

Solid-State Overdrive Control



*Design Features
Installation Instructions
and Operation*

*Triumph
A-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 A-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 disengaged

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. Figures 1A and 1B illustrate the effects of inductive flyback.

Unprotected Solenoid Relay Circuit

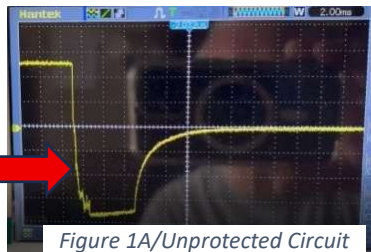


Figure 1A/Unprotected Circuit

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 20VDC), 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

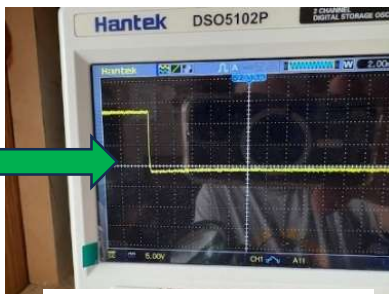


Figure 1B/Flyback Circuit

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 with flyback protection. The reverse voltage is clamped by a flyback diode 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 controller.
- YELLOW LED When the yellow LED is flashing on, 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.

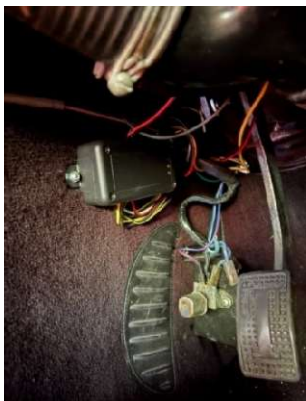


Figure 3a/ Controller Mounting Option 1



Figure 3b/ Controller Mounting Option 2

Section 5- Mounting the External LED



Figure 4/External LED Harness Assy

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. 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- Modifications to your existing A-Type overdrive electrical circuit

The first step is to remove the portions of the original overdrive wiring that are no longer needed. These steps are outlined below and shown schematically in Figure 5.

Step 1 – The overdrive relay removal

Refer to **Step 1** in Figure 5 to remove the existing A-type overdrive relay, as the solid-state controller will operate the solenoid directly. The relay is usually located on the left inner front in the TR6 or at the front of the passenger side footwell in the TR4/TR4A shaded red in the diagram.

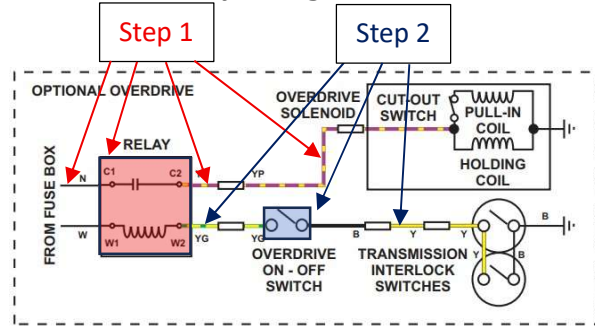


Figure 5
Modifications to the standard A-Type overdrive wiring

1. Remove the brown wire (N) and insulate the connector.
2. Remove the white wire, noting its fuse block connection for later use.
3. Disconnect and remove the yellow/purple wire (YP) back to the steering column switch.

After removing these wires, remove the overdrive relay.

Step 2 – Remove the stock column mounted overdrive switch

In Step 2 shown in figure 5 the overdrive switch is shaded in blue.

1. Ensure the yellow/green (YG) wire from the original relay to the column switch has been removed.
2. Disconnect the black wire from the overdrive switch from the yellow wire and remove the yellow wire back to the connector at the transmission tunnel.
3. Remove the steering column overdrive switch.

At the completion of this stage, only two wires remain from the original harness: the yellow wire to the overdrive solenoid and the yellow/purple wire from the transmission interrupt switches that are exiting the transmission tunnel. The electrical modifications are now complete, ready for the wire kit installation.

