EMD MAINTENANCE INSTRUCTION

TESTING AND/OR SETTING AUTOMATIC TRANSITION MODEL E8 AND E9 LOCOMOTIVES

INTRODUCTION

This bulletin is written to establish a uniform method for testing and/or setting automatic transition as applied to Model E8 and E9 locomotives, and to familiarize railroad personnel with the information required to maintain the automatic transition equipment. In this regard, it is of the utmost importance that the responsible railroad personnel recognize the principle of operation on which automatic transition is based. This form of locomotive automatic transition functions entirely on the power output of the main generator. Any condition which will alter this power output will have an undesirable effect on the function of the automatic transition system.

It is not within the scope of this bulletin to explain all of the items which can affect the generator output, resulting in the undesirable functioning of automatic transition. It is assumed that railroads will keep their locomotives maintained to proper standards.

Transition from one traction motor circuit arrangement to another is initiated in order that the highest possible generator power can be developed within the generator's current and voltage limits. The steps of forward transition take place at specific, predetermined values of generator voltage since generator voltage increases as locomotive speed increases. Backward transition on Model E8 and E9 locomotives is automatic down to parallel and manual from parallel to series. Manual operation is accomplished by merely returning the throttle to IDLE. This returns the automatic transition circuits to their normal or #1 position.

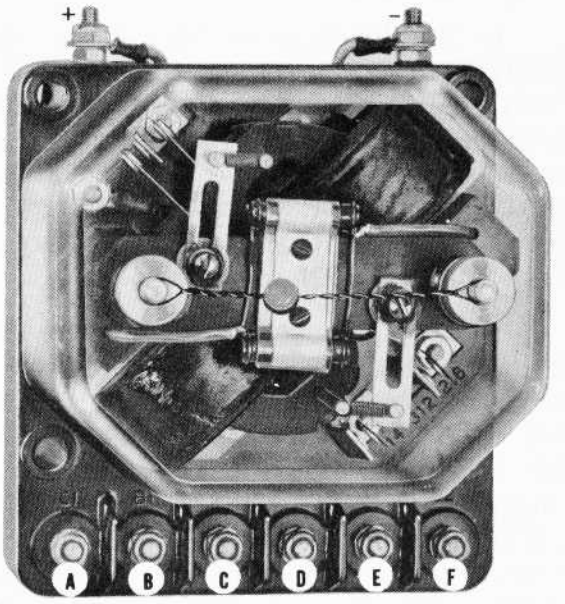

Fig. 1 - Forward Transition Relay (FTR)

MANUAL SEQUENCE TEST

A manual sequence test of the automatic transition control circuit should be made at periods specified in Scheduled Maintenance Program, Maintenance Instruction 1704. The purpose of this test is to insure the proper functioning of the miscellaneous relays and contactors used in conjunction with the FTR (Forward Transition Relay) relay, Fig. 1, to provide automatic transition. The test also will insure the proper functioning of the interconnecting control circuits.

In preparation for this check, shut down the engines in the unit to be tested. As a safety precaution, remove the battery field fuses. If the unit to be checked is connected in multiple with other units, isolate all of these units and remove the

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battery field fuses. The engines in these units may either be shut down or kept running. If it is desirable to keep them running, make certain that all isolation switches are in the START position and that all battery field fuses are removed. Check to see that the locomotive brakes are set and that sufficient control or electric air pressure is available for the check, then proceed as follows:

In the locomotive cab, place the CONTROL, FUEL PUMP and GENERATOR FIELD circuit breakers in the ON position. Place the transition lever in No. 1, place the reverse lever in FORWARD (or REVERSE) and advance the throttle lever to RUN 1. Put the isolation switch in RUN position.

