

PwrIn is terminal 30, the source of the 12v that will be passed through the relay to 87 or 87a.
PwrOut is terminal 87. (87a is power out when the relay is not activated)
TriggerPos is terminal 85. 12v goes to it, and when TriggerGnd is grounded, the relay is "active".
TriggerGnd is terminal 86.

Power goes from the battery to the "B" terminal on the starter motor.

A #10 red wire goes from the "B" terminal on the starter motor to a circuit breaker (labeled "Fuse" on the side of the white box). From the battery side of this fuse, a #10 red wire goes to 30 (terminal 30 - PwrIn) on the **SR** and to 30 on the **PHR**. (So those relays always have PwrIn, unless the battery is dead.)

87 (PwrOut) of the **SR** goes on a #10 yellow/red wire to the "S" terminal on the starter.

The fused side of the "Fuse" provides power to 85 (TriggerPos) of the **SR** (with a red wire), 30 (PwrIn) of the **RR** (red wire), and to the Shutdown Bypass / Pre-Heat Switch (red wire). So as long as the battery is not dead and "Fuse" is intact:

- The **SR** has TriggerPos and PwrIn, but not TriggerGnd.
- The **RR** has TriggerGnd and PwrIn, but not TriggerPos.
- The **PHR** has TriggerGnd and PwrIn, but not TriggerPos.
- The **SDR** has nothing.
- The Shutdown Bypass / Pre-Heat Switch has power to it.

TESTING: At this point, all of the above can be tested by removing all the relays and testing for 12V on all TriggerPos and PwrIn, and for 0.00 Ohms resistance between all TriggerGnd and a good ground, and all unmentioned terminals should NOT have 0.00 Ohms to ground.

When the Shutdown Bypass / Pre-Heat Switch is turned on, it provides TriggerPos to the **RR** and TriggerPos to the **PHR**. TriggerGnd on both the **PHR** and the **RR** are always grounded (to the engine block). So the Shutdown Bypass / Pre-Heat switch:

- Triggers the **PHR**, which fires up the glow plugs.
- Triggers the **RR**, which provides 12V to the Fuel Solenoid (purple), and TriggerPos to the **SDR** (don't know the color - probably through the sockets that the relays plug into), and PwrIn to the **SDR** (purple), and power to all the Control Panel Lights and Gauges (Hour Meter, Oil Pressure Gauge, Water Temp Gauge, Voltmeter, the backlights for all the gauges, and the Run Indicator Light (built into the Start / Stop Switch) (purple wire for all of this).

At this point, the **SDR** has PwrIn and TriggerPos, but doesn't have TriggerNeg, so the PwrOut goes to 87a, which provides SignalPos to the **RR**. Therefore, the **RR** has TriggerPos from the Shutdown Bypass / Pre-Heat switch, and from 87a of the **SDR**. (Both of these go to the **RR** through a diode, to prevent power from either of them going backwards to the other one. These diodes can fail!) To sum up:

- The **SR** has TriggerPos and PwrIn, but is doing nothing.
- The **PHR** has TriggerPos, TriggerGnd, and PwrIn, and is sending PwrOut to the glow

plugs.

- The **RR** has TriggerPos (from two sources), TriggerGnd, and PwrIn, and is sending PwrOut to the Fuel Solenoid, the Hour Meter, the Run Indicator Light, and to both TriggerPos and PwrIn of the **SDR**.
- The **SDR** has TriggerPos and PwrIn, but no TriggerNeg, so it's sending power out of 87a to TriggerPos of the **RR**.
- IOW, the glow plugs are hot, the Fuel Solenoid is on, all the gauges and their backlights are on, and the Run Indicator Light is on.

TESTING: To test, remove all the relays, and depress the Shutdown Bypass / Pre-Heat Switch, and test as follows - all TriggerPos and PwrIn should have 12V, all TriggerNeg should have 0.00 Ohms to a good ground:

- The **SR** has TriggerPos and PwrIn, but does not have TriggerGnd.
- The **PHR** has TriggerPos, TriggerGnd, and PwrIn.
- The **RR** has TriggerPos, TriggerGnd, and PwrIn.
- The **SDR** has nothing (no power or ground on any terminals).
- Plug in the **RR**, and test for:
- The **SDR** has TriggerPos and PwrIn, but TriggerGnd should NOT be grounded.
- Plug in the **PHR**, and test for 12V at one of the glow plugs.
- Release the Bypass Switch and depress the Stop Switch, and now the **SDR** should have TriggerGnd.
- To test that the **SDR** is passing PwrOut of 87a to TriggerPos of the **RR**, you would have to (not sure - come back to this if necessary).

When the Start Switch is turned on, this grounds (TriggerNeg) of the **SR**, which triggers the **SR**, which provides PwrOut to the starter solenoid, which engages the starter. When the Start Switch is released, TriggerNeg to the **SR** is cut off, so the **SR** stops sending PwrOut to the starter solenoid, so the starter stops turning.

TESTING: Do not depress the Shutdown Bypass / Pre-Heat Switch, but do depress the Start Switch. PwrIn and TriggerPos should have 12 V, and TriggerGnd should have 0.00 Ohms to ground.

When the Shutdown Bypass / Pre-Heat Switch is turned off, everything keeps running, because:

- "Fuse" is providing PwrIn to the **RR**, 87a of the SDR is providing TriggerPos to the **RR**, and TriggerGnd of the **RR** is always there (grounded to the engine block).
- PwrOut of the **RR** is providing PwrIn to the **SDR** and TriggerPos to the **SDR**, but since nothing is grounding TriggerGnd of the **SDR**, its PwrOut is going to TriggerPos of the **RR**.
- IOW, PwrIn is coming into the RR from "Fuse", and PwrOut is going to PwrIn of the SDR, whose PwrOut (through 87a) is providing the TriggerPos to the RR. Until something grounds the SDR, the Fuel Solenoid will keep providing fuel and the engine will keep running.

If anything grounds TriggerGnd of the **SDR**, PwrOut will stop going out of its 87a, which will stop TriggerPos to the **RR**, which will shut off the Fuel Solenoid, all the gauges and their backlights,

and the Run Indicator Light.