

Solid-State Overdrive Control



*Design Features
Installation Instructions
and Operation*

*Triumph
J-Type
Transmission*

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BEFORE YOU START

Please read completely through this instruction before you start. If you feel the installation is beyond your capabilities, please locate someone who can help you. I take no responsibility for damage due to errors in installing this control.

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Section 1- Specifications

Dimensions

Overall dimensions: 5.1" x 2" x 1", 2 (3/16") mounting holes on 4.50" centers. Approximate weight is 5 oz.

Power Requirements

Controller Circuitry: 11.5-13.4 VDC @ 160mA (0.16Amp) (resettable in-circuit fuse)

Relay Output: Externally fused @ 10 amps for A-type overdrive.

Section 2- Contents of the Installation Kit

The Retrotek Solid-State Overdrive Controller kit upgrades Triumph J-Type overdrive control from the steering column switch to a modern solid-state controller operated by a gear-shift-mounted switch. The kit includes:

1. Solid-state overdrive controller
2. External LED indicator
3. Wire kit
4. Shift knob with integrated overdrive push-button switch

Section 3- Design Features

Default State

Each time the ignition key is turned on, the controller powers up with the overdrive always disengaged and the transmission operates in direct drive.

Built in Inductive Flyback Protection

The controller includes a built-in inductive flyback protection circuit that safeguards both the output relay contacts and the solenoid coil from reverse EMF as shown below in figures 1A and 1B.

Unprotected Solenoid Relay Circuit



Figure 1A/Unprotected Circuit

Figure 1A shows a waveform capture of the overdrive solenoid switching off in a stock overdrive electrical circuit. As the solenoid is de-energized, the magnetic field within the coil rapidly collapses, producing a large reverse voltage spike. This spike is clearly visible in figure 1A as the voltage dropping well below ground (negative +20 VDC) indicated by the red arrow. This negative voltage transient is a characteristic effect of inductive flyback and is responsible for arcing and accelerated wear of the stock overdrive switch contacts, ultimately leading to reduced reliability and premature failure.

Protected Solenoid Relay Circuit

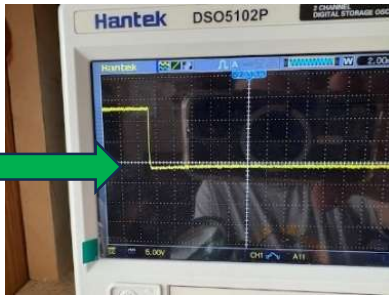


Figure 1B/Flyback Circuit

In figure 1B to the left is a screenshot of the waveform from the overdrive solenoid turning off when it's connected to the solid-state overdrive controller which includes flyback protection. The reverse voltage is clamped by a flyback diode at circuit ground which never lets the voltage go below ground and protects the output relay contacts.

Diagnostic LEDs

In addition to the Overdrive Status LED, the solid-state overdrive controller features **three diagnostic LEDs** on the right-hand side of the control case, as shown in Figure 2. These LEDs provide a visual indication of the controller's current operating state, helping to quickly identify normal operation, faults, or other conditions.



Figure 2/ Diagnostic LEDs

- RED LED** When the red LED is on, power is applied to the control.
- YELLOW LED** When the yellow LED is flashing, the control has sensed that the transmission is in a valid overdrive gear and the control will **“ARM”** which activates the overdrive switch on the shift knob.
- GREEN LED** When the green LED is on, the overdrive is **“ENGAGED”**. Continuing to actuate the overdrive switch in this state will cycle the overdrive on and off.

Section 4- Mounting your Solid-State Overdrive Controller

Before starting the wiring changes, disconnect positive battery terminal.

The solid-state overdrive controller must be mounted where it is protected from weather, as the case is not waterproof. While the circuit board has a moisture and dust-resistant coating, the terminal block is exposed. Ideally, mount the controller inside the passenger compartment (Figure 3a) or, alternatively, in the engine compartment (Figure 3b). Ensure the location allows easy access to the three diagnostic LEDs on the front panel.