Section 7- A-Type Solid-State Overdrive Control Installation Overview

A-Type Solid-State Controller Wiring Diagram

Figure 6 shows the electrical connections for interfacing the Solid-State Overdrive Controller with an A-Type system. The wire kit includes six wires, each labeled with a “W” number, which are referenced for installation and routing.

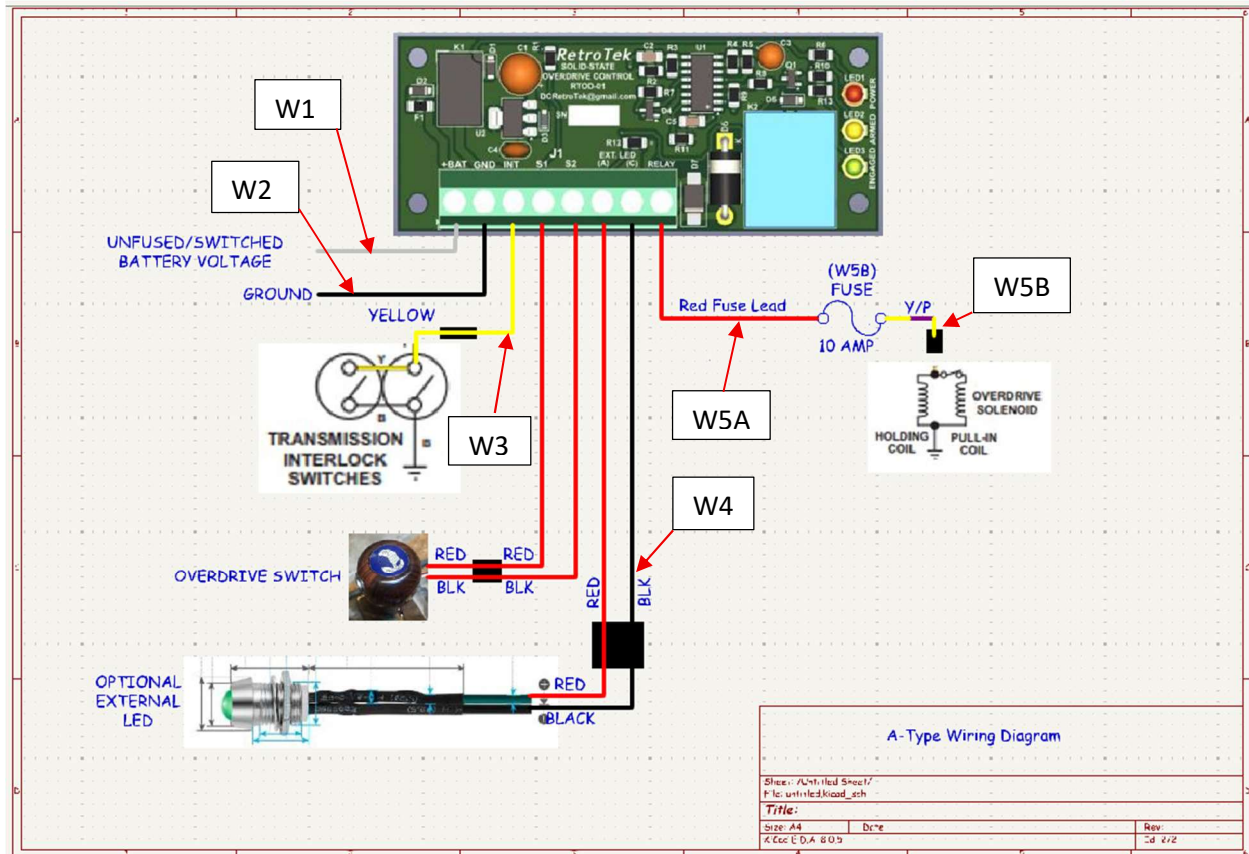


Figure 6 / A-Type Solid-State Overdrive Controller Wiring

Wire Kit

The wire kit includes all wiring for the Solid-State Overdrive Controller, with connectors to interface directly with the stock Triumph harness. Each wire is in a labeled bag indicating its function.

