TORO®

Consumer Products

2006

LX SERIES LAWN TRACTORS

GT2000 SERIES GARDEN TRACTORS

DEMYSTIFICATION GUIDE

About this manual

We hope that you find this manual a valuable addition to your service shop. If you have comments or questions about this manual contact your Distributor Service Manager or us directly at the following assress:

The Toro Company
Consumer service department
8111 Lyndale Avenue South
Bloomington, MN 55420-1196

The Toro company reserves the right to change product specifications or this manual without notice.

TABLE OF CONTENTS

CHAPTER **PAGE**

This page intentionally left blank

TIME SAVERS

Table of contents

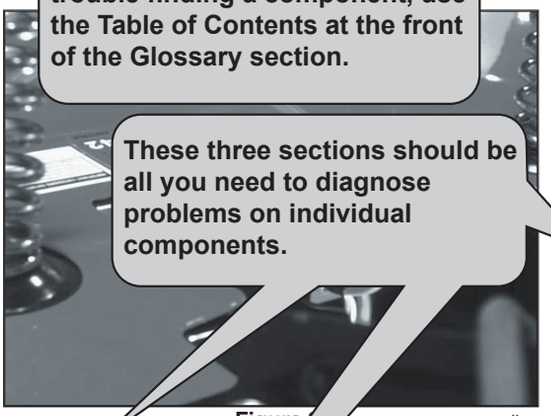
The Glossary contains information on virtually every electrical part used on Toro riding products.

Solenoid, Starter

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.

Loc

The der ass



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

Figure solloc

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.

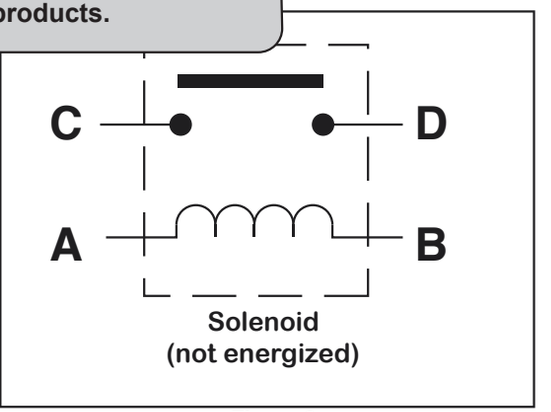


Figure 9 start sol

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.

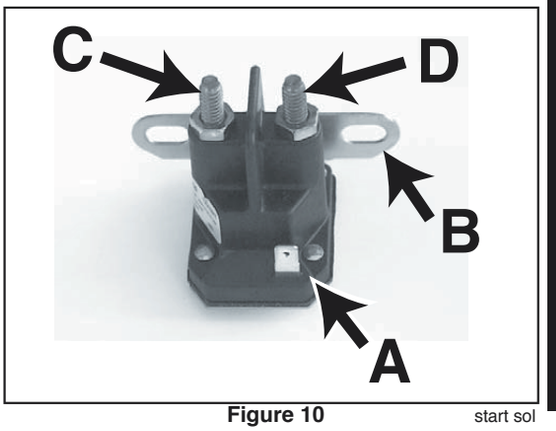


Figure 10 start sol

(A) & (B) Coil Terminals	(C) & (D) Contact Terminals

2

Each product series has its own section including:
- Info List
- Wiring Diagrams
- Circuit Diagrams

LX420, LX460

Image helps you quickly identify product sections.

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

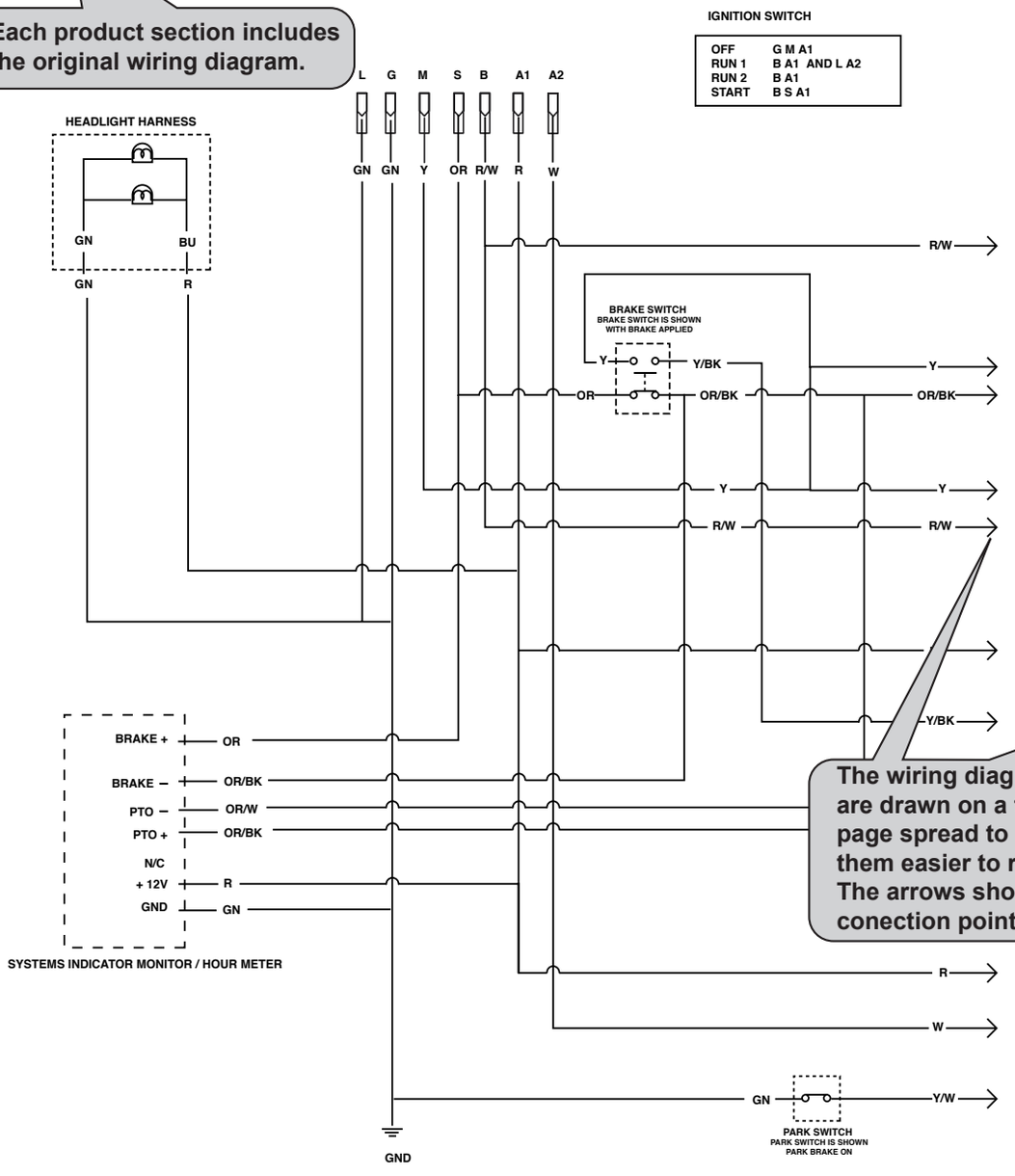
Each product section has its own "Table of Contents" to keep things simple.

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

LX420, LX460 2006

Wiring Diagram

Each product section includes the original wiring diagram.



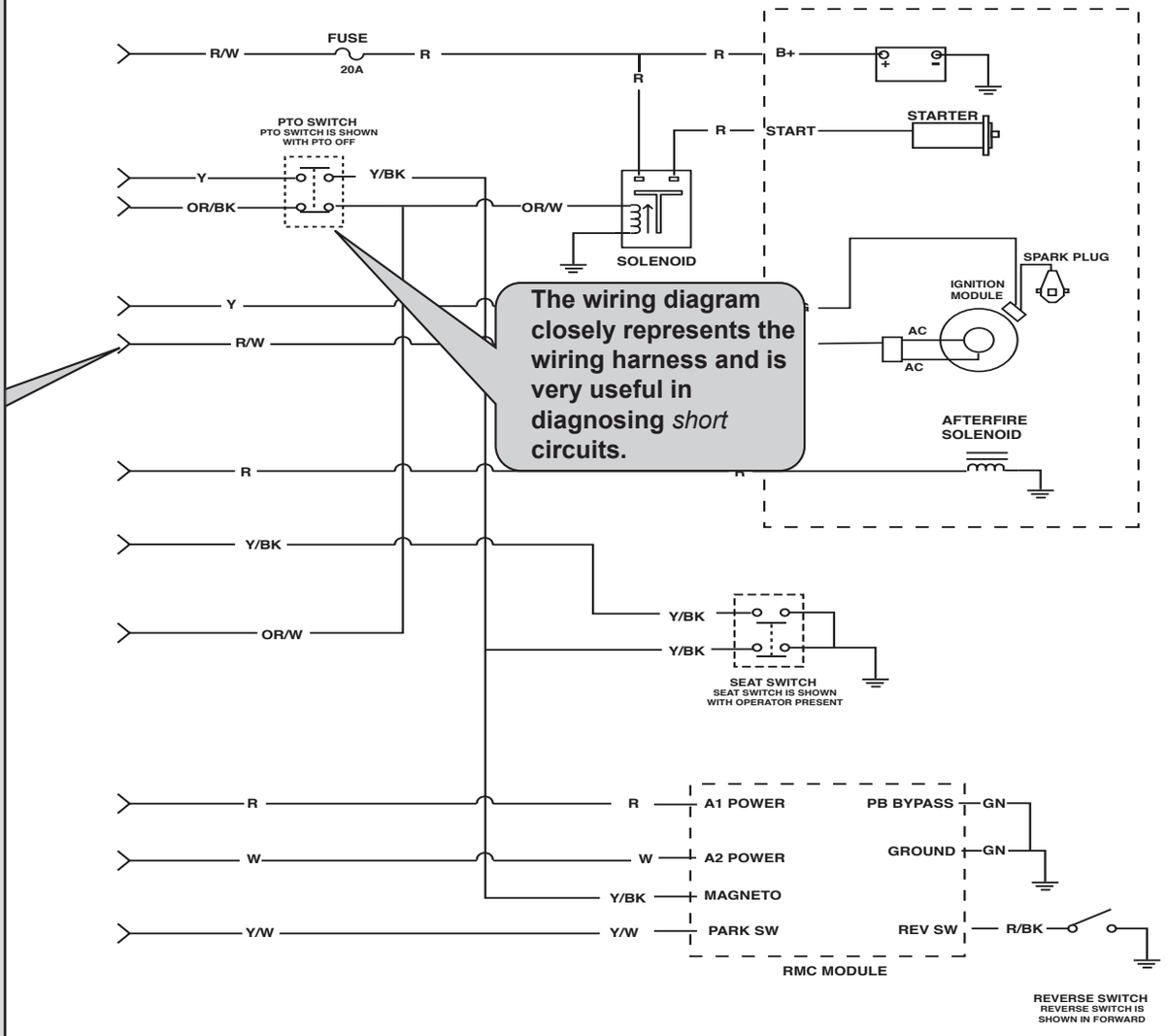
The wiring diagrams are drawn on a two page spread to make them easier to read. The arrows show the conection point.

2006 LX420, LX460

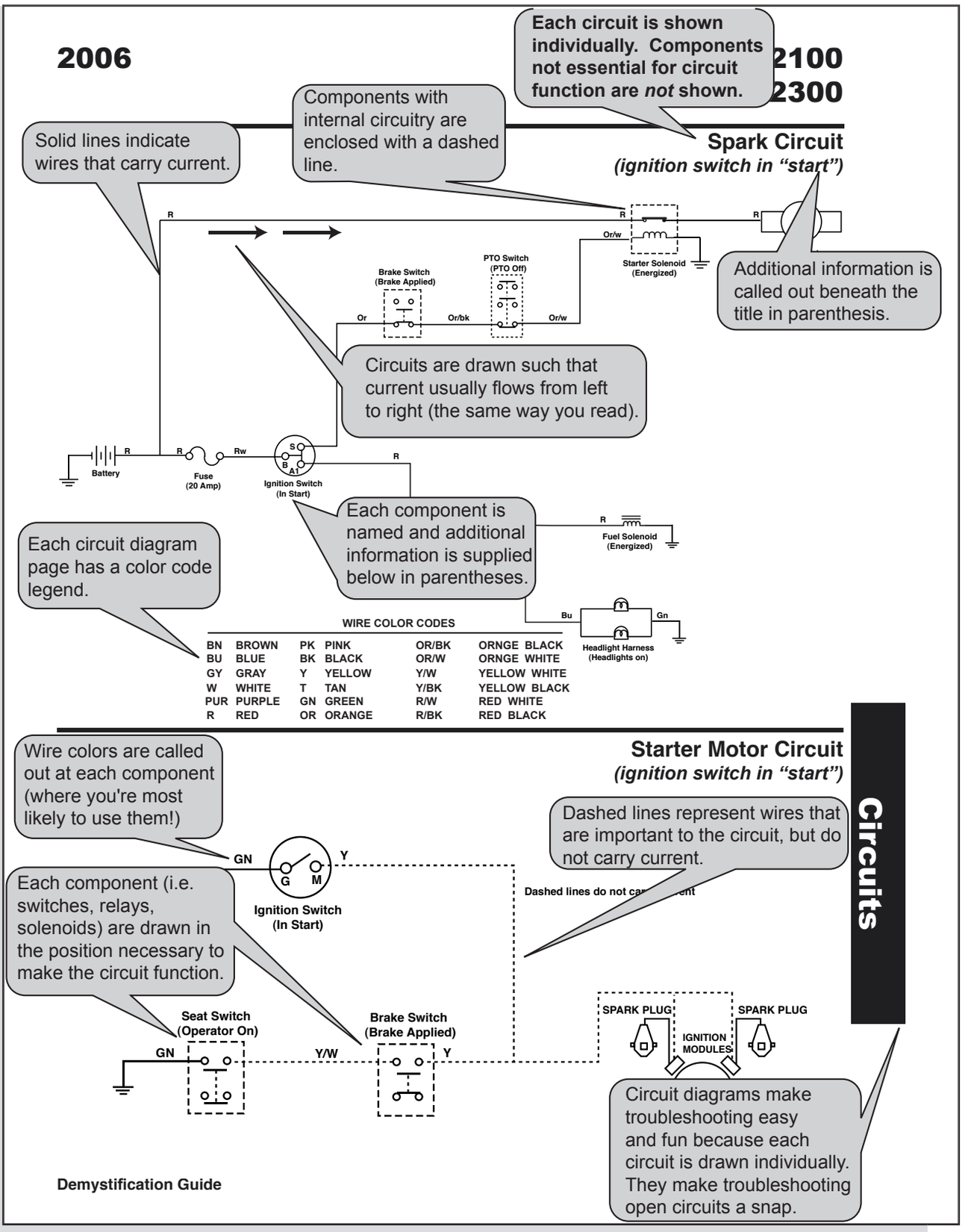
Wiring Diagram

WIRE COLOR CODES

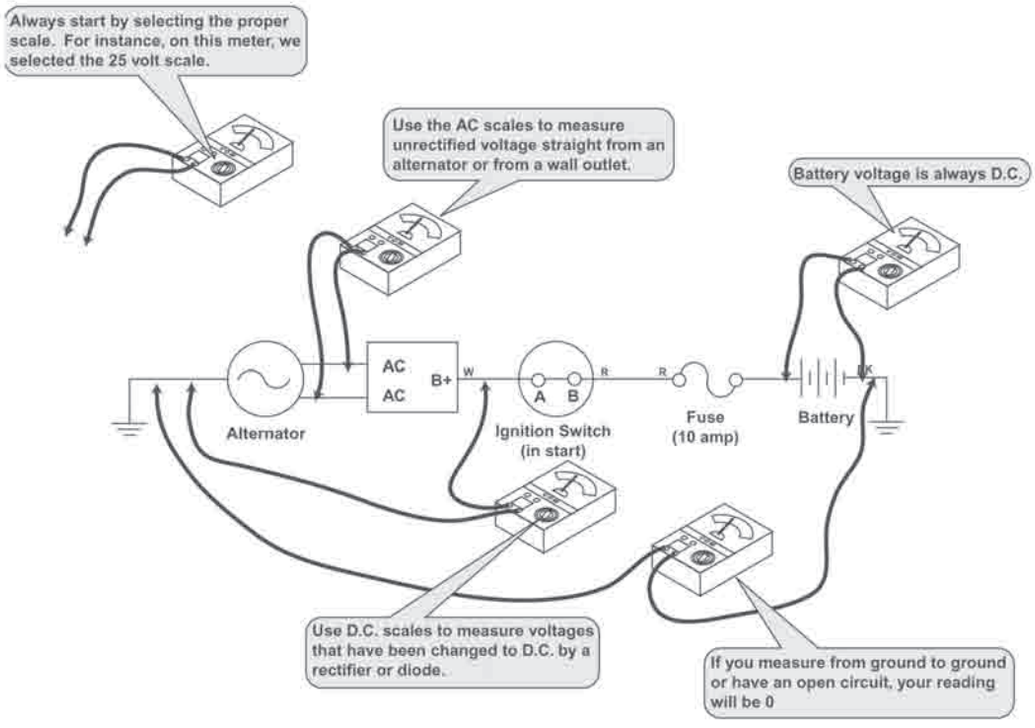
BN	BROWN	PK	PINK	OR/BK	ORNGE BLACK
BU	BLUE	BK	BLACK	OR/W	ORNGE WHITE
GY	GRAY	Y	YELLOW	Y/W	YELLOW WHITE
W	WHITE	T	TAN	Y/BK	YELLOW BLACK
PUR	PURPLE	GN	GREEN	R/W	RED WHITE
R	RED	OR	ORANGE	R/BK	RED BLACK



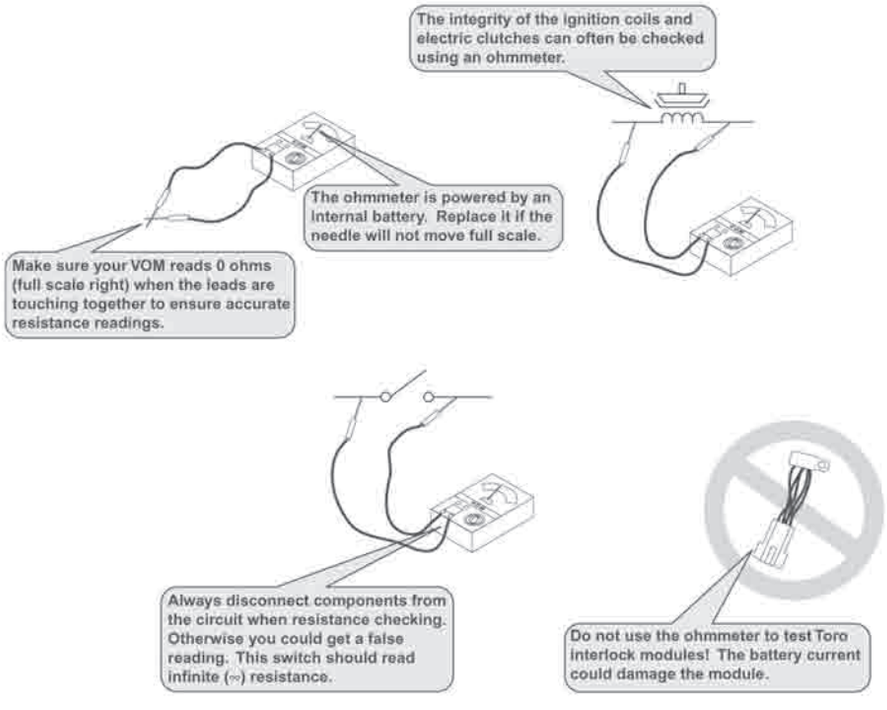
The wiring diagram closely represents the wiring harness and is very useful in diagnosing *short* circuits.


