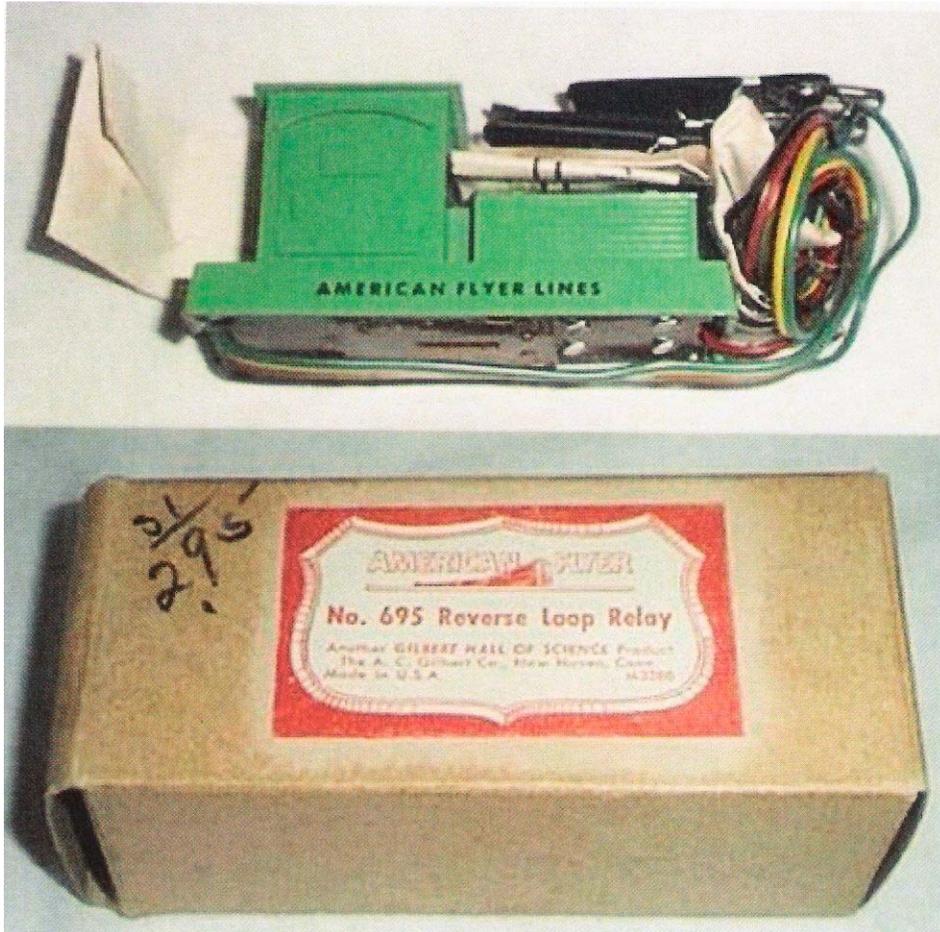


## Detailed Explanation of Function of AF 695 Reverse Loop Relay

The American Flyer (AF) Reverse Loop Relay sold for \$ 2.95 and \$ 3.95 respectively when manufactured in 1955 and 1956. The Reverse Loop Relay is shown below.



Picture courtesy of the "Gilbert Gallery"

### 1. Relay Description

The relay has 3 wires that exit one end and 4 wires that exit the opposite end. These wires connect as follows (see the switch connection diagram below):

- A. The 3 wires connect to the AF remote control switch as follows:
  - The black wire connects to the black switch control post (common).
  - The green wire connects to the green switch control post that is energized to give a straight switch position.
  - The red wire connects to the red switch control post that is energized to give a curved switch position.

B. The 4 wires connect to the track as follows:

- The black wire connects to the outside rail of the track at a point just ahead of the switch on the single-track side.
- The red wire connects to the inside rail of the track at a point just ahead of the switch on the single-track side.
- The green wire connects to the outside rail on the straight track that exits the two-track side of the switch.
- The yellow wire connects to the inside rail on the curved track that exits the two-track side of the switch.

The contact inside the reverse loop relay connects power from the black track power wire to the green track wire when the switch is energized for the straight position. The contact inside the reverse loop relay connects power from the red track power wire to the yellow track wire when the switch is energized for the curve position.

## 2. AF Conventions

It is important that the AF conventions be observed when making all the wire connections for the reverse loop. The items of importance are:

### A. Base Connection

- The AF convention defines the transformer "base" power lead ("U" terminal on Lionel transformers) as the power connection to the outer track rails.
- The "base" connection serves as the polarity reference for all other connections with regard to the reverse loop power.