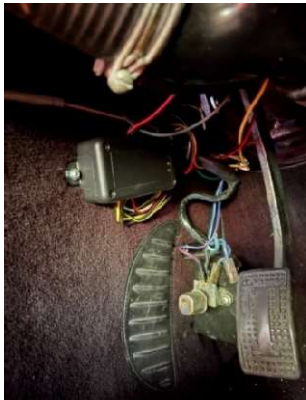


Figure 3a/ Controller Mounting Option 1



Figure 3b/ Controller Mounting Option 2

Section 5- Mounting the External LED

The external LED harness, shown in Figure 4a and installation examples 4b and 4c, includes a bezel-mounted LED on a 12” cable with a polarized connector linking it to a 4’ harness.



Figure 4/External LED Harness Assy

The machined bezel measures 7mm (.2756”), and the upper center of the dash support is an ideal mounting location.



Figure 4b/ TR6 External LED Location under the radio



Figure 4c/ TR4-TR4A External LED location above radio

Section 6 – Removing the Column Mounted Overdrive Switch

BEFORE STARTING THIS UPGRADE DISCONNECT THE POSITIVE BATTERY TERMINAL

Refer to **Figure 5** to remove the existing column-mounted J-type overdrive switch and its associated wiring. Begin by locating the column-mounted overdrive switch harness beneath the steering column. The harness contains a **yellow/green (YG)** wire and a **black** wire.

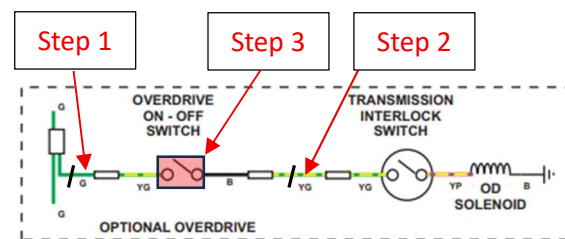


Figure 5

Modifications to the standard overdrive wiring harness

Step 1- Yellow/Green Wire

First, locate the **yellow/green (YG)** wire in the overdrive switch harness beneath the steering column that is connected to a **green** wire, as shown in **Figure 5, Step 1**. This green wire supplies power to the stock overdrive switch. Disconnect the green wire from the yellow/green (YG) wire in the overdrive switch harness under the dash, and remove the green wire as indicated by the black slash mark in **Figure 5, Step 1**.

Step 2 – Black Wire

Locate the **black** wire from the overdrive switch harness beneath the steering column that is connected to a **yellow/green (YG)** wire, as shown in **Figure 5, Step 2**. Disconnect the black wire from the **yellow/green (YG)** wire, then remove the **yellow/green (YG)** wire between the column-mounted overdrive switch and the connector at the transmission tunnel, as indicated by the black slash mark in **Figure 5, Step 2**.

Step 3 – Remove the Column Mounted Overdrive Switch

You can now remove the overdrive switch from the steering column.

At the completion of **Section 6**, the remaining J-type wire harness is shown in **Figure 6**. This will be further modified in later sections.

