LIONEL SERVICE MANUAL

OTTP.95

LIONEL "E-UNITS"

The E-Unit is a solenoid-operated rotary sequence switch used to reverse locomotive motors by interchanging the connections of the motor armature with respect to the motor field. The E-Unit is mounted in the locomotive and consists of a solenoid coil connected across the track, a plunger-and-pawl assembly, a rotating plastic drum equipped with copper contact inserts and a central toothed wheel, and an arrangement of solid silver contact springs riding on the drum. The E-Unit is also equipped with a lever-type switch or a plug-and-jack connection which are used to open the solenoid coil circuit, thus disconnecting the E-Unit. A typical wiring diagram of the E-Unit circuit is shown schematically in Figure 2.

Normally, i.e. when the solenoid circuit is closed and the solenoid coil is energized by track voltage, the plunger-and-pawl assembly remains drawn into the upper end of the solenoid tube, as shown in Figure 1 below. When track voltage is interrupted for any reason, or when it drops below the minimum 'holding' voltage of the solenoid (4-5 volts), the plunger drops and the pawl engages the next tooth on the drum. When the voltage is reapplied, (7-8 volts minimum), the plunger is drawn into the tube and the pawl rotates the drum into a new position. A cycle of operation consists of four positions: Forward, Stop, Reverse Stop. Since the coil rotates 45 degrees with each movement of the plunger, one complete rotation of the drum produces two full cycles.

