Chapter 4

Electrical

4

JACOBSEN
A Textron Company

Specifications

Test and Adjustment Specifications

Specification		
Resistance Across Solenoid Coil—Front Mow Solenoid Coil at 68° F	ohms	5.3 ± 10%
Resistance Across Solenoid Coil—Front Backlap Coil at 68° F	ohms	5.3 ± 10%
Resistance Across Solenoid Coil—Rear Mow Solenoid Coil at 68° F	ohms	5.3 ± 10%
Resistance Across Solenoid Coil—Rear Backlap Coil at 68° F	ohms	5.3 ± 10%
Resistance Across Solenoid Coil—Raise Solenoid Coil at 68° F	ohms	5.3 ± 10%
Resistance Across Solenoid Coil—Lower Solenoid Coil at 68° F	ohms	5.3 ± 10%
Resistance Across Solenoid Coil—Brake Solenoid Coil at 68° F	ohms	9 ± 10%
Resistance Across Solenoid Coil—Traction Solenoid Coil at 75° F	ohms	23
Resistance Across Fuel Shutoff Pull-In Coil at 68° F	ohm	0.5 ± 10%
Resistance Across Fuel Shutoff Hold-In Coil at 68° F	ohms	15 ± 10%
Traction Pedal Adjustment Value		200–205
Reel Level Proximity Switch Adjustment Lift Arm Angle	degrees	17 ± 1
Reel Level Proximity Switch to Lift Arm Air Gap	in. (mm)	0.118–0.196 (3–5)

Repair Specifications

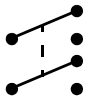
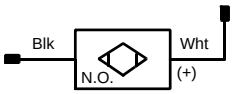
Specification		
Solenoid Nut Torque	lb-ft (N·m)	10 (13.6)
Brake Solenoid Nut Torque	lb-in. (N·m)	33–53 (4–6)

Theory and Diagnostic Information

Electrical Component Symbols

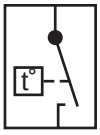
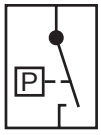
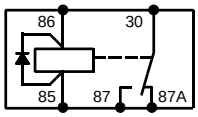
The following symbols are used in electrical schematics to represent various electrical components.

Switches[1]

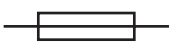
Single Pole, Single Throw (SPST) 	Double Pole, Single Throw (DPST) 
Single Pole, Double Throw (SPDT) 	Double Pole, Double Throw (DPDT) 
Proximity Switch 	

1 The sample switch symbols shown are just a few of the many switch configurations. Switches are designated by the number of "poles" (circuits controlled) and "throws" (actuator positions). Unless otherwise specified, switches are shown in "Normally Open" (N.O.) position.

Switching Devices

Temperature Switch 	Pressure Switch 
Relay 	

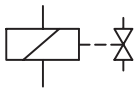
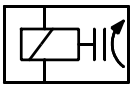
Circuit Protection Devices

Fuse 	Circuit Breaker 

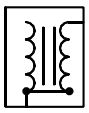
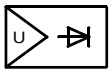
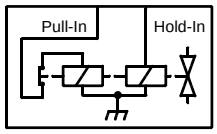
Motors and Generating Devices

Electric Motors (may also include “AC” or “DC.”) 	Stator 
Alternator 	

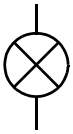
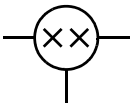
Actuating Devices

Solenoid Valve 	PTO Clutch 

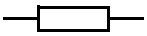
Engine-Related Devices

Ignition Coil 	Spark Plug 
Regulator 	Fuel Shutoff Solenoid 

Lights

Single-Element Light 	Dual-Element Light 

Miscellaneous Symbols

Enclosure (cabinet, housing, etc.) 	Wires (crossing but not connected) 
Ground (to earth) 	Wiring Connections 
Ground (to chassis) 	Coil
Direct Current (DC) (as shown on an oscilloscope)	Battery 
Alternating Current (AC) (as shown on an oscilloscope) 	Diode 
Resistor 	Pin and Socket Connector 

Electrical Schematic Component Identification

Electrical components shown in the main schematic are identified with an alphanumeric callout. All electrical components shown in the electrical schematic are listed below.

- A1—Main Control Unit (See Figure 4-4.)
- A2—Liquid Crystal Display (LCD) (See Figure 4-1.)
- A3—Traction Pedal Position Sensor (See Figure 4-5.)
- B1—Engine Oil Pressure Switch (See Figure 4-3.)
- B2—Hydraulic Oil Level Switch (See Figure 4-3.)
- B3—Hydraulic Filter Pressure Switch (See Figure 4-4.)
- B4—Engine Temperature Sensor (See Figure 4-3.)
- CB1—50A Circuit Breaker (See Figure 4-3.)
- E1—Left Work Light (See Figure 4-5.)
- E2—Right Work Light (See Figure 4-5.)
- F1—20A Fuse (See Figure 4-4.)
- F2—20A Fuse (See Figure 4-4.)
- F3—10A Fuse (See Figure 4-1.)
- F4—10A Fuse (See Figure 4-3.)
- G1—12V Battery (See Figure 4-3.)
- G2—Alternator (See Figure 4-3.)
- H1—Horn (See Figure 4-1.
- J9—Diagnostic Connector (See Figure 4-2.)
- J10A—Seat Connector (See Figure 4-3.)
- J10B—Deluxe Seat Connector (See Figure 4-3.)
- J99—12V Accessory Socket (See Figure 4-1.)
- K1—Start Relay (See Figure 4-3.)
- K2—Glow Plug Relay (See Figure 4-3.)
- M1—Starter Motor (See Figure 4-3.)
- R1—Glow Plugs (See Figure 4-3.)
- S1—Key Switch (See Figure 4-1.)
- S2—Horn Switch (See Figure 4-2.)
- S3—Work Light Switch (See Figure 4-2.)
- S4—Park Brake Switch (See Figure 4-2.)
- S5—Mow Switch (See Figure 4-2.)
- S6—Cruise Control Switch (See Figure 4-2.)
- S7—Raise/Lower Switch (See Figure 4-2.)
- S8—Seat Switch (See Figure 4-3.)
- S10—Reel Level Proximity Switch (See Figure 4-5.)
- S11—Backlap Switch (See Figure 4-5.)
- Y1—Fuel Shutoff Solenoid (See Figure 4-3.)
- Y3—Front Mow Solenoid (See Figure 4-5.)
- Y4—Rear Mow Solenoid (See Figure 4-5.)
- Y5—Raise Solenoid (See Figure 4-5.)
- Y6—Lower Solenoid (See Figure 4-5.)
- Y7—Front Backlap Solenoid (See Figure 4-5.)
- Y8—Rear Backlap Solenoid (See Figure 4-5.)
- Y9—Traction Solenoid (See Figure 4-5.)
- Y10—Brake Solenoid (See Figure 4-5.)

Electrical Schematic

See Figures 4-1 through 4-5.

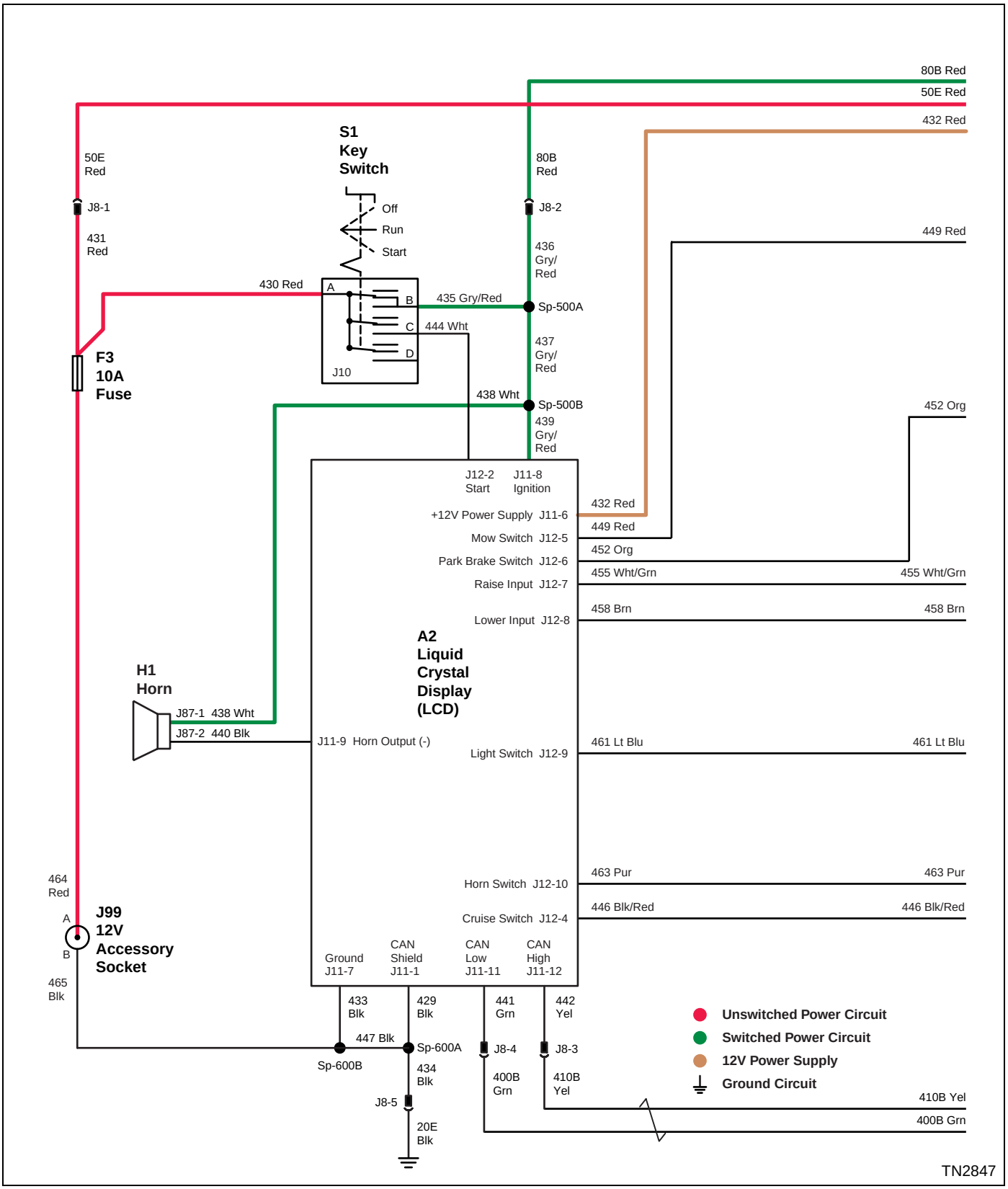


Figure 4-1

Electrical Schematic
Continued

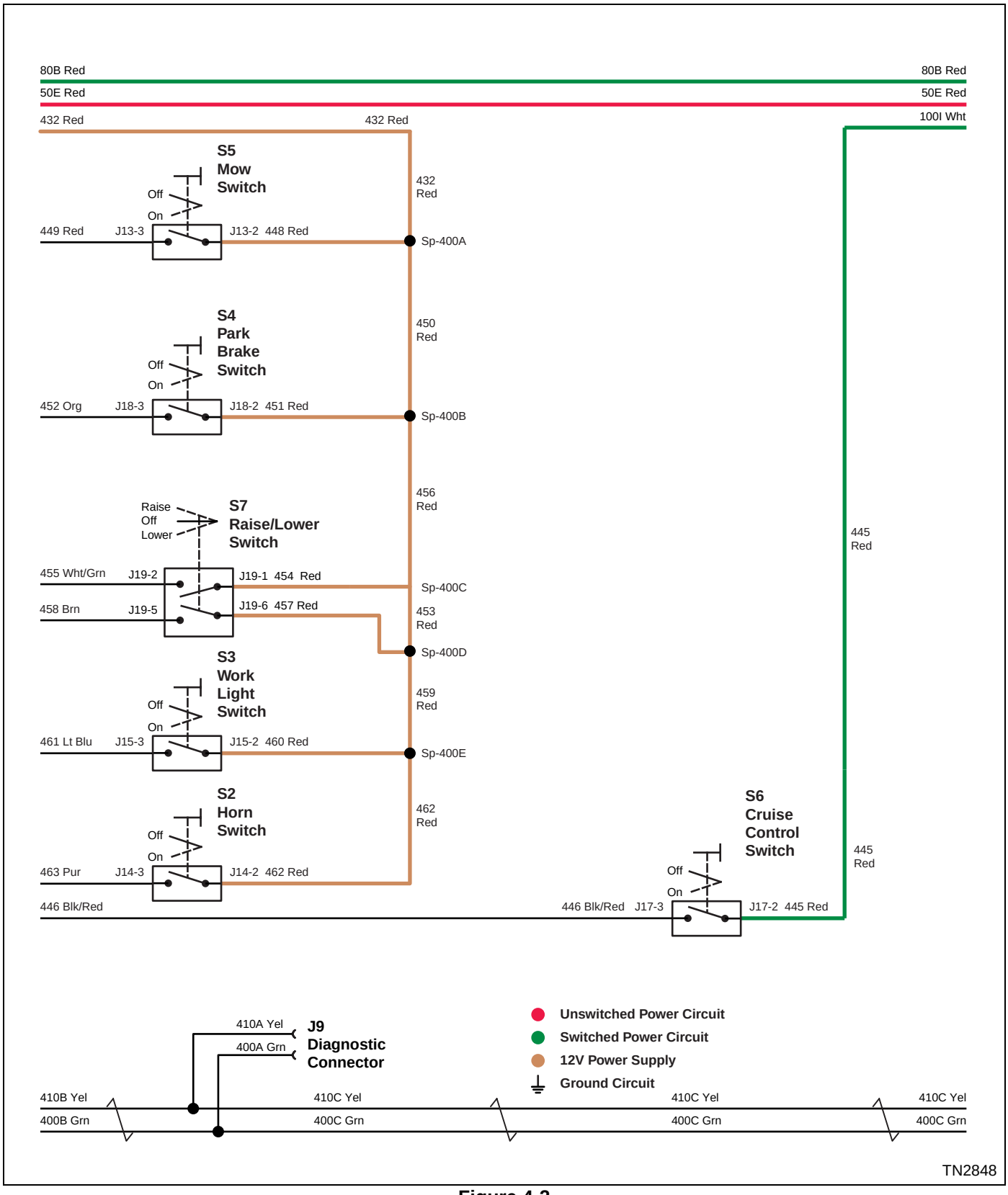


Figure 4-2

Electrical Schematic
Continued

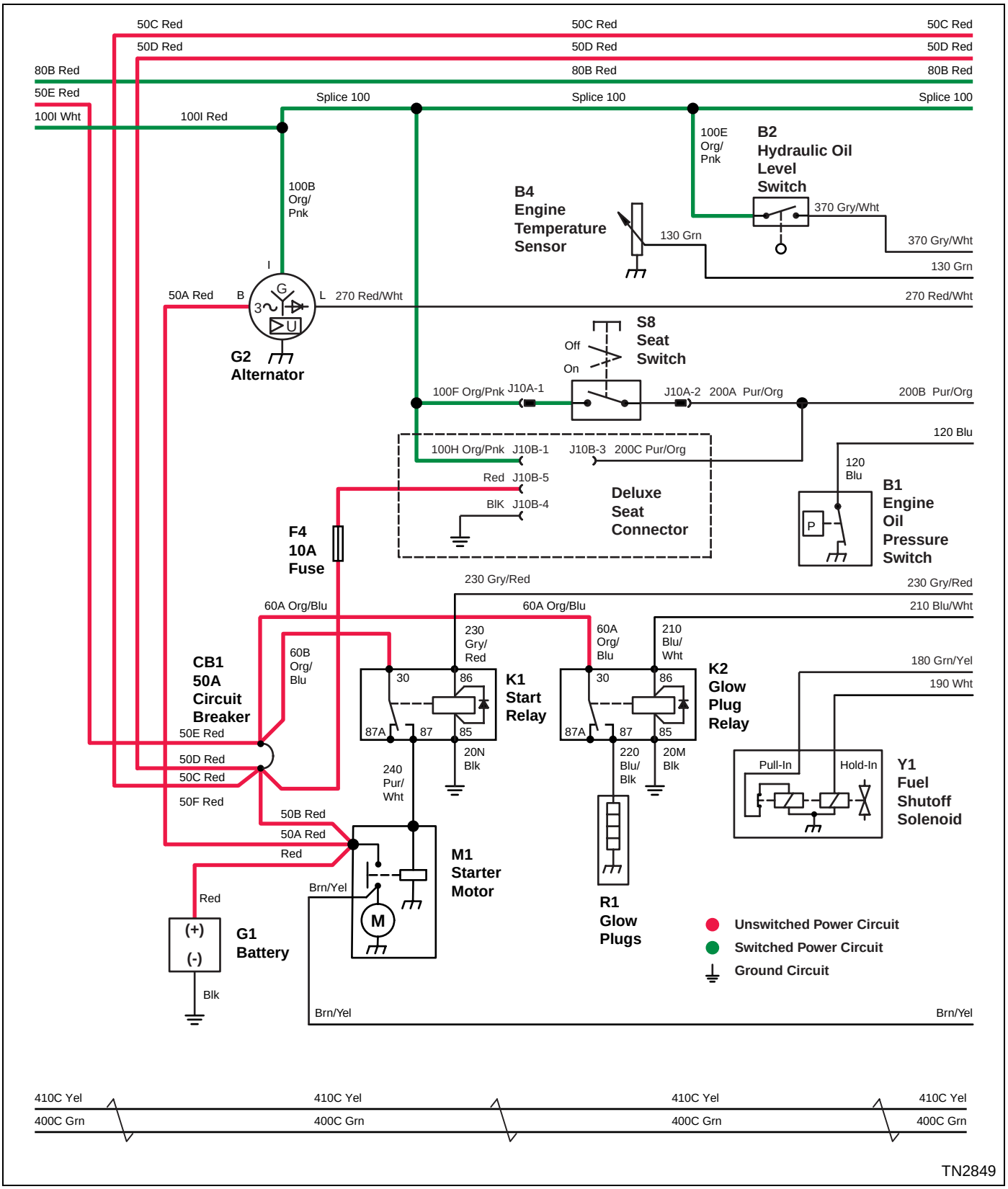


Figure 4-3

Electrical Schematic
Continued

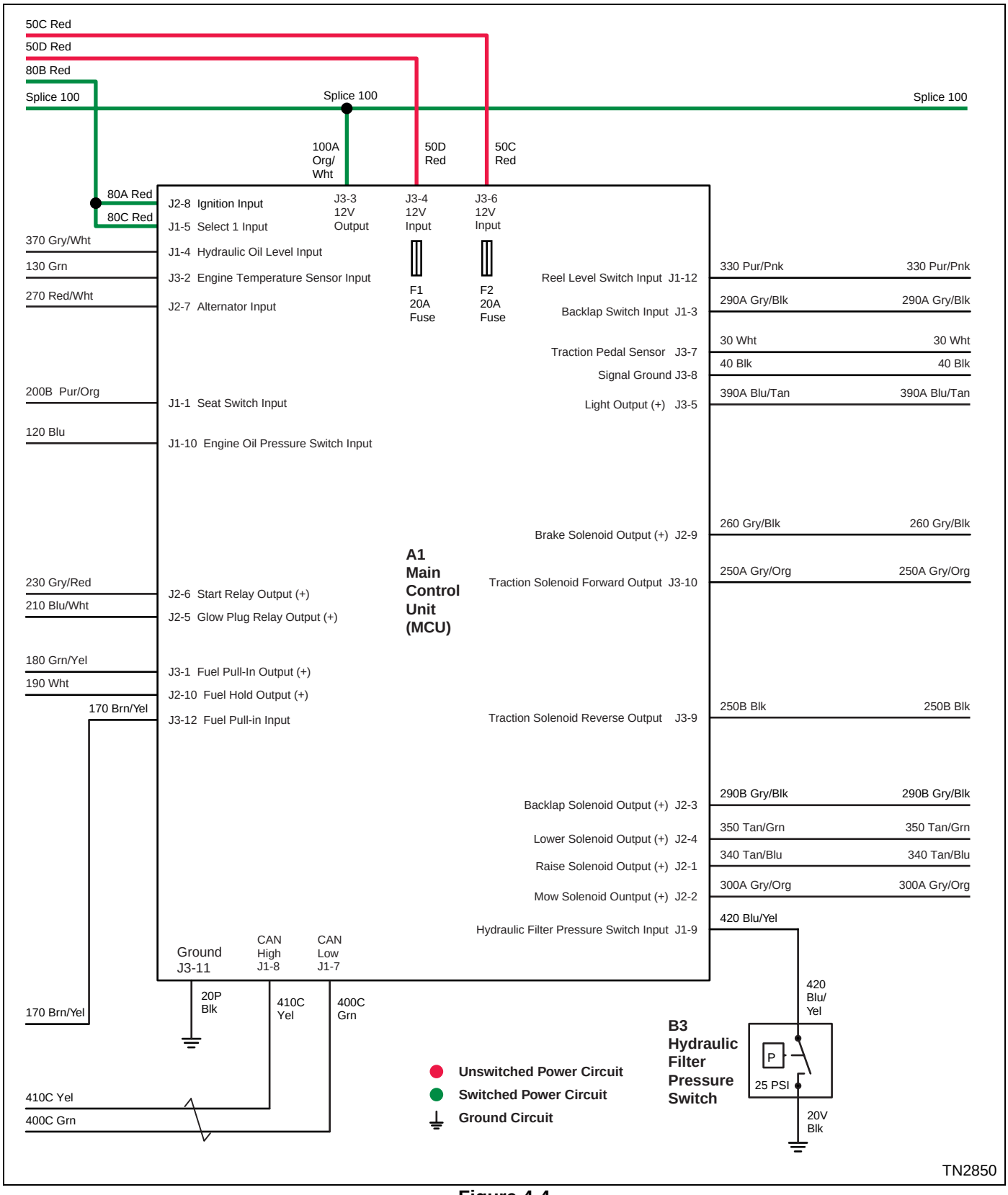


Figure 4-4

Electrical Schematic
Continued

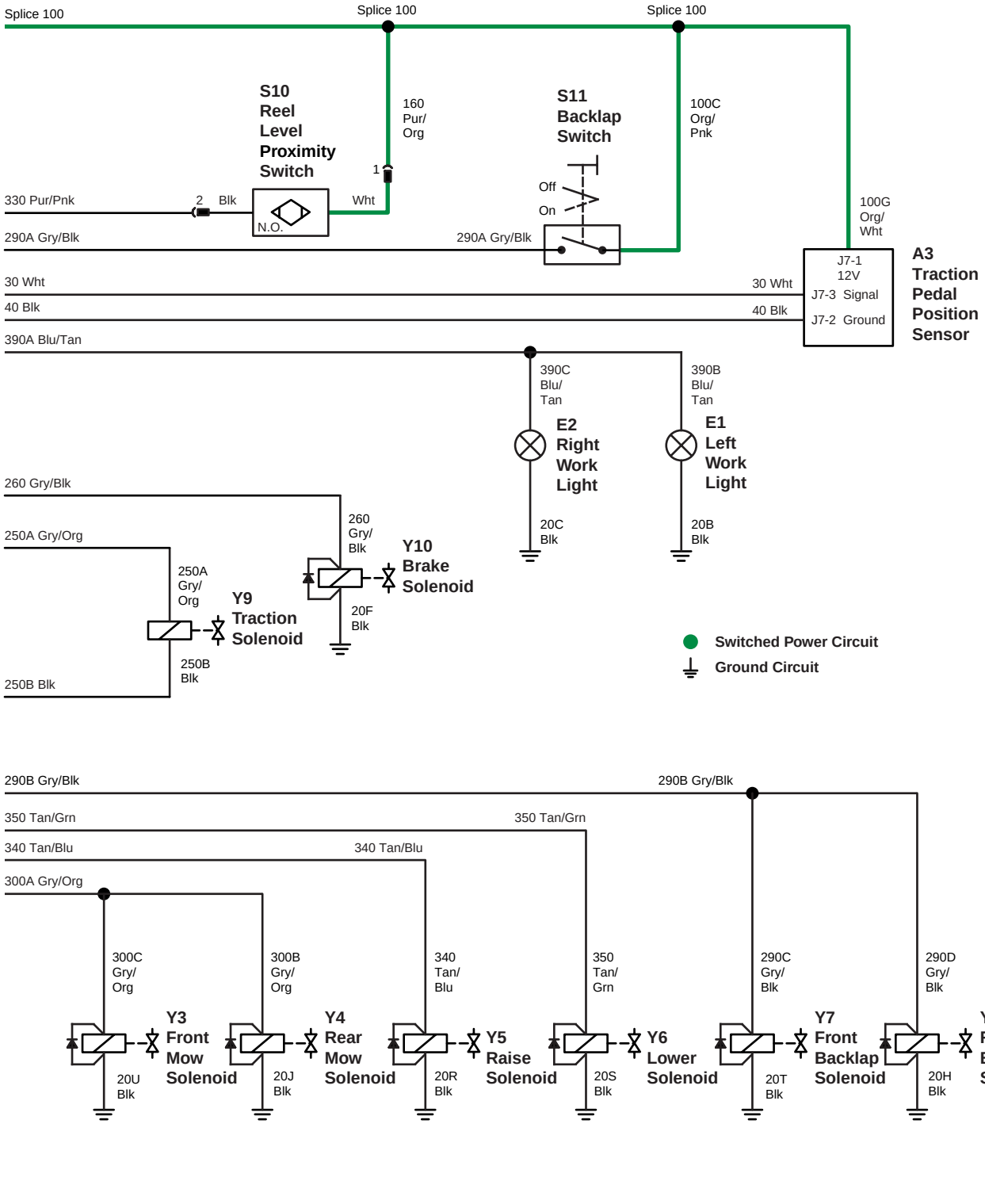


Figure 4-5

Theory of Operation and Sub-Circuit Schematics

Power Circuit—Theory of Operation

See Figures 4-1 through 4-5.

Unswitched Power Circuit

Unswitched power is available from the battery positive terminal to the starter motor battery terminal, and then from the starter motor battery terminal to the alternator battery terminal. Unswitched power is also available from the starter motor battery terminal to 50A circuit breaker battery terminal.

50A circuit breaker battery terminal provides unswitched power to the following:

- Main control unit connector J3-4
- Main control unit connector J3-6
- 10A fuse F4

50A circuit breaker output terminal provides unswitched power to the following:

- Start relay terminal 30
- Glow plug relay terminal 30
- 10A fuse F3 input terminal

Fuse F3 input terminal provides unswitched power to key switch terminal A. The 10A fuse F3 output terminal provides unswitched power to the12V accessory socket.

Switched Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU.

Voltage is also provided from key switch terminal B to MCU select 1 input terminal J1-5, activating the input. With the select 1 input activated, the MCU selects the software program for this model machine. This allows the MCU to be used in more than one model machine.

With the LCD powered up, voltage is provided from the LCD 12 volt power supply terminal J11-6 to the following:

- Horn switch
- Work light switch
- Park brake switch
- Mow switch
- Raise/lower switch

With the MCU powered up, voltage is provided from the MCU 12V output terminal J3-3 to the following:

- Hydraulic oil level switch
- Seat switch
- Alternator terminal
- Reel level proximity switch
- Backlap switch
- Traction pedal position sensor

The MCU provides internal protection for the 12V output circuit and to the input and output terminals.

Diesel Engine Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Glow Plug Circuit

With the MCU powered up, 12 volts is provided from the MCU glow plug relay output terminal J2-5 to glow plug relay terminal 86, energizing the relay. With the relay energized, voltage is switched between relay terminals 30 and 87 and is provided to the glow plugs, heating the glow plugs. At the same time the MCU instructs the LCD to turn on the glow plug light through the controller area network (CAN).

Glow plug timing is determined by the engine temperature sensor input. If the temperature is greater than 50° F (10° C), glow plug activation is not required.

Interlock Circuit

To start and operate the engine with the operator off or on the seat, the following must occur:

- Mow switch in the off position
- Park brake switch in the on position
- Traction pedal in the neutral position

When the mow switch is placed in the off position, voltage is not provided from the switch to the LCD mow switch input terminal J12-5, indicating the switch is in the off position.

When the park brake switch is in the on position, voltage is provided to the LCD park brake switch input terminal J12-6, indicating the switch is in the on position.

LCD communicates the status of the mow and park brake switch to the MCU.

The MCU uses the traction pedal position sensor voltage level to determine when the traction pedal is in the neutral position. When the traction pedal is in the neutral position, the sensor output voltage level is approximately 2.5 volts. Traction pedal position sensor signal terminal J7-3 connects to MCU traction pedal sensor input terminal J3-7.

Start Circuit

When the key switch is turned to the start position, voltage is provided from key switch terminal C to the LCD start input terminal J12-2, activating the input. The status of the key switch is communicated between LCD and the main control unit (MCU) through the controller area network (CAN).

With the key switch (status) in the start position, voltage is provided from the MCU fuel hold output terminal J2-10 to the fuel shutoff solenoid's hold-in coil.

The MCU start output terminal J2-6 provides voltage to start relay terminal 86, energizing the relay. With the start relay energized, voltage is switched between relay terminals 30 and 87 and provided to the starter motor solenoid, energizing the solenoid. With the starter solenoid energized, voltage is switched between the starter solenoid contacts to the starter motor, engaging the motor.

The MCU will engage the starter for only 10 seconds. If the engine fails to start, the key switch must be turned to the off position before attempting to start again.

With the starter solenoid energized, voltage is also provided from the starter solenoid contacts to MCU fuel pull-in input terminal J3-12, activating the input. With the fuel pull-in input activated, MCU fuel pull-in output terminal J3-1 provides voltage to the fuel shutoff solenoid pull-in coil, energizing the coil. With the pull-in coil energized, the solenoid plunger retracts.

When the solenoid plunger is fully retracted, an internal switch opens the pull-in coil circuit. This prevents extended activation of the high current pull-in coil. The hold-in coil keeps the solenoid plunger in the retracted position until it is de-energized.

With the solenoid plunger retracted, fuel is allowed to flow, and as the starter motor cranks the engine, the engine starts operating.

Run Circuit

When the operator is on the seat, the seat switch contacts close. With the seat switch contacts closed, voltage is provided to MCU seat switch input terminal J1-1, activating the input. With the input activated, the MCU allows the engine to continue to operate when the park brake switch is in the off position. With the seat switch input activated, MCU fuel hold-in output terminal J2-10 continues to provide voltage to the fuel shutoff solenoid hold-in coil, keeping the fuel shutoff solenoid plunger retracted. With the solenoid plunger retracted, fuel continues to flow to the engine.

The MCU will de-energize the fuel shutoff solenoid if the operator leaves the seat with the mow switch in the on position or with the park brake switch in the off position.

Charging Circuit

With the engine running, switched power is provided to the alternator field terminal, exciting the alternator. With the alternator field terminal excited, the alternator produces three-phase alternating current (AC). The AC voltage is provided to the alternator's internal voltage regulator.

When the battery voltage is low, the voltage regulator provides regulated voltage to charge the battery.

When the battery is fully charged, the regulator stops providing regulated voltage to the battery.

When the 12V battery drops to a specific voltage, the alternator L terminal provides a ground to the MCU alternator input terminal J2-7, activating the input. With the alternator input activated, the MCU instructs the LCD to turn on the 12V battery light through the controller area network (CAN).

Diesel Engine Circuit Schematic

See Figures 4-6 through 4-8.

