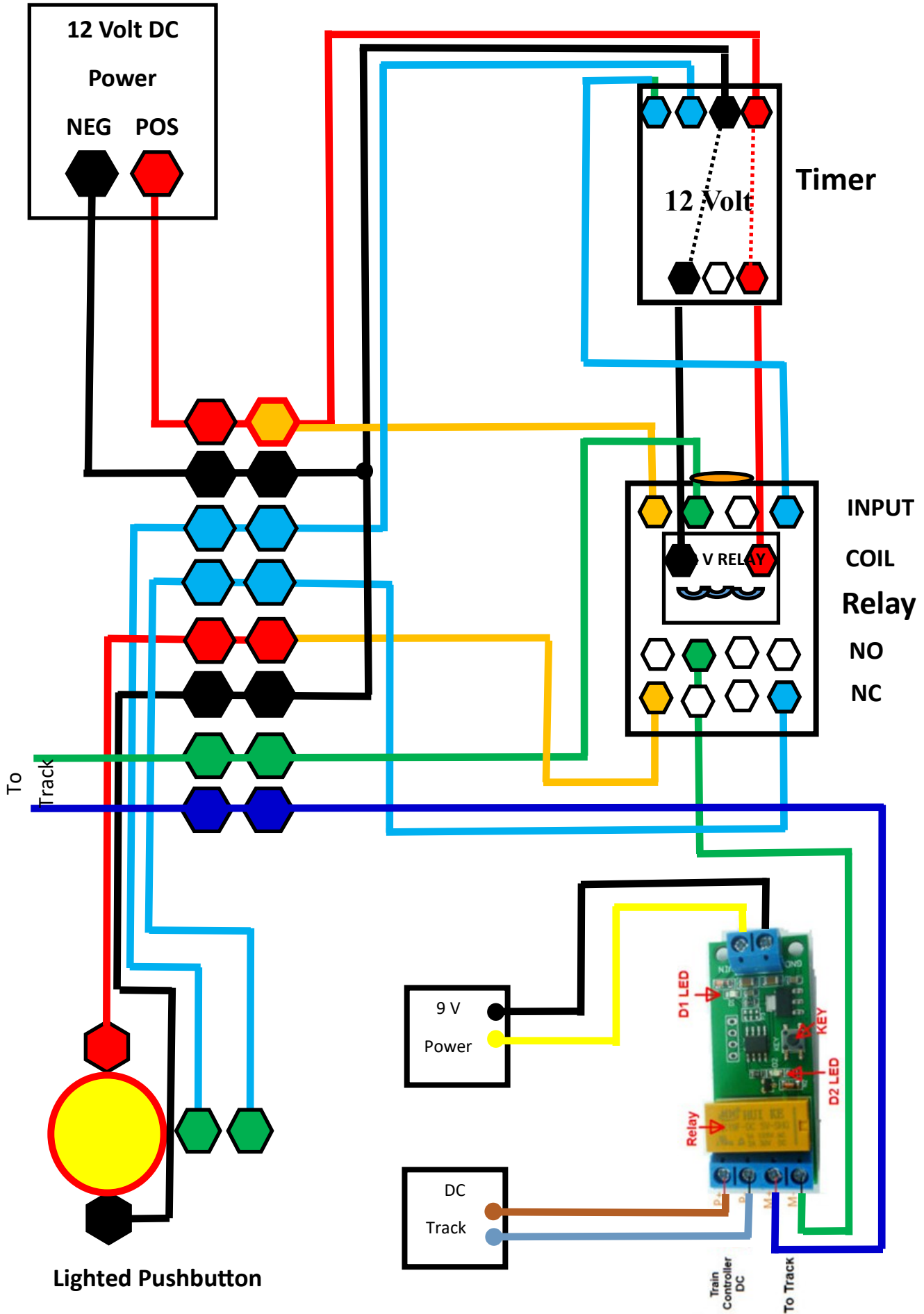


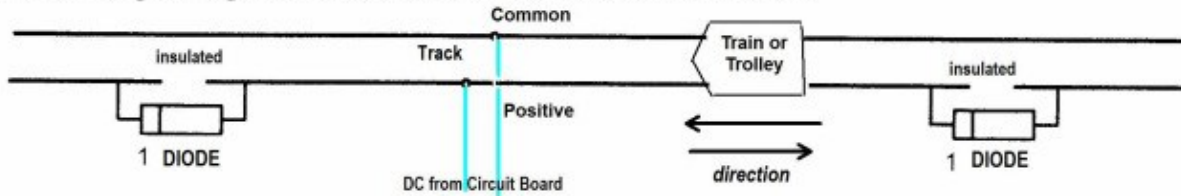
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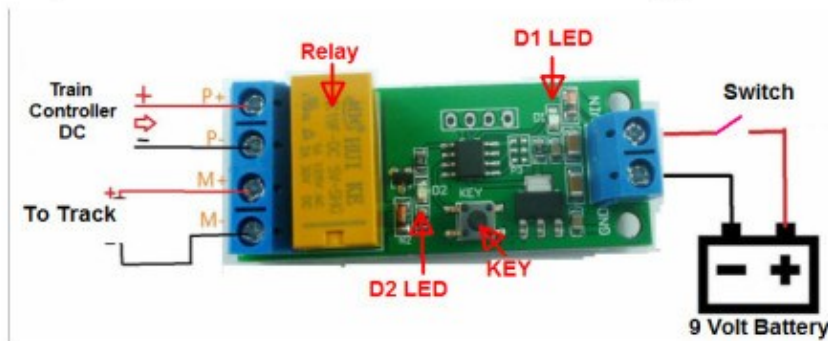
## Install a Point to Point Auto Reversing Relay Module (all scales-DC only)

Robert J. Wilkins April 2020

This automated system allows a train, tram or trolley to go from one point to another, stop, pause for a short period and return to the start again. Plus repeat the process over and over without intervention. The system uses a relay board and 2 diodes set at both ends of the track connecting across an insulated rail joiner to direct current flow in alternating directions. The system works with N, HO, S and O scales operating in DC mode. It will not work in DCC mode.



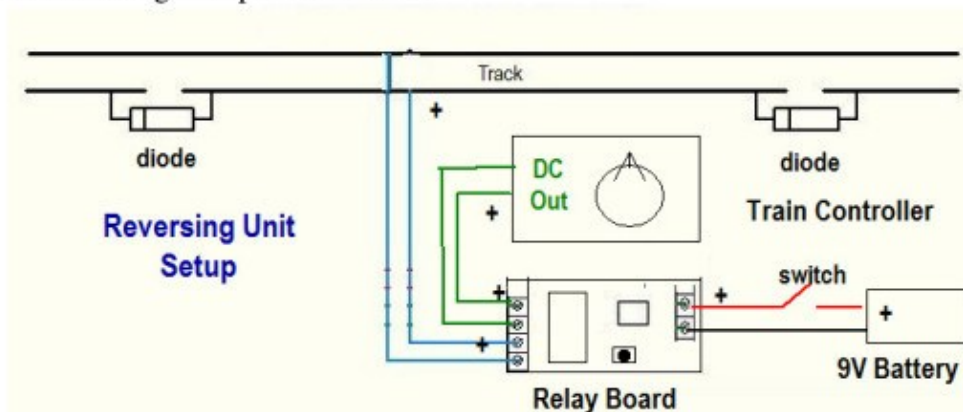
When the train proceeds to one end (Travel time) and crosses the insulated end it stops. After a slight pause (PauseTime) which can be set from a few seconds to several minutes the relay activates to reverse the polarity, the train or trolley returns to the point of origin and the sequence repeats. This Reversing Relay Board module is used to control this reversing process automatically.



The unit uses **9V Battery** or 9 Volt DC power source, preferably with a **switch** to turn the unit on and off. The battery leads are connected to the 2 Blue connector plugs labeled VIN and GND. The positive red wire to the VIN and black negative to the GND connector. The Train Transformer variable DC output wires connect to the terminals (**P+ and P-**). Wires from connectors **M+ and M-** are attached to the terminals on the Track. The Relay unit uses a DPDT (double pole double throw) circuit to activate the reversing of the polarity to the track. Two indicator **LEDs D1 and D2** are present on the board. The **D2 LED** will light OFF and ON during the Relay cycling times. The **OFF time** will be set to the Travel time plus the Pause time in the forward direction and the **ON time** will represent the Travel time and Stop time in the reverse direction. The **KEY** push switch is used to set the relay's ON and OFF times. Setting these times are outlined in Step 4 below.

### How to set-up the Back and Forth Relay unit.

The track and wiring set up is illustrated.



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1. First **set out the track design** that you wish to use. Set the power to the track terminals in the middle of the layout. Make sure the locomotive moves forward when the controller is in forward mode. Run your locomotive, train or trolley at the desired speed from one end to the other to determine the Travel time. Decide how long the train will Pause. Add these times together to determine the **OFF time** and **ON times** and for the relay. These times will be used to program the Relay board.

