# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table Of Contents</td>
<td>1-1</td>
</tr>
<tr>
<td>Time Savers</td>
<td>2-1</td>
</tr>
<tr>
<td>Glossary</td>
<td>3-1</td>
</tr>
<tr>
<td>(2006) 315-8</td>
<td>4-1</td>
</tr>
<tr>
<td>(2007) Classic GT</td>
<td>4-1</td>
</tr>
<tr>
<td>(2006) 14-38Z, 16-42Z</td>
<td>5-1</td>
</tr>
<tr>
<td>(2006) 17-42Z, 18-44Z</td>
<td>6-1</td>
</tr>
<tr>
<td>(2007)</td>
<td></td>
</tr>
<tr>
<td>(2006) 18-44ZX, 18-52ZX, 19-52ZX</td>
<td>7-1</td>
</tr>
<tr>
<td>(2007)</td>
<td></td>
</tr>
<tr>
<td>(2006) Z480, Z440 (Int’l)</td>
<td>8-1</td>
</tr>
<tr>
<td>(2007)</td>
<td></td>
</tr>
<tr>
<td>(2006) ZX480, ZX525 (Int’l), ZX525</td>
<td>9-1</td>
</tr>
<tr>
<td>(2007)</td>
<td></td>
</tr>
<tr>
<td>(2006) 1332-G (Int’l)</td>
<td>10-1</td>
</tr>
<tr>
<td>(2007) G132 (Int’l)</td>
<td>10-1</td>
</tr>
<tr>
<td>(2007) DH210 (Int’l), DH200 (Int’l)</td>
<td>12-1</td>
</tr>
<tr>
<td>(2006) 190-D (Int’l)</td>
<td>13-1</td>
</tr>
<tr>
<td>(2007) DH220 (Int’l)</td>
<td>13-1</td>
</tr>
<tr>
<td>(2007) Z504</td>
<td>14-1</td>
</tr>
<tr>
<td>(2007) Z502</td>
<td>15-1</td>
</tr>
<tr>
<td>(2007) Z500, Z420</td>
<td>16-1</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LX Series Lawn Tractors, GT2000 Series Garden Tractors</td>
<td></td>
</tr>
<tr>
<td>Table Of Contents</td>
<td>17-1</td>
</tr>
<tr>
<td>Time Savers</td>
<td>18-1</td>
</tr>
<tr>
<td>Glossary</td>
<td>19-1</td>
</tr>
<tr>
<td>(2006) LX420, LX 460</td>
<td>20-1</td>
</tr>
<tr>
<td>(2007)</td>
<td></td>
</tr>
<tr>
<td>(2006) LX500, GT2100, GT2200, GT2300</td>
<td>21-1</td>
</tr>
</tbody>
</table>
Table of Contents

Using this Manual ................................................................. 2 - 1
Using a VOM ................................................................. 2 - 7
Troubleshooting ................................................................. 2 - 9
Using this Manual

The components are listed alphabetically by noun, followed by any adjectives. If you have trouble finding a component, use the Table of Contents at the front of the Glossary section.

The Glossary contains information on virtually every electrical part used on Toro riding products.

Module, Low Voltage

Illumination of the battery light on the dash indicates the battery voltage is too low. This is sensed through the low voltage module (Figure 13).

How it works

The low voltage module is a voltage regulator/checker/rectifier. It maintains the correct voltage on the battery and warns the operator if the voltage is not adequate. The module is activated until the battery is charged.

These three sections should all you need to diagnose problems on individual components.

Testing

1. Before replacing the low voltage module, test the battery to make sure it is fully charged and is in good shape.

2. Next, check the charging system of the engine; follow the procedure in the Kohler Engine Service Manual.

3. If the battery checks out and is in good condition and the charging system checks out and is charging properly and the battery light on the dash is on, replace the low voltage module. Without specialized test equipment, it is not practical to test the low voltage module in the field.

Glossary

Purpose

The relay monitors current in one circuit. If current is present, it trips an SPDT switch to the other position.

How it works

A relay is an electrically actuated switch.

1. Coil: Terminals 85 and 86 are connected to a coil. Applying 12 volts to these terminals energizes the coil turning it into an electromagnet.

2. Switch: Terminals 30, 87, and 87a are actually part of a single pole double throw (SPDT) switch. Terminal 30 is the common lead. The switch is spring loaded so that 30 and 87a are connected when the coil is not energized. When the coil is energized, the switch is "thrown" and 30 and 87 are connected (Figure 14).

Testing

1. Disconnect the relay from the harness.

2. Verify the coil resistance between terminals 85 and 86 with a multimeter (ohms setting). Resistance should be from 70 to 90 ohms. There should be continuity between terminals 87a and 30 (Figure 15).
Each product series has its own section including:
- Info List
- Wiring Diagrams
- Circuit Diagrams

Image helps you quickly identify product sections.

Each product section has its own "Table of Contents" to keep things simple.

The "Info List" is the first page of each product section.

---

**XL Information List (2002 - 2003)**

- Wiring Diagram .......................... 6-2
- Circuit Diagrams
  - Starter Motor Circuit ................. 6-3
  - Spark Circuit ....................... 6-3 - 6-6
  - Charging Circuit .................... 6-6
  - Light Circuit ....................... 6-6
# Glossary

## Table of Contents

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch, Electric (PTO)</td>
<td>3-3</td>
</tr>
<tr>
<td>Gauge, Fuel</td>
<td>3-4</td>
</tr>
<tr>
<td>Gauge, Voltmeter</td>
<td>3-5</td>
</tr>
<tr>
<td>Hourmeter</td>
<td>3-6</td>
</tr>
<tr>
<td>Magnet Assembly - Cruise Control</td>
<td>3-7</td>
</tr>
<tr>
<td>Microswitches</td>
<td>3-7</td>
</tr>
<tr>
<td>KeyChoice™ Reverse Operating System</td>
<td>3-8</td>
</tr>
<tr>
<td>Module, KeyChoice™ Reverse Operating System (Electric PTO Clutch)</td>
<td>3-9</td>
</tr>
<tr>
<td>Module, KeyChoice™ Reverse Operating System (Manual PTO Clutch)</td>
<td>3-11</td>
</tr>
<tr>
<td>Module, Low Voltage</td>
<td>3-10</td>
</tr>
<tr>
<td>Relay</td>
<td>3-12</td>
</tr>
<tr>
<td>Sender, Fuel (P/N 94-1716)</td>
<td>3-13</td>
</tr>
<tr>
<td>Sender, Fuel (P/N 95-3971)</td>
<td>3-14</td>
</tr>
<tr>
<td>Solenoid</td>
<td>3-14</td>
</tr>
<tr>
<td>Switch, Brake</td>
<td>3-15</td>
</tr>
<tr>
<td>Switch, Cruise Control (P/N 93-0527 and P/N 94-7602)</td>
<td>3-16</td>
</tr>
<tr>
<td>Switch, Key (P/N 68-9830 or 104-2541)</td>
<td>3-17</td>
</tr>
<tr>
<td>Switch, Key (P/N 99-7429)</td>
<td>3-18</td>
</tr>
<tr>
<td>Switch, Key (P/N 92-6785)</td>
<td>3-19</td>
</tr>
<tr>
<td>Switch, KeyChoice™ Reverse Operating System</td>
<td>3-20</td>
</tr>
<tr>
<td>Switch, Light</td>
<td>3-21</td>
</tr>
<tr>
<td>Switch, Neutral</td>
<td>3-22</td>
</tr>
<tr>
<td>Switch, Neutral - Plunger Type</td>
<td>3-22</td>
</tr>
</tbody>
</table>

---

**Demystification Glossary**

3-1

The description is the name given to the part in the book only.

This is the most recent part number available at press time.
Wiring Diagram

Each product section includes the original wiring diagram.

The wiring diagram closely represents the wiring harness and is very useful in diagnosing short circuits.
TIME SAVERS

1

Checking Voltage

Always start by selecting the proper scale. For instance, on this meter, we selected the 25 volt scale.

Use the AC scales to measure unrectified voltage straight from an alternator or from a wall outlet.

Battery voltage is always D.C.

If you measure from ground to ground or have an open circuit, your reading will be 0.

2

Checking Resistance

The integrity of the ignition coils and electric clutches can often be checked using an ohmmeter.

The ohmmeter is powered by an internal battery. Replace it if the needle will not move full scale.

Always disconnect components from the circuit when resistance checking. Otherwise you could get a false reading. This switch should read infinity (~) resistance.

Do not use the ohmmeter to test Toro interlock modules! The battery current could damage the module.
What about checking current?

Using a VOM

Many ammeters can measure only .1 amp. The current in Toro riding products generally is from 3-90 amps. Make sure your VOM can measure these higher currents.
Sample Problem: 266-H electric clutch will not engage

1. Test for voltage at point "a": voltage is 12 volts. Move to point "b".

2-7. Testing for voltage at points "b" - "g" you find that all readings are 12 volts. Proceed to point "h".

Step 6. Testing at point "h" you find 0 voltage. You disconnect the switch from the circuit and test resistance. It is always open - a bad switch. Problem solved.

TIP: DON'T DISCONNECT ANY WIRES! When checking for voltage you need only touch the terminals. (Disconnect components when checking resistance.)

TIP: BE LAZY! If you have trouble getting to a component, skip it, and go to the next point. (You can always go back if your next reading is 0 volts.)

Same Sample Problem: 266-H electric clutch will not engage (this time)

TIP: SAVE TIME by starting in the middle of the suspected circuit!

Step 1. Test point "a" for voltage. Voltage is 12 volts. Problem is right half of circuit. Proceed to point "b".

Step 3. Test point "c": Voltage is 12 volts. Problem is between "c" and "b". Proceed to point "d".

Step 2. Test point "b": Voltage is 0 volts. Problem is between "a" and "b". Proceed to "c".

Step 4. Test point "d": Voltage is 12 volts. You disconnect the switch and find it to be defective. Problem solved 4 steps quicker than above.
Sample Problem: This XL lawn tractor won’t turn over. The customer parked it in the garage and turned it off. When he tried to start it a week later, he heard one click. After that, nothing would happen when he turned the key.

We know it is a short circuit because we found the 10 amp fuse blown.

Troubleshooting

Step 1. Interview the customer. Any information we get will help isolate the problem.

Step 2. Isolate the suspect area. Notice what we did to the wiring diagram below.

If the short was between the battery and the 10 amp fuse, we would have melted these wires.

Highlight the suspect area on a copy of the wiring diagram.

If the short was in the violet wire, the 10 amp fuse would have blown.

Eliminate all the black wires as possibilities because they’re supposed to go to ground.
Step 3. Break the suspect area down into "mini-circuits". Do this by removing the unblown fuses and by opening all switches.

Open the suspect part of the PTO switch by turning the deck to "on".

The seat switch is normally open without an operator.

Open the ignition switch by turning it to "off".

Open the neutral switch by putting the unit in gear.

Begin by removing the fuses. This simplifies troubleshooting by insuring these other circuits are "out of the way". Open the neutral switch by putting the unit in gear.
Troubleshooting

Step 4. Power up one "mini-circuit" at a time, beginning with the one closest to the battery.

When the ignition switch is turned to "on", the 10 amp fuse doesn't blow. This means the blue and gray wires are OK.

Next, turn the ignition switch to "start". This "powers up" the orange and green wires. The fuse doesn't blow so these wires are OK.

Install a new 10 amp fuse. This "powers up" the red wire to the ignition switch. The fuse doesn't blow, so this wire is OK.
Close the PTO switch by turning the deck on. This "powers up" the gray wire.

The fuse immediately blows! We've isolated the problem to the PTO switch, the gray wire, the reverse switch and the NMIR module.

Disconnect the PTO switch from the circuit and check its terminals for continuity to ground. It checks out OK.

Disconnect the NMIR module from the circuit and check the gray wire for continuity to ground. We find there is continuity.

Disconnect the reverse switch from the circuit and check the terminals for continuity to ground. We find no continuity. The neutral switch is OK.

Tracing the gray wire, we find that it is pinched between the steering column and the chassis. Problem solved!
# Table of Contents

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch, Electric (PTO)</td>
<td>3 - 3</td>
</tr>
<tr>
<td>Gauge, Fuel</td>
<td>3 - 4</td>
</tr>
<tr>
<td>Gauge, Voltmeter</td>
<td>3 - 5</td>
</tr>
<tr>
<td>Hourmeter</td>
<td>3 - 6</td>
</tr>
<tr>
<td>Magnet Assembly - Cruise Control</td>
<td>3 - 7</td>
</tr>
<tr>
<td>Microswitches</td>
<td>3 - 7</td>
</tr>
<tr>
<td>KeyChoice™ Reverse Operating System</td>
<td>3 - 8</td>
</tr>
<tr>
<td>KeyChoice™ Reverse Operating System Module</td>
<td>3 - 9</td>
</tr>
<tr>
<td>Module, KeyChoice™ Reverse Operating System (Electric PTO Clutch)</td>
<td>3 - 11</td>
</tr>
<tr>
<td>Module, KeyChoice™ Reverse Operating System (Manual PTO Clutch)</td>
<td>3 - 13</td>
</tr>
<tr>
<td>Module, Low Voltage</td>
<td>3 - 14</td>
</tr>
<tr>
<td>Relay</td>
<td>3 - 14</td>
</tr>
<tr>
<td>Sender, Fuel (P/N 94-1716)</td>
<td>3 - 15</td>
</tr>
<tr>
<td>Sender, Fuel (P/N 95-3971)</td>
<td>3 - 16</td>
</tr>
<tr>
<td>Solenoid</td>
<td>3 - 16</td>
</tr>
<tr>
<td>Switch, Brake</td>
<td>3 - 17</td>
</tr>
<tr>
<td>Switch, Cruise Control (P/N 93-0527 and P/N 94-7602)</td>
<td>3 - 18</td>
</tr>
<tr>
<td>Switch, Key (P/N 88-9830 or 104-2541)</td>
<td>3 - 19</td>
</tr>
<tr>
<td>Switch, Key (P/N 99-7429)</td>
<td>3 - 20</td>
</tr>
<tr>
<td>Switch, Key (P/N 92-6785)</td>
<td>3 - 21</td>
</tr>
<tr>
<td>Switch, KeyChoice™ Reverse Operating System</td>
<td>3 - 22</td>
</tr>
<tr>
<td>Switch, Light</td>
<td>3 - 23</td>
</tr>
<tr>
<td>Switch, Neutral</td>
<td>3 - 24</td>
</tr>
<tr>
<td>Switch, Neutral - Plunger Type</td>
<td>3 - 24</td>
</tr>
</tbody>
</table>
# Glossary

## Table of Contents

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch, Neutral Adjustable - Plunger Type</td>
<td>3 - 25</td>
</tr>
<tr>
<td>Switch, PTO</td>
<td>3 - 26</td>
</tr>
<tr>
<td>Switch, Reverse</td>
<td>3 - 27</td>
</tr>
<tr>
<td>Switch, Seat</td>
<td>3 - 27</td>
</tr>
</tbody>
</table>
Clutch, Electric (PTO)

Purpose

This clutch electrically controls the engagement and disengagement of the Power Take Off (PTO) pulley.