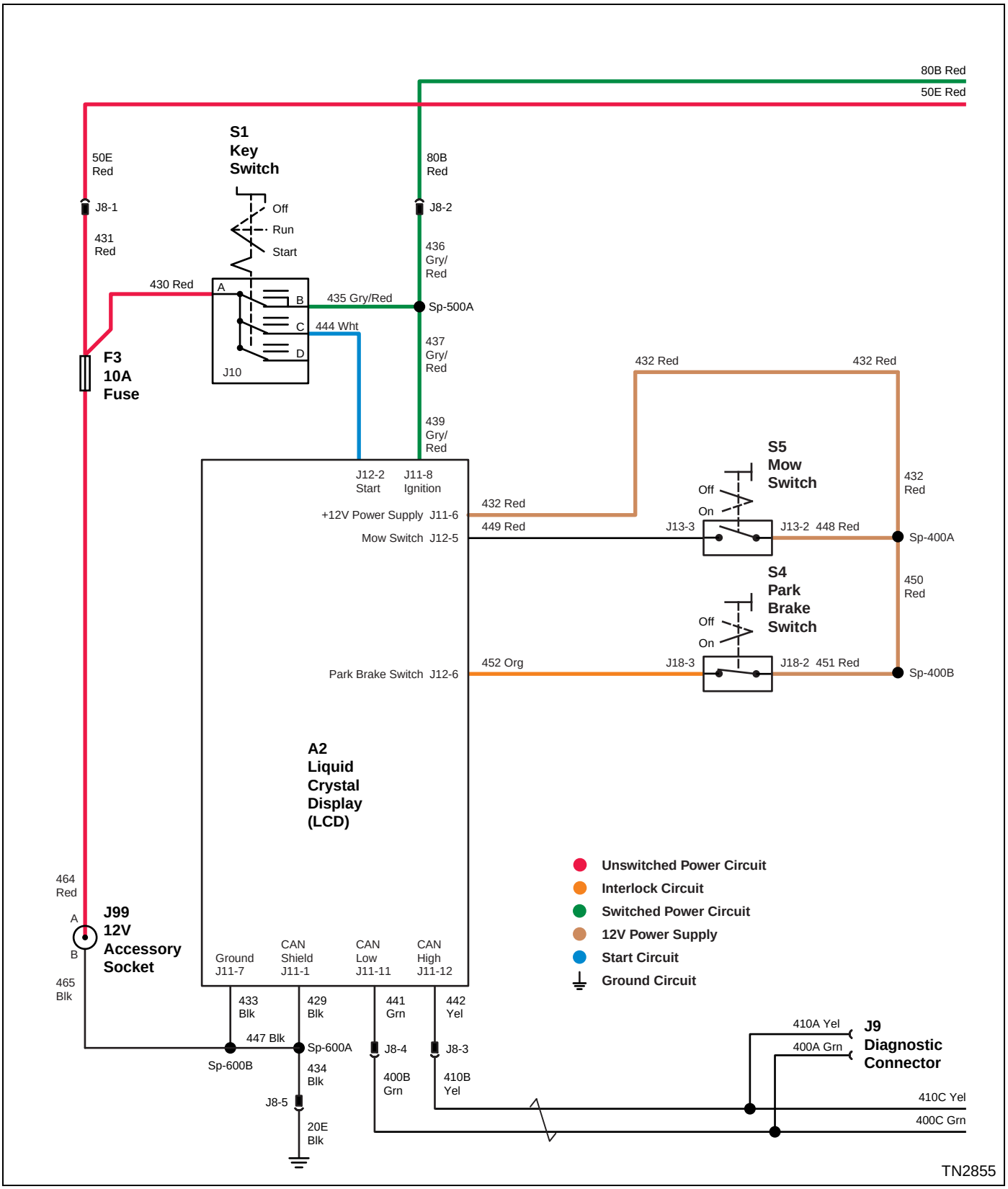


Figure 4-6

Diesel Engine Circuit Schematic Continued

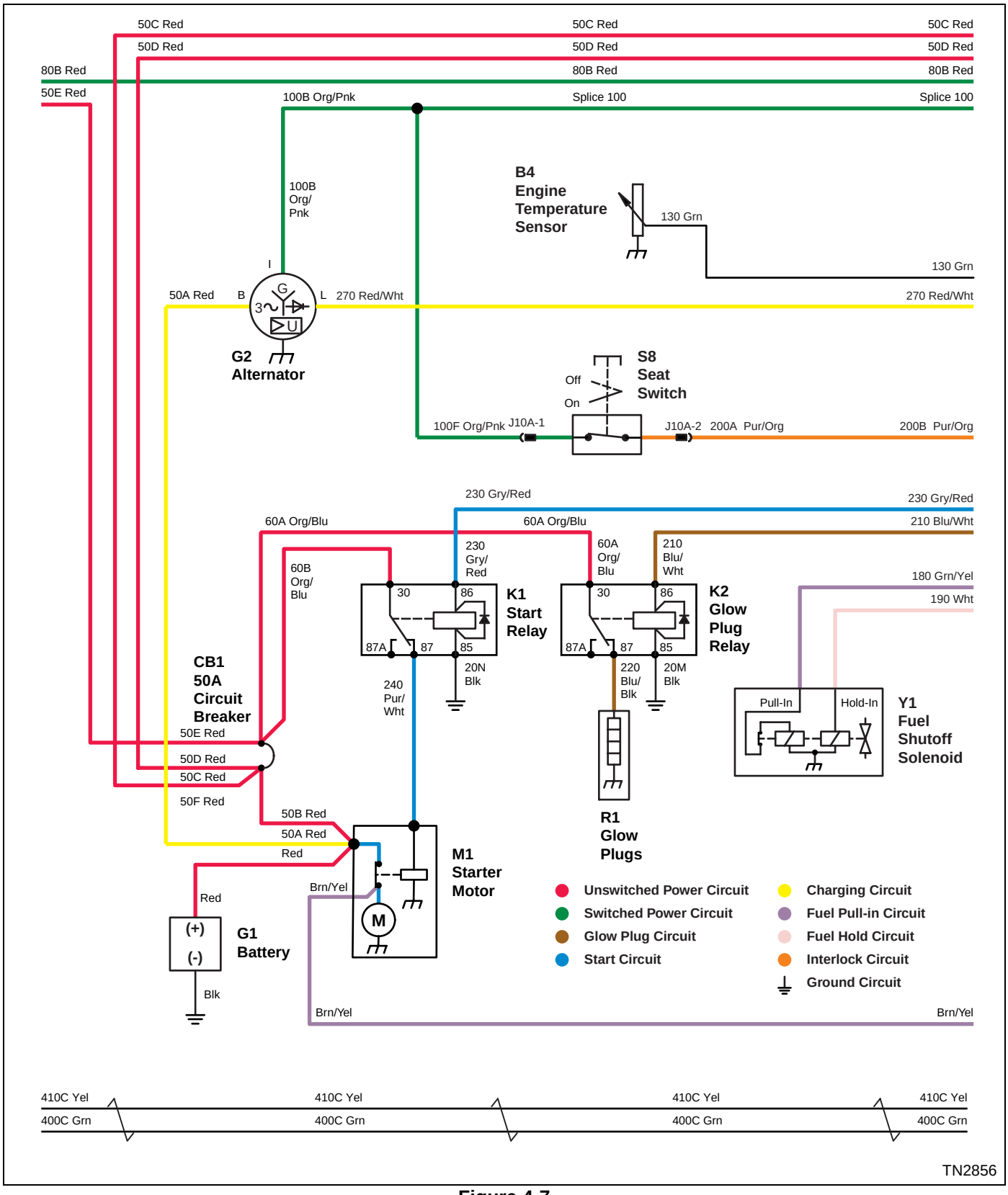


Figure 4-7

Diesel Engine Circuit Schematic Continued

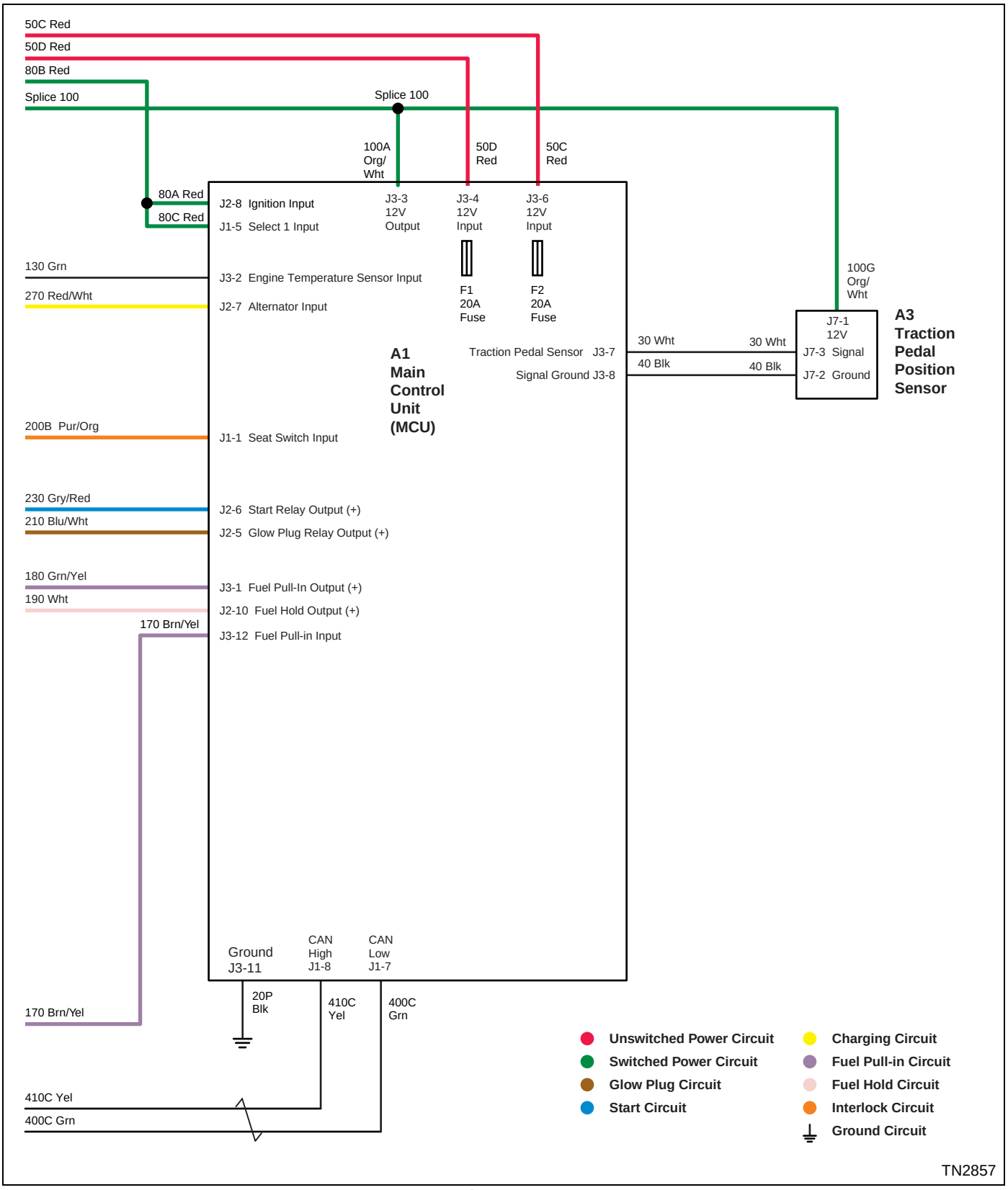


Figure 4-8

Raise/Lower Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Raise Circuit

When the raise/lower switch is placed in the raise position, voltage is provided to the LCD raise input terminal J12-7, activating the input. With the input activated, the LCD communicates the status of the raise switch to MCU through the controller area network (CAN).

After receiving the raise switch status from the LCD, the MCU raise solenoid output terminal J2-1 provides voltage to the raise solenoid, energizing the solenoid. With the solenoid energized, the cutting units will rise until the raise/lower switch is released, or until the cutting units reach their end of travel.

Lower Circuit

When the raise/lower switch is placed in the lower position, voltage is provided to the LCD lower input terminal J12-8, activating the input. With the input activated, the LCD communicates the status of the lower switch to MCU through the controller area network (CAN).

After receiving the lower switch status from the LCD, the MCU lower solenoid output terminal J2-4 provides voltage to the lower solenoid, energizing the solenoid. With the solenoid energized, the cutting units will lower until the raise/lower switch is released, or until the cutting units are fully lowered.

Note: While mowing, the raise/lower function will be in “one touch crosscut” mode, meaning the raise/lower lever only needs to be tapped to move the cutting units to a pre-determined position. When not mowing, the raise/lower lever must be held until the cutting units reach the desired position.

Raise Circuit Schematic

See Figures 4-9 and 4-10.

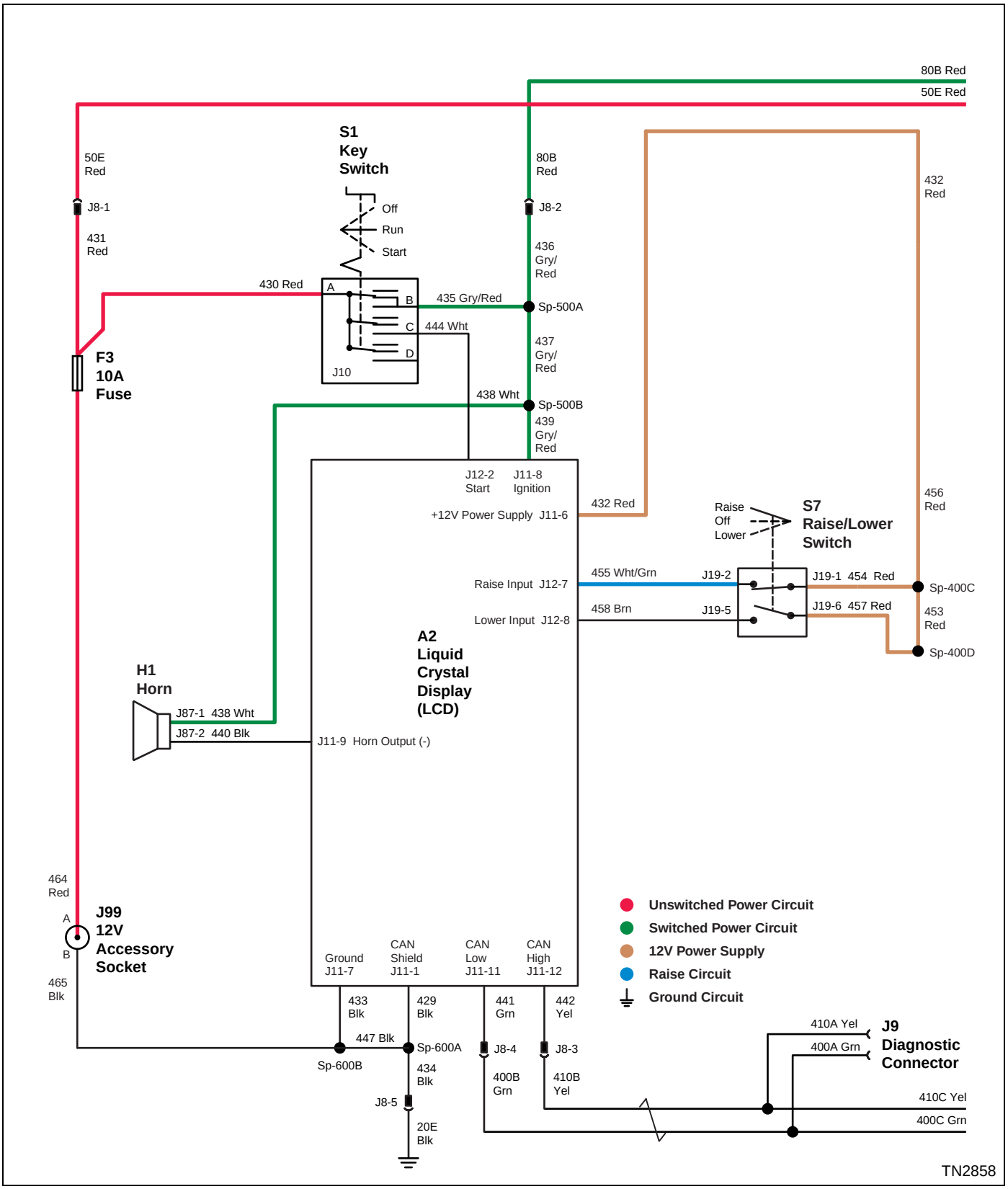


Figure 4-9

Raise Circuit Schematic Continued

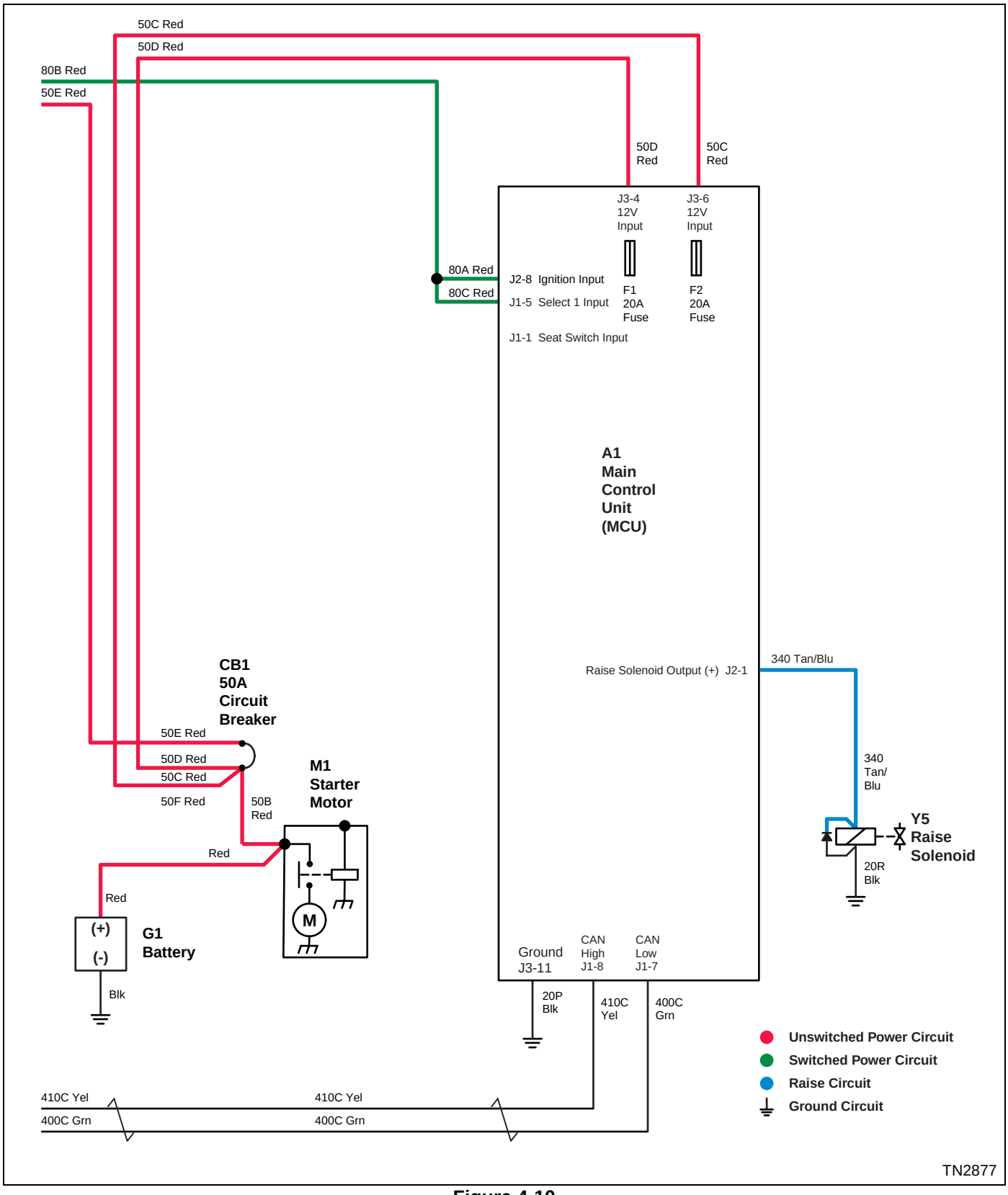


Figure 4-10

Lower Circuit Schematic

See Figures 4-11 and 4-12.

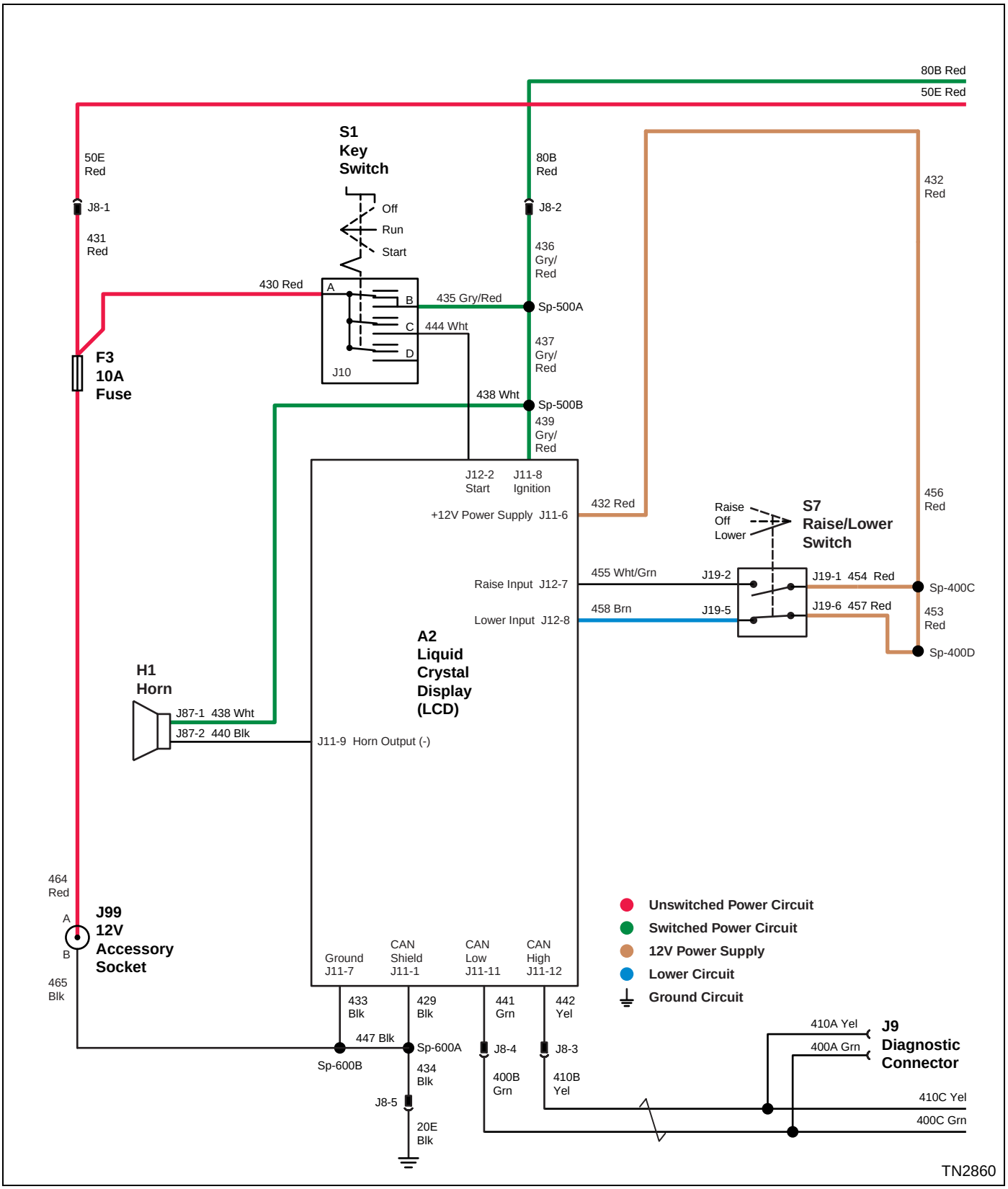


Figure 4-11

Lower Circuit Schematic
Continued

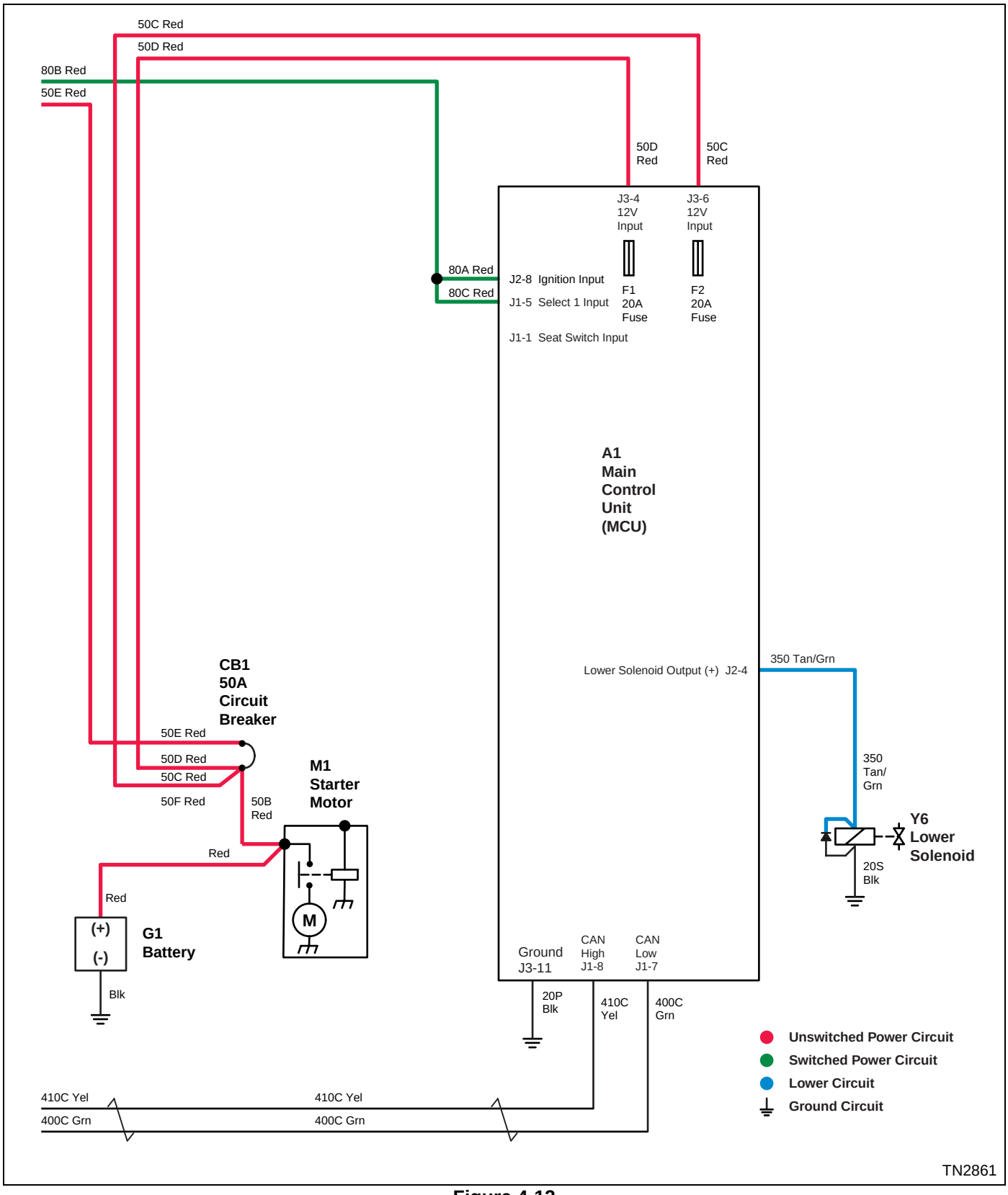


Figure 4-12

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Mow Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Interlock Circuit

Before the system allows activation of the mow circuit, the following must occur:

- MCU seat switch input activated
- Park brake switch in the off position
- Traction pedal in the forward position
- Reel proximity switch activated

To activate the MCU seat switch input, the operator must be on the seat. When the operator is on the seat, the seat switch contacts close. With the seat switch contacts closed, voltage is provided from the switch to the MCU seat switch input terminal J1-1, activating the input.

When the park brake switch is in the off position, voltage is not provided to the LCD park brake switch input terminal J12-6. With no input, the LCD communicates the status of the switch to the MCU. The MCU now provides voltage to the brake solenoid, energizing the solenoid.

Mow Circuit

With the traction pedal in the forward position, voltage is higher than 2.5 volts, providing a signal to MCU traction pedal sensor input J3-7.

When the cutting units are in the lowered position, the reel level proximity switch is activated. With the proximity switch activated, voltage is provided from the switch to the MCU reel switch input terminal J1-12, activating the input.

When the mow switch is placed in the on position, voltage is provided from the switch to the LCD mow switch input terminal J12-5, activating the input. With the input activated, the LCD communicates the status of the mow switch to the MCU. With the mow status active, reel switch input active, and traction pedal in the forward position, the MCU provides voltage from the MCU mow solenoid output terminal J2-2 to the front and rear mow solenoids, energizing the solenoids.

Mow Circuit Schematic

See Figures 4-13 and 4-14.

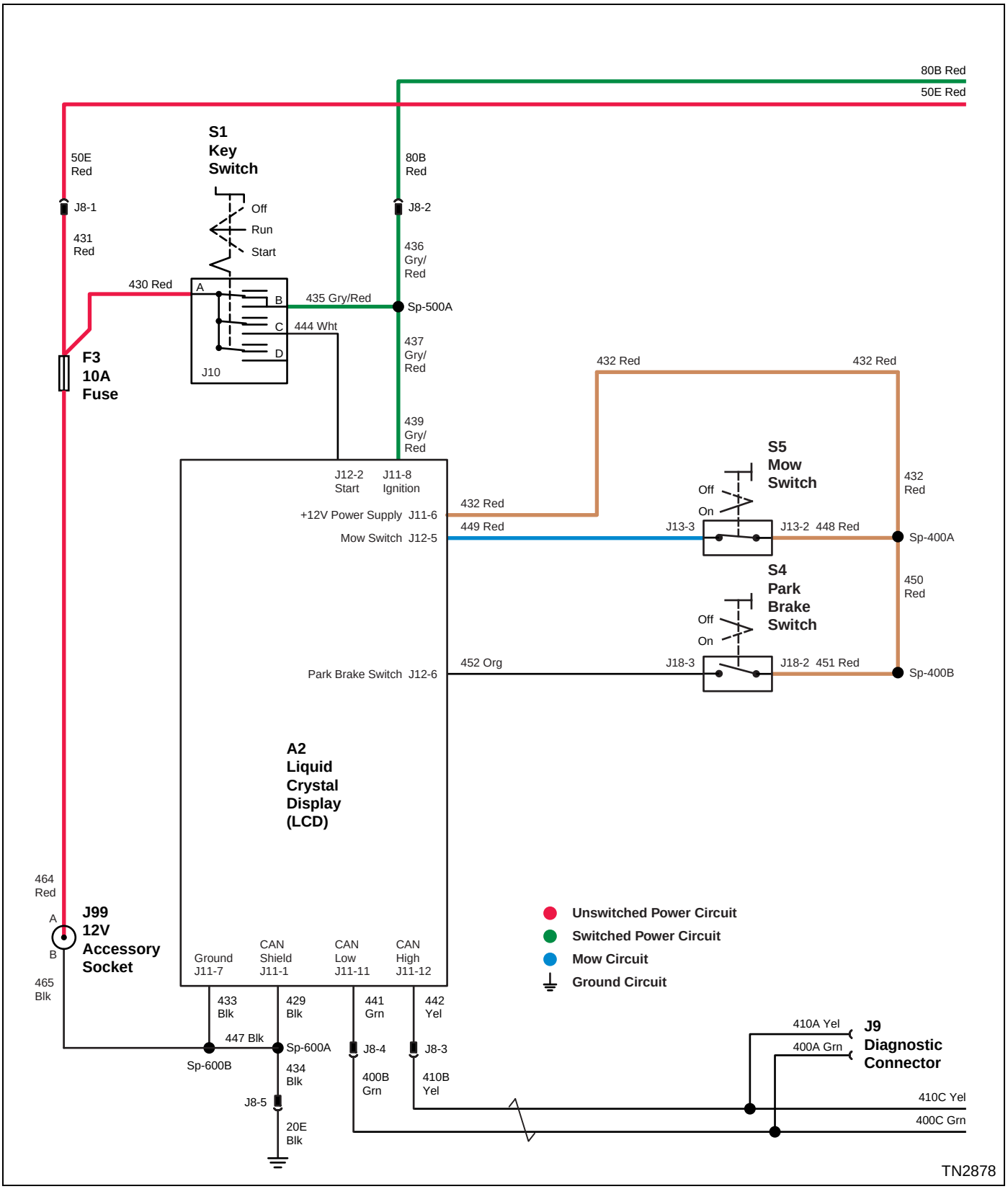

Figure 4-13

Mow Circuit Schematic Continued

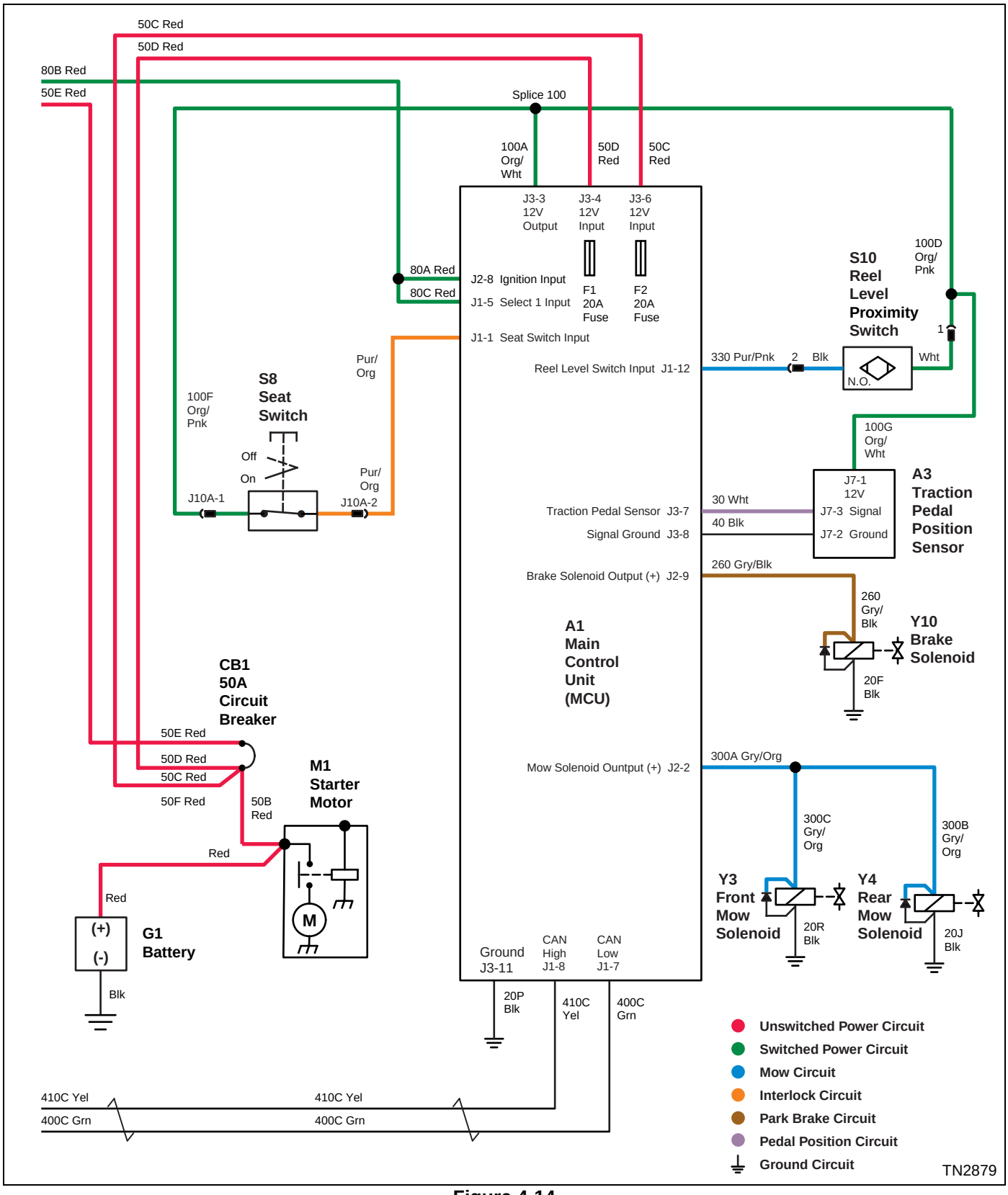

Figure 4-14

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Traction Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Interlock Circuit

Before the system allows operation of the traction circuit, the following must occur:

- MCU seat switch input activated
- Park brake switch in the off position

To activate the MCU seat switch input, the operator must be on the seat. With the operator is on the seat, the seat switch contacts close. When the seat switch contacts closed, voltage is provided from the switch to the MCU seat switch input terminal J1-1, activating the input.