2006
2100
2300
Each circuit is shown individually. Components not essential for circuit function are *not* shown.
Components with internal circuitry are enclosed with a dashed line.
Solid lines indicate wires that carry current.
Spark Circuit
(ignition switch in "start")
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.
Each circuit diagram page has a color code legend.
Starter Solenoid (Energized)
Brake Switch (Brake Applied)
PTO Switch (PTO Off)
Battery
Fuse (20 Amp)
Ignition Switch (In Start)
Fuel Solenoid (Energized)
Headlight Harness (Headlights on)
WIRE COLOR CODES
BN BROWN PK PINK OR/BK ORNGE BLACK
BU BLUE BK BLACK OR/W ORNGE 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
Starter Motor Circuit
(ignition switch in "start")
Wire colors are called out at each component (where you're most likely to use them!)
Dashed lines represent wires that are important to the circuit, but do not carry current.
Each component (i.e. switches, relays, solenoids) are drawn in the position necessary to make the circuit function.
Ignition Switch (In Start)
Seat Switch (Operator On)
Brake Switch (Brake Applied)
SPARK PLUG
SPARK PLUG
IGNITION MODULES
Circuit diagrams make troubleshooting easy and fun because each circuit is drawn individually. They make troubleshooting open circuits a snap.
Demystification Guide
Circuits

1 Checking Voltage

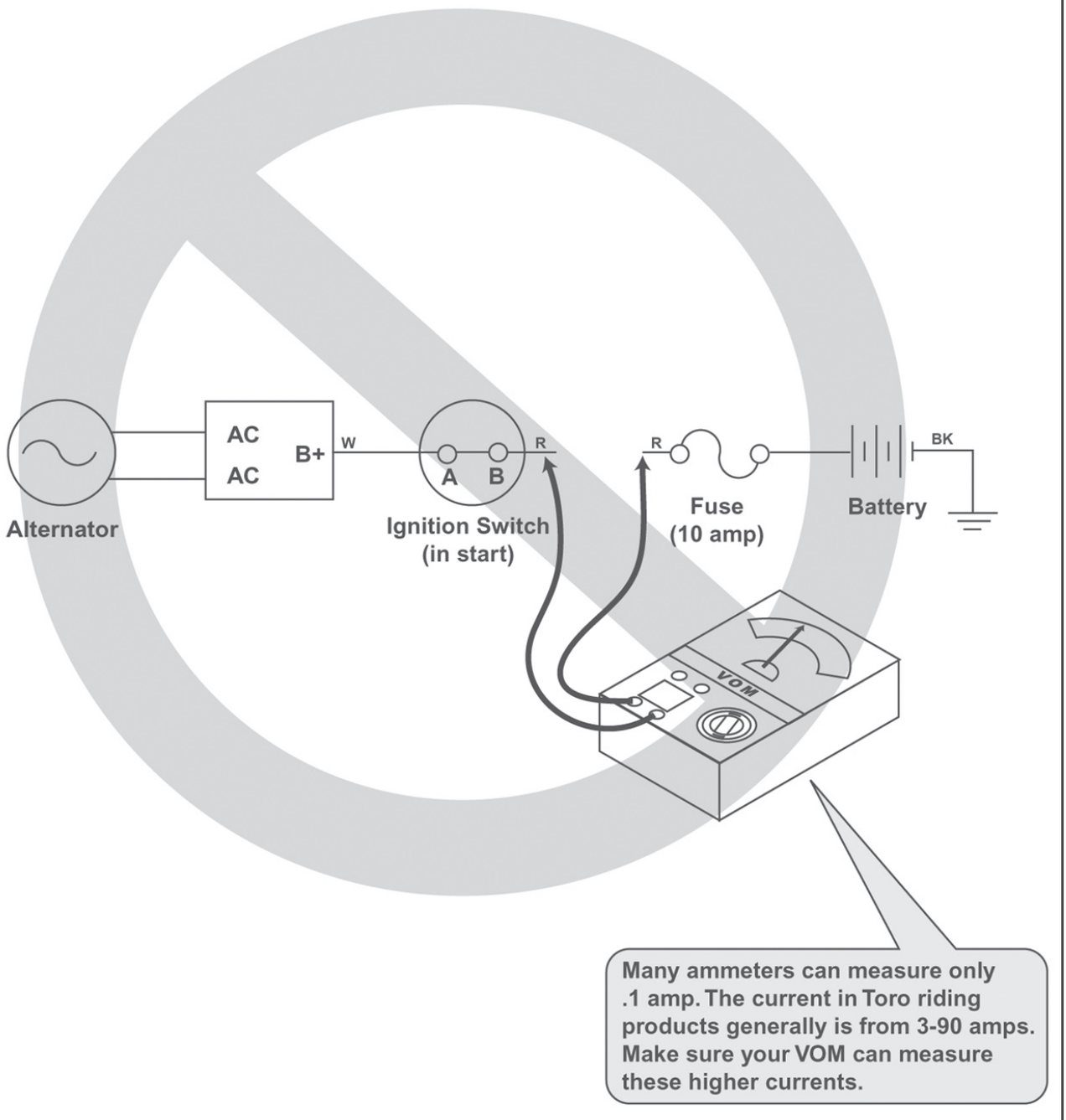


2 Checking Resistance

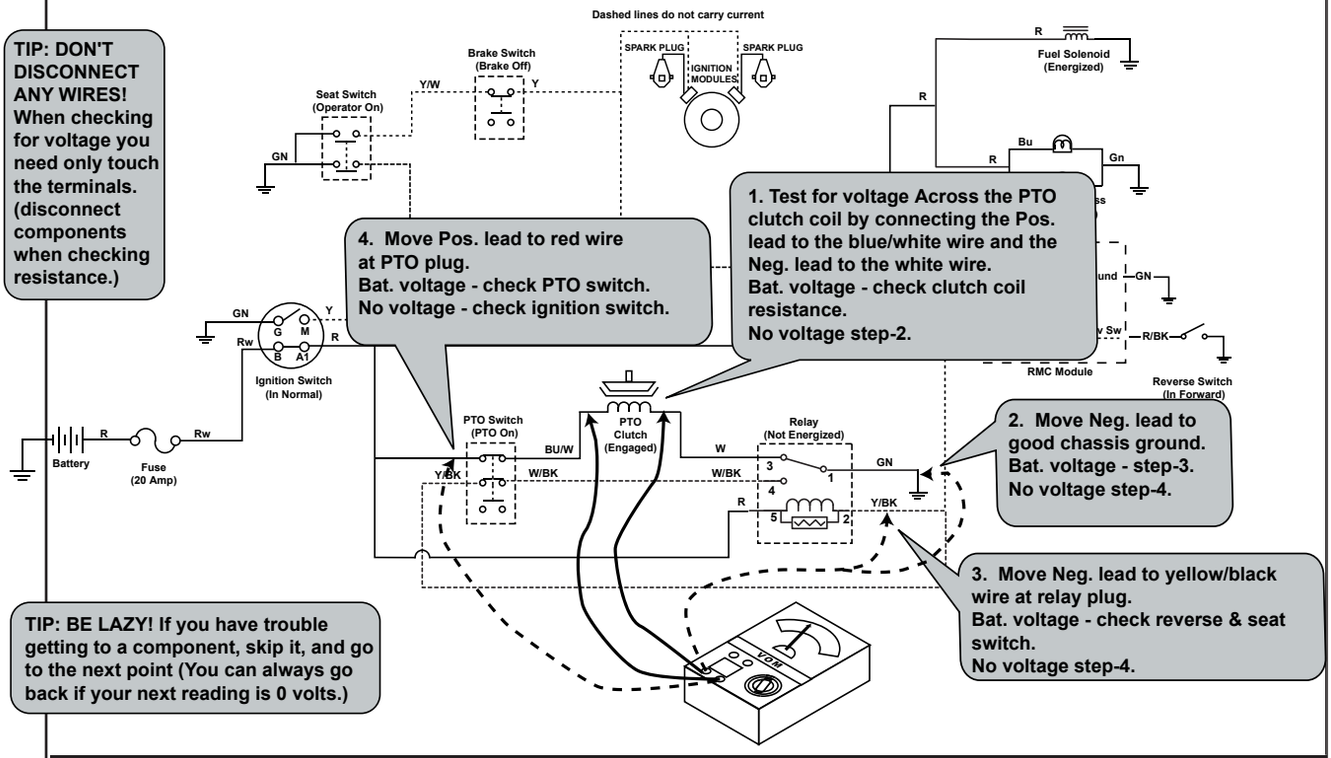


What about checking current?

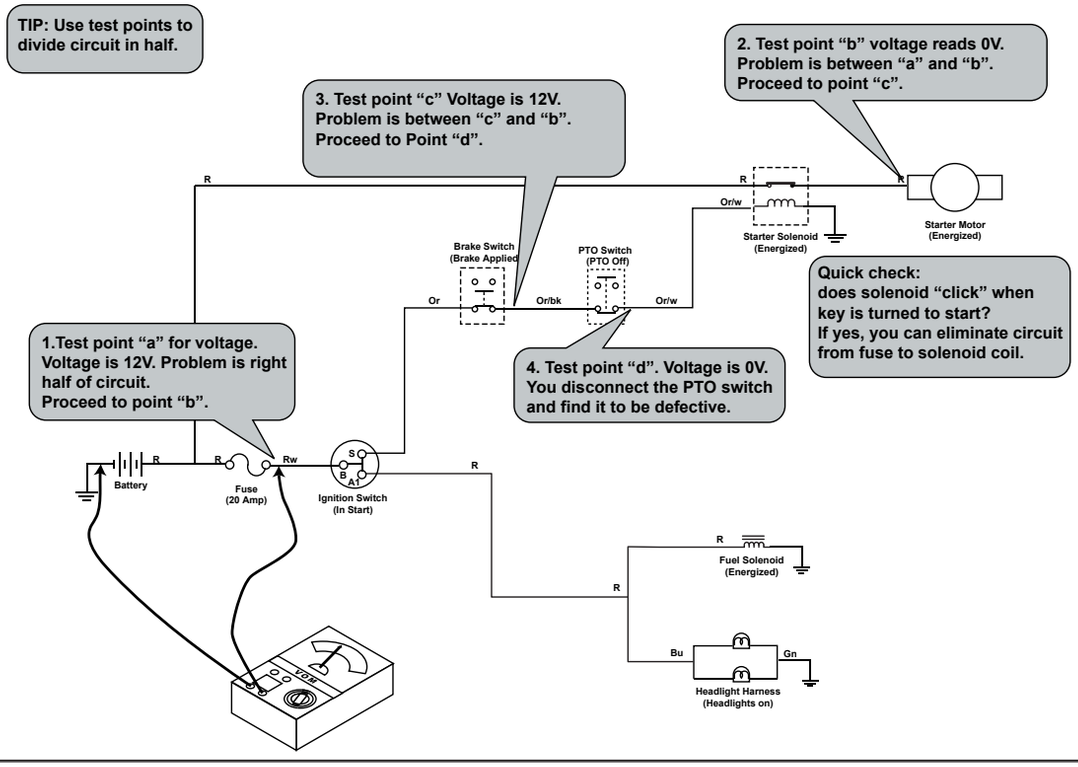
3



Sample Problem: GT2100 electric clutch will not engage



Sample Problem: LX420 will not crank



TIME SAVERS

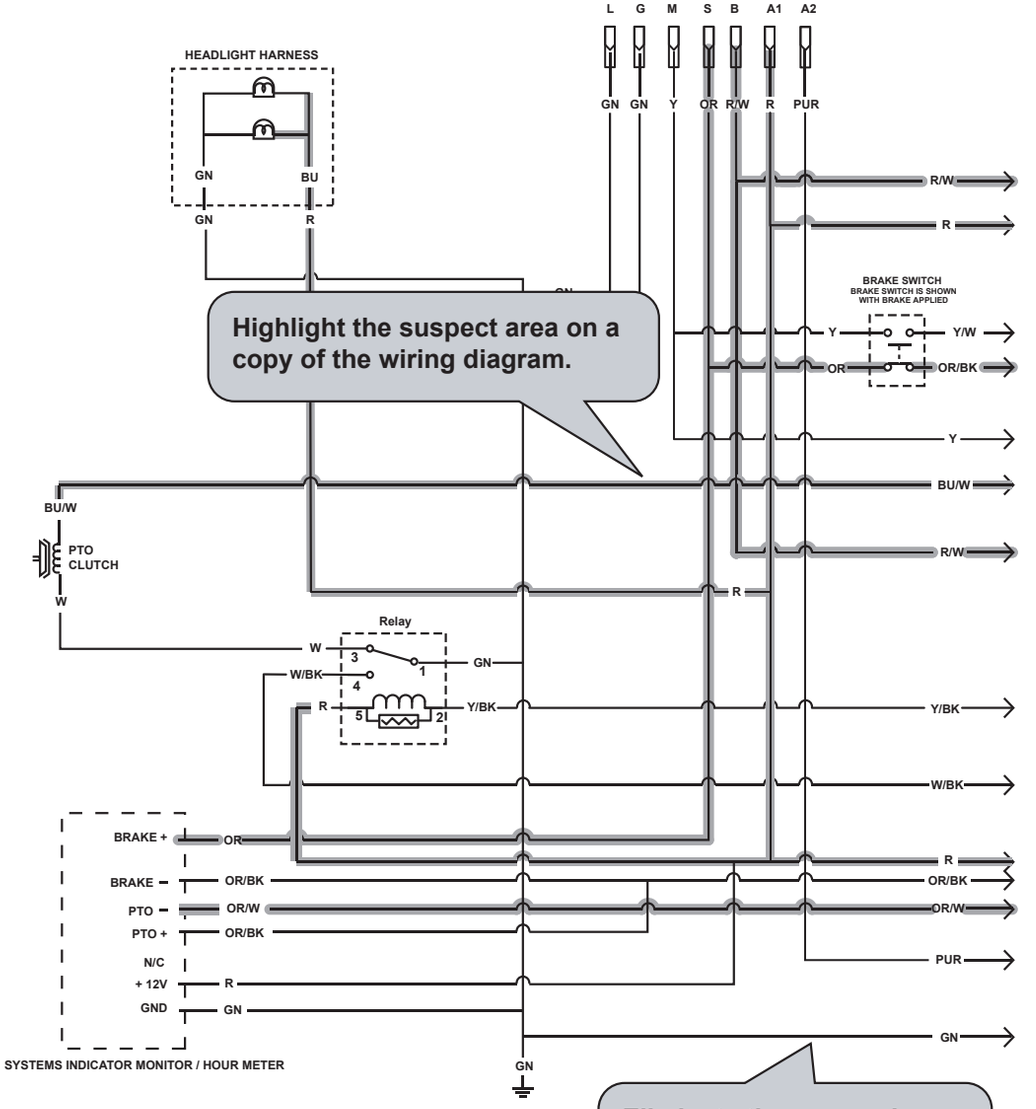
Sample Problem: This GT tractor won't turn over. The customer parked it in the garage and turned it off. When he tried to start it a week later, he heard one click. After that, nothing would happen when he turned the key.

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.

IGNITION SWITCH

OFF	G M A1
RUN 1	B A1 AND L A2
RUN 2	B A1
START	B S A1

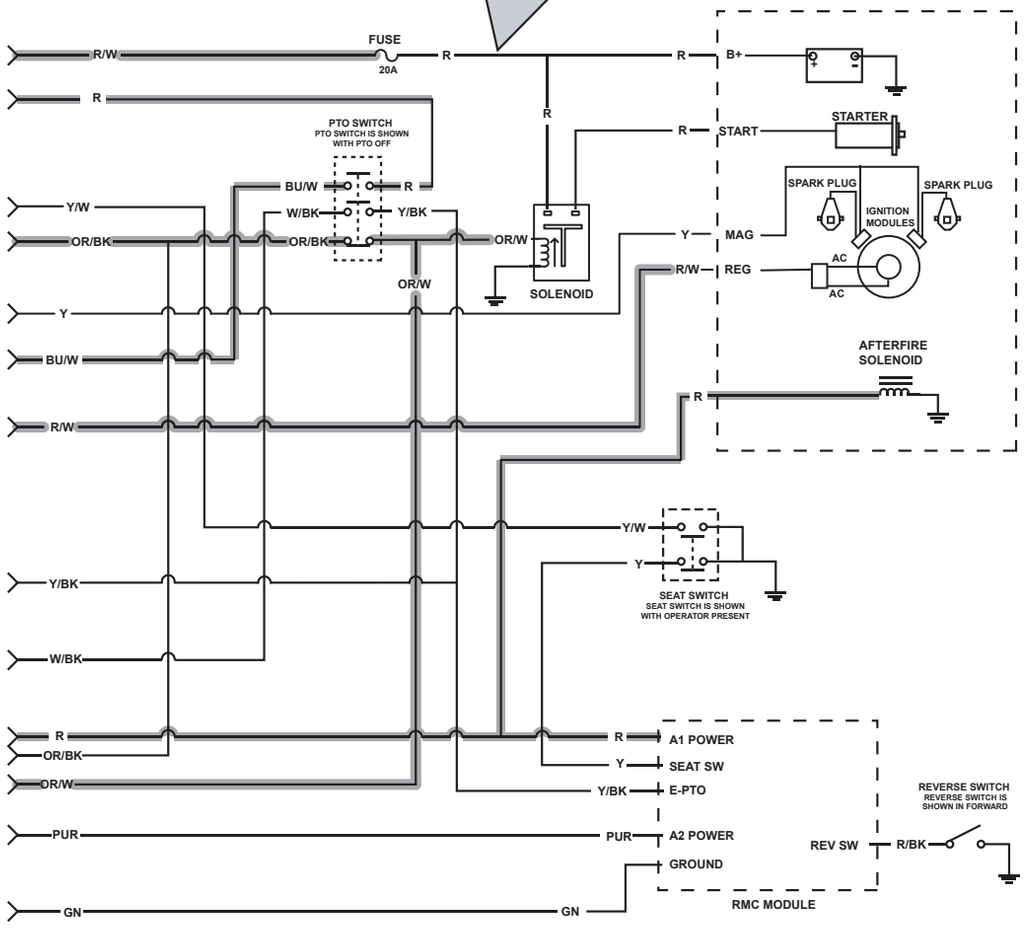


Highlight the suspect area on a copy of the wiring diagram.

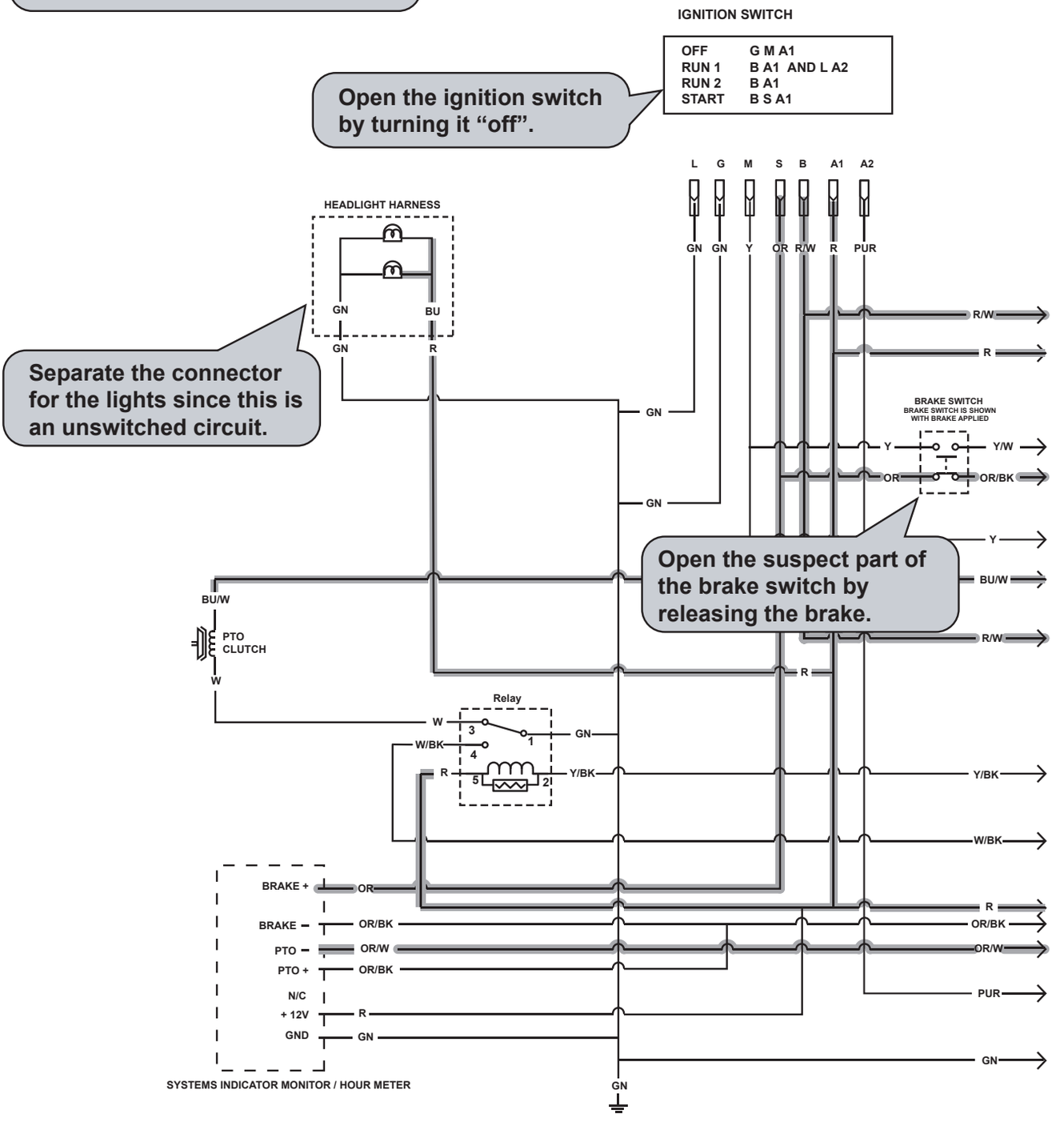
Eliminate the green wires as possibilities because they're *supposed* to go to ground.

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.