Place a jumper wire across the FTR-ab interlock and then jumper wire across the FTR-cd interlock, Fig. 1. This relay is located on the locomotive high and low voltage panel. When the jumper is applied to the "cd" interlock of FTR, TR or PR (depending on model of locomotive) should pick up and cause the SH to drop out. The shunt field dropping out then causes the BF to drop out. Refer to the specific locomotive wiring diagram and determine if proper relay and contactor action has taken place. Remove the jumper wire from FTR-cd after the TR or PR relays have closed. Now, removing the jumper wire from FTR-ab will cause transition from series to parallel to take place. Again refer to the locomotive wiring diagram and visually check to see that proper relay and contactor action has taken place. Transition from parallel to parallel-shunt is accomplished by re-jumpering the FTR-cd interlocks. This causes the FS (Field Shunting) contactor to pick up. This same contactor was referred to as an M contactor on Model E8 locomotives.

Removing the jumper from FTR-cd initiates backward transition from parallel-shunt to parallel. This opens the FS or M contactors. Backward transition from parallel to series is made by closing the throttle lever to IDLE and then opening to Run 1.

CHECK OF FTR RELAY OPERATION AND CALIBRATION

The procedure outlined below should be followed to check the setting of the FTR relay. Check the operation and calibration of FTR as follows. These checks are to be made with the engines shut down on the power plant under test.

A. At the high and low voltage panel.

1. As a precaution, remove the battery field fuse of all power plants in consist.
2. Disconnect the main generator negative lead to the FTR relay coil and fold lead back, Fig. 1. Connect the negative high voltage lead from motor-generator set and the negative lead of a 0-1000 voltmeter to the negative terminal post of the FTR coil. Connect the positive high voltage lead from motor-generator set and the positive lead of voltmeter to the upper terminal GS on the front resistor of the two 10,000 ohm resistors in series with FTR coil, see Figs. 2 and 3.
3. Connect the power leads of motor-generator set to a source of low voltage power. For example: the control switch on the No. 1 power plant or the main battery switch on the No. 2 power plant.

B. At the control station in cab.

1. Close control and generator field circuit breakers to "ON" position.
2. Place transition lever in No. 1.
3. Place reverse lever in FORWARD or REVERSE position.
4. Place throttle lever in Run 1.

C. Place isolation switch in RUN position on power plant being tested. Isolation switches on power plants not under test are to be in START position and tagged with "Test being conducted" sign on card.

