ELECTRO-MOTIVE DIVISION • GENERAL MOTORS CORPORATION
SERVICE DEPARTMENT

MAINTENANCE INSTRUCTION

EXTENDED RANGE DYNAMIC BRAKE
REVISED SETTINGS AND ADJUSTING PROCEDURE
4-AXLE GP OR DD (35 SERIES ONLY) TYPE LOCOMOTIVES

All GP and DD (35 series only) locomotives equipped with extended range dynamic brakes must use the new extended range settings when calibrating the extended range system. The new settings make it easier to adjust the extended range system and eliminate the possibility of "D" contactor cycling.

Also, new extended range adjustment procedures have been developed that will considerably shorten the adjustment time. The new procedure also can utilize stall current through the traction motors to obtain current through the brake current transductors (BCT 6, BCT 7). However, the use of stall current through the traction motors should only be used as an alternate to the regulator method of obtaining current through the BCT's as described in the applicable M.I. or Locomotive Service Manual. The use of stall current requires permission by the railroad since there is a safety factor involved – the possibility of the locomotive moving while testing. Also, railroad personnel assigned to test must exercise considerable caution and discretion to prevent possible equipment damage. The traction motor current levels and duration under stall conditions must be kept to an absolute minimum.

The procedure amounts to first checking and resetting (if necessary) the dynamic brake potential line voltage. The second section is for calibrating LOR, IRR, and DRR relays. Figs. 1, 2, 3, and 4 must be used for references when calibrating the extended range system.

GP30, GP35, DD35

The potential line brake calibration should be checked and adjusted (if necessary) before the extended range dynamic brake is adjusted. The potential line brake is calibrated as follows:

1. Shut the engine down and install a 2000 amp - 50 MV shunt in place of the main generator shunt panel. Connect a 0-50 millivolt meter to the shunt. Remove the BF fuses and restart the engine.

2. Put the "Field Loop - Potential Wire" selector switch (if so equipped) to the "Potential Wire" position.

3. Connect a 0-150 V DC Voltmeter positive lead on the dynamic brake zener (DBZ - GP30; Z2 - GP35) "A" terminal to monitor 24T voltage. Connect the negative lead to a NA source.

4. Energize the AC1 fan contactor with a jumper wire.

5. Set up the controls for dynamic brake and pull throttle out just far enough to pick up BFA contactor (minimum brake position). The voltmeter should read zero. Place the throttle in maximum brake position and the voltmeter should read at least 70 volts. If voltages are out of tolerance readjust the brake control rheostat to obtain proper voltages. Return throttle to idle when completed.

6. The minimum generator current should be checked and adjusted (if necessary).

   Reinstall the BF fuses and with the controls set up for dynamic brake put the throttle in minimum brake position (just far enough out to pick up BFA). The main generator current should be between 20-40 amps. If necessary, adjust the JT slider on the 200 ohm resistor of RE13 for GP30 or RE64C on GP35 to obtain proper current.

7. Disconnect all wires from LOR – No. 1 terminal.

8. With the unit set up for dynamic brake put the throttle in maximum brake position and observe traction motor field current (generator current) and 24T voltage. Adjust RH3 using Fig. 4. Return throttle to idle.

9. Reconnect the positive lead of the 0-150 V DC meter from the D.B. zener to LOR - No. 3 terminal. The negative lead remains on NA.

10. With the throttle in maximum brake position observe voltage and T.M. Field Current and adjust LOR setting at RE25C (GP30) or RE60C (GP35) using Fig. 3.

11. Recheck the RH3 setting as these two settings (RH3 and LOR) affect each other. The RH3

setting is checked by reconnecting the voltmeter back to the D.B. zener - "A" terminal. Recheck each setting (RH3 and LOR) until no further adjustment of either is necessary.

12. Return throttle to idle.

13. Reapply the wires to LOR - No. 1 terminal.

Isolate unit and adjust IRR and DRR as follows:

1. Connect the 0-50 millivolt meter to the indicating ammeter shunt.

2. Connect a 5000 ohm 25 watt rheostat in series with TRP panel (if so equipped) or in series with the PLS-3 terminal on units without a TRP.

3. Reconnect the positive lead of the 0-150 V DC meter to positive (+) terminal of CR63 (GP30) or CR6 (GP35) and negative to NA source.

