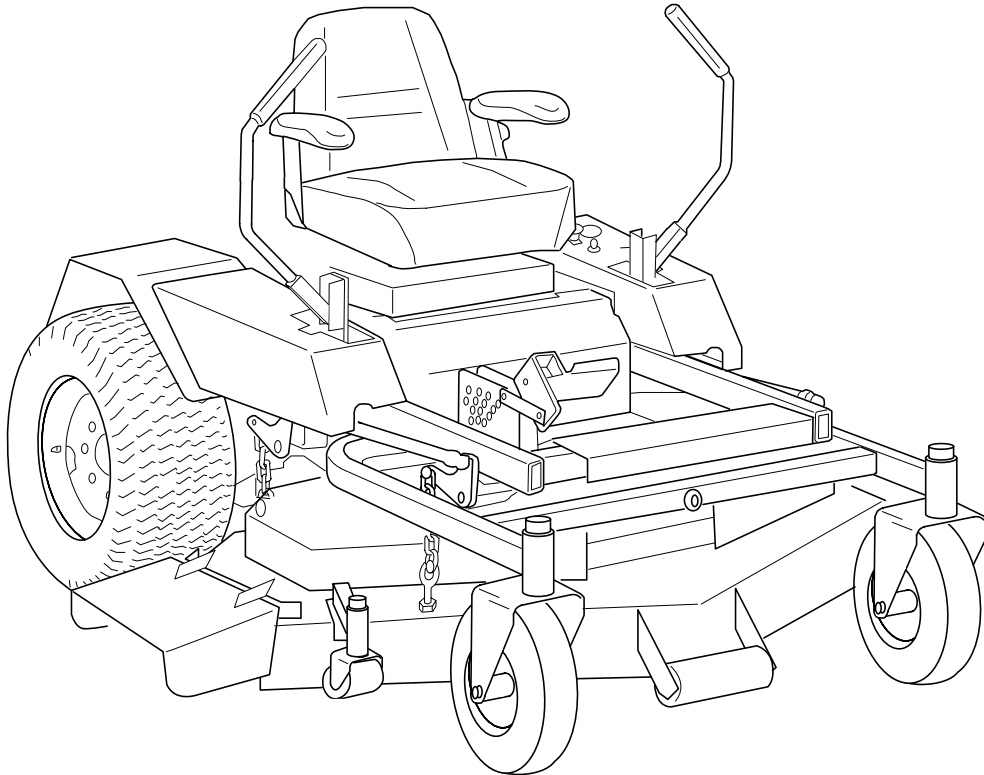




# OPERATOR'S MANUAL



## ISZ Zero-Turn Riding Mower

**Models:**

ISZKAV23/52

ISZKAV23/61

**Beginning Serial No:**

2269

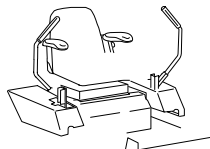
22422

3/2000

F-ISZ-OWN-00

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





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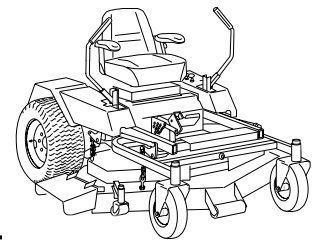
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*NOTE: In this manual, "left" and "right" are referred to as seen from the operating position.*

## **WARNING**

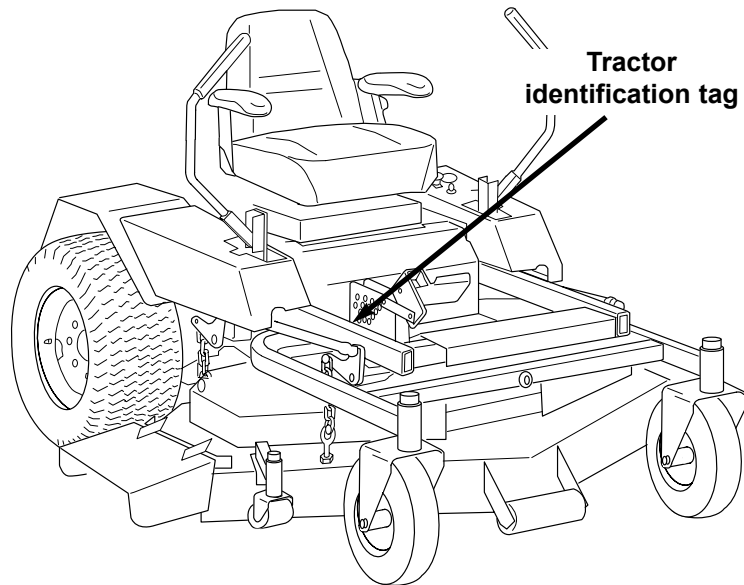
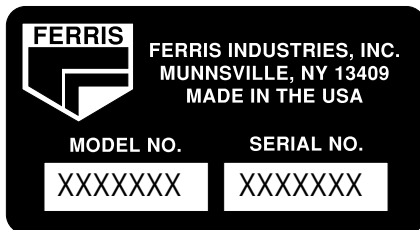
**Engine exhaust from this product contains chemicals known, in certain quantities, to cause cancer, birth defects, or other reproductive harm.**

# Identification Numbers



## IDENTIFICATION TAG LOCATIONS

When contacting your Authorized Dealer for replacement parts, service, or information **YOU MUST HAVE THESE NUMBERS.**



## IDENTIFICATION NUMBERS

Record your model name/number, unit and mower deck manufacturer numbers and engine serial number in the space provided for easy reference.

- The **Tractor I.D. tag** is located on the inside of the main frame rail, behind the deck height plate.
- For location of **Engine Serial Number**, refer to the Engine Owner's Manual.

Be sure to fill out and return the Warranty Registration Card supplied with your unit.

| PRODUCT REFERENCE DATA        |                                 |
|-------------------------------|---------------------------------|
| Model Description Name/Number |                                 |
| Unit MFG Number               | Unit SERIAL Number              |
| Mower Deck MFG Number<br>N/A  | Mower Deck SERIAL Number<br>N/A |
| Dealer Name                   | Date Purchased                  |
| ENGINE REFERENCE DATA         |                                 |
| Engine Make/Model             | Engine ID/Serial Number         |



# 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.

## GENERAL OPERATION

- Read, understand, and follow all instructions in the manual and on the unit before starting.
- Only allow responsible adults, who are familiar with the instructions, to operate the unit.
- Clear the area of objects such as rocks, toys, wire, etc., which could be picked up and thrown by the blade(s).
- Be sure the area is clear of other people before mowing. Stop unit if anyone enters the area.
- Never carry passengers.
- Do not mow in reverse unless absolutely necessary. Always look down and behind before and while travelling in reverse.
- 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.
- Slow down before turning.
- Never leave a running unit unattended. Always disengage the PTO, set parking brake, stop engine, and remove keys before dismounting.
- Turn off the PTO switch to disengage the blades when not mowing.
- Stop engine before removing grass catcher or unclogging chute.
- Mow only in daylight or good artificial light.
- Do not operate the unit while under the influence of alcohol or drugs.
- Watch for traffic when operating near or crossing roadways.
- Use extra care when loading or unloading the unit into a trailer or truck.
- 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.

## 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 30 percent (16.7°) which is a rise of three feet vertically in 10 feet horizontally.**

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

**Mow UP and DOWN the slope, never across the face, use caution when changing directions and DO NOT START OR STOP ON SLOPE.**

### Do

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

### Do Not

- *Do not* start or stop on a slope. If tires lose traction, disengage the blade(s) and proceed slowly straight down the slope.
- *Do not* turn on slopes unless necessary, and then, turn slowly and gradually downhill, if possible.
- *Do not* mow near drop-offs, ditches, or embankments. The mower could suddenly turn over if a wheel is over the edge of a cliff or ditch, or if an edge caves in.
- *Do not* mow on wet grass. Reduced traction could cause sliding.
- *Do not* try to stabilize the unit by putting your foot on the ground.
- *Do not* use grass catcher on steep slopes.

# Safety Rules & Information

---

## 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.

- Keep children out of the mowing area and under the watchful care of another responsible adult.
- Be alert and turn unit off if children enter the area.
- Before and during reverse operation, look behind and down for small children.
- Never carry children. They may fall off and be seriously injured or interfere with safe unit operation.
- Never allow children to operate the unit.
- Use extra care when approaching blind corners, shrubs, trees, or other objects that may obscure vision.

## TRANSPORTING AND STORAGE

- Always observe safe refueling and fuel handling practices when refueling the unit after transportation or storage.
- Always follow the engine manual instructions for storage preparations before storing the unit for both short and long term periods.
- Always follow the engine manual instructions for proper start-up procedures when returning the unit to service.
- Never store the unit or fuel container inside where there is an open flame or pilot light, such as in a water heater. Allow unit to cool before storing.

## SERVICE AND MAINTENANCE

- 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 the unit indoors.