NOTE: After completing Step "C" the series power contactor, the SH

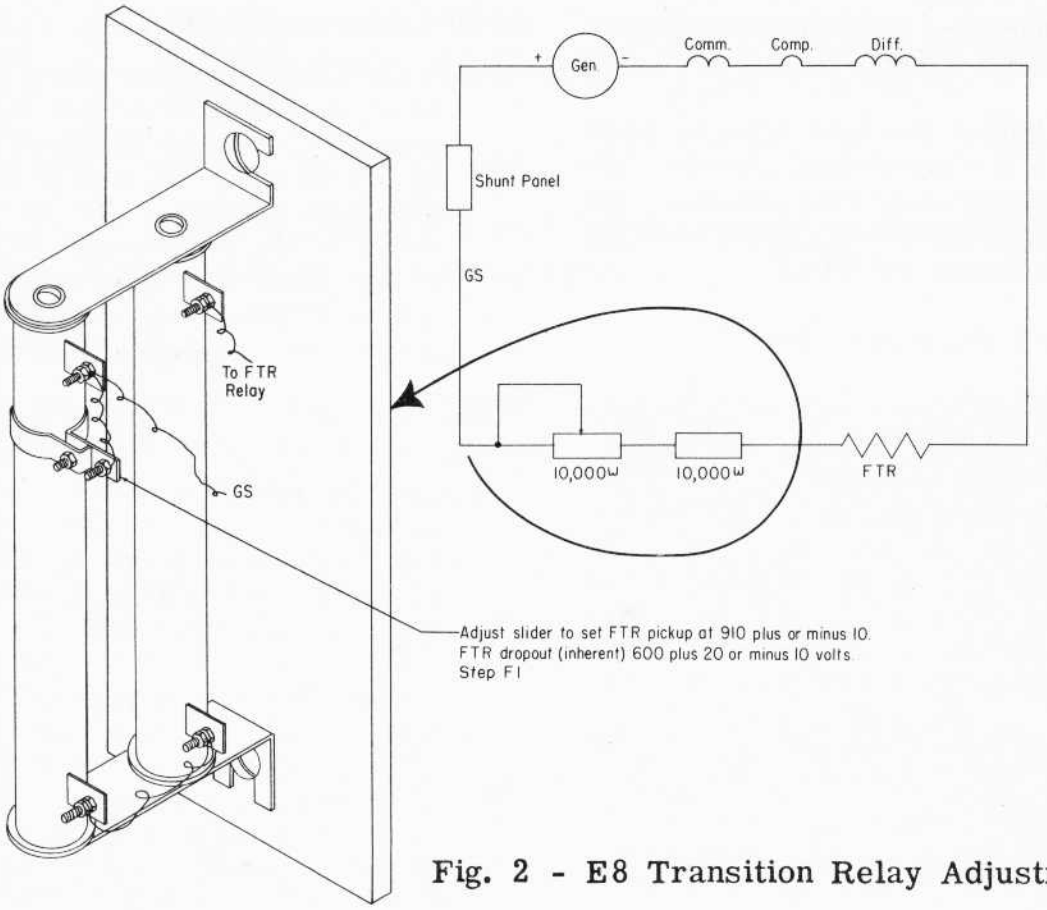

Fig. 2 - E8 Transition Relay Adjustments

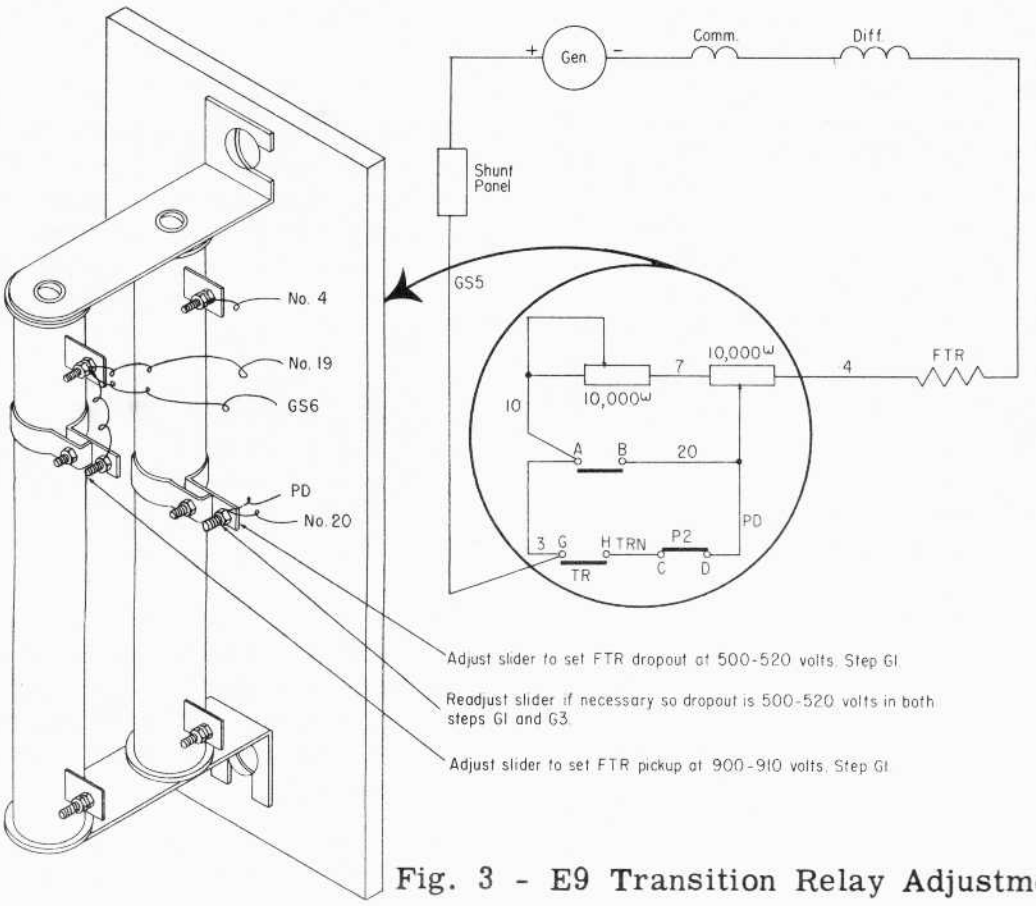

Fig. 3 - E9 Transition Relay Adjustments

(shunt) and BF (battery field) contactors should close.

D. Block (close) the NVR relay to keep alarm bell from ringing when the isolation switch is in RUN position. BE SURE TO REMOVE BLOCKING AFTER COMPLETION OF TEST.

E. Forward Transition Check

1. With the connections made as outlined above, raise the motor-generator set voltage until FTR relay picks up causing the TR relay (PR on the E8) to pick up, which in turn will open the shunt and battery field contactors. Hold voltage at 900 volts for about five minutes before making adjustments.

NOTE: Caution should be exercised against accidental contact with high voltage.

F. E8 Locomotives (ONLY)

1. Increase motor-generator set voltage and check pickup of FTR relay. Adjust pickup of FTR with resistor slider to value shown in Fig. 2. Decrease test set voltage and check dropout of FTR relay. The relay dropout voltage is inherent in the relay and cannot be readily adjusted with the relay on the locomotive. See Maintenance Instruction 5360 for internal adjustment. With FTR relay picked up, reduce voltage until relay drops out, thus making transition to parallel.

2. Increase test set voltage until FTR relay picks up and M contactor closes. This completes transition to parallel-shunt. Backward transition to parallel can be made by reducing test set voltage until FTR relay drops out which opens the M contactor. Transition from parallel to series is made manually by closing the throttle lever to IDLE and then opening to Run 1. After test is completed, reconnect circuits for normal operation.