Wire Kit Inventory

Your A-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 w/bullet terminal on one end.
4. W4 – External LED Harness.
5. W5A – Solenoid Wire (Yellow/Purple w/bullet terminal on one end & loose male spade crimp terminal
6. W5B – Relay/Solenoid inline fuse w/10 amp fuse with female spade crimp terminal.

Section 8- Installing the Wire Kit

Wiring your solid-state overdrive controller is broken down into 2 steps. Section 8 will walk you through connecting the wires into your existing electrical wiring system. Section 9 will instruct you in making the electrical connections to your solid-state overdrive controller.

Installing the wire kit into your Triumph wire harness

Temporarily remove the controller circuit board and place it in its antistatic bag to make wire routing easier through the slot in the case. Connect all wires to the terminal block while the board is outside its case, then reinstall and secure the board. Follow the wiring sequence below, checking each wire as it is routed, and verify connections using Figure 6.

Step W1 – Routing the +BAT Wire

Locate the white **+BAT wire W1** from the kit with a ¼-inch female spade connector (Figure W1) and connect it to the fuse box terminal formerly used by the overdrive relay's white wire (Figure 5). Route W1 to the controller, feed it through the case slot, and trim so about 4 inches extend beyond.

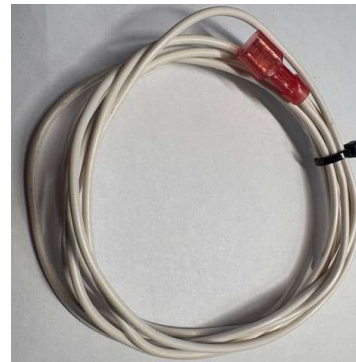


Figure W1/ +BATT Wire

Step W2 – Routing the Controller Ground Connection

Locate the black **Controller Ground wire W2** with a ring lug (Figure W2) and attach it to a suitable chassis ground. Route the other end to the controller, feed it through the case slot, and leave at least 4 inches extending beyond.



Figure W2/ Controller Ground Wire

Step W3 – Routing the Interrupt Switch Wire

Locate the yellow **Interrupt Switch wire W3** with a bullet terminal (Figure W3) and connect it to the yellow wire from the transmission-mounted interrupt switches. Route the other end to the controller, feed it through the case slot, leaving about 4 inches extending beyond.



Figure W3/ Interrupt Switch Wire

Step W4 – 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 **without pulling on the cable**. The polarized connector, about 12 inches from the LED, allows for future disassembly.

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 W4/ External LED Harness

Step W5 – Routing the Solenoid Wire

From the wire kit, locate the W5A wire which is a yellow/purple wire with a bullet terminal on one end and includes a loose female spade lug. From inside the car, plug the bullet terminal of the W5A wire into the yellow/purple wire exiting the transmission tunnel. Route the W5A wire up to the location of the controller.

Locate the W5B wire which is an in-line fuse holder containing a 10-amp fuse. One end is stripped and will be terminated directly into the controller. The other end contains a male spade lug. Save the female spade lug which will be used in the next section.



Figure W5A/ Solenoid Wire



Figure W5B/ Solenoid Fuse

Section 9- Installing the Shift Knob Mounted OD switch

The gear shift knob supplied in your installation kit is fabricated from solid hardwood. The shift-knob includes an electrical switch connection tailored specifically to operate your solid-state overdrive controller. Prior to installing the new shift knob, you will have to remove the center dash support to access the shift boot as shown in figure 8 below.



Figure 7/ Shift Knob

Shift Knob Harness Routing

Proper cable routing and abrasion protection are critical. The installation consists of the following steps:

1. Secure the cable to the shift lever.
2. Modify the transmission tunnel rubber.
3. Add additional abrasion protection.
4. Route the cable to exit the transmission.