4. To obtain current through the BCT's for calibrating DRR and IRR, one of the methods suggested may be used providing the following conditions are upheld:

   When using stall current the time element with stall current through the motor must be kept to an absolute minimum.

   When using stall current the air brakes must be set hard.

   a. Single Motor Stall Current — Isolate unit and remove arc chutes from S13 and S24 power contactors. Place insulating material between main contacts. Remove wires on P2 coil positive and apply jumper wire from PA source (POA - GP30) to P2 positive coil terminal. Remove W1A wire from CR1 and W2A wire from CR2 on GP30 or WP and WP1 wires removed from CR2 + on GP35. This will only provide current through the No. 2 motor, BCT's, and indicating ammeter shunt. Set up unit for power operation and set air brakes hard. Control current through BCT's with throttle and rheostat.

   b. Four Motor Stall Current — This method should only be used if the following conditions are upheld:

      Railroad rules permit use of testing with locomotive loaded against its brakes.

      Time element with stall current through motors held to absolute minimum during any individual test.

      The locomotive being tested should be coupled to another unit and all air brakes set hard to prevent movement.

      Only competent railroad personnel should use this method.

      Set up unit for power and control current through BCT's with throttle and rheostat.

   c. Cabling Method — Add a 1100/24 power cabling jumper from indicating ammeter shunt AA2 cable side to generator negative bus. Disable the power contactor circuits by removing the MF8 wire from BR-C1 on GP35 or 89H wire from BR-C1 on GP30. Jumper from GR-H to SF coil positive and another jumper from SF-coil positive to BFA coil positive. Set up the unit for power operation and control current with the throttle and rheostat.

5. IRR Setting — Obtain 550 amps through BCT's and adjust RH9 for 60 ±1 volt. Use the IRR curve in Fig. 1 as a reference. If range adjustment for RH9 is necessary adjust RE61A (GP30) or RE63A (GP35). Return throttle to idle when completed.

NOTE: The DRR adjustments must be made in the following sequence.

6. Reconnect the 0-150 V DC meter positive lead to positive (+) terminal of CR64 (GP30) or CR7 (GP35). Negative lead remains on NA.

7. DRR No. 1 Setting — Obtain 440 amps through the BCT's and adjust RH8 to 61 ±1 volts. Use DRR curve No. 1 Fig. 1 as a reference. If range adjustment for RH8 is necessary adjust RE60A (GP30) or RE62A (GP35).

8. Pick up the D1 and D2 extended range contactors by connecting jumpers across the BPS4 and BPS5 interlocks.

9. DRR No. 2 Setting — Obtain 450 amps through the BCT's and adjust RE61B (GP30) or RE63B (GP35) to 70 ±1 volt. Use DRR curve No. 2 in Fig. 1 for reference. Return throttle to idle when completed.

10. Pick up the D3 contactor along with the D1 and D2 by jumpering across BPS6 interlock.

11. DRR No. 3 Setting — Obtain 400 amps through the BCT's and adjust RE60B (GP30) or RE62B (GP35) to 70 ±1 volt. Use DRR curve No. 3 in Fig. 1 for reference. Return throttle to idle when complete.

12. To return the locomotive to normal do the following:

    a. Shut engine down and remove shunt and reinstall generator shunt panel bus.

    b. Remove all meters.

c. Remove the following jumpers (if used).

(1) Jumpers across BPS4, BPS5, BPS6 interlocks.

(2) Jumper to AC1 contactor.

(3) Jumper from PA (POA) source to P2 contactor coil.

(4) Power cabling jumper from indicating ammeter shunt to generator negative bus.

(5) Jumper from GR-H to SF coil and jumper from SF coil to BFA coil.

d. Remove the 5000 ohm rheostat and reconnect wires.

e. Reapply the following wires (if disconnected).

(1) MF8 wire to BR-C1 on GP35 or 89H wire to BR-C1 on GP30.

(2) W1A wire to CR1 and W2A wire to CR2 on GP30.

(3) WP and WP1 wires to CR2 + on GP35.

GP40 EXTENDED RANGE ADJUSTMENT PROCEDURE

The potential line brake calibration should be checked and adjusted (if necessary) before the extended range system is checked.

1. Shut the engine down and install a 4000 amp 50 MV shunt in place of the generator shunt panel. Connect a 0-50 millivolt meter to the shunt. Restart engine.