How It Works

The PTO clutch is composed of three major components; the field, the clutch plate, and the friction plate. The clutch plate always turns with the engine. The field is a coil of wire on an iron core, which becomes an electromagnet when power is applied. The friction plate can slide up and down on the crankshaft axis. It is normally spring loaded so that it is not in contact with the clutch plate and is pressed against the brake material opposite the clutch. When power is applied, the friction plate is drawn toward the clutch plate and the two rotate as one.

Testing

If the electric PTO clutch is not engaging or is suspected as a cause of electrical problems, use the troubleshooting steps. These procedures will help you determine if the clutch has failed or is the cause of the electrical problem.

Coil Resistance Measurement

1. Disengage the PTO, set the parking brake, turn the ignition key to OFF and remove the key.
2. Disconnect clutch wire connector.
3. Set the multimeter or volt/ohm meter to check resistance (ohms).
4. Connect the meter lead wires to the wires in the clutch connector (Figure 1).
5. The meter should read between 2.40 ohms and 3.40 ohms. If the reading is above or below these readings, the field has failed and needs to be replaced. If the reading is between these two limits, measure the clutch current draw.

Measuring Clutch Current Draw

1. Disengage the PTO, set the parking brake, and turn the ignition to OFF.
2. Disconnect the clutch wire connector.
3. Set the multimeter to check amps (10 amp scale).
4. Connect the positive meter lead to the tractor terminal (1) of the clutch wire, Figure 2.
5. Connect the negative meter lead to the corresponding wire terminal (3), Figure 2.
6. Connect a short jumper lead from terminal (2) to (4), Figure 2.
7. Turn the ignition switch to the “RUN” position and the PTO switch to the “ON” position.
8. If the meter reading is 3.5 amps or above, the system is functioning properly. If the meter reading is below 3.5 amps, check the electrical system for problems (i.e., the battery, ignition switch, PTO switch, or wiring harness may be malfunctioning).

**Figure 2**

**Clutch Burnishing Procedure**

The clutch should be burnished as part of the pre-delivery service, or whenever a new clutch is installed. Burnishing polishes the clutch plate, allowing for smooth clutch engagement.

With a PTO driven attachment installed (i.e., mower, snowthrower, or tiller), run the engine at half throttle. Engage and disengage the clutch 5 times (10 seconds on/10 off).

Increase engine RPM to ¾ to full throttle. Engage and disengage clutch 5 times (10 seconds on/10 seconds off). Check and adjust the PTO clutch air gap (not required on 2000 and later models).

**Figure 3**

**Gauge, Fuel**

**Purpose**

This gauge indicates fuel level (Figure 3).

**How it Works**

The meter movement moves in proportion to the amount of resistance provided by the fuel level sender in the tank. The movement is dampened to compensate for movement of the fuel in the tank.
Testing

1. With the gauge still connected to the harness, turn the key to the “RUN” position.

2. Using a VOM, set scale capable of reading 12 volts D.C., connect the negative lead to ground (Figure 4) to verify the conditions in the table below.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>0 volts</td>
</tr>
<tr>
<td>I</td>
<td>12 volts*</td>
</tr>
<tr>
<td>S</td>
<td>2.5 volts tank full</td>
</tr>
<tr>
<td>S</td>
<td>7.5 volts tank empty</td>
</tr>
</tbody>
</table>

* All voltage readings should be within 20%.

Gauge, Voltmeter

*Figure 5* mvc-106

Purpose

This gauge indicates the voltage across the battery (Figure 5).

How it Works

The meter movement moves proportional to the voltage level across the two terminals of the battery. This is accomplished by placing a resistor in parallel with the meter movement.

*Figure 6* mvc-151
Testing

1. With the meter still connected to the harness, turn the key to the “RUN” position.

2. Verify the conditions in the table below. If they are not met, replace the voltmeter as it is not serviceable (Figure 6).

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>12 volts DC +/- 20%</td>
</tr>
<tr>
<td>G</td>
<td>0 volts DC</td>
</tr>
</tbody>
</table>

Hourmeter

Purpose

The hourmeter keeps track of the actual engine hours (Figure 7). This is accomplished by connecting the hourmeter to the engine oil pressure switch.

How it Works

Since a normal clock might be affected by variations in voltage and current, the hourmeter is made up of a combination of an electric “winder” and a mechanical clock movement. When power is applied, a coil is energized to wind the movement. The movement unwinds in about two seconds. As it finishes its rotation, it re-energizes the coil so that the cycle can start over.

Testing

Verify that 12 volts is present across the two terminals when the engine is running. If so, and the meter is not running, replace the meter. If 12 volts is not present, check the connections and the engine oil pressure switch. The meter is a permanently sealed unit and is not repairable.
Magnet Assembly - Cruise Control

Purpose

When engaging cruise control, the magnet assembly engages a cruise control plate that locks the control linkage to the speed that is set (Figure 8).

How it Works

When the desired forward speed is obtained, push the cruise control switch on the dash. Through a cruise control relay, 12 volts is sent to the magnet assembly and this locks the magnet to the cruise control plate and locks the traction control. This allows you to remove your foot from the traction control.

Testing

1. Unplug the wires and remove the magnet assembly from the tractor.
2. Place the magnet assembly on a metal surface and apply 12 volts D.C. positive and negative to the wire leads.
3. The magnet assembly should hold to the metal surface. When voltage is removed, the magnet assembly can be removed from the metal surface.

Microswitches

Purpose

Microswitches are used to monitor whether or not a lever or pedal is in the correct position (Figure 9).

How It Works

This SPDT (Single Pole Double Throw) microswitch has three terminals. The lever is spring loaded in the “up” position. When the button is pushed down, continuity switches from COM and NC to COM and NO.

Testing

1. Disconnect the switch from the harness.
2. Using an ohmmeter (ohm), connect one meter lead to the “COM” terminal, and other lead to the “NC” terminal.
3. With the switch in the spring loaded “up” position, there should be continuity; the switch is operating properly. Push the button “down”. There should be no continuity; the switch is operating properly.
4. Connect one meter lead to the “COM” terminal and the other lead to the “NO” terminal.
5. With the button in the “OUT” spring loaded position, if there is no continuity, the switch is operating properly.
6. Then move the switch button to the “down” position. If there is continuity, the switch is operating properly.
KeyChoice™ Reverse Operating System

This interlock feature is provided to prevent unintentional engine-powered attachment operation in reverse. If the tractor is shifted into reverse while the mower blade or other Power Take Off (PTO) driven attachment is engaged, the electric clutch will disengage or the engine will stop, depending on the model. **DO NOT MOW WHILE BACKING UP UNLESS ABSOLUTELY NECESSARY.** If you need to mow while in reverse or use other PTO drive attachments (such as a snowthrower), this interlock feature may be temporarily deactivated.

Before deactivating this feature, be sure there are no children present on or near property where you are using the tractor and that are likely to appear while you are mowing or operating an attachment. Be extra observant after you have chosen to deactivate the interlock feature because the sound of the tractor’s engine might prevent you from being aware that a child or bystander has entered the area where you are operating the tractor.

Once you are sure you can safely mow in reverse or operate an attachment, deactivate the reverse operating system by turning the KeyChoice™ switch, located around the seat area, after engaging the PTO system. A red light will illuminate on the dash as a reminder that the reverse operating system interlock has been deactivated. Once the interlock is deactivated, it stays in this mode **WITH YOUR MOWER BLADE OR ATTACHMENT OPERATING WHENEVER YOU BACK-UP**, and the dash light stays on until either the PTO clutch is disengaged or the engine is turned off.

Systems:

There are two different “shutdown” systems used in the KeyChoice™ Reverse Operating System. One system is used with the electric (PTO) clutch - when the tractor is shifted to reverse while the mower blade or other PTO driven attachment is engaged the electric clutch will disengage. The other system is used with the manual (PTO) clutch - when the tractor is shifted to reverse while the mower blade or other PTO driven attachment is engaged, the engine will stop.

Testing the KeyChoice™ Reverse Operating System - Electric PTO System - Unactivated

1. With the parking brake released, seat occupied, turn the ignition key to “RUN” without starting the engine.
2. Pull the PTO electric clutch switch “ON”.
3. You should hear an audible click, indicating the PTO is activated and the PTO light will come on.
4. Move the forward/reverse pedal to reverse. On the gear drive tractors, shift the gear selector to reverse.
5. You should hear an audible click indicating the PTO is deactivated and the PTO light, on the dash, should turn off.

Testing the KeyChoice™ Reverse Operating System - Electric PTO System - Activated

1. With the parking brake released, seat occupied, turn the ignition switch to “RUN” without starting the engine.
2. Pull the PTO electric clutch switch to “ON”.
3. Turn the “KeyChoice” key and release.
4. The “KeyChoice” warning light on the dash should come on.
5. Move the foot pedal to reverse. On the gear drive model tractors, move the gear selector to reverse.
6. The PTO and “KeyChoice” warning lights on the dash should remain on.
7. Push the PTO switch to “OFF”.
8. The PTO light and the “KeyChoice” warning lights should turn off.

Testing the KeyChoice™ Reverse Operating System - Manual PTO System - Unactivated

1. Move the Power Take Off (PTO) lever to the “disengage” position and move the gear shift lever to neutral on the gear shift model tractors. Depress the clutch/brake pedal.
2. Now start the engine.
3. While the engine is running, move the PTO lever to the “engage” position, on gear shift models, move the gear shift lever in reverse, and on Hydro models, move the forward/reverse pedal to reverse.

4. The engine should stop.

**Testing the KeyChoice™ Reverse Operating System - Manual PTO System - Activated**

1. Move the PTO lever to the “disengage” position and move the gear shift lever to neutral on gear shift models. Depress the clutch/brake pedal on the Hydro’s.

2. Now start the engine.

3. Move the PTO lever to the “engage” position and turn the KeyChoice™ key, located around the seat area.

4. A red light on the dash turns on, indicating the interlock (Reverse Operating System) is disabled.

5. You should be able to operate the machine in reverse and the engine/mower will continue to run.

6. Move the PTO lever to the “disengage” position and the red light should turn off on the dash.

**How It Works**

Low Voltage - The low voltage portion of the module is a voltage comparator, checking the charge voltage from the engine regulator/rectifier system. If the charge is less than 11 volts D.C., the low voltage module senses this and activates the indicator lamp on the dash which will light until the voltage is over 11 volts D.C.

KeyChoice™ Reverse Operating Module - The KeyChoice™ Reverse Operating System Module is made up of several components, such as diodes and relays. When it is connected in the circuit, voltage is applied to certain terminals of the KeyChoice™ Reverse Operating System module from the PTO switch, reverse switch, and the override switch, which energizes certain relays in the module. If voltage is not applied to proper terminals on the KeyChoice™ Reverse Operating System Module, the electric PTO clutch will stop.

**Testing - Low Voltage Testing**

Before replacing the Low Voltage/KeyChoice™ Reverse Operating Module, Check the following:

1. Test the battery to make sure it is fully charged and is in good shape.

2. Next, check the charging system of the engine; follow the procedure in the appropriate engine service manual.

3. If the battery checks out and is in good condition and the charging system checks out and is charging properly and the battery light on the dash is on, replace the module. Without specialized test equipment, it is not practical to test the module in the field.

**KeyChoice™ Reverse Operating System Module**

**Purpose**

The KeyChoice™ Reverse Operating System Module must be removed from the wiring harness. Using a multimeter, check the following (Figure 10).

---

**Figure 10**

MVC-869F
Testing - No Power To Circuit (With Module Out of Circuit)

<table>
<thead>
<tr>
<th>Meter Scale</th>
<th>Meter Probe Negative</th>
<th>Meter Probe Positive</th>
<th>Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohms</td>
<td>Pin 3</td>
<td>Pin 5</td>
<td>Open (More than 100K ohms)</td>
</tr>
<tr>
<td>Diode*</td>
<td>Pin 3</td>
<td>Pin 6</td>
<td>.5 to 1 Volt</td>
</tr>
<tr>
<td>Diode*</td>
<td>Pin 3</td>
<td>Pin 1</td>
<td>.5 to 1 Volt</td>
</tr>
<tr>
<td>Diode*</td>
<td>Pin 3</td>
<td>Pin 4</td>
<td>.5 to 1 Volt</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 1</td>
<td>Pin 4</td>
<td>350 to 400 ohms</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 2</td>
<td>Pin 4</td>
<td>Open (more the 100K ohms)</td>
</tr>
</tbody>
</table>

*Note: If the multimeter does not have a diode test feature, this test can not be performed. This is not a problem if powered tests are done. Powered tests must be performed to test relays (see table below).

Testing - Powered Circuit (With Module Out of Circuit)

<table>
<thead>
<tr>
<th>Volt Meter</th>
<th>Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meter Scale</td>
<td>Neg Probe</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 3</td>
</tr>
<tr>
<td>Volts (Caution)</td>
<td>Pin 1</td>
</tr>
<tr>
<td>Volts (Caution)</td>
<td>Pin 3</td>
</tr>
</tbody>
</table>

*** Same as battery voltage

*Note: A 12 volt battery is needed for this test. **USE CAUTION WHEN MEASURING RESISTANCE WITH A POWERED CIRCUIT. CONTACTING A VOLTAGE SOURCE WITH A METER IN OHMS POSITION CAN SERIOUSLY DAMAGE THE METER.
Module, KeyChoice™ Reverse Operating System (Electric PTO Clutch)

Purpose

The KeyChoice™ Reverse Operating System Module (Figure 11) works with the KeyChoice™ switch, PTO switch, and the reverse switch. It responds to the reverse switch. If the override switch (KeyChoice™ switch) is not activated and the PTO is engaged, it will stop the electric PTO clutch.

How It Works

The KeyChoice™ Reverse Operating System Module is made up of several components, such as diodes and relays. When it is connected in the circuit, voltage is applied to certain terminals of the KeyChoice™ Reverse Operating System module from the PTO switch, reverse switch, and the override switch, which energizes certain relays in the module. If voltage is not applied to proper terminals on the KeyChoice™ Reverse Operating System Module, the electric PTO clutch will stop.