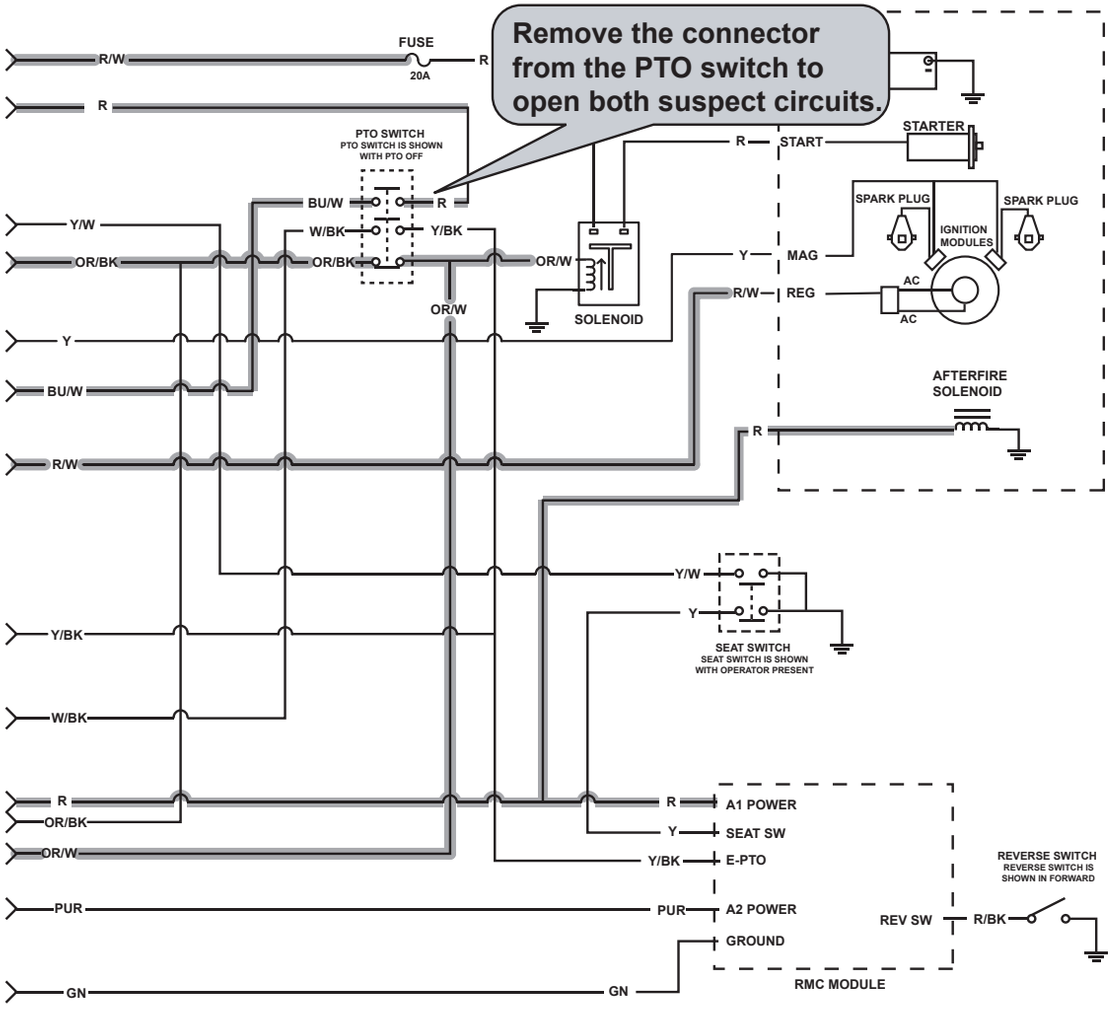


Step 3. Break the suspect area down into “mini-circuits”. Do this by unplugging unswitched circuits and by opening all Switches.



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

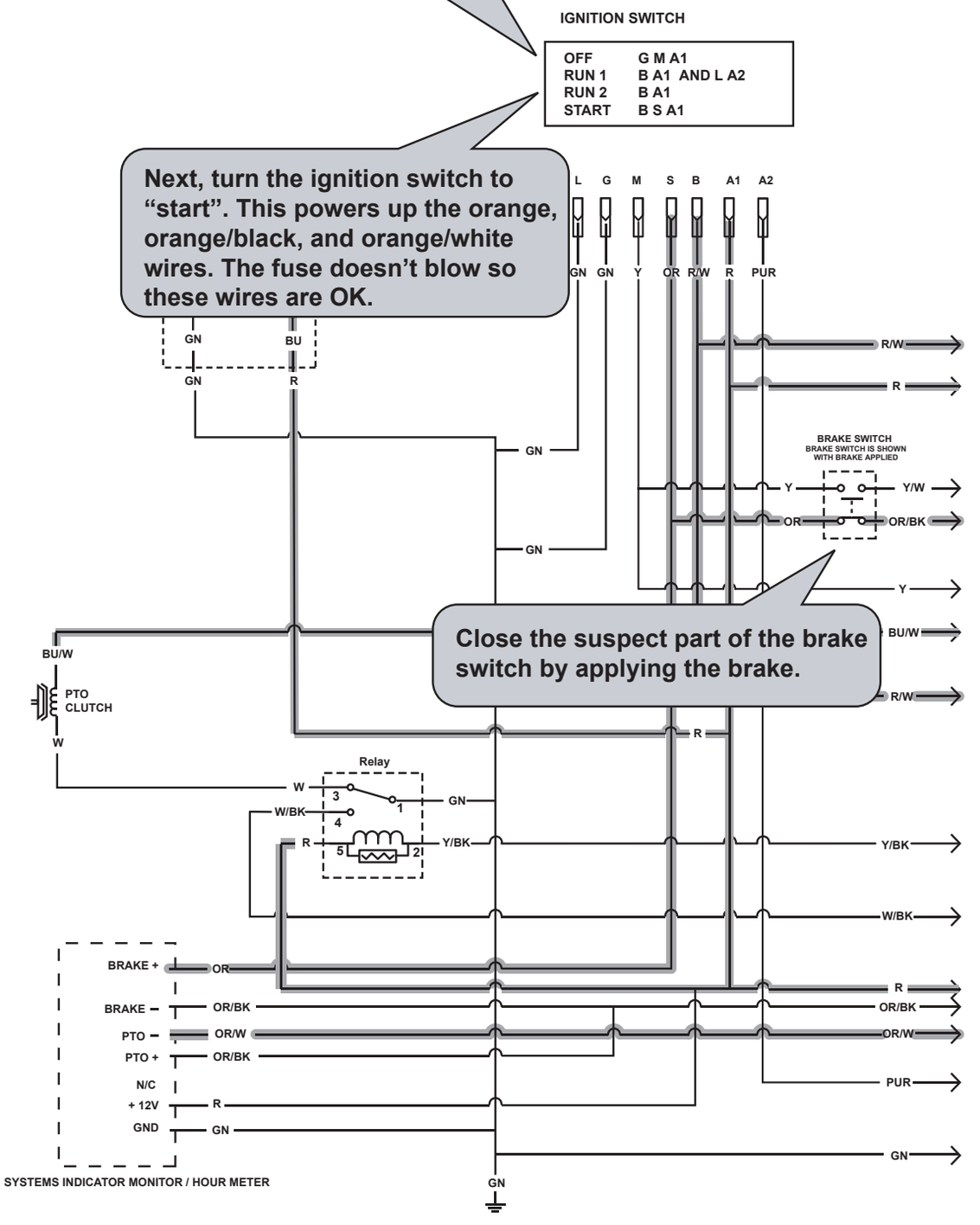


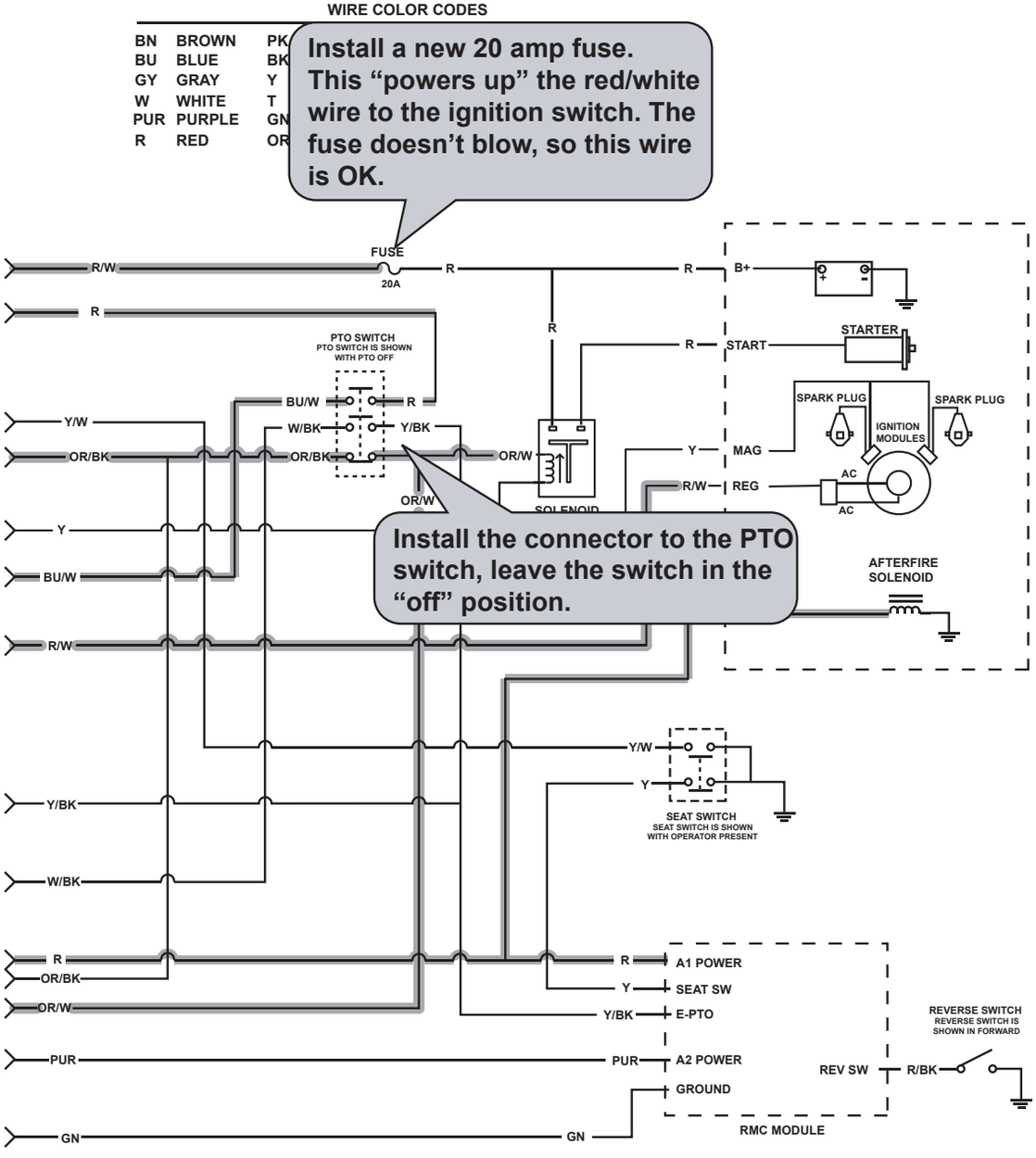
Step 4. Power up the mini-circuits one at a time, beginning with the one closest to the battery.

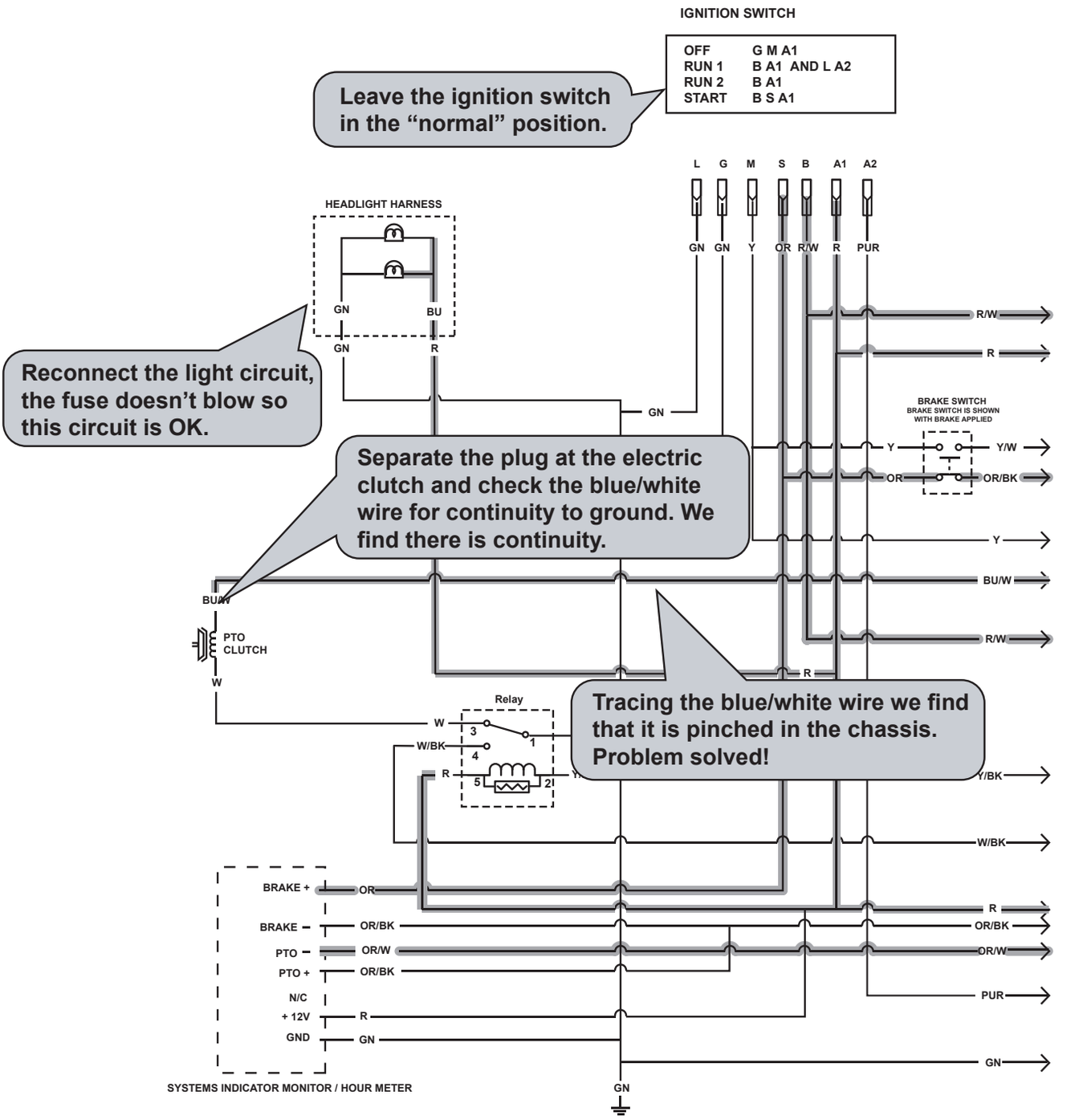
When the ignition switch is turned to “normal”, the 20 amp fuse doesn’t blow. This means the red wires are OK.

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.

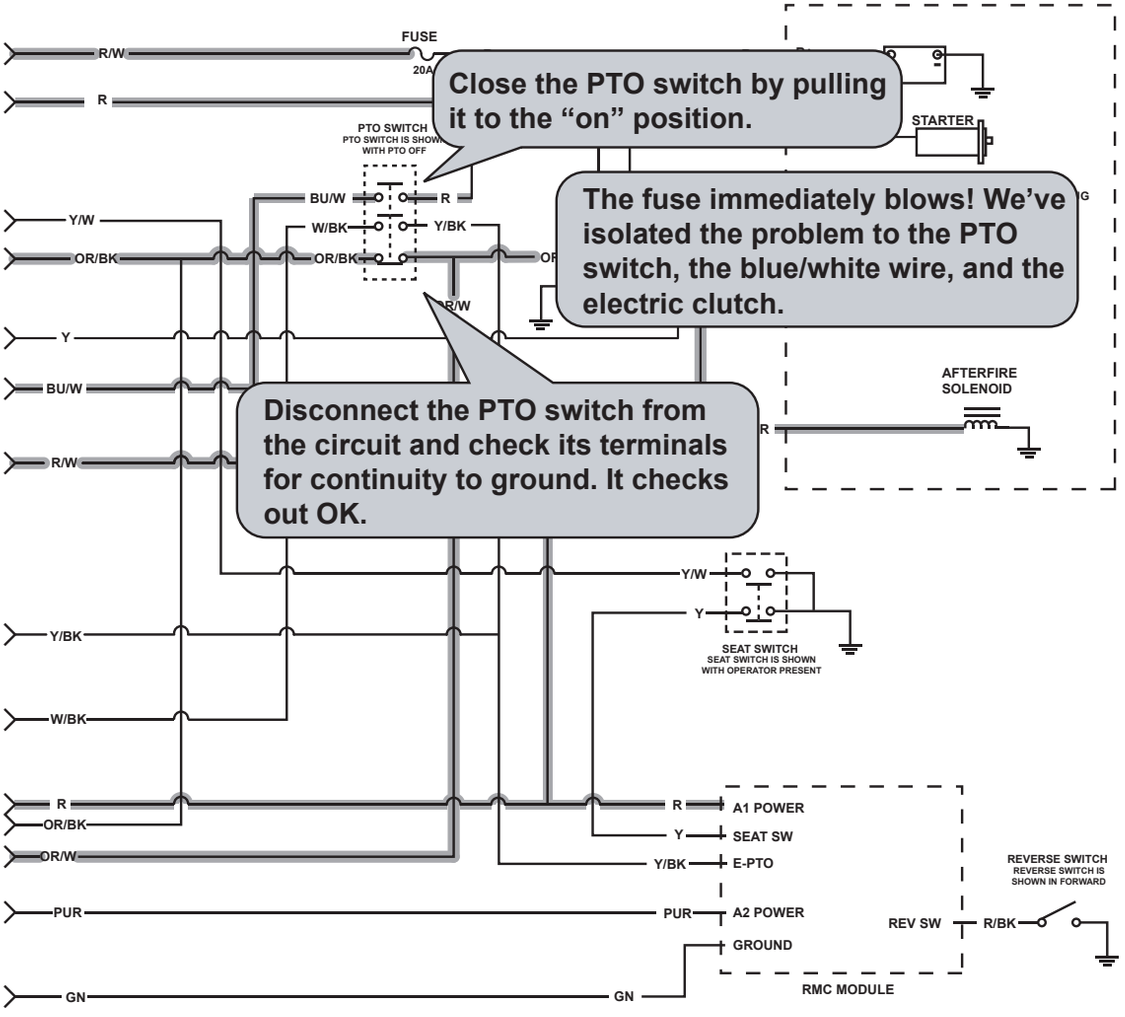



WIRE COLOR CODES
BN BROWN
BU BLUE
GY GRAY
W WHITE
PUR PURPLE
R RED
PK
BK
Y
T
GN
OR
Install a new 20 amp fuse. This "powers up" the red/white wire to the ignition switch. The fuse doesn't blow, so this wire is OK.
FUSE
20A
R/W
R
PTO SWITCH
PTO SWITCH IS SHOWN WITH PTO OFF
BU/W
W/BK
Y/BK
OR/BK
OR/W
Y/W
Y
BU/W
R/W
Y/BK
W/BK
SOLENOID
B+
START
STARTER
SPARK PLUG
SPARK PLUG
IGNITION MODULES
MAG
REG
AC
AC
AFTERFIRE SOLENOID
Install the connector to the PTO switch, leave the switch in the "off" position.
SEAT SWITCH
SEAT SWITCH IS SHOWN WITH OPERATOR PRESENT
A1 POWER
SEAT SW
E-PTO
A2 POWER
GROUND
PUR
GN
RMC MODULE
REVERSE SWITCH
REVERSE SWITCH IS SHOWN IN FORWARD
REV SW
R/BK


IGNITION SWITCH
OFF G M A1
RUN 1 B A1 AND L A2
RUN 2 B A1
START B S A1
Leave the ignition switch in the "normal" position.
L G M S B A1 A2
GN GN Y OR R/W R PUR
HEADLIGHT HARNESS
GN BU
GN R
Reconnect the light circuit, the fuse doesn't blow so this circuit is OK.
GN
BRAKE SWITCH
BRAKE SWITCH IS SHOWN WITH BRAKE APPLIED
Y Y/W
OR OR/BK
Separate the plug at the electric clutch and check the blue/white wire for continuity to ground. We find there is continuity.
BU/W
PTO CLUTCH
W
R/W
R
Y
BU/W
R/W
Relay
W
W/BK
R
3
1
4
5
2
Tracing the blue/white wire we find that it is pinched in the chassis. Problem solved!
Y/BK
W/BK
BRAKE +
BRAKE –
PTO –
PTO +
N/C
+ 12V
GND
OR
OR/BK
OR/W
OR/BK
R
SYSTEMS INDICATOR MONITOR / HOUR METER
R
OR/BK
OR/W
PUR
GN
GN

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



This page intentionally left blank

Table Of Contents

DESCRIPTION

This page intentionally left blank

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).