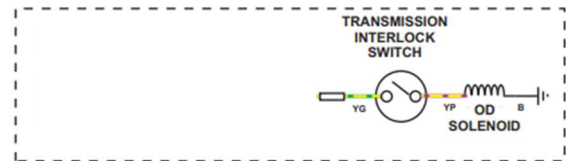


Figure 6
J-Type Step1 electrical modifications

Section 7- Solid-State Overdrive Controller Electrical Connections

J-Type Solid-State Controller Wiring Diagram

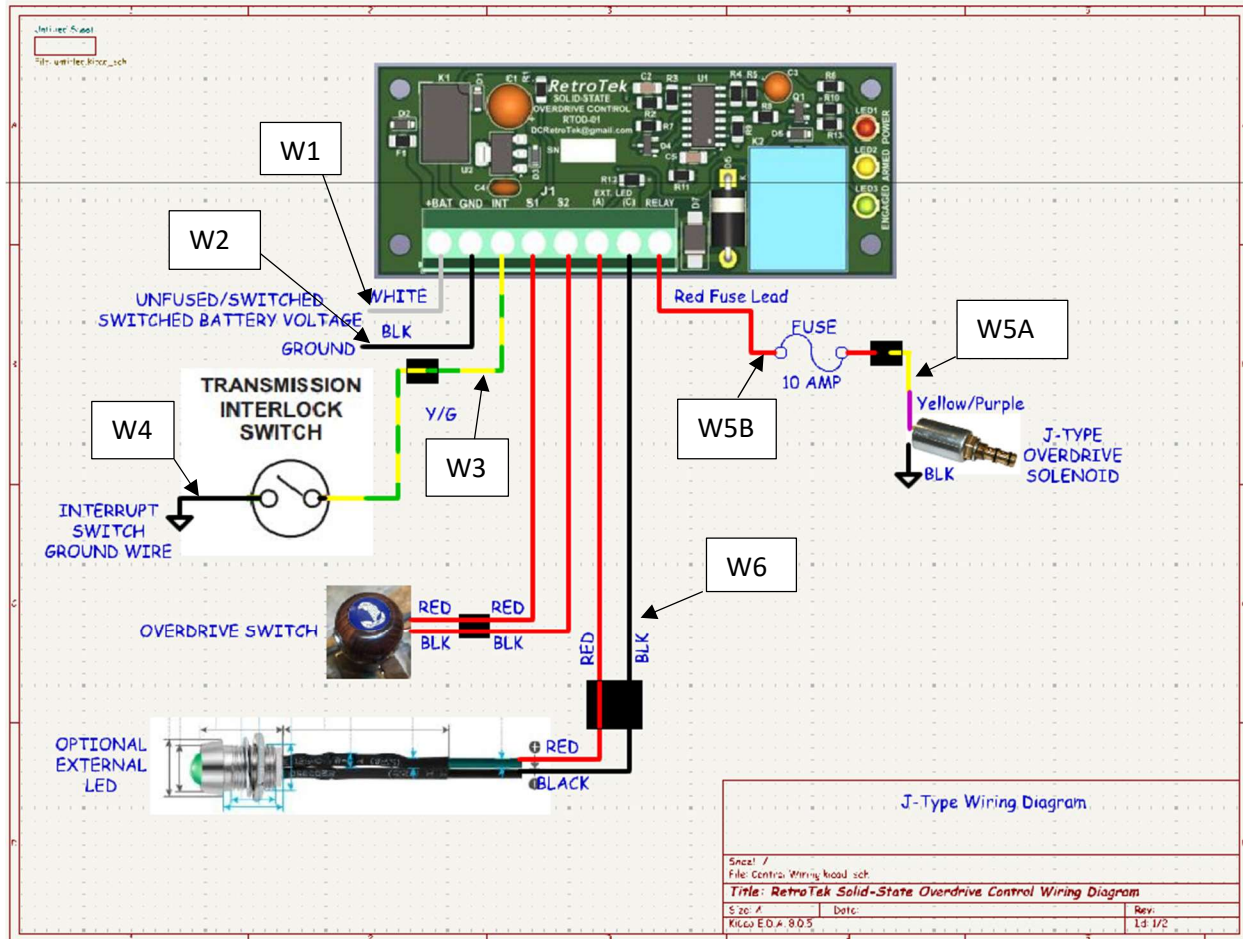


Figure 7/J-Type Wiring Diagram

Figure 7 above shows a completed J-Type Solid-State Overdrive Controller installation in a standard Triumph wiring harness. The “W” numbers identify the specific wire kit component, connections, locations, and functions. This wiring diagram will be referred to throughout this manual.

Wire Kit

All wires needed to install the Solid-State Overdrive Controller are included in the wire kit. Each wire is packaged in a labeled bag by function and installation step. **Before mounting the controller case, temporarily remove the circuit board and place it in the antistatic bag the controller was shipped in while routing the wires. This makes connecting wires to the terminal block easier. Once all wires are routed, reinstall the circuit board.** Follow the wiring sequence below, marking each wire as you go, and refer to **Figure 7** to confirm routing and connections.

Wire Kit Inventory

Your J-Type Solid-State Overdrive Controller wire kit contains the following items.

1. **W1** - +BAT Wire (white w/ female spade connector on one end).
2. **W2** – Controller Ground Wire (black wire w/ ¼” ring lug on one end).
3. **W3** – Interrupt Switch Wire (yellow/green wire w/bullet terminal on one end).
4. **W4** – Interrupt Switch Ground Wire (Black wire w/bullet connector & ring lug).
5. **W5A** – Relay/Solenoid Wire (Yel/Purple wire w/female spade terminal including a loose male spade terminal).
6. **W5B** – Relay/Solenoid inline fuse w/10 amp fuse.
7. **W6** – External LED Harness

Connecting & Routing the “Terminal” end of the Kit wires.