- Never run a unit in an enclosed area.
- Keep nuts and bolts, especially blade attachment bolts, tight and keep equipment in good condition.
- Never tamper with safety devices. Check their proper operation regularly.
- Keep unit free of grass, leaves, or other debris build-up. Clean up oil or fuel spillage.
- Stop and inspect the equipment if you strike an object. Repair, if necessary, before restarting.
- Never make adjustments or repairs with the engine running unless specified otherwise in the engine manufacturer's manual.
- 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.
- Mower blades are sharp and can cut. Wrap the blade(s) or wear gloves, and use extra caution when servicing them.
- Check brake operation frequently. Adjust and service as required.
- Use only factory authorized replacement parts when making repairs.
- Always comply with factory specifications on all settings and adjustments.
- Only authorized service locations should be utilized for major service and repair requirements.
- 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.

## SAFETY DECALS

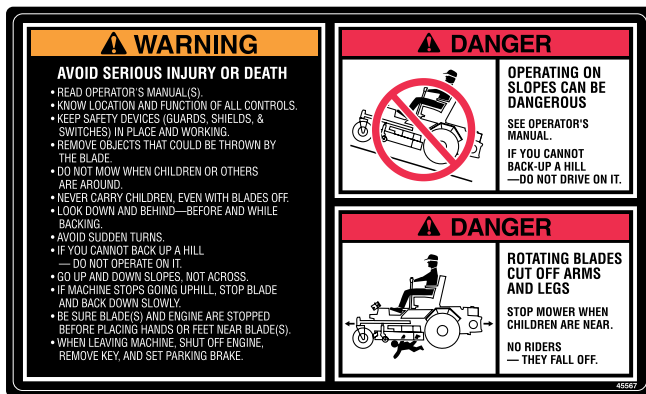
This unit has been designed and manufactured to provide you with the safety and reliability you would expect from an industry leader in outdoor power equipment manufacturing.

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.

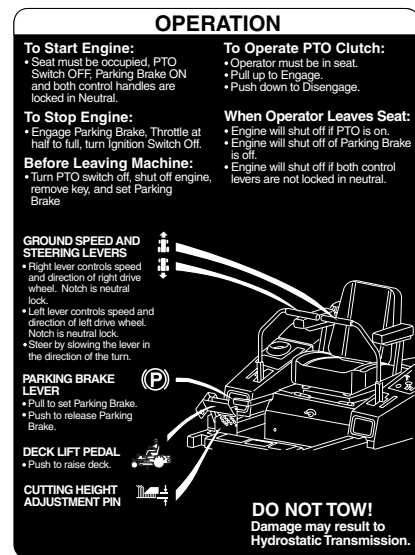
All DANGER, WARNING, CAUTION and instructional messages on your rider and mower should be carefully read and obeyed. Personal bodily injury can result when these instructions are not followed. The information is for your safety and it is important! The safety decals below are on your rider and mower.

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

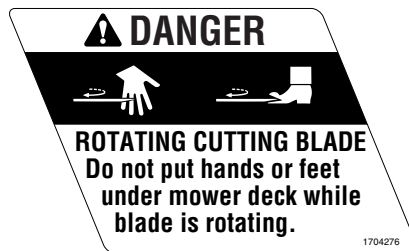
These labels are easily applied and will act as a constant visual reminder to you, and others who may use the equipment, to follow the safety instructions necessary for safe, effective operation.



Decal - Warning/Danger  
Part No. 45567



Decal - Operation & Controls  
Part No. 45559



Decal - Danger  
Part No. 1704276



Decal - Danger  
Part No. 1704277



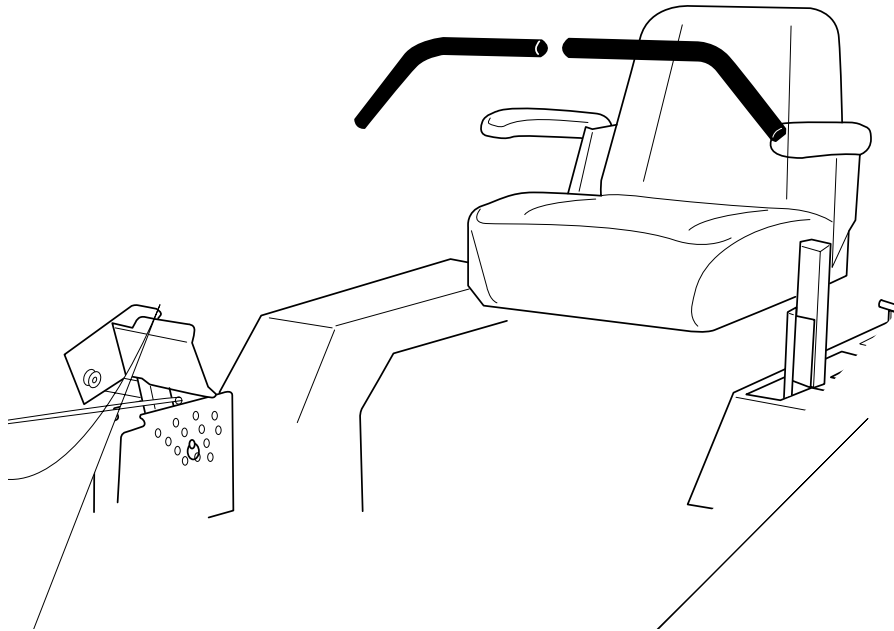
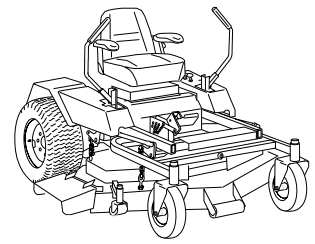
Decal - Warning  
Part No. 20337



Decal - Danger  
Part No. 22143

# Features & Controls of the Zero Turn Rider

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## A. Ground Speed Control Levers

These levers control the ground speed of the rider. The left lever controls the left rear drive wheel and the right controls the right rear drive wheel.

Moving a lever forward increases the FORWARD speed of the associated wheel, and pulling back on a lever increases the REVERSE speed.

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

*See the Operating the Zero Turn Rider section for steering instructions.*

## B. Seat Adjustment Lever

The seat can be adjusted forward and back. Move the lever forward, position the seat as desired, and release the lever to lock the seat in position.

## C. 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.*



## D. Parking Brake Handle

The parking brake is applied by pulling UP on the parking brake handle until it locks over-center. To release the parking brake, push the handle DOWN.

## E. 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.

## F & G. Deck Lift Pedal & Cutting Height Adjustment Pin

These control the cutting height of the mower deck.

Depress the pedal until it locks into the TRANSPORT position. Place the adjustment pin in the desired cutting height and release the lift pedal.

## H & I. Throttle / Choke Control

Pulling the round choke control knob (I) out fully chokes the engine for cold starts. (A warm engine may not require choking.) Moving the throttle control (H) fully forward is FULL throttle position. Always operate the unit at FULL throttle when mowing.

## J. Hour Meter

Measures the time of the PTO being engaged.

## K. Fuel Shut Off Valve

Turning the handle to the desired position determines which tank will be supplying fuel. With the handle pointing forward, it will draw fuel from the left-hand tank. With the handle pointed towards the rear, it will draw fuel from the right-hand fuel tank. With the handle pointing towards the right, it will shut off fuel flow to the engine.



## SAFETY INTERLOCK SYSTEM

This unit is equipped with safety interlock switches and other safety devices. 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

Your unit is equipped with a seat switch safety system. Check the seat switch operation every fall and spring with the following tests.

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

- PTO switch is engaged, OR
- Parking brake is not engaged, OR
- Motion control handles are not in the NEUTRAL position, OR
- Operator is not on the seat.

#### Test 2 — Engine SHOULD crank if:

- PTO switch is NOT engaged, AND
- Parking brake is engaged, AND
- Motion control handles are locked in the NEUTRAL position, AND
- Operator is on the seat.

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

- Operator rises off seat with PTO engaged, OR
- Operator rises off seat with parking brake disengaged.

#### Test 4 — Blade Brake Check

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

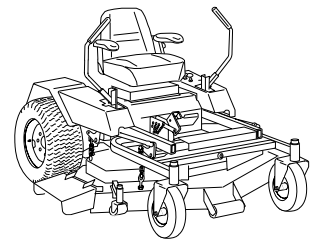
*NOTE: Once the engine has stopped, PTO switch must be turned off, parking brake must be engaged, and the motion control handles must be locked in the NEUTRAL position after the operator returns to the seat in order to start the engine.*

## 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.**

# Operating the Zero Turn Rider



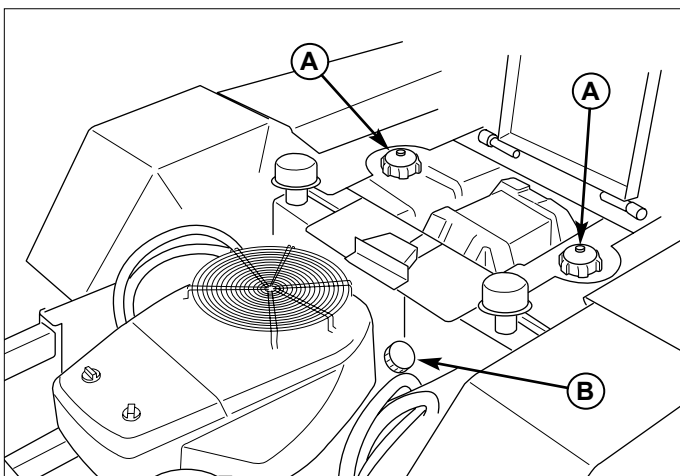
## GENERAL OPERATING SAFETY

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.