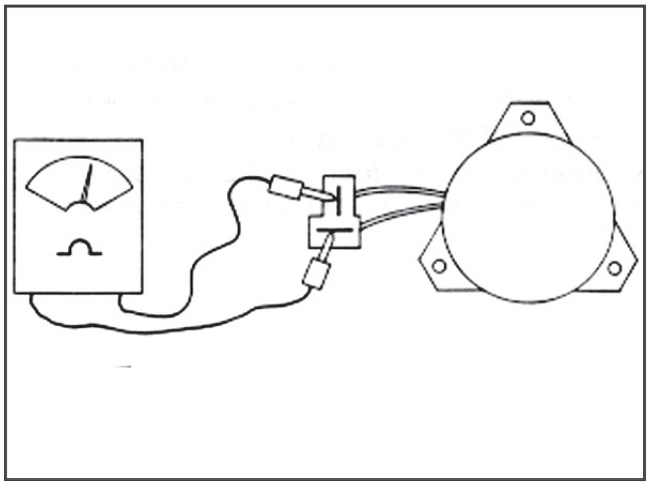


Figure 1 3-6

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).

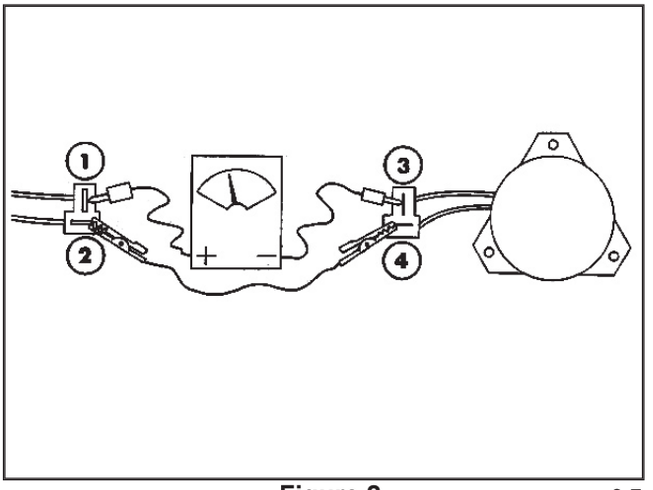


Figure 2 3-7

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).

Fuse

Location

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).

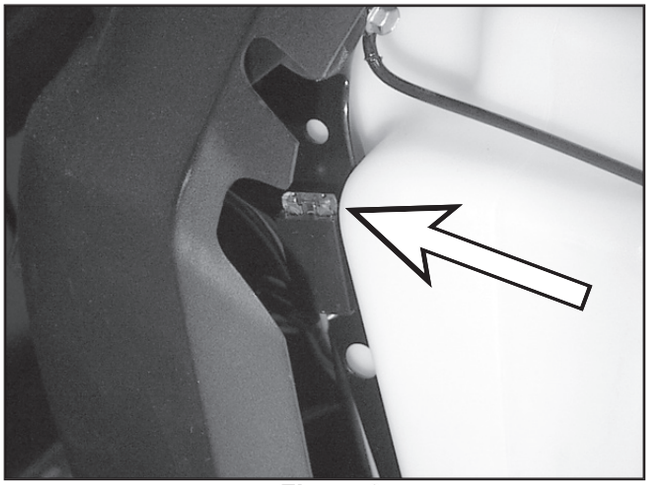


Figure 3 fuseIII

Purpose

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).

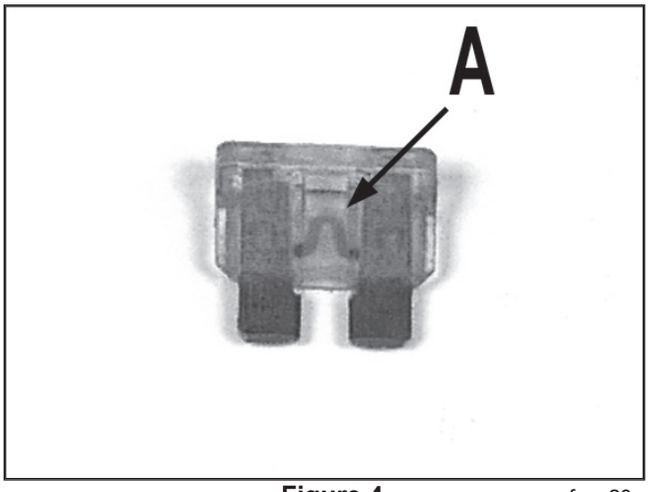


Figure 4 fuse20a

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).

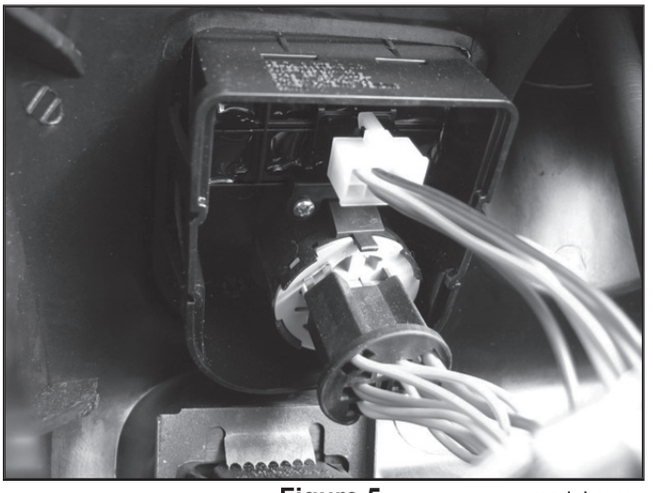


Figure 5 mod_keysw

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 equiped 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 equiped 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.

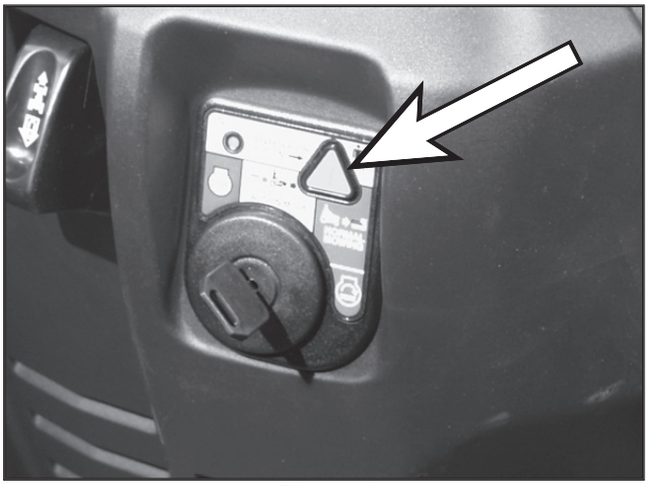


Figure 6 keysw

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.

Testing the RMC system – Electric 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, 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.

Testing the RMC system – Electric 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, pull the PTO switch to the "on" position.
4. With the brake applied, move the shift lever to the reverse position.
5. The electric clutch should remain engaged.

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.

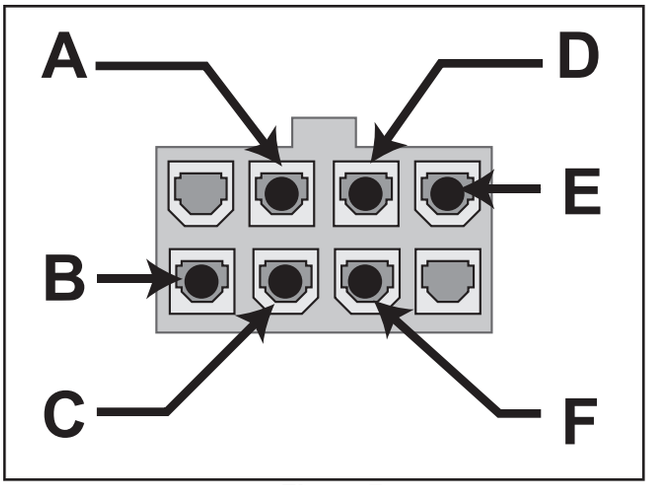


Figure 7 RMCPlugElec1

Circuit Testing - Electric PTO

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

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.

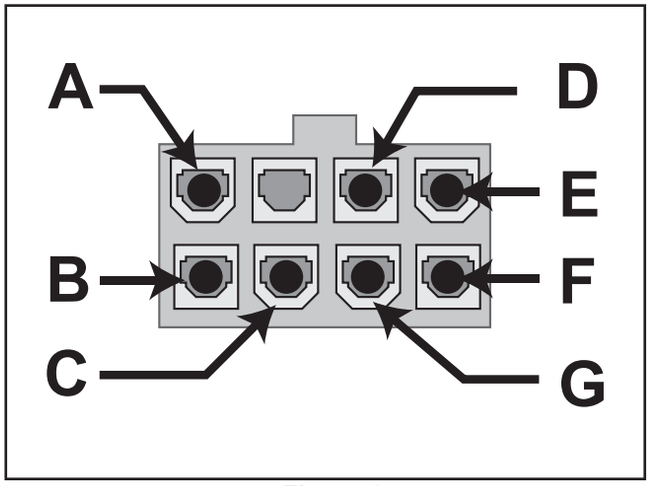


Figure 8 RMCPlugMan1

Circuit Testing - Manual PTO

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

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).

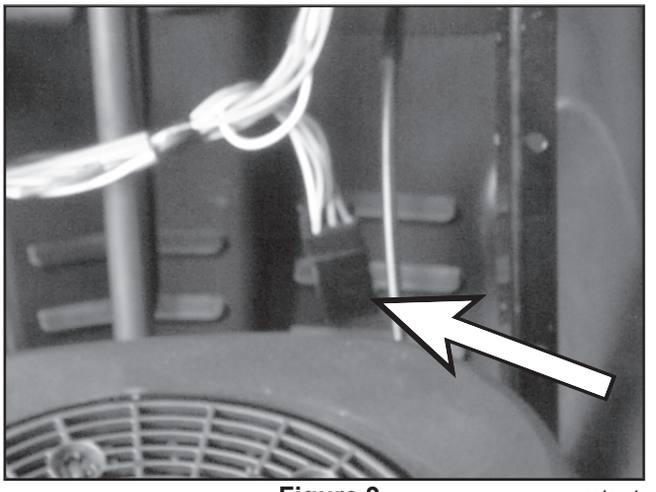


Figure 9 relay1

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.

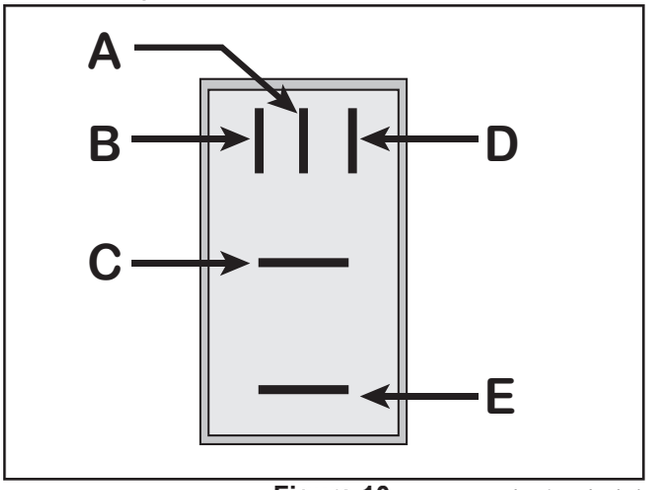


Figure 10 relay terminals1

A Norm. closed contact	B Coil Negative
C Norm. open contact	D Coil Positive
E Common contact	

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).

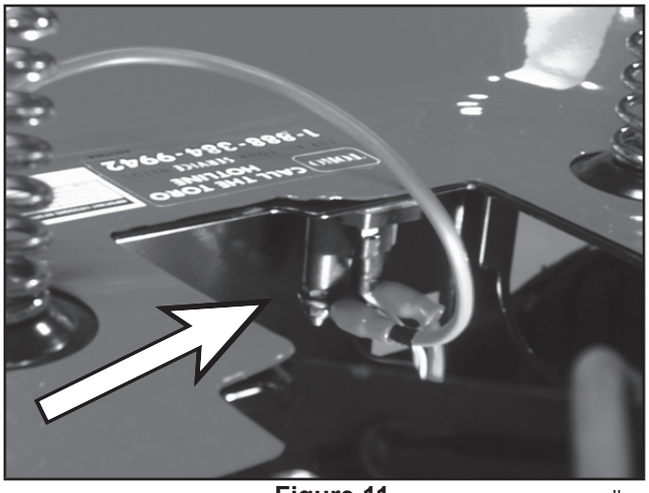


Figure 11 solloc

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.

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

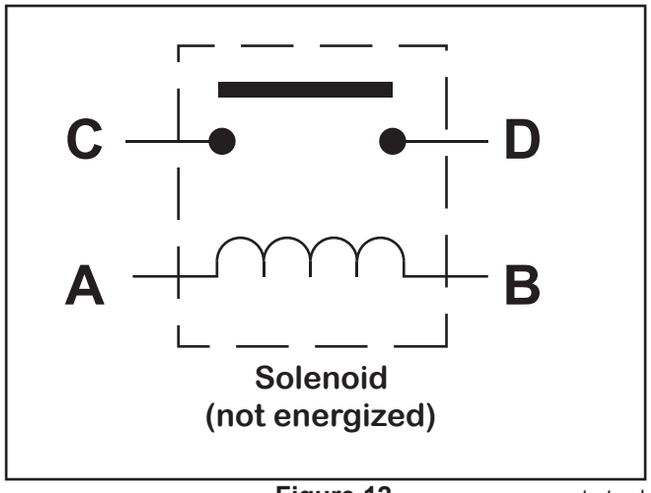


Figure 12 start sol

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.

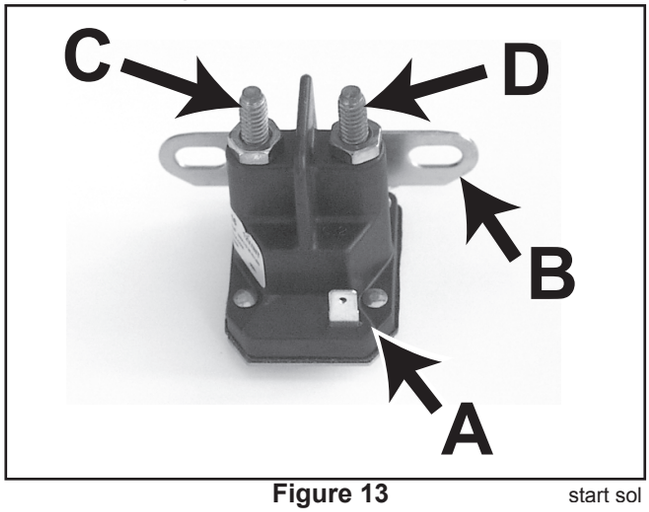


Figure 13 start sol

(A) & (B) Coil Terminals	(C) & (D) Contact Terminals

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).

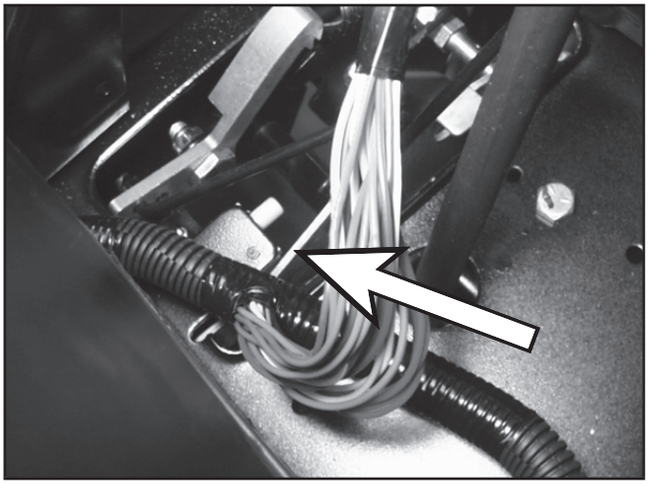


Figure 14 tbrakesw

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.

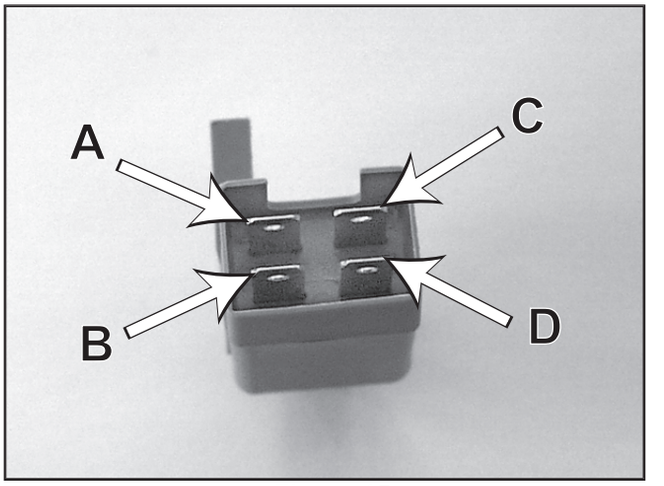


Figure 15 manptoterm

Plunger Not Depressed	Plunger Depressed
A&B Terminals – Closed Circuit – Continuity	A&B Terminals – Open Circuit – No Continuity
C&D Terminals – Open Circuit – No Continuity	C&D Terminals – Closed Circuit – Continuity

Switch, Parking Brake (Manual PTO)

Location

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

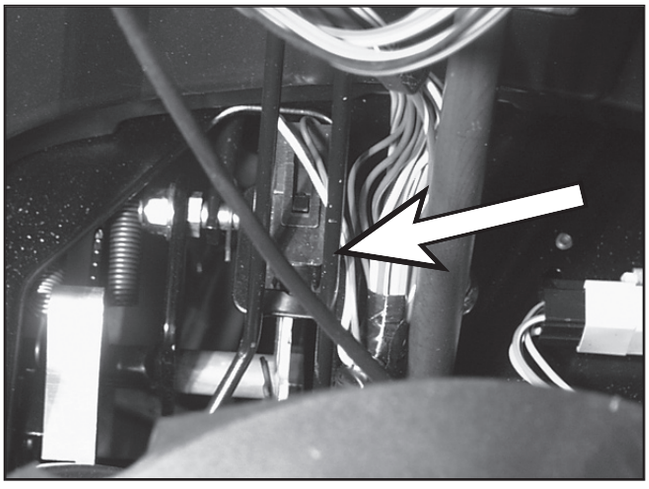


Figure 16 prkbrksw

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).

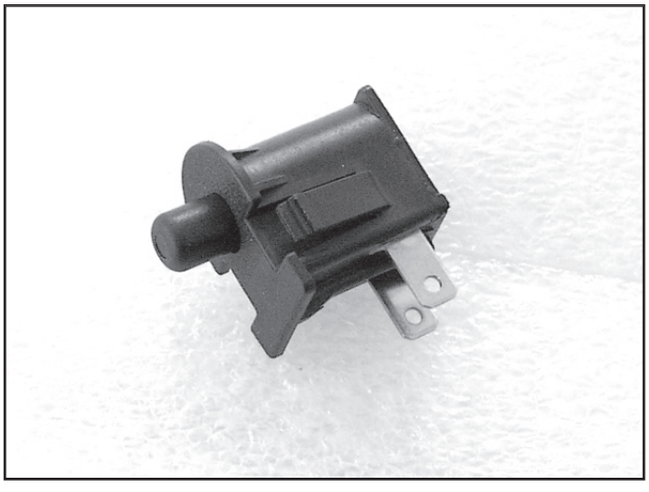


Figure 17 parkbrkswcu

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

Switch, Key

Purpose

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

Figure 18 keysw

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).

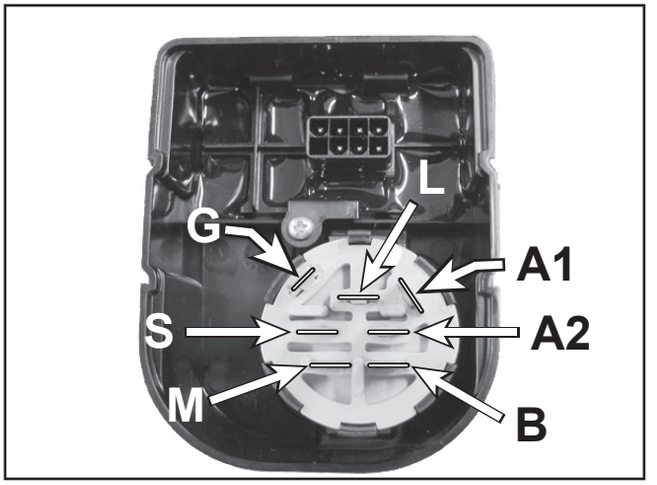


Figure 19 swign

Position	Condition
Off	G+M+A1
Reverse Caution (Run 1)	B+A 1 & L+A 2
Normal Mowing (Run 2)	B+A 1
Start	B+S+A 1

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).