Restraining the Cable to the Shift Lever

Remove your existing shift knob and leather shift lever gator if installed. Insert the shift lever cable through the leather shift lever gator if installed. Using care not to apply stress to the new shift knob cable, carefully thread the overdrive shift knob on the shift lever. Again, if your Triumph has a leather gator, ensure that as you thread the new shift knob on the shift lever, the cable from the knob doesn't twist around the shift lever inside the gator. Secure the shift lever locking nut after orienting the push button on the knob to be positioned under your thumb and the Triumph logo is facing up. Secure the shift-knob cable to the shift lever using electrical tape, as shown in figure 8 by the blue arrow. Wrap the tape snugly around both the cable and the shift lever to hold the cable firmly in place.



Figure 8/ shrink sleeving and cable restraint

Ensure the cable is routed straight along the shift lever and has sufficient slack to prevent tension during normal shifting movement. The taped section will prevent the cable from moving or rubbing against adjacent components while still allowing the shift lever to operate freely. Verify that the tape is securely applied and that the cable remains properly aligned before proceeding to the next installation step.

Wire Routing Preparations

Begin by wrapping electrical tape around the exposed threads of the bolt that secures the top cover over the shift lever, as indicated by the red arrow in Figure 9. Apply several tight, even layers of tape to fully cover the threads. This added protection creates a smooth surface and helps prevent the shift-knob cable from chafing or being damaged by contact with the sharp edges of the threaded bolt during normal vehicle operation and shifting.

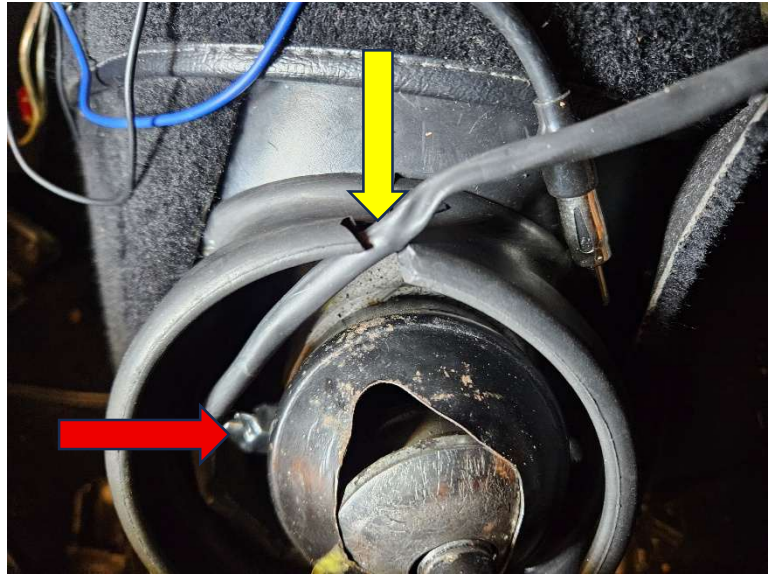


Figure 9/ Routing Preparations

Next, locate the rubber shift-lever boot and identify the 12 o'clock position. At this location, carefully cut a small V-shaped slot in the boot, as shown by the yellow arrow in Figure 9. The slot should be just large enough to allow the shift-knob harness to pass through without being pinched or stretched. This modification provides a controlled exit path for the harness as it leaves the transmission tunnel, while still maintaining a proper seal around the shift lever to minimize the entry of dirt, moisture, and noise.

Routing the Shift Knob Cable

The shift-lever cable exits the transmission tunnel as shown to the right in Figure 10. Start by carefully routing the cable downward toward the 180° position. Once positioned, wrap the cable counterclockwise around the outside of the gear-shift cap as illustrated. Make sure the cable does not make direct contact with the cap to prevent wear or abrasion over time.



Figure 10/ Cable Routing

As you guide the cable around the cap, maintain a smooth, even curve and check that it remains clear of any moving components or edges that could pinch or damage it. Finally, route the cable out of the transmission tunnel through the V-groove in the rubber boot. The V-groove provides a protected exit while minimizing friction and preventing potential chafing against the boot edges.

