



LS400 (Deutz Engine)

Cold Start Relay Kit

The following instructions are intended to assist the user in the installation of the Cold Start Relay Kit used on the LS400 Concrete Pump. Please read all instructions before installing the cold start relay kit.

REQUIRED TOOLS/COMPONENTS

- Electric Drill
- 7/16, 1/4, 1/2 and 3/4 Drill Bits
- Phillip Head Screw Driver
- Ratchet Set
- Current Probe

PARTS

Verify that all parts are accounted for. Reference Table 1.

Table 1. Required Parts				
Item No.	Part No.	Description	QTY.	Remarks
1	N/A	Cold Start Relay Box	1	Includes items 2-6
2	N/A	1/4-20X1" Bolt	2	
3	N/A	1/4-20" Hex Nut	2	
4	N/A	1/4" Lock Washer	2	
5	N/A	1/4" Flat Washer	4	
6	N/A	Fuse	2	
7	N/A	Terminal Block	1	Includes items 8-11
8	N/A	#10-32X5/8 Screw	2	
9	N/A	#10/32 Hex Nut	2	
10	N/A	#10 Lock Washer	2	
11	N/A	#10 Flat Washer	2	
12	01179016	Heating Element	2	Includes items 13-15
13	N/A	M5 Lock Washer	2	
14	N/A	M5 Flat Washer	4	
15	N/A	M5 Hex Nut	4	
16	N/A	Lamp	1	
17	N/A	Grommet	1	
P1	N/A	Plug	1	
W1	N/A	Wire, 10 AWG. RED	1	TB1/IGN.
W3	N/A	Wire, 10 AWG. ORANGE	1	TB1/Splice
W5	N/A	Wire, 10 AWG. RED	1	Splice/Lamp
W6	N/A	Wire, 10 AWG. RED	1	IGN./Splice
W8	N/A	Wire, 12 AWG BLUE	1	Glow Plug/TB1

WORK SAFELY!

Only a **qualified service technician** with proper training should perform this installation. Follow all shop safety rules when performing this installation.

ENGINE HOOD REMOVAL

1. Place the pump in an area free of dirt and debris.
2. Disconnect negative battery cable from the battery.
3. Remove the rain cap (A) from the muffler pipe as shown in Figure 1.
4. Using a 1/2-inch socket, remove the 2 bolts (B) that secure the exhaust pipe to the engine cover.
5. Using a 7/16-inch socket, remove the bolts (C) that secure the engine hood to the pump.

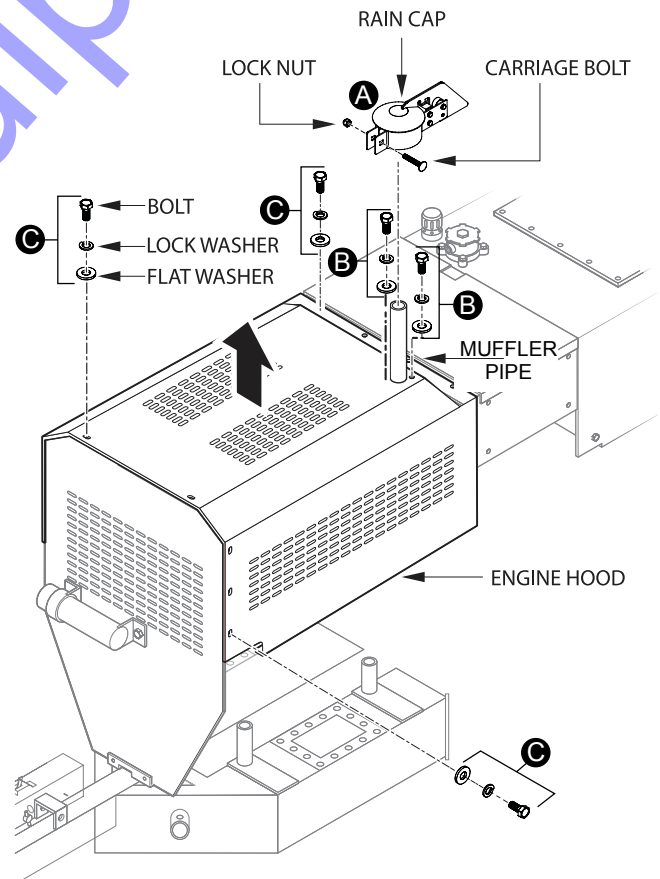


Figure 1. Hood Removal

- Lift engine hood from the pump and place in a safe location where it will not get damaged.
- Place all engine hood mounting hardware in a bag where it will not get lost. This mounting hardware will be needed during reassembly.

COLD START RELAY CONTROL BOX MOUNTING

- Grasp and turn the spring loaded butterfly latch located on the access door and open the door. This will provide easy access to where the cold start relay control box will be mounted.
- Using a 1/4-inch drill bit, drill 2 holes as shown in Figure 2 for the mounting of the Cold Start Relay Control Box.