## CHECKS BEFORE STARTING

- Check that crankcase is filled to full mark on dipstick. See the engine Operators Manual for instructions and oil recommendations.
- Make sure all nuts, bolts, screws and pins are in place and tight.
- Adjust the seat position, and make certain you can reach all controls from operators position.
- Fill the fuel tanks with fresh fuel. Refer to engine manual for fuel recommendations.



**Figure 2. Pre-start Checks**

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

## **!** WARNING

**Never allow passengers to ride on the unit.**

**Before leaving the operators 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.**

## **!** DANGER

### **OPERATING ON SLOPES CAN BE DANGEROUS**

**Never operate on slopes greater than 30 percent (16.7°) which is a rise of three feet vertically in 10 feet horizontally.**

**Operate the unit at a slow ground speed when driving onto slope.**

**Use extra caution when operating on slopes with rear-mounted grass catcher. Mow UP and DOWN the slope, never across the face, use caution when changing directions and DO NOT START OR STOP ON SLOPE.**

## 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. While sitting in the operators seat, engage the parking brake and make sure the PTO switch is disengaged and the motion control handles are locked in the NEUTRAL position.
2. **NOTE: A warm engine may not require choking.** Set the engine throttle control (H, Figure 1) to FAST throttle position. Then fully close the choke (I, Figure 1) by pulling the knob OUT fully.
3. Insert the key into the ignition switch (C, Figure 1) and turn it to START.
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 rider.*

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 RIDER**.

## STOPPING THE RIDER

1. Returning the ground speed control levers (A, Figure 1) to the middle position will stop tractor movement. Pivot the levers outward and lock them in NEUTRAL.
2. Disengage the PTO by pushing down on the PTO switch (E, Figure 1).
3. Engage the parking brake by pulling the handle (D, Figure 1) up until it locks into position.
4. Move the throttle control (H, Figure 1) to mid-throttle position and turn the ignition key to OFF. Remove the key.

## MOWING

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

## PUSHING THE RIDER BY HAND



### DO NOT TOW RIDER

Towing the unit will cause hydraulic pump and wheel motor 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. Locate the hydraulic by-pass handles under the machine, behind the fuel tank belly pan. The handles are equipped with a yellow cap on the end for easy identification.
3. To disengage the pumps (free-wheel position), move the hydraulic by-pass handles towards the left-hand side of the machine, approximately 90 degrees from its original position.
4. Disengage the parking brake. The tractor can now be pushed by hand.
5. After moving the tractor, re-engage the pumps (drive position) by moving the hydraulic by-pass handles towards the right-hand side of the machine until they stop.

# Operating the Zero Turn Rider

## ZERO TURN DRIVING PRACTICE

The lever controls of the Zero Turn rider are *responsive*, and learning to gain a *smooth* and *efficient* control of the rider's forward, reverse, and turning movements will take some practice.

Spending some time going through the maneuvers shown and becoming familiar with how the unit accelerates, travels, and steers — before you begin mowing — is absolutely essential to getting the most out of the Zero Turn rider.

**Locate a smooth, flat area of your lawn — one with plenty of room to maneuver.** (Clear the area of objects, people and animals before you begin.) Operate the unit at mid-throttle during this practice session (ALWAYS operate at full throttle when mowing), and turn slowly to prevent tire slippage and damage to your lawn.

We suggest you begin with the **Smooth Travel** procedure to the right, and then advance through the forward, reverse, and turning maneuvers.

You must release the parking brake prior to moving the control levers inward.

## Smooth Travel

The lever controls of the Zero Turn rider are **RESPONSIVE**.

*The BEST method of handling the ground speed control levers is in three steps — as shown in Figure 3.*

FIRST place your hands onto the levers as shown.

SECOND, to go forward gradually push the levers forward with your palms.

THIRD, to speed up move the levers farther forward. To slow down smoothly, slowly move the levers toward neutral.

Figure 3. Move Control Levers Gradually

## BASIC DRIVING

### Forward Travel Practice

Gradually move both ground speed control levers — evenly FORWARD from neutral. Slow down and repeat.

*NOTE: Straight forward travel takes practice. If necessary, top speed can be balance-adjusted — see the Speed Balancing Adjustment in the Adjustments section near the back of this manual.*

### Reverse Travel Practice

LOOK DOWN & BEHIND, then gradually move both ground speed control levers evenly BACK from neutral. Slow down and repeat.

*NOTE: Practice backing up for several minutes before attempting to do so near objects. The rider turns sharply in reverse as well as forward, and backing up straight takes practice.*

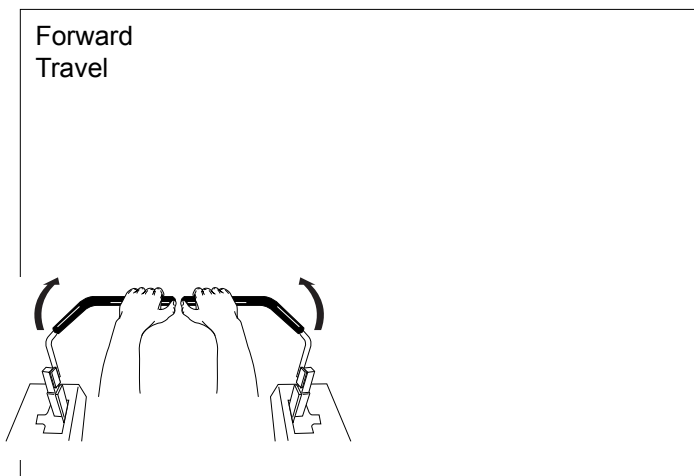


Figure 4. Forward Travel

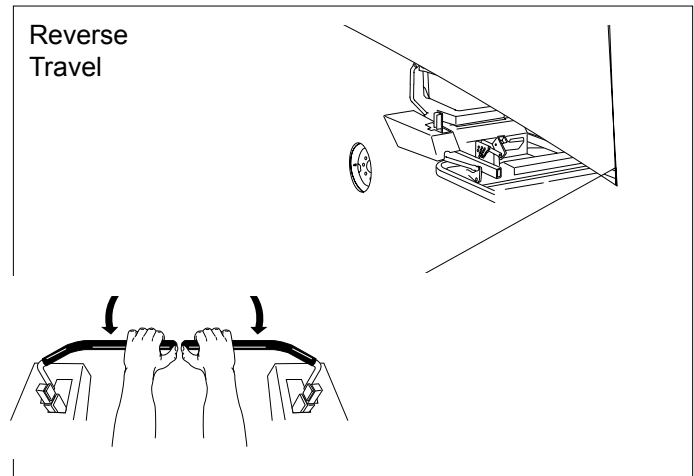


Figure 5. Forward Travel

## Practice Turning Around a Corner

While traveling forward allow one handle to gradually return back toward neutral. Repeat several times.

*NOTE: To prevent pivoting directly on the tire tread, it is best to keep both wheels going at least slightly forward.*

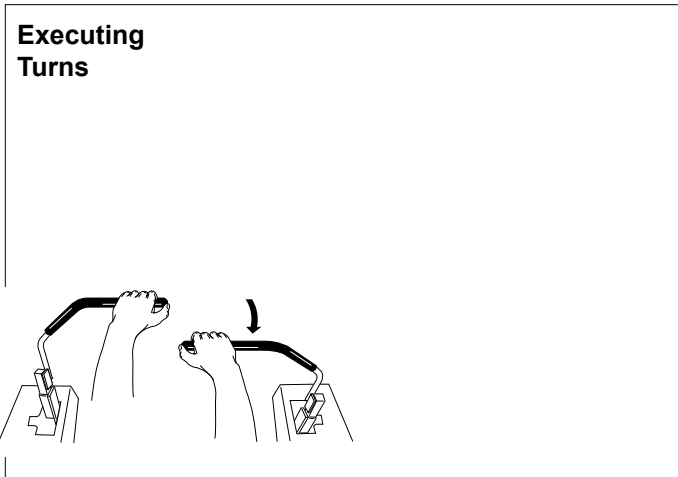


Figure 6. Turning Around a Corner

## Practice Turning In Place

To turn in place, “Zero Turn,” gradually move one ground speed control lever forward from neutral and one lever back from neutral simultaneously. Repeat several times.

