



M AINTENANCE I NSTRUCTION

TESTING OF DYNAMIC BRAKE FIELD LOOP CIRCUIT

DESCRIPTION

The basic principle of dynamic braking consists of converting the traction motors to generators and the fact that it takes power to generate power. With a locomotive and train in motion, the traction motor armature geared to the driving wheels will be rotating. By exciting the traction motor field windings in dynamic braking, a retarding effort will be exerted as the armatures generate electrical power. This electrical energy is then dissipated through resistor grids in the locomotive roof.

Limitations of dynamic braking or retarding effort exerted are determined by the electrical capacity of the traction motors and resistor grids. Along with limiting the maximum braking strength, provision must be made for varying the retarding effort below this maximum for certain operating conditions.

The field loop circuit connects the main generator battery fields of all units of a consist in series and by means of a manually controlled rheostat, the excitation of these generators can be controlled. The generator output is then directed to excite the traction motor field winding. As the generator output is varied through action of the field loop circuit, the traction motor excitation is also varied, thus providing a means of controlling the generated energy and retarding strength.

OPERATION

By tracing the typical schematic wiring circuit, Fig. 1, it can be seen that low voltage current from the lead

unit auxiliary generator or battery flows through an 80-ampere fuse, the brake regulating rheostat in the cab, the unit selector switch, a field loop contact and a battery field contact to the battery field windings of the main generator. The circuit continues through jumper cables to excite the battery field windings of the other generators in the locomotive consist then returns to complete the circuit in the lead unit. The brake regulating rheostat in the lead unit, controlled by a lever in the control stand, varies the excitation of the main generators in all units.

The unit selector switch has a very important function in the field loop circuit. It has four positions designating the number of locomotive units in a complete locomotive consist. Dynamic brakes are designed assuming that a maximum of four units will make up the consist. With a four unit consist the unit selector switch is placed in its #4 position with the result that no additional resistance is added to the circuit. Each receding position adds 1.2 ohms of resistance into the field loop circuit which is equal to that provided by all of the field loop cables and jumpers, and field windings in one locomotive unit. Operating less than a 4 unit consist requires that suitable resistance be added to the circuit by means of this switch to maintain a uniform excitation circuit for satisfactory operation.

Latest model locomotives have a "regohm" dynamic brake limiting regulator in this circuit. During dynamic braking, this device sets up a shunt field circuit to "buck" the effect of the main

of the field loop circuit. Make up shunt leads of suitable capacity, 19/27 or larger, with terminals to fit the BKT terminals. ("BKT" is a brake transfer switch or cam switch).