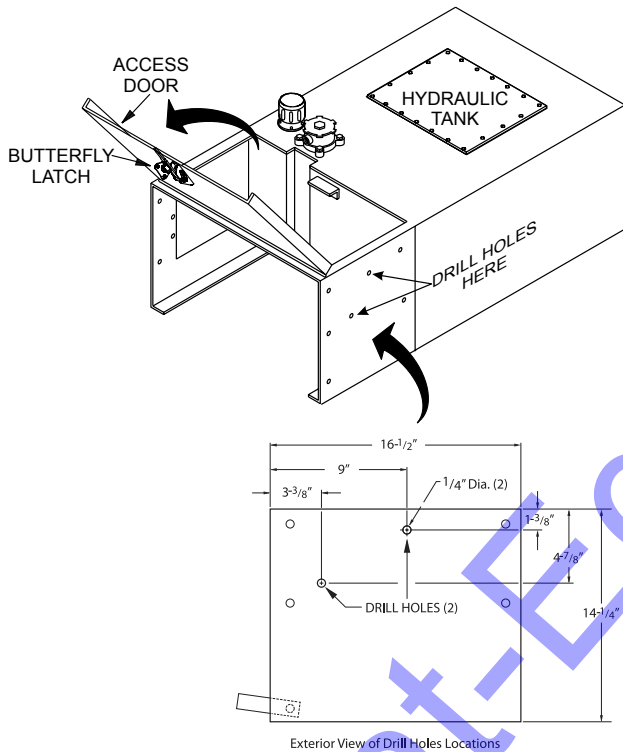


Figure 2. Cold Start Relay Control Box Mounting Holes

- Using a phillip-head screw driver remove the screws (4) that secure the cover (Figure 3) to the Cold Start Relay Control Box
- Mount the Cold Start Relay Control Box using a 1/4-20 X 1 bolt (2), 1/4-inch lock washer (2), 1/4-inch flat washer (4) and 1/4-20 nut (2).

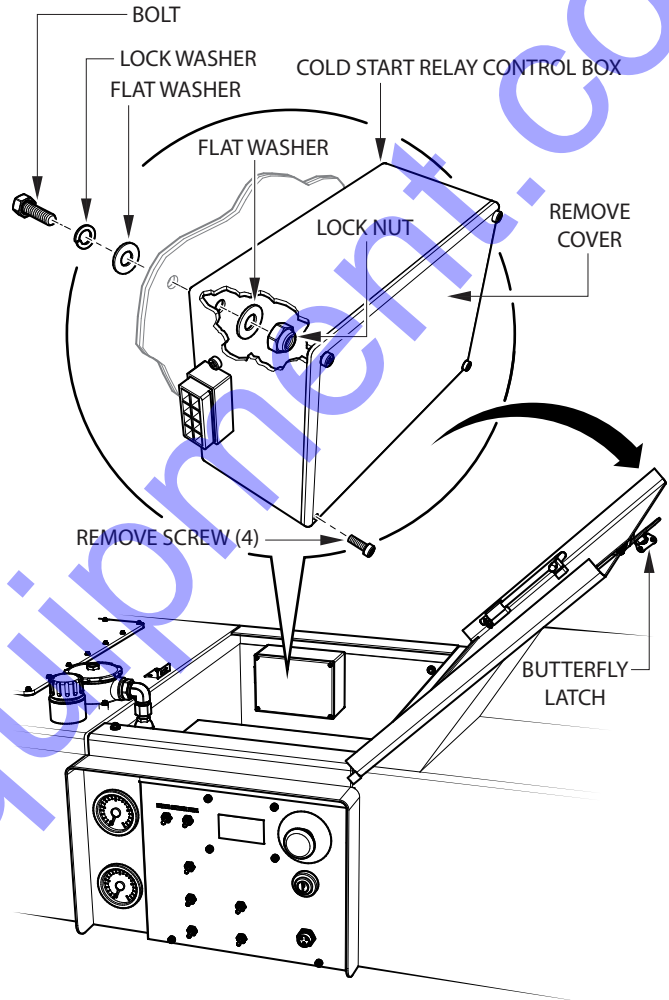


Figure 3. Cold Start Relay Control Box Mounting

- Reinstall the cover.