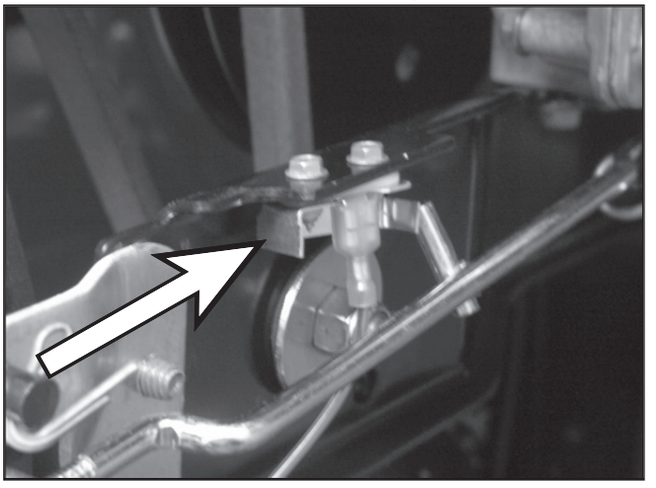


Figure 20 trevsw

Units equipped with hydrostatic transmissions

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

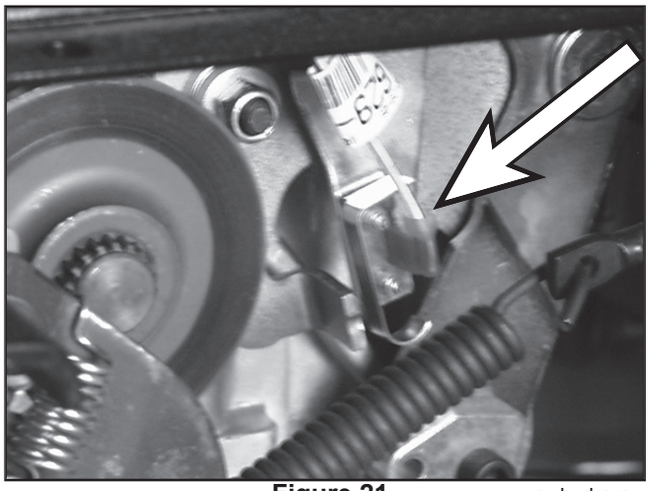


Figure 21 swhydrorev

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 (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.

Figure 22 tseatswl

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,

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.

Figure 23 tseatsw

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).

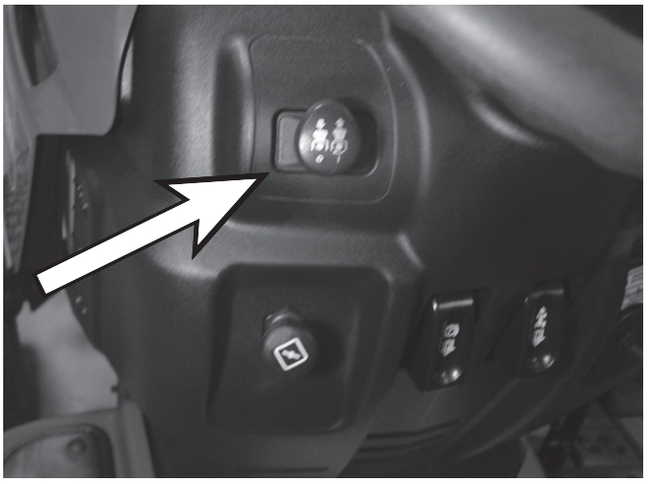


Figure 24 tseatsw

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.

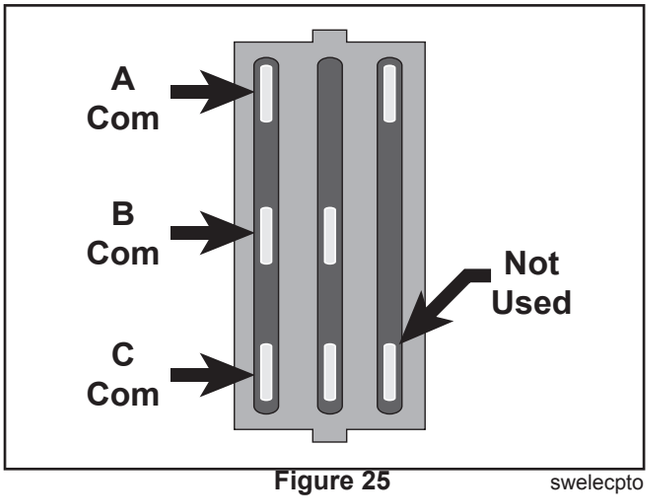


Figure 25 swelecpto

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).

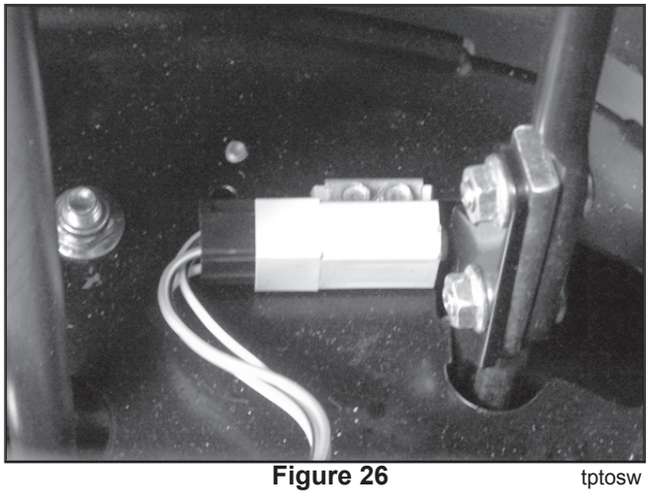


Figure 26 tptosw

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 an ohmmeter, follow the procedures listed below (Figure 27):

Note: Terminals on actual switch not labeled.

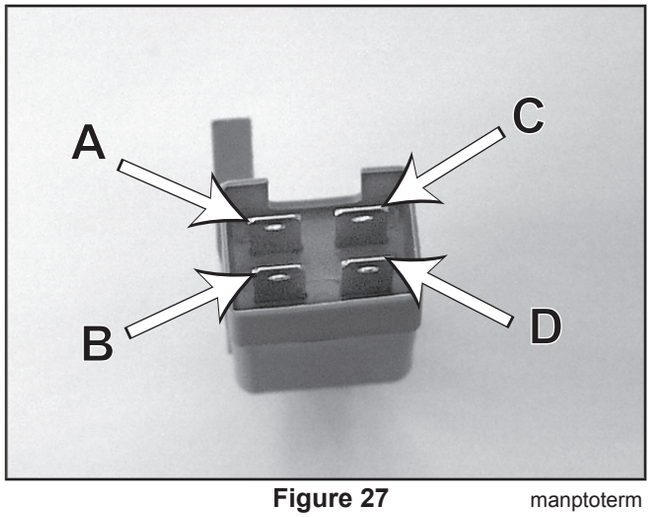


Figure 27 manptoterm

Plunger Not Depressed	Plunger Depressed
A&B Terminals – Closed Circuit – Continuity	A&B Terminals – Open Circuit – No Continuity
C&D Terminals – Open Circuit – No Continuity	C&D Terminals – Closed Circuit – Continuity

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).

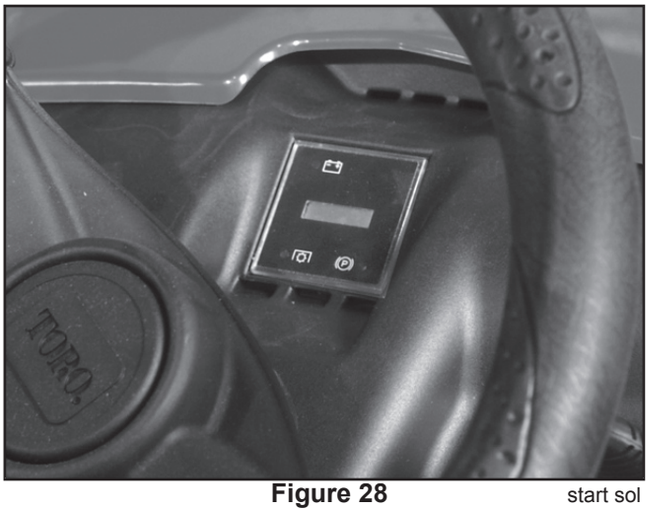


Figure 28 start sol

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.

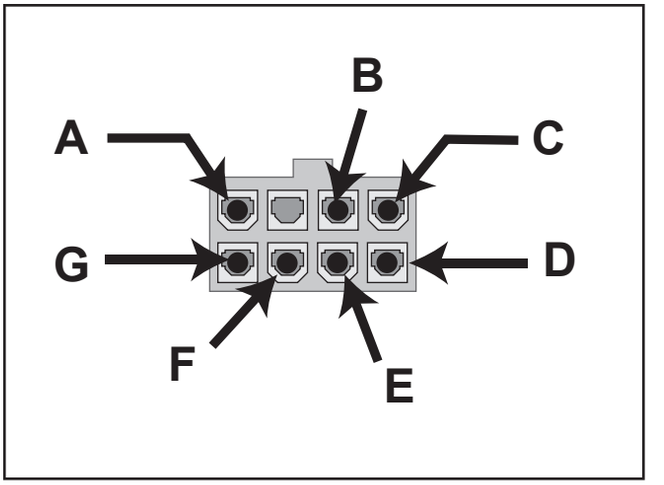


Figure 29 hourmeterplug

Wire Colors

A Green	B Black
C Red	D Orange/Black
E Orange	F Orange/White
G Orange/Black	

1. Disconnect the wiring harness connector from the back of the monitor.

2. At the wiring harness plug, connect a voltmeter positive lead to terminal “C” and the negative lead to terminal “A” (Figure 29). With the key in the “normal” or “Reverse Caution” position the meter should read battery voltage.

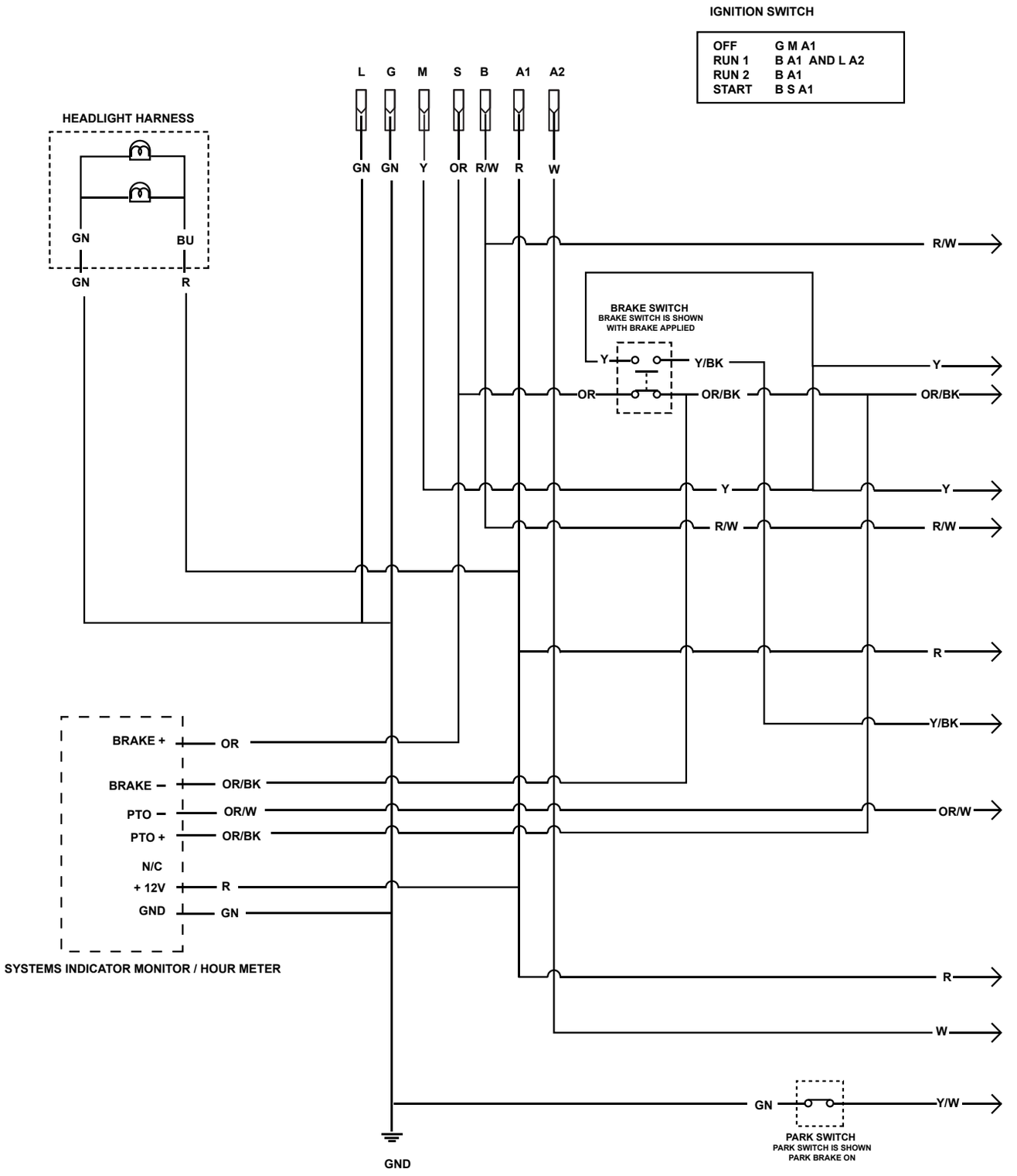
3. Connect an ohmmeter between terminals “F” and “G” (Figure 29), the meter should show continuity with the PTO off.

4. Connect an ohmmeter between terminals “D” and “E” (Figure 29), the meter should show continuity with the brake applied.

LX420 Information List (2006)

LX460 Information List (2006)