2. Disconnect all wires from LOR - No. 1 terminal.

3. Connect a 0-150 V DC meter positive lead to RCP-1 and negative to BN to monitor 24T voltage.

4. With the GF fuses in place, set up the unit for dynamic brake and place throttle in maximum position. Observe 24T voltage and TM Field Current and adjust RH3 using Fig. 4 so that setting is within the graph limits.

5. Return throttle to idle when completed. Reapply all wires to LOR - No. 1 terminal. Isolate unit.

Adjust LOR, IRR and DRR as follows:

1. Disconnect the 0-50 MV meter from main generator shunt and reconnect to indicating ammeter shunt.

2. On late model units disconnect the ALM wire from B23-A interlock.

3. Disconnect all wires at the center top of RH9.

4. Connect a 5000 ohm 25 rheostat in series with the TRP panel for controlling excitation. If this rheostat is not available use the 100 ohm 100 watt rheostat as described in GP40 Service Manual for controlling excitation.

5. Reconnect the positive lead of the 0-150 V DC meter to RH12 center tap (negative remains on BN).

6. To obtain current through the BCT's for calibrating LOR, DRR, and IRR the methods suggested under Steps 4b or 4c for the GP30 and GP35 procedure may be used. When using stall current the time element with stall current through motor must be kept to an absolute minimum.

7. Set up the locomotive for power operation.

8. Obtain 500 amps through the BCT's and adjust RH12 for 29 ±2 volts. Use Fig. 2 as reference. Reduce throttle to idle when complete.

9. Reconnect all wires to the center tap of RH9.

10. Reconnect the 0-150 V DC meter positive lead to center tap of RH9.

11. Obtain 550 amps through the BCT's and adjust RH9 to 60 ±1 volt. Use the IRR curve on Fig. 1 for reference. Return throttle to idle.

12. Reconnect 0-150 V meter to center tap of RH13.

NOTE: The DRR settings must be made in the following order.

13. Obtain 440 amps through the BCT's and adjust RH13 for 61 ±1 volts. Use the DRR - No. 1 curve in Fig. 1. Return throttle to idle.

14. Pick up the D1 and D2 extended range contactors by connecting jumpers across the BPS4 and BPS5 interlocks.

15. Obtain 450 amps through the BCT's and adjust RH15 to 70 ±1 volt. Use the DRR - No. 2 curve in Fig. 1 for reference. Return throttle to idle.

16. Pick up the D3 contactor along with the D1 and D2 by jumpering across the BPS6 interlock.

17. Obtain 400 amps through the BCT's and adjust RH14 to 70 ±1 volt. Use the DRR - No. 3 curve in Fig. 1 for reference. Return throttle to idle.

18. To return the locomotive to normal do the following:

    a. Remove 4000 amp shunt from shunt panel location.

    b. Remove jumpers from BPS4, BPS5, BPS6 interlocks.

    c. Reconnect ALM wire to B23-A (if removed).

    d. Remove meters and 5000 ohm rheostat (or 100 ohm rheostat).