DIGITAL CONTROL BOX MODIFICATION

1. Remove the screws (2) that secure the Digital Control Box front panel (Figure 4) to the pump.

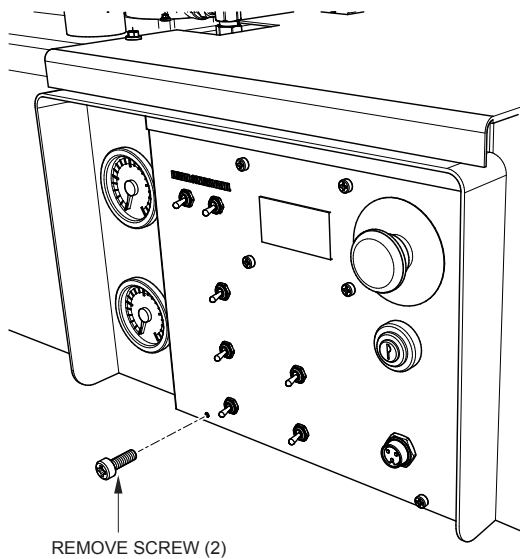


Figure 4. Digital Control Box Front Panel Removal

2. Tilt the front panel downward (Figure 5) and let it hang. This will allow for easy access inside the control box.

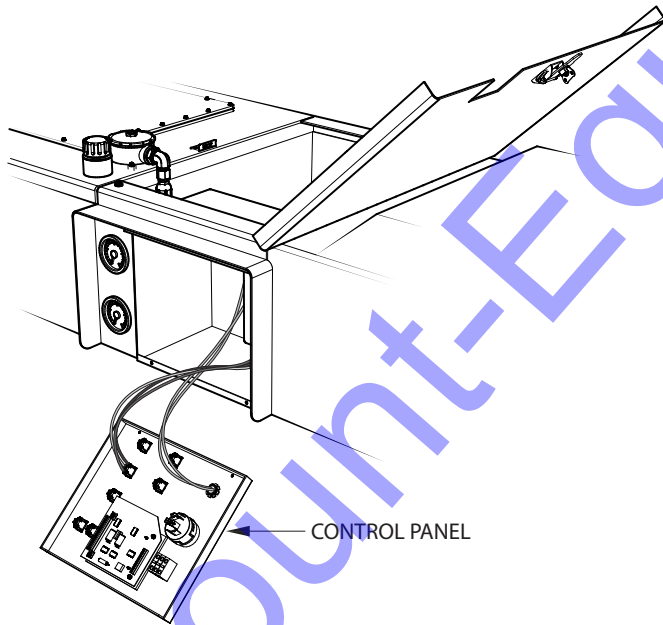


Figure 5. Digital Control Box Access

3. Using a 1/4-inch drill, drill 2 holes inside the Digital Control Box for the mounting of the terminal block.
4. Next, drill a 3/4-inch diameter hole inside the Digital Control Box as referenced in Figure 6. After hole has been drilled insert supplied grommet.

FRONT VIEW

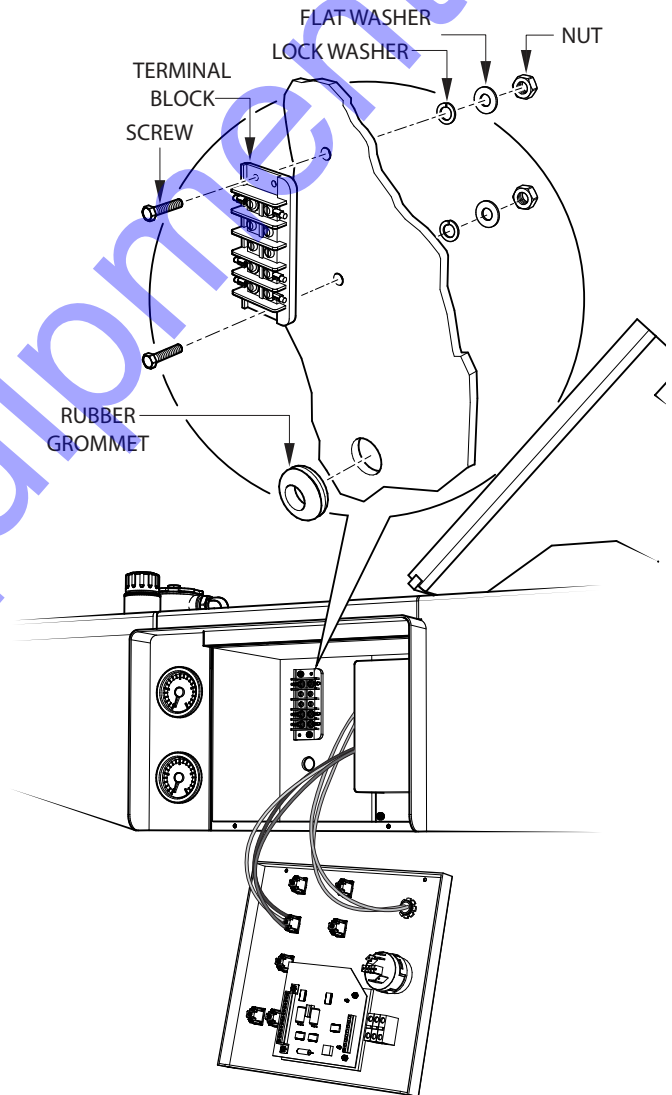
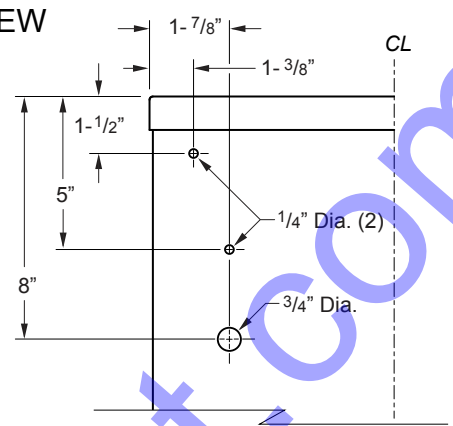


Figure 6. Digital Control Box Modification

5. Drill a 3/4-inch diameter hole as referenced in Figure 7. This hole will be for the mounting of the glow plug indicator lamp.