*NOTE: Changing the amount each lever is pulled—forward or back, changes the “pivot point” you turn on.*

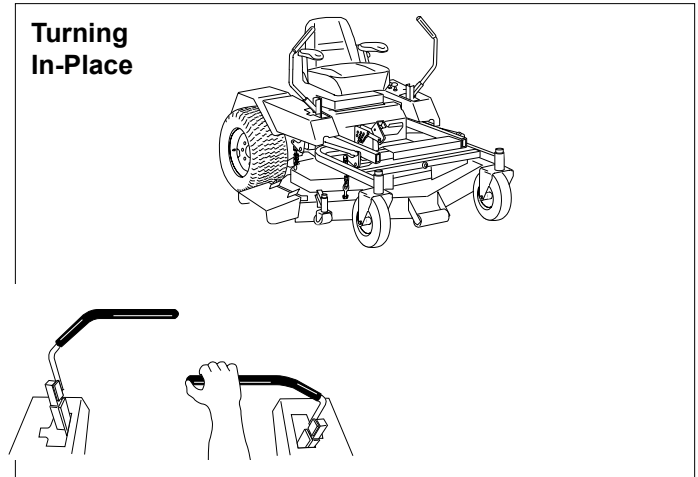


Figure 7. Turning in Place

## ADVANCED DRIVING

### Executing an End-Of-Row Zero Turn

Your Zero Turn Rider’s unique ability to turn in place allows you to turn around at the end of a cutting row rather than having to stop and Y-turn before starting a new row.

For example, to execute a right end-of row Zero Turn:

1. Slow down at the end of the row.
2. Move the LEFT ground speed control lever forward slightly while moving the RIGHT ground speed control lever back to center and then slightly back from center.
3. Begin mowing forward again.

This technique turns the rider RIGHT and slightly overlaps the row just cut —eliminating the need to back up and re-cut missed grass.

*As you become more familiar and experienced with operating the Zero Turn rider, you will learn more maneuvers that will make your mowing time easier and more enjoyable.*

**Remember, the more you practice, the better your control of the Zero Turn will be!**

# Operating the Zero Turn Rider

## 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.*

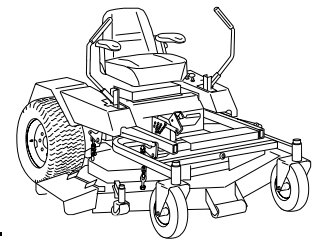
## STARTING AFTER LONG TERM STORAGE

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 rider and mower. You will need to keep a record of your operating time. Determining operating time is easily accomplished by observing the hour meter.

| 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        | 7        | X                |                 |               |                     |                 | X             |
| Check Rider Brakes                   | 22       | X                |                 |               |                     |                 | X             |
| Check Mower Blade Stopping Time      | 23       | X                |                 |               |                     | X               |               |
| 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 | —        |                  | X               | X             |                     |                 |               |
| Check Engine Oil Level               | 15*      | X                | X               | X             |                     |                 | X             |
| Check Engine Air Filter              | 15*      |                  | X               |               |                     | ***X            |               |
| Change Engine Oil & Filter **        | 15*      |                  |                 |               | ***X Every 50 Hours |                 | ***X          |
| Lubricate Rider & Mower              | 16       |                  |                 |               |                     | ***X            |               |
| Check Tire Pressure                  | 14       | X                |                 |               |                     | ***X            |               |
| Check Hydraulic Fluid                | 15       | X                |                 |               |                     | ***X            |               |
| Check Fuel Filter                    | 15       |                  |                 |               |                     | X               |               |
| Clean Battery & Cables               | 17       |                  |                 |               |                     | X               |               |
| Clean & Sharpen Mower Blades         | 18       |                  |                 |               |                     | X               |               |
| Inspect Spark Plug                   | 15*      |                  |                 |               |                     | X               |               |

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

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

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

## 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 | 20 psi (138 kPa) |
| Rear  | 15 psi (103 kPa) |

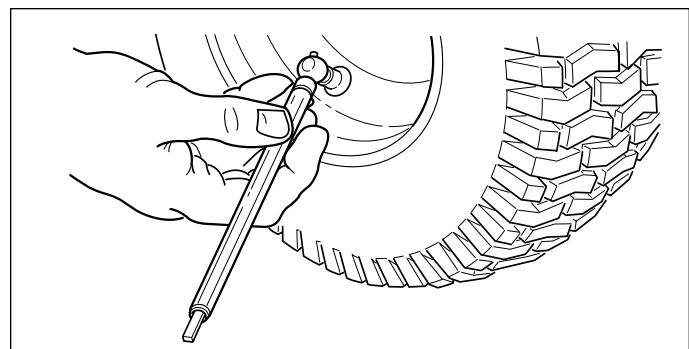


Figure 9. Checking Tire Pressure



## CHECKING / ADDING FUEL

To add fuel:

1. Remove the fuel cap (see A, Figure 2).
2. Fill the tank.  
Do not overfill. Leave approximately 1" of room in the tank for fuel expansion. 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 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 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

**NOTE:** Do not open the hydraulic oil reservoir unless oil is being added.

1. Remove the breather (B, Figure 10) from the filler neck of the hydraulic oil reservoir (A, Figure 10).
2. With a small diameter steel dowel, use it as a dipstick to check the oil level. When cold, there should be 3" of oil on the dowel.
3. If necessary, add either Mobil 1, 15W-50 synthetic oil or Castrol Syntec 5W-50 oil. **DO NOT** use conventional oils. Make sure area around the filler neck is free of dust, dirt, or other debris.

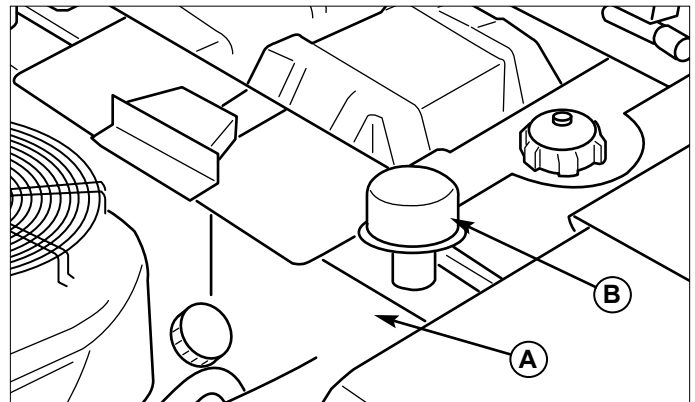
## ⚠ WARNING

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 10. Checking Hydraulic Oil Level**  
A. Hydraulic Oil Reservoir (Right-side shown)  
B. Breather

# Regular Maintenance

## LUBRICATION

Lubricate the unit at the locations shown in Figures 11 through 13 as well as the following lubrication points.

### Grease:



- front caster wheel axles
- motion control pivots
- suspension a-arms
- rear deck mounts
- deck lift pivots
- deck lift foot pedal
- front pivot frame
- blade spindles

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

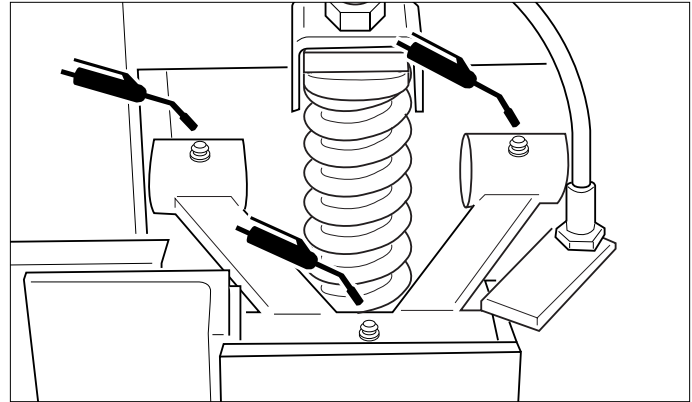
Not all greases are compatible. Ferris Red Grease is recommended, automotive-type high-temperature, lithium grease may be used when this is not available.



