



M AINTENANCE I NSTRUCTION

TESTING AND/OR SETTING AUTOMATIC TRANSITION SWITCHER LOCOMOTIVES WITH MODEL D15 GENERATORS

INTRODUCTION

This bulletin is written to establish a uniform method for testing and/or setting automatic transition as applied to switcher locomotives with Model D15 generators, 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 a specific, predetermined value of generator voltage since generator voltage increases as locomotive speed increases. Backward transition on switcher locomotives is manual from parallel to series. Manual operation is accomplished by merely returning the throttle to IDLE.



Fig. 1 - Forward Transition Relay

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 forward transition relay FTR, 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 engine in the unit to be tested. As a safety precaution, remove the battery field fuse. If the unit to be checked

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is connected in multiple with other units, isolate all of these units and remove the 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:

1. Close control and generator field switches on engineman's control stand.
2. Place reverse lever in the FORWARD or REVERSE position.
3. Place selector lever or transition forestalling switch if used, in the AUTO position.
4. Road service toggle switch (where used) may be in either the ROAD or SWITCHING position.
5. Motor cutout switch must be in the NORMAL position.
6. Place the isolation switch (where used) in the RUN position only on locomotive unit under test. Isolation switches on the other units of the consist not under test, are to be in the START position and tagged with "Test Being Conducted" sign.
7. Move throttle lever to the Run 1 position or move throttle switch (where used) one inch or more beyond the IDLE position.

NOTE: After completing Step 7 the S (Series) power contactor, SF (shunt) and BF (battery field) contactors should close.

Place jumper wires across FTR-ab and FTR-cd interlocks. This relay is located on the locomotive high and low voltage panel. When the jumper is applied to the "cd" interlock of FTR, PR (parallel relay) should pick up and cause the SF 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 contac-

tor action has taken place. Remove the jumper wire from FTR-cd after the PR relay has closed. PR relay will remain in the closed position. Now, removing the jumper wire from FTR-ab will cause transition from series to parallel to take place by opening the S contactor and closing the P1 and P2 (parallel) power contactors. Again refer to the locomotive wiring diagram and visually check to see that proper relay and contactor action has taken place.

Backward transition from parallel to series is made by closing the throttle to IDLE.

CHECK OF FTR RELAY OPERATION AND CALIBRATION

The procedure outlined below should be followed to check the setting, operation and calibration of the FTR relay. These checks are to be made with the engine shut down on the power plant under test and sufficient control or electric air pressure available.

A. Connections In Electrical Control Cabinet (Fig. 2)

1. Disconnect the TP wire lead from the stud of the rear 10,000 ohm resistor, located above and to the left of the ST contactor, and fold back.

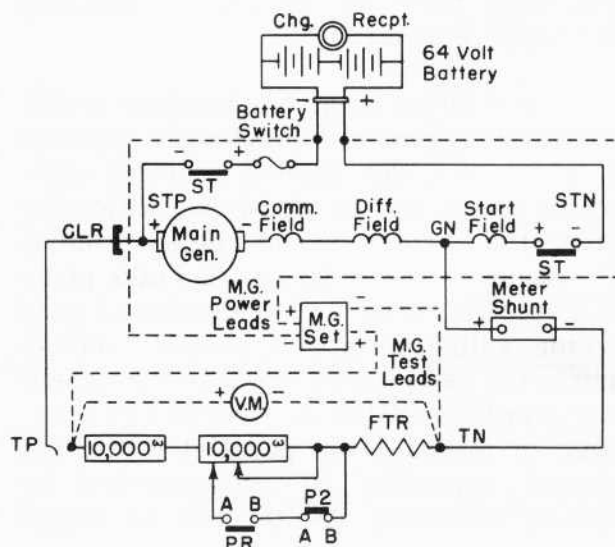


Fig. 2 - Test Equipment Circuit Connections

2. Connect the positive high voltage lead from the motor-generator set to the stud from which the TP wire was removed, and the negative high voltage lead to TN wire terminal post on the top of the FTR relay or to the TN wire terminal post at the meter shunt panel.
3. Connect the leads of a 0-1000 volt-meter with a $\pm 1/2\%$ accuracy to the same terminal posts which now hold the motor-generator leads.
4. Connect the power leads of the motor-generator set to a source of low voltage power. For example, the control switch or the main battery switch.

B. At The Control Station

1. Close control and generator field switches.
2. Place reverse lever in the FORWARD or REVERSE position.
3. Place selector lever or transition forestalling switch if used, in the AUTO position.
4. Road service toggle switch (where used) may be in the SWITCHING or ROAD position.
5. Move throttle lever to the Run 1 position or move the throttle switch (where used) one inch or more beyond the idle position.

C. Motor Cutout Switch Must Be In The NORMAL Position.

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.

NOTE: After completing Step "C" the S (series) power contactor, SF (shunt) and BF (battery field) contactors should close.