DIGITAL CONTROL BOX CONNECTIONS

Refer to Figure 8 for connections from the Cold Start Relay Control Box to the Digital Control Box (existing).

1. Connect one end of the wire labeled W1 (RED) to TB1-1.
2. Connect the other end of the wire labeled W1 (RED) to pin 17 on the ignition switch.
3. Connect the free end of the wire labeled W2 (RED) to TB1-1.
4. Connect one end of the wire labeled W3 (ORANGE) to TB1-4.
5. Connect the other end of the wire labeled W3 (ORANGE) to butt splice.
6. Connect one end of the wire labeled W5 (RED) to one side of the glow plug indicator light.
7. Connect the other end of the wire labeled W5 (RED) to butt splice.
8. Connect wire W6 (RED) between the free end of the butt splice and pin 15/54 on the ignition switch.

NOTICE

There may be existing wiring on pin 15/54 of the ignition switch. If the terminal next to pin 15/54 is vacant then use that terminal as a connection point. If the terminal is not vacant splicing will be required.

9. Connect the free end of the wire labeled W4 (ORANGE) to TB1-4.
10. Connect the free end of the wire labeled W7 (BLUE) to TB1-5.
11. Connect one end of the wire labeled W8 (BLUE) to TB1-5.
12. Connect the other end of the wire labeled W8 (BLUE) to one side of the glow plug indicator light.
13. Reinstall the front panel onto the control box.

NOTICE

After wiring has been routed, use tie wraps to secure wiring to pump frame, engine and inside Digital Control Box.

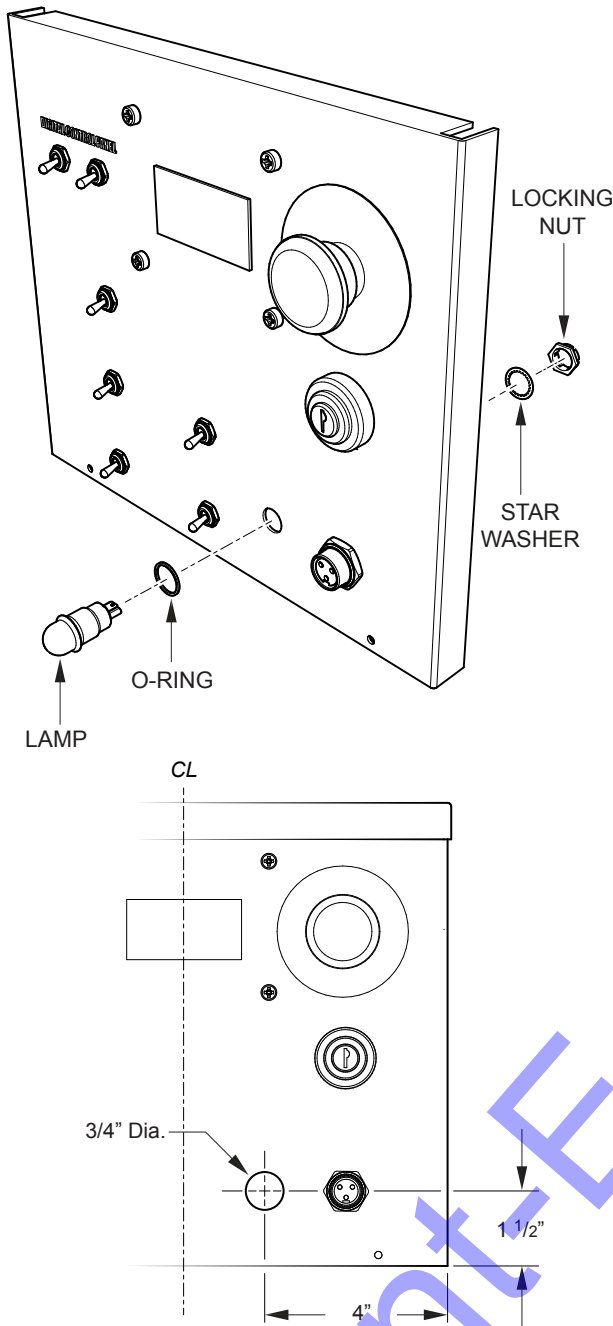


Figure 7. Glow Plug Indicator Lamp Mounting

6. Once the hole has been drilled, insert the glow plug indicator lamp into the hole and secure lamp with the supplied mounting hardware.
7. Remove all shavings from the control box.