2. Next determine how long the train or trolley is in length as this will determine where to insulate the track at both ends. The locomotive will stop when it passes over the insulated point. Install rail insulator rail joiners at these 2 points or cut gaps in the track.

3. **Solder the two diodes** across on the outer sides around the insulated track points. The grey band on the diode indicates the cathode side. *Both diodes must face in the same direction.*

### 4. Program the Relay Board (*This is can be done before connecting the board to the track*)

The Relay Board has 2 modes of operation, “**Working mode**” and “**Setup mode**”. When power is switched on **LED D1** will blink as the board enters the “**Working mode**” with the **LED D2** going ON and OFF as the Relay cycles. “**Setup mode**” is used to program the time of each ON and OFF cycle.

To enter **Setup mode** press the **KEY** switch for 2 seconds. **D1** will light. If **D2** is off you will be programming the **OFF time** which is the calculated forward travel time plus the pause time in seconds. Press the **KEY** twice, **D1** will go out, press **KEY** again and **D1** will start blinking. Allow the blinking for as long as the **OFF time** calculated. (eg 15 seconds). Now press the **KEY** again to stop the blinking and record the **OFF time** onto the chip. **D1** will remain on for up to 10 seconds. During this time you can press the **KEY** for 2 seconds to program the **On Time** or simply re-power the board. In **Setup mode**, if you do not press the **KEY** within 10 seconds the board will reset to the **Working mode**.

To program the **ON time** alone, press the **KEY** switch for 2 seconds, **D1** will light and **D2** will go out, Press the **KEY** again for 2 seconds and **D2** will light so both are on. With both lit press the **KEY** twice and **D1** will go off. Press the **KEY** again and **D1** will again blink. **D2** will remain lit. Allow **D1** to blink for the length of time for the reverse travel plus the pause time in seconds. Press the **KEY** to stop and record the **ON time**. Again wait 10 seconds for the board to reset or simply re-power the board to enter the **working mode** which should no cycle with the new relay times.

5. De-power the board and now connect the track wires to the M+ and M- terminal connection plugs.

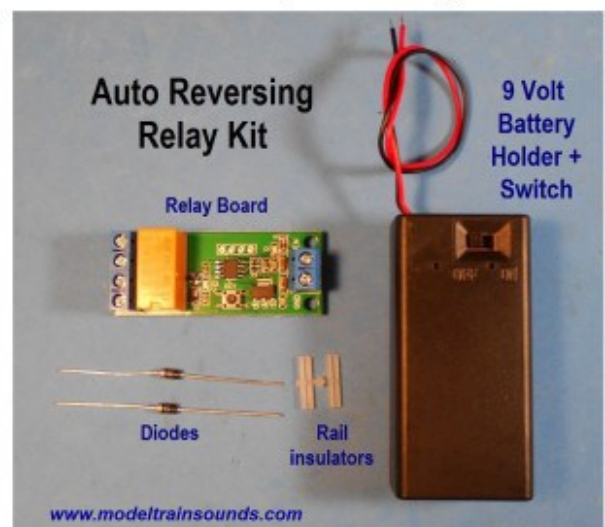
6. Connect the two wires from the variable DC side of the controller transformer to the P+ and P- connection plugs.

7. The system is ready to test. Power the Board on and place the test engine on the track near the middle. Turn on the controller to move the locomotive to the desired speed. When it crosses the insulated connection it will stop, pause and reverse the motion. After this step it should operate to the correct **ON and OFF times**.

8. If necessary reprogram the Board using the **KEY** to get the desired travel and pause times you want.

To try this Project a Kit containing the Reversing Relay Board Module, a 9V Battery Holder with switch, 2 diodes and insulators for HO scale can be purchased at the website [www.modeltrainsounds.com](http://www.modeltrainsounds.com)

A video and in color instructions can be found at this website. Project # 16



Instructions to set up the timer

Enter Setup—Press and hold **“KEY BUTTON”** down for 2 seconds

Recording off time

Press the **“KEY BUTTON”** twice. D1 should go out

Press the **“KEY BUTTON”** once more. D1 will start blinking

Allow up to 15 seconds

Press the **“KEY BUTTON”** once more. Recording time.

D1 will stay on for up to 10 seconds

Recording time one time

Press and hold the **“KEY BUTTON”** down for 2 seconds.