When the park brake switch is in the off position, voltage is not provided to the LCD park brake switch input terminal J12-6. With no input, the LCD communicates the status of the switch to the MCU. The MCU now provides voltage to the brake solenoid, energizing the solenoid.

Traction Pedal Circuit

As the traction pedal is moved in the forward or reverse direction, a voltage level is provided to the MCU relative to the position of the pedal. The MCU uses this voltage level to control the traction solenoid. Traction pedal position sensor signal terminal J7-3 connects to MCU traction pedal sensor input terminal J3-7.

The MCU also uses the traction pedal position sensor voltage level to determine when the traction pedal is in the neutral position. When the traction pedal is in the neutral position, the sensor output voltage level is approximately 2.5 volts. As the pedal is moved in the forward direction, the voltage level will vary in the range of approximately 2.5–4.5 volts. As the pedal is moved in the reverse direction, the voltage level will vary in the range of approximately 2.5–0.5 volts.

If the traction pedal is moved out of the neutral position while the park brake switch is on, the MCU will instruct the LCD to turn on the caution icon and sound the horn.

Traction Solenoid Circuit

The MCU traction solenoid output terminals J3-10 and J3-9 are bi-directional. Depending on the direction of the traction pedal, the MCU will provide voltage from traction solenoid output terminal J3-10 to the traction solenoid, and MCU solenoid output terminal J3-9 becomes the return side to the traction solenoid. The opposite occurs when changing direction. The MCU will provide voltage from traction solenoid output terminal J3-9 to the traction solenoid, and MCU solenoid output terminal J3-10 becomes the return side to the traction solenoid.

The current provided from the MCU traction solenoid output terminals is a pulse-width modulated (PWM) current which allows the MCU to control the travel speed of the machine. At 12 mph (19.3 km/h) in the forward direction, the current through the traction solenoid coil is 60- 65mA (PWM). At 5 mph (8.0 km/h) in the reverse direction, the current through the traction solenoid coil is 30-35mA (PWM).

Traction Circuit Schematic

See Figures 4-15 and 4-16.

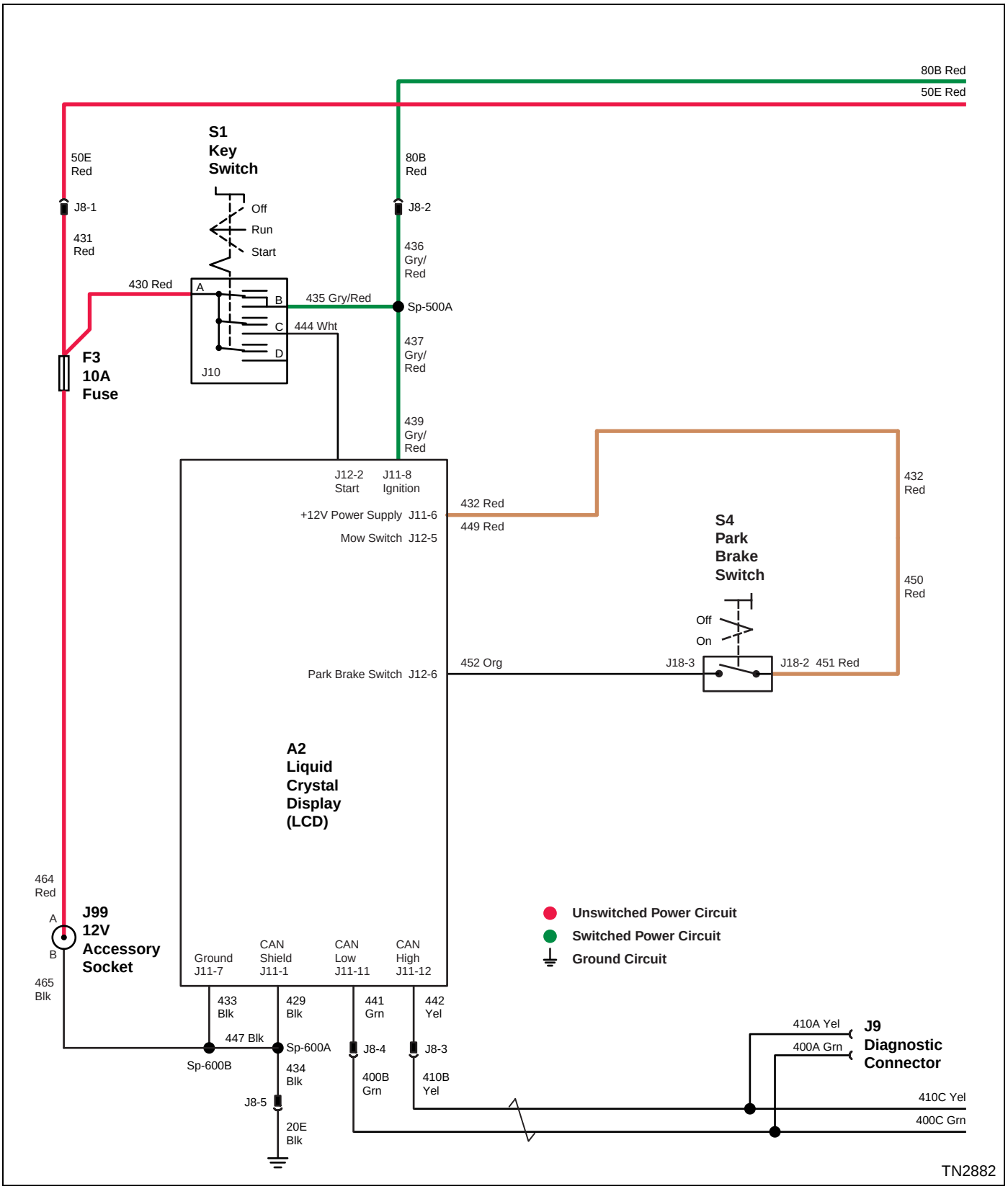

Figure 4-15

Traction Circuit Schematic Continued

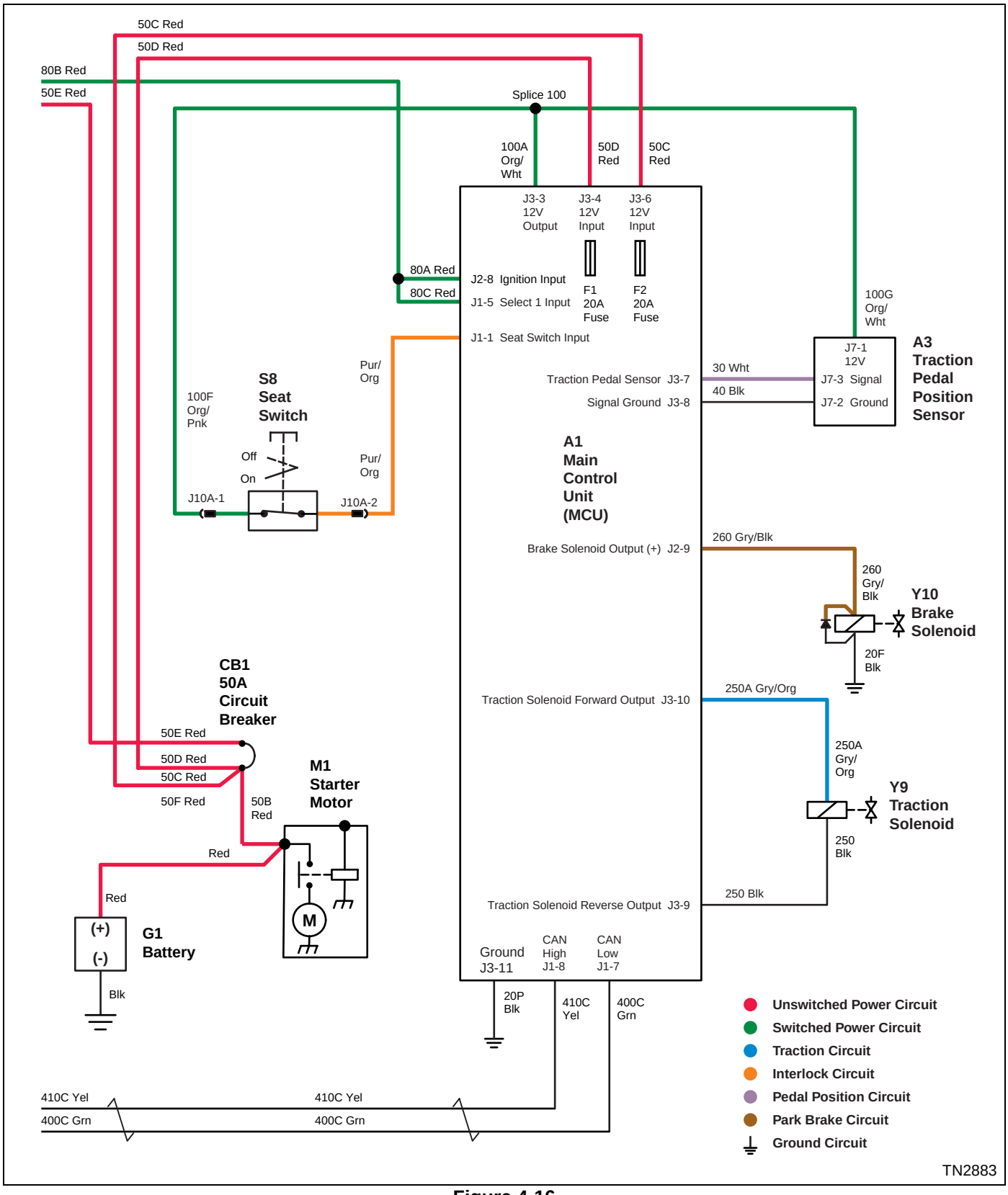

Figure 4-16

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Backlap Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Interlock Circuit

Before placing the backlap switch in the on position, the following must occur:

- Mow switch in the off position.
- Park brake switch in the on position
- Traction pedal in the neutral position.

When the mow switch is placed in the off position, voltage is not provided from the switch to the LCD mow switch input terminal J12-5, indicating the switch is in the off position.

When the park brake switch is in the on position, voltage is provided to the LCD park brake switch input terminal J12-6, indicating the switch is in the on position.

LCD communicates the status of the mow and park brake switches to the MCU.

The MCU uses the traction pedal position sensor voltage level to determine when the traction pedal is in the neutral position. When the traction pedal is in the neutral position, the sensor output voltage level is approximately 2.5 volts. The traction pedal position sensor signal is provided to the MCU traction pedal sensor input terminal J3-7.

Backlap Circuit

When the backlap switch is in the on position, voltage is provided from the switch to MCU backlap switch input terminal J1-3, activating the input. With the input activated, the MCU provides voltage from the MCU backlap solenoid output terminal J2-3 to the front and rear backlap solenoids, energizing the solenoids.

Backlap Circuit Schematic

See Figures 4-17 and 4-18.

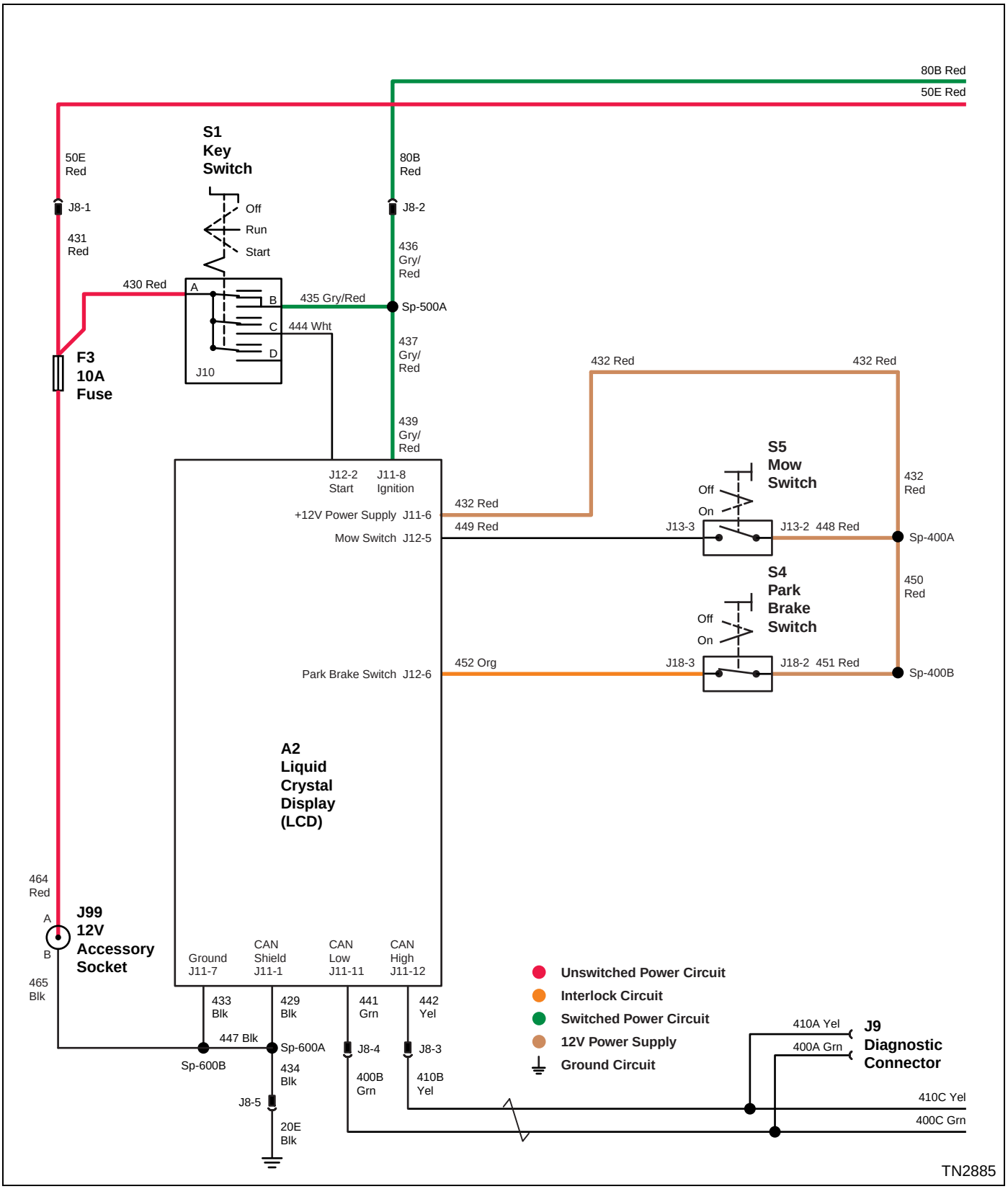

Figure 4-17

Backlap Circuit Schematic Continued

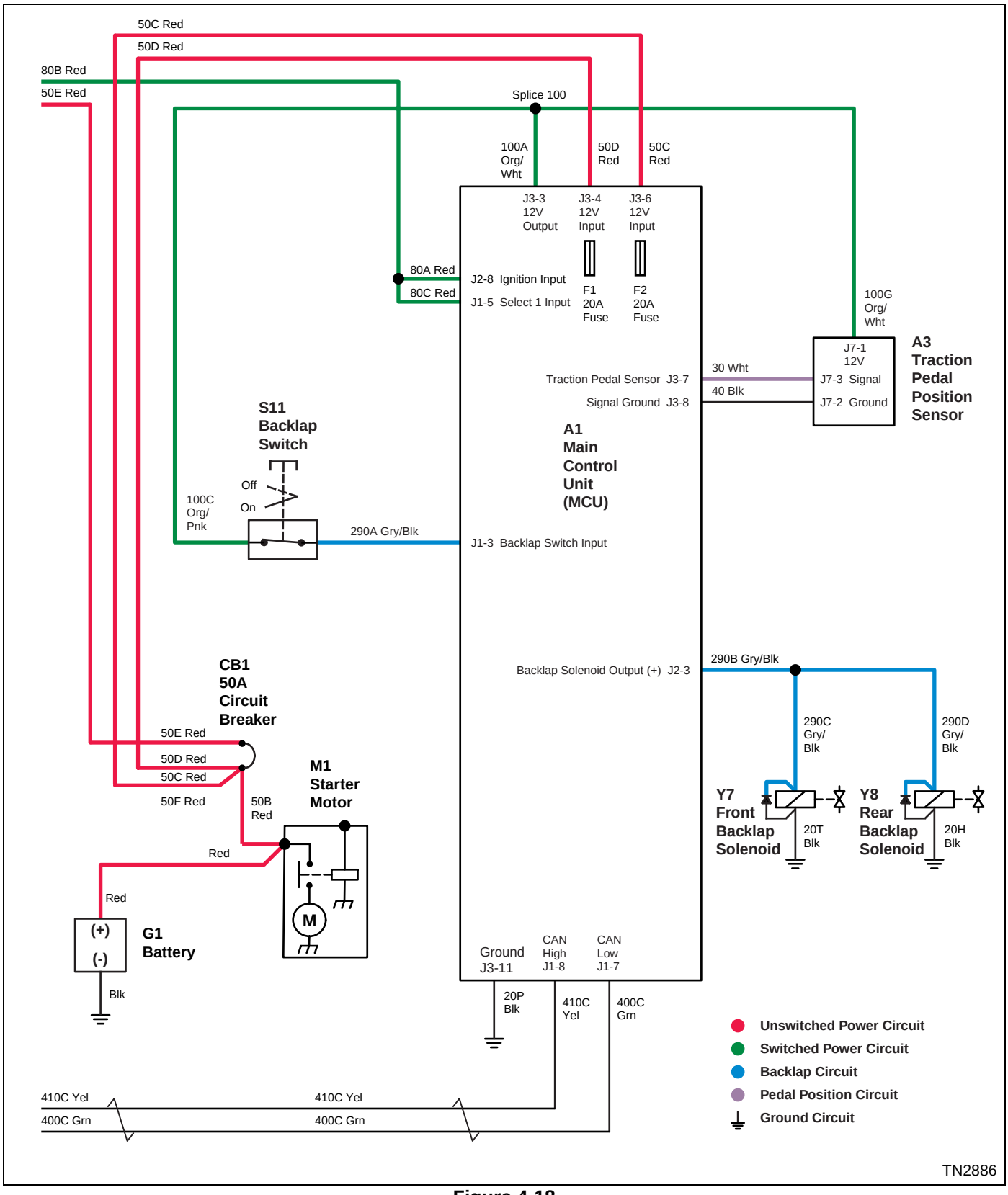

Figure 4-18

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Horn and Work Lights Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Horn Circuit

When the horn switch is in the on position, voltage is provided to the LCD horn switch input terminal J12-10, activating the input. With the input activated, the LCD horn output terminal J11-9 provides a ground to horn terminal J87-2, activating the horn.

Work Light Circuit

When the work light switch is in the on position, voltage is provided to LCD light switch input terminal J12-9, activating the input. With the input activated, the LCD communicates the work light switch status to the MCU.

After receiving the work light switch status from the LCD, the MCU light output terminal J3-5 provides voltage to the right and left work lights, turning on the lights.

Horn and Work Lights Circuit Schematic

See Figures 4-19 and 4-20.

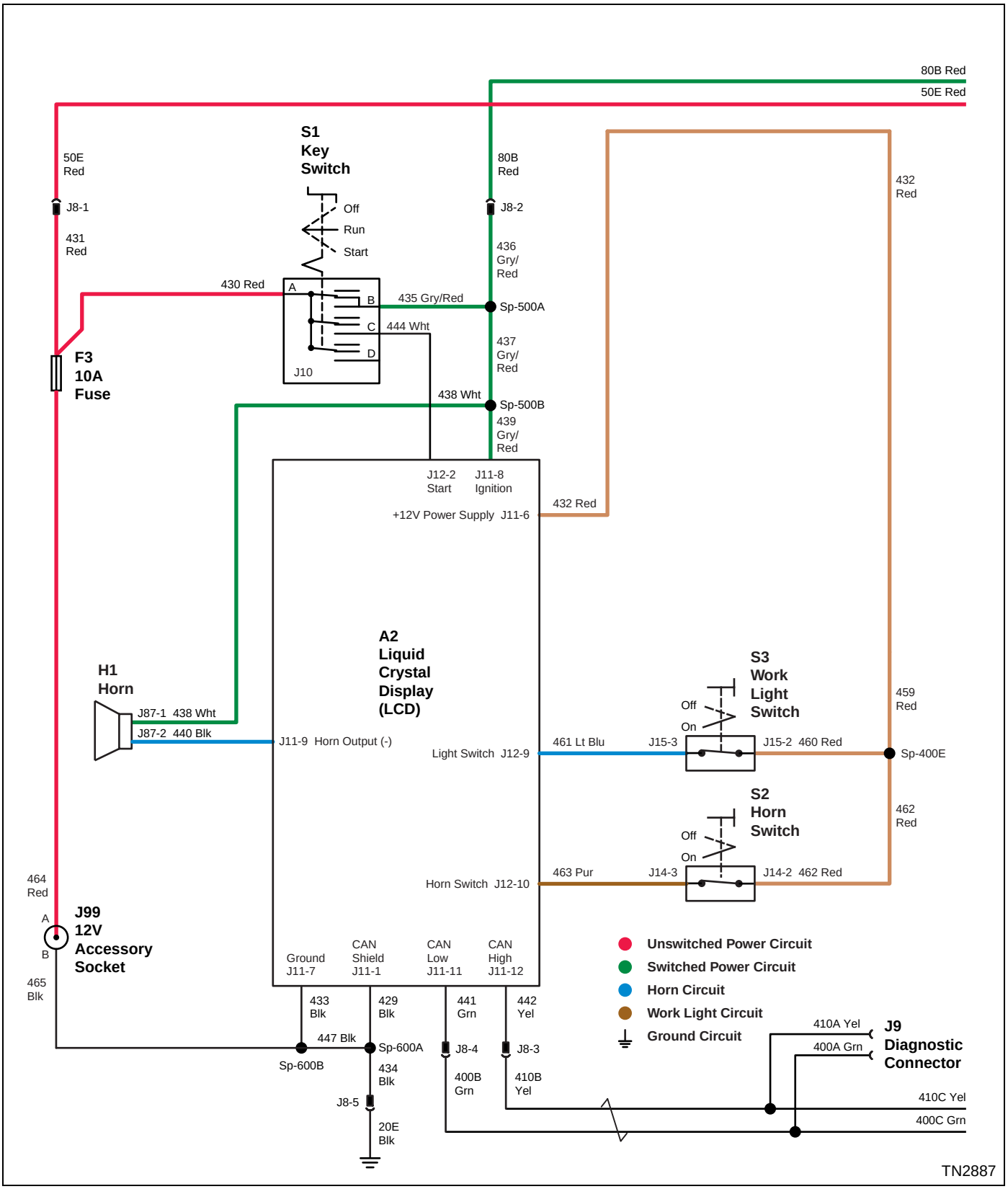

Figure 4-19

Horn and Work Lights Circuit Schematic Continued

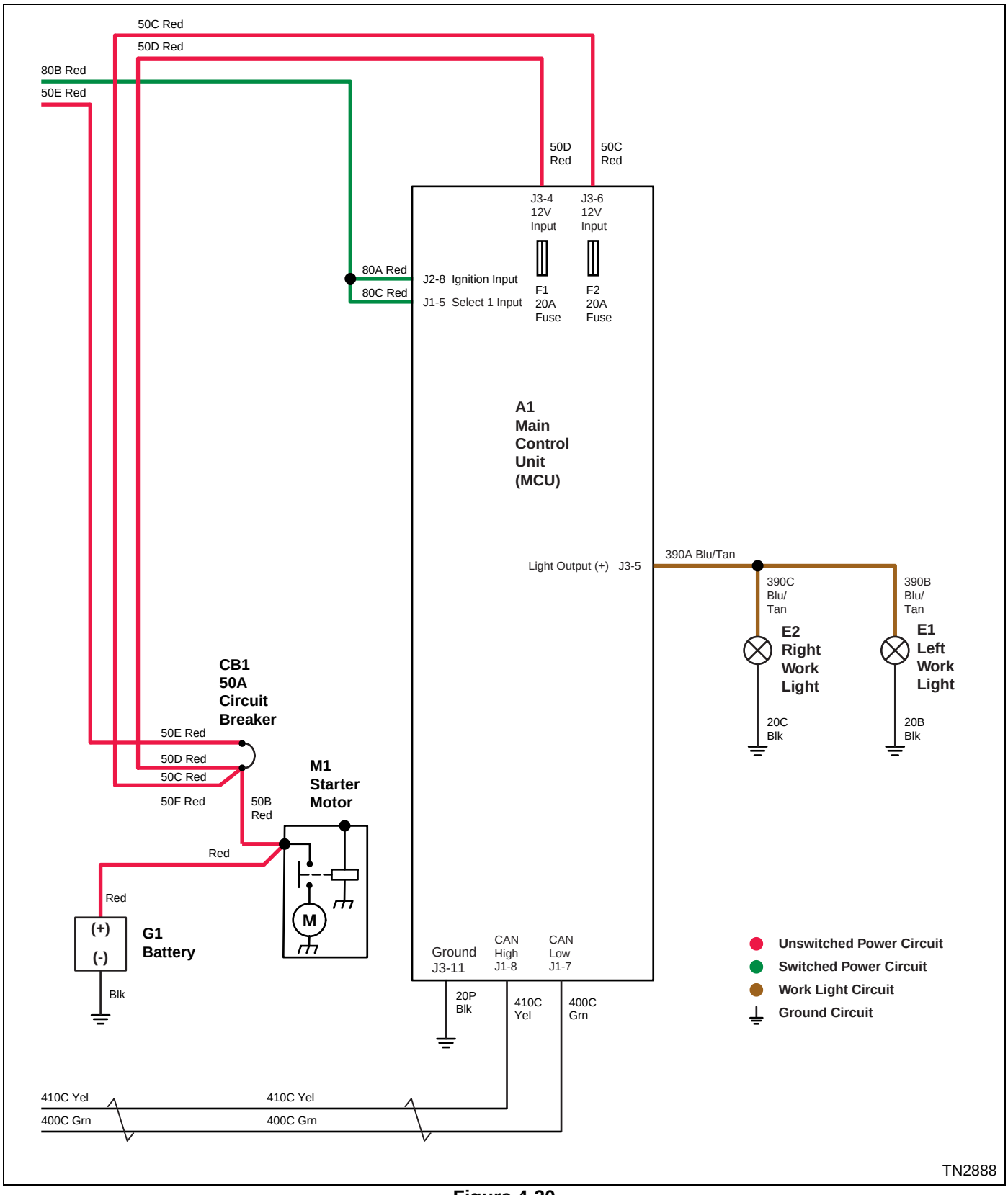

Figure 4-20

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Instrumentation Circuit—Theory of Operation

Power Circuit

When the key switch is turned to the run position, voltage is provided from key switch terminal B to liquid crystal display (LCD) ignition terminal J11-8, and to main control unit (MCU) ignition terminal J2-8, powering up the LCD and MCU. (See “Power Circuit—Theory of Operation” on page 4-13.)

Hour Meter

When the starter motor solenoid is energized, the starter contacts provide voltage to the MCU fuel pull-in terminal J3-12, momentarily activating the input. (See “Diesel Engine Circuit—Theory of Operation” on page 4-14.)

With the input momentarily activated, the MCU communicates to the LCD that the engine start sequence has occurred. The LCD now starts logging hours to the LCD hour meter function.

Hydraulic Oil Level Light

When the hydraulic oil level switch closes, voltage is provided to the MCU hydraulic oil level switch input terminal J1-4, activating the input. With the input activated, the MCU will deactivate the mow circuit and communicate the status of the hydraulic oil level switch to the LCD. The LCD now turns on the hydraulic oil level light icon and activates the horn circuit. The horn sounds for 5 seconds and then chirps every 3 seconds.

Hydraulic Filter Pressure Light

The hydraulic filter switch is a differential pressure switch. The switch closes when there is a 25 psi (1.724 bar) drop between the inlet and outlet pressures of the filter.

When the hydraulic filter pressure switch closes, a ground is provided from the switch to the MCU hydraulic filter pressure switch input terminal J1-9, activating the input. With the input activated, the MCU will deactivate the mow circuit and communicate the status of the hydraulic filter switch to the LCD. The LCD now turns on the hydraulic oil filter light icon and activates the horn circuit. The horn sounds for 5 seconds and then chirps every 3 seconds.

Engine Coolant Temperature Light

The engine temperature sensor resistance changes in relationship to the engine coolant temperature. As the engine temperature sensor is heated, the resistance of the sensor changes from a high resistance to a low resistance. The MCU engine temperature sensor input terminal J3-2 measures the resistance of the temperature sensor.

When the engine coolant temperature reaches 230° F (110° C), the MCU will deactivate the mow circuit and communicate an engine over-temperature status to the LCD. The LCD now turns on the coolant temperature light icon and activates the horn circuit. The horn sounds for 5 seconds and then chirps every 3 seconds.

Engine Oil Pressure Light

When the engine oil pressure is below 7 psi (0.483 bar), the engine oil pressure switch contacts close. With the switch contacts closed, a ground is provided to the MCU engine oil pressure switch input terminal J1-10, activating the input. With the input activated, the MCU will deactivate the mow circuit and communicate the status of the engine oil pressure switch to the LCD. The LCD now turns on the engine oil pressure light icon and activates the horn circuit. The horn sounds for 5 seconds and then chirps every 3 seconds.

Instrumentation Circuit Schematic

See Figures 4-21 and 4-22.

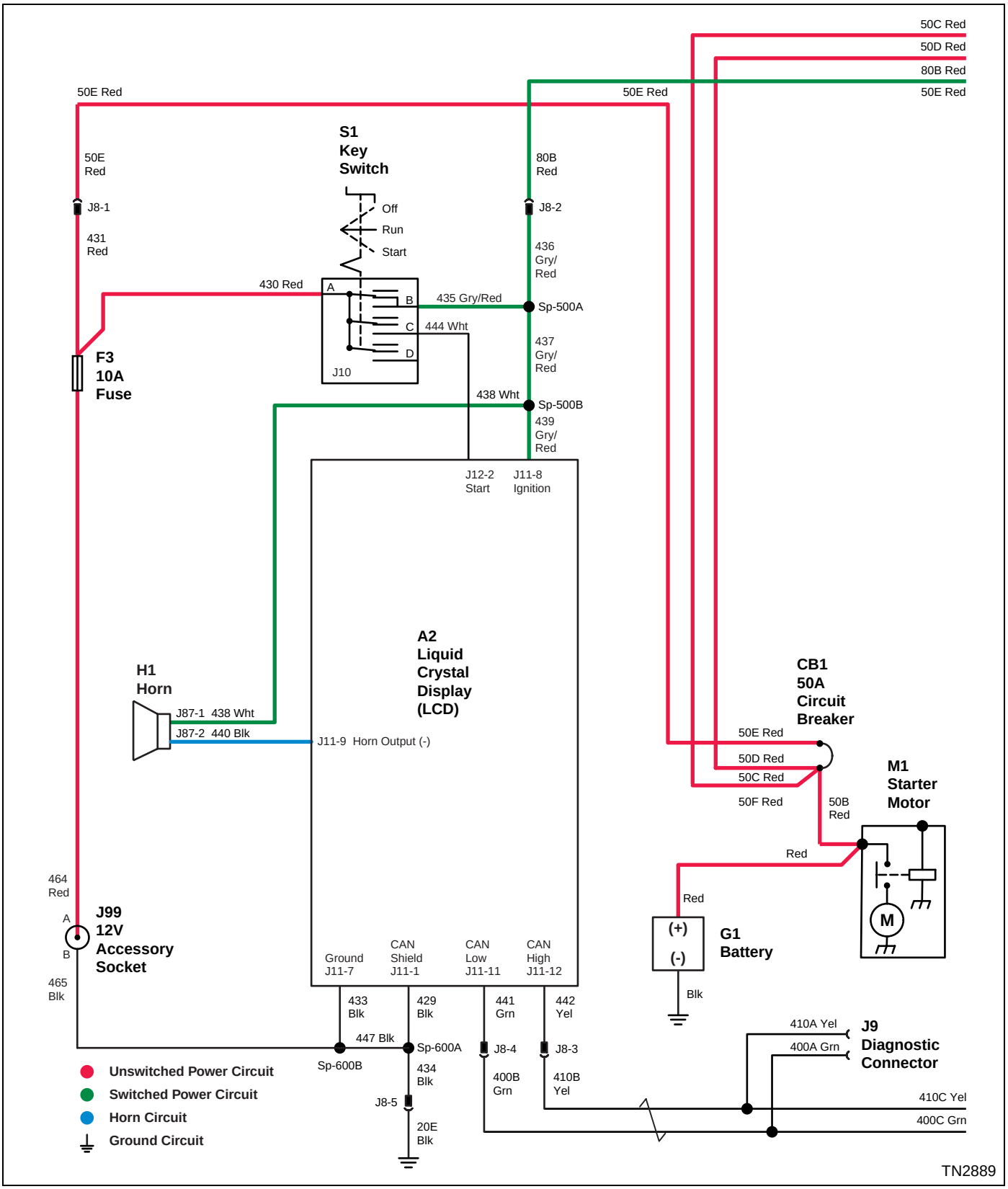


Figure 4-21

Instrumentation Circuit Schematic Continued

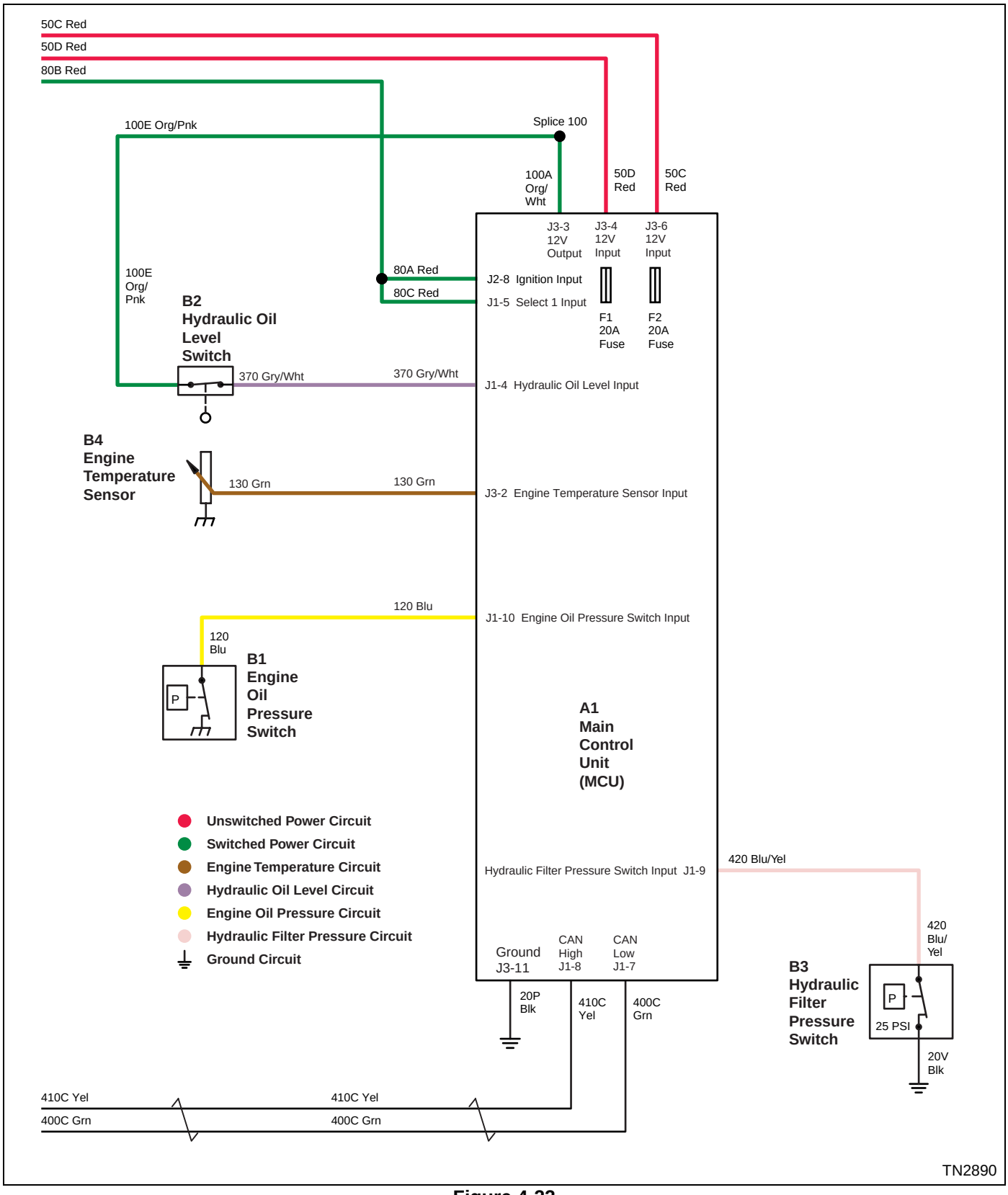


Figure 4-22

Troubleshooting

IMPORTANT

Before performing any component or wiring tests, ensure components are dry. The presence of moisture can adversely affect electrical system performance.