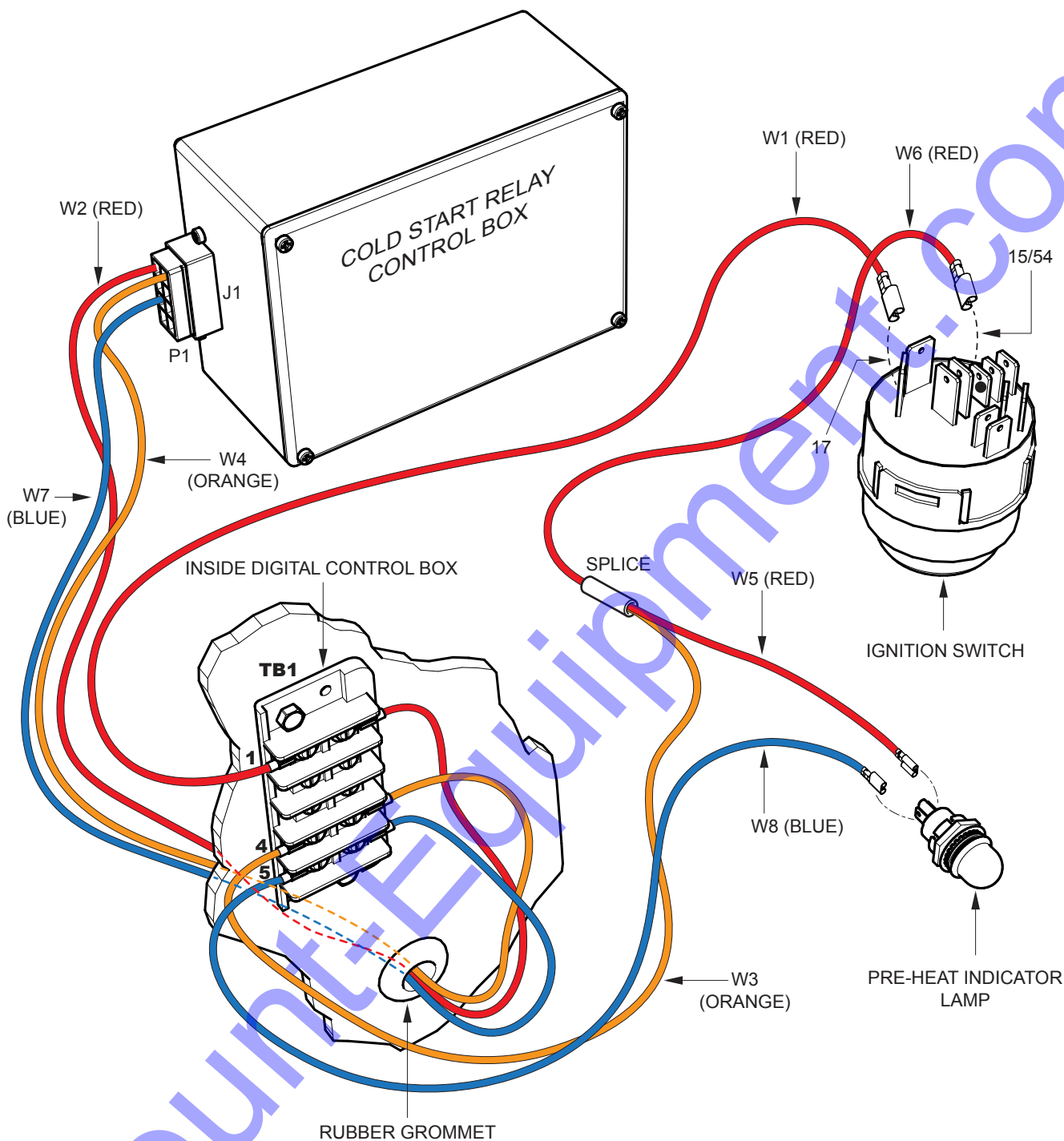


Figure 8. Digital Control Box Connections

MANIFOLD HEATING ELEMENT INSTALLATION

There are 2 manifold heating elements that need to be installed into the engine inlet manifold. Perform the following procedure to install the heating elements.