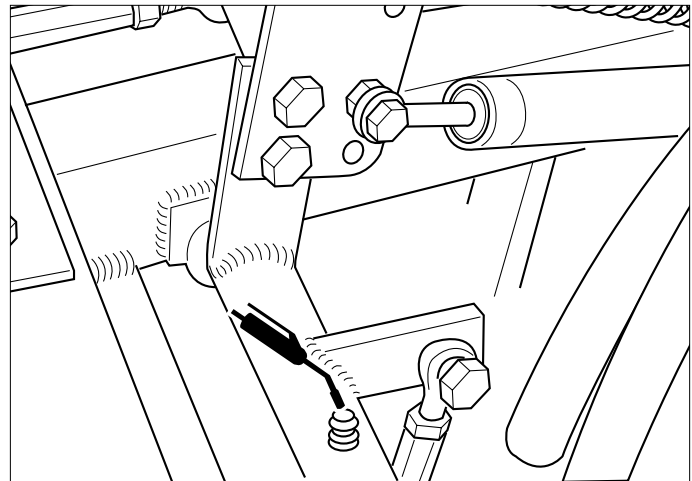
### Oil:

- control handle pivots
- floor plate hinge
- discharge chute hinge

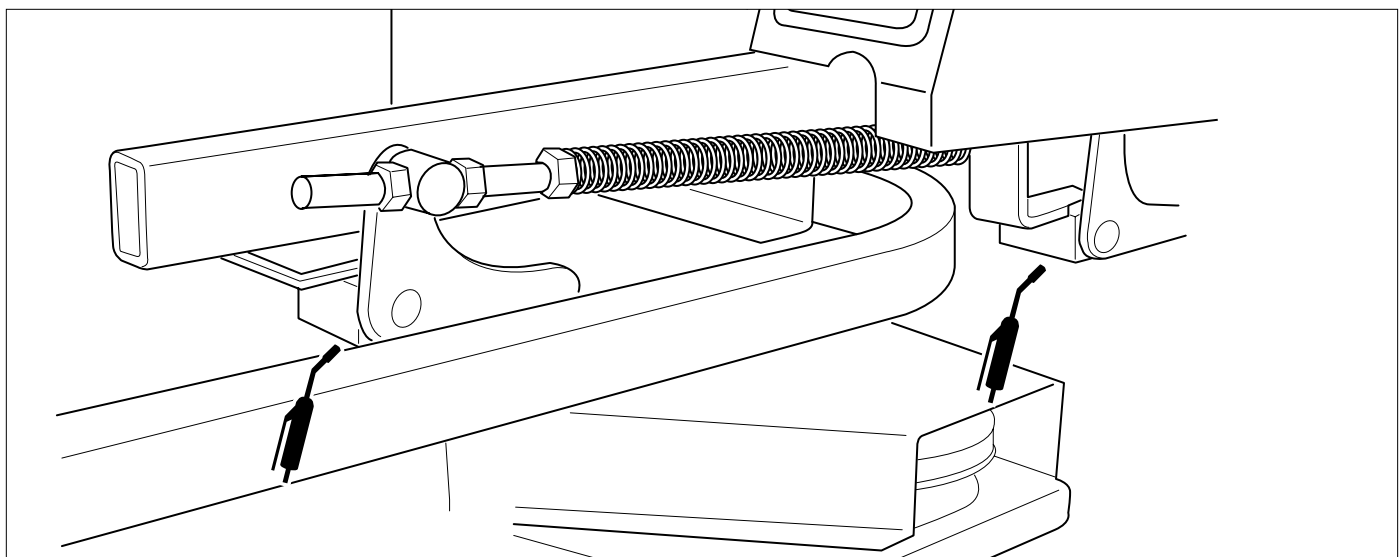
Generally, all moving metal parts should be oiled where contact is made with other parts. Keep oil and grease off belts and pulleys. Remember to wipe fittings and surfaces clean both before and after lubrication.



**Figure 11. Suspension Lubrication**  
Top & Bottom, Left & Right



**Figure 12. Rear Control Pivot Lubrication**



**Figure 13. Lift Pivot Lubrication**

## BATTERY MAINTENANCE

### Checking the Battery Fluid

1. Raise the seat plate to access battery.
2. Remove the rubber strap and battery box cover.
3. Remove the battery filler cap (A, Figure 14). Fluid must be even with the split ring full mark. If not, add distilled water.
4. Reinstall the filler cap.
5. Reinstall the the battery box cover and rubber strap.

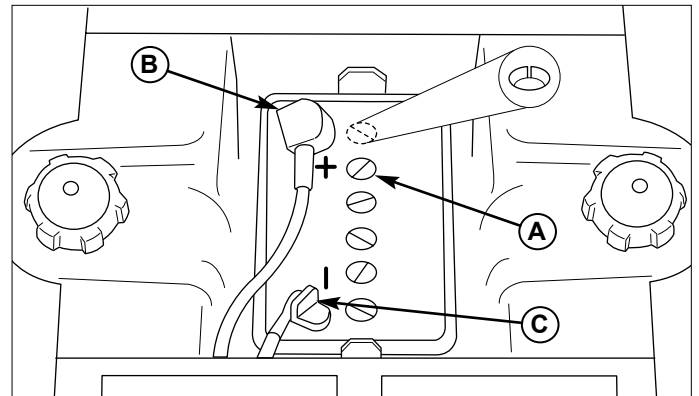
### Cleaning the Battery and Cables

1. Disconnect the cables from the battery, negative cable first (C, Figure 14).
2. Remove the battery and clean the compartment with a solution of baking soda and water.
3. Clean the battery terminals and cable ends with a wire brush until shiny.
4. Reinstall the battery and reattach the battery cables, positive cable first (see B, Figure 14)
5. Coat the cable ends and battery terminals with petroleum jelly or non-conducting grease.

## **!** 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.



**Figure 14. Battery Compartment**

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

# 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. To remove blade for sharpening, use a wood block to hold blade while removing the blade mounting bolt (Figure 15).
3. Use a file to sharpen blade to fine edge. Remove all nicks and dents in blade edge. If blade is severely damaged, it should be replaced.
4. Balance the blade as shown in Figure 16. Center the blade's hole on a nail lubricated with a drop of oil. A balanced blade will remain level.
5. Reinstall each blade with the tabs pointing up toward deck as shown in Figure 17. The five (5) blade spacers, blade, washer and bolt must be reinstalled in the exact same order in which they were removed. Secure with a bolt and hex nut. Use a wooden block to prevent blade rotation and torque bolts to 70 ft.lbs. (94 N.m.).

### **! WARNING**

For your personal safety, blade mounting bolts must each be installed with a flat washer then securely tightened. Torque blade mounting bolts to 70 ft.lbs. (94 N.m.)

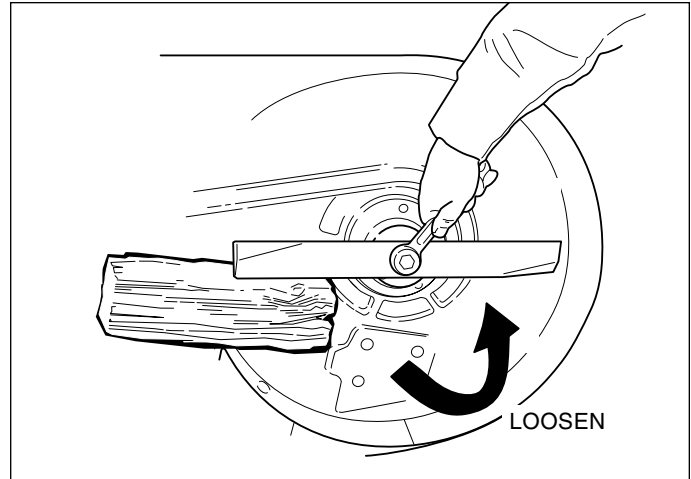


Figure 15. Removing the Blade

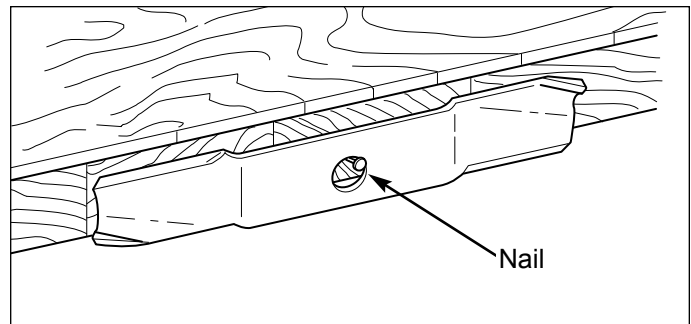


Figure 16. Balancing The Blade

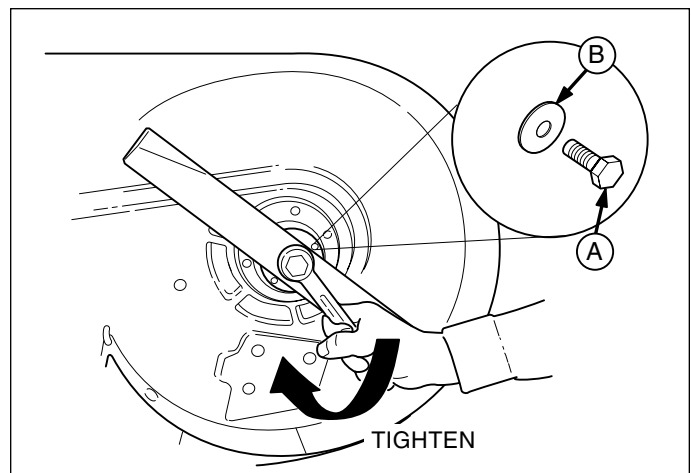


Figure 17. Installing The Blade

- A. 4x4 Wood Block      C. Blade Bolt  
B. Flat Washer

# Troubleshooting Adjustments & Service

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# Troubleshooting, Adjustment & Service