G. E9 Locomotives (ONLY)

1. After completing operations given under Section E, increase motor-generator set voltage and check pick-up of FTR relay. Adjust pickup of FTR with resistor slider to value shown in Fig. 3. Decrease test set voltage until FTR relay drops out. Adjust FTR relay dropout with resistor slider to value shown in Fig. 3.

NOTE: This setting is made with P2-cd and TR-gh interlocks closed.

2. After transition to parallel is completed, increase test set voltage until FTR relay picks up closing FS contactor, thus making transition to parallel-shunt. The FSD relay coil is energized at the same time as FS contactor and the FSD-ab interlock lowers the dropout value of the FTR relay to prevent cycling of FS contactor following transition from parallel to parallel-shunt. The FSD relay coil is de-energized when the FS contactor closes. This time delay relay has a delay on dropout which keeps FSD-ab interlock closed for 10 to 12 seconds after the relay is de-energized.

3. Reduce test set voltage until FTR relay drops out causing FS contactor to open. Check dropout value of FTR relay with FSD-ab interlock closed. Adjust, if necessary, by setting resistor slider to value shown in Fig. 3.

4. Check dropout of FTR relay with FSD-ab, P2-cd (or P3-cd) or TR-gh interlocks open even though this value is inherent in the relay and cannot be readily adjusted in the locomotive. See Maintenance Instruction 5360 for internal adjustment.

5. Backward transition to parallel is made by reducing test set voltage, dropping out FTR relay which opens FS contactor. Transition from parallel to series is made by moving throttle lever to idle and then to Run 1. After test is completed, reconnect circuits for normal operation.