Caution should be exercised against accidental contact with high voltage.

D. Forward Transition Check

1. Locomotive equipped with 60-ohm shunt field discharge resistor

- a. With the connections made as outlined in the previous sections, raise the motor-generator set voltage until the FTR relay picks up causing the PR relay to pick up, which in turn will open the shunt and battery fields. Hold voltage for about five minutes to charge relay and allow the circuit components to heat up and reach normal operating temperatures. After the circuit has warmed up, reduce motor-generator set to zero and proceed with check.
- b. Increase motor-generator set voltage gradually and observe pickup voltage of FTR relay.
- c. Decrease test set voltage gradually and observe dropout voltage of FTR relay. P2-ab and PR-ab interlocks must be closed.
- d. Refer to Maintenance Data at the end of this bulletin and compare readings obtained in Steps 1 and 2 with values shown, for specific locomotive. Should the FTR relay require adjustment, refer to Fig. 3 for information on proper resistor slider band to use in making settings.
- e. Check dropout of FTR relay with P2-ab and PR-ab interlocks open. Although this value is inherent in the relay and cannot be readily

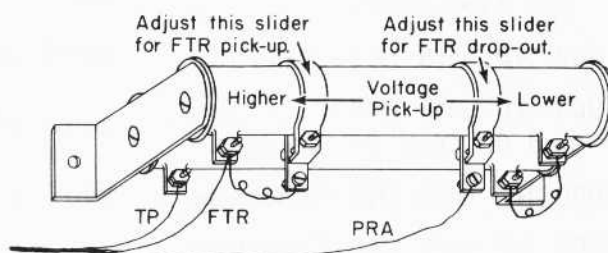


Fig. 3 - Transition Relay Adjustment For Units With 60-Ohm Shunt Field Discharge Resistor

adjusted in the locomotive, see Maintenance Instruction 5360 for internal adjustment of the relay.

- f. Transition from parallel to series is made manually by closing the throttle lever to IDLE. After test is completed, reconnect circuits for normal operation.

2. Other Switcher Locomotives

- a. After completing operations given under Step 1-a, Section D, increase motor-generator set voltage gradually and observe pickup voltage of the FTR relay.
- b. Decrease test set voltage gradually and observe dropout voltage of FTR relay.
- c. Refer to Maintenance Data and compare reading in Step 1 with value shown, for specific locomotive. Should the FTR relay require adjustment, move the resistor slider band, Fig. 4, on the 10,000 ohm resistor. Increasing the resistance raises the pickup voltage and decreasing resistance lowers the pickup voltage.

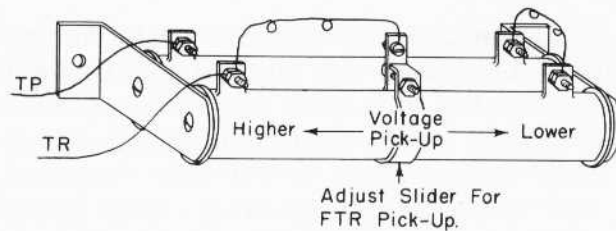


Fig. 4 - Transition Relay Adjustment

- d. The dropout voltage of the FTR relay is inherent in the relay and cannot be readily adjusted in the locomotive. See Maintenance Instruction 5360 for internal adjustment.
- e. Transition from parallel to series is made manually by closing the throttle lever to IDLE. After test is completed, reconnect circuits for normal operation.

NOTE: Safety to personnel and equipment cannot be overemphasized. Caution should be exercised against accidental contact with high voltage from the motor-generator set. Reduce motor-generator set voltage to zero before making any adjustments.

MAINTENANCE DATA

Type Of Switcher Locomotive	Voltage Relay Pickup	Voltage Relay Dropout	Voltage Relay Dropout (Inherent)
600 HP with D15 Generator	800 ± 10 volts		540 ± 20 volts
600 HP with D15 Generator and TOC Relay	940 ± 10 volts		630 ± 20 volts
800 HP with D15 Generator	850 ± 10 volts		570 ± 20 volts
800 HP with D15 Generator and TOC Relay	940 ± 10 volts		630 ± 20 volts
900 HP with D15 Generator	940 ± 10 volts		630 ± 20 volts
900 HP with D15 Generator and 60 Ohm SF Resistor	940 ± 10 volts	500 to 525 volts	630 ± 20 volts
1000 HP with D15 Generator	940 ± 10 volts		630 ± 20 volts
1000 HP with D15 Generator and 60 Ohm SF Resistor	940 ± 10 volts	500 to 525 volts	630 ± 20 volts
1200 HP with D15 Generator	940 ± 10 volts		630 ± 20 volts
1200 HP with D15 Generator and 60 Ohm SF Resistor	940 ± 10 volts	500 to 525 volts	630 ± 20 volts