## *Rider Troubleshooting Continued.*

| <b>PROBLEM</b>                                | <b>CAUSE</b>   | <b>REMEDY</b>   |
|---|--|---|
| <b>Engine runs, but rider will not drive.</b> | <ol style="list-style-type: none"> <li>1. Hydraulic release valve(s) in "open" 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. Turn valve(s) clockwise to close.</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>Rider drive belt slips.</b>                | <ol style="list-style-type: none"> <li>1. Clutch is out of adjustment.</li> <li>2. Pulleys or belt greasy or oily.</li> <li>3. Belt stretched or worn.</li> </ol>                                      | <ol style="list-style-type: none"> <li>1. See authorized service dealer.</li> <li>2. Clean as required.</li> <li>3. Replace belt.</li> </ol>  |
| <b>Brake will not hold.</b>                   | <ol style="list-style-type: none"> <li>1. Brake is incorrectly adjusted.</li> <li>2. Brake caliper pads worn.</li> </ol>   | <ol style="list-style-type: none"> <li>1. See Brake Adjustment.</li> <li>2. Replace with new brake pads.</li> </ol>   |
| <b>Rider steers 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**

| <b>PROBLEM</b>                                   | <b>CAUSE</b>  | <b>REMEDY</b>   |
|--|---|---|
| <b>Mower will not raise.</b>                     | <ol style="list-style-type: none"> <li>1. Lift linkage not properly attached or damaged.</li> </ol>   | <ol style="list-style-type: none"> <li>1. See authorized service dealer for repair.</li> </ol>  |
| <b>Mower cut is uneven.</b>                      | <ol style="list-style-type: none"> <li>1. Mower not leveled properly.</li> <li>2. Rider 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 45-55 ft.lbs. (61-75 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. Idler pulley spring broken or not properly attached.</li> <li>2. Mower drive belt broken.</li> </ol>  | <ol style="list-style-type: none"> <li>1. Repair or replace as needed.</li> <li>2. Replace drive belt.</li> </ol>   |

## SEAT ADJUSTMENT

See Figure 18. The seat can be adjusted forward and back. Move the lever forward, position the seat as desired, and release the lever to lock the seat into position.

## GROUND SPEED CONTROL LEVER ADJUSTMENT

The control levers can be adjusted in two ways. The alignment of the control levers can be adjusted along with the placement of the levers (how close the ends are to one another) can be adjusted.

### To Adjust the Handle Alignment

Loosen the mount bolts (A, Figure 19) and pivot the lever(s) (C, Figure 19) to align with each other.

### To Adjust the Handle Placement

Loosen the jam nuts and adjust the placement bolt (B, Figure 19) in or out to properly adjust the lever end spacing.

## SPEED BALANCING ADJUSTMENT

If the rider veers to the right or left when the ground speed control levers are in the maximum forward position, the top speed of each of these levers can be balanced by turning the adjustment bolt(s) (A, Figure 20). Only adjust the speed of the wheel that is traveling faster.

### To Reduce the Speed of the Faster Wheel

1. Loosen the lock nut.
2. turn the top speed adjustment bolt COUNTER-CLOCKWISE to reduce the speed.
3. Retighten the lock nut when adjustment is complete.

## WARNING

**DO NOT** adjust the tractor for a faster overall speed forward or reverse than it was designed for.

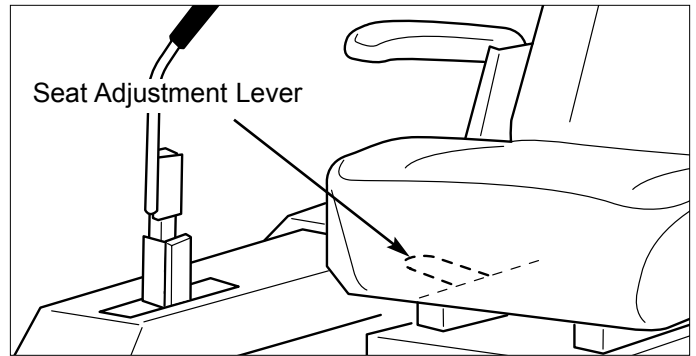


Figure 18. Seat Adjustment

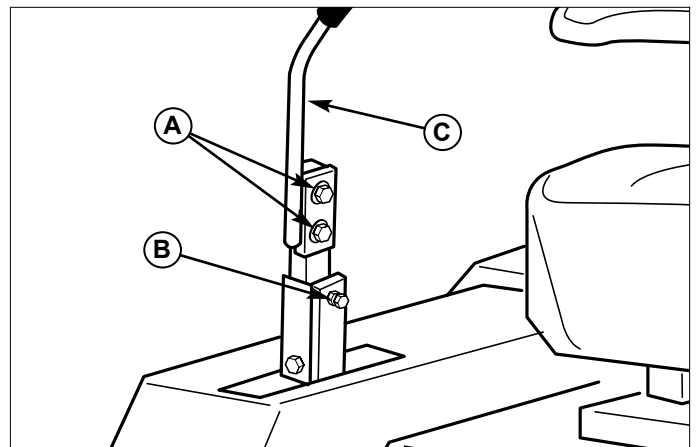


Figure 19. Control Lever Adjustment

- A. Alignment Hardware
- B. Placement Hardware
- C. Ground Speed Control Lever

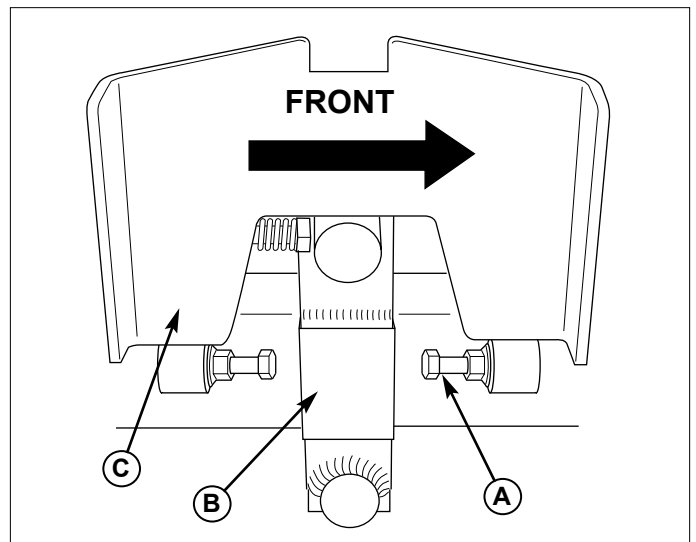


Figure 20. Top Speed Adjustment  
(Right side shown with control cover removed.)

- A. Top Speed Adjustment Bolt
- B. Control Lever Base
- C. Neutral Lock Plate

## PARKING BRAKE ADJUSTMENT

1. Disengage the PTO, stop the engine, block the front wheels, remove the ignition key, and engage the parking brake.
2. Remove both control covers.
3. Locate the upper brake spring (A, Figure 21).
4. With the parking brake engaged, measure the compressed spring length. The spring should be 2" to 2-1/8" (5.0 - 5.4cm) when compressed.
5. If the spring is not within this range, jack up the rear of the machine and secure with jackstands. Remove both drive tires.
6. Locate the lower brake spring (A, Figure 22), adjustment nuts (B, Figure 22) and adjustment link (C, Figure 22).
7. Release the parking brake and turn the adjustment nuts to compress or release the upper spring. Lock the nuts against the adjustment link (C, Figure 22).

**NOTE:** Do not adjust the spring to be shorter than 2" when compressed. This may damage the caliper case.

If this problem does not correct a braking problem, see your dealer.

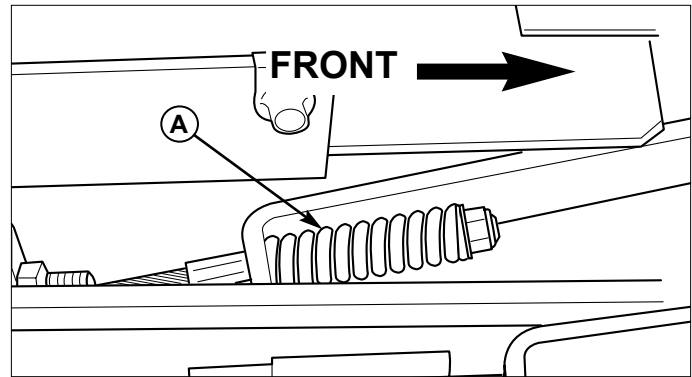
## SUSPENSION HEIGHT ADJUSTMENT

If the rider tilts either side-to-side or front-to-rear, this adjustment will level the frame with the ground.