Step W1 – Routing the +BAT Wire

From the wire kit, locate the **white wire** with a ¼” **female spade connector**, as shown in **Figure W1**. Connect the female spade to an open white terminal in the fuse box. If no open terminal is available, use the included adapter to share a terminal. Route the white wire back to the Solid-State Overdrive Controller and pass it through the slot in the bottom of the case. Trim the wire to about **4” beyond the slot**.



Figure W1/ +BATT Wire

Step W2 – Routing the Controller Ground Connection

From the wire kit, locate the **black wire** with a **ring lug** on one end, as shown in **Figure W2**. Attach the ring lug to a suitable chassis ground, then route the other end to the controller, passing it through the slot in the bottom of the plastic case. Leave at least **4 inches** of wire beyond the slot.



Figure W2/ Controller Ground Wire

Step W3 – Routing the Interrupt Switch Wire

From the wire kit, locate the **yellow/green Interrupt Switch wire (W3)** with a bullet terminal, as shown in **Figure W3**. At the right side of the transmission tunnel, connect W3 to the **yellow/green (YG)** interrupt switch wire exiting the transmission tunnel. Route the other end to the controller, pass it through the case slot, and leave **4”** beyond the slot.



Figure W3/ Interrupt Switch Wire

The **W4** and **W5A** wires require the car to be raised for access to the overdrive solenoid and interrupt switch wires. Before going under the car, locate from the wire kit the **black interrupt switch ground wire (W4)** with a ring lug on one end and a bullet connector on the other, and the **yellow/purple solenoid wire (W5A)** with a bullet connector, as shown in **Figures W4 and W5A**.

Step W4 – Interrupt Switch Ground Wire

From under the car, locate the wire connecting the overdrive solenoid to the interrupt switch. Disconnect the solenoid from the interrupt switch and connect the **bullet terminal of W4** to the interrupt switch wire that formerly went to the solenoid. Bolt the **ring lug** to a suitable ground. As shown in **Figure 7**, one terminal of the interrupt switch is now grounded, and the other connects to the **yellow/green (YG)** wire exiting the transmission tunnel.



Figure W4/ Interrupt Switch Ground Wire

Step W5A – Yellow/Purple Solenoid Wire

Have an assistant feed the **female spade end of W5A** down through the same hole in the transmission tunnel as the yellow/green interrupt switch wire, and route it to the overdrive solenoid. Disconnect the wire from the solenoid terminal opposite the ground, and connect the **W5A female spade** in its place.

The remaining wiring connections can be completed with the car on the ground.



Figure W5A/ Yellow/Purple Solenoid

Step W5B – Solenoid Fuse Wire

Locate the **W5B wire**, which has an in-line 10 A fuse. One end is stripped for direct connection to the Solid-State Overdrive Controller terminal block, and the other end has a **male spade lug**. This wire will be installed in the next section when all wires are connected to the Solid-State Overdrive Controller terminal block.



Figure W5B/ Inline Fuse Holder

Step W6 – Routing the External LED Harness

Locate the **External LED Harness W4** from the kit. Choose a location for the LED that can be easily viewed from the driver's seat, drill a 9/32" (0.281) hole, and insert the LED male connector through the hole and insert the LED flush to the hole. **DO NOT PULL ON THIS CABLE AS YOU MAY DAMAGE THE CABLE.** The connector is polarized and will only plug in one way.

Route the 2-conductor wire to the controller, feed it through the case slot, leaving 3–4 inches beyond. Separate the conductors and strip about ¼ inch of insulation for connection.



Figure W6/ External LED Harness

Section 8- Installing the Shift Knob with OD switch

The shift-knob includes an electrical connection tailored specifically for the solid-state overdrive controller. Its innovative design improves durability and helps to shield the cable from abrasion as it passes down the shift lever, around the base of the gear shift lever, and through both the shift-lever gaiter and the rubber transmission boot at the top of the transmission.



Figure 8/ Shift Knob

Preparing to install your new overdrive gear shift knob

Prior to installing your gear shift knob, you will need to:

1. Remove your existing shift knob.
2. Remove the center dashboard support.
3. Remove the leather gator on the shift lever and the top rubber boot on the shift lever if installed.

