



**AIR BRAKE
and
TRAIN HANDLING**

RULES AND INSTRUCTIONS

EC - 99

Revised 1/98

NOTICE

These rules and instructions govern the operation, testing and maintenance of air brake equipment. They must be obeyed by all employees whose duties are affected by them.

Employees whose duties are affected by these rules must attend an air brake instruction class at least once every two years or as required by proper authority.

Each affected employee must have a copy of this book (including all revisions) available while on duty and when attending instruction classes.

INDEX

Page

1. STANDARD AIR PRESSURE

- 1.1 Brake Pipe Equalization Pressures..... 1

2. LOCOMOTIVE AIR BRAKES (MECHANICAL FORCES)

- 2.1 Maintenance 2
2.2 Responsibility 2

3. LOCOMOTIVE AIR BRAKES (ENGINEERS)

- 3.1 Inspections 2
3.2 Responsibility 2
3.3 Locomotive Brake Inspection 3
3.4 Locomotive Brake Tests 4
3.5 Change of Crew 6
3.6 Securing Locomotives Left Unattended 6
3.7 Failure of Locomotive Air Brakes 7
3.8 Locomotive Air Brakes-General 8
3.9 Pressure Maintaining Feature Test 8
3.10 Electric Parking Brake 9

4. POSITIONING LOCOMOTIVE AIR BRAKE EQUIPMENT

- 4.1 General Instructions 11
4.2 Positioning 26/30 Equipment 11
4.3 Positioning EPIC Equipment EMD Locomotives 13
4.4 Positioning EPIC Equipment GE Locomotives 14
4.5 Positioning 24RL Equipment 16
4.6 Positioning No. 6 and 14 Equipment 17
4.7 Positioning Air Brake Equipment on
Helper Locomotive at Rear of Train 18
4.8 Positioning Air Brake Equipment on
Helper or Double-Heading Locomotive at Front of Train 18
4.9 Coupling Units in Multiple 19

5. HAULING DEAD LOCOMOTIVES

- 5.1 Conditions 27
5.2 Determining Set Up 27
5.3 Set Up "Dead-In Consist" 28
5.4 Set Up "Dead-In Train" (Main Reservoir Available) 28
5.5 Set Up "Dead-In Train" (Main Reservoir NOT Available) 29

6. MAKING UP TRAINS

- 6.1 General 30
6.2 Connecting Brake Pipe 30
6.3 Coupling Locomotive 30
6.4 Charging Train from Locomotive 30
6.5 Charging from Yard Air Supply 31
6.6 Approximate Charging Time to 90 PSI 31
6.7 Adding Cars to Rear of Train 31

7. TRAIN AIR BRAKE INSPECTIONS

Page

7.1 Brake Pipe and Connections	32
7.2 Retaining Valves	32
7.3 Brake Rigging	32
7.4 Hand Brakes	32
7.5 Piston Travel	32

8. INOPERATIVE BRAKES EN ROUTE

8.1 Percent of Operative Brakes	33
8.2 Handling of Cars with Inoperative Brakes	34
8.3 Cutting Out Car Brakes	35
8.4 Nullifying Brake Pipe Vent Valve	36
8.5 Failure to Maintain Adequate Pressure	36

9. PASSENGER EQUIPMENT

9.1 Making Up Passenger Trains	37
9.2 Mixed Consists	37
9.3 Communicating Signal System	37
9.4 Brake Tests (Passenger)	38

10. TRAIN AIR BRAKE TESTS - GENERAL

10.1 Condition of Brakes	38
10.2 Responsibility	39
10.3 Signal for Brake Application	39
10.4 Air Flow Method Brake Test (AFM)	39
10.5 Brake Pipe Leakage Test	40
10.6 Hand Brakes	41
10.7 Functional Test of End of Train System Device (EOT)	41

11. INITIAL TERMINAL TEST AND INSPECTION

11.1 Where Required	43
11.2 Train Brake Inspection	43
11.3 Charge Required for Freight Train	43
11.4 Performance of Brake Test	43
11.5 Inspection of Brake Application	44
11.6 Inspection of Brake Release	44
11.7 Test made from a Yard Air Supply	44
11.8 Notification of Completion of Test	45

12. TRANSFER TRAIN AND YARD TRAIN TESTS

12.1 Where Movement Does Not Exceed 20 Mile	46
12.2 Where Movement Exceeds 20 Miles	46

13. ROAD TEST

13.1 Where Required	47
13.2 Procedure	47

14. INTERMEDIATE BRAKE TESTS

14.1 1,000 Mile Inspection	48
14.2 Test of Cars Added to a Train	48
14.3 Change of Crew - No Change of Consist.	49