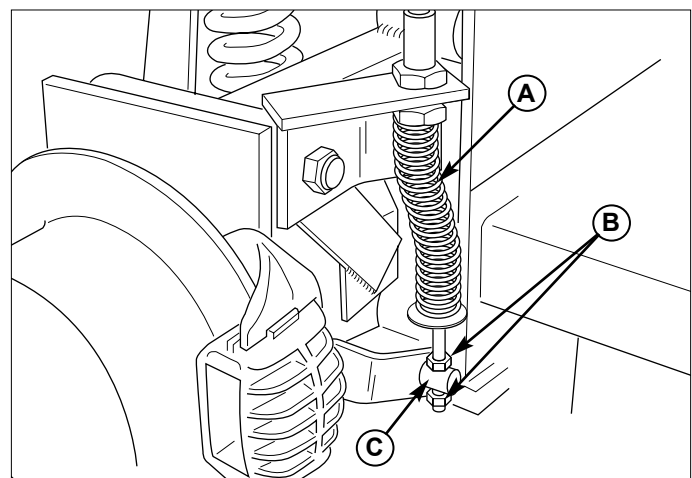
Although this adjustment may not be necessary, it may be required if additional weight (ie. a grass catcher) is added to the frame or a drive tire is replaced.

To level the frame, loosen the jam nut (B, Figure 23) and turn the height adjustment bolt (A, Figure 23) COUNTER-CLOCKWISE to lower the corresponding side of the frame, and CLOCKWISE to raise the frame.

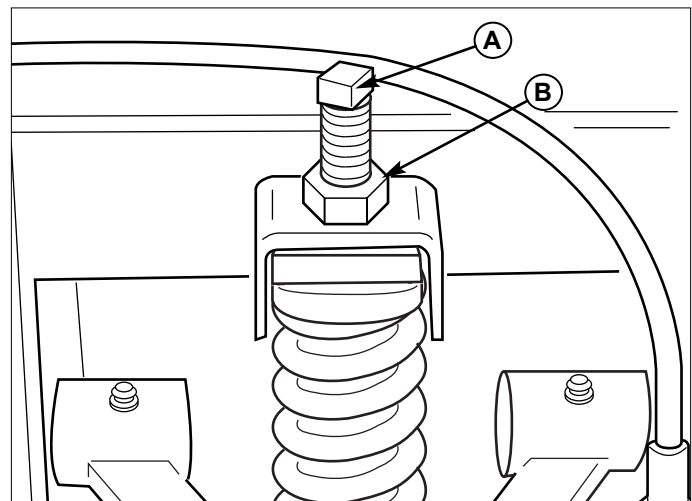
**NOTE:** Perform this adjustment on a hard, level surface such as a concrete floor. Making this adjustment will affect the mower cutting height. For fine cutting height adjustment, see your authorized dealer.



**Figure 21. Parking Brake Adjustment**  
A. Upper Brake Spring

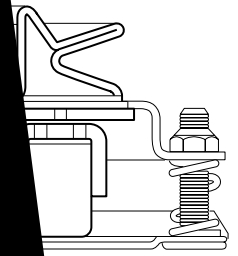


**Figure 22. Parking Brake Adjustment**  
A. Lower Brake Spring  
B. Adjustment Nuts  
C. Adjustment Link



**Figure 23. Suspension Height Adjustment**  
A. Height Adjustment Bolt  
B. Jam Nut





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# Troubleshooting, Adjustment & Service

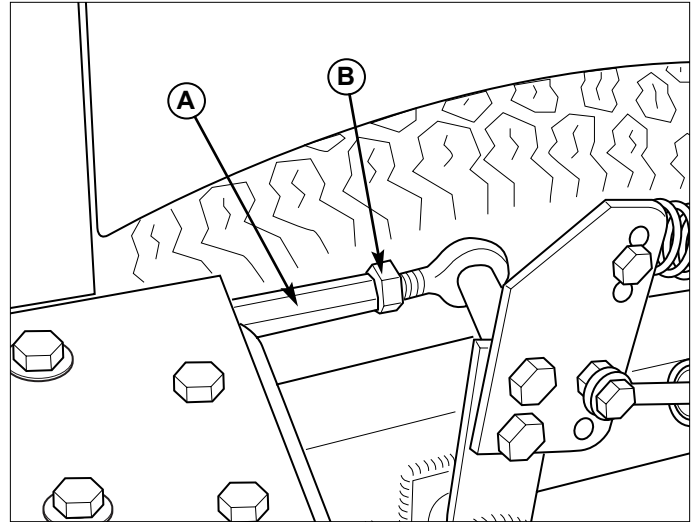
## NEUTRAL ADJUSTMENT

If the tractor “creeps” while the ground speed control levers are locked in NEUTRAL, than it may be necessary to adjust the control linkage.

*NOTE: Perform this adjustment on a hard, level surface such as a concrete floor.*

1. Disengage the PTO, engage the parking brake and turn off the engine.
2. Loosen the jam nut (B, Figure 26) and turn the adjustment linkage (A, Figure 26) to adjust. If the machine creeps forward, turn the linkage CLOCKWISE (while standing at the rear of the machine, facing forward), if the machine creeps backward, turn the linkage COUNTER-CLOCKWISE.
3. Lock the jam nut (B) when neutral is achieved.

*NOTE: This adjustment should not be performed while the machine is running. It may take several attempts to achieved neutral, depending upon how much the machine creeps.*



**Figure 26. Neutral Adjustment**

- A. Control Linkage
- B. Jam Nut

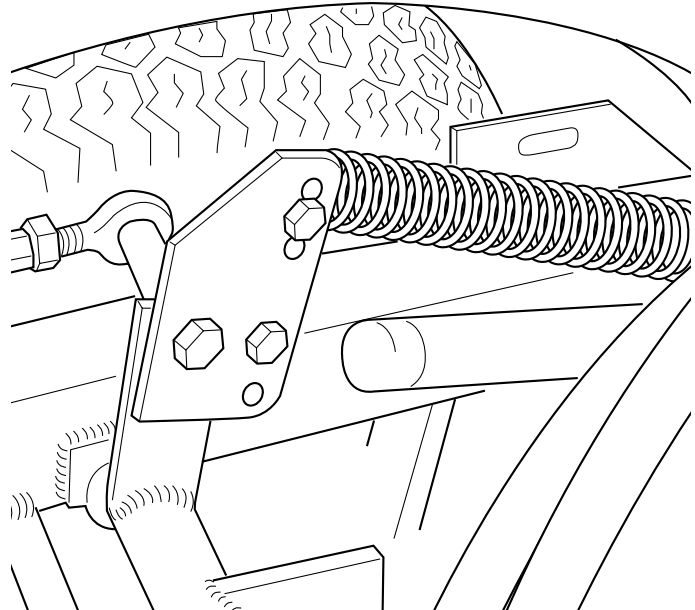
## DAMPENER FORCE & NEUTRAL SPRING RETURN ADJUSTMENT

These adjustments will taylor the “feel” of the control levers to the operator.

Each of the dampeners and springs (C and A, Figure 27) has three adjustment holes (D and B, Figure 27). The farther up the dampener and spring is placed, the more effective the dampener becomes and the more spring force will be felt by the operator while driving forward.

The closer together the dampeners and springs are placed, the slower the machine will return to NEUTRAL when the control levers are released. The farther apart the dampeners and springs are placed, the faster the machine will return to neutral.

*NOTE: These adjustments must be made to BOTH sides at the same time, and be placed in the SAME position to one another.*



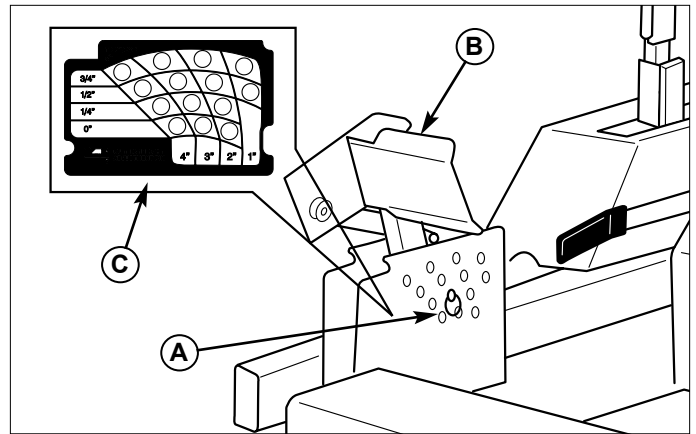
## CUTTING HEIGHT ADJUSTMENT

### **! WARNING**

Before checking mower, shut off PTO and engine. Allow all moving parts to stop. Remove ignition key, then disconnect the spark plug wire and fasten it away from the spark plug.

The cutting height adjustment pin (A, Figure 28) controls the mower cutting height. The cutting height is adjustable between 1-3/4" (4.4cm) and 5" (12.7cm) in 1/4" (.64cm) increments.

Depress the deck lift foot pedal (B, Figure 28), placing the majority of the force on the top edge of the pedal until it locks into the "TRANSPORT" position. Place the cutting height adjustment pin in the desired cutting height. Depress the deck lift foot pedal, placing the majority of the force on the bottom edge of the pedal to release the pedal from the "TRANSPORT" position.