Securing the cable to the Shift Lever

Insert the female plug of the cable on the gear shift knob and the supplied hex nut through the leather gator and the rubber upper boot if equipped. **CAREFULLY**, thread the gear shift knob onto the shift lever, ensuring the cable doesn't wind around the shift lever. Secure the gear shift knob cable to the shift lever with electrical tape approximately 2 inches from the base, as shown in Figure 9 (red arrow).

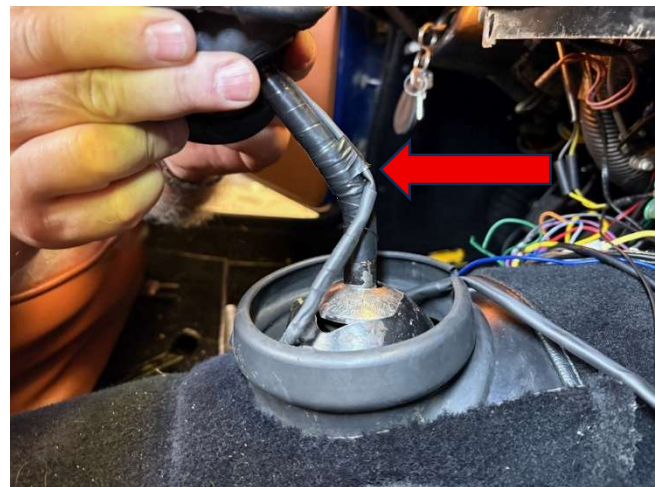


Figure 9/ Red arrow locating cable restraint

When properly installed, the cable will run straight down to the base of the shift lever, and the switch will sit under your thumb when seated in the driver's position.

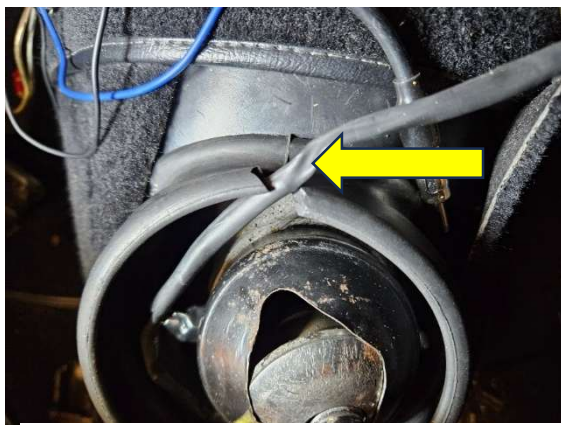


Figure 10/ Routing Preparations

Wrap the nut on the side of the gear shift cap with electrical tape to prevent abrasion of the gear shift harness, as shown by the red arrow in Figure 10.

Next, locate the 12 o'clock position on the rubber boot (yellow arrow in Figure 10) and cut a small V-shaped notch to route the harness through. The opening should be just large enough to allow the harness to pass without being pinched or stretched.

Routing the Shift Knob Cable

Carefully route the cable downward toward the 180° position (blue arrow, Figure 10), avoiding sharp bends or twists.

Wrap the cable clockwise around the outside of the gear-shift cap as shown. When properly positioned, the cable should sit approximately midway between the shift lever and the rubber tunnel boot. Keep the harness centered in this space as you guide it around the cap.

Route the cable out of the transmission tunnel through the V-groove in the rubber boot. This notch provides a protected exit and helps prevent chafing.

After routing, shift through all gears to verify the cable moves freely without rubbing or binding.



Figure 10/ Cable Routing



Figure 11/ top view of correctly routed cable

Plug male connector of the included cable into the gear shift female connector and route the long cable to the location of the solid-state overdrive controller. Cut the cable long enough to allow 3"-4" past the controller and strip the outer jacket to expose the 2 inner wires.

This completes the installation of the gear shift mounted overdrive switch. You and now replace the dash support and proceed with the next step of your Solid-State Overdrive Controller installation.

Section 9- Deleting the Old Overdrive Harness Remnants

If the original overdrive harness has not yet been removed, do so now. Leaving it in place can create clutter and confusion when routing the new wiring. Although the factory overdrive wiring is self-contained, it may have been modified over the years. Check carefully for wires bundled with other circuits to avoid disconnecting unrelated systems.

Remove any clips, ties, or fasteners securing the old harness and withdraw it carefully, keeping the wires together to prevent snagging. Once removed, inspect the area for frayed insulation, exposed conductors, or debris that could interfere with the new Solid-State Overdrive Controller wiring.