LCD Maintenance Mode

See Figures 4-23 and 4-24.

When placed in maintenance mode, the LCD provides monitoring and testing of the machine components. Also when in maintenance mode, the LCD provides machine configuration displays. Consult the “Safety and Operations Manual” or “Parts and Maintenance Manual” for information on machine configuration.

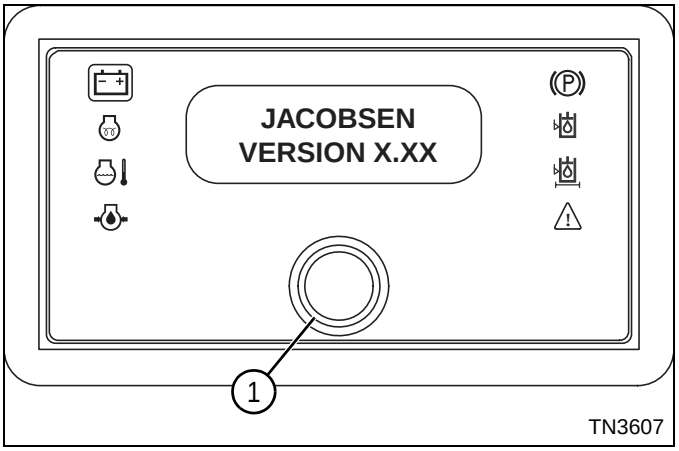


Figure 4-23

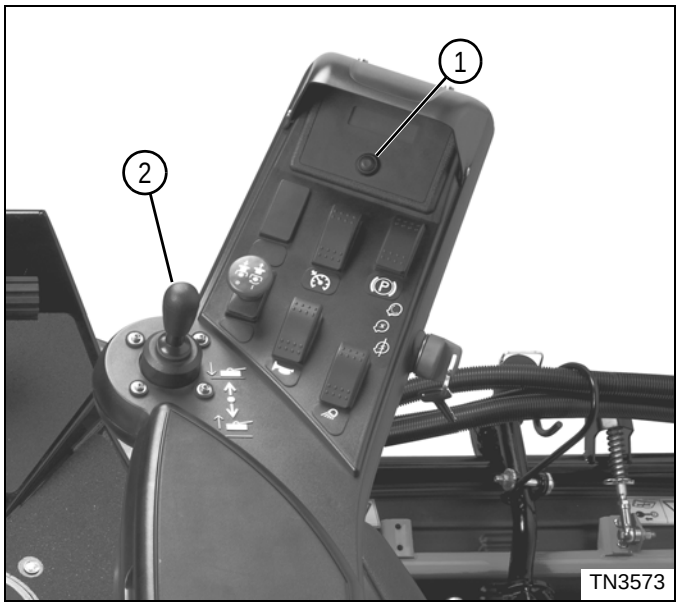


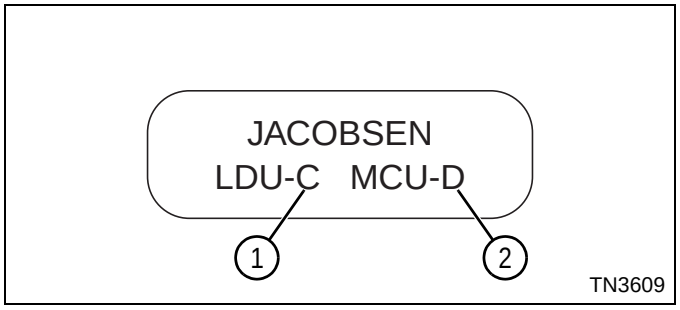
Figure 4-24

There are two controls to operate the LCD. The button (1) on the LCD is used to enter maintenance mode, enter set mode, and set values. The joystick (2) is used to change display screens and change values.

To place the LCD into maintenance mode, turn key to the run position. When the hours screen is on the display, press button (1) once to display the “Enter Pin?” screen. Use the joystick (2) to change value to YES and push button (1). Use the joystick (2) to increase or decrease and button (1) to enter the digits for the mechanic mode PIN.

Software Revision Level

See Figure 4-25.



1 Liquid Crystal Display Unit Software Revision Level
2 Main Control Unit Software Revision Level

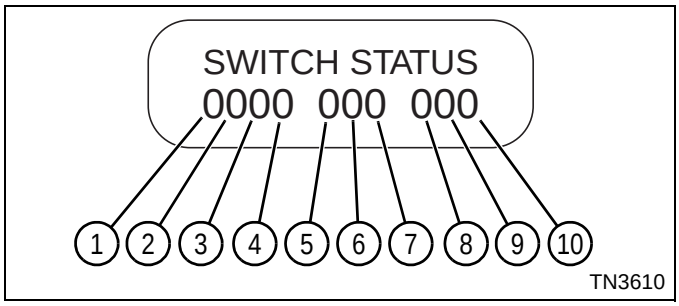
Figure 4-25

The LCD provides the means to view the software revision of the controllers. It may be necessary to provide this information when servicing the machine.

Cycle through the LCD menu until the software revision level screen is displayed. The software revision levels of the LDU and MCU are displayed.

Switch Test

See Figure 4-26.



1	Traction Pedal	6	Park Brake Switch
2	Reel Level Proximity Switch	7	Key Switch
3	Seat Switch	8	Mow Switch
4	Backlap Switch	9	Horn Switch
5	Cruise Control Switch	10	Work Light Switch

Figure 4-26

Cycle through the LCD menu until the switch test screen is displayed. When in this mode, ten digits are displayed as zeros. Each digit represents the status of a switch. When a switch is turned on, the digit will change from a zero to a one.

If a switch fails to change between zero and one, check connections and wiring. If the connections and wiring are good, test the switch.

Basic LCD System Troubleshooting

The following real world scenarios are intended to provide the technician with a simplified method of system troubleshooting. The technician will utilize the built-in diagnostic features of the LCD system and sequential checks to systematically diagnose and correct the malfunction.

The approach to troubleshooting can be broken into three main areas:

- Switch Status Testing
- Voltage Output Testing/Continuity Testing
- Substituting Known Good Components

NOTE

Before performing LCD system troubleshooting, ensure the battery is fully charged and check battery cables and connections. Repair or replace as needed.

Raise/Lower Circuit

See Figures 4-27 through 4-30.

Symptom: Cutting Units Will Not Lower

1. Turn the key to the run position.

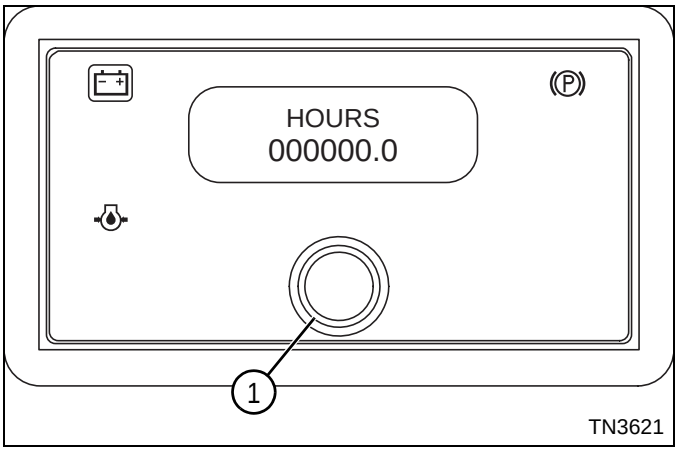


Figure 4-27

2. Press button (1) on the LCD to display the enter pin screen.

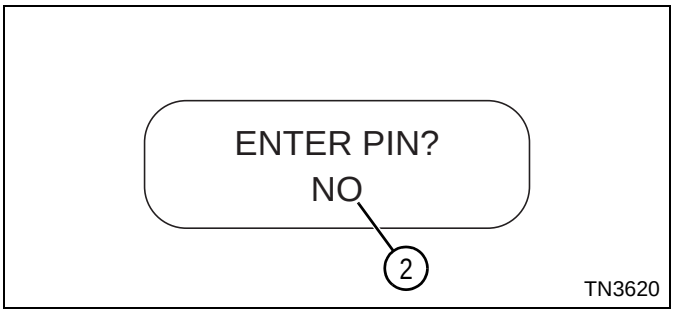


Figure 4-28

3. Move the raise/lower switch to the raise position and observe the answer at position (2).

   Does the answer toggle between NO and YES when the raise/lower switch is moved in either direction?

   YES *Raise/lower switch is good. Proceed to the next step.*

   NO *The raise/lower switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

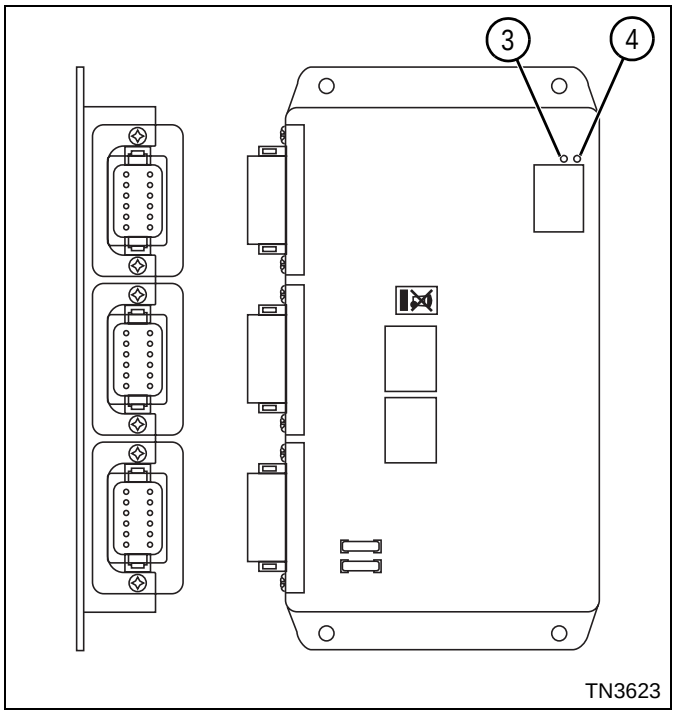


Figure 4-29

4. Observe the POWER LED (3) on the MCU. An illuminated LED indicates the MCU is receiving switched power at ignition input terminal J2-8.

   Does the MCU have power?

   YES *MCU is receiving power. Proceed to the next step.*

   NO *MCU power is faulty. Check for 12 volts at the MCU ignition input terminal J2-8.*

5. Observe the COMM LED (4) on the MCU. An illuminated LED indicates the LCD is communicating with the CAN system.

   Is the LCD communicating with the CAN system?

   YES *LCD communication is good. Proceed to the next step.*

   NO *LCD communication is faulty. Check CAN line connections.*

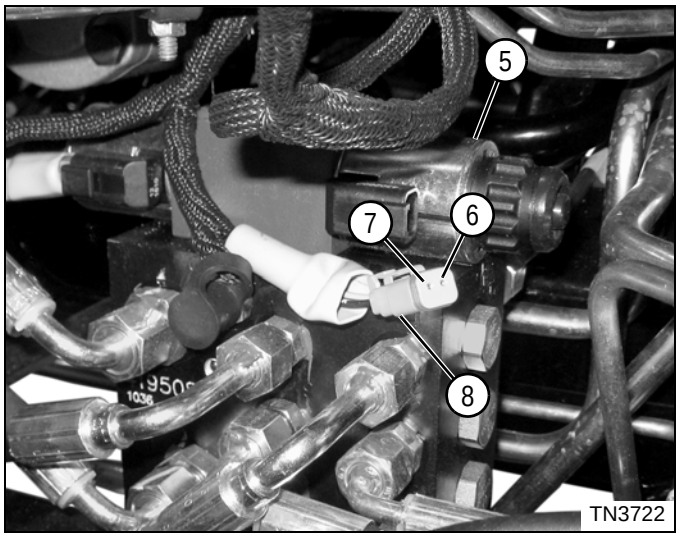


Figure 4-30

6. Disconnect the lower solenoid connector (8) at the lower solenoid (5).
7. Connect a multimeter to the harness side of the lower solenoid connector, placing the red test lead on terminal (6) and the black test lead on terminal (7). Set the multimeter to VDC.
8. Start the machine.
9. Move the raise/lower switch to the lower position and observe the voltage measurement.

   Does the multimeter display 12 VDC?

   YES *Bench test the lower solenoid and replace as needed.*

   NO *Proceed to next step.*

10. Check wiring harness and connections between lower solenoid and MCU for continuity.

    Is continuity indicated?

    YES *MCU is faulty. Replace MCU.*

    NO *Wiring harness or connections are faulty. Repair or replace wiring harness as needed.*

Mow Circuit

See Figures 4-31 through See Figures 4-33.

Symptom: Reels Will Not Engage

1. Park the machine with the cutting units in the lowered position. (See “Park Mower Safely” on page 1-6.)
2. Turn the key to the run position. Enter the maintenance mode. Toggle the LCD to the switch status screen.

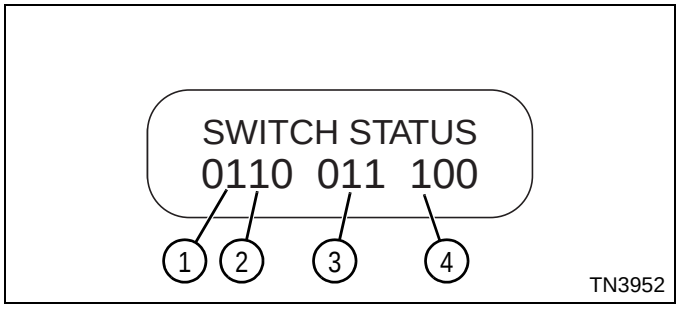


Figure 4-31

3. Observe the digit at position (1).

   Is a one displayed at position (1) when cutting units are in the lower position?

   YES *The reel level proximity switch is good. Proceed to the next step.*

   NO *The reel level proximity switch is faulty. Check reel level proximity switch adjustment. Check connections at switch and/or bench test switch and replace as needed.*

4. Sit in the seat and observe the digit at position (2).

   Does the zero change to a one when the seat switch is engaged?

   YES *The seat switch is good. Proceed to the next step.*

   NO *The seat switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

5. Enable the mow switch. Observe the digit at position (4).

   Does the zero change to a one when the mow switch is engaged?

   YES *The mow switch is good. Proceed to the next step.*

   NO *The mow switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

6. Ensure the park brake switch is engaged. Observe the digit at position (3).

   Does the zero change to a one when the park brake switch is engaged?

   YES *Park brake switch is good. Proceed to next step.*

   NO *The park brake switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

7. Turn the key switch to the off position.

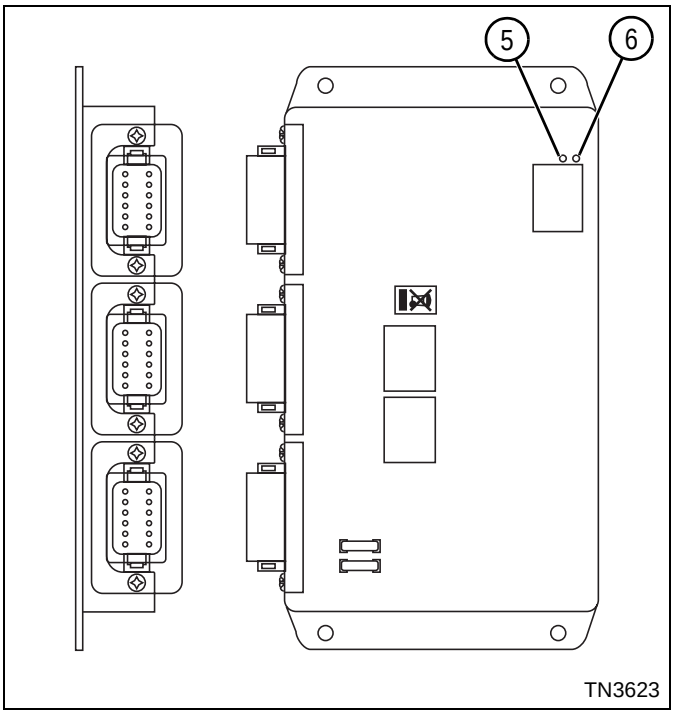


Figure 4-32

8. Turn key switch to the run position and observe the POWER LED (5) on the MCU. An illuminated LED indicates the MCU is receiving switched power at ignition input terminal J2-8.

   Does the MCU have power?

   YES *MCU is receiving power. Proceed to the next step.*

   NO *MCU power is faulty. Check for 12 volts at the MCU ignition input terminal J2-8.*

9. Observe the COMM LED (6) on the MCU. An illuminated LED indicates the LCD is communicating with the CAN system.

   Is the LCD communicating with the CAN system?

   YES *LCD communication is good. Proceed to the next step.*

   NO *LCD communication is faulty. Check CAN line connections.*

10. Turn key switch to the off position.

11. Bypass the seat switch.

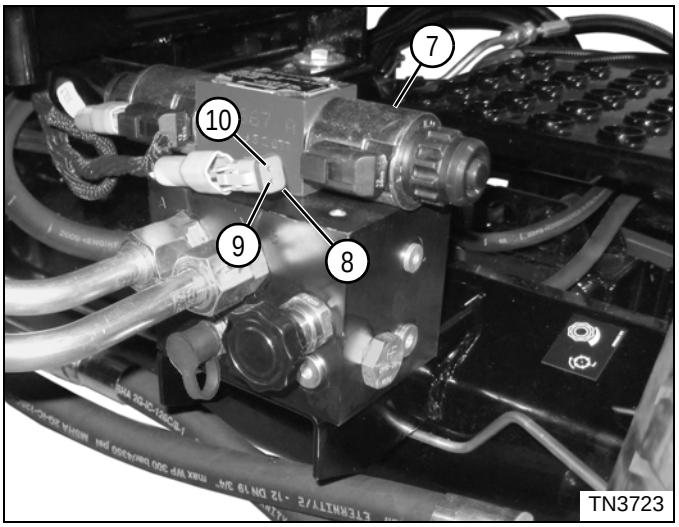


Figure 4-33

12. Disconnect the rear mow solenoid connector (8) at the rear mow solenoid (7).
13. Connect a multimeter to the harness side of the rear mow solenoid connector, placing the red test lead on terminal (10) and the black test lead on terminal (9). Set the multimeter to VDC.
14. Start the machine.

CAUTION

Reels will be activated during testing. To prevent personal injury, keep hands, feet, and clothing away from moving parts.

15. Engage the mow switch, ensure the park brake switch is engaged, and engage and release the raise/lower switch to the lower position **twice**.
16. With the mow switch enabled, observe the voltage measurement.

    Does the multimeter display 12 VDC?

    YES *Bench test the rear mow solenoid and replace as needed.*

    NO *Proceed to next step.*

17. Check wiring harness and connections between the rear mow solenoid and MCU for continuity.

    Is continuity indicated?

    YES *Turn off machine and proceed to next step.*

    NO *Wiring harness or connections between the rear mow solenoid and MCU are faulty. Repair or replace wiring harness as needed.*

18. Turn key switch to the off position.
19. Reconnect the rear mow solenoid connector (8) to the rear mow solenoid (7).

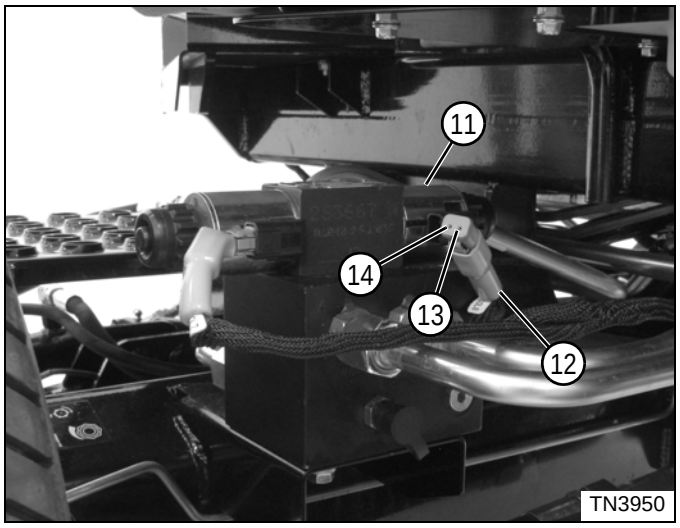


Figure 4-34

20. Disconnect the front mow solenoid connector (12) at the front mow solenoid (11).
21. Connect a multimeter to the harness side of the front mow solenoid connector, placing the red test lead on terminal (14) and the black test lead on terminal (13). Set the multimeter to VDC.
22. Start the machine.
23. Engage the mow switch, ensure the park brake switch is engaged, and engage and release the raise/lower switch to the lower position **twice**.
24. With the mow switch enabled, observe the voltage measurement.

    Does the multimeter display 12 VDC?

    YES *Bench test the front mow solenoid and replace as needed.*

    NO *Proceed to next step.*

25. Check wiring harness and connections between the front mow solenoid and MCU for continuity.

    Is continuity indicated?

    YES *Turn off machine and proceed to next step.*

    NO *Wiring harness or connections between the front mow solenoid and MCU are faulty. Repair or replace wiring harness as needed.*

26. MCU is faulty. Replace MCU.
27. Remove bypass from seat switch.

Traction Circuit

See Figures 4-35 through 4-39.

Symptom: Machine Will Not Move

1. Turn the key to the run position. Enter the maintenance mode. Toggle the LCD to the set max speed screen and ensure machine is set to 12 mph (19.3 km/h).
2. Toggle the LCD to the switch status screen.

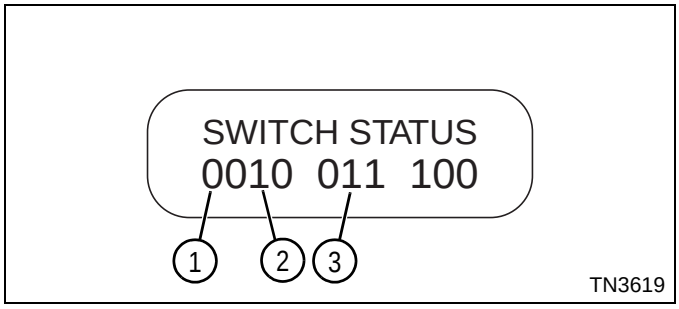


Figure 4-35

3. Sit in the seat and enable the park brake switch. Observe the digit at position (3).

   Does the zero change to a one when the park brake switch is engaged?

   YES *Park brake switch is good. Proceed to next step.*

   NO *The park brake switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

4. Sit in the seat and observe the digit at position (2).

   Does the zero change to a one when the seat switch is engaged?

   YES *The seat switch is good. Proceed to the next step.*

   NO *The seat switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

5. Sit in the seat and observe the digit at position (1).

   Is the digit a zero when the traction pedal is in the neutral position?

   YES *The traction pedal position sensor is good. Proceed to the next step.*

   NO *The traction pedal position sensor is faulty. Check connections at traction pedal position sensor and/or replace traction pedal position sensor as needed.*

6. Turn key switch to the off position.

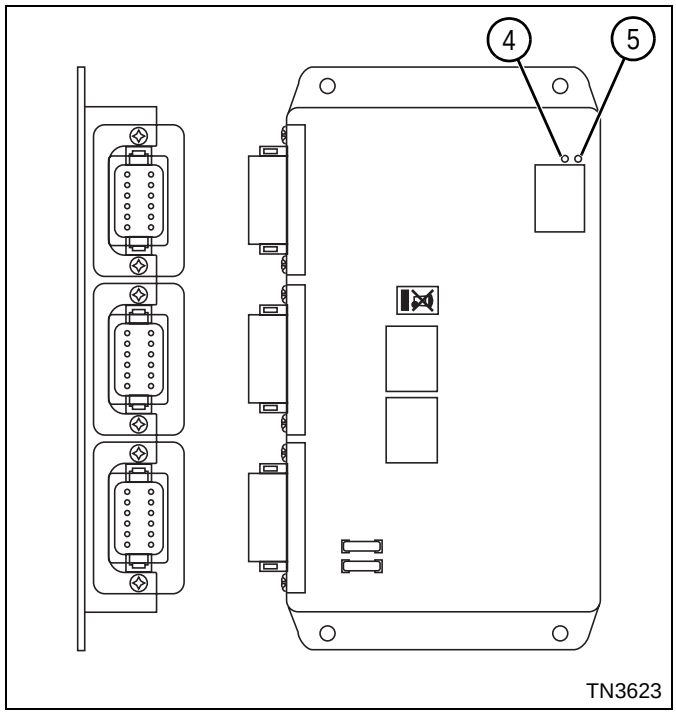


Figure 4-36

7. Turn key switch to the run position and observe the POWER LED (5) on the MCU. An illuminated LED indicates the MCU is receiving switched power at ignition input terminal J2-8.

   Does the MCU have power?

   YES *MCU is receiving power. Proceed to the next step.*

   NO *MCU power is faulty. Check for 12 volts at the MCU ignition input terminal J2-8.*

8. Observe the COMM LED (6) on the MCU. An illuminated LED indicates the LCD is communicating with the CAN system.

   Is the LCD communicating with the CAN system?

   YES *LCD communication is good. Proceed to the next step.*

   NO *LCD communication is faulty. Check CAN line connections.*

9. Turn key switch to the off position.
10. Bypass the seat switch.
11. Turn key switch to the run position.
12. Place the park brake switch in the off position.

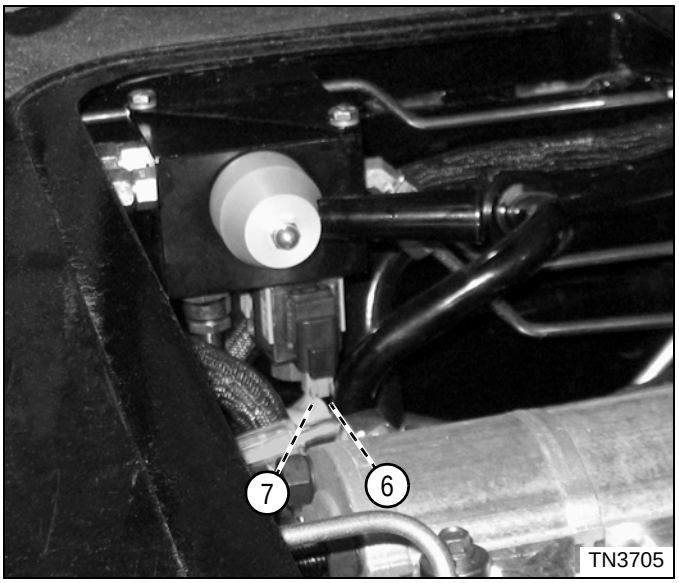


Figure 4-37

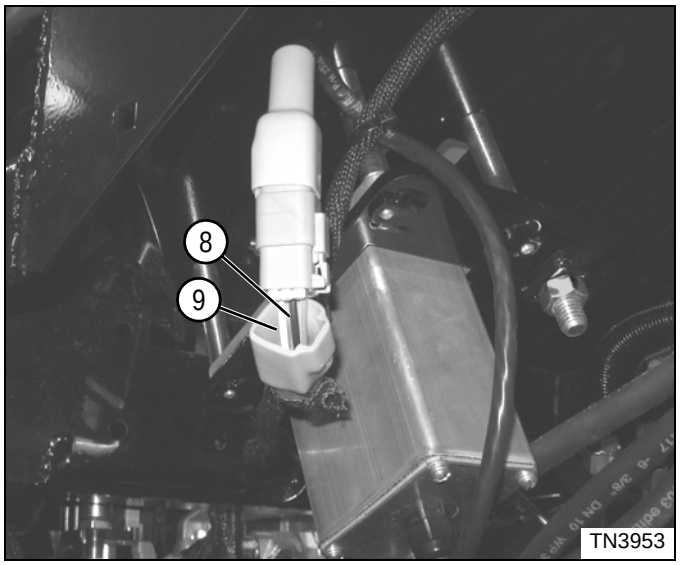


Figure 4-38

13. Using a multimeter, probe the red test lead to contact the gry/blk wire (7) of the brake solenoid wire harness and probe the black test lead to contact the blk wire (6) of the brake solenoid wire harness. Set the multimeter to VDC.
14. Move traction pedal to the forward position and observe the voltage measurement.

    Does the multimeter display 12 VDC?

    YES *The wire harness and MCU are good. Check connections at the brake solenoid and/or bench test brake solenoid and replace as needed, then proceed to step 16.*

    NO *Proceed to next step.*
15. Check wiring harness and connections between the brake solenoid and MCU for continuity.

    Is continuity indicated?

    YES *MCU is faulty. Replace MCU.*

    NO *Wiring harness or connections between the brake solenoid and MCU are faulty. Repair or replace wiring harness as needed.*

NOTE

Do not disconnect connector for testing in step 16.

16. Using a multimeter, probe the red test lead to contact the wht wire (9) of the traction pedal position wire harness and probe the black test lead to contact the blk wire (8) of the traction pedal position sensor wire harness. Set the multimeter to VDC.
17. Move the traction pedal to the neutral position.

    Does the multimeter display 2.5 VDC?

    YES *Proceed to next step.*

    NO *Proceed to step 19.*
18. Move the traction pedal fully forward.

    Does the multimeter display 4.5 VDC?

    YES *The wire harness and traction pedal position sensor are good. Proceed to step 20.*

    NO *Proceed to next step.*
19. Check wiring harness and connections between the traction pedal position sensor and MCU for continuity.

    Is continuity indicated?

    YES *Traction pedal position sensor is faulty. Adjust or replace traction pedal position sensor.*

    NO *Wiring harness or connections between the traction pedal position sensor and MCU are faulty. Repair or replace wiring harness as needed.*

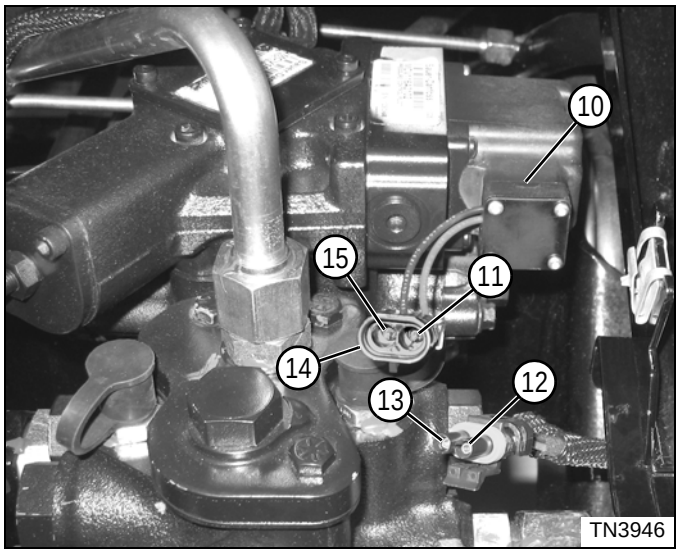


Figure 4-39

20. Disconnect the traction solenoid connector (14) at the traction solenoid (10).
21. Connect a jumper wire between terminals (15 and 12).
22. Using a multimeter, place the red test lead on terminal (11) and the black test lead on terminal (13). Set the multimeter to mA.
23. Sit in the seat and place the park brake switch in the off position.
24. Turn the key to the run position and move the traction pedal fully forward. Observe the current measurement.