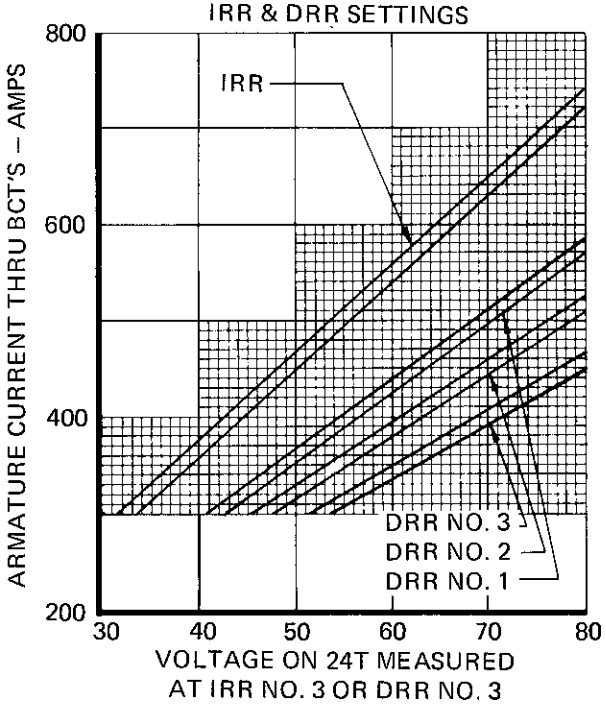

Fig. 1

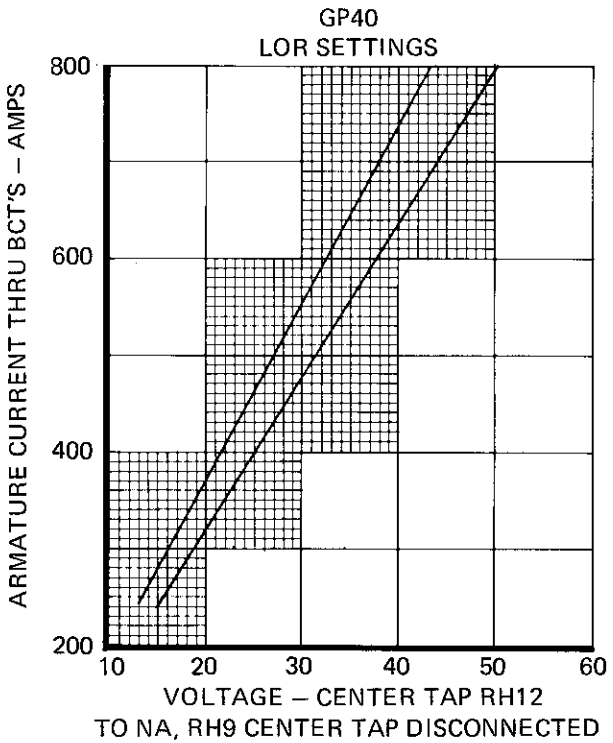

Fig. 2

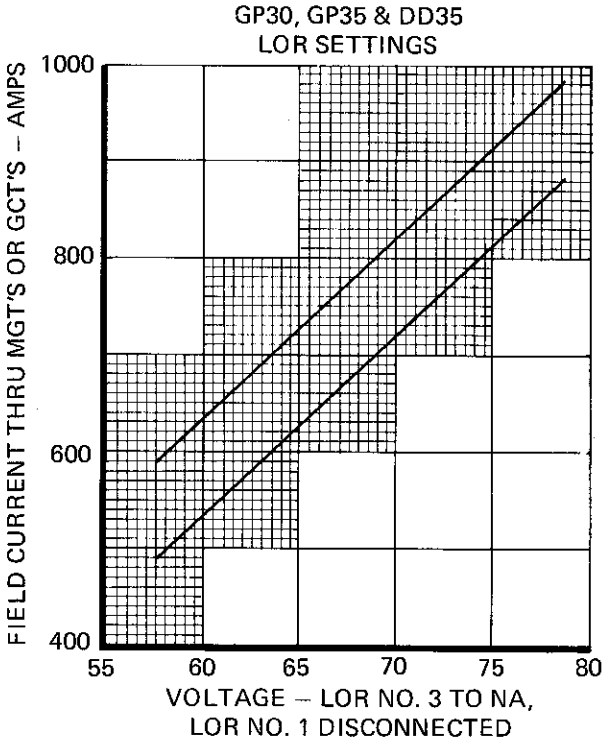

Fig. 3

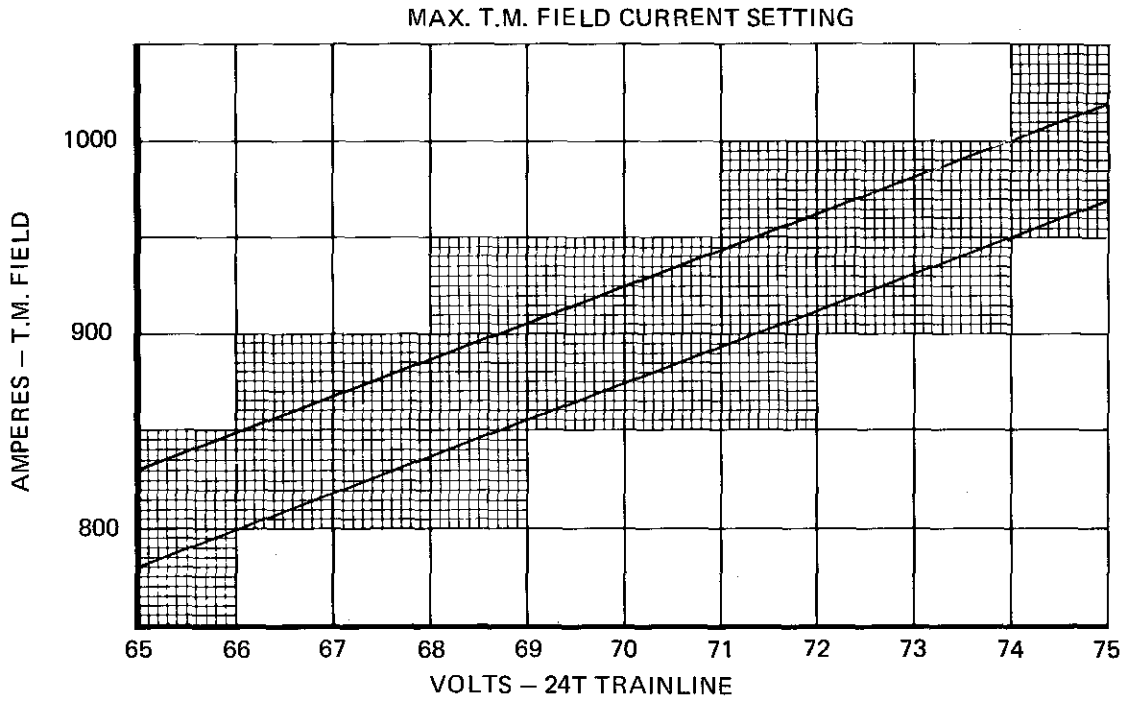

Fig. 4

ITEM NO.	DEVICE	FUNCTION	TEST CONDITIONS	ADJUST AT				SETTINGS	REMARKS
				GP30	GP35 DD35	GP38 WITH 2 FIELD D32	GP39, GP40 & GP38 WITH SINGLE FIELD D32		
1	OCP	OPEN CIRCUIT PROTECTION		RE25B	RE60B	RE13B	RE18B "40" RE19B "34-39"	400 $^{+25}_{0}$ V	
2	OCP WITH OCL	OPEN CIRCUIT PROTECTION		NEW RE25B	NEW RE60B	NONE	NONE	700 ± 100V	FUNCTIONAL CHECK ON ALL BUT GP30, GP35 & DD35
3	LOR	LOCKOUT	CURRENT THRU MGT'S OR GCT'S.	RE25C	RE60C	—	—	GRAPH-LOR GP30-35	VOLTAGE AT LOR #3, LOR #1 DISCONNECTED
4	LOR	LOCKOUT		—	—	RH12	—	CLOSE LOR 8-2	SEE CHARTS & GRAPHS NO. 8393426
5	LOR	LOCKOUT	CURRENT THRU BCT'S	—	—	—	RH12	GRAPH-LOR	VOLTAGE AT CENTER TAP OF RH12 WITH CENTER TAP OF RH9 DISCONNECTED BR DROPPED OUT.