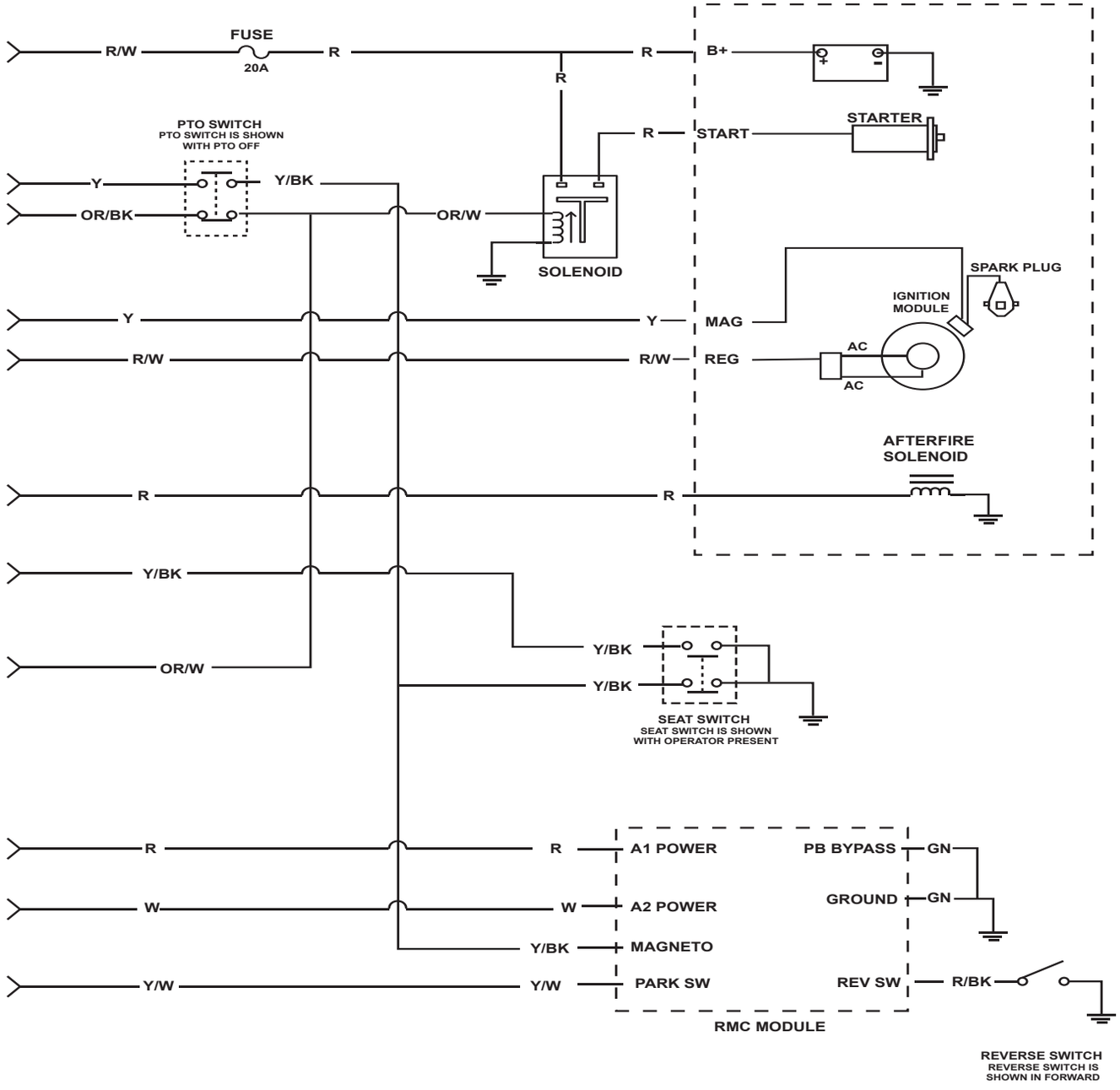
Wiring Diagram



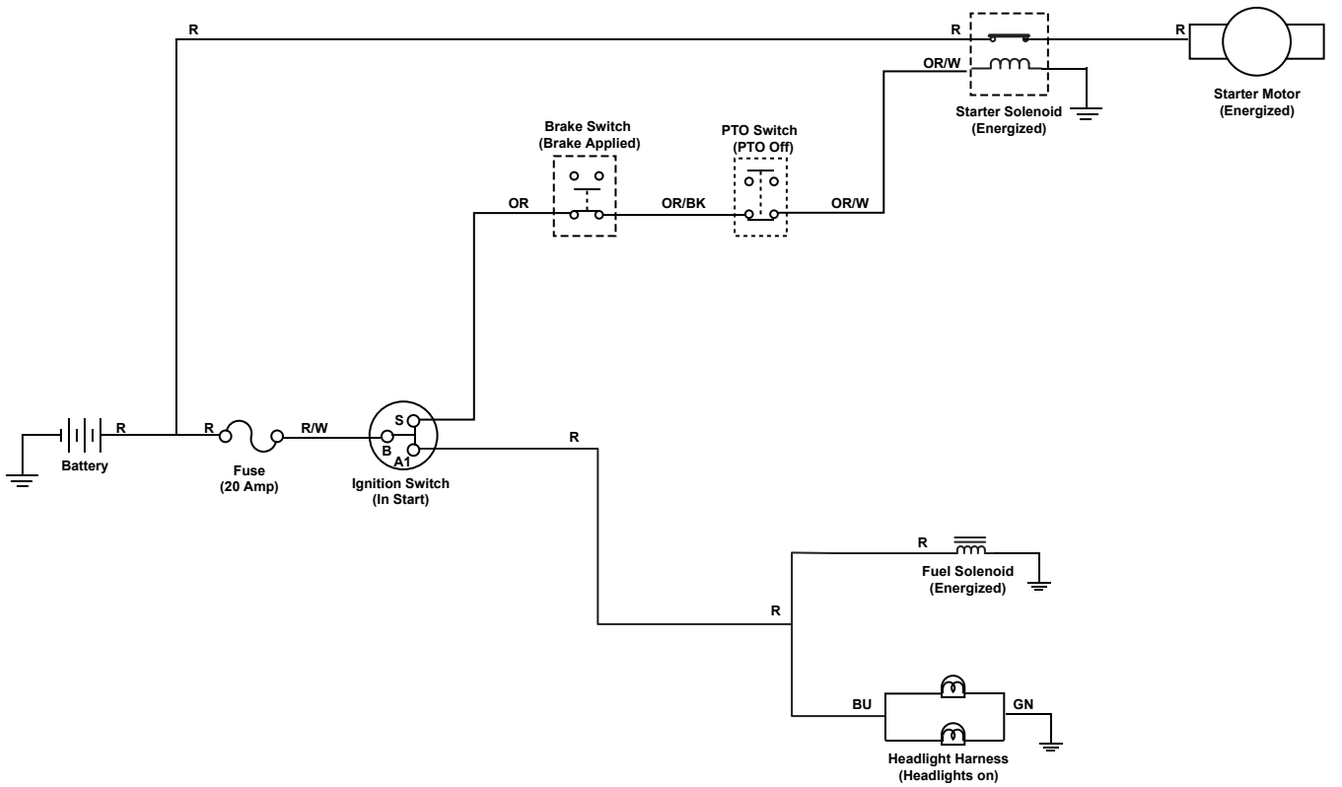
Wiring Diagram

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



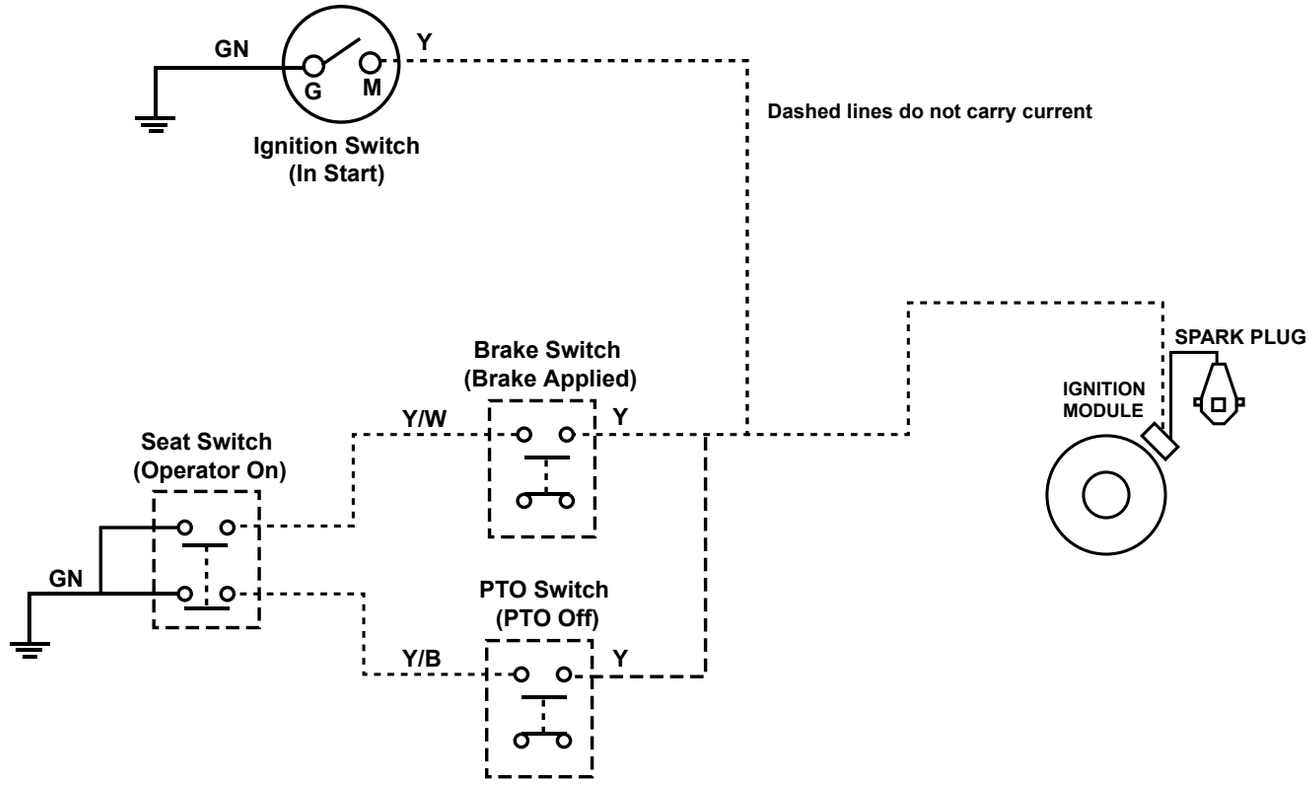
Starter Motor Circuit
(ignition switch in "start")



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

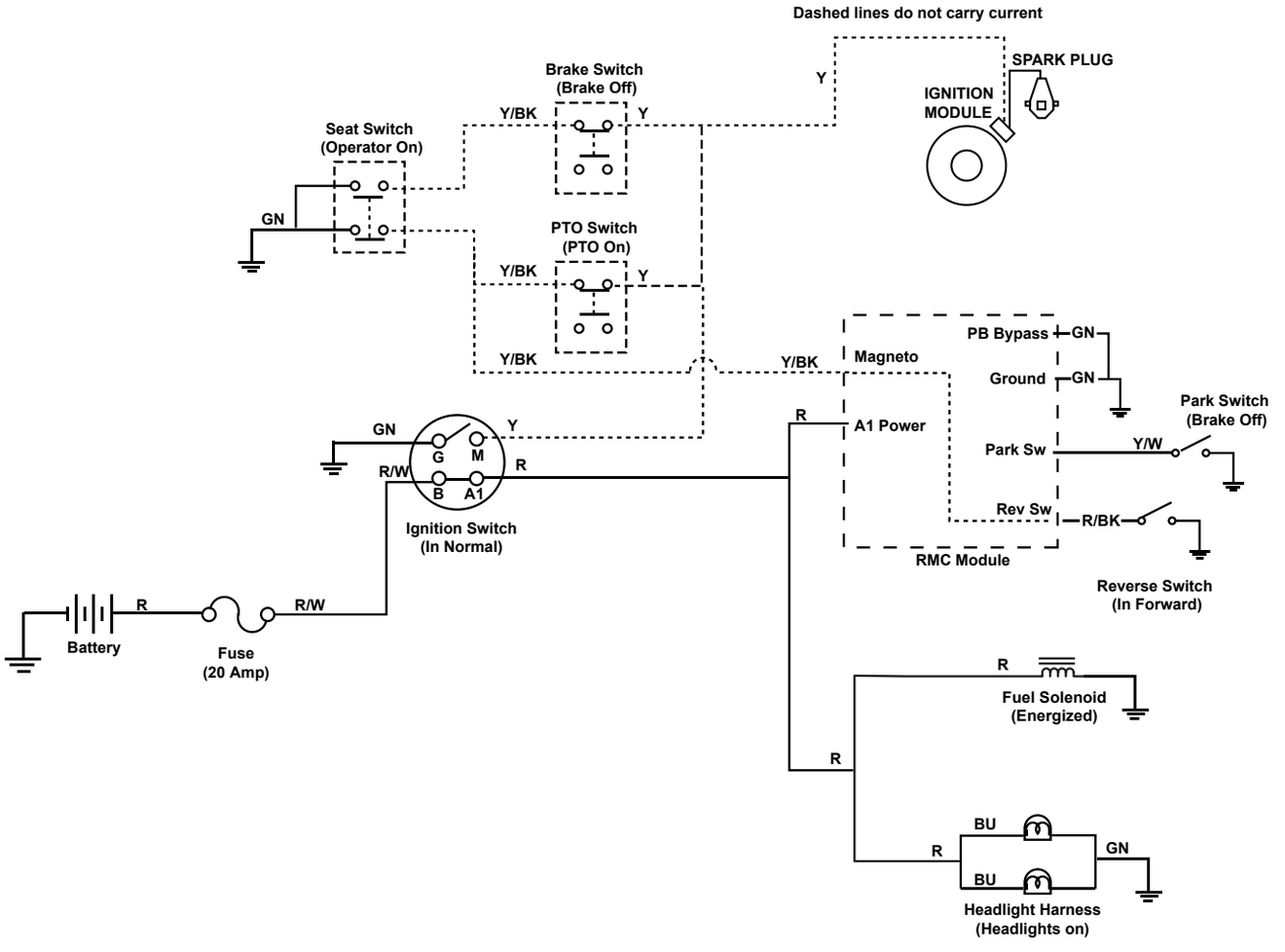
Spark Circuit
(ignition switch in "start")



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

Spark Circuit
(ignition switch in "Normal", PTO "on")

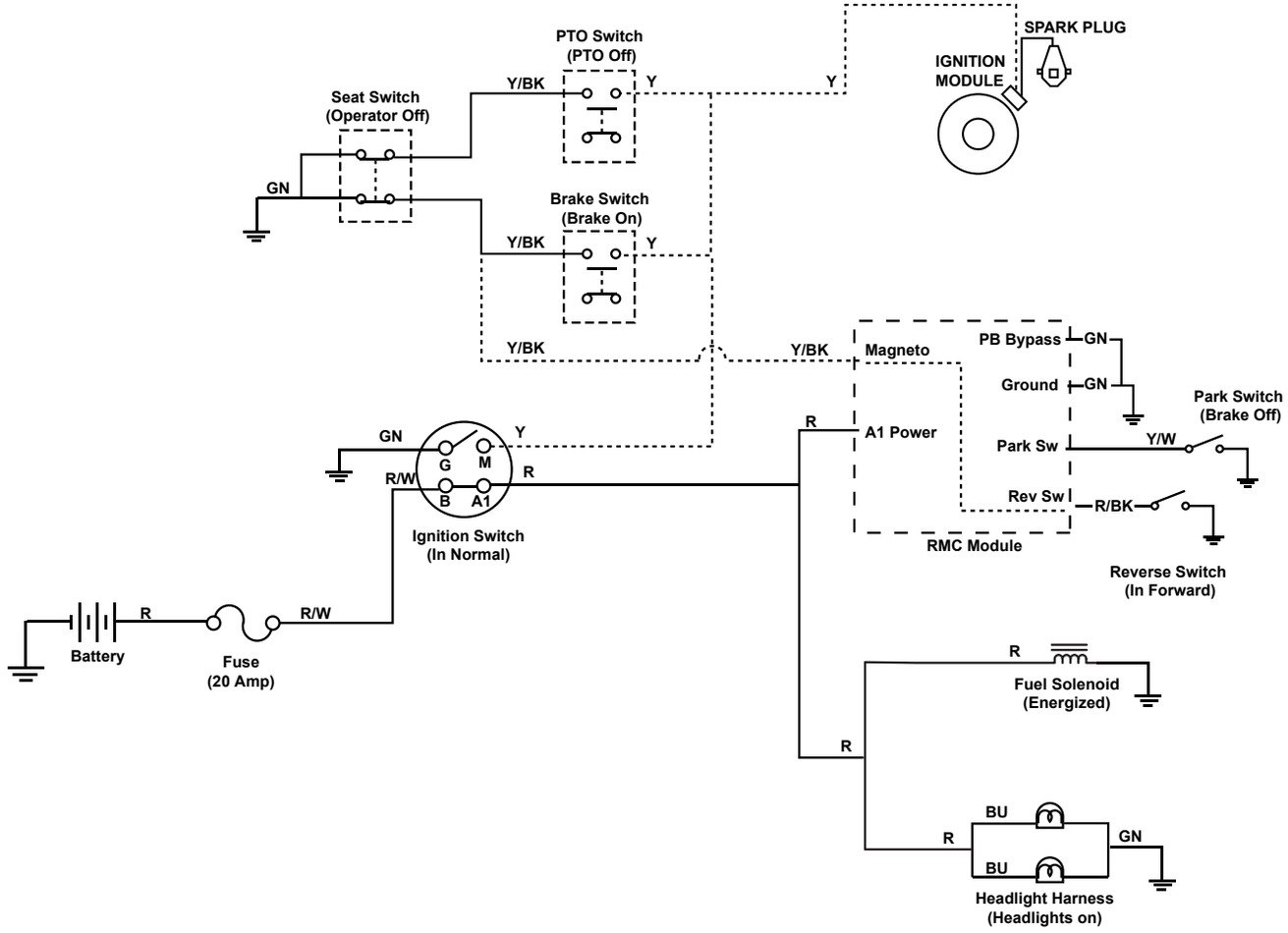


WIRE COLOR CODES

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

Spark Circuit

(ignition switch in "Normal", operator "off", brake "on", PTO "off")

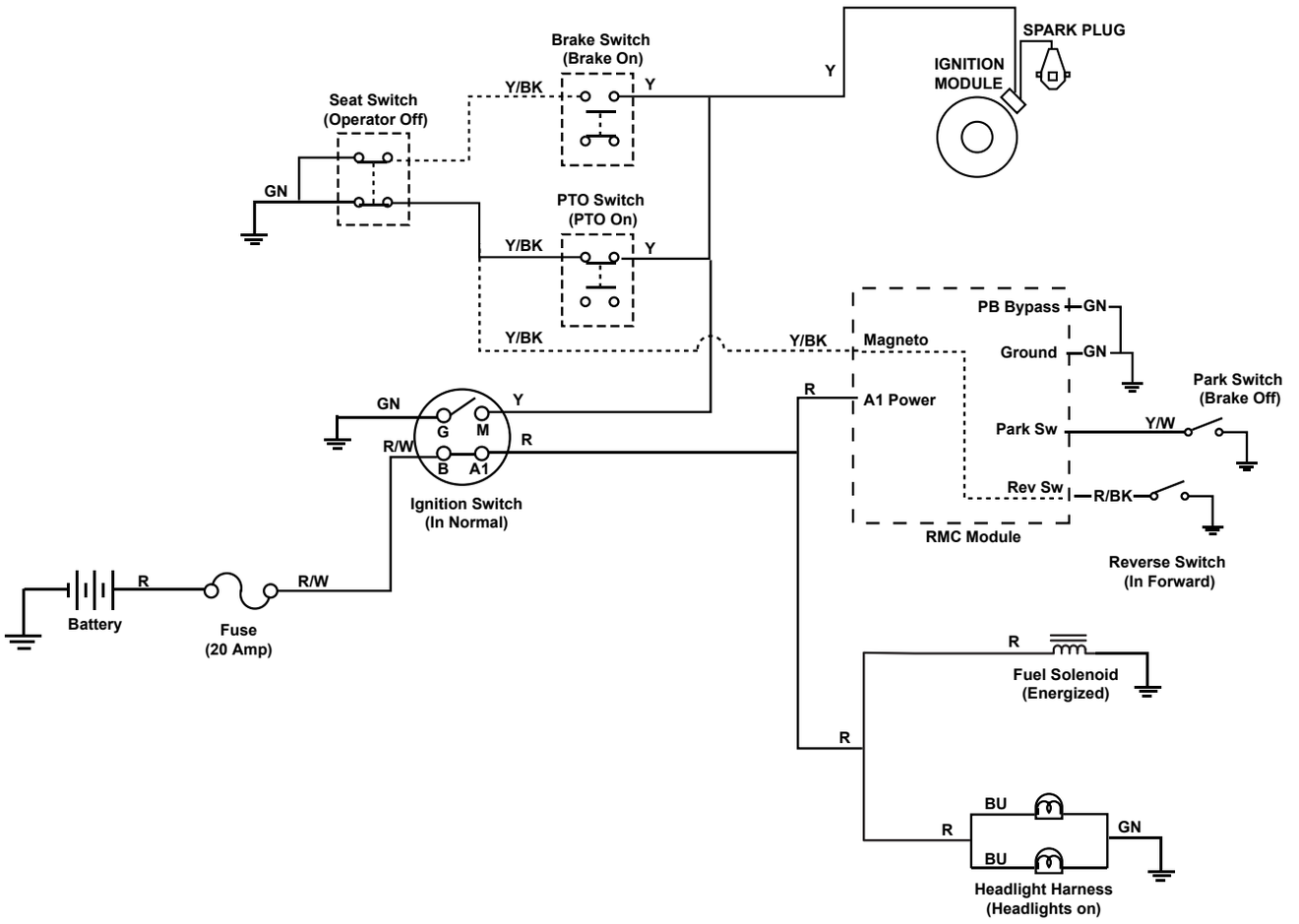


WIRE COLOR CODES

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

Spark Circuit

(ignition switch in "Normal", operator "off", brake "on", PTO "on")

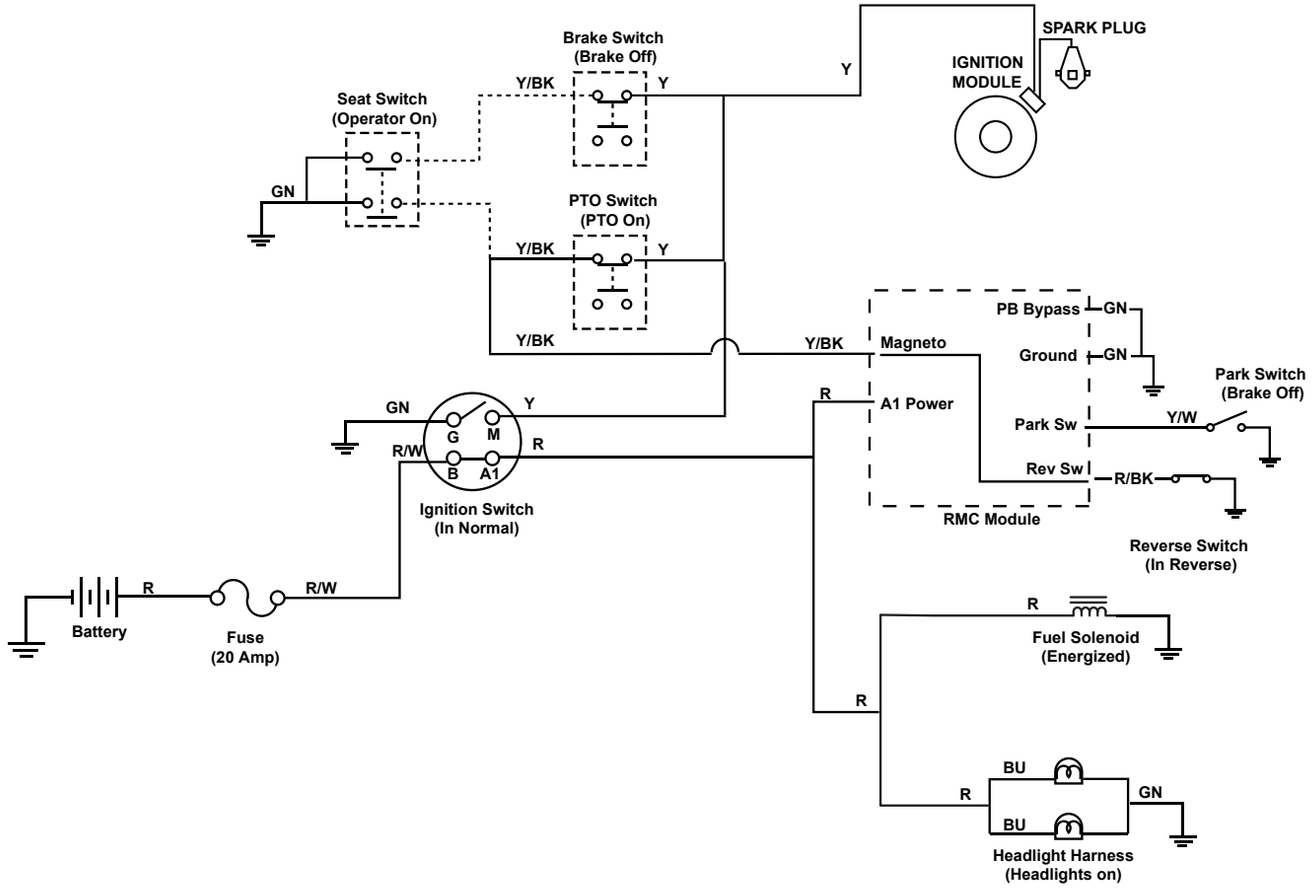


WIRE COLOR CODES

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

Reverse Operating System

(ignition switch in "Normal", PTO "on", transmission in "reverse")

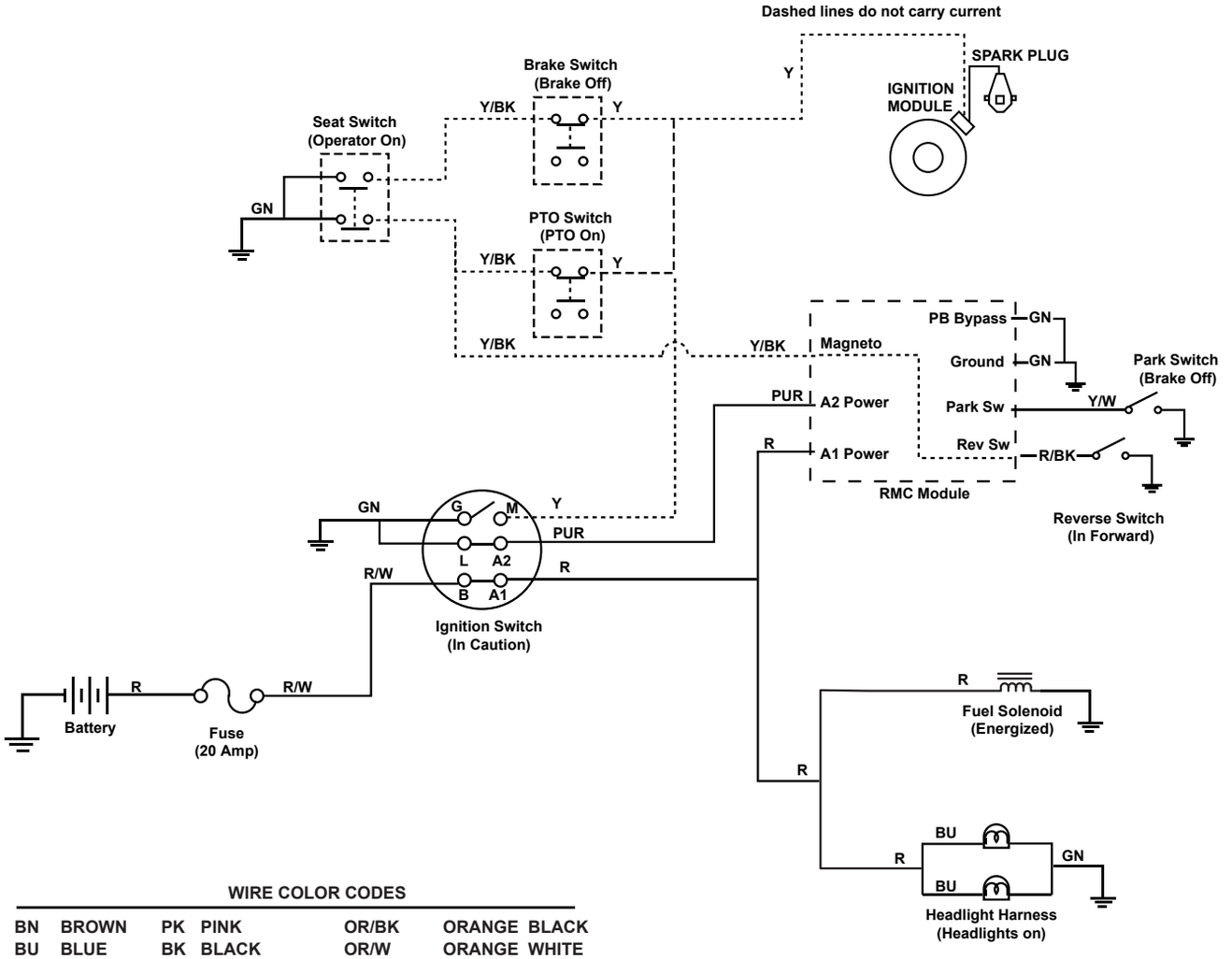


WIRE COLOR CODES

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

Reverse Oprerating System

(ignition switch in "Reverse Caution", PTO "on")