    Does the multimeter display 60- 65mA?

    YES *Proceed to step 25.*

    NO *Traction solenoid is faulty. Replace traction solenoid.*

25. Move the traction pedal fully rearward. Observe the current measurement.

    Does the multimeter display 30-35mA?

    YES *Proceed to the next step.*

    NO *Traction solenoid is faulty. Replace traction solenoid.*

26. Check wiring harness between the traction solenoid and MCU for continuity.

    Is continuity indicated?

    YES *MCU is faulty. Replace MCU.*

    NO *Wiring harness or connections between the traction solenoid and MCU are faulty. Repair or replace wiring harness as needed.*

Start Circuit

See Figures 4-40 and 4-41.

Symptom: Machine Will Not Start (Starter Does Not Engage)

1. Turn the key to the run position. Enter the maintenance mode. Toggle the LCD to the switch status screen.

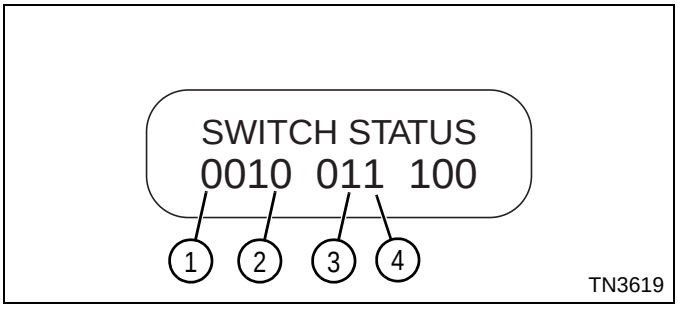


Figure 4-40

2. Sit in the seat and observe the digit at position (2).

   Is a zero displayed at position (2)?

   YES *Proceed to next step.*

   NO *Disengage the backlap switch.*

3. Ensure the park brake switch is engaged. Observe the digit at position (3).

   Is a one displayed at position (3)?

   YES *Park brake switch is good. Proceed to next step.*

   NO *The park brake switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

4. Place park brake switch in the off position and move the traction pedal forward. Observe the digit at position (1).

   Does the zero change to a one when the traction pedal is moved forward?

   YES *The traction pedal position sensor is good. Proceed to the next step.*

   NO *The traction pedal position sensor is faulty. Check connections at traction pedal position sensor and/or replace traction pedal position sensor as needed.*

5. Turn the key to the start position. Observe the digit at position (4).

   Does the zero change to a one when the key switch is turned to the start position?

   YES *Key switch is good. Proceed to next step.*

   NO *The key switch is faulty. Check connections at switch and/or bench test switch and replace as needed.*

6. Turn the key switch to the off position.

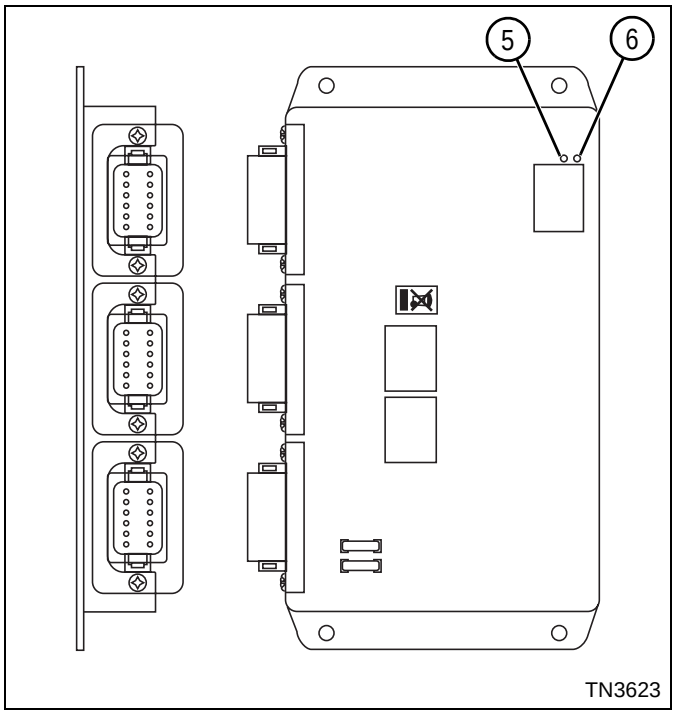


Figure 4-41

7. Turn the key switch to the run position and observe the COMM LED (5) on the MCU. An illuminated LED indicates the LCD is communicating with the CAN system.

   Is the LCD communicating with the CAN system?

   YES *LCD communication is good. Proceed to the next step.*

   NO *LCD communication is faulty. Check CAN line connections and check for 12 volts at the LCD ignition terminal J11-8.*

8. Observe the POWER LED (6) on the MCU. An illuminated LED indicates the MCU is receiving switched power at ignition input terminal J2-8.

   Does the MCU have power?

   YES *MCU is receiving power. Proceed to the next step.*

   NO *MCU power is faulty. Check for 12 volts at the MCU ignition input terminal J2-8.*

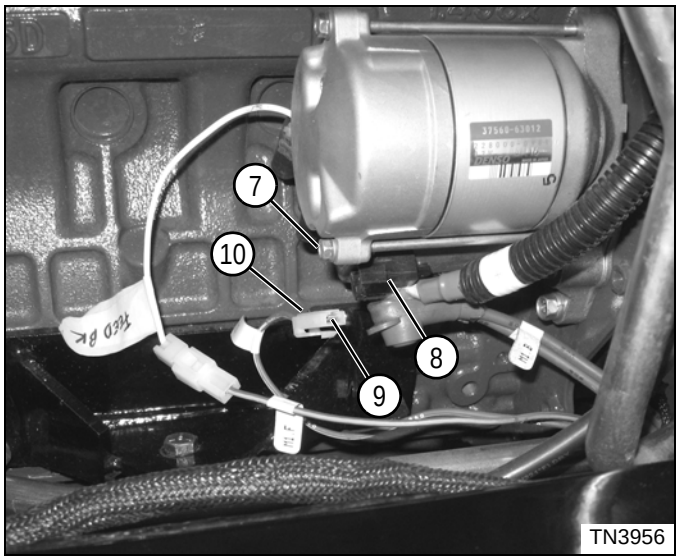


Figure 4-42

9. Disconnect the starter solenoid connector (10) at the starter motor (8).
10. Using a multimeter, place the red test lead on terminal (9) and the black test lead to ground (7). Set the multimeter to VDC.
11. Turn the key to the start position and observe the voltage measurement.

    Does the multimeter display 12 VDC?

    YES *Starter solenoid is faulty. Replace starter solenoid.*

    NO *Proceed to next step.*

12. Check wiring harness and connections between starter solenoid and start relay terminal 87 for continuity.

    Is continuity indicated?

    YES *Proceed to next step.*

    NO *Wiring harness or connections between starter solenoid and start relay are faulty. Repair or replace wiring harness as needed.*

13. Bench test the start relay. (See “Relays Test” on page 4-65.)

    Does the start relay test good?

    YES *Proceed to next step.*

    NO *Start relay is faulty. Replace start relay.*

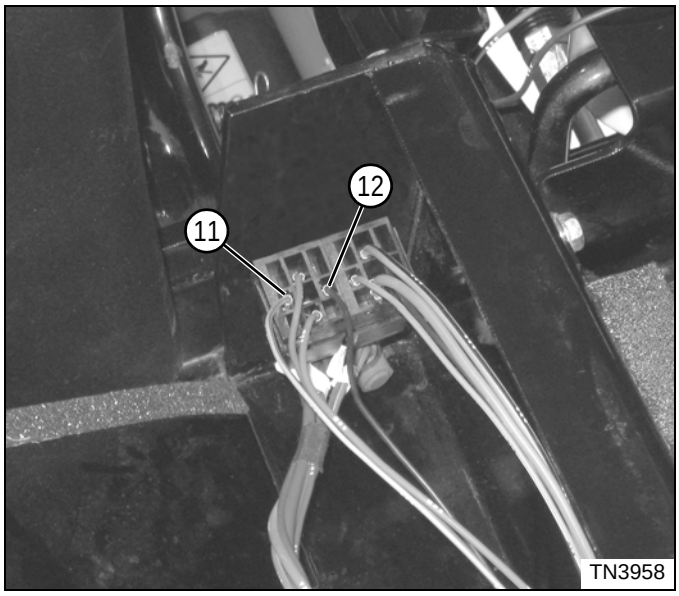


Figure 4-43

14. Connect a multimeter to the start relay, placing the red test lead on terminal 86 (11) and the black test lead on ground terminal (12). Set the multimeter to VDC.
15. Turn the key to the start position and observe the voltage measurement.

    Does the multimeter display 12 VDC?

    YES *Starter motor is faulty. Replace starter motor.*

    NO *Proceed to next step.*
16. Check wiring harness and connections between start relay and MCU for continuity.

    Is continuity indicated?

    YES *MCU is faulty. Replace MCU.*

    NO *Wiring harness or connections* between start relay and MCU *are faulty. Repair or replace wiring harness as needed.*

System Diagnostic Screens

See Figure 4-44.

As an aid to troubleshooting, the following screens appear if an open circuit or short circuit is detected on the indicated output.

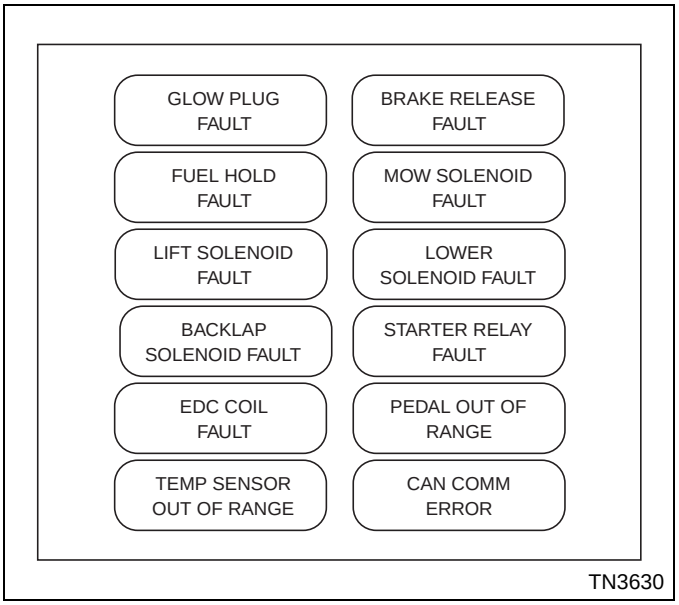


Figure 4-44

Diagnostic Screen: Glow Plug Fault

Probable Cause	Remedy
Faulty glow plug relay output.	Turn the key switch to the run position; check for 12 volts at the MCU glow plug relay output terminal J2-5. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and glow plug relay and repair or replace as needed.
Faulty glow plug relay.	Test the glow plug relay. (See “Relays Test” on page 4-65.)

Diagnostic Screen: Fuel Hold Fault

Probable Cause	Remedy
Faulty fuel hold output.	Turn the key switch to the start position; check for 12 volts at the MCU fuel hold output terminal J2-10. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and fuel shutoff solenoid and repair or replace as needed.
Faulty fuel shutoff solenoid.	Test the fuel shutoff solenoid. (See “Fuel Shutoff Solenoid Test” on page 4-72.)

Diagnostic Screen: Lift Solenoid Fault

Probable Cause	Remedy
Faulty raise solenoid output.	Turn the key switch to the run position; check for 12 volts at the MCU raise solenoid output terminal J2-1. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and raise solenoid and repair or replace as needed.
Faulty raise solenoid.	Test the raise solenoid. (See “Solenoids Test” on page 4-71.)

Diagnostic Screen: Backlap Solenoid Fault

Probable Cause	Remedy
Faulty backlap solenoid output.	Turn the key switch to the run position; check for 12 volts at the MCU backlap solenoid output terminal J2-3. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and backlap solenoid and repair or replace as needed.
Faulty backlap solenoid.	Test the backlap solenoid. (See “Solenoids Test” on page 4-71.)

Diagnostic Screen: EDC Coil Fault

Probable Cause	Remedy
Faulty traction solenoid output.	Turn the key switch to the run position; check for 12 volts at the MCU traction solenoid output terminal J3-10. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and traction solenoid and repair or replace as needed.
Faulty traction solenoid.	Test the traction solenoid. (See “Traction Solenoid Test” on page 4-71.)

Diagnostic Screen: Temperature Sensor Out of Range

Probable Cause	Remedy
Faulty engine temperature sensor.	Substitute engine temperature sensor with a known good temperature sensor.
Faulty wiring.	Check wiring and connections between the MCU and engine temperature sensor and repair or replace as needed.
Shorted wiring harness.	Make sure wiring harness is free of nicks and cuts and not pinched to machine frame.

Diagnostic Screen: Brake Release Fault

Probable Cause	Remedy
Faulty brake solenoid output.	Turn the key switch to the run position; check for 12 volts at the MCU brake solenoid output terminal J2-9. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and brake solenoid and repair or replace as needed.
Faulty brake solenoid.	Test the brake solenoid. (See “Traction Solenoid Test” on page 4-71.)

Diagnostic Screen: Mow Solenoid Fault

Probable Cause	Remedy
Faulty mow solenoid output.	Turn the key switch to the run position; check for 12 volts at the MCU mow solenoid output terminal J2-2. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the MCU and mow solenoid and repair or replace as needed.
Faulty mow solenoid.	Test the mow solenoid. (See “Solenoids Test” on page 4-71.)

Diagnostic Screen: Lower Solenoid Fault

Probable Cause	Remedy
Faulty lower solenoid output.	Turn the key switch to the run position; check for 12 volts at the MCU lower solenoid output terminal J2-4. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the lower solenoid and MCU and repair or replace as needed.
Faulty lower solenoid.	Test the lower solenoid. (See “Solenoids Test” on page 4-71.)

Diagnostic Screen: Start Relay Fault

Probable Cause	Remedy
Faulty start relay output.	Turn the key switch to the start position; check for 12 volts at the MCU start output terminal J2-6. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between MCU and start relay and repair or replace as needed.
Faulty start relay.	Test the start relay. (See “Relays Test” on page 4-65.)

Diagnostic Screen: Pedal Out of Range

Probable Cause	Remedy
Faulty wiring.	Check wiring and connections between the MCU and traction pedal position sensor and repair or replace as needed.
Shorted wiring harness.	Make sure wiring harness is free of nicks and cuts and not pinched to machine frame.
Faulty traction pedal position sensor adjustment.	Adjust traction pedal position sensor. (See “Traction Pedal Adjustment” on page 4-73.)
Faulty traction pedal position sensor.	Substitute traction pedal position sensor with a known good traction pedal position sensor.

Diagnostic Screen: CAN Comm Error

Probable Cause	Remedy
Faulty CAN wiring.	Check the CAN wiring between the LCD and MCU.
Shorted wiring harness.	Make sure wiring harness is free of nicks and cuts and not pinched to machine frame.

Power Circuit

Symptom: Machine does not power up.

Probable Cause	Remedy
Battery low.	Charge the battery.
Faulty 50A circuit breaker.	Test circuit breaker. (See “50A Circuit Breaker Test” on page 4-64.)
Faulty key switch.	Test key switch. (See “Key Switch Test” on page 4-65.)
Faulty MCU.	Substitute the PDU with a known good PDU.
Faulty LCD.	Substitute the LCD with a known good LCD.

Symptom: No power at 12V accessory socket.

Probable Cause	Remedy
Open 10A fuse.	Test 12V accessory socket fuse. (See “Fuses Test” on page 4-64.)
Faulty wiring.	Check wiring and connections between 12V accessory socket and 50A circuit breaker and repair or replace as needed.

Horn Circuit

Symptom: Horn does not turn on.

Probable Cause	Remedy
Faulty horn switch.	Test horn switch using LCD “Switch Test.” (See “Switch Test” on page 4-45.)
	If the horn switch does not activate during the LCD “Switch Test,” bench test the switch. (See “Rocker Switches Test” on page 4-66.)
Faulty wiring.	Check wiring and connections between horn and LCD and repair or replace as needed.
Faulty horn.	Substitute the horn with a known good horn.
Faulty LCD.	Substitute the LCD with a known good LCD.

Work Light Circuit

Symptom: Work light does not turn on.

Probable Cause	Remedy
Faulty work light switch.	Test work light switch using LCD “Switch Test.” (See “Switch Test” on page 4-45.)
	If the work light switch does not activate during the LCD “Switch Test,” bench test the switch. (See “Rocker Switches Test” on page 4-66.)
Faulty wiring.	Check wiring and connections between work lights and MCU and repair or replace as needed.
Faulty work light output circuit.	With the key switch in the run position, place the work light switch in the on position and check for 12 volts at the MCU light output terminal J3-5. If the output is 12 volts, work light output circuit is good; replace work light. If the output is not 12 volts, MCU work light output circuit is faulty; substitute the MCU with a known good MCU.

Symptom: Work light does not turn off.

Probable Cause	Remedy
Faulty work light switch.	Test work light switch using LCD “Switch Test.” (See “Switch Test” on page 4-45.)
	If the work light switch does not activate during the LCD “Switch Test,” bench test the switch. (See “Rocker Switches Test” on page 4-66.)
Faulty work light output circuit.	With the key switch in the run position, place the work light switch in the off position and check for 12 volts at the MCU light output terminal J3-5. If the output is12 volts, work light output circuit is faulty; substitute the MCU with a known good MCU.

Glow Plug Circuit

Symptom: Glow plugs do not get hot when engine temperature is less than 50° F (10° C).

Probable Cause	Remedy
Faulty glow plug relay output.	Turn the key switch to the run position; check for 12 volts at the MCU glow plug relay output terminal J2-5. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between the glow plug terminal strip and MCU and repair or replace as needed.
Faulty glow plug relay.	Test the glow plug relay. (See “Relays Test” on page 4-65.)

Start Circuit

Symptom: Starter motor solenoid does not engage.

Probable Cause	Remedy
Battery low.	Charge battery.
Mow switch is in the mow position.	Place the mow switch in the off position.
Faulty start relay output.	Turn the key switch to the start position; check for 12 volts at the MCU start output terminal J2-6. If the output is not 12 volts, substitute the MCU with a known good MCU.
Faulty wiring.	Check wiring and connections between starter motor solenoid and MCU and repair or replace as needed.
Faulty start relay.	Test the start relay. (See “Relays Test” on page 4-65.)

Charging Circuit

Symptom: Battery not charging.

Probable Cause	Remedy
Faulty output circuit.	Make sure alternator output cable and battery positive (+) cable terminals are clean and tight.
	Check continuity between battery terminal and the alternator battery positive (+) terminal. Continuity must be indicated. If continuity is not indicated, inspect cable and connections and repair or replace as needed.
Faulty battery ground circuit.	Make sure battery negative (–) cable terminals are clean and tight.
	Check continuity between battery negative (–) terminal and ground. Continuity must be indicated. If continuity is not indicated, inspect cable and connections and repair or replace as needed.
Faulty battery.	Check specific gravity of the individual battery cells.

Symptom: Battery light stays on.

Probable Cause	Remedy
Missing excitation voltage (diesel model).	With the key switch in the run position, measure voltage between alternator ignition terminal. Voltage must be approximately 12 VDC.
Faulty alternator.	With the engine running, measure voltage between battery terminals. Voltage must be approximately 14 VDC. If the voltage is below 12 volts, replace the alternator.
Faulty battery.	Check specific gravity of the individual battery cells.

Raise/Lower Circuit

Symptom: Cutting units will not rise.

Probable Cause	Remedy
Faulty raise switch.	Test raise switch using LCD “Switch Test.” (See “Switch Test” on page 4-45.)
	If the raise switch does not activate during the LCD “Switch Test,” bench test the switch. (See “Raise/Lower Switch Assembly Test” on page 4-68.)
Faulty connections.	Check connections; make sure connections are clean and tight.
Faulty wiring harness.	Make sure wiring harness is free of nicks and cuts and not pinched to machine frame.
Faulty raise solenoid.	Test raise solenoid. (See “Solenoids Test” on page 4-71.)

Symptom: Cutting units will not lower.

Probable Cause	Remedy
Faulty lower switch.	Test lower switch using LCD “Switch Test.” (See “Switch Test” on page 4-45.)
	If the lower switch does not activate during the LCD “Switch Test,” bench test the switch. (See “Raise/Lower Switch Assembly Test” on page 4-68.)
Faulty connections.	Check connections; make sure connections are clean and tight.
Faulty wiring harness.	Make sure wiring harness is free of nicks and cuts and not pinched to machine frame.
Faulty lower solenoid.	Test lower solenoid. (See “Solenoids Test” on page 4-71.)

Mow Circuit

Symptom: Machine will not mow.

Probable Cause	Remedy
Faulty mow switch.	Test mow switch. (See “Switch Test” on page 4-45.) (See “Mow Switch Test” on page 4-66.)
Faulty connections.	Check connections; make sure connections are clean and tight.
Faulty wiring harness.	Make sure wiring harness is free of nicks and cuts and not pinched to machine frame.
Faulty mow solenoid.	Test mow solenoid. (See “Solenoids Test” on page 4-71.)

Instrumentation Circuit

Symptom: Engine oil pressure light does not turn on.

Probable Cause	Remedy
Faulty engine oil pressure switch.	With the key switch in the off position, check continuity between engine oil pressure switch housing and ground. Continuity must be indicated. If continuity is not indicated, replace engine oil pressure switch.
Faulty engine oil pressure light switched power circuit.	With the key switch in the run position (engine off), measure voltage between engine oil pressure switch (blu wire terminal) and ground. Voltage must be approximately 12 VDC.
Faulty engine oil pressure switch circuit.	Check continuity between engine oil pressure switch (blu wire terminal) and MCU engine oil pressure switch input terminal J1-10. Continuity must be indicated. If continuity is not indicated, inspect wire harness and connections and repair or replace as needed.
Faulty LCD.	Replace LCD with known good LCD.

Symptom: Engine oil pressure light stays on with engine running.

Probable Cause	Remedy
Low engine oil pressure.	Check engine oil pressure.
Faulty engine oil pressure switch.	If engine oil pressure tests good, replace engine oil pressure switch.

Symptom: Hydraulic oil filter light does not turn on with a blocked filter.

Probable Cause	Remedy
Faulty hydraulic filter pressure light switched power circuit.	With the key switch in the run position (engine off), measure voltage between hydraulic filter pressure switch (blu/yel wire terminal) and ground. Voltage must be approximately 12 VDC.
Faulty hydraulic filter pressure switch circuit.	Check continuity between hydraulic filter pressure switch (blu/yel wire terminal) and MCU hydraulic filter pressure switch input terminal J1-9. Continuity must be indicated. If continuity is not indicated, inspect wire harness and connections and repair or replace as needed.
Faulty hydraulic filter pressure switch.	Replace hydraulic filter pressure switch.

Symptom: Hydraulic oil filter light is on with the key switch in the run position (engine off).

Probable Cause	Remedy
Faulty hydraulic filter pressure switch.	Replace hydraulic filter pressure switch.

Symptom: Hydraulic oil filter light is on with the key switch in the run position (engine on).

Probable Cause	Remedy
Blocked hydraulic oil charge filter.	Replace hydraulic oil charge filter.
Faulty hydraulic filter pressure switch.	Replace hydraulic filter pressure switch.

Symptom: Engine coolant temperature light does not turn on.

Probable Cause	Remedy
Faulty engine temperature sensor.	With a jumper wire, connect the engine temperature sensor terminal to ground. With the key switch in the run position, check the engine coolant temperature light. If the light turns on, replace the engine temperature sensor.
Faulty wiring.	Check continuity between engine temperature sensor (grn wire terminal) and the engine MCU engine temperature sensor input terminal J3-2. Continuity must be indicated. If continuity is not indicated, inspect wire harness and connections and repair or replace as needed.

Symptom: Engine coolant temperature light turns on when engine is cold.

Probable Cause	Remedy
Faulty engine temperature sensor.	Disconnect the engine temperature sensor terminal. With the key switch in the run position, check the engine coolant temperature light. If the light turns off, replace the engine coolant temperature switch.
Faulty wiring.	Check ground short on engine coolant temperature switch (grn wire terminal).

Symptom: Hydraulic oil level light does not turn on.

Probable Cause	Remedy
Faulty hydraulic oil level switch.	Disconnect wire connector from the hydraulic oil level switch and connect the wire connector terminals with a jumper wire. With the key switch in the run position, check the hydraulic oil level light. If the light turns on, replace the hydraulic oil level switch.
Faulty wiring.	Check continuity between hydraulic filter pressure switch connector (org/pnk wire terminal) and MCU 12V output terminal J3-3. Continuity must be indicated. If continuity is not indicated, inspect wire harness and connections and repair or replace as needed.
	Check continuity between hydraulic filter pressure switch connector (gry/wht wire terminal) and MCU hydraulic oil level input terminal J1-4. Continuity must be indicated. If continuity is not indicated, inspect wire harness and connections and repair or replace as needed.

Component Testing

Electrical System and Component Testing

General Information

Repair of the electrical system, for the most part, is limited to the replacement of defective components or wiring. When replacing either electrical components or wiring, be sure to apply dielectric grease (Jacobsen PN 365422) to all connector terminals to prevent corrosion. Wiring diagrams are provided in this section for troubleshooting and/or testing the electrical system. Specific testing and replacement information, where applicable, is also provided in this section.

In addition to testing a suspected faulty component, it may be necessary to check for shorts or breaks in the wiring to the component. A common method of testing wires or circuits is to perform a continuity check as described in the following tests.

NOTE

Before performing any component or wiring tests, check for corrosion and loose or missing connections.

If a component (switch, relay, etc.) is removed for testing or replacement, make sure to identify and label all wires so that the component can be installed correctly.

Continuity Test

Required Tools or Equipment
Digital Multimeter, Ohmmeter, or Continuity Tester

1. Identify and locate the wire or component to be checked using the electrical schematic.

NOTE

Some meters may have a continuity tester setting that uses a buzzer to indicate continuity. Refer to the meter operator's manual for more information.

2. If using a multimeter, set to read ohms or set meter to continuity setting.
3. Disconnect the ends of the wire being tested.
4. Touch meter leads to the ends of the wire or to the terminals of the component to be tested.

   Does meter read less than 0.02 ohm and/or does the buzzer sound?

   YES *The wire is good.*

   NO *Proceed to step 5.*

5. Use a known good jumper wire of the correct gauge to bypass the wire in question.
6. Test the function of the circuit.

   Does the circuit now operate properly?

   YES *Replace the wire.*

   NO *Continue testing other wires and components in the circuit.*

Resistance Test

Required Tools or Equipment
Digital Multimeter or Ohmmeter

1. Identify and locate the wire or component to be checked using the electrical schematic.

NOTE

On some meters it will be necessary to select an ohms scale. Select an appropriate range for the component being tested. Refer to the specifications listed in the component test procedure.

2. If using a multimeter, set to read ohms.
3. Isolate (disconnect) the component to be tested from the circuit to prevent a false reading through the circuit.
4. Connect the meter leads to the terminals of the component being tested. Check the component test procedure for specifications and additional test conditions.

   Does the resistance through the component match the specified value listed in the test procedure?

   YES *The component is good.*

   NO *Replace the component.*

50A Circuit Breaker Test

See Figure 4-45.

Required Tools or Equipment
Digital Multimeter

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Set the multimeter to 20 volts DC.
3. Connect the black test lead to the battery negative (–) terminal.

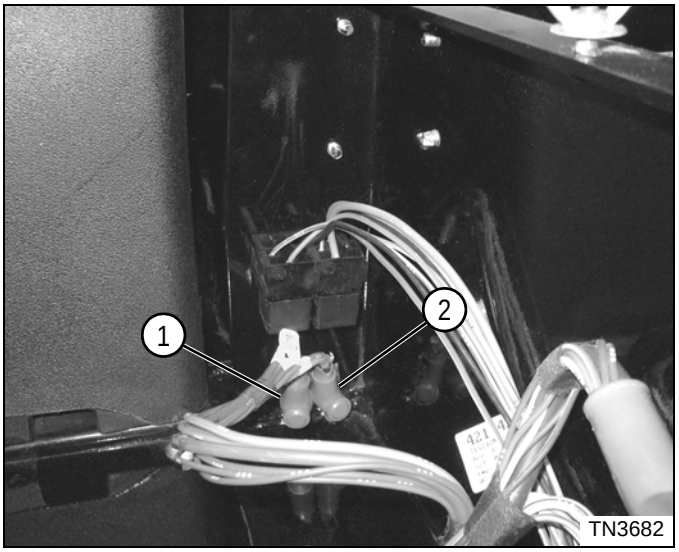


Figure 4-45

4. Remove terminal caps (1 and 2).
5. Connect the red test lead to each of the circuit breaker terminals.

Is battery voltage indicated?

YES *The circuit breaker is good.*

NO *The circuit breaker is faulty; replace the circuit breaker.*

Fuses Test

See Figure 4-46.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

This procedure applies to the following fuses:

- *12V Accessory Socket Fuse*
- *MCU Fuses*

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove fuse. (See “12V Accessory Socket Fuse” on page 4-84 or “MCU Fuses” on page 4-85.)

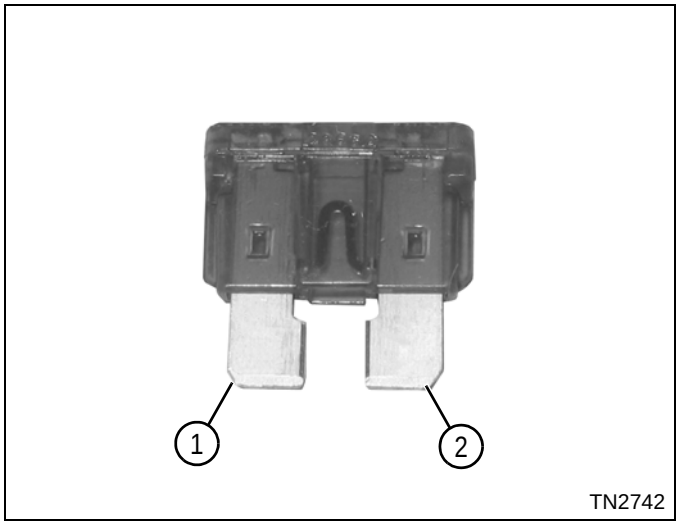


Figure 4-46

3. Set the meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. Measure the resistance between terminals (1 and 2).

Is the resistance value 0.02 ohm or less?

YES *The fuse is good.*

NO *The fuse is faulty; replace the fuse.*

Relays Test

See Figure 4-47.

Required Tools or Equipment
• Digital Multimeter or Ohmmeter • 12-Volt DC Power Source

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove relay. (See “Start Relay” on page 4-86 or “Glow Plug Relay” on page 4-86.)

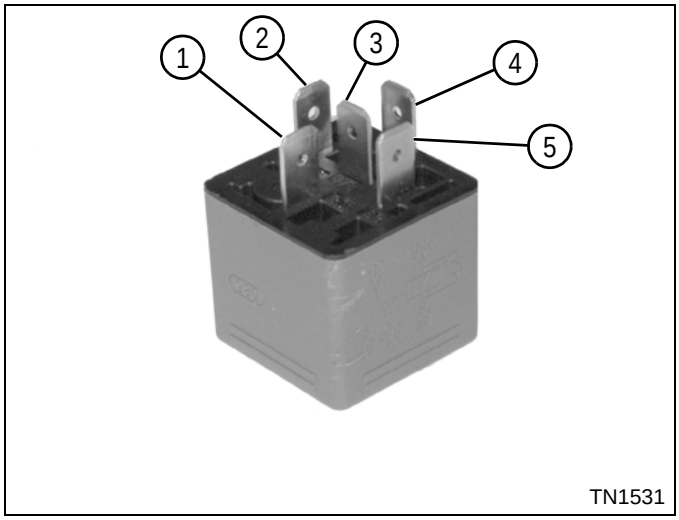


Figure 4-47

3. Set the meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. Measure the resistance between terminals 30 (1) and 87a (3).

   Is the resistance value 0.02 ohm or less?

   YES *Proceed to step 6.*

   NO *The relay is faulty; replace the relay.*
6. Using a 12-volt DC power source, connect the positive output to terminal 86 (2) and connect the negative output to terminal 85 (5).
7. Measure the resistance between terminals 30 (1) and 87 (4).

   Is the resistance value 0.02 ohm or less?

   YES *The relay is good.*

   NO *The relay is faulty; replace the relay.*

Key Switch Test

See Figure 4-48.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

Test the component utilizing the LCD switch status menu before performing the component bench test. (See “Switch Test” on page 4-45.)

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove key switch. (See “Key Switch” on page 4-81.)