Or you can Repower the board by turning off the switch  
and then back on again

Press the **“KEY BUTTON”** for two seconds and the D1 will light.

Press the **“KEY BUTTON”** for 2 more seconds again

D1 will start blinking

Allow D1 to blink for up to 15 seconds

Press the **“KEY BUTTON”** to stop and record the ON time.

Again turn onff the board and back on.

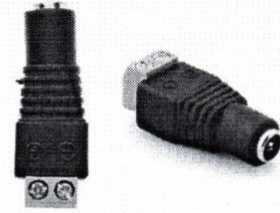
The timer should now be in the working mode and running.

## Automatic Reversing Unit Accessories

Several accessories are available at the website [modeltrainsounds.com](http://modeltrainsounds.com) to enhance this product. See the Order page under Project 16.

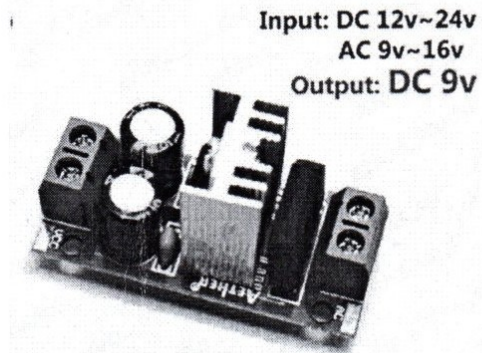
### 1. DC Adapter plug for using a wall plug in Power Source.

Instead of using a 9 Volt battery to power the automatic reversing module you can use a plug in wall adapter rated for 6 to 12 Volts DC current output. We recommend a 9 Volt unit . In order to use the power pack an adapter plug is required to interface the unit to the power unit. This adapter plug has a receptacle that accepts the 5.5 x 2.1mm plug on most of these plug in units. The screw down terminals allow wires to connect to the auto reversing unit for DC input .



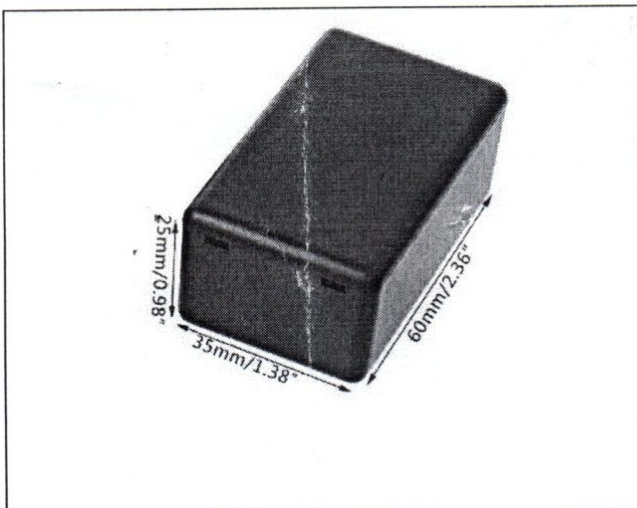
### 2. 12 VOLT AC to 9 Volt DC Power Converter.

This 12V AC to 9 V DC converter allows for the use of many older toy train controllers that have a 12 Volt alternating current (AC) source usually used for accessories. This AC voltage source is variable, around 12 VAC but can be converted to a stable direct current (DC) using this converter module that provides a regulated constant 9 Volt DC for powering the automatic reversing module.

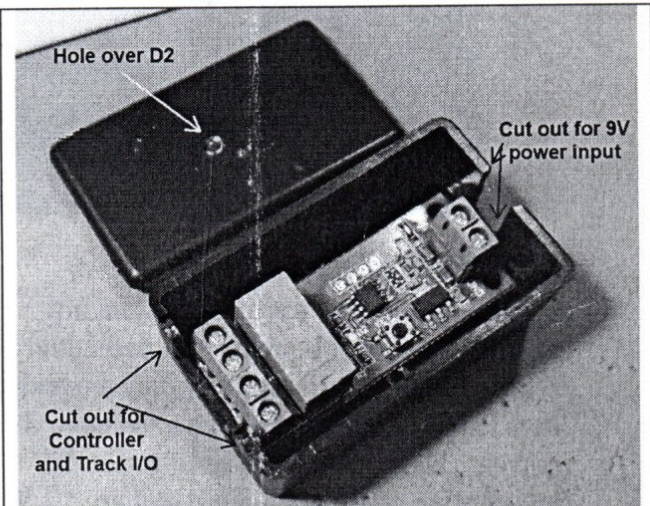


### 3. Relay module Project Box.

This small black plastic project box can be modified to house the automatic reversing relay board. Cut out sections in the side to accommodate the wires and drill a hole in the top to view the D2 cycling LED. The box is supplied unmodified and requires cutting the access holes.