Testing

The KeyChoice™ Reverse Operating System Module must be removed from the wiring harness. Using a multimeter check the following (Figure 12):

Figure 11 MVC-385X

Figure 12 NMIR Module
### Testing - No Power To Circuit (With Module Out of Circuit)

<table>
<thead>
<tr>
<th>Meter Scale</th>
<th>Meter Probe Negative</th>
<th>Meter Probe Positive</th>
<th>Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohms</td>
<td>Pin 3</td>
<td>Pin 5</td>
<td>Open (More than 100K ohms)</td>
</tr>
<tr>
<td>Diode*</td>
<td>Pin 3</td>
<td>Pin 6</td>
<td>.5 to 1 Volt</td>
</tr>
<tr>
<td>Diode*</td>
<td>Pin 3</td>
<td>Pin 1</td>
<td>.5 to 1 Volt</td>
</tr>
<tr>
<td>Diode*</td>
<td>Pin 3</td>
<td>Pin 4</td>
<td>.5 to 1 Volt</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 1</td>
<td>Pin 4</td>
<td>350 to 400 ohms</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 2</td>
<td>Pin 4</td>
<td>Open (more the 100K ohms)</td>
</tr>
</tbody>
</table>

*Note: If the multimeter does not have a diode test feature, this test can not be performed. This is not a problem if powered tests are done. Powered tests must be performed to test relays (see table below).

### Testing - Powered Circuit (With Module Out of Circuit)

<table>
<thead>
<tr>
<th>Volt Meter</th>
<th>Battery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meter Scale</td>
<td>Neg Probe</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Volts (Caution)</td>
<td>Pin 1</td>
</tr>
<tr>
<td>Volts (Caution)</td>
<td>Pin 3</td>
</tr>
</tbody>
</table>

*** Same as battery voltage

Note: A 12 volt battery is needed for this test. USE CAUTION WHEN MEASURING RESISTANCE WITH A POWERED CIRCUIT. CONTACTING A VOLTAGE SOURCE WITH A METER IN OHMS POSITION CAN SERIOUSLY DAMAGE THE METER.
Module, KeyChoice™ Reverse Operating System (Manual PTO Clutch)

Purpose

The KeyChoice™ Reverse Operating System module works with the KeyChoice™ switch, PTO switch, and the reverse switch. It responds to the reverse switch; if the override switch (KeyChoice™ switch) is not activated and the PTO is engaged, it will stop the engine (Figure 13).

How it Works

The KeyChoice™ Reverse Operating System is made up of several components, such as diodes and relays. When it is connected in the circuit, voltage is applied to certain terminals of the KeyChoice™ Reverse Operating System module from the PTO switch, reverse switch, and the override switch, which energizes certain relays in the module. If voltage is not applied to the proper terminals on the KeyChoice™ Reverse Operating System module, the engine will stop.

Testing

The KeyChoice™ Reverse Operating System module must be removed from the circuit. Using a multimeter check the following:

<table>
<thead>
<tr>
<th>Meter Scale</th>
<th>Meter Probe Negative</th>
<th>Meter Probe Positive</th>
<th>Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ohms</td>
<td>Pin 3</td>
<td>Pin 1</td>
<td>Open (more than 100k ohm)</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 3</td>
<td>Pin 2</td>
<td>350 to 450 ohms</td>
</tr>
<tr>
<td>Diode</td>
<td>Pin 3</td>
<td>Pin 4</td>
<td>0.7V to 1.0V *</td>
</tr>
<tr>
<td>Diode</td>
<td>Pin 3</td>
<td>Pin 5</td>
<td>0.7V to 1.0V *</td>
</tr>
<tr>
<td>Ohms</td>
<td>Pin 3</td>
<td>Pin 6</td>
<td>Open (more than 100k ohms)</td>
</tr>
</tbody>
</table>

* NOTE: If multimeter does not have a diode scale, this test can not be done. This is not a problem if powered tests are done. Powered test must be done to check out relays (Figure 14).

Figure 13

Figure 14

**NOTE:** Actual reading should be same as B+ applied to Pin 2.

Testing

Powered circuit test (with module out of circuit). A 12 volt battery is needed for this test. NOTE: USE CAUTION WHEN MEASURING RESISTANCE WITH A POWERED CIRCUIT. CONTACTING A VOLTAGE SOURCE WITH METER IN OHMS POSITION CAN SERIOUSLY DAMAGE THE METER.

<table>
<thead>
<tr>
<th>Ground</th>
<th>B+ (12V)</th>
<th>Meter Probe Neg.</th>
<th>Meter Probe Pos.</th>
<th>Meter Scale</th>
<th>Meter Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 3</td>
<td>Pin 4</td>
<td>Pin 3</td>
<td>Pin 1</td>
<td>Ohms</td>
<td>&lt;2 ohms</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Pin 5</td>
<td>Pin 3</td>
<td>Pin 1</td>
<td>Ohms</td>
<td>&lt;2 ohms</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Pin 2</td>
<td>Pin 3</td>
<td>Pin 1</td>
<td>Ohms</td>
<td>&lt;2 ohms</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Pin 2</td>
<td>Pin 3</td>
<td>Pin 6</td>
<td>Volts</td>
<td>12 V **</td>
</tr>
</tbody>
</table>

**NOTE:** Actual reading should be same as B+ applied to Pin 2.
Module, Low Voltage

Purpose

The illumination of the battery light on the dash indicates the battery voltage is too low. This is controlled by the low voltage module (Figure 15).

How it works

The low voltage module is a voltage comparator, checking the charge voltage from the engine regulator/rectifier system. If the charge voltage is less than 11.3 volts D.C., the low voltage module senses this and activates the indicator lamp on the dash which will light until the voltage is over 12 volts D.C.

Testing

1. Before replacing the low voltage module, test the battery to make sure it is fully charged and is in good shape.
2. Next, check the charging system of the engine; follow the procedure in the appropriate engine service manual.
3. If the battery checks out and is in good condition and the charging system checks out and is charging properly and the battery light on the dash is on, replace the low voltage module. Without specialized test equipment, it is not practical to test the low voltage module in the field.

Figure 15

Relay

Purpose

The relay is used in a variety of ways to turn circuits on and off.

How it Works

A relay is an electrically actuated switch.

1. Coil: Terminals 85 and 86 are connected to a coil. Applying 12 volts to these terminals energizes the coil turning it into an electromagnet.
2. Switch: Terminals 30, 87, and 87a are actually part of a single pole, double throw (SPDT) switch. Terminal 30 is the common lead. The switch is spring loaded so that 30 and 87a are connected when the coil is not energized. When the coil is energized, the switch is “thrown” and 30 and 87 are connected (Figure 16).

Testing

1. Disconnect the relay from the harness.
2. Verify the coil resistance between terminals 85 and 86 with a multimeter (ohms setting). Resistance should be from 70 to 90 ohms. There should be continuity between terminals 87a and 30 (Figure 17).
3. Connect multimeter (ohms setting) leads to relay terminals 30 and 87. Ground terminal 86 and apply +12 VDC to terminal 85. The relay should make and break continuity between terminals 30 and 87 as 12 VDC is applied and removed from terminal 85 (Figure 17).

4. Connect multimeter (ohms setting) leads to relay terminals 30 and 87a. Apply +12 VDC to terminal 85. With terminal 86 still grounded, the relay should break and make continuity between terminals 30 and 87a as 12 VDC is applied and removed from terminal (Figure 17).

5. Disconnect voltage and multimeter leads from relay terminals.

Sender, Fuel
(P/N 94-1716)

Purpose
This electrical component monitors the level of fuel in the tank (Figure 18).

How it Works
Located at the bottom of the fuel sender is a float. When fuel runs low in the fuel tank, the float should drop. When it reaches a certain point, the sensor’s contacts close and the low fuel light, located on the dash, lights up.

Testing
1. Disconnect the fuel sender from the wiring harness and remove from the fuel tank.

2. With a VOM set for continuity, connect to the two wire leads, hold the fuel sender upright, float in down position, and the wiring facing the top. You should have continuity.

3. Turn the fuel sender upside down, with the float up and the wires down. You should have NO continuity.
Sender, Fuel
(P/N 95-3971)

Purpose
This electrical component monitors the level of fuel in the tank (Figure 19).

How it Works
A float is attached to a pivoting lever. This lever rotates a potentiometer (a device much like the volume control on your stereo) to vary resistance. The resistance will be 25 to 200 ohms, plus or minus 20%.

Testing
1. Before removing the unit, verify that the float has not sunk. Replace the float if it is sunk.
2. Disconnect the sender unit from the wiring harness and remove from the gas tank.
3. Verify that it matches the resistance in the following table.

<table>
<thead>
<tr>
<th>Float Position</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full</td>
<td>25 ohms +/- 20%</td>
</tr>
<tr>
<td>Empty</td>
<td>200 ohms +/- 20%</td>
</tr>
</tbody>
</table>

Solenoid

Purpose
The solenoid’s purpose is simply to connect the battery to the starter motor when the ignition switch is turned to “START”. The solenoid is used to protect the ignition switch from the high current drawn by the starter motor.

How it Works
The solenoid has two primary parts. One is a coil of wire wrapped around an iron core. Whenever 12 volts is applied to the coil, it becomes a magnet. The other part is a bar type switch (Figure 20). Because it has a large contact area with the contact terminals it can easily handle the high current loads required by the starter motor.

When 12 volts is applied to the coil, it becomes an electromagnet. This quickly pulls the bar toward contacts and closes the switch. When power is removed from the coil, the spring loaded bar returns to its “normally open” position. The solenoid closes and opens the switch very quickly. This minimizes the “arching” that can damage other types of switches.

The ignition switch is protected because only a small amount of current is needed to activate the coil.

Glossary
Testing

1. Disconnect the solenoid from the wiring harness.

2. With a multimeter (ohms setting), check to ensure that terminals “c” and “d” are open (no continuity) (Figure 20).

3. Apply +12 VDC to terminal “a” and ground terminal “b”. Terminals “c” and “d” should now be closed (continuity) (Figure 20).

4. You should be able to hear the solenoid switch “click” when you make the connection.

Switch, Brake

Purpose

This double pole plunger type switch has four terminals. When the brake pedal is depressed, it completes the safety circuit for start. On tractors with cruise control, the cruise control circuit is connected to the brake switch. When the brake pedal is depressed, the switch opens and the cruise control magnet disengages.

How it Works

This double pole plunger switch has four terminals. When the brake pedal is depressed, it pushes on the plunger, closing and opening the contacts in the switch.

Testing

1. Disconnect the switch from the wiring harness.

2. Using a multimeter, follow the procedures listed below (Figure 22):

<table>
<thead>
<tr>
<th>Plunger Not Depressed</th>
<th>Plunger Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/B Terminals - Closed Circuit - Continuity</td>
<td>A/B Terminals - Open Circuit - No Continuity</td>
</tr>
<tr>
<td>C/D Terminals - Open Circuit - No Continuity</td>
<td>C/D Terminals - Closed Circuit - Continuity</td>
</tr>
</tbody>
</table>

Note: Terminals on actual switch not labeled.
Switch, Cruise Control
P/N 93-0527 and P/N 94-7602

Purpose
This rocker switch is used to provide switching for the cruise control (Figure 23 and Figure 24).

How it Works
The switch has contacts inside which connect two terminals in one position while disconnecting them in the other. There are 3 positions to the switch; OFF, START, and RUN. The start position is spring loaded so that the switch automatically returns to the “RUN” position.

Testing
1. Disconnect the switch from the wiring harness.
2. Using a VOM or test lamp, test the continuity of the terminals using the following diagrams (Figure 25 and Figure 26).

P/N 93-0527

“OFF” Position continuity between terminals 8 and 7 only

“START” Position continuity between terminals 7-8, 2-3, 5-6

“RUN” Position continuity between terminals 7-8, 2-3
Switch, Key
(P/N 88-9830 or 104-2541)

Purpose
This component provides the proper switching for the starter, ignition, accessories, and safety circuits (Figure 27).

How it Works
Detents inside the switch give it 3 positions: OFF, RUN, and START. The START position is spring loaded so the cylinder automatically returns to RUN once the key is released.
Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for the switch position. Verify that there is NO continuity between terminals not listed for the switch position (Figure 28).

Switch, Key
(P/N 99-7429)

Purpose

This switch provides the proper switching for the starter, ignition, accessories, and safety circuits (Figure 29).

How it Works

Detents inside the switch give it 3 positions: OFF, RUN, and START. The START position is spring loaded so the cylinder returns to RUN once the key is released.
Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for the switch position. Verify that there is NO continuity between terminals not listed for the switch (Figure 30).

<table>
<thead>
<tr>
<th>Position</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>+M + - M</td>
</tr>
<tr>
<td>Start</td>
<td>B + A + S</td>
</tr>
<tr>
<td>Run</td>
<td>B + A</td>
</tr>
</tbody>
</table>

Switch, Key
(P/N 92-6785)

Purpose

This component provides the proper switching for the starter, ignition, accessories, and safety circuits (Figure 31).

How It Works

Detents inside the switch give it four positions: OFF, LIGHTS (ACCESSORIES), RUN, and START. The START position is spring loaded so the cylinder automatically returns to RUN once the key is released.

Terminals of the ignition switch as viewed from the terminal end (Figure 31).

B = Battery voltage “in”
S = Starting Circuit
I = Safety & Ignition Circuit
R = Regulator Circuit
L = Light Circuit
Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for the switch position. Verify that there is **NO** continuity between terminals not listed for the switch position (Figure 32).

### Switch, KeyChoice™ Reverse Operating System

#### Purpose

This switch is used in the Key Choice™ Reverse Operating System circuit. When turned to the On position, it allows the operator to mow in reverse.

#### How It Works

The switch is basically an on/off switch spring-loaded to return to the Off position. When turned to the On position with the PTO engaged, it activates circuits in the Key Choice™ Reverse Operating System reverse module and allows the operator to mow in reverse (Figure 33).

<table>
<thead>
<tr>
<th>Position</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
<td>No Continuity</td>
</tr>
<tr>
<td>Start</td>
<td>B + I + S</td>
</tr>
<tr>
<td>Run</td>
<td>B + I + R</td>
</tr>
<tr>
<td>Run - Lights</td>
<td>B + I + R + L</td>
</tr>
</tbody>
</table>

#### Testing

1. Disconnect the switch from the circuit.

2. With a multimeter, check the continuity across the two terminals.

3. Turn the key to the on position and hold, since the switch is spring loaded. There should be continuity across the two terminals.
Switch, Light

**Purpose**
This rocker switch is typically used to provide switching for the lights (Figure 34).

**How it Works**
The switch has contacts inside which connect two terminals in one position while disconnecting the other two. The rating on the switch is 20 amp capacity at 12 volts.

**Testing**
1. Disconnect the switch from the wiring harness.
2. Using a VOM or test lamp, test the continuity of the terminals, using the diagrams below (Figure 35).

![Diagram of Switch Connections](mvc162art)
Switch, Neutral

**Purpose**

Used to ensure the transmission is in neutral when starting the unit. It is activated when the clutch/brake pedal is depressed.

**How It Works**

This single pole plunger type switch has two terminals. When the clutch/brake pedal is depressed, it pushes on the plunger, closing the contact, and connecting the two terminals (Figure 36).