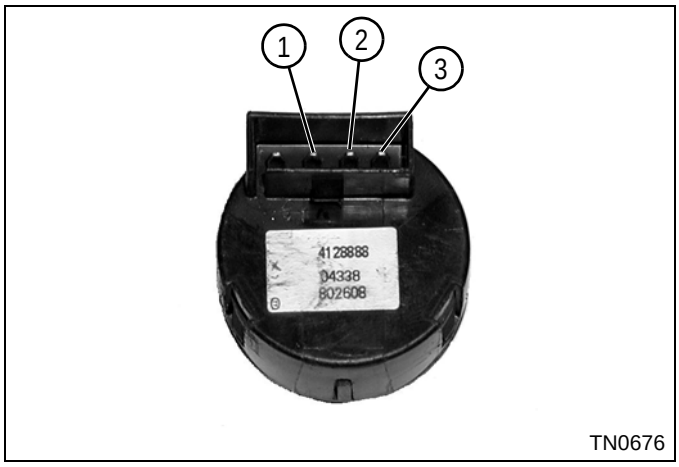


Figure 4-48

3. Move key switch to the on position.
4. Set the meter to read ohms.
5. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
6. Measure the resistance between terminals (2 and 3).

   Is the resistance value 0.02 ohm or less?

   YES *Proceed to step 7.*

   NO *The key switch is faulty; replace the key switch.*
7. Move key switch to the start position and measure the resistance between terminals (1 and 2, 1 and 3, and 2 and 3).

   Are the resistance values 0.02 ohm or less?

   YES *The key switch is good.*

   NO *The key switch is faulty; replace the key switch.*

Mow Switch Test

See Figure 4-49.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

Test the component utilizing the LCD switch status menu before performing the component bench test. (See "Switch Test" on page 4-45.)

1. Park the mower safely. (See "Park Mower Safely" on page 1-6.)
2. Remove mow switch. (See "Rocker Switches" on page 4-80.)

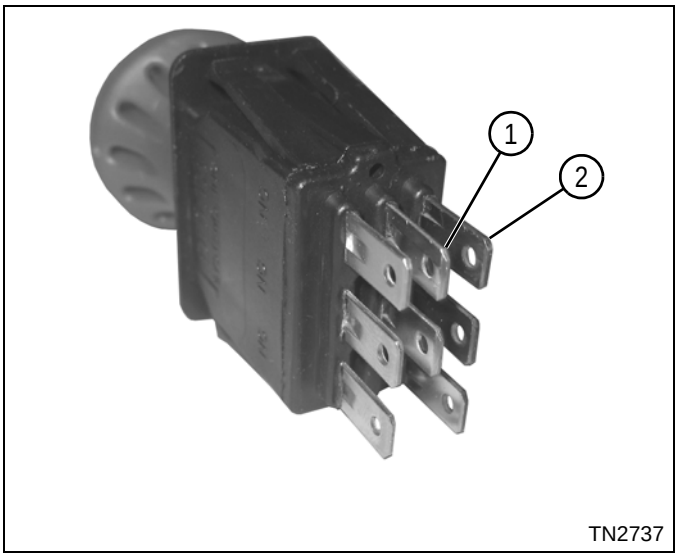


Figure 4-49

3. Pull mow switch knob to the on position.
4. Set the meter to read ohms.
5. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
6. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *Proceed to step 7.*

   NO *Mow switch is faulty; replace mow switch.*
7. Push mow switch knob to the off position.
8. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The mow switch is faulty; replace the mow switch.*

   NO *The mow switch is good.*

Rocker Switches Test

See Figure 4-50.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

This procedure applies to the following switches:

- *Work Light Switch*
- *Park Brake Switch*
- *Cruise Control Switch*

NOTE

Test the component utilizing the LCD switch status menu before performing the component bench test. (See "Switch Test" on page 4-45.)

1. Park the mower safely. (See "Park Mower Safely" on page 1-6.)
2. Remove rocker switch. (See "Rocker Switches" on page 4-80.)

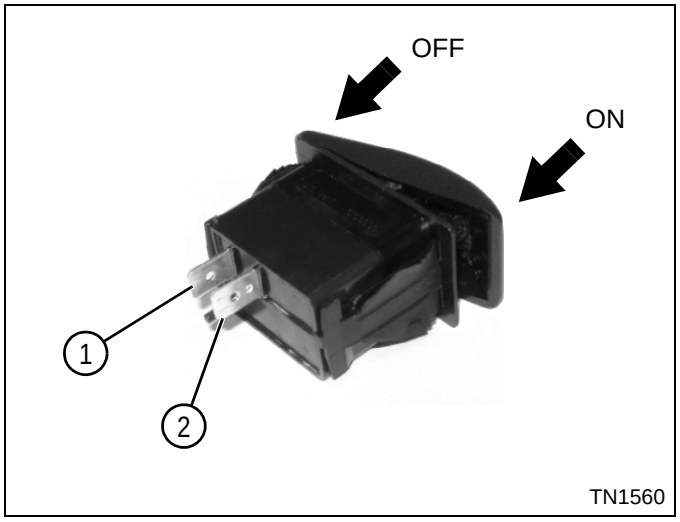


Figure 4-50

3. Place rocker switch in the on position.
4. Set the meter to read ohms.
5. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
6. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *Proceed to step 7.*

   NO *The rocker switch is faulty; replace the rocker switch.*
7. Place rocker switch in the off position.

8. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The rocker switch is faulty; replace the rocker switch.*

   NO *The rocker switch is good.*

Horn Switch Test

See Figure 4-51.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

Test the component utilizing the LCD switch status menu before performing the component bench test. (See "Switch Test" on page 4-45.)

1. Park the mower safely. (See "Park Mower Safely" on page 1-6.)
2. Remove horn switch. (See "Rocker Switches" on page 4-80.)

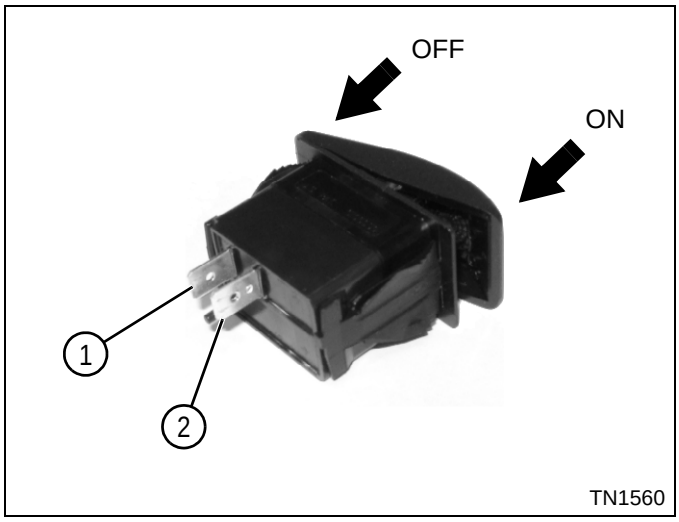


Figure 4-51

3. The horn switch is normally in the off position.
4. Set the meter to read ohms.
5. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
6. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The horn switch is faulty; replace the horn switch.*

   NO *Proceed to step 7.*

7. Depress and hold horn switch in the on position.
8. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The horn switch is good.*

   NO *The horn switch is faulty; replace the horn switch.*

Backlap Switch Test

See Figure 4-52.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

Test the component utilizing the LCD switch status menu before performing the component bench test. (See "Switch Test" on page 4-45.)

1. Park the mower safely. (See "Park Mower Safely" on page 1-6.)
2. Remove backlap switch. (See "Backlap Switch" on page 4-83.)

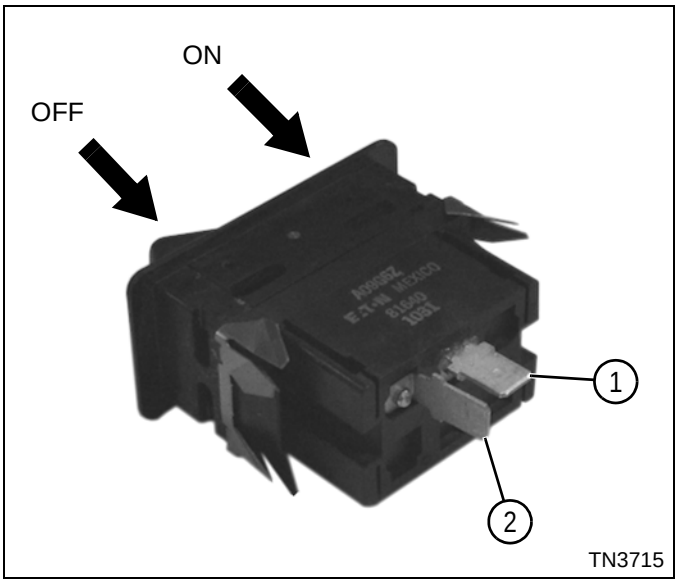


Figure 4-52

3. Place backlap switch in the off position.
4. Set the meter to read ohms.
5. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
6. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The backlap switch is faulty; replace the backlap switch.*

   NO *Proceed to step 7.*

7. Place backlap switch in the on position.
8. Measure the resistance between terminals (1 and 2).

Is the resistance value 0.02 ohm or less?

YES *The backlap switch is good.*

NO *The backlap switch is faulty; replace the backlap switch.*

Raise/Lower Switch Assembly Test

See Figure 4-53.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove raise/lower switch assembly. (See “Raise/Lower Switch Assembly” on page 4-82.)

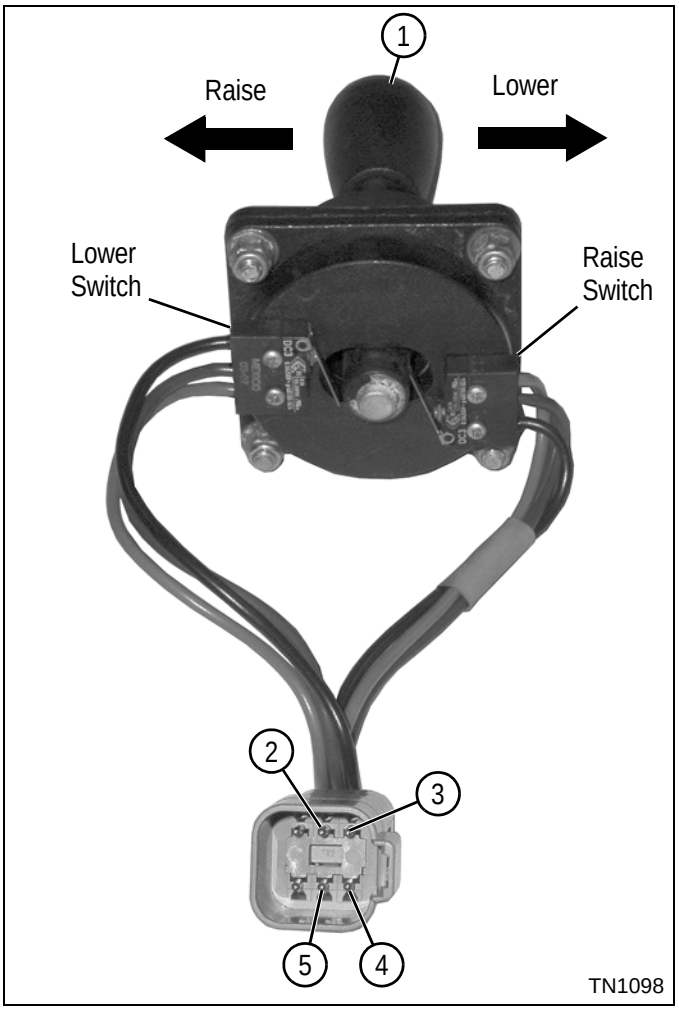


Figure 4-53

3. Set the meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. Measure the resistance between terminals (2 and 3).

Is the resistance value 0.02 ohm or less?

YES *The switch is faulty; replace the raise/lower switch assembly.*

NO *Proceed to step 6.*

6. Move and hold the raise/lower switch assembly in the lower position and measure the resistance between terminals (2 and 3).

Is the resistance value 0.02 ohm or less?

YES *Proceed to step 7.*

NO *The switch is faulty; replace the raise/lower switch assembly.*

7. Return the raise/lower switch assembly to the center (neutral) position.
8. Measure the resistance between terminals (4 and 5).

Is the resistance value 0.02 ohm or less?

YES *The switch is faulty; replace the raise/lower switch assembly.*

NO *Proceed to step 9.*

9. Move and hold the raise/lower switch assembly in the raise position and measure the resistance between terminals (4 and 5).

Is the resistance value 0.02 ohm or less?

YES *The raise/lower switch assembly is good.*

NO *The raise/lower switch assembly is faulty; replace the raise/lower switch assembly.*

Seat Switch Test

See Figures 4-54 and 4-55.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

Test the component utilizing the LCD switch status menu before performing the component bench test. (See "Switch Test" on page 4-45.)

1. Park the mower safely. (See "Park Mower Safely" on page 1-6.)
2. Tag and disconnect the seat switch wire connector.
3. Set the meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. For the deluxe seat, proceed to step 8.

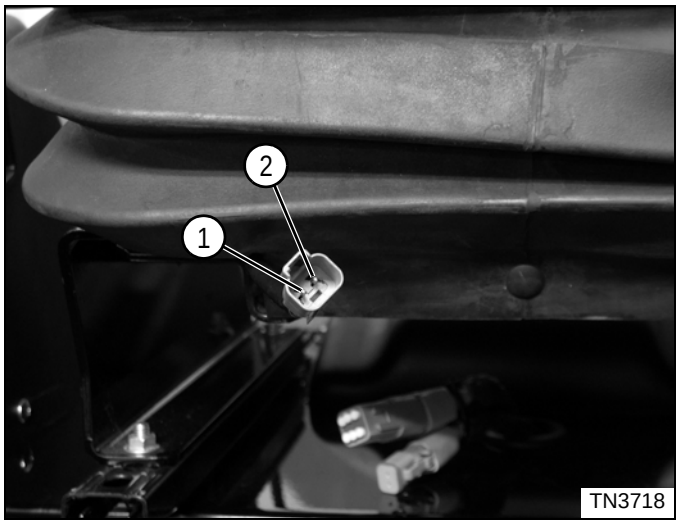


Figure 4-54

6. Measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The seat switch is faulty; replace the seat switch.*

   NO *Proceed to step 7.*

7. Depress the seat switch and measure the resistance between terminals (1 and 2).

   Is the resistance value 0.02 ohm or less?

   YES *The seat switch is good.*

   NO *The seat switch is faulty; replace the seat switch.*

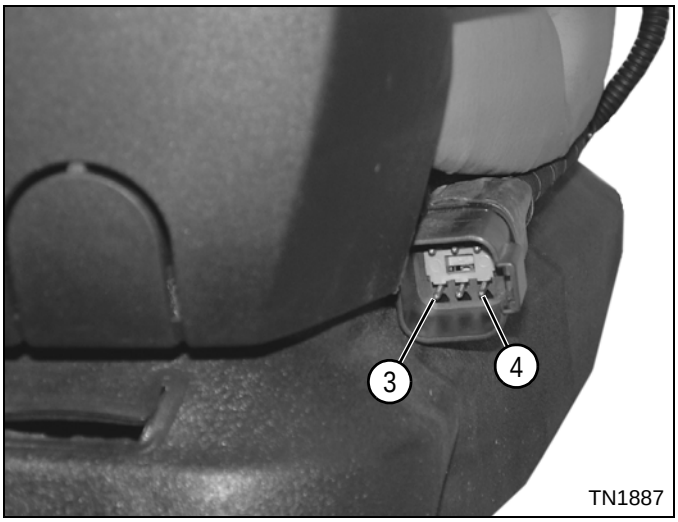


Figure 4-55

8. Measure the resistance between terminals (3 and 4).

   Is the resistance value 0.02 ohm or less?

   YES *The seat switch is faulty; replace the seat switch.*

   NO *Proceed to step 9.*

9. Depress the seat switch and measure the resistance between terminals (3 and 4).

   Is the resistance value 0.02 ohm or less?

   YES *The seat switch is good.*

   NO *The seat switch is faulty; replace the seat switch.*

Hydraulic Oil Level Switch Test

See Figures 4-56 and 4-57.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove hydraulic oil level switch. (See “Hydraulic Oil Level Switch” on page 4-89.)

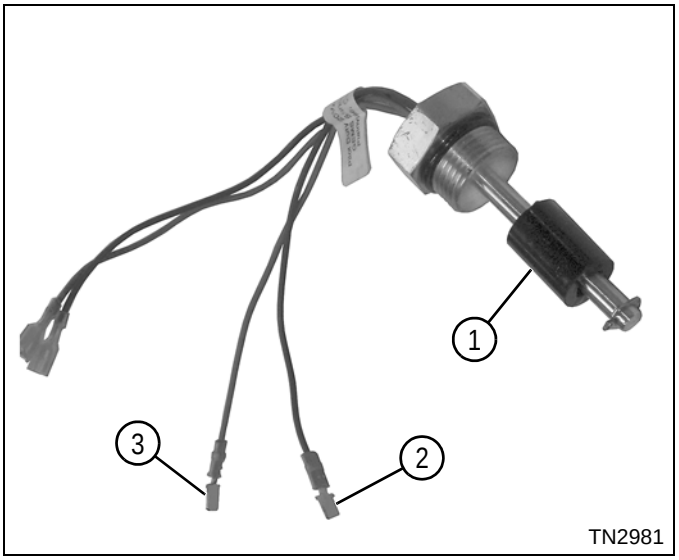


Figure 4-56

3. Set the meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. Push the float (1) to the up position.
6. Measure the resistance between the red (3) and black (2) terminals.

   Is the resistance value 0.02 ohm or less?

   YES *The hydraulic oil level switch is faulty; replace the hydraulic oil level switch.*

   NO *Proceed to step 7.*

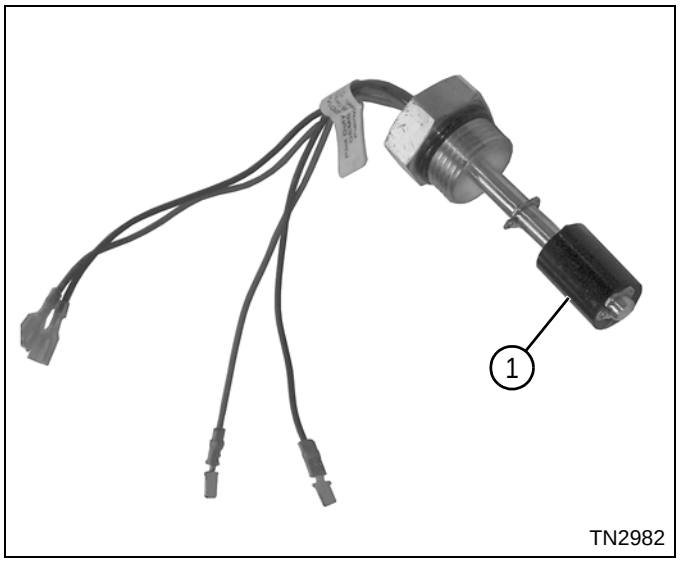


Figure 4-57

7. Push the float (1) to the down position.
8. Measure the resistance between the red (3) and black (2) terminals.

   Is the resistance value 0.02 ohm or less?

   YES *The hydraulic oil level switch is good.*

   NO *The hydraulic oil level switch is faulty; replace the hydraulic oil level switch.*

Solenoids Test

See Figure 4-58.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

NOTE

This procedure applies to the following solenoids:

- *Front Mow Solenoid*
- *Front Backlap Solenoid*
- *Rear Mow Solenoid*
- *Rear Backlap Solenoid*
- *Raise Solenoid*
- *Lower Solenoid*
- *Brake Solenoid*

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove solenoid. (See “Solenoids” on page 4-91 or “Brake Solenoid” on page 4-92.)

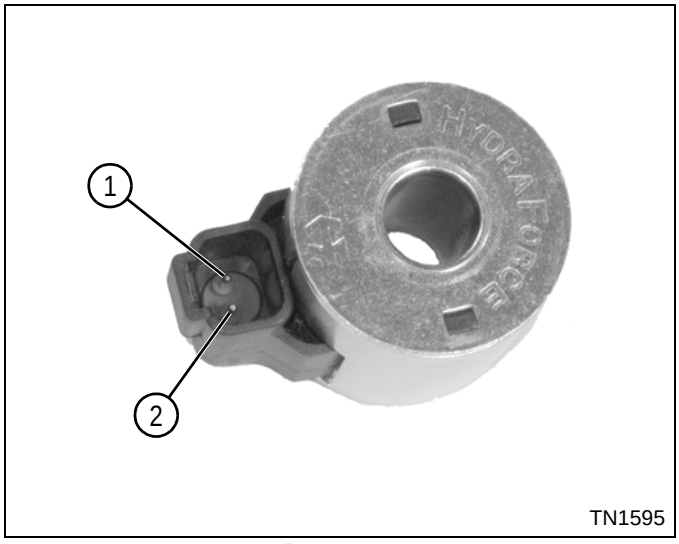


Figure 4-58

NOTE

On some meters it will be necessary to select a range for the solenoid being tested.

3. Set the meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. Measure the resistance between terminals (1 and 2). Refer to the specifications listed for the specific solenoid resistance.
   - Front Mow Solenoid Coil– 5.3 ohms ± 10% at 68° F
   - Front Backlap Solenoid Coil– 5.3 ohms ± 10% at 68° F
   - Rear Mow Solenoid Coil– 5.3 ohms ± 10% at 68° F
   - Rear Backlap Solenoid Coil– 5.3 ohms ± 10% at 68 ° F
   - Raise Solenoid Coil– 5.3 ohms ± 10% at 68° F
   - Lower Solenoid Coil– 5.3 ohms ± 10% at 68° F
   - Brake Solenoid Coil– 9 ohms ± 10% at 68° F

   Does the resistance value match the specified value listed?

   YES *The solenoid is good.*

   NO *The solenoid is faulty; replace the solenoid.*

Traction Solenoid Test

See Figure 4-59.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Tag and disconnect traction solenoid wire connector.

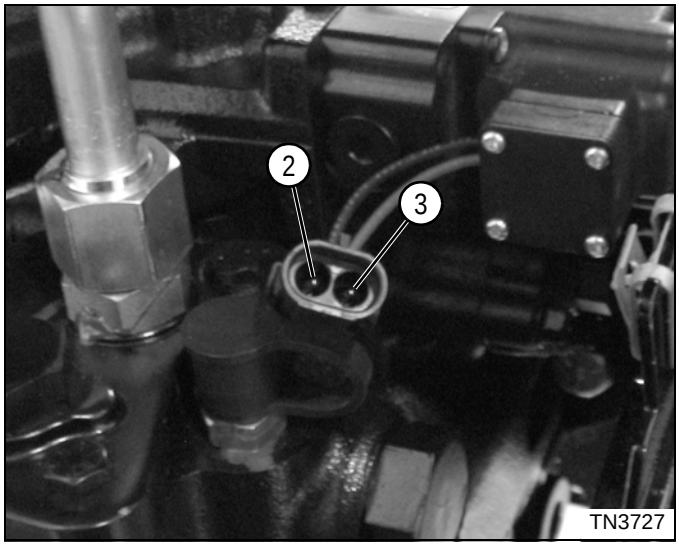


Figure 4-59

3. Set meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.

5. Measure the resistance between terminals (2 and 3).

   Is the resistance value approximately 23 ohms?

   YES *The traction solenoid is good.*

   NO *The traction solenoid is faulty; replace the traction solenoid.*

Fuel Shutoff Solenoid Test

See Figures 4-60 and 4-61.

Required Tools or Equipment
Digital Multimeter or Ohmmeter

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

Figure 4-60

2. Tag and disconnect fuel shutoff solenoid wire connector (1).

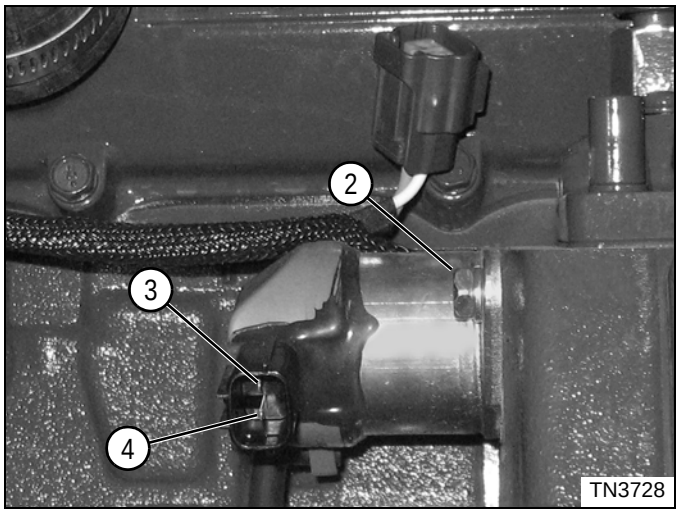


Figure 4-61

3. Set meter to read ohms.
4. Touch meter leads to each other and confirm a resistance value of 0.0 ohm.
5. Measure the resistance between terminal (3) and ground (2).

   Is the resistance value approximately 15 ohms?

   YES *Proceed to step 6.*

   NO *The fuel shutoff solenoid is faulty; replace the fuel shutoff solenoid.*

6. Measure the resistance between terminal (4) and ground (2).

   Is the resistance value approximately 0.5 ohm?

   YES *The fuel shutoff solenoid is good.*

   NO *The fuel shutoff solenoid is faulty; replace the fuel shutoff solenoid.*

Traction Pedal Adjustment

See Figure 4-62.

Required Tools or Equipment
• Digital Multimeter • Pedal Adjustment Harness (Jacobsen PN 4225240)

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Enter Maintenance Mode on the LDU and go to the calibrate pedal screen. Refer to “Parts and Maintenance Manual” for specific information and illustrations.

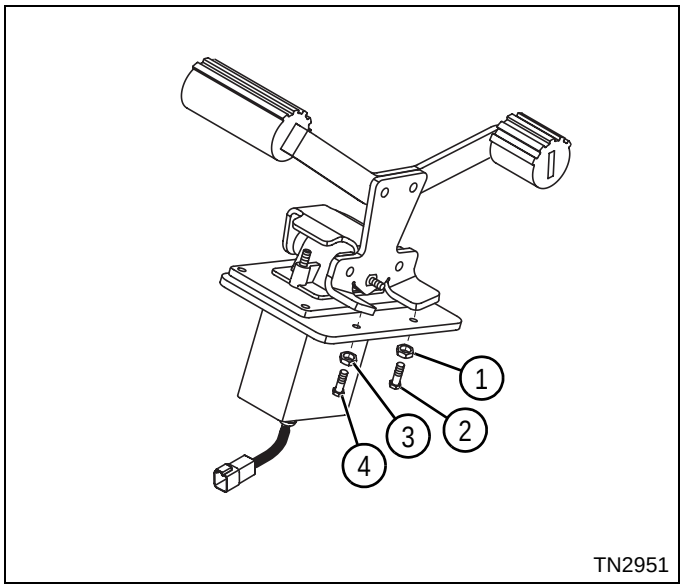


Figure 4-62

3. Press traction pedal for full forward movement.
4. Monitor the traction pedal value on the LCD.

   Is number within 200–205?

   YES *Proceed to step 8*.

   NO *Proceed to step 5*.
5. Loosen jam nut (3) and turn stop screw (4) until number is within 200–205.
6. Tighten jam nut.
7. Proceed to step 8.
8. Press traction pedal for full reverse movement.
9. Monitor the traction pedal number on the LCD.

   Is number within 200–205?

   YES *No adjustment is necessary*.

   NO *Proceed to step 10*.
10. Loosen jam nut (1) and turn stop screw (2) until number is within 200–205.
11. Tighten jam nut.

Reel Level Proximity Switch Adjustment

See Figures 4-63 through 4-66.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove left front cutting unit. (See “5-Inch Cutting Unit” on page 8-23 or “7-Inch Cutting Unit” on page 8-23.)

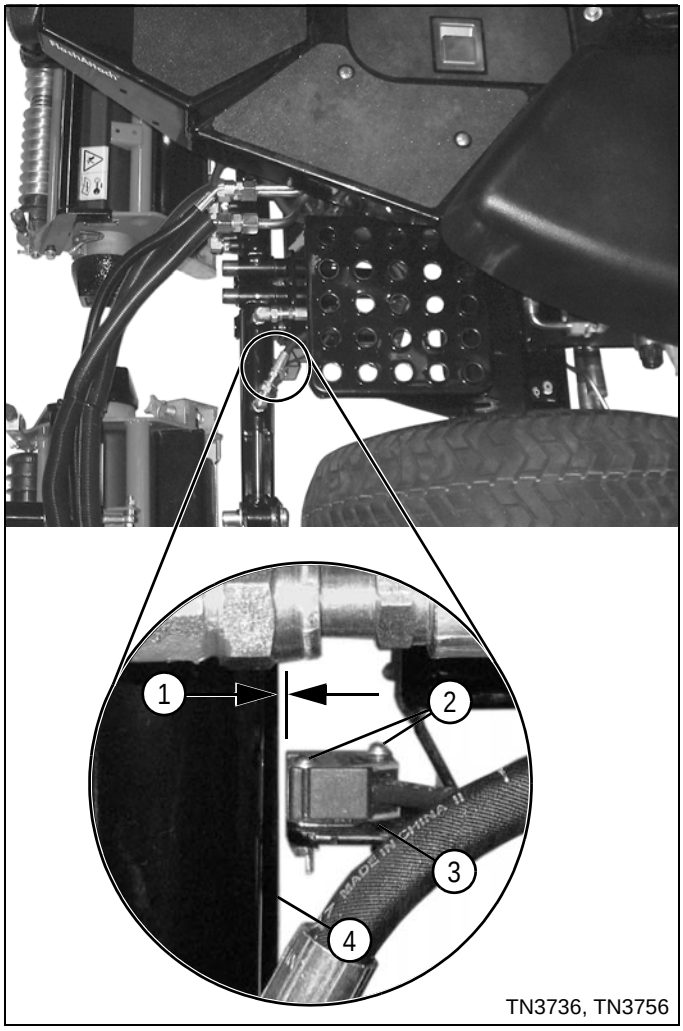


Figure 4-63

3. Loosen screws (2) and adjust reel level proximity switch (3) to obtain an air gap (1) of 0.118–0.196 in. (3–5 mm) between the reel level proximity switch (3) and the lift arm (4).

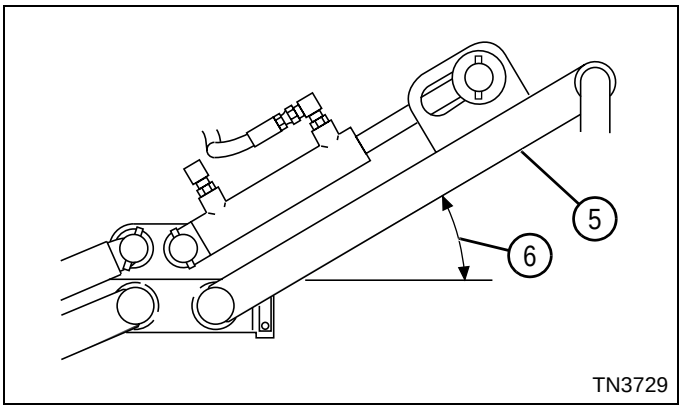


Figure 4-64

4. Raise and support lift arm (5) at a 17 ± 1º angle (6).
5. Enter Maintenance Mode on the LDU and go to the switch status screen. (See “Switch Test” on page 4-45.)

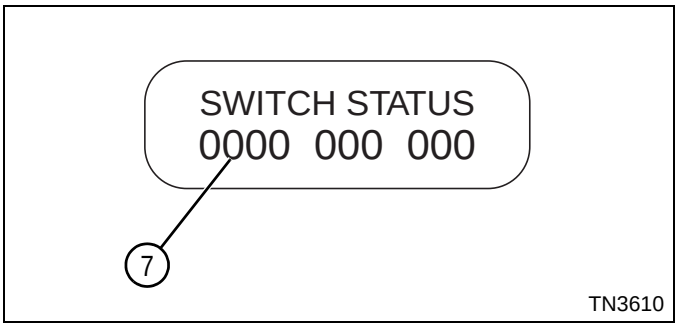


Figure 4-65

6. Monitor the reel level proximity switch status (7).

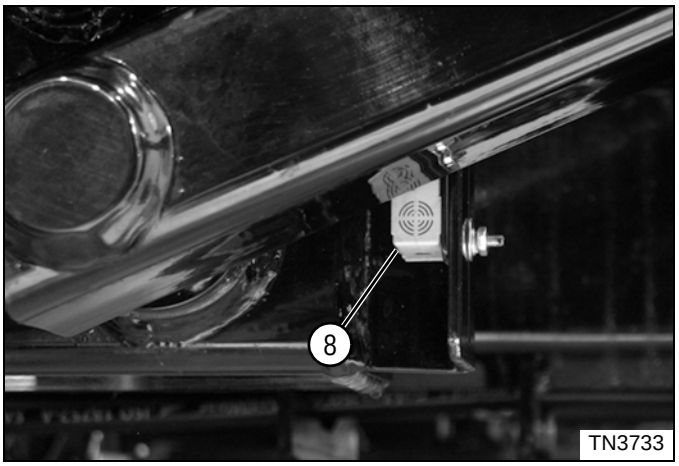


Figure 4-66

7. Adjust the reel level proximity switch (8) up or down until the reel level proximity switch status (7) indicates that the switch is on. Secure reel level proximity switch in position.
8. Lower the lift arm.
9. Reinstall the left front cutting unit. (See “5-Inch Cutting Unit” on page 8-23 or “7-Inch Cutting Unit” on page 8-23.)
10. Start the machine and verify that the cutting units turn off when lift arms are fully raised.

Repair

Front Cover

Removal and Installation

See Figure 4-67.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.

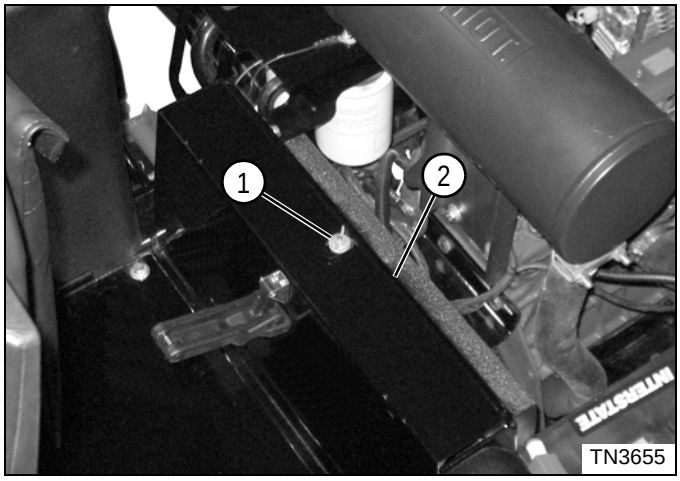


Figure 4-67

3. Move seat forward, loosen wing nut (1), and remove front cover (2).

Installation Note

Install front cover by reversing the order of removal.