6	IRR	INCREASE GRID RESISTANCE	CURRENT THRU BCT'S	RH9	RH9	RH9	RH9	GRAPH-IRR	24T VOLTAGE MEASURED AT IRR #3
7	DRR	DECREASE GRID RESISTANCE	CURRENT THRU BCT'S	RH8	RH8	RH13	RH13	GRAPH-DRR #1	24T VOLTAGE MEASURED AT DRR #3
				RE61B	RE63B	RH15	RH15	GRAPH DRR #2	
				RE60B	RE62B	RH14	RH14	GRAPH DRR #3	
8	TDP	BPS TIME DELAY		DEVICE	DEVICE	DEVICE	DEVICE	2-3 SEC.	TIME DELAY AFTER ENERGIZATION- 2 SEC. ABSOLUTE MINIMUM
9	IPS	FLAT WHEEL PROTECTION		DEVICE	DEVICE	DEVICE	DEVICE	15 PSI	RETURNS BPS TO #1 MAX. RESISTANCE POS.
10	DBR	RECALIBRATION IN EXT. RANGE		—	—	—	RE43 WITH SL DR ONLY	MIDPOINT	
11		MAX. DYNAMIC BRAKE FIELD CURRENT	MAIN GEN. CURRENT	RH3	RH3	—	RH3	GRAPH	

NOTE: For extended range dynamic brake checking, an additional tolerance band shall be allowed above and below the setting band. These additional tolerance bands shall be equal in width and shape to the setting band.

Fig. 5