![Figure 36](mvc-680)

**Testing**

1. Disconnect the switch from the wiring harness.
2. Check first to ensure that there is NO continuity between either terminal. Foot OFF the pedal.
3. With the clutch/brake pedal depressed there should be continuity between the terminals.

Switch, Neutral - Plunger Type

**Purpose**

Used to ensure the transmission is in neutral when starting the unit. It is activated when the brake pedal is depressed.

**How it Works**

This double pole plunger type switch has four terminals (Figure 37). When the brake pedal is depressed, it pulls an arm that pushes on the plunger of the switch, closing the contacts, and connecting the four terminals.

![Figure 37](MVC-400X)
Testing

1. Disconnect the switch from the wiring harness.

2. Using a multimeter, follow the procedure listed below (Figure 38):

   - Disconnect the switch from the wiring harness.
   - Using a multimeter, check for continuity between the terminals.
   - Plunger Not Depressed:
     - A/B Terminals: Open Circuit - No Continuity
     - C/D Terminals: Open Circuit - No Continuity
   - Plunger Depressed:
     - A/B Terminals: Closed Circuit - Continuity
     - C/D Terminals: Closed Circuit - Continuity

Note: Terminals on actual switch not labeled.

Switch, Neutral Adjustable - Plunger Type

Purpose

Used to ensure the transmission is in neutral and the park brake is engaged. It is activated when the forward/reverse control handles are in the start position (Figure 39).

How it Works

This single pole plunger type switch has two terminals. When the forward/reverse control handle is in the start position (park position), it pushes on the plunger, closing the contact, and connecting the terminals.

Testing

1. Disconnect the switch from the wiring harness.

2. Using a VOM or test lamp, check first to ensure that there is NO continuity between either terminal, plunger out.

3. With the plunger pushed in, there should be continuity between the terminals.
Switch, PTO

Purpose

The PTO switch is typically used to turn on the Electric PTO Clutch and to function as part of the safety interlock system.

How it Works

When the PTO switch is pulled out to the “ON” position, contacts inside the switch electrically connect various terminals. One terminal is connected to the wire that goes directly to the electric clutch. When the PTO is pulled out to the “ON” position, voltage flows to the electric clutch and engages.

Testing

1. Disengage the PTO, set the parking brake, and turn the ignition to **OFF** and remove the key.
2. Disconnect the wiring harness from the PTO switch.
3. Press in on the locking tabs, on each side of the switch, and pull the switch out of the dash (towards the rear of the tractor).
4. Verify that there is continuity between the appropriate terminals in the “ON” and “OFF” positions, Figure 40.
5. Replace the switch if your test results do not correspond with those given in Figure 40.

Mount the PTO switch back into the dash and reinstall the wiring harness.

![Testing Diagram](image-url)
Switch, Reverse

Purpose

This switch works in the Key Choice™ Reverse Operating System circuit when the mower (PTO) is engaged.

How It Works

This single pole plunger type switch has two terminals. When the unit is shifted in reverse while the mower blade (PTO engagement lever) is engaged, the reverse switch opens and will stop the engine, unless the KeyChoice switch has been operated.

Testing

1. Disconnect the switch from the wiring circuit.
2. With a multimeter, check the continuity across the terminals. There should be continuity.
3. Depress the plunger on the switch and check the continuity across the terminals, there should be NO continuity (Figure 41).

Switch, Seat

Purpose

The switch is in the safety circuit. If the engine is running and the operator vacates the seat with either PTO engaged or the parking brake off, the engine will shut down.

Testing

1. Disconnect the switch from the wiring circuit.
2. With a multimeter, check the continuity across the terminals. There should be continuity.
3. Depress the plunger on the switch and check the continuity across the terminals, there should be NO continuity (Figure 41).

Figure 41

Seat switch (ribbon type) used on 2000 and prior models (Figure 42)

Figure 42

Seat switch (mushroom type) used on 2001 and later models (Figure 43)

Figure 43
How It Works

When the seat is vacated, the switch is open and there is no continuity between the two terminals. When the seat is occupied, the switch closes and there should be continuity between the two terminals.

Testing

1. Disconnect the switch from the wiring harness.

2. With a multimeter, check the continuity between the two terminals of the switch. There should be NO continuity.

3. With weight or pressure on the seat, check the continuity again on the two terminals of the switch. There should be continuity.
Information List (2006 - 2007)

Wiring Diagrams. ......................... 4-2 & 4-3
Circuit Diagrams
  Starter Motor Circuit ..................... 4-4
  Spark Circuits .......................... 4-4 & 4-5
  Reverse Operating System Circuits. .. 4-6 - 4-10
  Battery Charge Circuit ................. 4-10
  Light Circuit ........................... 4-11
  Low Oil Pressure Light Circuit ......... 4-11
  Hourmeter .............................. 4-11
Starter Motor Circuit
(ignition switch in “start”)

Spark Circuit
(ignition switch in “start” position)
Spark Circuit

(ignition switch in “run”)
Reverse Operating System Circuit

(PTO “off”, in forward)

Dashed lines do not carry current

Legend

- Black (Bk)
- Blue (Bu)
- Brown (Bn)
- Green (Gn)
- Grey (Gy)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vio)
- White (W)
- Yellow (Y)

Circuits
Reverse Operating System Circuit
(PTO “on”, in forward)

Legend
Black Bk
Blue Bu
Brown Brn
Green Gn
Grey Gy
Orange Or
Pink Pk
Red Re
Tan T
Violet Vio
White W
Yellow Y

Circuits
Reverse Operating System Circuit
(PTO “on”, in reverse)

Legend
- Black (BK)
- Blue (BU)
- Brown (BN)
- Green (GN)
- Grey (GY)
- Orange (OR)
- Pink (PK)
- Red (RE)
- Tan (T)
- Violet (VIO)
- White (W)
- Yellow (Y)

Circuits
Reverse Operating System Circuit
(Override key switch “activated”)

Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Blu</td>
</tr>
<tr>
<td>Brown</td>
<td>Bn</td>
</tr>
<tr>
<td>Green</td>
<td>Gn</td>
</tr>
<tr>
<td>Grey</td>
<td>GY</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>
Reverse Operating System Circuit
(PTO “on”, in reverse, override mode)

Battery Charge Circuit
(ignition switch in “run”)
Low Oil Pressure Light Circuit
(ignition switch in “run”)

Hourmeter
(ignition switch in “run”)
This page intentionally left blank
Information List (2006 - 2007)

Wiring Diagram ............................. 5-2
Circuit Diagrams
  Starter Motor Circuit .................... 5-3
  Spark Circuits ........................... 5-3 & 5-4
  Battery Charge Circuit .................. 5-4
  PTO Clutch Circuit ..................... 5-4
Starter Motor Circuit
(ignition switch in “start”)

Spark Circuit
(ignition switch in “start”)

Legend
- Black (BK)
- Blue (Bu)
- Brown (Br)
- Green (Gn)
- Grey (Gr)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vo)
- White (W)
- Yellow (Y)
Spark Circuit
(ignition switch in “run”)

<table>
<thead>
<tr>
<th>Legend</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Bu</td>
</tr>
<tr>
<td>Brown</td>
<td>Br</td>
</tr>
<tr>
<td>Green</td>
<td>Gr</td>
</tr>
<tr>
<td>Grey</td>
<td>Gy</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>

Dashed lines do not carry current

Battery Charge Circuit
(ignition switch in “run”)

PTO Clutch Circuit
(ignition switch in “run”)

Demystification Guide
Information List (2006 - 2007)

Wiring Diagram ........................................ 6-2
Circuit Diagrams
  Starter Motor Circuit .............................. 6-3
  Spark Circuits ........................................ 6-3 & 6-4
  PTO Clutch Circuit ................................. 6-4
Starter Motor Circuit
(ignition switch in “start”)

Spark Circuit
(ignition switch in “start”)

Legend
Black   Bk
Blue    Bu
Brown   Br
Green   Gn
Grey    Gy
Orange  Or
Pink    Pk
Red     Re
Tan     T
Violet  Vi
White   W
Yellow  Y

Demystification Guide 6 - 3
Spark Circuit
(ignition switch in “run”)
2006 ZX480, ZX525 (Int’l), ZX525
2007 Z440 (Int’l)

Information List

(2006) ZX480, ZX525 (Int’l) ZX525
(2007) ZX440 (Int’l)

Wiring Diagram ........................................ 7-2
Circuit Diagrams
  Starter Motor Circuit .............................. 7-3
  Spark Circuits ................................. 7-3 & 7-4
  Battery Charge Circuit ..................... 7-4
  PTO Clutch Circuit ......................... 7-4

Demystification Guide 7 - 1
Wiring Diagram

WIRE COLOR CODES:
- BN: BROWN
- BU: BLUE
- GY: GRAY
- W: WHITE
- VIO: VIOLET
- R: RED
- PK: PINK
- BK: BLACK
- ORANGE
- YELLOW
- GREEN

SW1 (IGNITION)
- OFF: NO CONNECTION
- ON: IGNITION ON
- START: START

KEY SWITCH
- TERMINAL VIEW FROM BACK OF SWITCH

SW2 (PTO)
- SHOWN IN OFF POSITION

SW3 (BRAKE)
- SHOWN WITH PARK BRAKE DISENGAGED

SW4 (NEUTRAL)
- SHOWN WITH LEVER IN NEUTRAL POSITION

SW5 (NEUTRAL)
- SHOWN WITH LEVER IN NEUTRAL POSITION

K1 (KILL RELAY)

REGULATOR

FUEL SOLENOID

MAGNETO

PTO CLUTCH

TO HEADLIGHT HARNESS

BATTERY +
START
Starter Motor Circuit
(ignition switch in “start”)
Spark Circuit
(ignition switch in “run”)

Battery Charge Circuit
(ignition switch in “run”)

PTO Clutch Circuit
(ignition switch in “run”)
Information List (2006 - 2007)

Wiring Diagrams ....................... 8-2 & 8-3
Circuit Diagrams
  Starter Motor Circuit ................. 8-4
  Spark Circuits ...................... 8-4 - 8-7
  Battery Charge Circuit .............. 8-8
  Bag Full Circuit .................... 8-8
Wiring Diagram

1332-G (Int'l) 2006
G132 (Int'l) 2007

Wiring Diagram

Demystification Guide
Starter Motor Circuit  
(ignition switch in “start”)

Spark Circuit  
(ignition switch in “start”)

**Legend**
- Black (Blk)
- Blue (Bu)
- Brown (Brn)
- Green (Gn)
- Grey (Gry)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vio)
- White (W)
- Yellow (Y)
Spark Circuit
(in reverse, PTO “on”)

Legend
- Black (Bk)
- Blue (Bu)
- Brown (Br)
- Green (Gn)
- Grey (Gy)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vo)
- White (W)
- Yellow (Y)

Spark Circuit
(in reverse, override key switch activated)
Spark Circuit
(in reverse, PTO “on”, override mode)

Legend
Black Bk
Blue Bl
Brown Br
Green Gr
Grey GY
Orange Or
Pink Pk
Red Re
Tan T
Violet Vio
White W
Yellow Y

Circuits
Battery Charge Circuit

Bag Full Circuit
(ignition switch in “run”)

Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Bu</td>
</tr>
<tr>
<td>Brown</td>
<td>Br</td>
</tr>
<tr>
<td>Green</td>
<td>Gr</td>
</tr>
<tr>
<td>Grey</td>
<td>Gv</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vl</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>
Information List (2006 - 2007)

Wiring Diagrams ...................... 9-2 & 9-3
Circuit Diagrams
  Starter Motor Circuit ................. 9-4
  Spark Circuits ...................... 9-4 - 9-7
  Battery Charge Circuit .............. 9-7
  Bag Full Circuit .................... 9-8
Wiring Diagram

1332-H (Int'l) 2006 2007

Wiring Diagram

Demystification Guide
Starter Motor Circuit
(ignition switch in “start”)

Spark Circuit
(ignition switch in “start”)

Legend
Black  Blk
Blue   Bu
Brown  Brn
Green  Grn
Gray   Gry
Orange Or
Pink   Pnk
Red    Re
Tan    T
Violet Vio
White  W
Yellow Y
2006 1332-H Int’l)
2007 H132 (Int’l)

Spark Circuit
(ignition switch in “run”)

Dashed lines do not carry current

Legend
Black Bk
Blue Bl
Brown Brn
Green Grn
Grey GY
Orange Or
Pink Pk
Red Re
Tan T
Violet Vio
White W
Yellow Y
Spark Circuit
(in reverse, PTO “on”)

Spark Circuit
(in reverse, override key switch activated)
Spark Circuit
(in reverse, PTO “on”, override mode)

Battery Charge Circuit

Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Bu</td>
</tr>
<tr>
<td>Brown</td>
<td>Br</td>
</tr>
<tr>
<td>Green</td>
<td>Gr</td>
</tr>
<tr>
<td>Grey</td>
<td>Gy</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>
Bag Full Circuit
(ignition switch in “run”)

Legend

Black  Bk
Blue    Bu
Brown   Ln
Green   Gn
Grey    Gy
Orange  Or
Pink    Pk
Red     Re
Tan     T
Violet  Vio
White   W
Yellow  Y

Circuits
Information List (2006 - 2007)

Wiring Diagrams . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10-2 & 10-3
Circuit Diagrams
  Starter Motor Circuit . . . . . . . . . . . . . . . . . . . . . . . . . 10-4
  Spark Circuits . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10-4 & 10-5
  Reverse Operating System Circuits . . . . . . . . . . . . . . . . . . 10-6 - 10-10
  Charging Circuit . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10-10
  Light Circuit . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10-11
  Hourmeter Circuit . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10-11
  Bag Full Circuit . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10-11
Wiring Diagram
Starter Motor Circuit
(activation switch in “start”)
Spark Circuit
(ignition switch in “run”)

Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bl</td>
</tr>
<tr>
<td>Blue</td>
<td>Bu</td>
</tr>
<tr>
<td>Brown</td>
<td>Br</td>
</tr>
<tr>
<td>Green</td>
<td>Gn</td>
</tr>
<tr>
<td>Grey</td>
<td>GY</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>

Circuits
Reverse Operating System Circuit

(PTO “off”, in forward)

Dashed lines do not carry current

Legend

Black  Bk
Blue    Bu
Brown   Bn
Green   Gn
Grey    Gy
Orange  Or
Pink    Pk
Red     Re
Tan     T
Violet  Vio
White   W
Yellow  Y
Reverse Operating System Circuit

(PTO “on”, in forward)

Legend

- Black (Bl)
- Blue (Bu)
- Brown (Bn)
- Green (Gr)
- Grey (Gy)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vio)
- White (W)
- Yellow (Y)
Reverse Operating System Circuit
(PTO “on”, in reverse)

Legend
Black  Bk
Blue   Bu
Brown  Bn
Green  Gn
Grey   Gy
Orange Or
Pink   Pk
Red    Re
Tan    T
Violet Vio
White  W
Yellow Y