MCU

Removal and Installation

See Figure 4-68.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove front cover. (See “Front Cover” on page 4-75.)

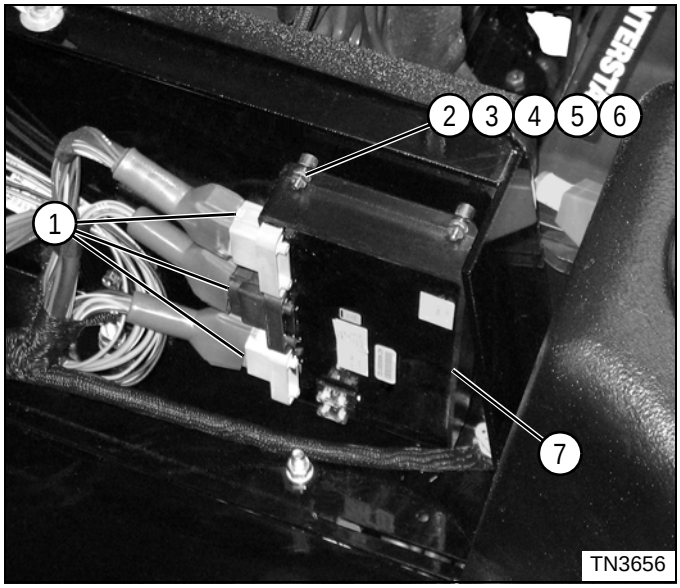


Figure 4-68

NOTE

Label all wires before disconnecting to ensure correct installation.

4. Disconnect MCU connectors (1).
5. Remove four nuts (2), lock washers (3), flat washers (4), spacers (5), and screws (6).
6. Remove MCU (7).

Installation Notes

- *Install MCU by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*

Battery and Battery Tray

Removal and Installation

See Figures 4-69 and 4-70.

WARNING

- **Battery posts, terminals, and related accessories contain lead and lead compounds. Wash your hands after handling.**
- **Always wear eye protection when servicing battery.**

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.

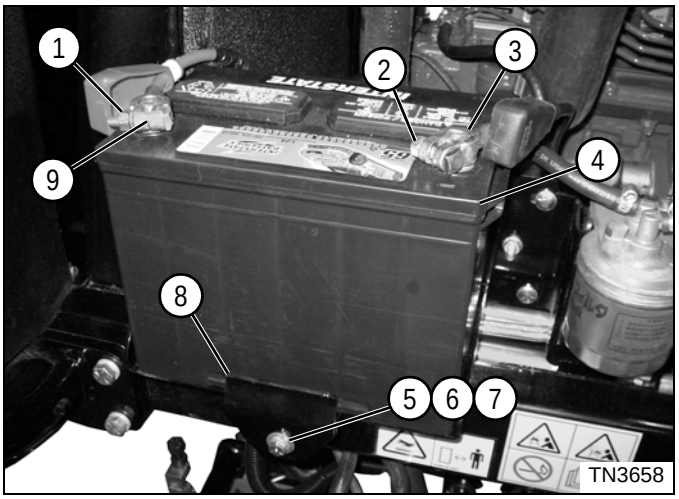


Figure 4-69

WARNING

Always disconnect the negative terminal first and positive terminal last. Connect positive terminal first and negative terminal last. Use care when testing live circuits to prevent arcing. Arcing could result in death or serious injury.

3. Remove nut (2), and disconnect the battery negative (–) cable (3).
4. Remove nut (1), and disconnect the battery positive (+) cable (9).
5. Remove screw (5), lock washer (6), flat washer (7), and retainer bracket (8) from battery tray.

NOTICE

Never place used batteries in the garbage. Dispose of used batteries in accordance with all applicable regulations.

6. Remove battery (4).

NOTE

Perform steps 7 through 11 if the battery tray is to be removed.

7. Remove front cover. (See “Front Cover” on page 4-75.)

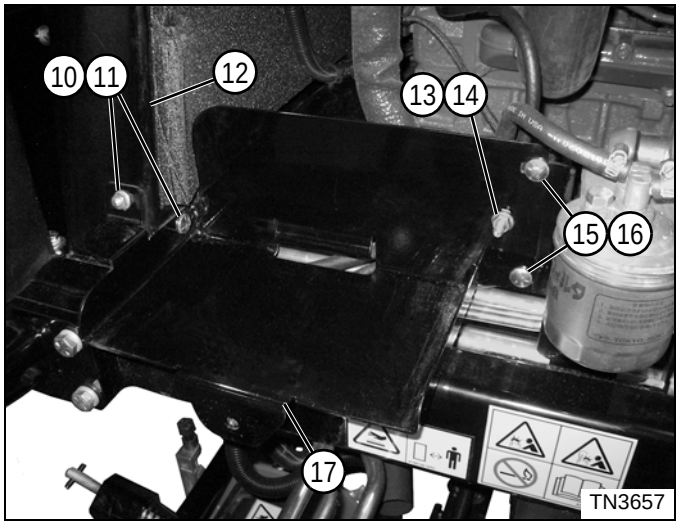


Figure 4-70

8. Remove screws (10) and nuts (11) from controller support (12) and battery tray (17).
9. Remove screws (15) and nuts (16).
10. Remove screw (13) and nut (14).
11. Remove battery tray (17).

Installation Note

Install battery and battery tray by reversing the order of removal.

Alternator

Removal and Installation

See Figure 4-71.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.
3. Disconnect the battery negative (–) cable at the battery.

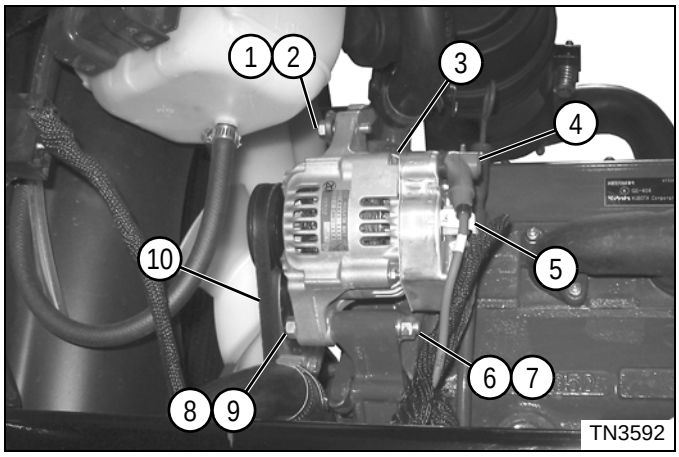


Figure 4-71

NOTE

Label all wires before disconnecting to ensure correct installation.

4. Disconnect wire connectors (4 and 5) from alternator (3).
5. Loosen screw (1) and push alternator (3) toward engine.
6. Remove fan belt (10) from alternator pulley.
7. Support alternator (3).
8. Remove screw (1) and lock washer (2).
9. Remove screw (8), lock washer (9), nut (6), and lock washer (7).
10. Remove alternator (3).

Installation Notes

- *Install alternator by reversing the order of removal.*
- *Adjust fan belt tension. (See “Fan Belt” on page 3-6.)*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*

Starter Motor

Removal and Installation

See Figure 4-72.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.
3. Disconnect the battery negative (–) cable at the battery.

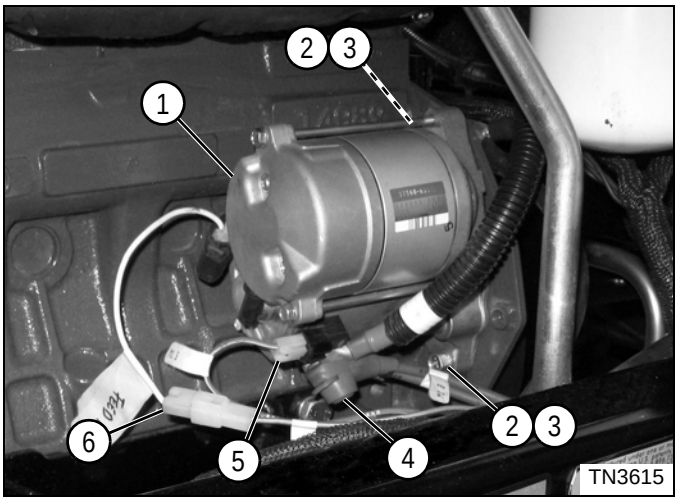


Figure 4-72

NOTE

Label all wires before disconnecting to ensure correct installation.

4. Disconnect wire connectors (4 through 6) from starter motor (1).
5. Support starter motor (1).
6. Remove screws (2) and lock washers (3).
7. Remove starter motor (1).

Installation Notes

- *Install starter motor by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*

Armrest Assembly

Removal and Installation

See Figures 4-73 and 4-74.

NOTE

Armrest and instrument panel are removed as an assembly.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.

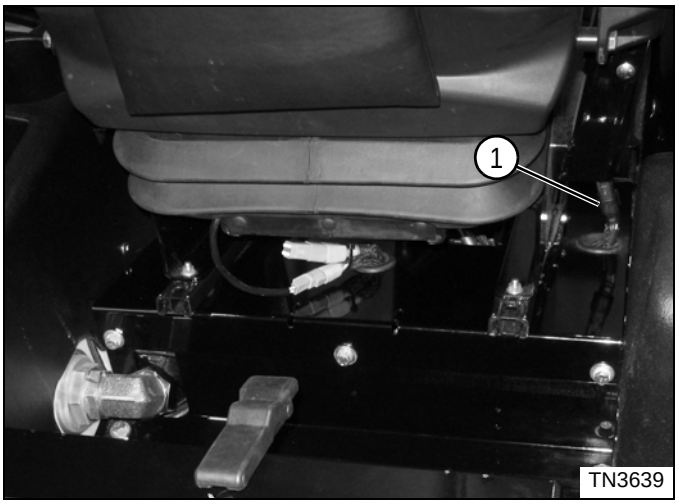


Figure 4-73

NOTES

- *Label all wires before disconnecting to ensure correct installation.*
- *If moving the armrest assembly aside, use caution to prevent stretching or pinching the wires.*

3. Disconnect wire connector (1).

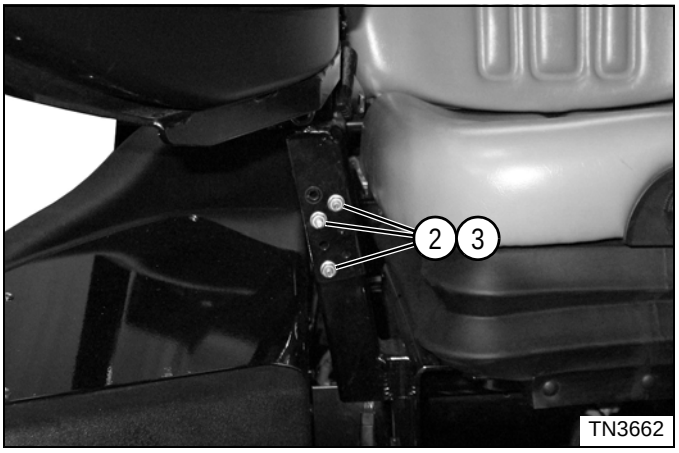


Figure 4-74

4. Support armrest. Remove screws (2) and nuts (3).

Installation Notes

- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Lubricate grease fitting.*
- *Install armrest assembly by reversing the order of removal.*

Instrument Panel

Removal and Installation

See Figures 4-75 through 4-78.

NOTE

If servicing individual components, it is not necessary to completely remove the instrument panel. In most cases, the instrument panel can be moved aside for access to components.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

NOTES

- *Label all wires before disconnecting to ensure correct installation.*
- *If moving the instrument panel aside, use caution to prevent stretching or pinching the wires.*

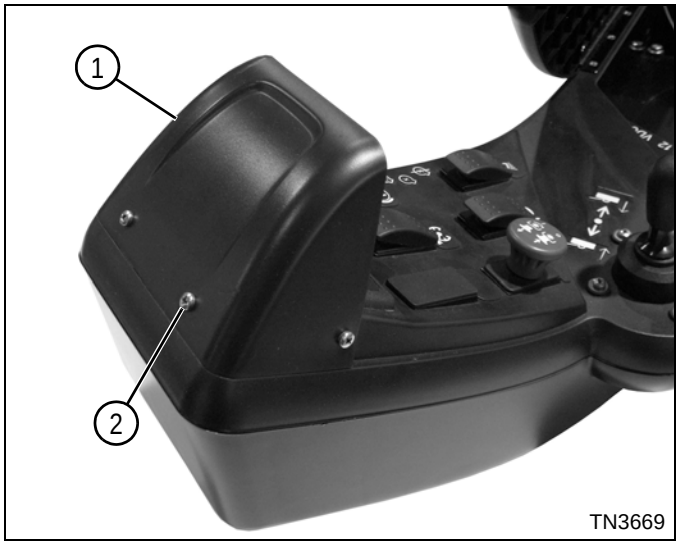


Figure 4-75

2. Remove four visor screws (2), and remove visor (1).

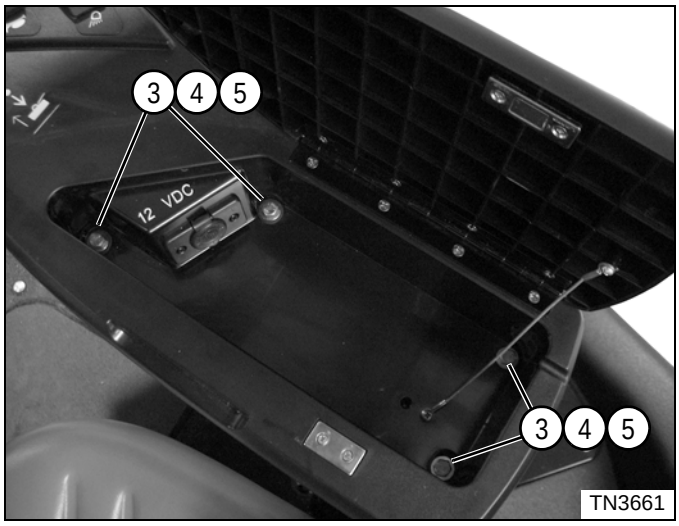


Figure 4-76

3. Open armrest door and remove screws (3), washers (4), and spacers (5).

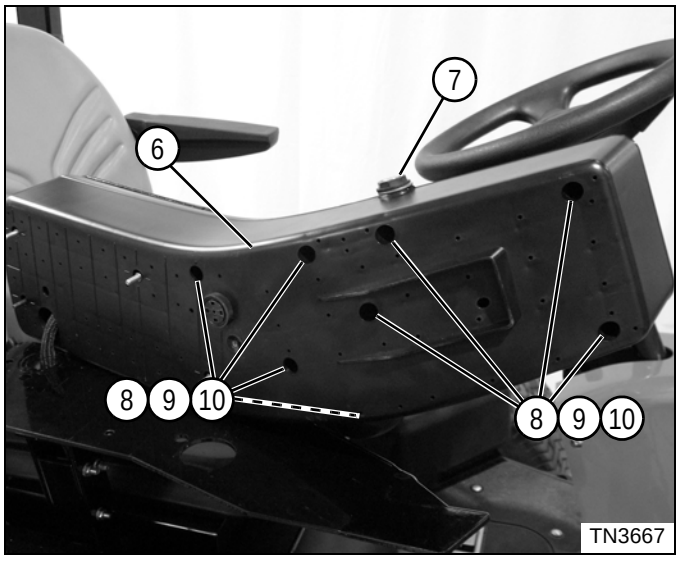


Figure 4-77

4. Remove screws (8), flanges (9), and washers (10) from the underside of instrument panel (6).
5. Loosen the key switch mounting nut (7).

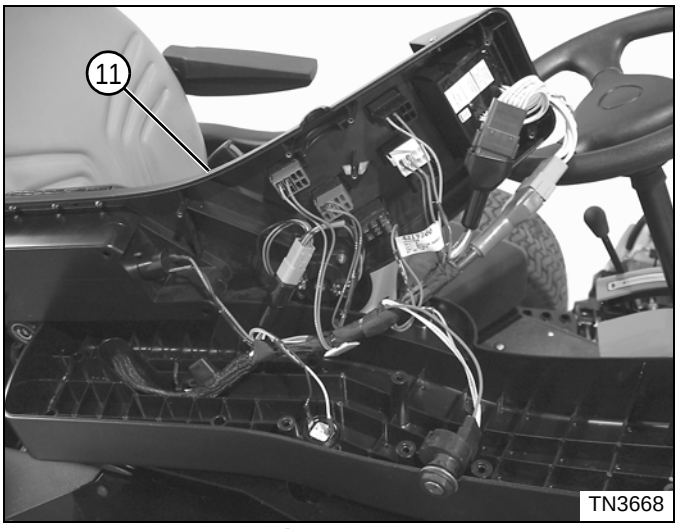


Figure 4-78

6. Lift and move the instrument panel (11) aside or service components as needed.

Installation Notes

Required Materials
Anti-Seize Compound

- *Anti-seize compound must be applied to screw threads when installing instrument panel.*
- *Apply dielectric grease to any wire connectors disconnected.*
- *Use new cable ties to secure wire connectors and wire harness.*
- *Install instrument panel by reversing the order of removal.*

LCD

Removal and Installation

See Figure 4-79.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove instrument panel. (See “Instrument Panel” on page 4-78.)

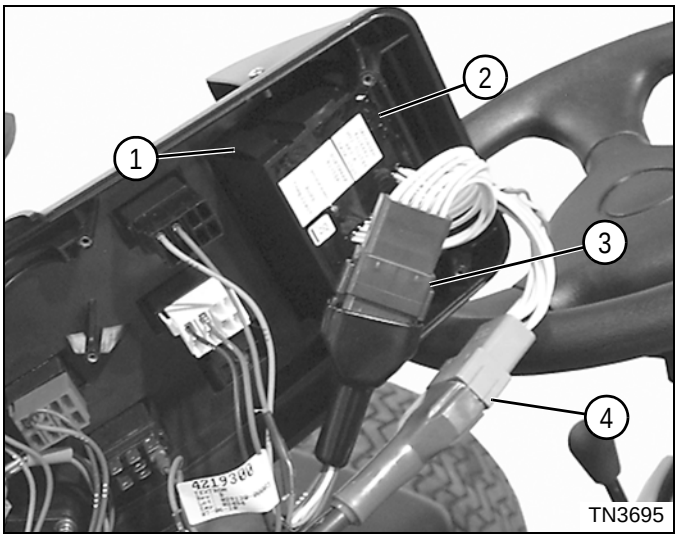


Figure 4-79

NOTE

Label all wires before disconnecting to ensure correct installation.

3. Disconnect LCD wire connectors (3 and 4).
4. Squeeze the two clips (1) securing the LCD.
5. Remove LCD (2) from the top section of the instrument panel.

Installation Notes

- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Install LCD by reversing the order of removal.*

Rocker Switches

See Figure 4-80.

Figure 4-80

NOTE

This procedure applies to the following switches:

- *Cruise Control Switch (1)*
- *Park Brake Switch (2)*
- *Work Light Switch (3)*
- *Horn Switch (4)*
- *Mow Switch (5)*

Removal and Installation

See Figure 4-81.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove instrument panel. (See “Instrument Panel” on page 4-78.)

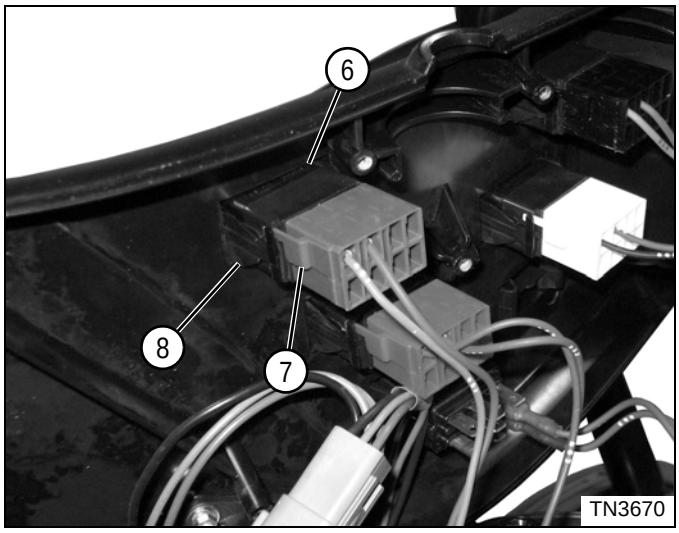


Figure 4-81

NOTES

- *Note orientation of each switch to ensure correct installation.*
- *Label all wires before disconnecting to ensure correct installation.*

4. Disconnect wire connector (7) on rocker switch (6).
5. Depress tabs (8) on each side of rocker switch and remove rocker switch from instrument panel.

Installation Notes

- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Use new cable ties to secure wire connectors and wire harness.*
- *Install rocker switches by reversing the order of removal.*

Key Switch

Removal and Installation

See Figure 4-82.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove instrument panel. (See “Instrument Panel” on page 4-78.)
3. Disconnect the battery negative (–) cable at the battery.

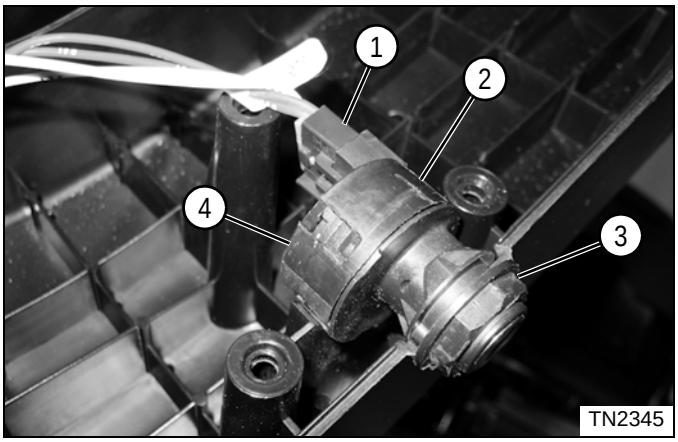


Figure 4-82

NOTES

- *Note orientation of the key switch to ensure correct installation.*
- *Label all wires before disconnecting to ensure correct installation.*

4. Remove key.
5. Disconnect wire connector (1) from key switch (2).
6. Remove retaining nut (3).
7. Remove key switch (4).

Installation Note

Install key switch by reversing the order of removal.

Raise/Lower Switch Assembly

Removal and Installation

See Figures 4-83 and 4-84.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove instrument panel. (See “Instrument Panel” on page 4-78.)

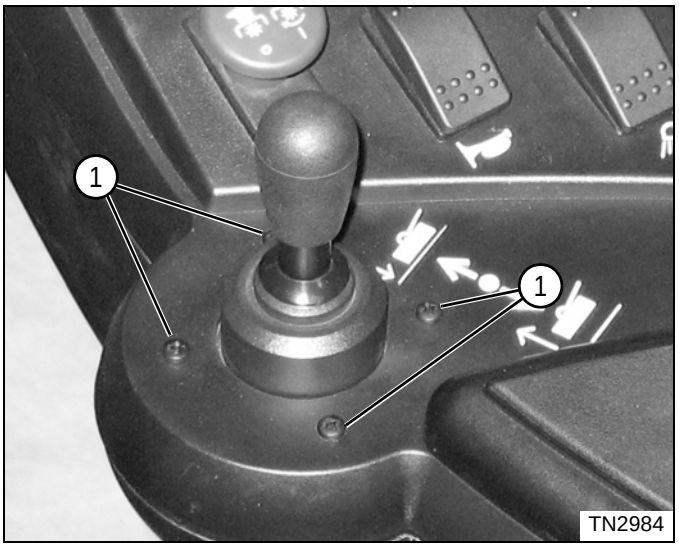


Figure 4-83

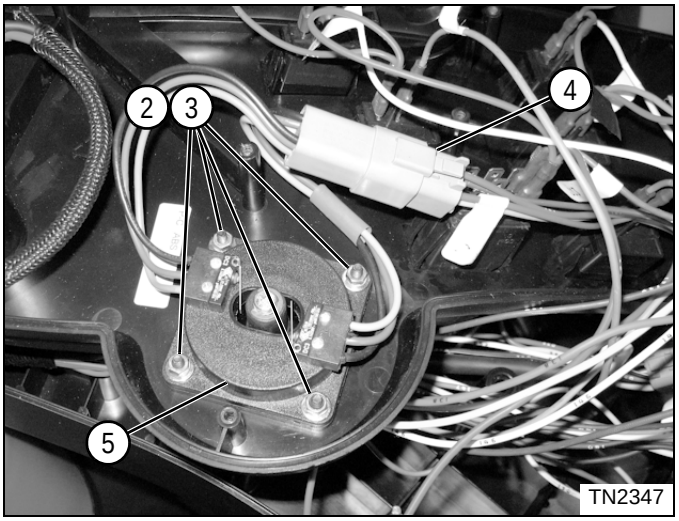


Figure 4-84

NOTES

- *Note orientation of the raise/lower switch assembly to ensure correct installation.*
- *Label all wires before disconnecting to ensure correct installation.*

4. Remove screws (1), nuts (2), and washers (3).
5. Disconnect wire connector (4).
6. Remove raise/lower switch assembly (5).

Installation Notes

- *Use new cable ties to secure wire connectors and wire harness.*
- *Install raise/lower switch assembly by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*

Reel Level Proximity Switch

Removal and Installation

See Figure 4-85.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.

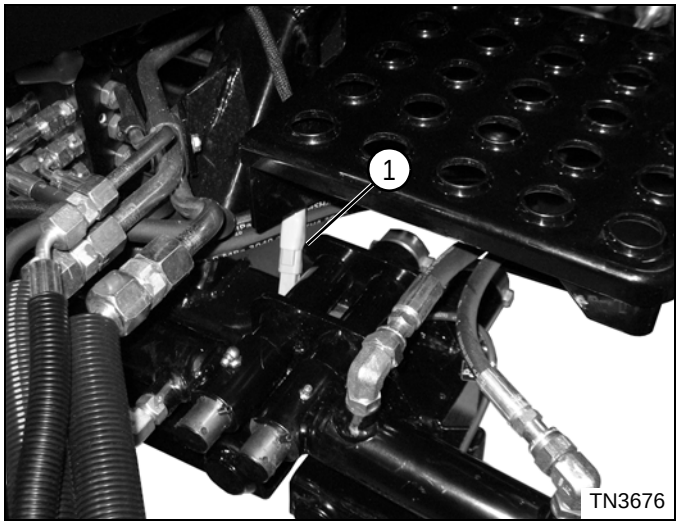


Figure 4-85

NOTE

Label all wires before disconnecting to ensure correct installation.

3. Disconnect wire connector (1).

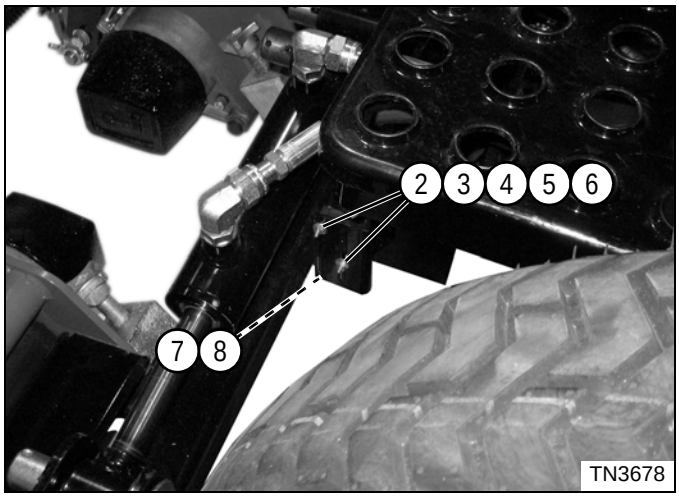


Figure 4-86

4. Remove two screws (2), two lock washers (5), two nuts (6), and four flat washers (3 and 4).
5. Remove reel level proximity switch (8) and proximity switch plate (7).

Installation Notes

- *Install reel level proximity switch by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Adjust reel level proximity switch. (See "Reel Level Proximity Switch Adjustment" on page 4-73.)*

Backlap Switch

Removal and Installation

See Figure 4-87.

1. Park the mower safely. (See "Park Mower Safely" on page 1-6.)
2. Raise the hood.
3. Disconnect the battery negative (–) cable at the battery.

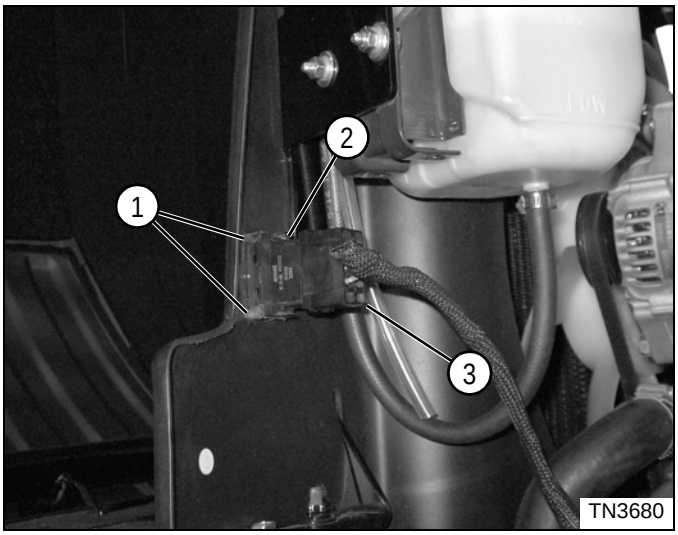


Figure 4-87

4. Disconnect wire connector (3).
5. Depress tabs (1) on each side of switch (2), and remove from shroud.

Installation Notes

- *Install backlap switch by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*

12V Accessory Socket

Removal and Installation

See Figures 4-88 and 4-89.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove instrument panel. (See “Instrument Panel” on page 4-78.)

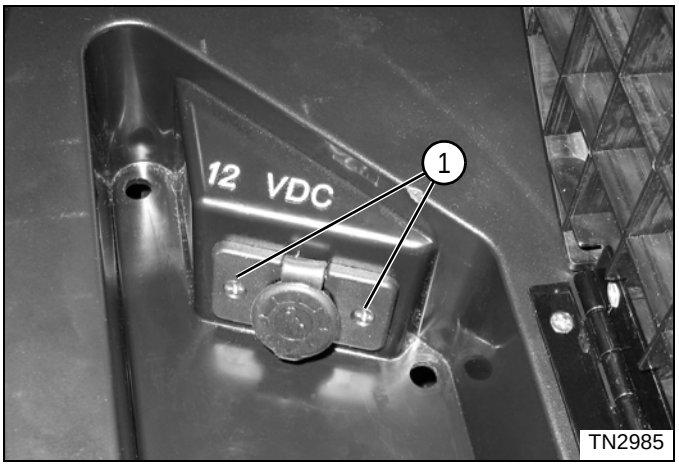


Figure 4-88

4. Remove two screws (1).

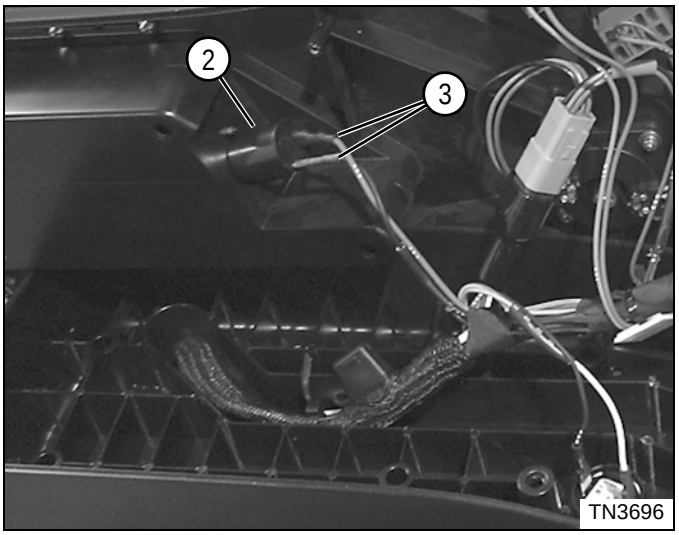


Figure 4-89

NOTES

- *Note orientation of the 12V accessory socket (2) to ensure correct installation.*
- *Label all wires before disconnecting to ensure correct installation.*

5. Disconnect wire connectors (3).
6. Remove 12V accessory socket (2).

Installation Notes

- *Use new cable ties to secure wire connectors and wire harness.*
- *Install the 12V accessory socket by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*

12V Accessory Socket Fuse

Removal and Installation

See Figure 4-90.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove instrument panel. (See “Instrument Panel” on page 4-78.)

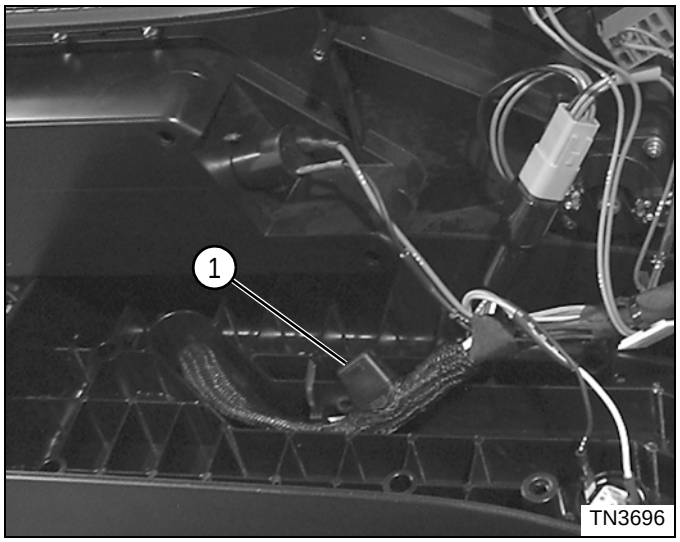


Figure 4-90

4. Remove cap (1). Remove fuse.

Installation Note

Install the 12V accessory socket fuse by reversing the order of removal.