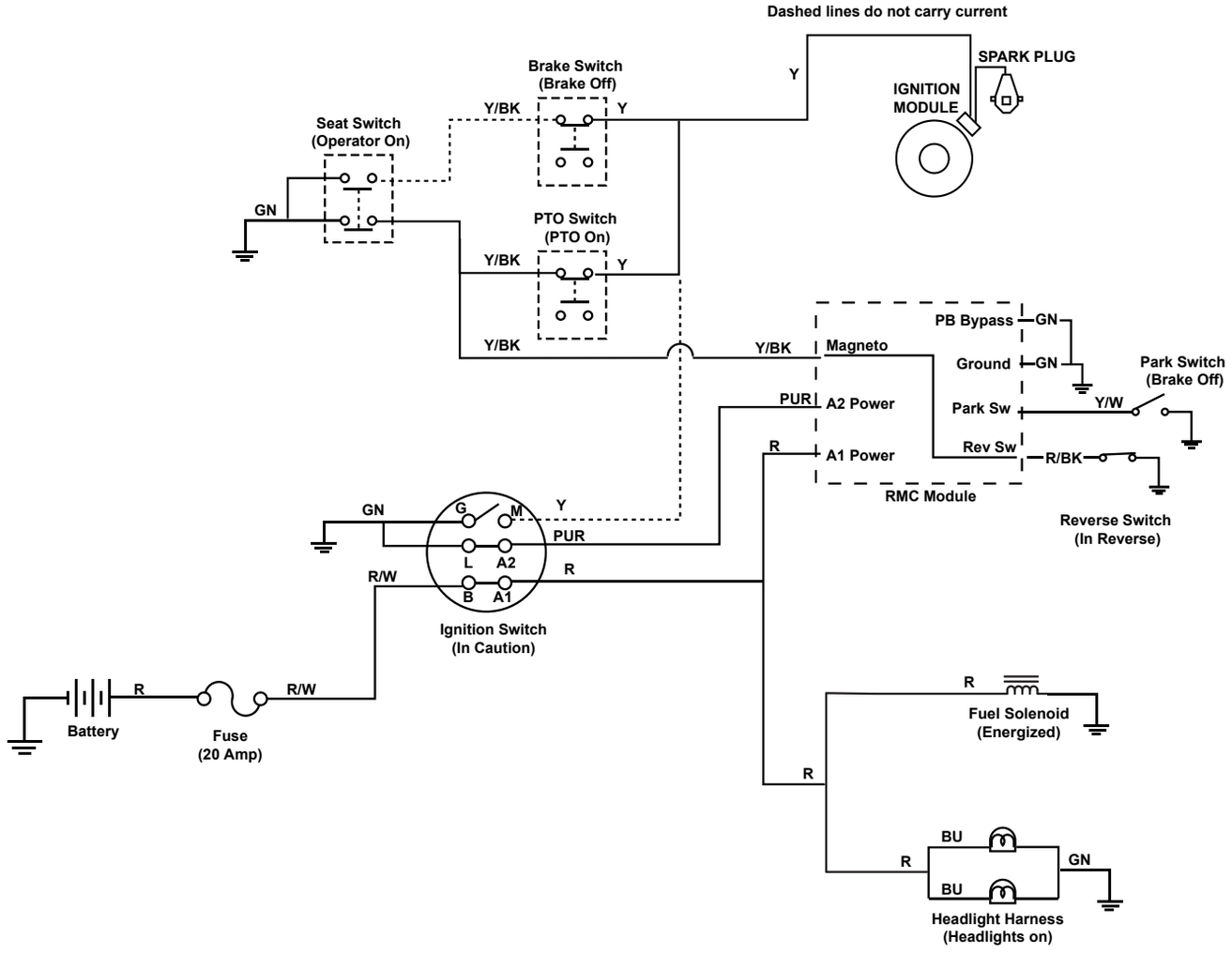


WIRE COLOR CODES

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

Reverse Operating System

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

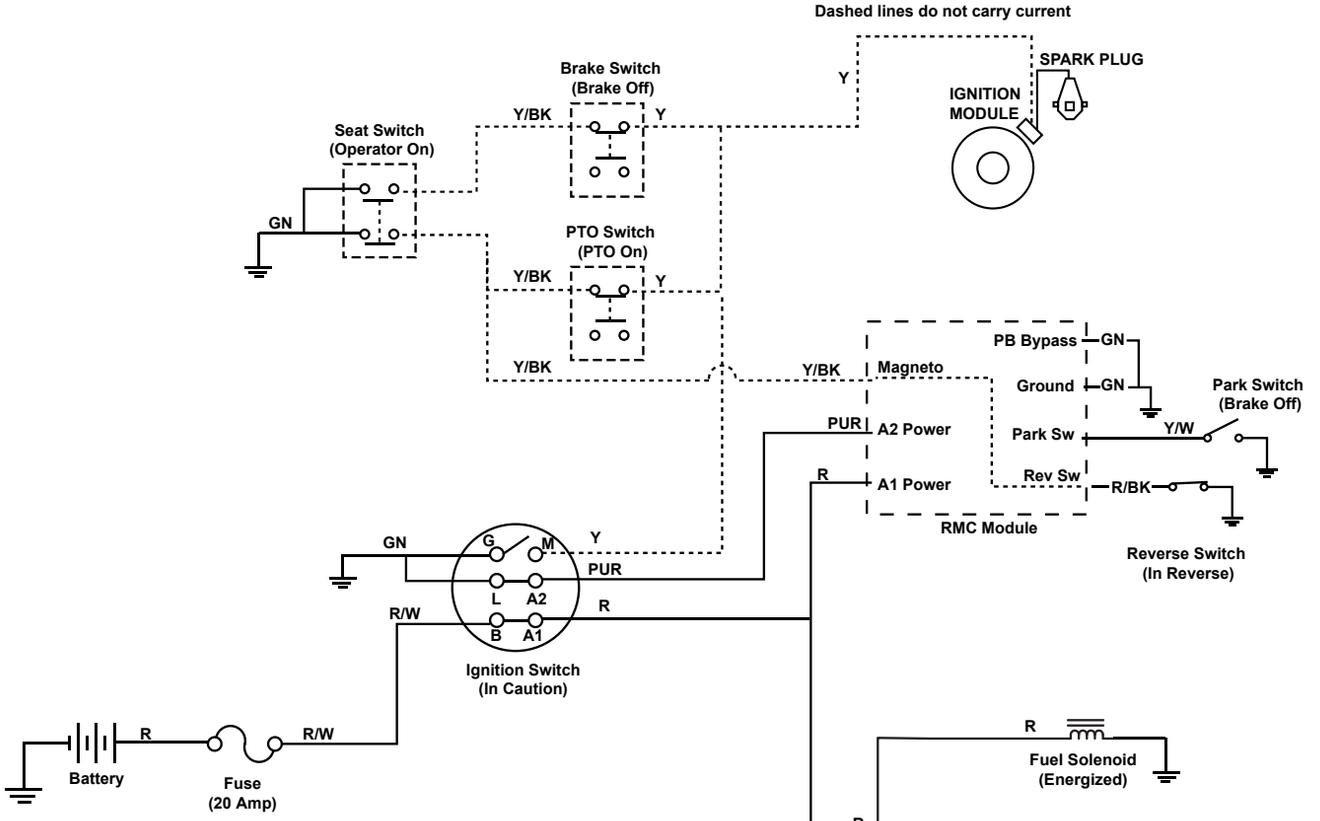


WIRE COLOR CODES

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

Reverse Operating System

(ignition switch in "Reverse Caution", RMC "activated", transmission in "reverse", PTO "on")

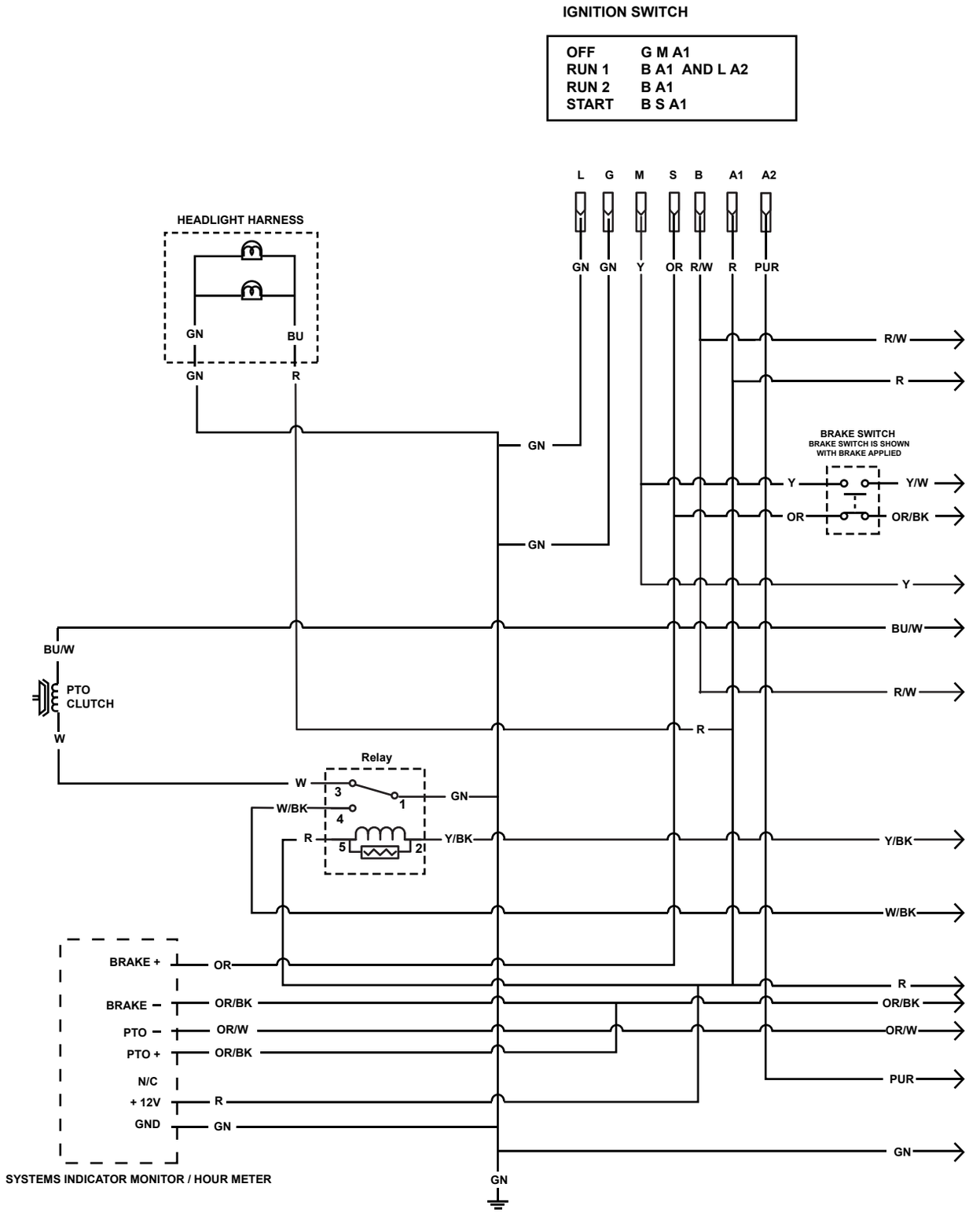


WIRE COLOR CODES

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

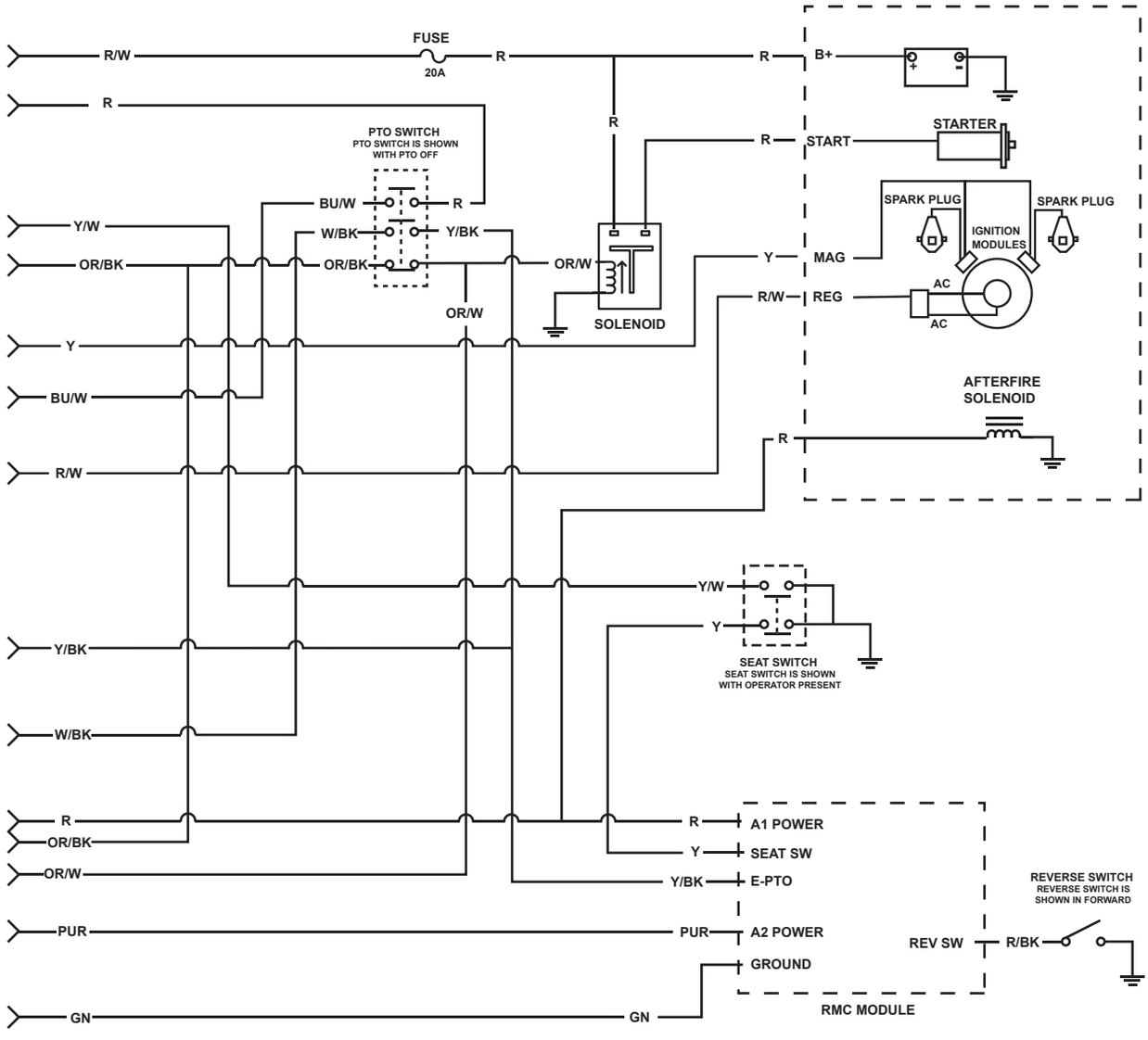
LX500 Information List (2006)
GT2100 Information List (2006)
GT2100 Information List (2006)
GT2100 Information List (2006)

Wiring Diagram

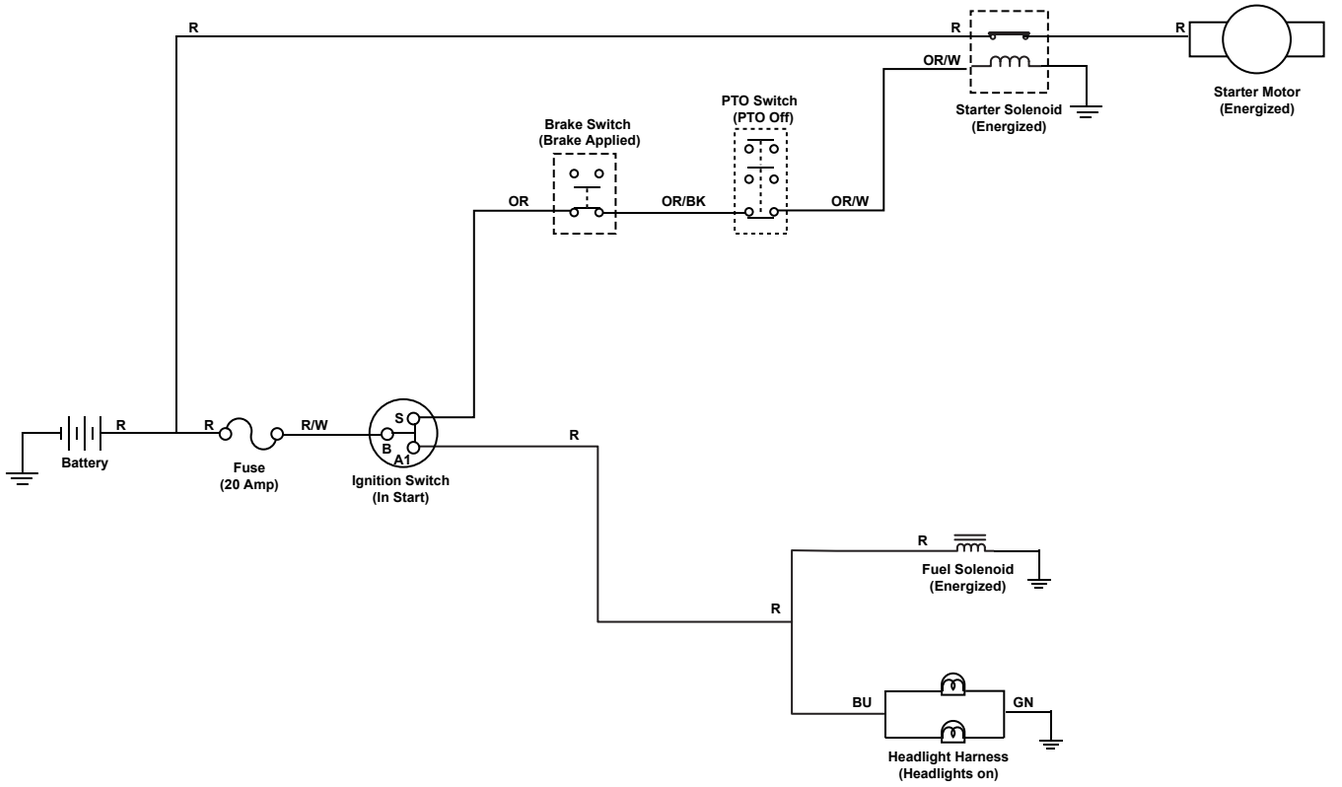


Wiring Diagram

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



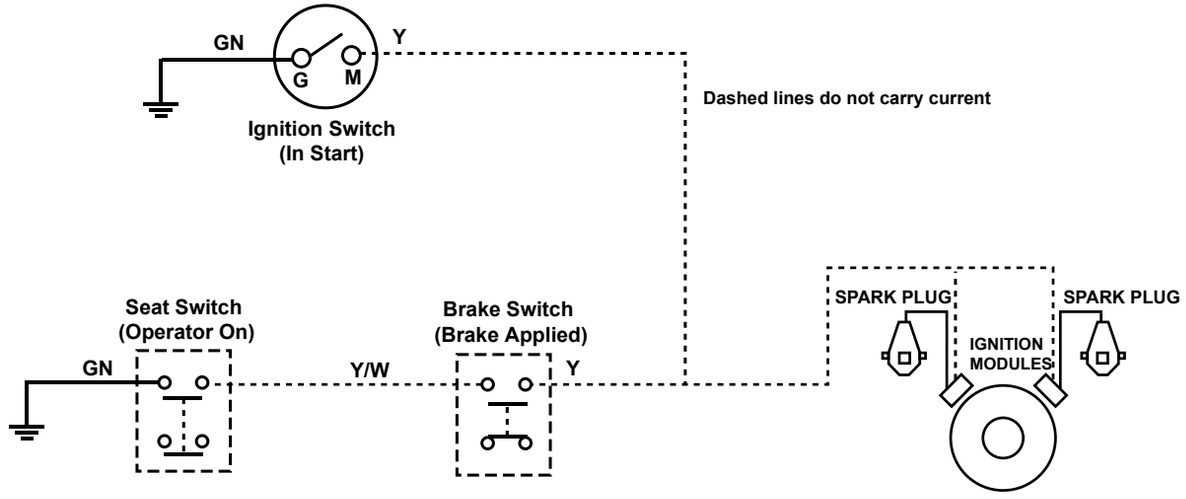
Starter Motor Circuit
(ignition switch in "start")