	<u>Page</u>
15. RUNNING TEST	
15.1 Where Required	49
15.2 Procedure	50
16. BRAKE RULES - GENERAL	
16.1 Cutting Off Cars or Locomotives from Train	50
16.2 Brake Application from Train	52
16.3 Emergency Application	54
16.4 Sticking Brakes	54
16.5 Undesired Release	56
16.7 Double Heading and Helping Locomotives	57
17. INBOUND BRAKE EQUIPMENT INSPECTION	
17.1 Inspection of Trains	58
18. FREIGHT TRAIN HANDLING	
18.1 General Instructions	59
18.2 Starting Freight Trains	60
18.3 Use of Sand	60
18.4 Accelerating Freight Trains	61
18.5 Braking Freight Trains	61
18.6 Releasing Brakes	63
18.7 Stopping Freight Trains	63
18.8 Grade Braking - General	64
18.9 Pressure Maintaining Method	64
18.10 Non-Equipped Method	64
18.11 Depleted Brake Pressure	65
19. OPERATION OF EQUIPMENT	
19.1 Dynamic Brake	65
19.2 Select-A-Power Fuel Saver Device	67
19.3 Back-up Hose	67
19.4 Caboose Valves	69
19.5 Brake Pipe Flow Indicator	70
19.6 Retaining Valves	70
19.7 End of Train (EOT)	71
20. AIR BRAKE FORMS	
20.1 Form MP-261C (Initial Terminal Air Brake Test)	77
20.2 Form EC-100 (Defective Air Brake)	77
APPENDIX A - Daily Test of Alerters	79
APPENDIX B - Daily Test of Safety Control	80
APPENDIX C - Locomotive Speed Limiter (LSL) Departure Test	81
APPENDIX D - Departure Test of Cab Signals and Automatic Train Stop	85
APPENDIX E - Set Up Procedures for Locotrol II Equipment	89
APPENDIX F - Set Up & Test Procedures - Distributed Power System	96
DEFINITIONS	108

1. STANDARD AIR PRESSURE

Pressure regulating devices for air brake equipment must be adjusted to the following pressures:

	BRAKE Pipe	MAIN Res.
a. Locomotives:		
Passenger service	110	130-140
Freight service - Road*	90	125-140
- Yard	80	125-140
- Light	90	125-140
MISC.		
b. Reducing Valves:		
Yard Air Supply		80
Locomotive:		
Control air pressure		90
c. Safety Valves		
Control & Distributing Valves		60
Main Reservoir		150
Compressor:		
Intercooler		60
Discharge pipe		185
d. Locomotive Independent Brake Cylinder Pressures		
Cast iron brake shoes, (two shoes per wheel)		45
Composition brake shoes, (two shoes per wheel)		36
Composition brake shoes, (one shoe per wheel)		72

NOTE: Pressure must be within +/-3 psi. of reading indicated, with Independent Brake Valve cut-in fully applied position.

*When freight locomotives are used to haul passenger trains, brake pipe pressure must be increased to standard for passenger locomotives before locomotive is coupled to train.

1.1 BRAKE PIPE EQUALIZATION PRESSURES

Brake Pipe Pressure	Equalization Pressure	Full Service Reduction
70	50	20
80	57	23

Brake Pipe Pressure	Equalization Pressure	Full Service Reduction
90	64	26
100	71	29
110	78	32

Equalization pressure is the highest brake pressure that can be obtained from a service brake application.

2. LOCOMOTIVE AIR BRAKES (MECHANICAL FORCES)

2.1 MAINTENANCE

2.1.1 - Brake equipment on locomotives must be inspected and maintained in accordance with current "Standard Maintenance Regulations -Locomotives" (S.M.R. 1000).

2.2 RESPONSIBILITY

2.2.1 -Where mechanical forces are on duty, it will be their responsibility to know that the brakes are in a safe and suitable condition for service, that the locomotives have been inspected in accordance with Standard Maintenance Regulations, and that all necessary repairs have been made before units are dispatched for service.

2.2.2 - The place, date and time of inspection must be recorded on form MP13 in the cab on each locomotive unit.

3. LOCOMOTIVE AIR BRAKES (ENGINEERS)

3.1 INSPECTIONS

3.1.1 - Each locomotive in use shall be inspected at least once during each calendar day. A written report (EL106A) of this inspection shall be made and a record (MP13) maintained on each locomotive showing the place, date and time of the inspection.

3.2 RESPONSIBILITY

3.2.1 - Engineers, when taking charge of locomotives, must determine that the inspection has been made by examining the cab record (MP13).

3.2.2 - Where mechanical forces are on duty, the engineer will accept the inspection of the mechanical forces and will be only required to make the brake tests outlined in Section 3.4.

3.2.3 - Where mechanical forces are not on duty and cab record (MP13) is not within date, the engineer must make an inspection as specified in Section 3.3.