Removing the old harness provides a clean workspace, simplifies routing of the new wiring, and reduces the risk of miswiring or short circuits.

Section 10- Final Wiring into the Terminal Block

Overdrive Controller Terminal Block

In **Figure 12** to the right is an enlarged view of the overdrive controller **terminal block**.

All electrical connections are made through this **8-position terminal block** (positions 1–8).

Each terminal is functionally labeled on the printed circuit board, as shown.

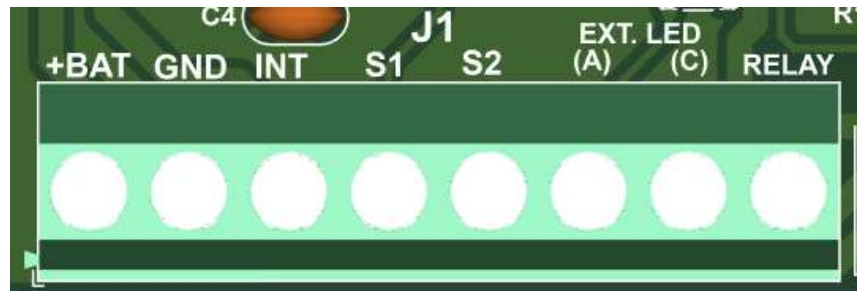


Figure 12/ Connection Terminal Block

Solid-State Overdrive Control Terminal Block Function Table

Terminal	Wire Color	Function
+BAT	WHT	Supplies switched 12V to control
YGND	Black	Chassis Ground (black wire)
INT	Yellow	Connects to transmission interrupt circuit
S1	Red	Connects to overdrive switch
S2	Red	Connects to overdrive switch
EXT LED (C)	Black	Connects to cathode of external LED overdrive indicator
EXT LED (A)	Red	Connects to anode of external LED overdrive indicator
RLY	Yel/BLK	Overdrive relay drive output

Table 1/Terminal Block Pin Assignments

You will need a **small flathead screwdriver** (about 1/8" wide) to terminate the wires into the Solid-State Controller terminal block. Refer to **Figure 7** and **Table 1** for guidance while attaching the wires. Each terminal is labeled above the green terminal strip for clarity. Strip approximately **¼" of insulation** from each wire before termination, and allow enough extra wire to create a **service loop** after reinstalling the controller circuit board into its case. **Please refer to figure 12 (Connection Terminal Block) and Table 1 and confirm each connection per figure 7 as you complete each wire connection.**

Terminating Wires into the Terminal Block

Terminal 1- +BAT

Connect the white power wire (**figure W1**) to the terminal labeled **+BAT** terminal in figure 12.

Terminal 2 – GND

Connect the black wire (**figure W2**) into the terminal labeled **GND** terminal in figure 12.

Terminal 3 – INT

Connect the yellow wire (**figure W3**) into the terminal labeled **INT** in figure 12.

Terminal 4 – S1

Locate the 2 - conductor cable from the shift knob. You can terminate either wire into either terminal **S1** or **S2** in figure 12 as there is no polarization for these connections.

Terminal 5 – S2

Locate the remaining wire of the 2-conductor cable from the shift knob and terminate it into the remaining "**S**" terminal on the controller as shown in figure 12.

Terminal 6 – External LED (A)

Locate the 2-conductor harness from the External LED (figure W6) and connect the **red wire** to terminal labeled **Ext. LED (A)** as shown in figure 12.

Terminal 7 – External LED (C)

Connect the **black** wire from the External LED 2-conductor harness (figure W6) to terminal labeled **Ext. LED (C)** as shown in figure 12.

Terminal 8 – Relay

Connect the stripped wire on the inline fuse (figure W5B) into terminal labeled **Relay** in figure 12.

Referring to **Figure 7**, locate the **yellow/purple wire (W5A)** coming from the overdrive solenoid. This wire will connect to the **W5B in-line fuse wire** using the included crimp-on male spade lug. First, trim the yellow/purple W5A wire to a suitable length so it reaches the male spade connector with enough slack to allow proper positioning and support of the in-line fuse holder. Strip approximately **¼" of insulation** from the end of the W5A wire, then attach the included **male spade connector** using a suitable crimping tool, ensuring a secure and reliable electrical connection. Once crimped, plug the male spade into the **female spade connector** on the W5B in-line fuse.

