
- Clippings act as a safe, non-polluting and inexpensive fertilizer that nourishes your lawn. Fresh cut grass blades are 85% water, and are a rich source of nitrogen which is essential to lush growth. And one garbage bag of clippings contains about 1/4 lb. of usable organic nitrogen.

## COMPOSTING

The best way to recycle excess clippings and leave your lawn looking immaculate is to collect them with an efficient collection system and deposit them in a compost pile. A compost pile is a collection of grass, leaves, and other organic wastes which—when properly tended—decompose into an odorless, topsoil material. This material, in turn, acts as an inexpensive fertilizer for your lawn and garden.

### How to start a healthy compost pile:

- 1 Build a bin using bricks, fencing, cement blocks, etc. or purchase a prefabricated bin from a garden store. The bin should also have venting on each side and from the bottom to the top.

- 2 Fill the bin with alternating layers of yard waste. Follow this recipe:

First layer: 3-4 inches of chopped brush or other coarse material.

Second layer: 6-8 inches of mixed leaves, grass clippings, sawdust, etc. Materials should be "sponge damp."

Third layer: 1 inch of soil to add micro-organisms that help break down organic matter.

Fourth layer: 1-2 inches of manure to provide the nitrogen needed by micro-organisms.

Keep adding layers until the bin is almost full. Top off with a 4-6 inch layer of straw and scoop out a "basin" to catch rain water.

- 3 Four or five days later the pile will reach temperatures of 140-160 degrees. At this time you'll notice it settling, a good sign your compost is working properly.
- 4 After 5-6 weeks, fork materials into a new pile, turning the outside of the old heap into the center of the new one. Add water if necessary. The compost should be ready to use within three to four months when dark brown, crumbly, and earthy-smelling.



# Lawn Care & Mowing Information

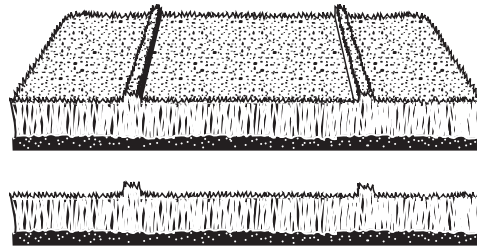
---

## SOLUTIONS FOR COMMON MOWING PROBLEMS

### Streaking

Streaking is when thin strips of uncut grass are left behind the mower. Streaking is usually caused by operator error or poor blade maintenance.

Streaking



#### CAUSE

- Blades are not sharp
- Blades are worn down too far
- Engine speed is too slow
- Ground speed is too fast
- Deck is plugged with grass
- Not overlapping cutting rows enough
- Not overlapping enough when turning

#### SOLUTION

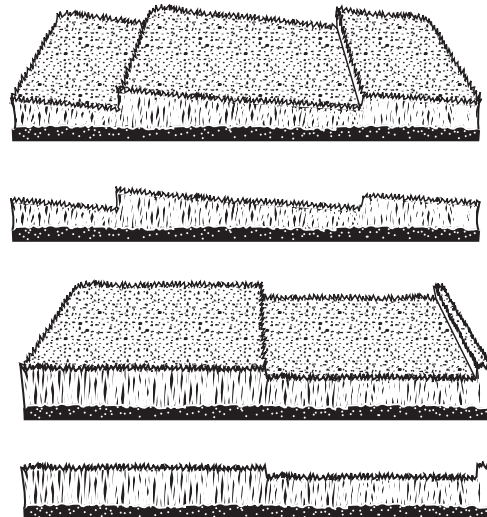
- Sharpen your blades
- Replace your blades
- Always mow at full throttle
- Slow down
- Clean out the mower
- Overlap your cutting rows
- When turning your effective cutting width decreases—overlap more when turning

---

### Stepped Cutting

Stepped cutting is sharp ridges or uneven levels left in the lawn surface. Stepped cutting is usually caused by mower deck damage or misadjustment, or damage to mower blades.