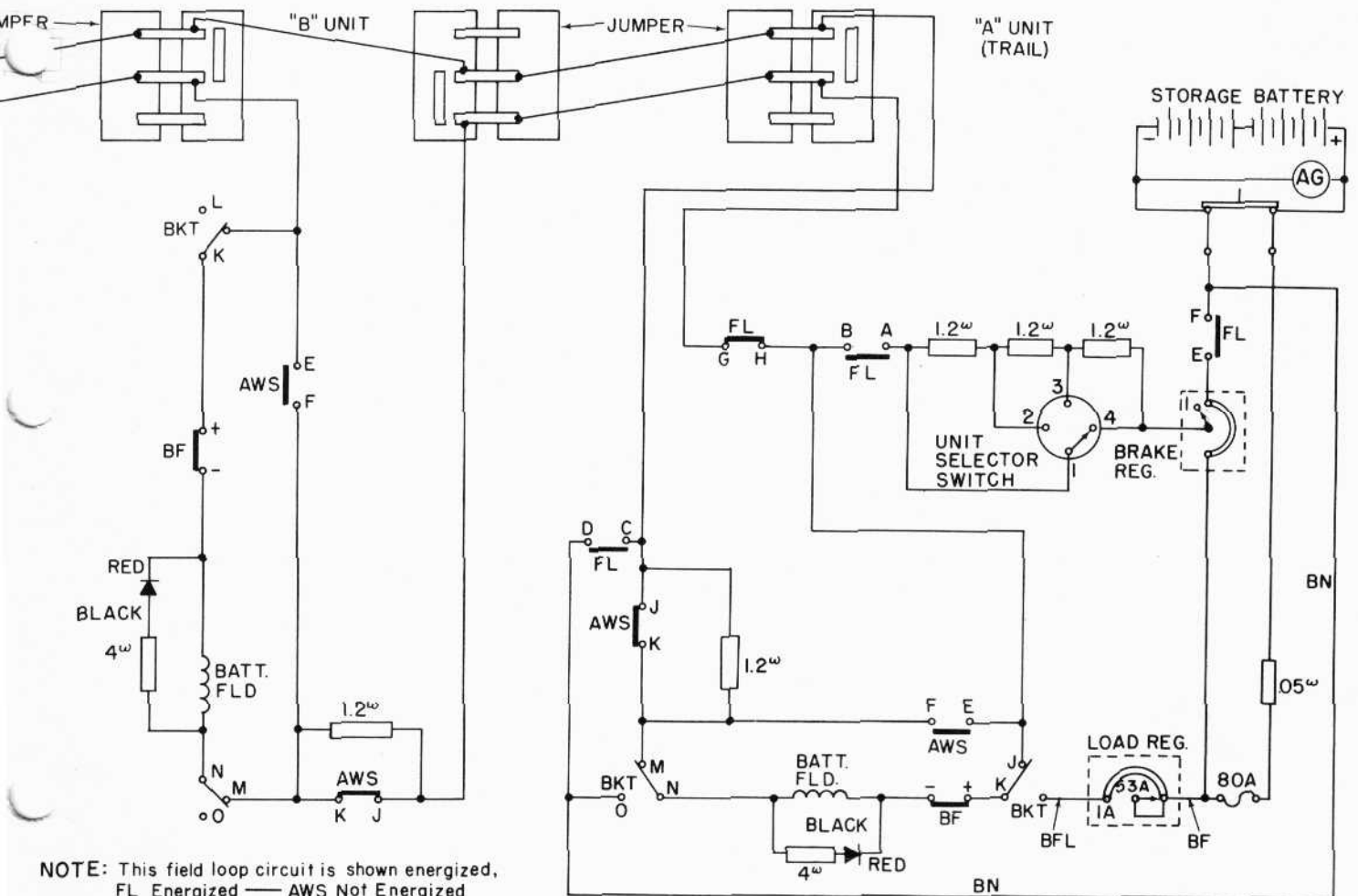
Remove interlock wire in field loop circuit from "BKT" switch and clip on the ammeter shunt. Attach the meter leads to shunt. Shunt leads should be connected to the terminal on BKT which is closed with BKT in the braking or TOW position and consequently open in the MOT position. In this manner, the ammeter will not indicate except in the braking position.

4. Start the "A" unit engine (No. 1 on E8 or E9) and allow engine to run at idle speed.
5. Tag the isolation switches in all units under test with a warning sign "Under Test." Keep isolation switches open.

6. Keep the generator field push button switch open. Later locomotive types are equipped with circuit breakers instead of push button switches. Keep open.

TEST PROCEDURE

1. Place the reverse lever in FORWARD position, the isolation switches in RUN position and move the transition-brake lever to minimum brake position to energize the "BG" wire ("B" position on early locomotives).
2. Check the field loop and battery field contactors. They should be closed when in this position. All brake transfer switches (BKT) should be in TOW when this test is made.
3. With the auxiliary generator voltage at 74 volts, the field loop current should be 1.32 amperes \pm 10% (depending upon temperature) on all model locomotives except E8 and E9



with series type dynamic brake control. The current in these units should read 1.34 amperes $\pm 10\%$. Locomotives with potentiometer type dynamic brake control should have no current flow in the field loop circuit with the dynamic brake control in the minimum brake position.

4. Move the transition-brake lever slowly to the right toward maximum brake. This should increase the field current progressively up to 14 amperes $\pm 5\%$ when hot, on all locomotive models except E8 and E9. On E8 and E9 locomotives, adjust the variable resistor in the field loop circuit to obtain a field loop current of 18 amperes $\pm 5\%$ when hot. E8 locomotives not equipped with this variable 1.2 ohm resistor have a maximum field loop current of $20 \pm 10\%$ amperes.
5. Test each position of the unit selector switch, pulling out the field loop

jumper assemblies to make the consist agree with the position of the switch. The minimum current as noted in step three should be approximately the same in all positions of the unit selector switch. If not, check for defective 1.2 ohm resistor connected into the switch.

In case the locomotive consist includes two "A" units, the same test should be made from both ends. Move the ammeter and shunt to the BKT in the opposite "A" unit and connect to the terminals indicated on the wiring diagram for that type of locomotive. Proceed with the test as outlined above.

The wiring diagram, Fig. 1, illustrates the basic method of dynamic brake operation but does not necessarily apply to all types of locomotives. Refer to the specific wiring diagram for the locomotive to be tested.