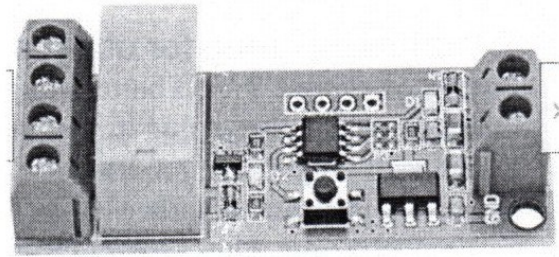
The box is black with dimensions 60x36x25mm / 2.36"x1.38"x0.98"



This box was prepared using a Dremel rotary tool and a rotary diamond cutting disc. A hole was drilled over the location of the D2. A clear plastic jewel cut from a clear white 3mm LED was glued into the 3mm hole . When the D2 LED lights it will also illuminate,

#### 4. Replacement Relay Module

The Relay module relies on an electromechanical mechanism to switch the current direction. Performance is rated for over 1 million switches. With continuous use these modules may fail. If a replacement module is needed it can be ordered separately.

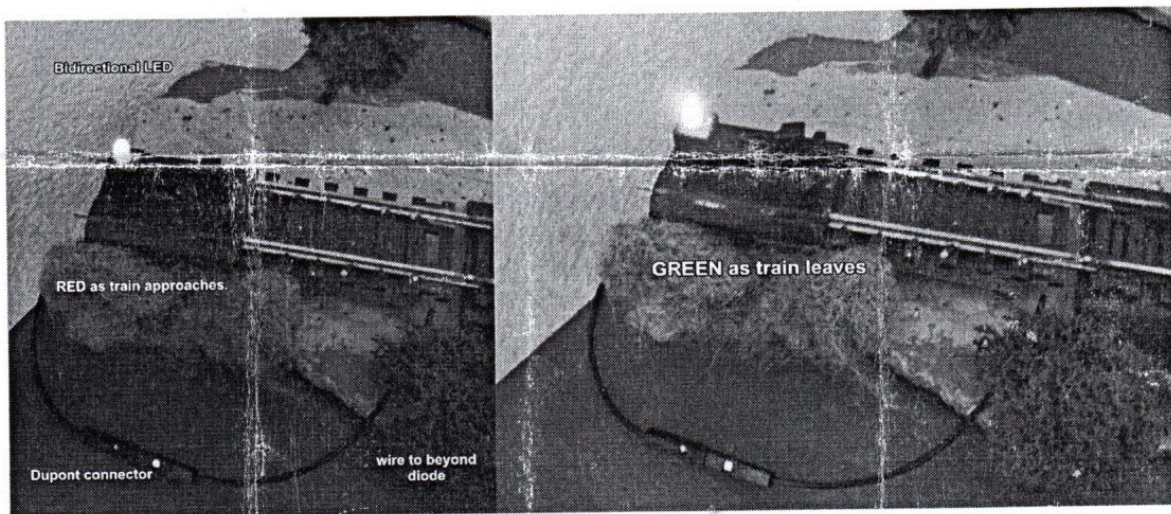


#### 5. Lighted Bumpers for the Reversing Unit Layout.

These modified Atlas bumpers are specifically wired for use with a automatic reversing circuit.

A bidirectional LED Red/Green aspect is included so that the red lights when the train or trolley approaches the end bumper and changes to green when the locomotive leaves.

The unit come with a wire soldered on the side of the track which contains the insulator and diode, the positive side. A Dupont connector plug, shown here, is attached to the end. The matching plug wire is included and can be lengthened with additional wiring soldered on that extends to be soldered to the track beyond the insulator and diode. This ensures that the bumper is electrified even when the end track is not.



#### 6. POWER UNITS

A number of older train controllers are available that can be used as a dedicated power source for this project. Examples are shown here. These controllers have a variable direct current (DC) that can be used to set the locomotive or trolley speed and an 12 Volt AC source that can be used to power the auto reversing module *when* the 12V AC to 9 V DC converter (Item 2) is used . These units are not listed for sale at [modeltrainsounds.com](http://modeltrainsounds.com). However we occasionally find some and list them at the R and B Store on ebay.