Circuits
Reverse Operating System Circuit

(Override key switch “activated”)

Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Blu</td>
</tr>
<tr>
<td>Brown</td>
<td>Bn</td>
</tr>
<tr>
<td>Green</td>
<td>Gn</td>
</tr>
<tr>
<td>Grey</td>
<td>Gy</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>

Dashed lines do not carry current
Reverse Operating System Circuit
(PTO “on”, in reverse, override mode)

Charging Circuit
(ignition switch in “run”)

Legend
Black Bk
Blue Bu
Brown Bn
Green Gn
Grey Gy
Orange Or
Pink Pk
Red Re
Tan T
Violet Vio
White W
Yellow Y

Diagram showing the circuit connections for reverse operating system and charging system.
2006 170-D (Int’l), 150-D (Int’l)
2007 DH210 (Int’l), DH210

Light Circuit
(ignition switch in “run/lights”)

Hourmeter Circuit
(ignition switch in “run”)

Bag Full Circuit
(ignition switch in “run”)

Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Bu</td>
</tr>
<tr>
<td>Brown</td>
<td>Bn</td>
</tr>
<tr>
<td>Green</td>
<td>Gn</td>
</tr>
<tr>
<td>Grey</td>
<td>Gy</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>

Circuits
This page intentionally left blank
Information List (2006 - 2007)

Wiring Diagram . . . . . . . . . . . . . . . . . . . 11-2 & 11-3
Circuit Diagrams
  Starter Motor Circuit . . . . . . . . . . . . . . . . 11-4
  Spark Circuits . . . . . . . . . . . . . . . . . . . . 11-4
  Reverse Operating System Circuits . . 11-6 - 11-10
  Charging Circuit . . . . . . . . . . . . . . . . . . . 11-10
  Light Circuit . . . . . . . . . . . . . . . . . . . . 11-11
  Hourmeter Circuit . . . . . . . . . . . . . . . . . 11-11
  Bag Full Circuit . . . . . . . . . . . . . . . . . . 11-11
  Cruise Control Circuit . . . . . . . . . . . . . . 11-12
2006 190-D (Int’l)
2007 DH220 (Int’l)

Starter Motor Circuit
(ignition switch in “start”)

Spark Circuit
(ignition switch in “start” position)
Demystification Guide

2006 190-D (Int'l)
2007 DH220 (Int'l)

Spark Circuit
(ignition switch in "run")

Legend

- Black (Bl)
- Blue (Bu)
- Brown (Bn)
- Green (Gn)
- Grey (Gr)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vio)
- White (W)
- Yellow (Y)

Dashed lines do not carry current

Circuits
Reverse Operating System Circuit
*(PTO “off”, in forward)*

Dashed lines do not carry current

- **Legend**
  - Black: Bk
  - Blue: Bu
  - Brown: Br
  - Green: Gr
  - Grey: Gy
  - Orange: Or
  - Pink: Pk
  - Red: Re
  - Tan: T
  - Violet: Vio
  - White: W
  - Yellow: Y

- **Circuits**
2006 190-D (Int’l)
2007 DH220 (Int’l)

Reverse Operating System Circuit
*(PTO “on”, in forward)*

### Legend

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Bk</td>
</tr>
<tr>
<td>Blue</td>
<td>Bu</td>
</tr>
<tr>
<td>Brown</td>
<td>Bn</td>
</tr>
<tr>
<td>Green</td>
<td>Gn</td>
</tr>
<tr>
<td>Grey</td>
<td>Gy</td>
</tr>
<tr>
<td>Orange</td>
<td>Or</td>
</tr>
<tr>
<td>Pink</td>
<td>Pk</td>
</tr>
<tr>
<td>Red</td>
<td>Re</td>
</tr>
<tr>
<td>Tan</td>
<td>T</td>
</tr>
<tr>
<td>Violet</td>
<td>Vio</td>
</tr>
<tr>
<td>White</td>
<td>W</td>
</tr>
<tr>
<td>Yellow</td>
<td>Y</td>
</tr>
</tbody>
</table>

Circuits
Reverse Operating System Circuit
(PTO “on”, in reverse)

Legend
- Black (Bk)
- Blue (Bu)
- Brown (Br)
- Green (Gn)
- Grey (Gy)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vio)
- White (W)
- Yellow (Y)

Circuits
Reverse Operating System Circuit
(Override key switch “activated”)

Legend
- Black Bk
- Blue Bu
- Brown Br
- Green Gn
- Grey Gy
- Orange Or
- Pink Pk
- Red Re
- Tan T
- Violet Vio
- White W
- Yellow Y

Circuits
Reverse Operating System Circuit
*(PTO “on”, in reverse, override mode)*

Charging Circuit
*(ignition switch in “run”)*

Legend:
- Black: Bk
- Blue: Blu
- Brown: Bn
- Green: Gn
- Grey: Gy
- Orange: Or
- Pink: Pk
- Red: Re
- Tan: T
- Violet: Vio
- White: W
- Yellow: Y
Light Circuit

Hourmeter Circuit

Bag Full Circuit

Legend
- Black (Bk)
- Blue (Bl)
- Brown (Br)
- Green (Gn)
- Grey (Gy)
- Orange (Or)
- Pink (Pk)
- Red (Re)
- Tan (T)
- Violet (Vio)
- White (W)
- Yellow (Y)
Cruise Control Circuit
(ignition switch in “run”)

Legend
Black  Bk
Blue   Bu
Brown  Bn
Green  Gn
Grey   GY
Orange Or
Pink   Pk
Red    Re
Tan    T
Violet Vo
White  W
Yellow Y
Information List (2007)

Wiring Diagram. ........................................... 12-2
Circuit Diagrams
  Starter Motor Circuit ................................. 12-3
  Spark Circuits .................................................. 12-4 & 12-5
  PTO Circuits ...................................................... 12-6
  Charging Circuit ................................................ 12-6
Wiring Diagram

Starter Motor Circuit
(ignition switch in “start”)

- Battery
- Fuse (30 amp)
- Ignition Switch (in start)
- PTO Switch (PTO off)
- Brake Switch (brake on)
- Brake Switch (brake on)
- Kill Relay (energized)
- Fuel Solenoid (energized)
- Starter Motor (energized)
- Starter Solenoid (energized)
Spark Circuit
(ignition switch in “start”)

Battery
Fuse (30 amp)
Ignition Switch (in start)
PTO Switch (PTO off)
Brake Switch (brake on)
Brake Switch (brake on)
Kill Relay (energized)
Fuel Solenoid (energized)

Dashed lines do not carry current
Spark Circuit
(ignition switch in “run”)

Dashed lines do not carry current
PTO Clutch Circuit
*(ignition switch in “run”)*

Battery → Fuse (30 amp) → Ignition Switch (in run) → PTO Switch (PTO on) → PTO Clutch (energized)

Battery Charge Circuit
*(ignition switch in “run”)*

Alternator → Voltage Regulator → Fuse (25 amp) → Ignition Switch (in run) → Fuse (30 amp) → Battery
Information List (2007)

Wiring Diagram ............................................. 13-2
Circuit Diagrams
   Starter Motor Circuit ................................. 13-3
   Spark Circuits ....................................... 13-4 & 13-5
   PTO Circuits ......................................... 13-6
   Charging Circuit .................................... 13-6
Wiring Diagram

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>Black</td>
</tr>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>GN</td>
<td>Green</td>
</tr>
<tr>
<td>GY</td>
<td>Grey</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>PK</td>
<td>Pink</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>T</td>
<td>Tan</td>
</tr>
<tr>
<td>VIO</td>
<td>Violet</td>
</tr>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>YY</td>
<td>Yellow</td>
</tr>
</tbody>
</table>

SW2 (PTO)

- PTO CLUTCH
- SHOWN IN OFF POSITION

SW3 (RH BRAKE)

- SHOWN WITH PARK BRAKE DISENGAGED

SW4 (SEAT)

- SHOWN WITH OPERATOR IN SEAT

TAP TERMINAL VIEW FROM BACK OF SWITCH

- 25A
- 30A

KEY SWITCH PN 88-9830

- OFF NO CONNECTION
- ON BA AND XY

TERMINAL VIEW FROM BACK OF SWITCH

- KEY SW

SPARK PLUG

- IGNITION MODULES

STARTER

- MAG

FUEL SOLENOID

- 30A F1
- 25A F2

SWITCH PN 88-9830

- KEY SW

Demystification Guide
Starter Motor Circuit
(ignition switch in “start”)
Spark Circuit
(ignition switch in “start”)
Spark Circuit
(ignition switch in “run”)

Dashed lines do not carry current

Battery
Fuse (30 amp)
Ignition Switch
(in run)

Seal Switch
(operator on)

Kill Relay
(energized)

Fuel Solenoid
(energized)
PTO Clutch Circuit
*(ignition switch in “run”)*

Battery Charge Circuit
*(ignition switch in “run”)*
Information List (2007)

Wiring Diagram .................................................. 14-2
Circuit Diagrams
  Starter Motor Circuit .......................................... 14-3
  Spark Circuits ................................................. 14-4 & 14-5
  PTO Circuits .................................................... 14-6
  Charging Circuit ............................................... 14-6
Wiring Diagram

WIRE COLOR CODES
- GND: BLACK
- BN: BROWN
- BU: BLUE
- GN: GREEN
- GY: GREY
- OR: ORANGE
- PK: PINK
- R: RED
- BU: BLUE
- T: TAN
- VIO: VIOLET
- W: WHITE
- Y: YELLOW

KEY SWITCH PN 88-9830
- OFF: NO CONNECTION
- ON: START
- START: BIA AND XY
- BIA: START
- XY: KEY SW

TERMINAL VIEW FROM BACK OF SWITCH

SW1 (IGNITION)
- 1: JS
- 2: JS
- 3: JS
- 4: JS
- 5: JS
- 6: JS

SW2 (PTO)
- BN: OR
- PK: OR

SW3 (RH BRAKE)
- GY: OR

SW4 (SEAT)
- BU: OR

SW5 (PTO)
- BN: OR

PTO CLUTCH
- BN: OR

SPARK PLUG
- MAG: AC
- REG: AC

STARTER
- STARTER SOLENOID

FUEL SOLENOID

K1 (KILL RELAY)
- GW: OR
- GND: OR
Starter Motor Circuit
(ignition switch in “start”)

Wiring Diagram

Demystification Guide
Spark Circuit
*(ignition switch in “start”)*

Dashed lines do not carry current
Spark Circuit
(ignition switch in “run”)
PTO Clutch Circuit
*(ignition switch in “run”)*

Battery → Fuse (30 amp) → Ignition Switch (in run) → PTO Switch (PTO on) → PTO Clutch (energized) → Battery

Battery Charge Circuit
*(ignition switch in “run”)*

Alternator → Voltage Regulator → Fuse (25 amp) → Ignition Switch (in run) → Fuse (30 amp) → Battery
<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of contents</td>
<td>15-1</td>
</tr>
<tr>
<td>Time Savers</td>
<td>16-1</td>
</tr>
<tr>
<td>Glossary</td>
<td>17-1</td>
</tr>
<tr>
<td>(2006) LX420 / LX460</td>
<td>18-1</td>
</tr>
<tr>
<td>(2007) LX425 / LX465</td>
<td>18-1</td>
</tr>
<tr>
<td>(2006) LX500 / GT2100 / GT2200 / GT2300</td>
<td>19-1</td>
</tr>
<tr>
<td>(2007)</td>
<td></td>
</tr>
</tbody>
</table>
This page intentionally left blank
Table of contents

Using this manual ........................................................ 16-2
Using a VOM ........................................................... 16-7
Troubleshooting ......................................................... 16-9
Demystification Glossary

The components are listed alphabetically by noun, followed by any adjectives. If you have trouble finding a component, use the Table of Contents at the front of the Glossary section.

These three sections should be all you need to diagnose problems on individual components.

Solenoid, Starter

Purpose

The solenoid’s purpose is simply to connect the battery to the starter motor when the ignition switch is turned to “START”. The solenoid is used to protect the ignition switch from the high current drawn by the starter motor.

How it Works

The solenoid has two primary parts. One is a coil of wire wrapped around an iron core. Whenever 12 volts is applied to the coil, it becomes a magnet. The other part is a bar type switch (Figure 9). Because it has a large contact area with the contact terminals it can easily handle the high current loads required by the starter motor.

When 12 volts is applied to the coil, it becomes an electromagnet. This quickly pulls the bar toward contacts and closes the switch. When power is removed from the coil, the spring loaded bar returns to its “normally open” position. The solenoid closes and opens the switch very quickly. This minimizes the “arcing” that can damage other types of switches.

The ignition switch is protected because only a small amount of current is needed to activate the coil.

Testing

1. Disconnect the solenoid from the wiring harness.

2. With a multimeter (ohms setting), check to ensure that terminals “c” and “d” are open (no continuity) (Figure 10).

3. Apply +12 VDC to terminal “a” and ground mounting tab “b”. Terminals “c” and “d” should now be closed (continuity) (Figure 10).

4. You should be able to hear the solenoid switch “click” when you make the connection.
Each product series has its own section including:
- Info List
- Wiring Diagrams
- Circuit Diagrams

Image helps you quickly identify product sections.

LX420 Information List (2006)
LX460 Information List (2006)

Wiring Diagram.......................... 3 - 2
Circuit Diagrams
  Starter Motor Circuit ................. 3 - 4
  Spark Circuits ....................... 3 - 5 - 3 - 12

The "Info List" is the first page of each product section.

Each product section has its own "Table of Contents" to keep things simple.
Using this Manual

Each product section includes the original wiring diagram.

Wiring Diagram

The wiring diagrams are drawn on a two page spread to make them easier to read. The arrows show the connection point.
2006  LX420, LX460

Wiring Diagram

Wire Color Codes

<table>
<thead>
<tr>
<th>BN</th>
<th>BROWN</th>
<th>PK</th>
<th>PINK</th>
<th>OR/BK</th>
<th>ORANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BU</td>
<td>BLUE</td>
<td>BK</td>
<td>BLACK</td>
<td>OR/W</td>
<td>WHITE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
<td>Y</td>
<td>YELLOW</td>
<td>Y/W</td>
<td>YELLOW</td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
<td>GN</td>
<td>GREEN</td>
<td>R/W</td>
<td>RED</td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
<td>OR</td>
<td>ORANGE</td>
<td>R/BK</td>
<td>RED</td>
</tr>
</tbody>
</table>

The wiring diagram closely represents the wiring harness and is very useful in diagnosing short circuits.
Demystification Guide

Circuits

Each circuit is shown individually. Components not essential for circuit function are not shown.

Additional information is called out beneath the title in parenthesis.

Circuits are drawn such that current usually flows from left to right (the same way you read).

Each component is named and additional information is supplied below in parentheses.