After making the connections, secure the in-line fuse holder with a tie-wrap or similar method to prevent movement or vibration during operation. Route all wiring neatly, keeping it clear of moving parts, heat sources, and sharp edges.

Reinstall the controller circuit board into the plastic case, ensuring all external wires are properly positioned and restrained. Use tape or tie-wraps as needed to maintain a clean, organized layout inside the case.

Verify that no wires are pinched and that each connection matches the terminal layout shown in Figure 12.

Section 11- Testing your Solid-State Overdrive Installation

1. **Wiring:** Using figure 7, double check that your wiring connections and ensure you have routed all the new wires neatly and correctly.
2. **Ignition Points (if applicable):** For vehicles with conventional ignition points, temporarily disconnect the white wire from the ignition coil. This prevents inadvertent damage to your ignition system while testing your solid-state overdrive controller.
3. **Battery Ground:** Reconnect the battery ground to ensure the system has a proper electrical reference for testing. A secure ground is critical for the correct operation of the overdrive controller and for accurate diagnostic LED feedback.
4. **Power-On Test:** With the transmission in neutral, turn on the ignition switch. The red diagnostic “Power LED” on the Solid-State Overdrive Controller should illuminate, indicating that the controller is receiving power. If the LED does not turn on, recheck that the white wire (W1) is connected to the fuse block connector correctly. Verify that you have power at the male spade lug on the white (W1) wire. Also, verify that you have a good ground connection at the black W2 wire.
5. **Overdrive Lockout Test:** With the ignition switch in the “On” position and the transmission in neutral, press the gearshift-mounted pushbutton. There should be no action at the overdrive controller at this stage, “Armed” and “Engaged” LEDs should be off and the overdrive should not activate using the gear shift mounted overdrive button, confirming that the system correctly prevents engagement in a “non-overdrive” gear selection. Check that the “Armed” LED doesn’t turn on in any other “non-overdrive” gears such as reverse, first, or second gear.
6. **Overdrive Gear Test:** With the ignition switch in the “On” position, shift the transmission into an 3rd gear. The yellow diagnostic “Armed” LED will flash, signaling that the overdrive controller is ready for overdrive engagement. Pressing the gear shift mounted push button will now engage the overdrive. Pressing the push button again will disengage the overdrive. Test each valid overdrive gear individually, noting that as you shift through neutral, the yellow LED turns off and reactivates as you engage the next overdrive gear. This verifies that the controller senses correct gear position. With the transmission in an 3rd or 4th gear with the overdrive disengaged and the yellow “Armed” LED flashing, press the shift knob overdrive switch once. The following should occur:
 - a. The external dash-mounted LED will illuminate, confirming overdrive activation.
 - b. You should hear a click from the overdrive solenoid as the overdrive engages.
 - c. The green “Enabled” diagnostic LED will turn on.

7. **Completion:** After testing, reconnect the white wire to the ignition coil if it was temporarily disconnected.

Following these steps confirms that your Solid-State Overdrive Controller is correctly installed, fully operational, and safe for regular driving.

Congratulations and happy motoring!

Section 12- Troubleshooting

Red “Power” LED is not on:

Verify there is battery power on the +BAT terminal when the ignition is on. Verify that there is a good ground connection on the GND terminal.

Yellow “Armed” LED does not flash:

Verify the transmission is in a valid overdrive gear (3rd or 4th). Check the gear-position sensing connections from the “INT” terminal on the controller, through the Yellow/Green wire connection at the transmission tunnel, to one terminal on the transmission mounted interrupt switch and finally the ground connection (W4) wire.

Dash-mounted LED does not illuminate:

Check the external LED wiring, polarity, and ground connection. Verify the controller output is connected correctly.

No audible click from the overdrive solenoid:

Inspect the solenoid wiring and fuse. Confirm the solenoid is properly grounded and that battery voltage is present at the solenoid when overdrive is commanded.

Green “Enabled” LED does not turn on:

Indicates the controller did not detect successful overdrive engagement. Recheck solenoid operation, wiring continuity, and transmission overdrive functionality.

Customer Support

For customer support, I can be reached via email at DCRetrotek@gmail.com or via cell phone at (513) 484-8420. Calls can be made from Monday-Friday 10:00AM – 5:00PM EST.