1. Using a 10 mm allen wrench, remove the two inlet manifold port plugs located on the inlet manifold. (Figure 9).

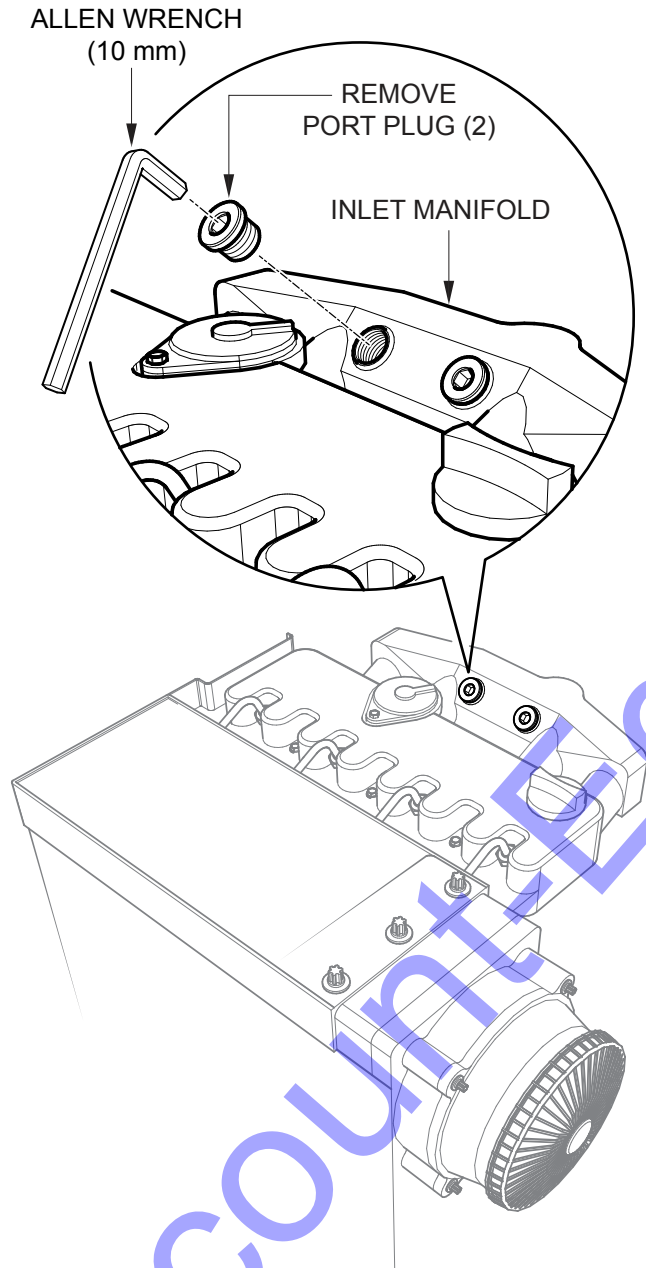


Figure 9. Inlet Manifold Plug Removal

2. Discard both inlet manifold port plugs.

3. Insert the supplied heating elements (Figure 10) into the same location where the inlet manifold plugs were removed. Be sure that the copper seal ring has been installed.

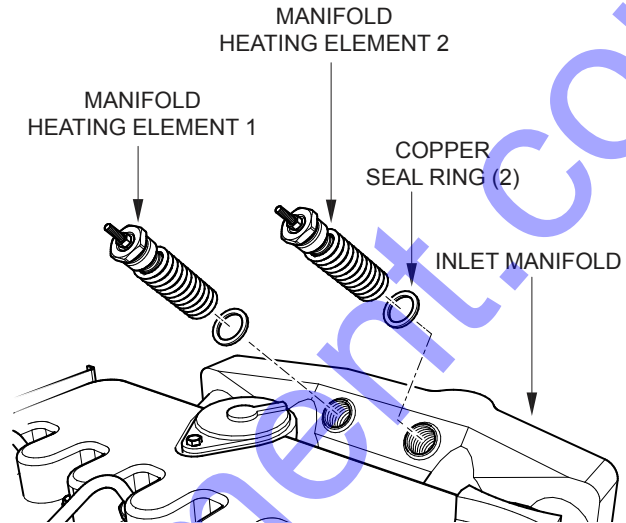


Figure 10. Heating Element Installation

4. Tighten each heating element securely. **DO NOT** over tighten.

FUSE, HEATING ELEMENTS AND GROUND CONNECTIONS

Refer to Figure 11 for connections from the cold start relay box to the engine glow plugs and fuses.

1. Connect BLACK wire W9 (junction of fuses F1 and F2) to starter solenoid (+12 VDC).
2. Connect BLACK wire W10-HE1 to HEATING ELEMENT #1 using supplied hardware.
3. Connect BLACK wire W11-HE2 to HEATING ELEMENT #2.
4. Connect BLACK wire W14 to STARTER SOLENOID GND.

NOTICE

For proper operation, wire W10 must be connected to HEATING ELEMENT #1. **DO NOT** connect wire W10 to HEATING ELEMENT #2.