Wire colors are called out at each component (where you're most likely to use them!)

Each component (i.e. switches, relays, solenoids) are drawn in the position necessary to make the circuit function.

Circuit diagrams make troubleshooting easy and fun because each circuit is drawn individually. They make troubleshooting open circuits a snap.
1 Checking Voltage

Always start by selecting the proper scale. For instance, on this meter, we selected the 25 volt scale.

Use the AC scales to measure unrectified voltage straight from an alternator or from a wall cellist.

Battery voltage is always D.C.

2 Checking Resistance

The ohmmeter is powered by an internal battery. Replace it if the needle will not move full scale.

Make sure your VOM reads 0 ohms (full scale right) when the leads are touching together to ensure accurate resistance readings.

Always disconnect components from the circuit when resistance checking. Otherwise you could get a false reading. This switch should read infinite (∞) resistance.

Do not use the ohmmeter to test Toro interlock modules! The battery current could damage the module.
TIME SAVERS

What about checking current?

3

Using a VOM

Many ammeters can measure only .1 amp. The current in Toro riding products generally is from 3-90 amps. Make sure your VOM can measure these higher currents.
Sample Problem: GT2100 electric clutch will not engage

TIP: DON'T DISCONNECT ANY WIRES! When checking for voltage you need only touch the terminals. (disconnect components when checking resistance.)

1. Test for voltage across the PTO clutch coil by connecting the Pos. lead to the blue/white wire and the Neg. lead to the white wire. Bat. voltage - check clutch coil resistance. No voltage step-2.


Sample Problem: LX420 will not crank

TIP: Use test points to divide circuit in half.

1. Test point “a” for voltage. Voltage is 12V. Problem is right half of circuit. Proceed to point “b”.

2. Test point “b” voltage reads 0V. Problem is between “a” and “b”. Proceed to point “c”.

3. Test point “c” Voltage is 12V. Problem is between “c” and “b”. Proceed to Point “d”.

4. Test point “d” Voltage is 0V. You disconnect the PTO switch and find it to be defective.

Quick check: does solenoid “click” when key is turned to start? If yes, you can eliminate circuit from fuse to solenoid coil.
Sample Problem: This GT tractor won’t turn over. The customer parked it in the garage and turned it off. When he tried to start it a week later, he heard one click. After that, nothing would happen when he turned the key.

We know it’s a short because we found the 20 amp fuse blown.

**Step 1. Interview the customer.** Any information we get will help isolate the problem.

**Highlight the suspect area on a copy of the wiring diagram.**

**Eliminate the green wires as possibilities because they’re supposed to go to ground.**
Step 2. Isolate the suspect area. Notice what we did to the wiring diagram below.

If the short was between the battery and the 20 amp fuse, we would have melted these wires.
Step 3. Break the suspect area down into “mini-circuits”. Do this by unplugging unswitched circuits and by opening all Switches.

Open the ignition switch by turning it “off”.

Separate the connector for the lights since this is an unswitched circuit.

Open the suspect part of the brake switch by releasing the brake.
Remove the connector from the PTO switch to open both suspect circuits.
Step 4. Power up the mini-circuits one at a time, beginning with the one closest to the battery.

When the ignition switch is turned to “normal”, the 20 amp fuse doesn’t blow. This means the red wires are OK.

Next, turn the ignition switch to “start”. This powers up the orange, orange/black, and orange/white wires. The fuse doesn’t blow so these wires are OK.

Close the suspect part of the brake switch by applying the brake.
Troubleshooting

WIRE COLOR CODES

- BN BROWN
- BU BLUE
- GY GRAY
- W WHITE
- PUR PURPLE
- R RED
- OR ORANGE
- Y YELLOW
- W WHITE
- PK PINK
- BK BLACK
- GRAY
- WHITE
- PURPLE
- RED
- PINK
- BLACK
- TAN
- GREEN
- ORANGE
- WIRE COLOR CODES

Install a new 20 amp fuse. This “powers up” the red/white wire to the ignition switch. The fuse doesn’t blow, so this wire is OK.

Install the connector to the PTO switch, leave the switch in the “off” position.

Install a new 20 amp fuse. This “powers up” the red/white wire to the ignition switch. The fuse doesn’t blow, so this wire is OK.

Install the connector to the PTO switch, leave the switch in the “off” position.
Troubleshooting

Leave the ignition switch in the “normal” position.

Reconnect the light circuit, the fuse doesn’t blow so this circuit is OK.

Separate the plug at the electric clutch and check the blue/white wire for continuity to ground. We find there is continuity.

Tracing the blue/white wire we find that it is pinched in the chassis. Problem solved!

Reconnect the light circuit, the fuse doesn’t blow so this circuit is OK.
The fuse immediately blows! We’ve isolated the problem to the PTO switch, the blue/white wire, and the electric clutch.

Disconnect the PTO switch from the circuit and check its terminals for continuity to ground. It checks out OK.

Close the PTO switch by pulling it to the “on” position.
# Glossary

## Table Of Contents

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clutch, Electric PTO</td>
<td>17-3</td>
</tr>
<tr>
<td>Fuse</td>
<td>17-4</td>
</tr>
<tr>
<td>RMC Module</td>
<td>17-5</td>
</tr>
<tr>
<td>Relay (Electric PTO)</td>
<td>17-10</td>
</tr>
<tr>
<td>Solenoid, Starter</td>
<td>17-11</td>
</tr>
<tr>
<td>Switch, Brake</td>
<td>17-12</td>
</tr>
<tr>
<td>Switch, Parking Brake (Manual PTO)</td>
<td>17-13</td>
</tr>
<tr>
<td>Switch, Key</td>
<td>17-14</td>
</tr>
<tr>
<td>Switch, Reverse</td>
<td>17-14</td>
</tr>
<tr>
<td>Switch, Seat (Electric PTO Clutch)</td>
<td>17-15</td>
</tr>
<tr>
<td>Switch, Seat (Manual PTO Clutch)</td>
<td>17-16</td>
</tr>
<tr>
<td>Switch, PTO (Electric PTO)</td>
<td>17-16</td>
</tr>
<tr>
<td>Switch, PTO (Manual PTO)</td>
<td>17-17</td>
</tr>
<tr>
<td>Systems Indicator Monitor / Hourmeter</td>
<td>17-18</td>
</tr>
</tbody>
</table>
**Clutch, Electric PTO**

**Purpose**

This clutch electrically controls the engagement and disengagement of the Power Take Off (PTO) pulley.

**How It Works**

The PTO clutch is composed of three major components: the field, the clutch plate, and the friction plate. The clutch plate always turns with the engine. The field is a coil of wire on an iron core, which becomes an electromagnet when power is applied. The friction plate can slide up and down on the crankshaft axis. It is normally spring loaded so that it is not in contact with the clutch plate and is pressed against the brake material opposite the clutch. When power is applied, the friction plate is drawn toward the clutch plate and the two rotate as one.

**Testing**

If the electric PTO clutch is not engaging or is suspected as a cause of electrical problems, use the troubleshooting steps. These procedures will help you determine if the clutch has failed or is the cause of the electrical problem.

**Coil Resistance Measurement**

1. Disengage the PTO, set the parking brake, turn the ignition key to OFF and remove the key.
2. Disconnect clutch wire connector.
3. Set the multimeter or volt/ohm meter to check resistance (ohms).

4. Connect the meter lead wires to the wires in the clutch connector (Figure 1).

5. The meter should read 2.84 ohms plus or minus 5%. If the reading is above or below these readings, the field has failed and needs to be replaced. If the reading is within these limits, measure the clutch current draw.

**Measuring Clutch Current Draw**

1. Disengage the PTO, set the parking brake, and turn the ignition to OFF.
2. Disconnect the clutch wire connector.
3. Set the multimeter to check amps (10 amp scale).
4. Connect the positive meter lead to the tractor terminal (1) of the clutch wire, (Figure 2).
5. Connect the negative meter lead to the corresponding wire terminal (3), (Figure 2).
6. Connect a short jumper lead from terminal (2) to (4), (Figure 2).
7. Turn the ignition switch to the “RUN” position and the PTO switch to the “ON” position.
8. If the meter reading is 3.5 amps or above, the system is functioning properly. If the meter reading is below 3.5 amps, check the electrical system for problems (i.e., the battery, ignition switch, PTO switch, or wiring harness may be malfunctioning).
The clutch should be burnished as part of the pre-delivery service, or whenever a new clutch is installed. Burnishing polishes the clutch plate, allowing for smooth clutch engagement.

With a PTO driven attachment installed (i.e., mower, snowthrower, or tiller), run the engine at half throttle. Engage and disengage the clutch 5 times (10 seconds on/10 off).

The 20 amp fuse is located at the right side of the fuel tank. It is wired in series between the battery positive terminal and the “B” terminal of the ignition switch (Figure 3).

Fuses are electrical safety valves that protect wiring and electrical components from damage from high current flow by creating an open circuit.

Fuses are rated for a specific current flow (amps).

Never connect a jumper wire across a fuse. Never connect additional fuses in parallel.

Always use the proper fuse. Always find and correct the reason for a blown fuse.
Testing

A blade type fuse may be checked visually. If the loop (A) is open, the fuse is blown. If in doubt, the fuse may also be tested with an ohmmeter (Figure 4).

RMC Module

This interlock feature is provided to prevent unintentional engine-powered attachment operation in reverse. If the tractor is shifted into reverse while the mower blade or other Power Take Off (PTO) driven attachment is engaged, the electric clutch will disengage or the engine will stop, depending on the model. **DO NOT MOW WHILE BACKING UP UNLESS ABSOLUTELY NECESSARY.** If you need to mow while in reverse or use other PTO drive attachments (such as a snowthrower), this interlock feature may be temporarily deactivated.

Before deactivating this feature, be sure there are no children present on or near property where you are using the tractor and that are likely to appear while you are mowing or operating an attachment. Be extra observant after you have chosen to deactivate the interlock feature because the sound of the tractor’s engine might prevent you from being aware that a child or bystander has entered the area where you are operating the tractor.

Once you are sure you can safely mow in reverse or operate an attachment, deactivate the reverse operating system by turning the key switch, to the reverse caution position, which arms the module, then depressing the reverse push button. A red light to the left of the push button comes on indicating that the PTO will remain engaged with the transmission in reverse. Once activated it stays in this mode **WITH YOUR MOWER BLADE OR ATTACHMENT OPERATING WHENEVER YOU BACK-UP**, and the dash light stays on until the key switch is placed in the normal mowing or stop position, or the operator leaves the seat.
Location

The RMC module is located on the back of the instrument panel in the same housing as the keyswitch (Figure 5).

Systems:

There are two different “shutdown” systems used in the Reverse Operating System. One system is used with the electric (PTO) clutch - when the tractor is shifted to reverse while the mower blade or other PTO driven attachment is engaged the electric clutch will disengage. The other system is used with the manual (PTO) clutch - when the tractor is shifted to reverse while the mower blade or other PTO driven attachment is engaged, the engine will stop.

How It Works

On units equipped with manual PTO clutch

The reverse switch is wired in series between the module and ground. When the Module is not activated (indicator light off) the reverse and magneto terminals of the module are connected together. If the shift lever is placed in reverse, the magneto is connected to ground through the PTO switch, RMC module, and reverse switch, shutting down the engine. Pressing the reverse push button (Figure 6) with the key switch in the reverse caution position activates the reverse caution mode (indicator light on). This disconnects the reverse switch terminal from the magneto, allowing the engine to continue run in reverse.

On units equipped with electric PTO clutch

The reverse switch is connected in series between module and ground. When the Module is not activated (indicator light off) the switch is internally connected to the E-PTO terminal. If the shift lever is placed in reverse, the relay coil is connected to ground through the RMC module and reverse switch, energizing the relay. This opens the normally closed contacts removing the ground from the electric clutch, causing it to disengage. The normally open contacts are now closed, providing a second ground path to the coil through the PTO switch, keeping the relay energized. This prevents re-engagement of the electric clutch until PTO is cycled off.

Pressing the reverse push button (Figure 6) with the key switch in the reverse caution position activates the reverse caution mode (indicator light on), disconnecting the reverse switch terminal from the E-PTO terminal, allowing the electric clutch to remain engaged.

Testing

Testing the RMC system – Manual PTO - keyswitch in “Normal”

1. Start the engine; place the keyswitch in the normal position.
2. With the seat occupied, place the PTO lever in the “on” position.
3. With the brake applied, move the shift lever to the reverse position.
4. The engine should shut down.
Testing the RMC system – Manual PTO - keyswitch in “Reverse Caution” Unactivated (Indicator light off)

1. Start the engine; place the keyswitch in the reverse caution position.
2. With the seat occupied, place the PTO lever in the “on” position.
3. With the brake applied, move the shift lever to the reverse position.
4. The engine should shut down.

Testing the RMC system – Manual PTO - keyswitch in “Reverse Caution” Activated (Indicator light on)

1. Start the engine; place the keyswitch in the reverse caution position.
2. Press the reverse push button.
3. With the seat occupied, place the PTO lever in the “on” position.
4. With the brake applied, move the shift lever to the reverse position.
5. The engine should continue to run.

Testing the RMC system – Electric PTO - keyswitch in “Normal”

1. Start the engine; place the keyswitch in the normal position.
2. With the seat occupied, pull the PTO switch to the “on” position.
3. With the brake applied, move the shift lever to the reverse position.
4. The electric clutch should disengage.
5. Place the shift lever in forward.
6. The electric clutch should remain disengaged.
7. Cycle the PTO switch off and on.
8. The electric clutch should re-engage.

1. Start the engine; place the keyswitch in the reverse caution position.
2. With the seat occupied, pull the PTO switch to the “on” position.
3. With the brake applied, move the shift lever to the reverse position.
4. The electric clutch should disengage.
5. Place the shift lever in forward.
6. The electric clutch should remain disengaged.
7. Cycle the PTO switch off and on.
8. The electric clutch should re-engage.

Demystification Glossary
Testing the RMC module

It is not practical to test the RMC module directly. If the RMC system is not functioning as described above, it will be necessary to test the inputs to, and outputs from, the module. If the inputs are correct but the outputs are not, replace the module.

Note: Be sure the battery is fully charged before testing.

Electric PTO Clutch

Symptom:

The electric clutch does not disengage when shifting into reverse with the reverse caution mode not activated.

OR

The electric clutch does not disengage when the operator leaves the seat with the PTO on.

Connect an ohmmeter between the E-PTO terminal at the module (yellow/black wire) and ground. With the key in the “ON” or “Reverse Caution” position, PTO switch on, and the seat occupied the meter should show continuity when the shift lever is placed in reverse, or the operator gets out of the seat.

a) Continuity: the module is OK, check the relay or associated wiring.

b) No continuity: Remove the connector from the module (Figure 7). Using a multimeter check the electrical circuits for the conditions listed in the table below.