Stepped Cutting



#### CAUSE

- Deck is not leveled correctly
- Tires are not properly inflated
- Blades are damaged
- Deck shell is damaged
- Mower spindle is bent or loose
- Blades are installed incorrectly

#### SOLUTION

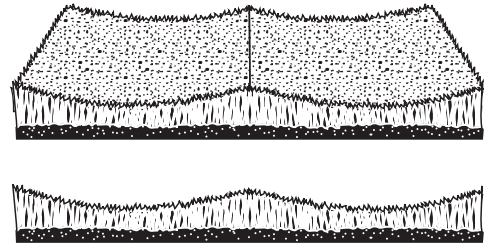
- Level the deck correctly
- Check and inflate the tires
- Replace the blades
- Repair or replace the deck
- Repair or replace the spindle
- Reinstall the blades correctly

# Lawn Care & Mowing Information

## Uneven Cutting

Uneven cutting is waviness or smooth troughs in the lawn surface. Uneven cutting is usually caused by mower deck damage or misadjustment.

## Uneven Cutting



### CAUSE

- Deck is not leveled correctly
- Blades are dull or worn
- Blades are damaged
- Deck is clogged with grass clippings
- Deck shell is damaged
- Mower spindle is bent or loose
- Blades are installed incorrectly

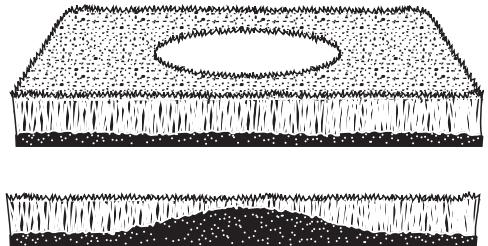
### SOLUTION

- Level the deck correctly
- Sharpen or replace the blades
- Replace the blades
- Clean out the deck
- Repair or replace the deck
- Repair or replace the spindle
- Reinstall the blades correctly

## Scalping

Scalping is when the mower deck comes close to or hits the ground. Scalping can be caused by the mower deck misadjustment, unevenness in the lawn, or by mower deck bouncing because the ground speed is too fast.

## Scalping



### CAUSE

- Lawn is uneven or bumpy
- Mower deck cutting height is set too low
- Ground speed is too fast
- Deck is not leveled correctly
- Tire pressure is low or uneven

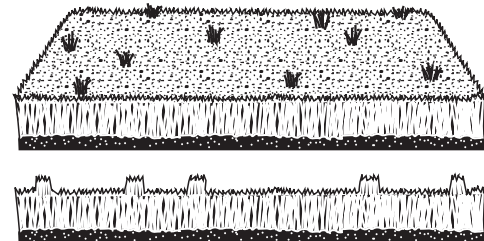
### SOLUTION

- Roll or level the lawn
- Raise the cutting height
- Slow down
- Correctly level the deck
- Check and inflate the tires

## Stingers

Stingers are sparse patches of uncut grass left behind the mower. Stingers are usually caused by operator error or poor blade maintenance.

## Stingers



### CAUSE

- Blades are not sharp or are nicked
- Blades are worn down too far
- Engine speed is too slow
- Ground speed is too fast
- Deck is plugged with grass

### SOLUTION

- Sharpen your blades
- Replace your blades
- Always mow at full throttle
- Slow down
- Clean out the mower

# Common International Symbols

 Choke

 Fast (Throttle)


 Slow (Throttle)

 Throttle

 Fuel

 PTO Clutch

 Parking Brake

 Brake

 Mower Cutting Height Adjustment

 Headlights

# Technical Manuals

## Additional Technical Literature Available

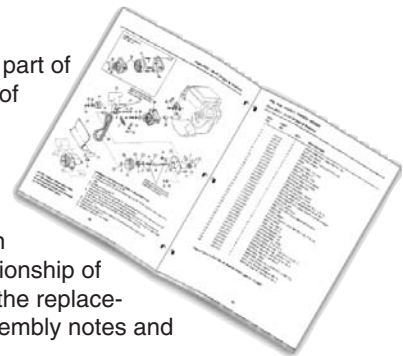


### Operators Manuals

Additional copies of this manual are available, (and as part of our product support commitment, we maintain a stock of printed operators manuals going back many years!)

### Parts Manuals

Fully illustrated parts manuals are also available — these manuals show all of the product's components in exploded views ("3D" illustrations which show the relationship of the parts and how they go together), as well as giving the replacement part numbers and quantities used. Important assembly notes and special torque values are included in these manuals.