MCU Fuses

Removal and Installation

See Figure 4-91.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove front cover. (See “Front Cover” on page 4-75.)

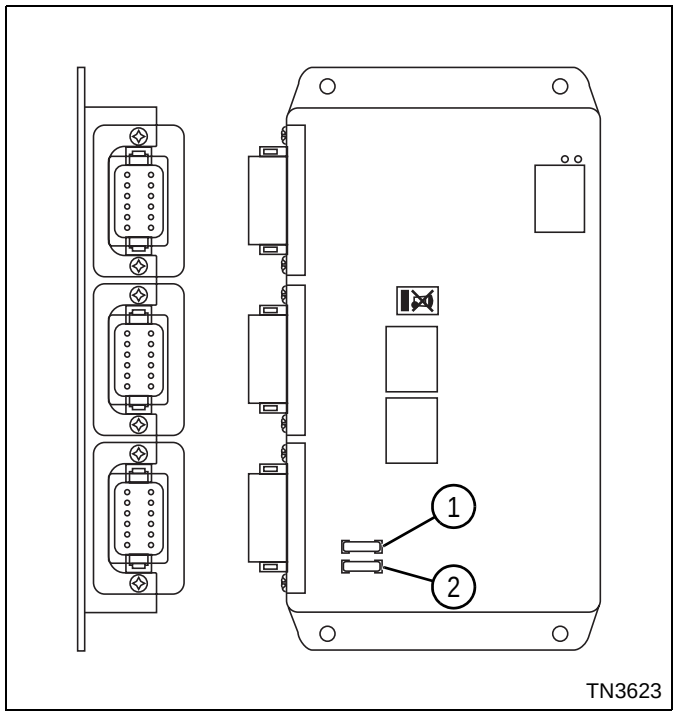


Figure 4-91

4. Remove 20A fuses (1 and 2).

Installation Note

Install MCU fuses by reversing the order of removal.

50A Circuit Breaker

Removal and Installation

See Figures 4-92 and 4-93.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove front cover. (See “Front Cover” on page 4-75.)

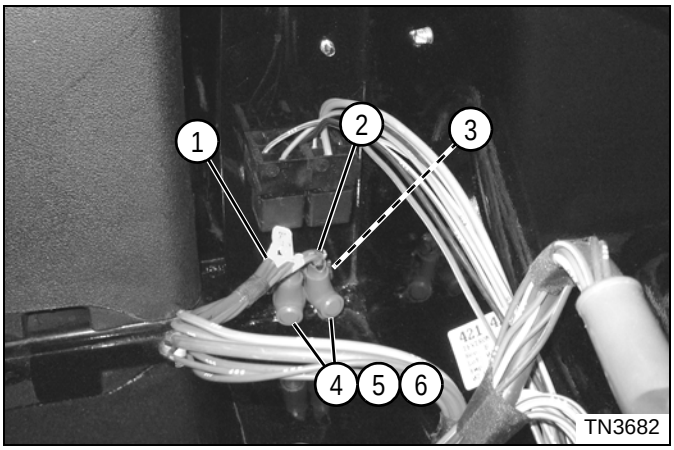


Figure 4-92

NOTE

Label all wires before disconnecting to ensure correct installation.

4. Remove boots (4), nuts (5), and lock washers (6).
5. Disconnect wire connectors (1 and 2).

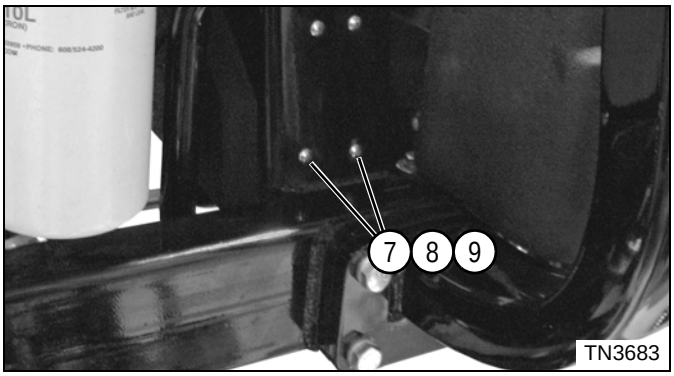


Figure 4-93

6. Remove screws (7), nuts (8), and washers (9) and 50A circuit breaker (3).

Installation Note

Install 50A circuit breaker by reversing the order of removal.

Start Relay

Removal and Installation

See Figure 4-94.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove front cover. (See “Front Cover” on page 4-75.)

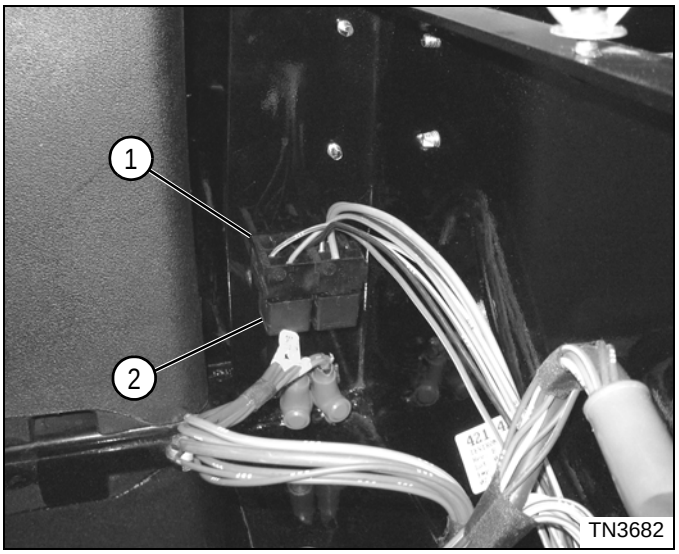


Figure 4-94

4. Pull the relay (2) straight down and out of the relay base (1).

Installation Note

Install start relay by reversing the order of removal.

Glow Plug Relay

Removal and Installation

See Figure 4-95.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove front cover. (See “Front Cover” on page 4-75.)

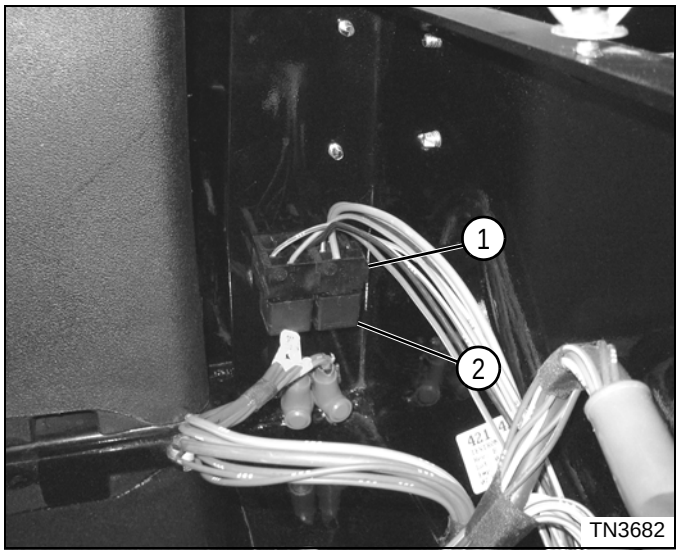


Figure 4-95

4. Pull the relay (2) straight down and out of the relay base (1).

Installation Note

Install glow plug relay by reversing the order of removal.

Traction Pedal Position Sensor

Removal and Installation

See Figures 4-96 and 4-97.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Remove traction pedal. (See “Traction Pedal” on page 9-6.)
3. Disconnect the battery negative (–) cable at the battery.

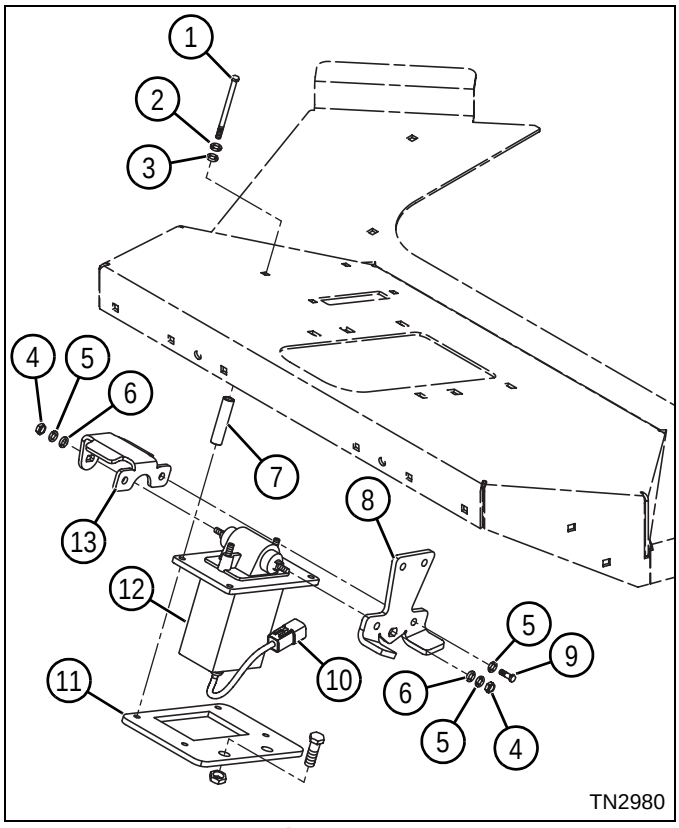


Figure 4-96

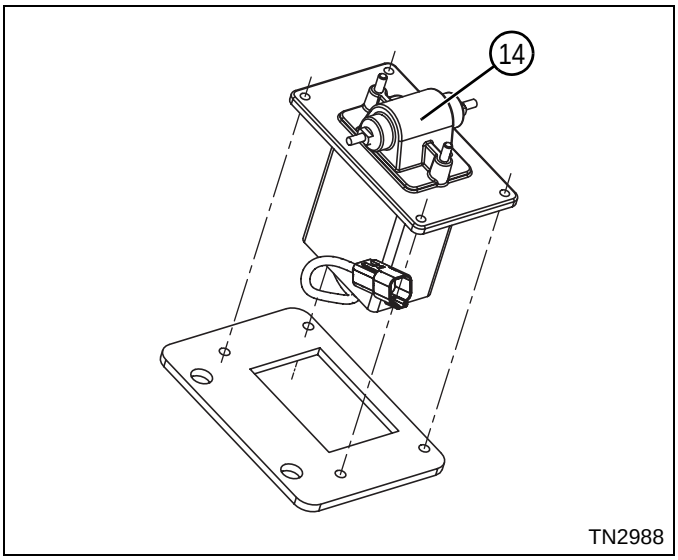


Figure 4-97

4. Tag and disconnect wire connector (10).

NOTE

Note location of cable tie securing traction pedal position sensor wire harness.

5. Cut cable tie securing traction pedal position sensor wire harness.
6. Support traction pedal position sensor (12).
7. Remove four screws (1), lock washers (2), flat washers (3), spacers (7), traction pedal support plate (11), and traction pedal position sensor (12).
8. Remove two screws (9), four nuts (5), two nuts (4), two flat washers (6), arm mount (13), and pedal pivot plate (8).

Installation Notes

IMPORTANT

Install traction pedal position sensor so that dimple (14) points toward the rear of the machine.

- *Install traction pedal position sensor by reversing the order of removal.*
- *Use new cable tie to secure traction pedal position sensor wire harness.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Adjust traction pedal. (See “Traction Pedal Adjustment” on page 4-73.)*

Engine Oil Pressure Switch

Removal and Installation

See Figure 4-98.

CAUTION

Engine components will become hot during operation. Allow engine components to cool before performing service.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.

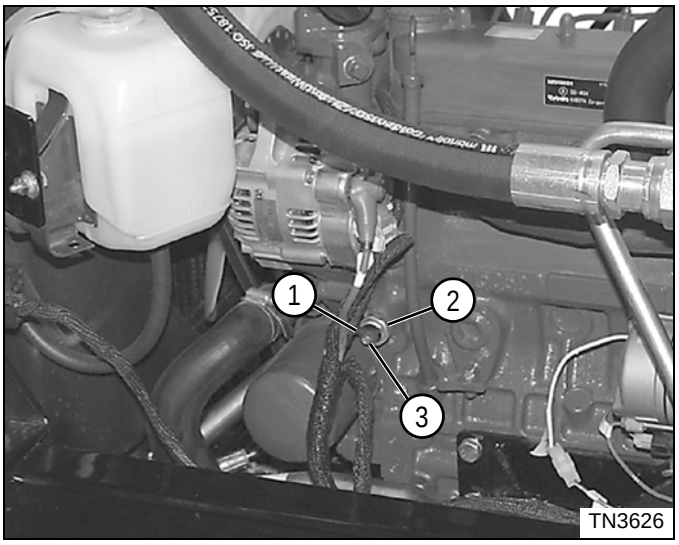


Figure 4-98

NOTE

Label all wires before disconnecting to ensure correct installation.

3. Remove screw (3) and disconnect wire (1) from the engine oil pressure switch (2).
4. Remove engine oil pressure switch.

Installation Notes

Required Materials
Telfon® Tape

- *Apply Teflon® tape to the threads of the engine oil pressure switch prior to installation.*
- *Install engine oil pressure switch by reversing the order of removal.*

Engine Temperature Sensor

Removal and Installation

See Figure 4-99.

WARNING

Engine coolant is hot and under pressure! Allow the cooling system to cool completely before performing service.

Rotate the filler cap 1/2 turn counterclockwise and allow pressure to vent before removing filler cap.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.
3. Disconnect the battery negative (–) cable at the battery.

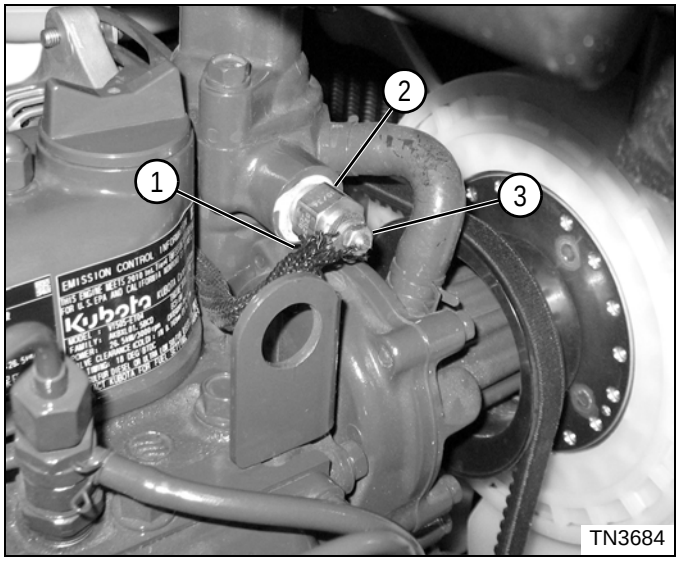


Figure 4-99

NOTE

Label all wires before disconnecting to ensure correct installation.

4. Remove nut (3) and disconnect wire (1) from the engine temperature sensor (2).
5. Remove engine temperature sensor.

Installation Notes

Required Materials
Telfon® Tape

- *Apply Teflon® tape to the threads of the engine temperature sensor prior to installation.*
- *Install engine temperature sensor by reversing the order of removal.*

Hydraulic Oil Level Switch

Removal and Installation

See Figures 4-100 and 4-101.

WARNING

The hydraulic system is under pressure, and the oil may be hot!

- **Always allow the machine to cool completely before performing service.**
- **Always relieve pressure in the hydraulic system before performing service.**
- **Always use appropriate safety equipment and clothing to protect exposed skin and eyes from high-pressure oil.**
- **Tighten all connections to proper specifications before applying pressure.**
- **Never use bare hands to check for leaks! Oil under pressure can penetrate the skin and can cause gangrene within a few hours if not properly removed. Use a piece of cardboard to check for leaks.**

Failure to follow appropriate safety precautions may result in death or serious injury.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)

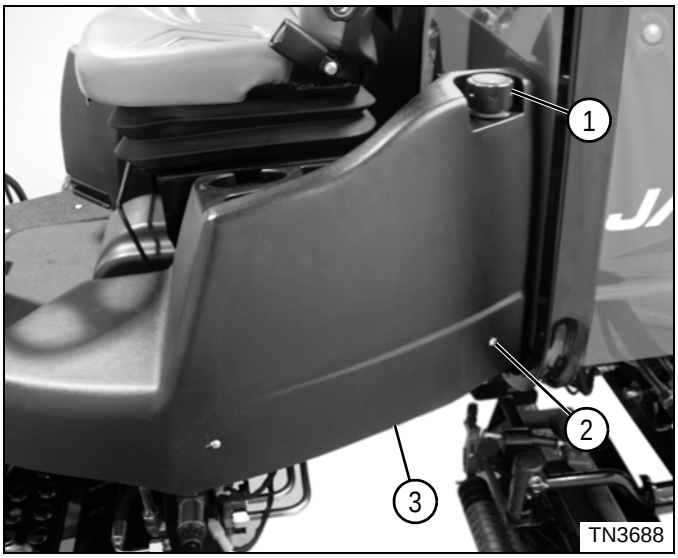


Figure 4-100

2. Remove hydraulic tank filler cap (1).
3. Remove five screws (2).
4. Remove hydraulic tank cover (3).

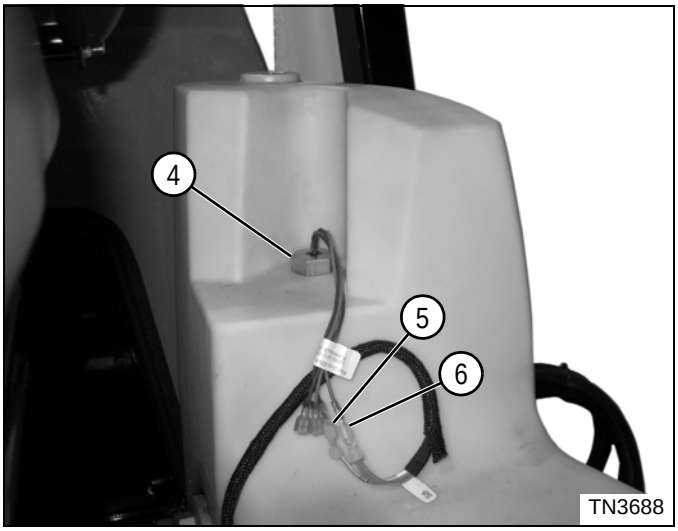


Figure 4-101

5. Disconnect wire connectors (5 and 6).
6. Remove hydraulic oil level switch (4).

Installation Notes

Required Materials
• Telfon® Tape • Anti-Seize Compound

- *Apply Teflon® tape to the threads of the hydraulic oil level switch prior to installation. Do not overtighten hydraulic oil level switch or tank may crack and leak.*
- *Apply anti-seize compound to screws (2) prior to installation. Do not overtighten these screws or tank may crack and leak.*
- *Install hydraulic oil level switch by reversing the order of removal.*

Hydraulic Filter Pressure Switch

Removal and Installation

See Figure 4-102.

WARNING

The hydraulic system is under pressure, and the oil may be hot!

- **Always allow the machine to cool completely before performing service.**
- **Always relieve pressure in the hydraulic system before performing service.**
- **Always use appropriate safety equipment and clothing to protect exposed skin and eyes from high-pressure oil.**
- **Tighten all connections to proper specifications before applying pressure.**
- **Never use bare hands to check for leaks! Oil under pressure can penetrate the skin and can cause gangrene within a few hours if not properly removed. Use a piece of cardboard to check for leaks.**

Failure to follow appropriate safety precautions may result in death or serious injury.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.

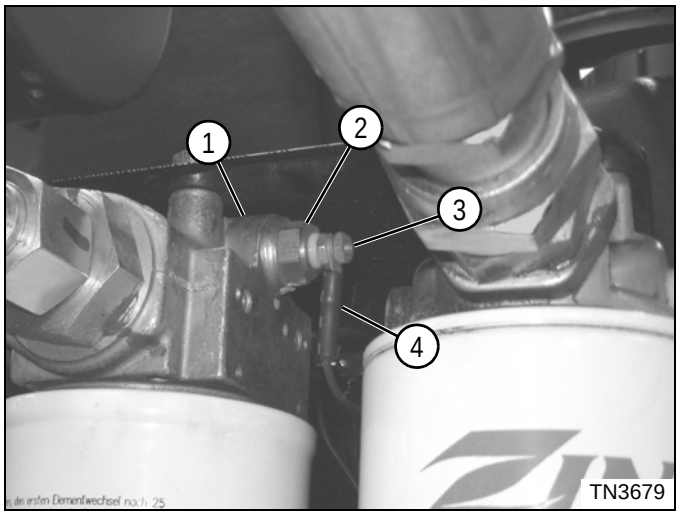


Figure 4-102

3. Remove nut (3), and disconnect wire (4) from hydraulic filter pressure switch (2).
4. Remove hydraulic filter pressure switch (2) from filter head (1).

Installation Notes

Required Materials
Telfon® Tape

- *Apply Teflon® tape to the threads of the hydraulic filter switch prior to installation.*
- *Install hydraulic filter pressure switch by reversing the order of removal.*

Solenoids

See Figures 4-103 through 4-106.

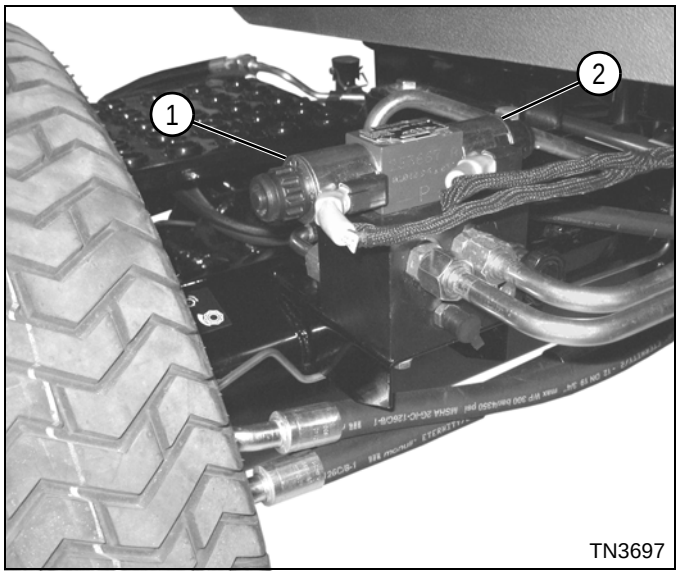


Figure 4-103: Front Mow and Front Backlap Solenoids

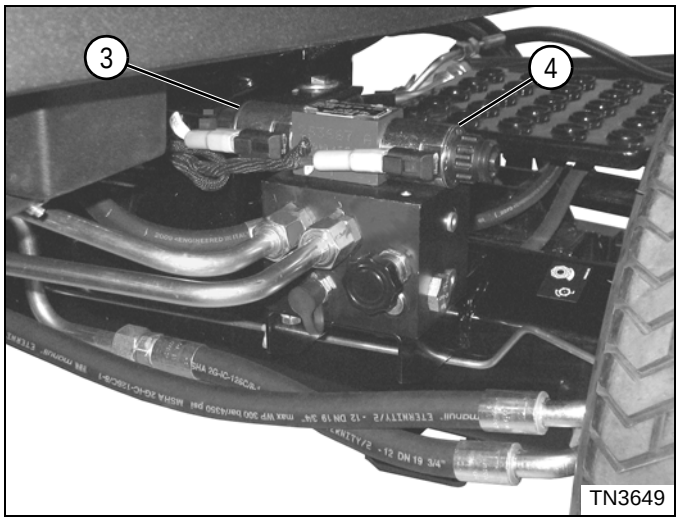


Figure 4-104: Rear Mow and Rear Backlap Solenoids

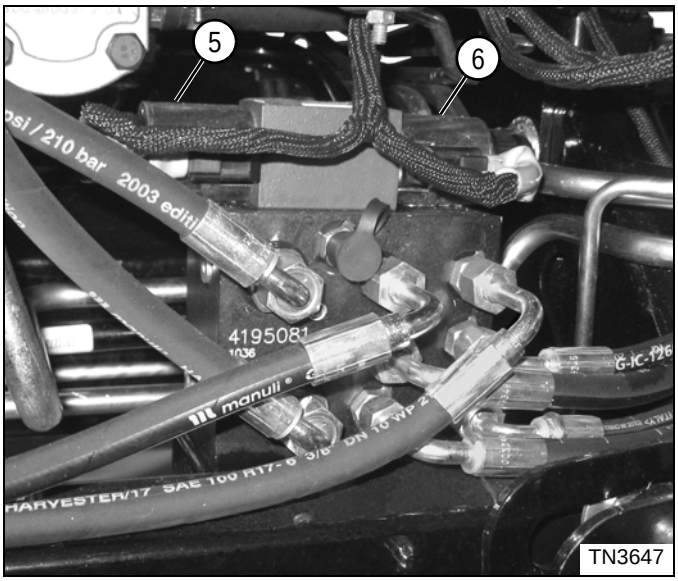


Figure 4-105: Raise and Lower Solenoids

NOTE

This procedure applies to the following solenoids:

- *Front Backlap Solenoid (1)*
- *Front Mow Solenoid (2)*
- *Rear Backlap Solenoid (3)*
- *Rear Mow Solenoid (4)*
- *Raise Solenoid (5)*
- *Lower Solenoid (6)*

The front mow solenoid and front backlap solenoid are located on the front reel valve.

The rear mow solenoid and rear backlap solenoid are located on the rear reel valve.

The raise solenoid and lower solenoid are located on the lift valve.

Removal and Installation

See Figure 4-106.

NOTE

The front mow solenoid is shown; all solenoids are removed and installed the same way.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Locate the correct solenoid.

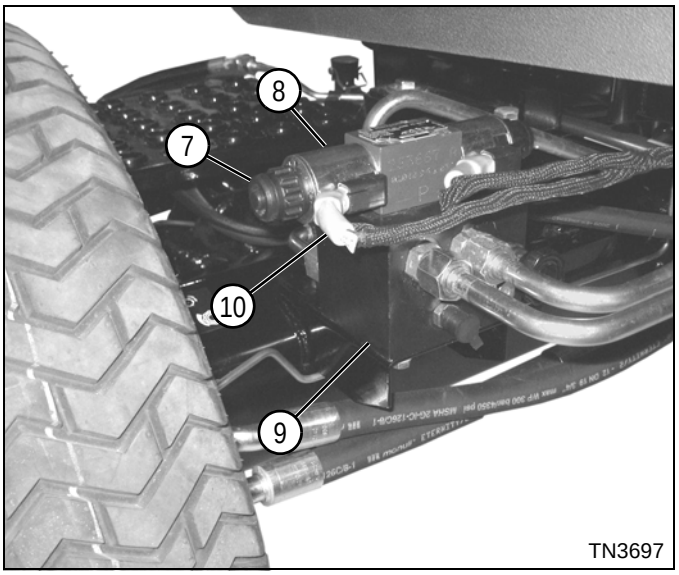


Figure 4-106

NOTE

Label wire connectors before disconnecting to ensure correct installation.

4. Disconnect wire connector (10) from solenoid (8).
5. Remove nut (7) and solenoid (8) from the valve (9).

Installation Notes

- *Clean solenoid of any debris or surface rust and apply dielectric grease (Jacobsen PN 365422) to solenoid before installation.*
- *Install solenoid by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Tighten nut (7) to 10 lb-ft (13.6 N·m).*

Brake Solenoid

Removal and Installation

See Figure 4-107.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.

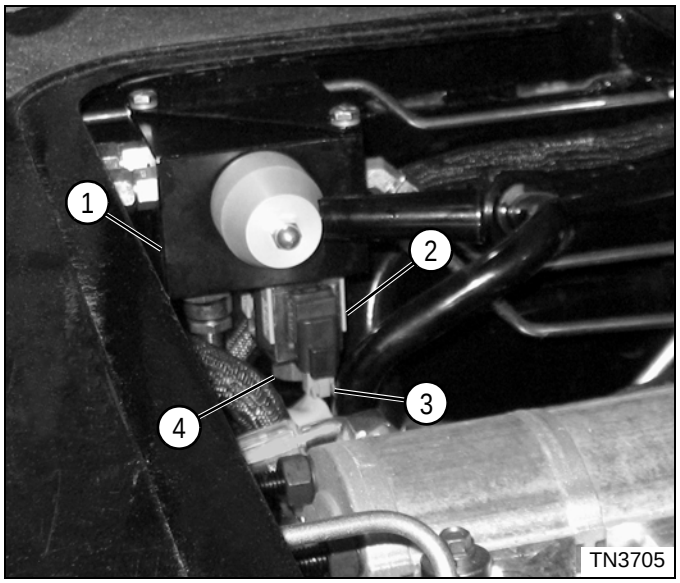


Figure 4-107

NOTE

Label wire connectors before disconnecting to ensure correct installation.

3. Disconnect wire connector (3) from solenoid (2).
4. Remove nut (4) and solenoid (2) from the valve (1).

Installation Notes

- *Clean solenoid of any debris or surface rust and apply dielectric grease (Jacobsen PN 365422) to solenoid before installation.*
- *Install brake solenoid by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*
- *Tighten nut (4) to 33–53 lb-in. (4–6 N·m).*

Fuel Shutoff Solenoid

Removal and Installation

See Figure 4-108.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Raise the hood.
3. Disconnect the battery negative (–) cable at the battery.

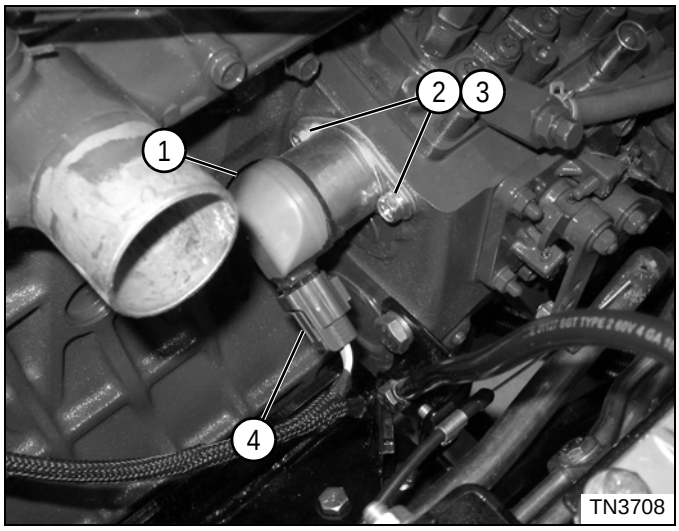


Figure 4-108

NOTES

- *Air intake hose removed for picture clarity.*
- *Label all wires before disconnecting to ensure correct installation.*

4. Disconnect wire connector (4).
5. Remove screws (2) and lock washers (3).
6. Remove fuel shutoff solenoid (1).

Installation Note

Install fuel shutoff solenoid by reversing the order of removal.

Horn

Removal and Installation

See Figures 4-109 and 4-110.

1. Park the mower safely. (See “Park Mower Safely” on page 1-6.)
2. Disconnect the battery negative (–) cable at the battery.
3. Remove instrument panel. (See “Instrument Panel” on page 4-78.)

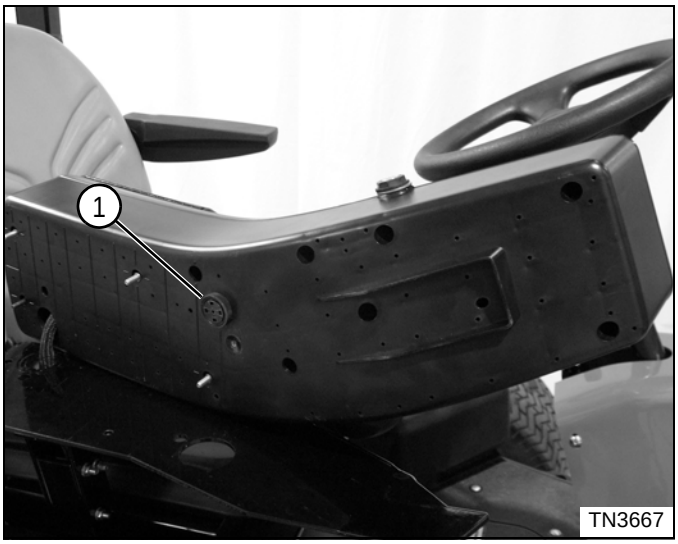


Figure 4-109

4. Remove retaining ring (1).

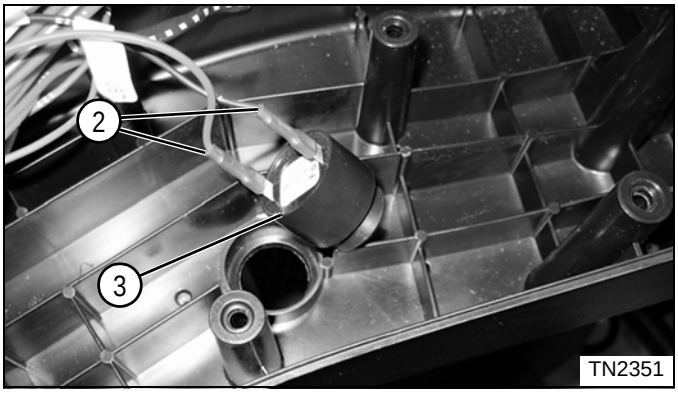


Figure 4-110

NOTE

Label all wires before disconnecting to ensure correct installation.

5. Disconnect wire connectors (2).
6. Remove horn (3).

Installation Notes

- *Install horn by reversing the order of removal.*
- *Apply dielectric grease (Jacobsen PN 365422) to any wire connectors disconnected.*