If the circuit conditions are met, replace the module.

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Wire Color</th>
<th>Connected to</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - (E-PTO)</td>
<td>Yellow/Black</td>
<td>Relay coil, PTO switch</td>
<td>RMC module output, provides ground to relay</td>
</tr>
<tr>
<td>B - (A1 Power)</td>
<td>Red</td>
<td>A1 term of keyswitch</td>
<td>B+ w/ key in “normal” or “Rev. Caution”</td>
</tr>
<tr>
<td>C - (Seat Sw)</td>
<td>Yellow</td>
<td>Seat switch</td>
<td>Ground operator on Open operator off</td>
</tr>
<tr>
<td>D - (Reverse Sw)</td>
<td>Red/Black</td>
<td>Reverse switch</td>
<td>Ground in reverse Open in forward</td>
</tr>
<tr>
<td>E - (Ground)</td>
<td>Green</td>
<td>Chassis</td>
<td>Connected to ground</td>
</tr>
<tr>
<td>F - (A2 Power)</td>
<td>Purple</td>
<td>A2 Term. of keyswitch</td>
<td>Ground in Rev. Caution Open otherwise</td>
</tr>
</tbody>
</table>
Manual PTO Clutch

Symptom:

The engine does not shut down when shifting into reverse when the reverse caution mode is not activated.

OR

The engine does not shut down when the operator leaves the seat with the PTO on.

Connect an ohmmeter between the magneto terminal (yellow/black wire) at the module and ground. With the key in the “ON” or “Reverse Caution” position, PTO engaged, and the seat occupied the meter should show continuity when the shift lever is placed in reverse, or the operator gets out of the seat.

a) Continuity: the module is OK, check the associated wiring.

b) No continuity: Remove the connector from the module (Figure 8). Using a multimeter check the electrical circuits for the conditions listed in the table below.

If the circuit conditions are met, replace the module.

### Circuit Testing - Manual PTO

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Wire Color</th>
<th>Connected to</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - (Magneto)</td>
<td>Yellow/Black</td>
<td>Seat Switch</td>
<td>RMC module output, provides ground to magneto through PTO switch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PTO switch</td>
<td></td>
</tr>
<tr>
<td>B - (A1 Power)</td>
<td>Red</td>
<td>A1 term of keyswitch</td>
<td>B+ w/ key in “normal” or “Rev. Caution”</td>
</tr>
<tr>
<td>C - (Park Sw)</td>
<td>Yellow/White</td>
<td>Park switch</td>
<td>Ground Park brake latched</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Open Brake off</td>
</tr>
<tr>
<td>D - (Reverse Sw)</td>
<td>Red/Black</td>
<td>Reverse switch</td>
<td>Ground in reverse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Open in forward</td>
</tr>
<tr>
<td>E - (Ground)</td>
<td>Green</td>
<td>Chassis</td>
<td>Connected to ground</td>
</tr>
<tr>
<td>F - (PB Bypass)</td>
<td>Green</td>
<td>Chassis</td>
<td>Connected to ground</td>
</tr>
<tr>
<td>G - (A2 Power)</td>
<td>White</td>
<td>A2 Term. of keyswitch</td>
<td>Ground in Rev. Caution</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Open otherwise</td>
</tr>
</tbody>
</table>
Relay (Electric PTO)

Location

The relay is part of the wiring harness and is located behind the fuel tank near the PTO connector (Figure 9).

Purpose

The relay disconnects the electric PTO clutch from ground when the PTO is engaged and the shift lever is in reverse, stopping the blades, unless the reverse caution mode has been activated.

How It Works

The relay is an electrically activated single pole double throw switch.

A common terminal (E) connects the ground wire of the PTO clutch to ground through the normally closed contact (A). Voltage is supplied to the positive side of the coil (D) from the A1 terminal of the keyswitch (Figure 10).

Placing the shift lever in reverse energizes the relay by providing a ground connection to the coil from the reverse switch, through the module, and PTO switch. This opens the normally closed contacts, disconnecting the PTO clutch from ground.

Testing

1. Disconnect the relay from the harness.

2. Verify the coil resistance between terminals B and D with a multimeter (ohms setting). Resistance should be approximately 105 ohms. There should be continuity between terminals A and E (Figure 10).

3. Connect multimeter (ohms setting) leads to relay terminals E and C. Ground terminal B and apply +12 VDC to terminal D. The relay should make and break continuity between terminals E and C as 12 VDC is applied and removed from terminal D (Figure 10).

4. Connect multimeter (ohms setting) leads to relay terminals E and A. Apply +12 VDC to terminal D. With terminal B still grounded, the relay should break and make continuity between terminals E and A as 12 VDC is applied and removed from terminal D (Figure 10).

5. Disconnect voltage source and multimeter leads from relay terminals.
Solenoid, Starter

Location

The starter solenoid is located under the rear fender behind the battery. Remove the battery and battery tray to access the solenoid (Figure 11).

Purpose

The solenoid’s purpose is simply to connect the battery to the starter motor when the ignition switch is turned to “START”. The solenoid is used to protect the ignition switch from the high current drawn by the starter motor.

How It Works

The solenoid has two primary parts (Figure 12):

1. A coil of wire wrapped around an iron core.

2. A bar type switch.

When 12 volts is applied to the coil, it becomes an electromagnet. This quickly pulls the bar toward the contacts and closes the switch. Because the contact terminals have a large contact area it can easily handle the high current loads required by the starter motor. When power is removed from the coil, the spring loaded bar returns to its “normally open” position. The solenoid closes and opens the switch very quickly. This minimizes the “arcing” that can damage other types of switches.

Testing

1. Disconnect the solenoid from the wiring harness.

2. With a multimeter (ohms setting), check to ensure that terminals “C” and “D” are open (no continuity) (Figure 13).

3. Apply +12 VDC to terminal “a” and ground mounting tab “B”. Terminals “C” and “D” should now be closed (continuity) (Figure 13).

4. You should be able to hear the solenoid switch “click” when you make the connection.
Switch, Brake

Location

The brake switch is attached to the tractor frame, under the fuel tank, near the base of the brake lever (Figure 14).

![Figure 14](image)

Purpose

As part of the safety interlock system the brake switch has two sets of terminals; one pair prevents the engine from cranking if the brake is not applied. The other pair causes the engine to shut down if the operator gets off the seat with the brake released.

How It Works

The plunger is depressed when the brake is applied, closing contacts “C” and “D”. This allows voltage from the key switch to pass through the brake switch to the PTO switch, then on to the start solenoid to crank the engine.

Applying the brake also causes a second set of contacts (“A” and “B”) to open. This prevents the magneto from connecting to ground and shutting the engine down if the operator gets off the seat.

Testing

1. Disconnect the switch from the wiring harness.

2. Using a multimeter, follow the procedures listed below (Figure 15).

Note: Terminals on actual switch not labeled.

<table>
<thead>
<tr>
<th>Plunger Not Depressed</th>
<th>Plunger Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;B Terminals – Open Circuit – No Continuity</td>
<td>A&amp;B Terminals – Closed Circuit – Continuity</td>
</tr>
<tr>
<td>C&amp;D Terminals – Open Circuit – No Continuity</td>
<td>C&amp;D Terminals – Closed Circuit – Continuity</td>
</tr>
</tbody>
</table>

![Figure 15](image)
Switch, Parking Brake (Manual PTO)

Location

The parking brake switch is located under the fuel tank near the locking lever (Figure 16).

Testing

1. Disconnect the switch from the wiring harness.

2. Use a ohmmeter to test continuity between the terminals (figure 17).

   Plunger out – no continuity
   Plunger in - continuity

Purpose

The parking brake switch is part of the safety interlock system. The engine will shut down if the operator leaves the seat without engaging the parking brake.

How It Works

When the parking brake is latched, the plunger is depressed, closing the contacts (figure 17).
Switch, Key

Purpose

This component provides the proper switching for the starter, ignition, accessories, and safety circuits (Figure 18).

How It Works

Detents inside the switch give it 4 positions: STOP, REVERSE CAUTION, NORMAL MOWING, and START. The START position is spring loaded so the cylinder automatically returns to NORMAL MOWING once the key is released.

Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for each switch position. Verify that there is NO continuity between terminals not listed for the switch position (Figure 19).

Switch, Reverse

Location

Units equipped with constant velocity transmissions (CVT)

The reverse switch is attached to the underside of the tractor next to the reverse lever (Figure 20).
Units equipped with hydrostatic transmissions

The reverse switch is located on the right side of the transmission near the brake (Figure 21).

Switch, Seat (Electric PTO Clutch)

Purpose

Shuts the engine down if the operator gets off the seat with the brake not applied.

Disengages the PTO Clutch if the operator gets out of the seat with the PTO engaged.

How It Works

The seat switch consists of a pair of normally closed contacts (Figure 22), which open when the operator is on the seat. One contact is connected in series to the magneto through the brake switch. If the operator vacates the seat while the engine is running, and the brake released, the contacts close, and the magneto is grounded, stopping the engine.

The other contact is connected to the relay through the RMC module. If the operator gets off the seat with the brake applied and the PTO engaged, the relay coil is connected to ground, energizing the relay. This opens the relays, normally closed contacts, disconnecting the electric clutch from ground, causing it to disengage.

Testing

1. Disconnect the switch from the wiring harness.

2. With a multimeter, check for continuity between the switch terminals and ground. There should be continuity.

3. Recheck for continuity with someone in the seat. There should not be continuity.

Purpose (All units)

Provides ground signal to RMC module when the shift lever is in reverse.

How It Works

The reverse switch is a metal tang, which is connected to ground when the reverse lever contacts it.

Testing (All units)

1. Disconnect the switch from the wiring harness.

2. Using a multimeter, check for continuity between the switch terminal and ground. With the shift lever in forward, there should not be continuity.

3. Place the shift lever into reverse. There should be continuity.
Switch, Seat (Manual PTO Clutch)

**Purpose**
To shut the engine down if the operator gets off the seat while the engine is running with the PTO engaged or the brake released.

**How It Works**
The seat switch consists of a pair of normally closed contacts which open when the operator is on the seat (Figure 23). One contact is connected in series to the magneto through the brake switch. If the operator vacates the seat while the engine is running, and the brake released, the contacts close and the magneto is grounded, stopping the engine.

The other contact is connected in series to the magneto through the PTO switch. If the operator gets off the seat with the PTO engaged and the brake applied, the contacts close, connecting the magneto to ground, stopping the engine.

**Testing**
1. Disconnect the switch from the wiring harness.
2. With a multimeter, check for continuity between the switch terminals and ground. There should be continuity.
3. Recheck for continuity with someone in the seat. There should not be continuity.

Switch, PTO (Electric PTO)

**Purpose**
The PTO switch is used to engage the electric clutch (Figure 24).

**How It Works**
It is also part of the safety circuit:
1. Prevents the engine from cranking with the key switch in the start position when the PTO switch is on.
2. It is part of the circuit that prevents the electric PTO clutch from re-engaging after moving the shift lever in and out of reverse without activating the reverse caution mode.
3. It is part of the circuit that prevents the electric PTO clutch from re-engaging if the operator gets off and back on the seat.

**How It Works**
The PTO switch uses three sets of contacts: (Figure 25)
1. **A – Com (normally closed)**
   Wired in series between the brake switch and start solenoid. Preventing power from reaching the starter solenoid when the PTO switch is on.
2. **B – Com (normally open)**
   Connected in series between the relay coil and the normally open relay contact. Once the relay is energized these contacts provide a ground path to the relay coil preventing it from de-energizing until the PTO is switched off.
3. **C – Com (normally open)**
   Connected in series between the A1 terminal of
the ignition switch and the electric clutch. Pulling the switch to the on position closes these contacts providing voltage to the electric clutch.

Testing

1. Remove the PTO switch from the tractor.
2. Connect an ohmmeter across each pair of terminals and check for continuity with the switch in the "OFF" and "ON" positions.
3. Replace the switch if the results do not correspond to the description given above.

Switch, PTO (Manual PTO)

Location

The manual PTO Switch is located under the hood near the base of the actuation rod (Figure 26).

Purpose

Part of the safety interlock system:
1. Prevents the engine from cranking if the PTO lever is in the engaged position.
2. Shuts the engine down if the operator gets off the seat with the PTO lever in the engaged position, or the shift lever is placed in the reverse position without activating the reverse caution mode.

How It Works

This double pole plunger type switch has four terminals, one pair normally open, and the other pair normally closed. When the PTO lever is in the off position the plunger is depressed.

Testing

1. Disconnect the switch from the wiring harness.
2. Using a ohmmeter, follow the procedures listed below (Figure 27):

Note: Terminals on actual switch not labeled.

<table>
<thead>
<tr>
<th>Plunger Not Depressed</th>
<th>Plunger Depressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;B Terminals – Closed Circuit – Continuity</td>
<td>A&amp;B Terminals – Open Circuit – No Continuity</td>
</tr>
<tr>
<td>C&amp;D Terminals – Open Circuit – No Continuity</td>
<td>C&amp;D Terminals – Closed Circuit – Continuity</td>
</tr>
</tbody>
</table>
Systems Indicator Monitor / Hourmeter

Purpose

Lights on the monitor panel are used to indicate the position of the brake and PTO controls, as well as the condition of the battery charging system. The LCD at the center of the panel displays accumulated engine hours and flashes when maintenance is due (Figure 28).

How It Works

The Systems Indicator Monitor/Hourmeter is a solid state device. Battery voltage from the A1 terminal of the keyswitch powers the unit and runs the hourmeter. An internal circuit monitors battery voltage and causes the battery LED to light when battery voltage falls below a specified level. Additional sensing circuits monitor the status of the brake and PTO switches. When the brake is applied or the PTO is engaged, contacts in the switches close, completing the sensing circuit and lighting the appropriate LED.

Testing

Testing the Systems Indicator Monitor/Hourmeter directly is not practical. If it is not functioning correctly, test the inputs to the unit at the wiring harness connector and replace the monitor if the inputs are correct.

