

**Primary-Secondary Relay Combination
For Improving D. C. Track Circuit
Shunting Sensitivity**

Purpose: The primary-secondary track relay combination provides reliable track circuit operation for light-weight trains and where conditions of infrequent traffic or poor ballast resistance make operation difficult with standard-type track relays. The primary-secondary combination also provides proper time margins for successive track circuits as required in various signal circuits even with the shortest train equipments.

Explanation of Operation: The operation of the Union primary-secondary combination is shown schematically in Diagram A, Plate E-4934. When both the primary and secondary relays are deenergized, the primary relay coils have terminal S1 connected with terminal S2 through the back contact of the secondary relay to make the full primary coil winding effective for pick-up. When the primary relay picks up, it energizes the secondary relay, and when this relay picks up at the end of the retardation interval it transfers the primary relay to its holding circuit by connecting terminal S1 to S3 and opening S2. The continuity contact on the secondary relay prevents opening of the primary relay circuit during this transfer. Part of the winding of the primary relay is thus cut out and a resistance, which is wound in the coil, is substituted so that when the train shunt is applied, the current has to be reduced to a value only slightly below the pick-up value in order to make the relay release. This change in coil connections also makes the relay shunt out very rapidly.

If shunting conditions are particularly severe, further improvement can be obtained by using the series resistor as shown between the rails and the primary relay, together with an increased voltage across the rails. (See Test Run No. 5 as discussed in U.D. 236).

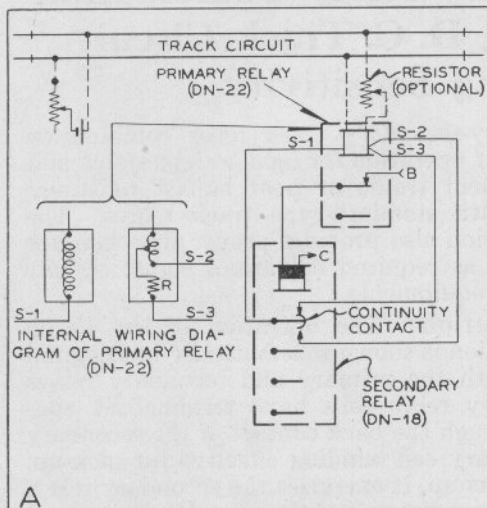
The circuit shown in Diagram B is applicable at locations where a neutral track relay controls a polarized line relay at the same location. In this application the DP-21 Relay may perform the functions of three relays: (1) slow pick-up secondary relay, (2) standard polarized relay, and (3) slow-release repeater of the polarized relay. The DP-21 Relay is slow pick-up and is made to release quickly in this application by opening the circuit of the retaining coils at the same time that the main coil circuit is open.

Advantages of the Union Primary-Secondary Combination:

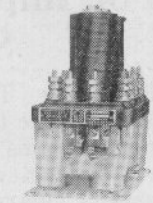
1. Increased shunting sensitivity because of high release value and extremely quick shunting.
2. Low track circuit operating current (only 0.062 amp. working value for the 4-ohm relay, which is commonly used. Other resistances are available to suit individual requirements).

(Continued Under List)

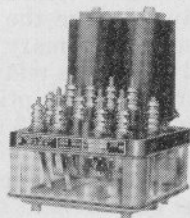
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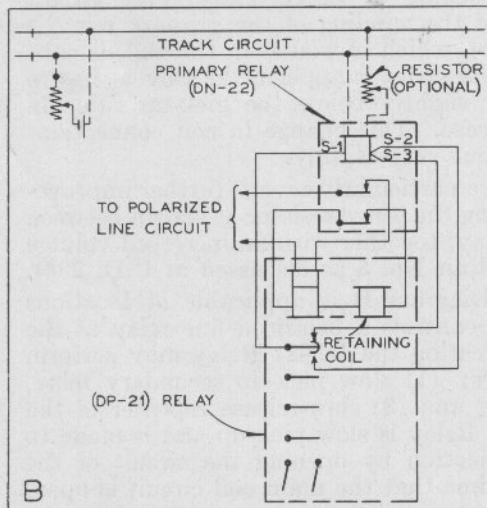
PRIMARY-SECONDARY RELAY COMBINATION USING STYLE DN-22 PRIMARY RELAY AND STYLE DN-18 SLOW PICK-UP, ORDINARY RELEASE SECONDARY RELAY.



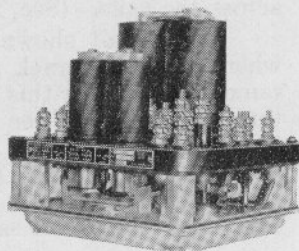
Style DN-22 Primary Relay



Style DN-18 Secondary Relay



PRIMARY-SECONDARY RELAY COMBINATION USING STYLE DN-22 PRIMARY RELAY AND STYLE DP-21 SECONDARY RELAY CONNECTED TO BE ORDINARY RELEASING. USED WHEN CONTROL CIRCUIT IS POLARIZED.



Style DP-21 (Polarized) Secondary Relay

Primary-Secondary Relay Combination

Primary-Secondary Relay Combination For Improving D. C. Track Circuit Shunting Sensitivity

The primary or track relay is always a Style DN-22 two front and one back dependent contact relay Plate E-4935 with special winding on one coil. The secondary or track repeater relay may be either a Style DN-18 relay (Plate E-4930) for neutral control circuits or a Style DP-21 relay (Plate E-5121) for polarized control circuits. Each secondary relay is equipped with one continuity contact on the neutral armature. Shock absorber bases and wall mounting brackets if required for secondary relays may be ordered from Plates E-4975 or E-5168. Style DN-22 primary relays are equipped with shock absorber bases. Orders should mention whether for shelf or wall mounting. (Refs. 56 or 57, Plate E-4978).

Order by Plate, Piece, Reference and Description

Piece	Ref.	Description	Drawing Reference
	A	Primary-Secondary Relay Combination consisting of one . . . ohms Style DN-22 primary relay Plate E-4935 and one (4 or 6) point Style DN-18 (neutral) secondary relay Plate E-4930. Mention number and type (lead or Edison storage, or primary) cells available for operation of the secondary relay.	
	B	Primary-Secondary Relay Combination consisting of one . . . ohms Style DN-22 primary relay Plate E-4935 and one (4 or 6) point Style DP-21 (polarized) secondary relay Plate E-5121. Mention number and type (lead or Edison storage, or primary) cells available for operation of the secondary relay.	

(Continued from first page of Plate E-4934)

3. Protection against intermittent loss of shunt because of slow pick-up, quick-release secondary relay and special continuity contact which transfers the primary relay to its holding circuit before closing the signal control contacts.
4. Directional setups that depend upon operation of relays in successive track circuits are definitely maintained. When used for two track circuits in succession, the quick-releasing, slow pick-up characteristic of the secondary relays will provide time for the pick-up of a standard relay over the back contacts of the two secondary relays regardless of the length and speed of operation of the cars involved.
5. High-efficiency secondary relays. These can be operated from signal battery if available, or from track battery used as local battery. For example, a 90-ohm DN-18 relay is used for 2-Volt battery.