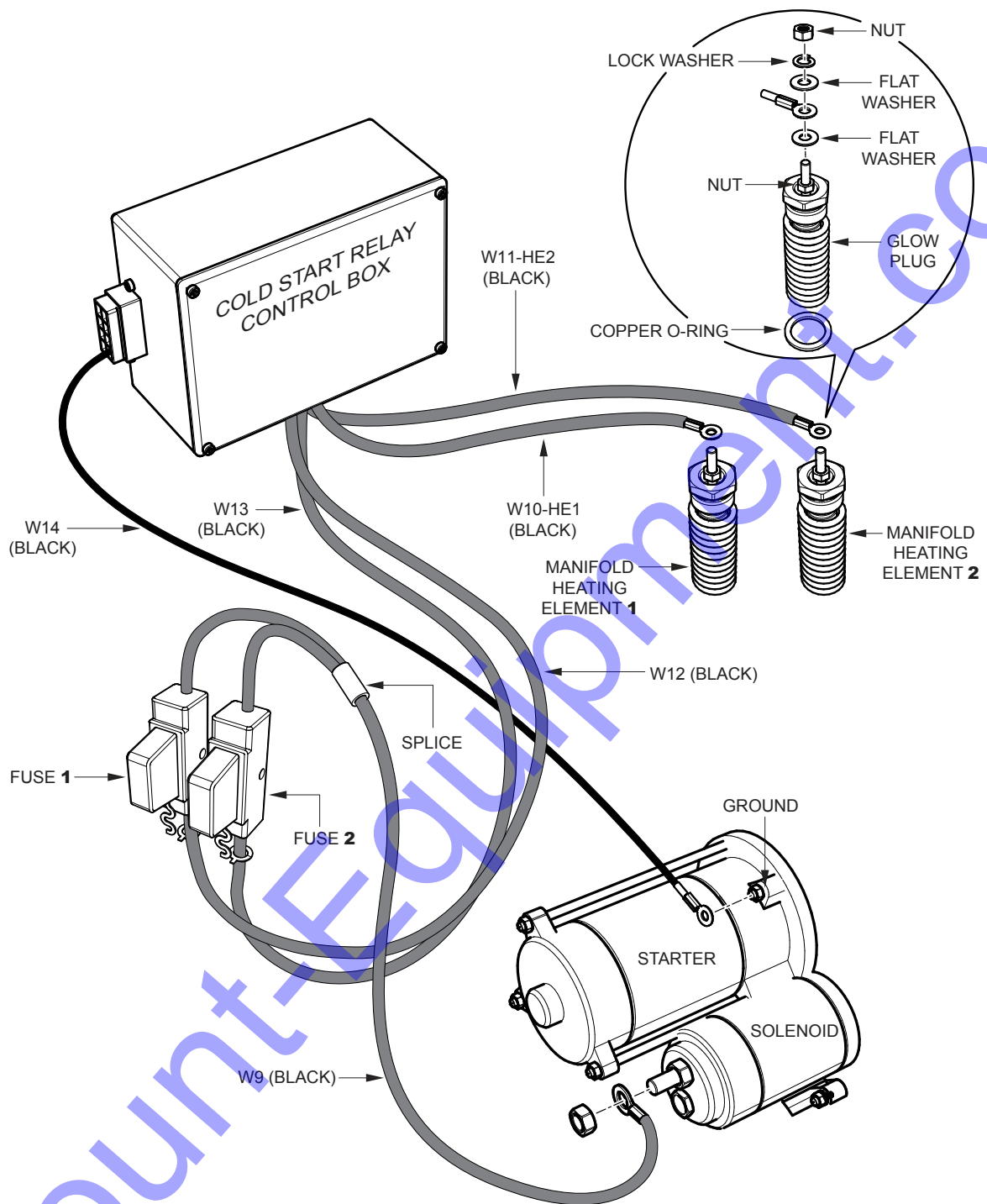


Figure 11. Engine Wiring Connections

TEST VERIFICATION

Perform the following procedure to test the cold start relay control box installation.

1. Reconnect battery
2. As shown in Figure 12, connect a current probe around wire W10 (Heating Element #1).
3. Make sure battery is fully charged.
4. Turn ignition key to position 1 and verify that glow plug lamp is lit (ON).
5. Verify that glow plug lamp remains ON for approximately 30-35 seconds.
6. When the glow plug lamp goes OFF, turn ignition key all the way clockwise to the start position (engine cranking).
7. Once the engine has started verify that current probe attached to Heating Element #1 reads approximately 50 amps.
8. Next, connect the current probe around wire W11 (Heating Element #2) and verify that it also reads approximately 50 amps.
9. Next, verify that both heating elements read approximately 50 amps for approximately 2 to 3 minutes.
10. After glow plugs have warmed (2-3 minutes) verify that the current probe reads zero amps for each heating element.