Note: The following tests are performed with the engine off.
LX420 Information List (2006)
LX425 Information List (2007)
LX460 Information List (2006)
LX465 Information List (2007)

Wiring Diagram. .............................. 18-2
Circuit Diagrams
  Starter Motor Circuit ..................... 18-4
  Spark Circuits .......................... 18-5
  Reverse Operating System ............... 18-9
Starter Motor Circuit
(ignition switch in “start”)
**2006 2007**

**LX420, LX460**

**LX425, LX465**

---

**Spark Circuit**

*(ignition switch in “start”)*

---

![Diagram of Spark Circuit]

- **Ignition Switch (In Start)**
- **Brake Switch (Brake Applied)**
- **Seat Switch (Operator On)**
- **PTO Switch (PTO Off)**

---

**WIRE COLOR CODES**

- **BN** BROWN
- **PK** PINK
- **OR/BK** ORANGE BLACK
- **BU** BLUE
- **BK** BLACK
- **OR/W** ORANGE WHITE
- **GY** GRAY
- **Y** YELLOW
- **Y/W** YELLOW WHITE
- **W** WHITE
- **T** TAN
- **Y/BK** YELLOW BLACK
- **PUR** PURPLE
- **GN** GREEN
- **R/W** RED WHITE
- **R** RED
- **OR** ORANGE
- **R/BK** RED BLACK

---

**Demystification Guide** 18-5
Spark Circuit
(ignition switch in “Normal”, PTO “on”)

Dashed lines do not carry current

IGNITION
MODULE

SPARK PLUG

A1 Power

Ignition Switch (In Normal)

Brake Switch (Brake Off)

PTO Switch (PTO On)

Magneto

PB Bypass

Park Switch (Brake Off)

Reverse Switch (In Forward)

Fuel Solenoid (Energized)

Headlight Harness (Headlights on)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>PK</td>
<td>Pink</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>R/W</td>
<td>Purple</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>GY</td>
<td>Gray</td>
</tr>
<tr>
<td>Y</td>
<td>Yellow</td>
</tr>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>PUR</td>
<td>Purple</td>
</tr>
<tr>
<td>GN</td>
<td>Green</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>R/BK</td>
<td>Red Black</td>
</tr>
</tbody>
</table>

Circuits
Spark Circuit
(ignition switch in “Normal”,
operator “off”, brake “on”, PTO “off”)

2006 LX420, LX460
2007 LX425, LX465

Circuits
Spark Circuit
(ignition switch in “Normal”, operator “off”, brake “on”, PTO “on”)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>GY</td>
<td>Gray</td>
</tr>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>PK</td>
<td>Pink</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>Y</td>
<td>Yellow</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>OR/BK</td>
<td>Orange/Black</td>
</tr>
<tr>
<td>OR/W</td>
<td>Orange/White</td>
</tr>
<tr>
<td>Y/BK</td>
<td>Yellow/Black</td>
</tr>
<tr>
<td>R/W</td>
<td>Red/White</td>
</tr>
</tbody>
</table>

电路图

电池
坚线
信号

电路图

拆除

18-8
Demystification Guide
Reverse Operating System
(ignition switch in “Normal”,
PTO “on”, transmission in “reverse”)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>BROWN</td>
</tr>
<tr>
<td>BU</td>
<td>BLUE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
</tr>
<tr>
<td>W</td>
<td>TAN</td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
</tr>
</tbody>
</table>
Reverse Operating System
(ignition switch in “Reverse Caution”, PTO “on”)

Circuits

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>BROWN</td>
</tr>
<tr>
<td>PK</td>
<td>PINK</td>
</tr>
<tr>
<td>OR/BK</td>
<td>ORANGE BLACK</td>
</tr>
<tr>
<td>BU</td>
<td>BLUE</td>
</tr>
<tr>
<td>BK</td>
<td>BLACK</td>
</tr>
<tr>
<td>OR/W</td>
<td>ORANGE WHITE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
</tr>
<tr>
<td>T</td>
<td>TAN</td>
</tr>
<tr>
<td>Y/BK</td>
<td>YELLOW BLACK</td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
</tr>
<tr>
<td>GN</td>
<td>GREEN</td>
</tr>
<tr>
<td>R/W</td>
<td>RED WHITE</td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
</tr>
<tr>
<td>OR</td>
<td>ORANGE</td>
</tr>
<tr>
<td>R/BK</td>
<td>RED BLACK</td>
</tr>
</tbody>
</table>

Headlight Harness
(Headlights on)

Ignition Switch
(In Caution)

Brake Switch
(Brake Off)

Seat Switch
(Operator On)

PTO Switch
(PTO On)

A1 Power
A2 Power

PB Bypass
Magneto

Ground

Rev Sw
Park Sw

Reverse Switch
(In Forward)

Park Switch
(Brake Off)
Reverse Operating System

(ignition switch in “Reverse Caution”, transmission in “reverse”, PTO “on”)

Circuits

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>GY</td>
<td>Gray</td>
</tr>
<tr>
<td>G</td>
<td>Green</td>
</tr>
<tr>
<td>PL</td>
<td>Purple</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>R/W</td>
<td>Red/White</td>
</tr>
<tr>
<td>R/BK</td>
<td>Red/Black</td>
</tr>
<tr>
<td>R/BK</td>
<td>Red/Black</td>
</tr>
</tbody>
</table>
Reverse Operating System
(ignition switch in “Reverse Caution”, RMC “activated”, transmission in “reverse”, PTO “on”)

CIRCUITS

IGNITION

MODULE

SPARK PLUG

IGNITION

MOTORE

Spark Plug

Dashed lines do not carry current

Seat Switch (Operator On)

PTO Switch (PTO On)

Brake Switch (Brake Off)

Ignition Switch (In Caution)

Battery Fuse (20 Amp)

Fuel Solenoid (Energized)

Headlight Harness (Headlights on)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>BN</th>
<th>BROWN</th>
<th>PK</th>
<th>PINK</th>
<th>OR/BK</th>
<th>ORANGE</th>
<th>BLACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>BU</td>
<td>BLUE</td>
<td>BK</td>
<td>BLACK</td>
<td>OR/W</td>
<td>ORANGE</td>
<td>WHITE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
<td>Y</td>
<td>YELLOW</td>
<td>Y/W</td>
<td>YELLOW</td>
<td>WHITE</td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
<td>T</td>
<td>TAN</td>
<td>Y/BK</td>
<td>YELLOW</td>
<td>BLACK</td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
<td>GN</td>
<td>GREEN</td>
<td>R/W</td>
<td>RED</td>
<td>WHITE</td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
<td>OR</td>
<td>ORANGE</td>
<td>R/BK</td>
<td>RED</td>
<td>BLACK</td>
</tr>
</tbody>
</table>

2006

2007

LX420, LX460

LX425, LX465

Demystification Guide
LX500 Information List (2006 - 2007)
GT2100 Information List (2006 - 2007)
GT2100 Information List (2006 - 2007)
GT2100 Information List (2006 - 2007)

Wiring Diagram.............................. 19-2
Circuit Diagrams
  Starter Motor Circuit ..................... 19-4
  Spark Circuits .......................... 19-5
  PTO Circuits ........................... 19-7
  Reverse Operating System ............... 19-9
**WIRE COLOR CODES**

<table>
<thead>
<tr>
<th>Color Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>GY</td>
<td>Gray</td>
</tr>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>PUR</td>
<td>Purple</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>OR/W</td>
<td>Orange/White</td>
</tr>
<tr>
<td>Y/BK</td>
<td>Yellow/Black</td>
</tr>
<tr>
<td>OR/W</td>
<td>Orange/White</td>
</tr>
<tr>
<td>OR/BK</td>
<td>Orange/Black</td>
</tr>
<tr>
<td>BU/W</td>
<td>Brown/White</td>
</tr>
<tr>
<td>Y/W</td>
<td>Yellow/White</td>
</tr>
<tr>
<td>R/W</td>
<td>Red/White</td>
</tr>
<tr>
<td>R/BK</td>
<td>Red/Black</td>
</tr>
</tbody>
</table>

**Diagram**

- **Fuse**: 20A
- **PTO Switch**: PTO Switch is shown with PTO off
- **Spark Plug**: Spark Plug
- **Solenoid**: Solenoid
- **Reverse Switch**: Reverse Switch is shown in forward
- **Seat Switch**: Seat Switch is shown with operator present
- **Power Switch**: A1 Power, A2 Power
- **Reverse Switch**: Reverse Switch shown in forward
- **Ground**: Ground
- **RMC Module**: RMC Module

Demystification Guide 19-3
Starter Motor Circuit
(ignition switch in “start”)

Battery Fuse (20 Amp)
Ignition Switch (In Start)
Brake Switch (Brake Applied)
PTO Switch (PTO Off)
Starter Solenoid (Energized)
Fuel Solenoid (Energized)
Headlight Harness (Headlights on)

<table>
<thead>
<tr>
<th>WIRE ODR OBS</th>
<th>BN BROWN</th>
<th>PK PINK</th>
<th>OR/BK ORANGE B&amp;B</th>
<th>BU BLUE</th>
<th>BK BLACK</th>
<th>OR/W ORANGE WHITE</th>
<th>GY GRAY</th>
<th>Y YELLOW</th>
<th>EDW WHITE</th>
<th>W WHITE</th>
<th>T TAN</th>
<th>BK BLACK</th>
<th>PUR PURPLE</th>
<th>GN GREEN</th>
<th>R/W REDWHI</th>
<th>R RED</th>
<th>OR ORANGE</th>
<th>R/BK REDB&amp;B</th>
</tr>
</thead>
</table>

Demystification Guide
Spark Circuit
(ignition switch in “start”)

Dashed lines do not carry current

IGNITION MODULES

SPARK PLUG
IGNITION MODULES

SPARK PLUG

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>BROWN</td>
</tr>
<tr>
<td>BU</td>
<td>BLUE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
</tr>
<tr>
<td>PK</td>
<td>PINK</td>
</tr>
<tr>
<td>OR</td>
<td>ORANGE</td>
</tr>
<tr>
<td>OR/BK</td>
<td>ORANGE BLACK</td>
</tr>
<tr>
<td>OR/W</td>
<td>ORANGE WHITE</td>
</tr>
<tr>
<td>Y</td>
<td>YELLOW</td>
</tr>
<tr>
<td>Y/BK</td>
<td>YELLOW BLACK</td>
</tr>
<tr>
<td>Y/W</td>
<td>YELLOW WHITE</td>
</tr>
<tr>
<td>R/W</td>
<td>RED WHITE</td>
</tr>
<tr>
<td>R/BK</td>
<td>RED BLACK</td>
</tr>
</tbody>
</table>

Demystification Guide 19-5
Spark Circuit

(ignition switch in “Normal”, PTO “on”)
PTO Circuit
(ignition switch in “Normal”, operator “off”, brake “on”)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>GY</td>
<td>Gray</td>
</tr>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>PUR</td>
<td>Purple</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>Y</td>
<td>Yellow</td>
</tr>
<tr>
<td>W/BK</td>
<td>White Black</td>
</tr>
<tr>
<td>OR/W</td>
<td>Orange White</td>
</tr>
<tr>
<td>R/W</td>
<td>Red White</td>
</tr>
<tr>
<td>R/BK</td>
<td>Red Black</td>
</tr>
</tbody>
</table>

Demystification Guide
PTO Circuit
(ignition switch in "Normal", operator "off", PTO "on")

Dashed lines do not carry current

**WIRE COLOR CODES**

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>Brown</td>
</tr>
<tr>
<td>PK</td>
<td>Pink</td>
</tr>
<tr>
<td>OR/BK</td>
<td>Orange Black</td>
</tr>
<tr>
<td>BU</td>
<td>Blue</td>
</tr>
<tr>
<td>BK</td>
<td>Black</td>
</tr>
<tr>
<td>GR</td>
<td>Gray</td>
</tr>
<tr>
<td>Y</td>
<td>Yellow</td>
</tr>
<tr>
<td>W</td>
<td>White</td>
</tr>
<tr>
<td>PUR</td>
<td>Purple</td>
</tr>
<tr>
<td>GN</td>
<td>Green</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
</tr>
<tr>
<td>OR</td>
<td>Orange</td>
</tr>
<tr>
<td>R/BK</td>
<td>Red Black</td>
</tr>
</tbody>
</table>
Reverse Operating System
(ignition switch in “Reverse Caution”, PTO “on”, transmission in “forward”)
Reverse Operating System
(ignition switch in “Normal”,
PTO “on”, transmission in “reverse”)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Color</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>BROWN</td>
</tr>
<tr>
<td>BU</td>
<td>BLUE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
</tr>
<tr>
<td>PK</td>
<td>PINK</td>
</tr>
<tr>
<td>BK</td>
<td>BLACK</td>
</tr>
<tr>
<td>Y</td>
<td>YELLOW</td>
</tr>
<tr>
<td>OR</td>
<td>ORANGE</td>
</tr>
<tr>
<td>OR/BK</td>
<td>ORANGE BLACK</td>
</tr>
<tr>
<td>OR/W</td>
<td>ORANGE WHITE</td>
</tr>
<tr>
<td>Y/W</td>
<td>YELLOW WHITE</td>
</tr>
<tr>
<td>Y/BK</td>
<td>YELLOW BLACK</td>
</tr>
<tr>
<td>R/W</td>
<td>RED WHITE</td>
</tr>
<tr>
<td>R/3</td>
<td>RED BLACK</td>
</tr>
</tbody>
</table>
PTO Circuit
(ignition switch in “Reverse Caution”, PTO “on”, transmission in “reverse”)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>Code</th>
<th>Color</th>
<th>Code</th>
<th>Color</th>
<th>Code</th>
<th>Color</th>
<th>Code</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN</td>
<td>BROWN</td>
<td>PK</td>
<td>PINK</td>
<td>OR/BK</td>
<td>ORANGE BLACK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BU</td>
<td>BLUE</td>
<td>BK</td>
<td>BLACK</td>
<td>OR/W</td>
<td>ORANGE WHITE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
<td>Y</td>
<td>YELLOW</td>
<td>Y/W</td>
<td>YELLOW WHITE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
<td>T</td>
<td>TAN</td>
<td>Y/BK</td>
<td>YELLOW BLACK</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
<td>GN</td>
<td>GREEN</td>
<td>R/W</td>
<td>RED WHITE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
<td>OR</td>
<td>ORANGE</td>
<td>R/BK</td>
<td>RED BLACK</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Demystification Guide 19-11
PTO Circuit
(ignition switch in “Reverse Caution”,
RMC “activated”, PTO “on”, transmission in “reverse”)

WIRE COLOR CODES

<table>
<thead>
<tr>
<th>BN</th>
<th>BROWN</th>
<th>PK</th>
<th>PINK</th>
<th>OR/BK</th>
<th>ORANGE BLACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>BU</td>
<td>BLUE</td>
<td>BK</td>
<td>BLACK</td>
<td>OR/W</td>
<td>ORANGE WHITE</td>
</tr>
<tr>
<td>GY</td>
<td>GRAY</td>
<td>Y</td>
<td>YELLOW</td>
<td>Y/W</td>
<td>YELLOW WHITE</td>
</tr>
<tr>
<td>W</td>
<td>WHITE</td>
<td>T</td>
<td>TAN</td>
<td>Y/BK</td>
<td>YELLOW BLACK</td>
</tr>
<tr>
<td>PUR</td>
<td>PURPLE</td>
<td>GN</td>
<td>GREEN</td>
<td>R/W</td>
<td>RED WHITE</td>
</tr>
<tr>
<td>R</td>
<td>RED</td>
<td>OR</td>
<td>ORANGE</td>
<td>R/BK</td>
<td>RED BLACK</td>
</tr>
</tbody>
</table>