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

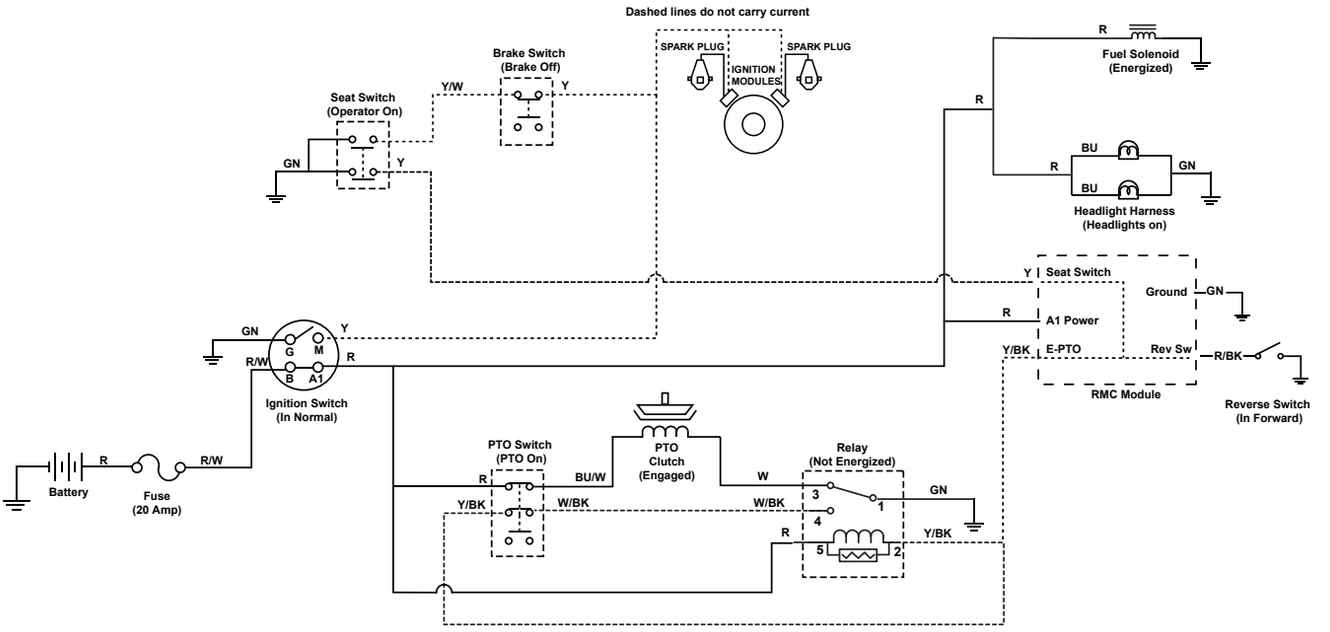
Spark Circuit
(ignition switch in "start")



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

Spark Circuit
(ignition switch in "Normal", PTO "on")

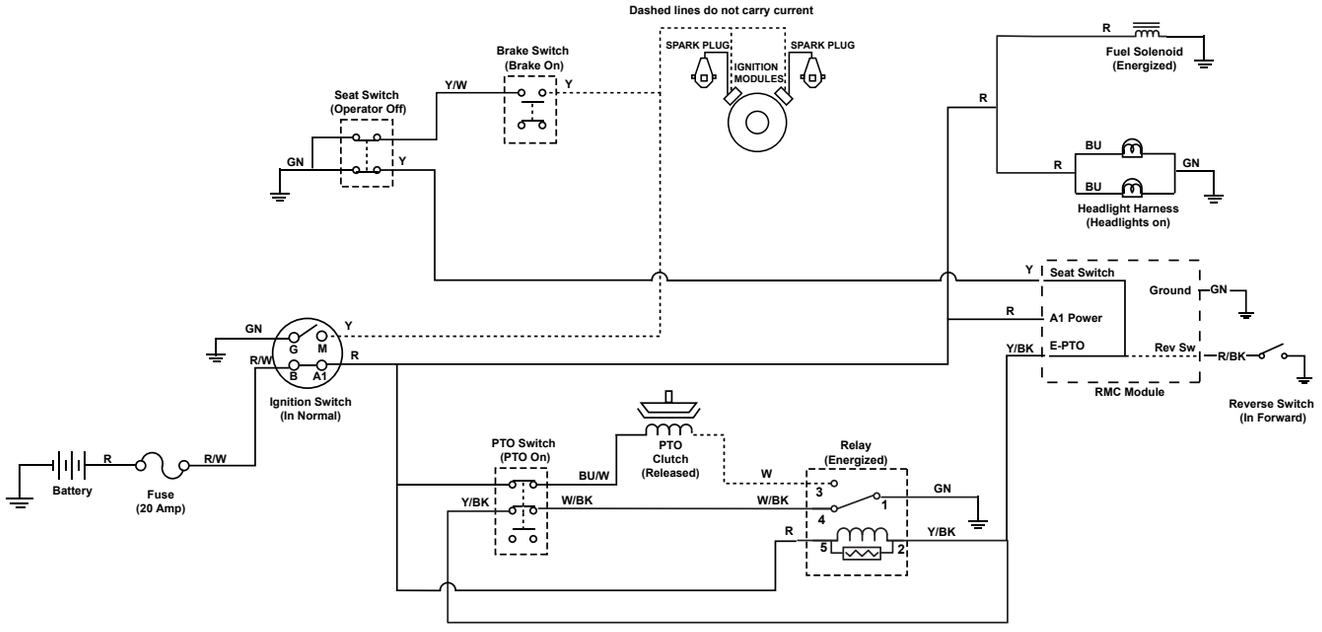


WIRE COLOR CODES

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

PTO Circuit

(ignition switch in "Normal", operator "off", brake "on")



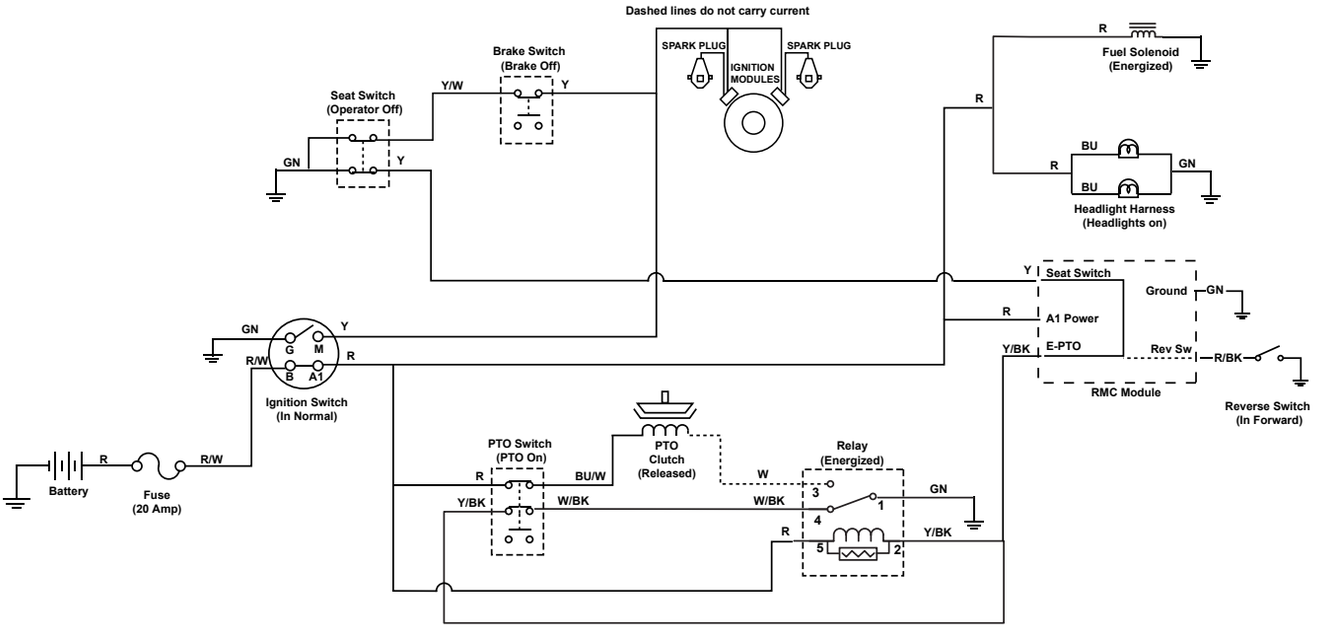
WIRE COLOR CODES

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

Circuits

PTO Circuit

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

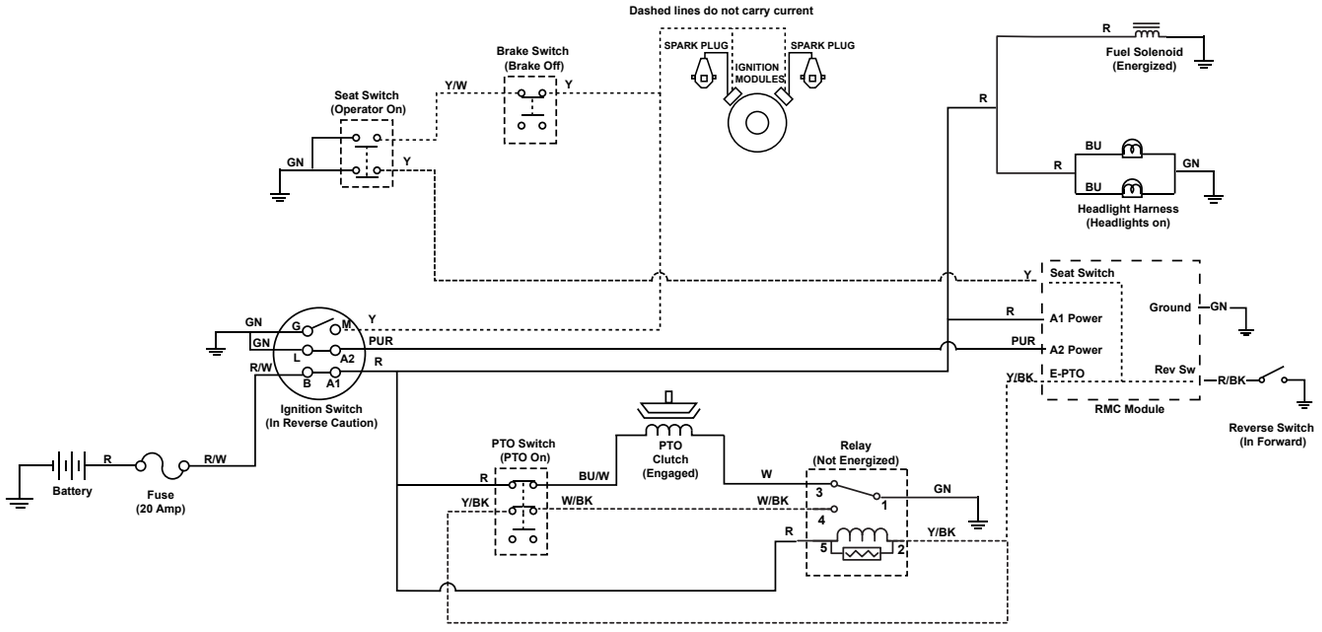


WIRE COLOR CODES

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

Reverse Operating System

(ignition switch in "Reverse Caution", PTO "on", transmission in "foward")

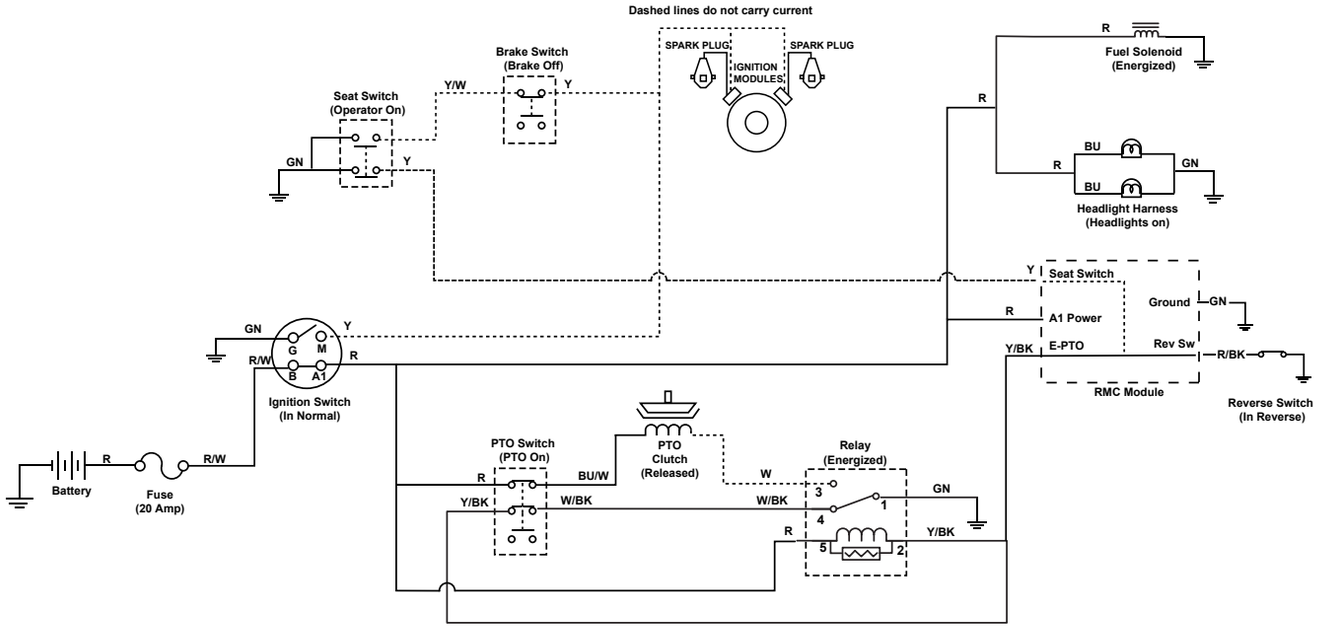


WIRE COLOR CODES

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

Reverse Operating System

(ignition switch in "Normal",
PTO "on", transmission in "reverse")



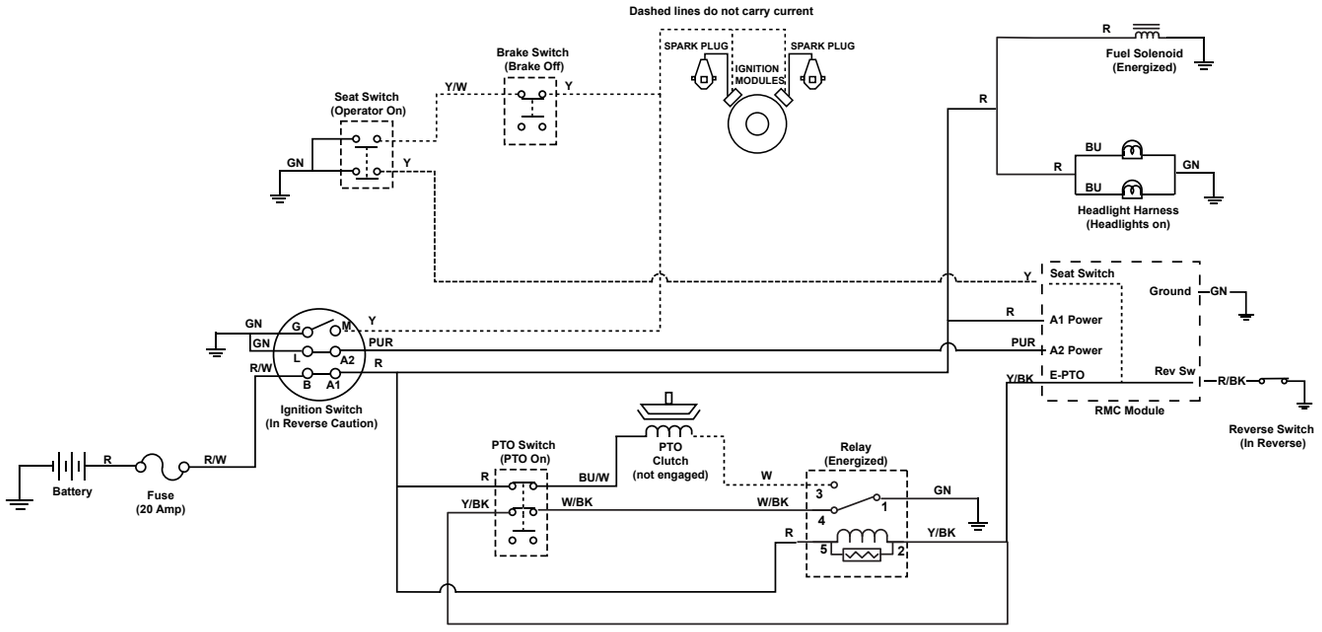
WIRE COLOR CODES

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

Circuits

PTO Circuit

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

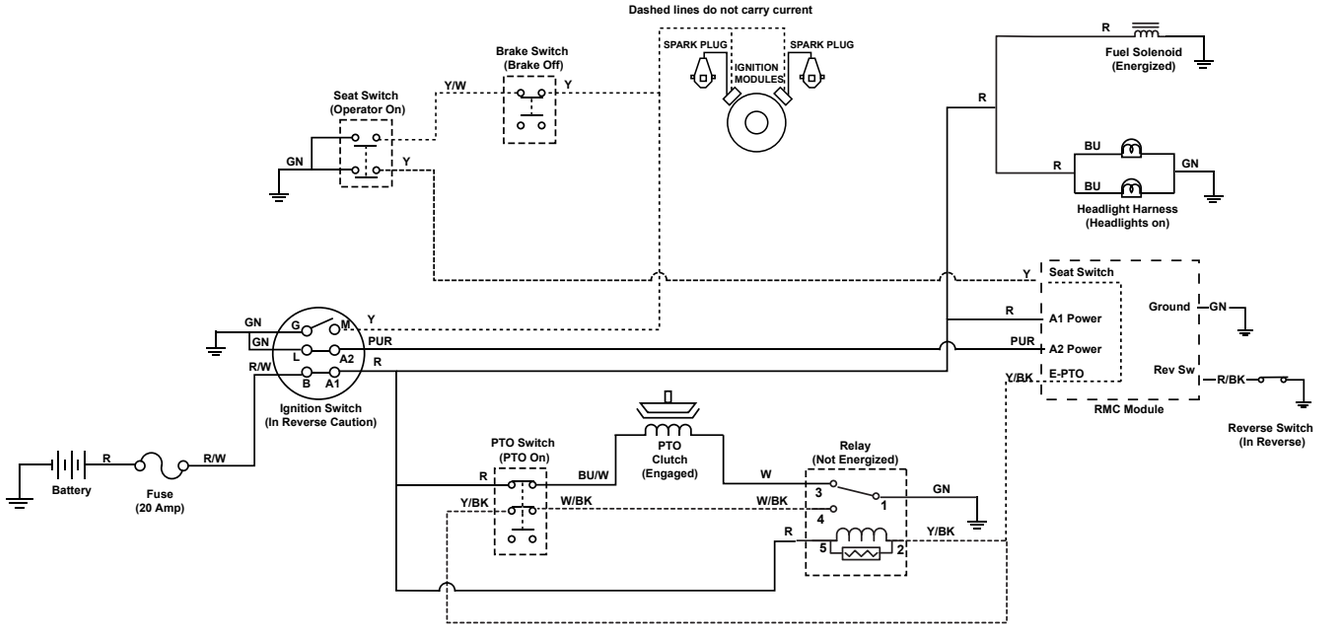


WIRE COLOR CODES

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

PTO Circuit

(ignition switch in "Reverse Caution", RMC "activated", PTO "on", transmission in "reverse")



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

2006
LX Series Lawn Tractors
GT2000 Series Garden Tractors
Demystification Guide

Form No. 492-9161