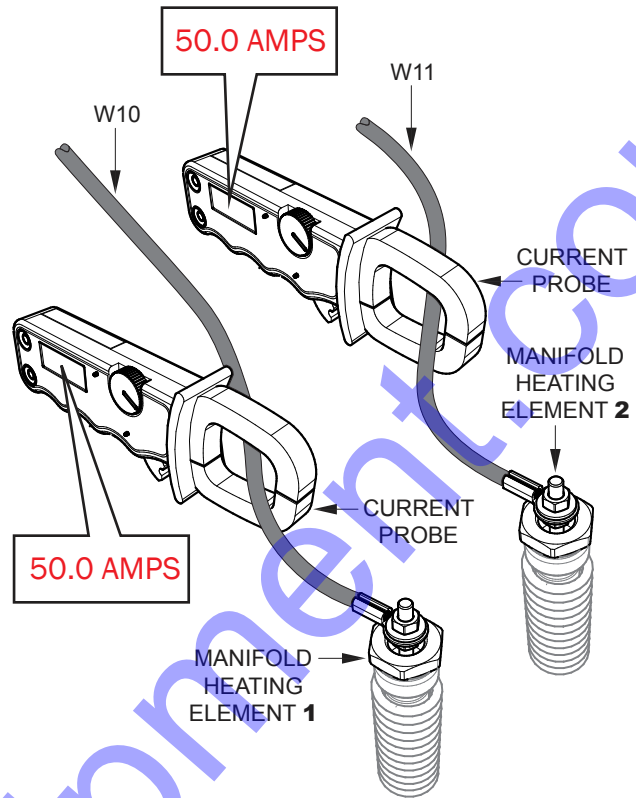
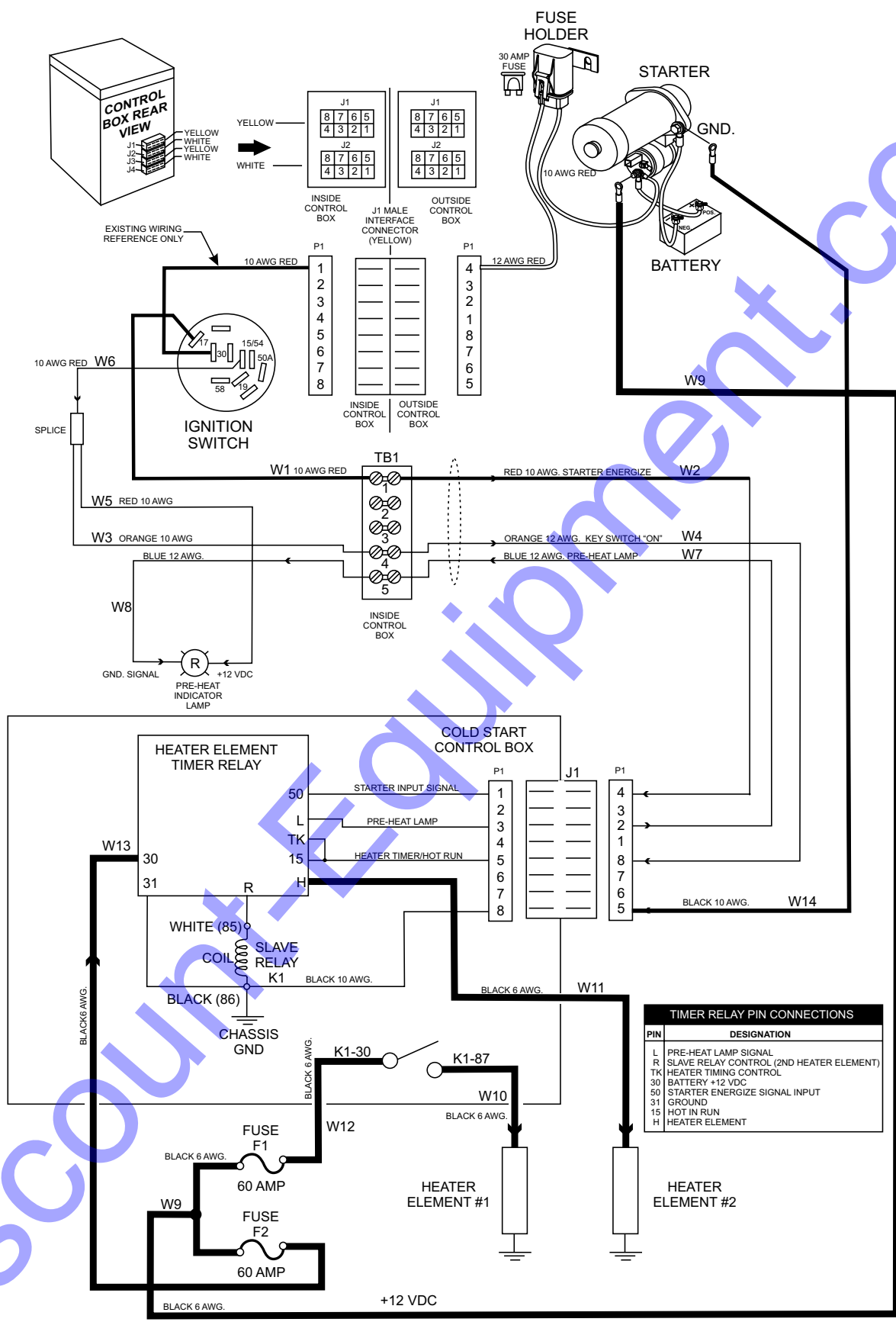


Figure 12. Heating Element Measurement

REASSEMBLY

Reattach hood and rain cap to pump in the reverse order in which they were removed.



PIN	DESIGNATION
L	PRE-HEAT LAMP SIGNAL
R	SLAVE RELAY CONTROL (2ND HEATER ELEMENT)
TK	HEATER TIMING CONTROL
30	BATTERY +12 VDC
50	STARTER ENERGIZE SIGNAL INPUT
31	GROUND
15	HOT IN RUN
H	HEATER ELEMENT

Figure 13. Cold Start Relay Wiring Diagram