*For the applicable manuals currently available for your model, contact your local dealer. Have the information listed in the box at the right available when making your request.*

**Model:** \_\_\_\_\_

**Serial No.:** \_\_\_\_\_

**Your Name:** \_\_\_\_\_

**Address:** \_\_\_\_\_

**City, State, Zip:** \_\_\_\_\_

**Visa/Mastercard No.:** \_\_\_\_\_

**Card Expiration Date:** \_\_\_\_\_

**Ferris Industries - a division of Simplicity Manufacturing Inc.**  
**Owner's Limited Warranty Information**

(Effective 04/28/2004)

**Thank you** for purchasing Ferris commercial mowing equipment. Please take a few minutes to read this limited warranty information. It contains all the information you will need to have your Ferris mower repaired in the unlikely event that a breakdown covered by this limited warranty should occur.

**Owner's Responsibilities** - As a condition to our obligations under this limited warranty, you shall have read the operator's manual and you shall have completed and submitted to Ferris, within 20 days from the date of purchase, the Ferris Product Registration. You must properly service and maintain your Ferris product as described in the operator's manual. Such routine maintenance, whether performed by a dealer or by you, is at your expense. The Ferris equipment, including any defective part covered by this limited warranty, must be returned to an authorized Ferris dealer within the warranty period for warranty service. This limited warranty extends only to equipment operated under normal conditions and in accordance with Ferris' instructions.

**Warranty Start Date** - The limited warranty coverage begins on the day you buy your new Ferris commercial mowing equipment. An authorized Ferris dealer will assist you in filling out a Ferris Product Registration with specific information for the model you purchase and your personal information, which must be returned to Ferris.

**Limited Warranty** - The limited warranty, set forth below, is a written guarantee by Ferris, during the warranty period, to repair or replace parts which have a substantial defect in materials or workmanship. The warranty is "limited" because it is for a specified period of time, applies to the original purchaser only, and is subject to other restrictions.

**FERRIS LIMITED WARRANTY**

Ferris Industries (Ferris) warrants, in accordance with the provisions below, to the original purchaser only, for the periods described below that the commercial mower shall be free from substantial defects in material or workmanship under normal use and service. If you wish to file a claim under this limited warranty, you must provide prompt notice of your claim to an authorized Ferris dealer during the warranty period. Ferris' obligation under this limited warranty is, at Ferris' option, to repair or replace any part or parts of the mower, which, in the judgment of Ferris, are found to be defective and covered by this limited warranty. An authorized Ferris dealer will repair or replace the defective part or parts, at the dealer's place of business, at no charge for the labor or parts. This limited warranty applies only to mowers sold in the United States and Canada and is subject to the following limitations.

**Covered Parts**

All Mowers

**Warranty Period**

2-years (24 months) from date of retail purchase by the original purchaser for parts & labor (90 days for rental mowers)  
(Except as noted below\*)

\*Belts, Tires, Brake Pads  
And Hoses, Battery, Blades

90 days from date of retail purchase by the original purchaser

\*Attachments

1 year from date of retail purchase by the original purchaser

\*Engine

If the engine manufacturer provides any warranty on the mower's engine, Ferris will assign that warranty to the original purchaser of the mower if such assignment is reasonably practicable. Please refer to the engine manufacturer's warranty statement, if any, that is included in the owner's packet. We are not authorized to handle warranty adjustments or repairs on engines. Ferris offers **NO WARRANTY** on mower engines. Ferris does not guarantee or represent that any engine manufacturer will comply with the terms of its warranty.