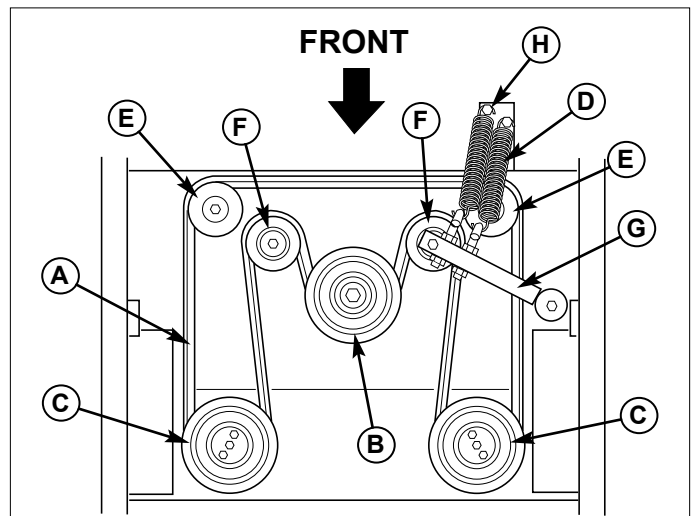


**Figure 28. Cutting Height Adjustment**

- A. Cutting Height Adjustment Pin
- B. Deck Lift Foot Pedal
- C. Cutting Height Selection Decal

## HYDRAULIC PUMP DRIVE BELT REPLACEMENT

1. Park the tractor 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 PTO drive belt (see MOWER BELT REPLACEMENT for removal instructions).
3. Remove the nuts fastening the spring anchor bolts (H, Figure 29) to the anchor arm.
4. Remove the old belt and replace it with the new one. Be sure the ribs of the belt are seated correctly in the grooves of the pump pulleys, crankshaft pulley and the ribbed idler pulleys (C, B and E, Figure 29).
5. Reinstall the anchor bolts (H, Figure 29) into the anchor arm and fasten the nuts.
6. Reinstall the PTO drive belt.



**Figure 29. Hydraulic Pump Drive Belt Replacement**

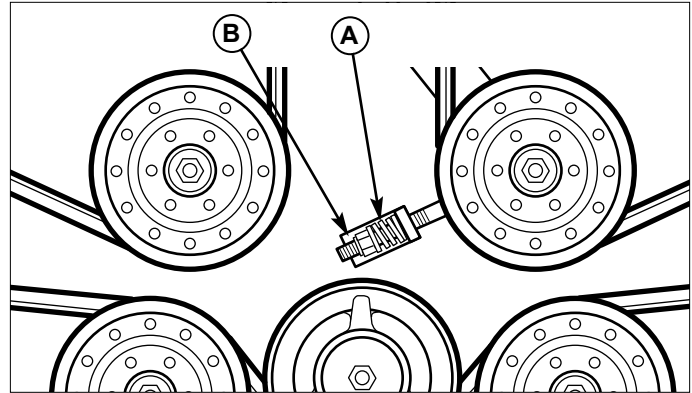
- A. Pump Drive Belt
- B. Crankshaft Pulley
- C. Pump Pulley
- D. Spring(s)
- E. Idler Pulley (Ribbed)
- F. Idler Pulley (Smooth)
- G. Idler Arm
- H. Spring Anchor Bolt(s)

## MOWER BELT REPLACEMENT



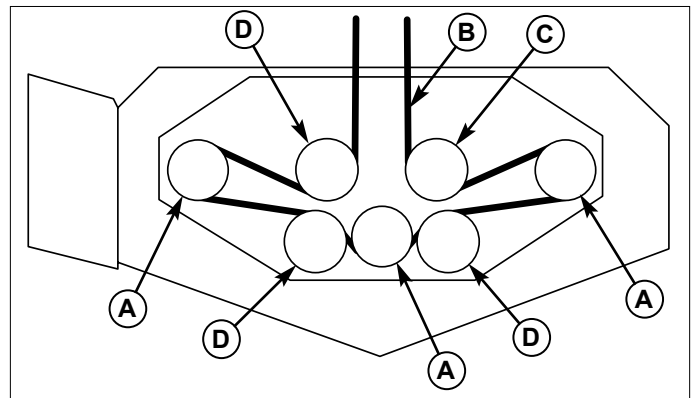
To avoid damaging belts, DO NOT PRY BELTS OVER PULLEYS.

1. Park the tractor 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 hairpin clip and clevis pin and remove the deck lift foot pedal. Lift the floor plate to gain access to the PTO drive belt.
3. Loosen the spring compression nut (B, Figure 30) to release the belt tension.
4. Slide the drive belt over the edge of the idler pulley. Drop the belt from the PTO clutch pulley groove.
5. Remove the old belt and replace with a new one. Make sure the V-side of the belt runs in the pulley grooves (Figure 31).
6. Install the drive belt on the PTO pulley, the spindle pulleys and idler pulleys. Tighten the spring compression nut (B, Figure 30) until the belt tension spring (A, Figure 30) is 5/8" long.
7. Run the mower under no-load condition for about 5 minutes.



**Figure 30. Mower PTO Belt**

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



**Figure 31. Mower PTO Belt Routing**

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

### 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

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 43 .

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.

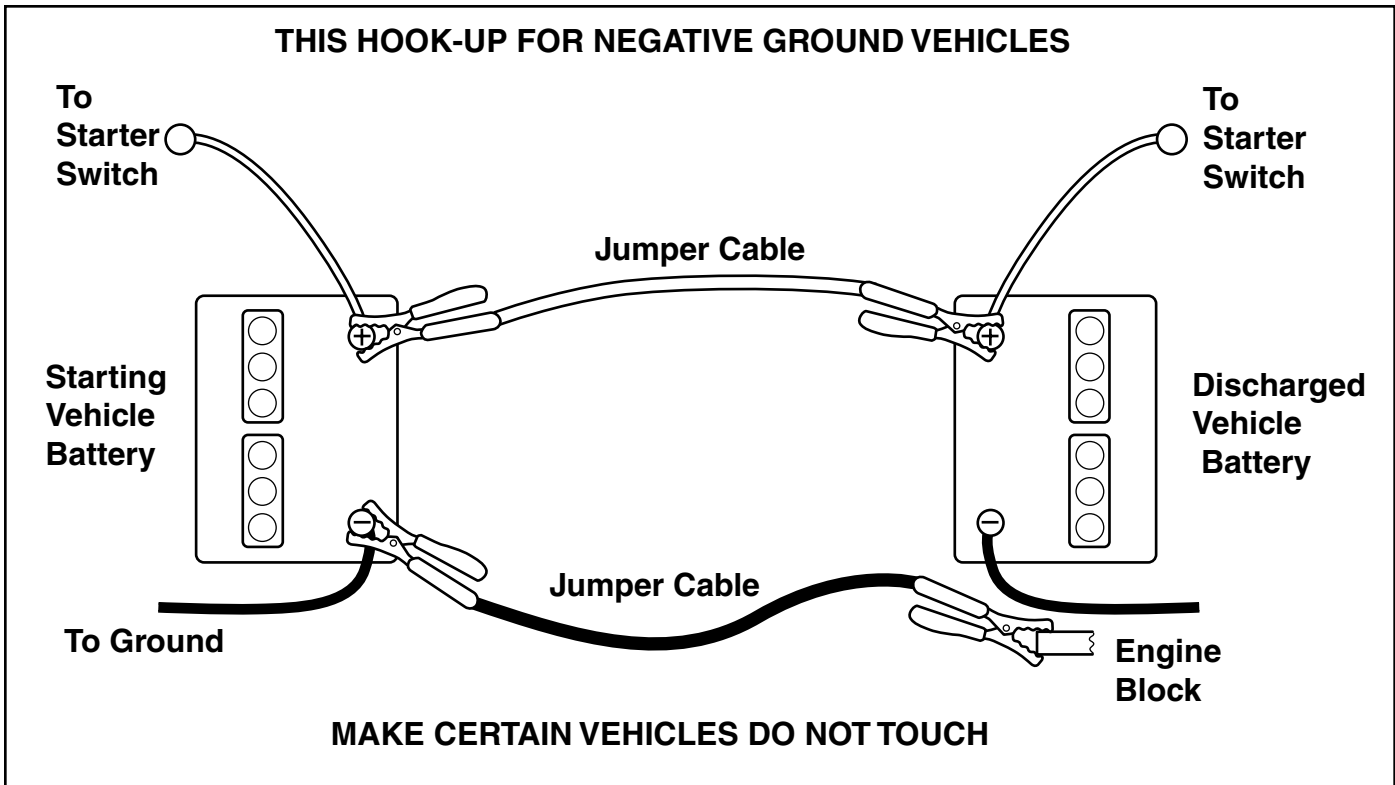


Figure 32. Jump Starting

## **! 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.



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