Section 10 – Verify Wire Kit Installation

Use the following table to verify that the kit wires have been properly installed per section 9.

Wire Kit Step	Electrical Connection	Completed
Step W1	White Wire w/Female spade to switched 12VDC	
Step W2	Black wire w/ring lug to chassis Gnd.	
Step W3	Yellow wire w/bullet terminal to interrupt switches	
Step W4	Red & Black wires to Ext. LED	
Step W5A	Yellow/Purple w/bullet terminal to solenoid	

Table 1/ Wire Kit Connections to vehicle electrical system

Section 11- Terminating the Wire Kit at your Solid-State Overdrive Controller

Overdrive Controller Terminal Block

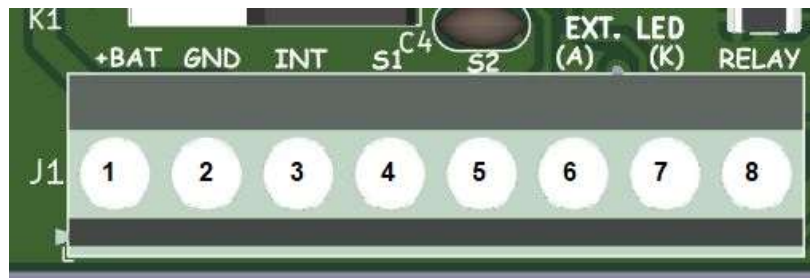


Figure 11/ Connection Terminal Block

Figure 11 shows a detailed view of the terminal block located on the Solid-State Overdrive Controller. This terminal block features eight labeled positions, each designed to accommodate a specific wire from the overdrive wire kit.

All electrical connections to the controller are made through this single terminal block, providing a centralized point for organizing and securing the wiring. Each terminal is clearly labeled with its function, indicating which circuit or signal should be connected to that position.

The labeling helps ensure correct installation, reducing the risk of miswiring and potential damage to the controller or vehicle electrical system.

When connecting wires, ensure that each conductor is stripped to the appropriate length and fully seated in its respective terminal. Tighten the terminal screws securely but avoid over-tightening, which could damage the wire or the terminal block itself. Properly routing and securing wires to this block not only facilitates reliable electrical operation but also makes future maintenance or troubleshooting easier.

Solid-State Overdrive Control Terminal Block Function Table

Terminal Name	Term. No.	Wire Color	Function
+BAT	1	WHT	Supplies switched 12V to control
GND	2	Black	Chassis Ground (black wire)
INT	3	Yellow	Connects to transmission interrupt circuit
S1	4	Red	Connects to overdrive switch
S2	5	Red	Connects to overdrive switch
EXT. LED (C)	6	Black	Connects to cathode of external LED overdrive indicator
EXT. LED (A)	7	Red	Connects to anode of external LED overdrive indicator
RLY	8	Yel/BLK	Overdrive relay drive output*

Table 2/Terminal Block Pin Assignments

To terminate the wires into your Solid-State Overdrive Controller, you will need a small flat blade screwdriver with an approximate 1/8" wide blade. Refer to Figures 6 and 11, as well as Table 1 in the previous sections, for guidance on wire placement and terminal identification.

Before cutting the wires, use your judgment to allow enough length for a service loop, which provides slack for future maintenance or adjustments. Strip roughly 1/4" of insulation from the end of each wire prior to termination.

Once stripped, carefully twist all wire strands together to ensure a that you have no stray strands of wire to ensure there are no accidental shorts between adjacent terminals. Insert the prepared wire fully into the appropriate terminal and tighten the screw securely, taking care not to over-tighten, which could damage the wire or the terminal block. Proper preparation and secure connections are essential for reliable operation of the overdrive controller.

Terminating Wires into the Terminal Block

Terminal 1- +BAT

Connect the white power wire (Wire W1) into the +BAT terminal which is terminal #1.