**Items and Conditions Not Covered**

This warranty does not cover, and Ferris makes **NO WARRANTY** regarding, the following:

- Mowers or their parts if a complete and accurate Ferris Product Registration has not been received by Ferris.
- Loss or damage to person or property other than that expressly covered by the terms of this limited warranty.
- Pickup and delivery charges and risk of loss or damage in transit to and from any authorized Ferris dealer.
- Any damage or deterioration due to normal use, wear and tear, or environmental or natural elements, or exposure.
- Cost of regular maintenance service or parts, such as but not limited to, filters, fuel, lubricants, tune-up parts, and adjustments.
- Claims arising due to failure to follow Ferris' written instructions, or improper storage or maintenance.
- Any repairs necessary due to use of parts, accessories or supplies, including gasoline, oil or lubricants, incompatible with the mowing equipment, or other than as recommended in the operator's manual or other written operational instructions provided by Ferris.
- Use of non-Ferris approved parts or accessories.
- Any overtime or other extraordinary repair charges or charges relating to repairs or replacements.
- Rental of like or similar replacement equipment during the period of any warranty, repair or replacement work.
- Loss of revenue, time or use of the mowing equipment.
- Travel, telephone or other communication charges.
- Damage from continued use of defective mowing equipment.
- Freight charges on replacement parts.
- Any mowing equipment or part which, in the judgment of Ferris, has been altered or tampered with in any way or has been subjected to misuse, abuse, abnormal usage, unauthorized repair, neglect or accident, damage in transit, or has had the serial numbers altered, effaced or removed.
- Any equipment, part or item not mentioned under "Covered Parts," above.

**General Conditions**

Ferris is continually striving to improve its products, and therefore reserves the right to make improvements or changes without incurring any obligation to make changes or additions to products sold previously. Any oral or written description of Ferris products is for the sole purpose of identifying the products and shall not be construed as an express warranty. No warranty claim shall give rise to a right for the purchaser to cancel or rescind any sale. No person is authorized to make any warranty or assume for Ferris any liability not strictly in accordance with this limited warranty. Any assistance Ferris provides to or procures for the purchaser outside the terms, limitations or exclusions of this limited warranty will not constitute a waiver of the terms, limitations or exclusions of this limited warranty, nor will such assistance extend or revive the limited warranty. Ferris will not reimburse the purchaser for any expenses incurred by the purchaser in repairing, correcting or replacing any defective products except for those incurred with Ferris' prior written permission and in accordance with this limited warranty.

Ferris' sole and exclusive liability with respect to this limited warranty, and the purchaser's exclusive remedy, shall be repair or replacement as set forth herein. All warranty work must be performed by an authorized Ferris dealer using only Ferris approved replacement parts. **FERRIS SHALL HAVE NO LIABILITY FOR ANY OTHER COST, LOSS OR DAMAGE, INCLUDING BUT NOT LIMITED TO, ANY INCIDENTAL, COMPENSATORY, INDIRECT, PUNITIVE, SPECIAL OR CONSEQUENTIAL LOSS OR DAMAGE. FERRIS' AGGREGATE LIABILITY WITH RESPECT TO A DEFECTIVE PRODUCT OR PART SHALL BE LIMITED TO AN AMOUNT EQUAL TO THE MONIES PAID BY THE PURCHASER FOR THAT DEFECTIVE PRODUCT OR PART. THIS LIMITED WARRANTY, AND FERRIS' OBLIGATIONS HEREUNDER, ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. FERRIS SHALL NOT BE LIABLE TO THE PURCHASER, OR TO ANYONE CLAIMING UNDER THE PURCHASER, FOR ANY OTHER OBLIGATIONS OR LIABILITIES, INCLUDING, BUT NOT LIMITED TO, OBLIGATIONS OR LIABILITIES ARISING OUT OF BREACH OF CONTRACT OR WARRANTY, NEGLIGENCE OR OTHER TORT OR ANY THEORY OF STRICT LIABILITY, WITH RESPECT TO FERRIS PRODUCTS OR FERRIS' ACTS OR OMISSIONS OR OTHERWISE.**

It is the express wish of the parties that this agreement and any related documents be drafted in English. Il est la volonté expresse des parties que cette convention et tous les documents s'y rattachent soient rédigés en anglais.

# ***OPERATOR'S MANUAL***

## ***HydroWalk Series***

### ***Dual Drive Walk-Behind Mowers***



**Ferris Industries**  
5375 North Main Street  
Munnsville, NY 13409  
800-933-6175

[www.ferrisindustries.com](http://www.ferrisindustries.com)

© Copyright 2006 Ferris Industries  
All Rights Reserved. Printed in USA.