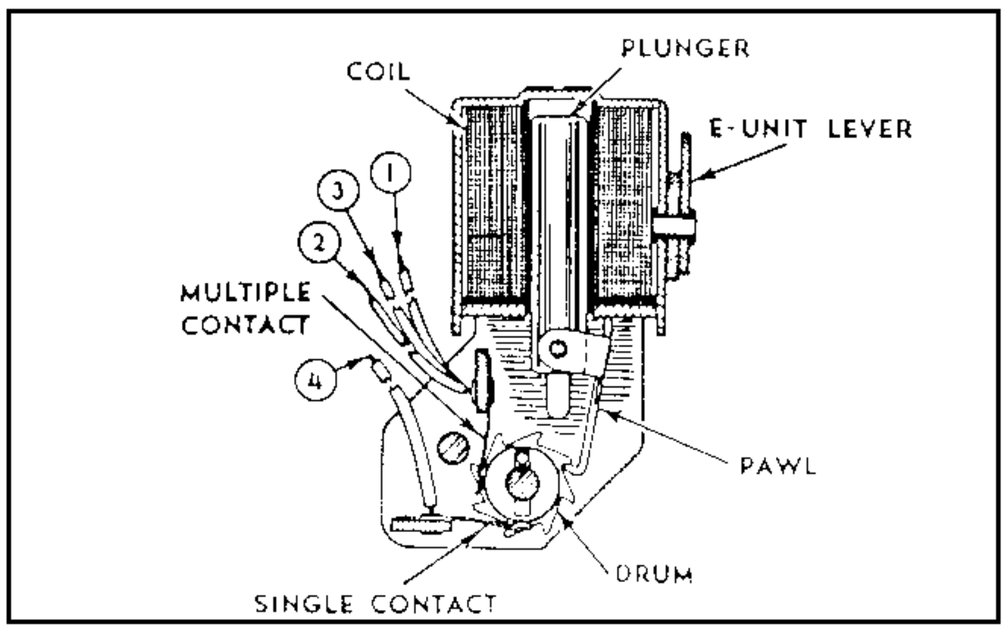
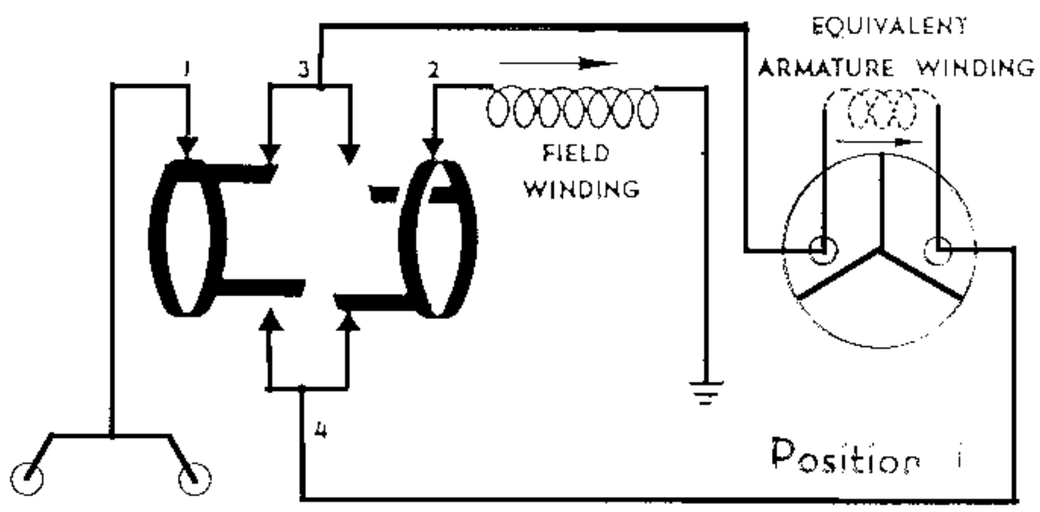
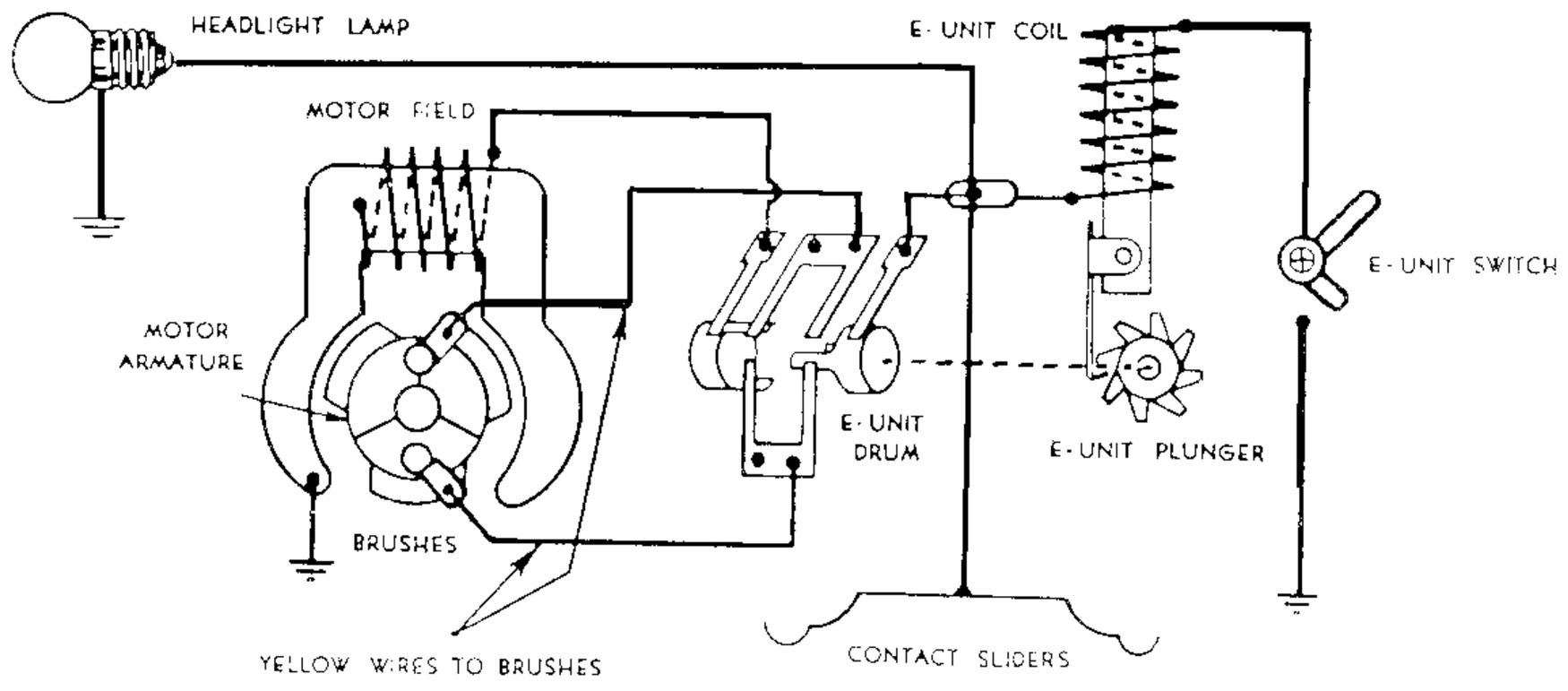


Figure 1 - Cross-section view of a E-Unit



In Position 1 the drum is turned so that contact springs 1 and 3 are connected by a metal insert on top of the drum while contact springs 2 and 4 are similarly connected by an insert in the bottom of the drum. Current from center rail follows the path in the direction of the arrows through contacts 1 and 3 to the motor armature and then through contacts 4 and 2 to the motor field and to the outside or 'ground' rail. In this position the direction of the current through the field and the armature is the same so that the motor turns 'forward.'

Figure 2 - Schematic Wiring Diagram of a Typical E-Unit Installation



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