### B. Switch Set for Two Train Operation

- The remote control track switch has a slide button located between the straight and curve tracks that exit the switch. This button needs to be pushed toward this end of the switch to set the switch for "Two-Train" operation.
- In two-train operation the frog of the remote control switch disconnects the power from inner rail of the track on the single-track end of the switch from the inner rail of the reverse loop track when the switch is in the turnout position.

### C. Location for Track Power Pickup

- The track power that connects to the red and black wires on the reverse loop relay must be derived from the first section of track that connects to the single-track end of the switch.

- The black wire always connects to the outside rail and the red wire always connects to the inside rail.

#### D. Isolation of Solid Rails of Switch

- The track rails of the remote control switch that pass through the switch as solid rails must be insulated with insulating track pins.
- In cases where both turnouts of the switch are part of the reverse loop then both solid rails on the turnout side of the switch will require insulating pins.
- In the rare case where the reverse loop contains the turnout of one switch and the straight track of the second switch then the switch with the straight track in the reverse loop will require an insulating track pin in the solid rail at the single-track end of the switch.

#### E. Separation of Power Feeder Wires

- It is important to remember that the power connections inside the reverse loop have a reverse connection from those outside of the loop.
- Many people use multiple track power feeder wires spaced along sections of track to insure good power connections and minimum voltage drop. Care must be taken to insure that feeder wires inside and outside the reverse loop are never connected together or a short circuit will be created.

### 3. Track Switch and Reverse Loop Diagrams

The reverse loop relay and the remote control switch work together to accomplish reversing the power connections for the reverse loop to insure that a short circuit is avoided.

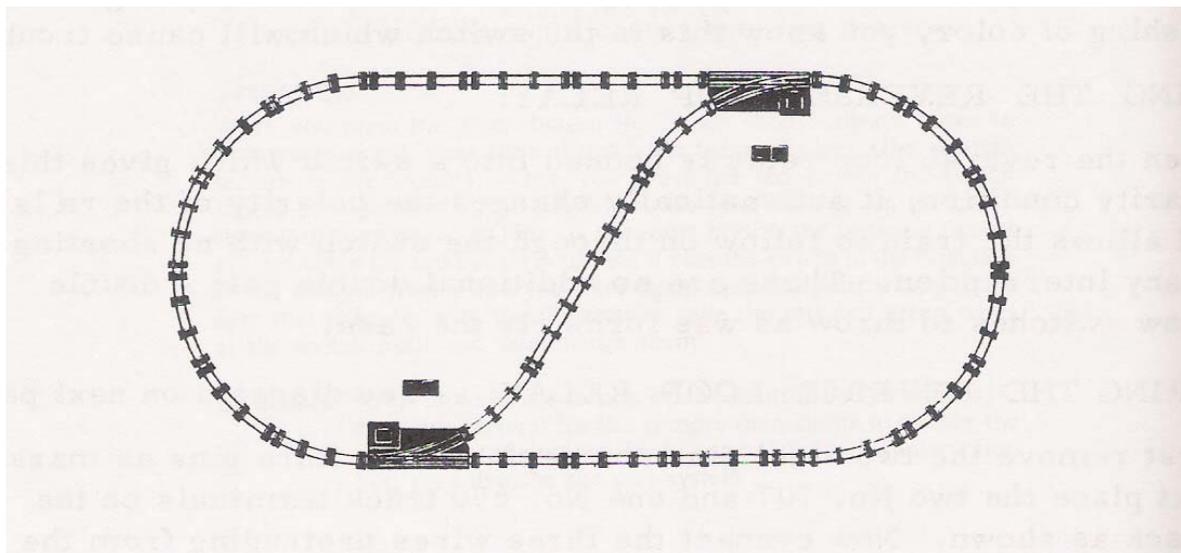


Diagram courtesy of the "Complete Service Manual for American Flyer Trains"