Terminal 2 – GND

Connect the black wire (wire W2) into the GND terminal which is terminal #2.

Terminal 3 – INT

Connect the yellow wire (wire W3) into the INT terminal which is terminal #3.

Terminal 4 – S1

Locate the 2- conductor cable from the shift knob. You can terminate either shift knob wire into terminal S1 which is terminal #4 as there is no polarization of this connection.

Terminal 5 – S2

Locate the remaining wire of the 2-conductor cable from the shift knob and terminate it into terminal S2 which is terminal #5 on the controller.

Terminal 6 – External LED (A)

Locate the 2-conductor harness from the External LED (wire W4) and connect the red wire to terminal #6 which is Ext. LED (A).

Terminal 7 – External LED (C)

Connect remaining black wire from the External LED 2-conductor harness (wire W4) to terminal #7 which is Ext. LED (C).

Terminal 8 – Relay

- Connect the stripped wire on the inline fuse (wire W5B) into terminal 8 which is labeled “Relay”.
- Locate the yellow/purple wire (wire W5A) and the male crimp spade terminal supplied with the yellow/purple wire. Trim the yellow purple wire to a length which provides a suitable wire loop after crimping the male spade connector to connect the yellow/purple wire to the female spade terminal on the inline fuse.

Reattach the controller circuit board into the plastic case and ensure the fuse holder and all wires are restrained using tape or tie-wraps. You can now proceed to the testing section.

Section 11- Testing your Solid-State Overdrive Installation

Follow these steps to complete the installation and testing of your Solid-State Overdrive Controller, ensuring safe operation and proper functionality.

Please refer to section 13 – Troubleshooting to resolve any possible issues.

1. **Wiring:** Using figure 6 and tables 1 & 2, 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 power up the electrical system.
4. **Power-On Test:** With the transmission in neutral, turn on the ignition switch. Looking at the 3 status LEDs on the front panel of the Solid-State Overdrive Controller, the red “Power LED” will illuminate, indicating that the controller is receiving power.
5. **Overdrive Lockout Test:** With the ignition switch in the “On” position and the transmission in neutral, the yellow “ARMED” LED is off. If you press the gearshift-mounted pushbutton the overdrive won’t engage. The overdrive controller locks out the gear shift mounted overdrive switch in this state. Check that if you select any “non-overdrive” gear including neutral, the gear shift mounted switch is disabled and the overdrive is not engaged.
6. **Overdrive Selection Test:** Shift the transmission into an overdrive gear. The yellow diagnostic “Armed” LED will flash, signaling that the Solid-State Overdrive Controller recognizes that you have selected a valid overdrive gear and has unlocked the switch on the gear shift knob. 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 correctly senses gear position.
7. **Engaging Overdrive:** With the yellow “Armed” LED flashing, press the shift knob overdrive switch once. The following should occur:
 - o The external dash-mounted LED will illuminate, confirming overdrive activation.
 - o You should hear a click from the overdrive solenoid as the overdrive engages.
 - o The green “Enabled” diagnostic LED will turn on, indicating that overdrive is fully active.
8. **Cycle Overdrive:** Pressing the switch again will disengage the overdrive, turning off the green LED and the external dash LED. Alternately, if you shift into neutral while overdrive is engaged, the yellow “Armed” LED will turn off, the pushbutton will be inactive, and the overdrive will automatically disengage.
9. **Repeat Activation:** Shifting back into an overdrive gear will reactivate the yellow “Armed” LED and enable the pushbutton. While the system is “Armed,” you can cycle the overdrive on and off repeatedly to confirm consistent operation.
10. **Completion:** After testing, reconnect the white wire to the ignition coil if it was temporarily disconnected. Ensure all wires are properly secured and that no loose connections or exposed terminals remain.

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

Section 12 – Functional Overview

Solid-State Overdrive Controller Inputs

The Solid-State Overdrive Controller continuously monitors two key status inputs to ensure proper operation and safety. The first input is the interrupt switch, which is connected to Terminal 3. This input detects conditions that require immediate disengagement of the overdrive, such as shifting into neutral or other scenarios that could damage the transmission if overdrive remained engaged. The interrupt switch acts as a safety override, preventing accidental or unsafe activation of the overdrive system.

The second input consists of the overdrive switch, which is connected to Terminals 4 and 5. This switch allows the driver to manually engage or disengage the overdrive function via the gearshift-mounted pushbutton. The controller uses these inputs to determine when the overdrive should be activated, ensuring it only engages when the transmission is in a valid overdrive gear and the system is “Armed.”

By monitoring both the interrupt switch and the overdrive switch simultaneously, the controller provides a reliable, fail-safe method for controlling overdrive operation. The combination of these inputs allows the system to automatically disengage overdrive when necessary while giving the driver full control over engagement when conditions are safe. Proper wiring and connection of these terminals are critical to ensure accurate signal detection and overall system functionality.

Gear shift Mounted Overdrive Switch

The Solid-State Overdrive Controller is designed to work with a “momentary” style overdrive switch rather than the stock “On/Off” style switch. A momentary switch only completes the circuit while it is being pressed, providing a brief input signal to the controller, which allows precise control over the engagement and disengagement of the overdrive system.

When the gearshift-mounted overdrive switch is depressed while the transmission is in a valid overdrive gear, the controller interprets this input and activates the overdrive by applying power to the overdrive relay. This engagement powers the overdrive solenoid, enabling the transmission to shift into overdrive smoothly and safely.

The controller also allows the driver to cycle the overdrive on and off by repeatedly pressing the momentary switch. Each press toggles the overdrive state, turning it on if it is off, and off if it is on, while maintaining full protection from unsafe conditions. Because the system only responds to brief, deliberate inputs from the momentary switch, it reduces the risk of accidentally leaving overdrive engaged or causing damage due to extended or unintended switch activation.

This design ensures a more reliable and user-friendly operation compared to the stock On/Off switch, providing both visual feedback through diagnostic LEDs and consistent control over the overdrive system while the vehicle is in motion. Proper installation and wiring of the momentary switch are critical for the controller to function correctly and safe.

Solid-State Overdrive Control Outputs

Relay/Solenoid Drive Output

The Solid-State Overdrive Controller features a dedicated 15-amp relay/solenoid output designed to directly power an A-type overdrive solenoid. This output is engineered to provide sufficient current to reliably engage the overdrive solenoid while maintaining safe operation under normal driving conditions.

To protect both the controller and the vehicle's electrical system, the output includes a flyback diode. The flyback diode prevents voltage spikes generated when the inductive load of the solenoid is de-energized from damaging the controller's circuitry. In addition, a Transient Voltage Suppressor (TVS) is integrated, which absorbs and mitigates any transient voltage surges that could occur due to electrical noise or sudden changes in the system, further enhancing reliability. Figures 1A and 1B illustrate how the flyback diode and TVS are connected in the circuit to safeguard the controller during solenoid operation.

For additional protection, a 10-amp inline fuse is installed between the controller and the solenoid. This fuse acts as a secondary safeguard, preventing excessive current from reaching the solenoid in the event of a short circuit or component failure. Together, these protective measures ensure that the overdrive solenoid is powered safely, the controller remains protected from electrical damage, and the overall system maintains long-term reliability. Proper installation, including correct routing of wires and secure connections, is essential to ensure the relay/solenoid output functions as intended.

External LED Overdrive Indicator

The external LED indicator will turn on anytime the overdrive is turned on.

Section 13- 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. 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. Verify that the interrupt switches are working correctly.

Dash Mounted LED does not illuminate:

Check the external LED wiring connections into the Solid-State Overdrive Controller. The red wire should go to the **(A) terminal 6** and the black wire should go to the **(C) terminal 7**.

The solenoid is not engaging but the green “Engaged” LED lights:

Inspect the solenoid wiring and fuse.

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 10:00AM – 5:00PM EST.