## WIRING THE REVERSE LOOP RELAY:

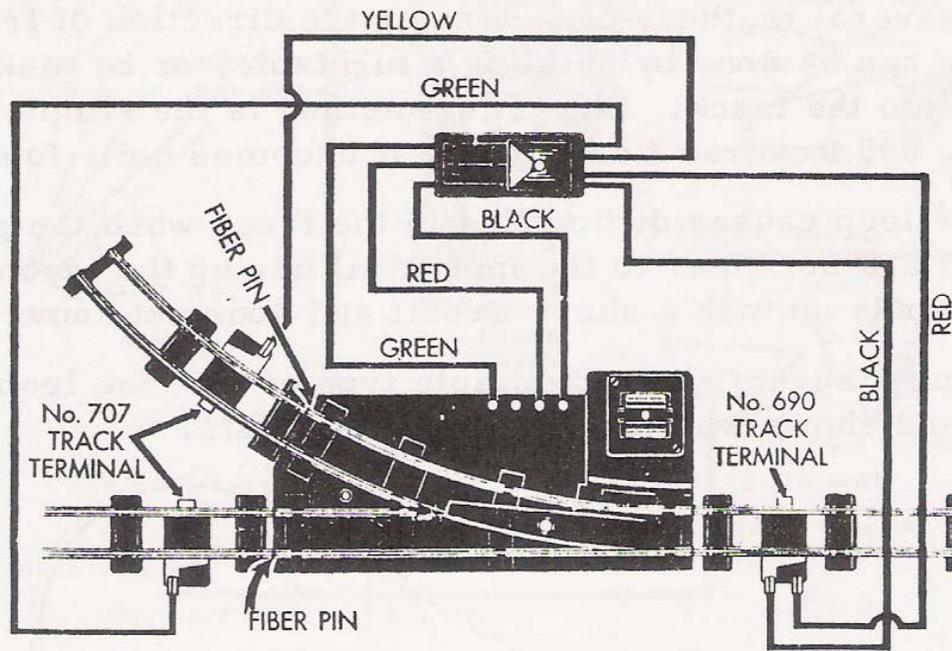


Diagram courtesy of the "Complete Service Manual for American Flyer Trains"

A Reverse Loop Relay will be required for every track switch that is part of the reversing loop. The reverse loop diagram above has two track switches each with its own Reverse Loop Relay. Each Reverse Loop Relay is wired identical and wired as shown in the diagram above "Wiring the Reverse Loop". The two track switches shown in the reverse loop diagram should be operated from a single switch controller. The controller is wired to one-track switch in the normal manner matching the wire colors with the colors of the terminal posts on the switch. Wires are connected from this track switch to the second track switch following the same color codes, thus providing simultaneous operation of the switches.

### 3. Description of Reverse Polarity Sequence

#### A. Polarity connections when track switches are in the straight position

- The frog of the track switch connects power from the red track power wire located on the single-track end of the switch to the inside rail of the reverse loop. The frog disconnects power from the inside rail of the turnout as a result of the two-train switch setting.

- The Reverse Loop Relay connects power to the outside rail of the reverse loop (black power wire of Reverse Loop Relay connects to green wire of the relay). This provides a connection to jumper power over the insulating track pin.

#### **B. Polarity connections when track switches in turnout position**

- The frog of the track switch connects power from the black power wire located on the single-track end of the switch to the inside rail of the reverse loop. The frog disconnects the red track power wire from the inside rail of the reverse loop as a result of the two-train switch setting.
- The Reverse Loop Relay connects power from the red relay wire to the outside rail of the reverse loop (red power wire of Reverse Loop Relay connects to yellow wire of relay). This provides a connection to jumper power over the insulating track pin.

#### **4. Avoiding Train Derailments**

The track diagram above shows the reverse loop on the right side of the diagram. The train enters the reverse loop via the lower track switch. Both track switches are in the turnout position at this time. The train continues around the loop until it approaches the lower track switch again. The train will derail at this switch unless the switch is set to the straight position. The derailment can be avoided by placing a 697 Pressure Track Trip under the track within the reverse loop just ahead of the lower switch. The track trip is wired so that the yellow track switch terminal post connects to the green track switch terminal post when the weight of the train causes the normally open contact of the track trip to close. The action of the track trip will put both track switches in the straight position (since the control for the two track switches is wired together) and thus eliminate train derailments. The 697 Pressure Track Trip is shown in the diagram below.



Picture courtesy of the "Gilbert Gallery"

The power polarity switching is handled by the combination of the Reverse Loop Relay and the Remote Control Track Switches in such a way as to prevent short circuits. They also provide continuous operation of the train in and out of the reverse loop without the need to start and stop the train to switch polarities of the power.

#### **5. Inexpensive Replacement for the AF Reverse Loop Relay**

The 695 Reverse Loop Relay is somewhat rare and may be both difficult to locate and expensive to buy. A reverse loop relay is required for every track switch that is contained within the reverse loop. These items have been selling for 100 to 200 dollars or more on Ebay. The relay can be replaced for less than 15 dollars by properly wiring a Double Pole Double Throw (DPDT) two coil (set & reset) latching relay. Another article is being written describing the design of this replacement including giving the source of supply for all the required materials.

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