3.3 LOCOMOTIVE BRAKE INSPECTION

- (1) Secure locomotive to prevent movement by applying hand brake on leading unit. Hand brakes should be released on all trailing units unless required to hold locomotive.
- (2) Drain condensate from main reservoir system.
- (3) Blow condensate from end brake pipe and main reservoir equalizing hoses.
- (4) Couple MU hoses properly between units. On leading and trailing ends of consist, place hoses in proper receptacles or couple to dummy couplings.
- (5) Place all angle cocks, cut-out cocks and portions used to multiple the air brake equipment in their proper positions.
- (6) Cut out (close) brake valve cut-out cocks at all stations except the station from which the brakes will be controlled.
- (7) At the operating station from which the brakes will be controlled:
 - a. Insert independent brake valve handle and place in full application position.
 - b. Cut in (open) the independent brake cut-out cock.
 - c. Insert automatic brake valve handle and place in charging position.
 - d. Cut in (open) the automatic brake valve cut out cock.

- (8) Check that air pressure regulating devices are functioning properly and are adjusted to the standard pressures shown in Rule 1.
- (9) Check that cut-out cock for deadman/alerter device is properly positioned and sealed or locked.
- (10) Test deadman/alerter device operation as per Appendix A or B.
- (11) Check that brake shoes are approximately in line with wheel tread and that brake cylinder piston travel does not exceed 1-1/2 inches less than the maximum piston travel indicated on the blue cab form (FRA F6180-49A).
- (12) Check that brake levers, rods, hangers and pins do not bind or foul; that pins are securely applied; and that no part of the rigging is less than 2-1/2 inches above top of rail.
- (13) Test emergency brake valve and the emergency position of the Automatic Brake Valve.
- (14) After inspection is completed, release all hand brakes.

3.4 LOCOMOTIVE BRAKE TEST

3.4.1 - BRAKE PIPE LEAKAGE TEST

- (1) Make a ten (10) pound service brake pipe reduction.
- (2) Cut out the pressure maintaining feature.
- (3) Brake pipe leakage must not exceed three (3) pounds per minute.

3.4.2 - STANDING LOCOMOTIVE BRAKE TEST

This test must be made:

- (1) When initially taking charge of a light locomotive.

- (2) After changing control stations on a light locomotive.
- (3) Before making initial movement after cutting away from a train.

To determine effectiveness of brakes:

- (1) Apply independent brake in Full Application position.
- (2) Observe brake cylinder gauge for pressure.
- (3) Momentarily apply power to insure that brakes are cut in an capable of holding locomotive.
- (4) Shut off power before releasing brakes.

3.4.3 - RUNNING LOCOMOTIVE BRAKE TEST

This test must be made as soon as operating conditions permit, and immediately after:

- (1) Initial movement of light locomotive.
- (2) A change has been made in consist of light locomotive.
- (3) Changing control stations.

To determine effectiveness of brakes while the locomotive is moving:

- (1) Apply independent brake sufficiently to develop noticeable brake cylinder pressure. Check appropriate retarding effort.
- (2) Release independent brake and make a service application with automatic brake. Check brake cylinder pressure and retarding effort.
- (3) Depress independent brake handle and hold down. Check that brake cylinder pressure releases and locomotive rolls free.

3.5 CHANGE OF CREW

Engineers taking charge of locomotives will ascertain from incoming engineer either verbally or on prescribed form (EL106A) that locomotive brakes are in operative condition.

3.6 SECURING LOCOMOTIVES LEFT UNATTENDED

3.6.1 - When one or more locomotives are set off or otherwise left unattended, the locomotive(s) must be secured as follows:

3.6.2 - Except in engine house territory, hand brakes must be applied on all locomotives left unattended. On multiple unit consists, a hand brake must be applied on each locomotive equipped. Hand brakes must be applied and tested by releasing air brakes and determining that locomotive(s) remain stationary. After any hand brake has been applied, employee must follow test procedure shown below.

(1) Release independent brake and automatic brake, noting that brake cylinder pressure decreases to zero psi.

(2) Note that locomotive does not move for a period of one minute. (Employee may be required to reset alerter device one or more times during this timed period.)

(3) If hand brake is found to be ineffective, the unattended locomotive(s) must be accompanied by at least one car or locomotive with an effective hand brake.

3.6.3 - The reverse lever must be placed in neutral position and removed from all units of the locomotive consist. When the reverse lever is not removable, it must be locked in the neutral position. The Generator Field switch must be placed in the OFF position. The unit or units must be isolated.

3.6.4 - Independent brake must be Cut In and placed in Full Application position, automatic brake Cut In and placed in Full Service position and hand brake applied. Observe that brake shoes remain against wheel and that hand brake chain is not fouled or binding. Chocks must be applied to wheels where conditions require.

3.6.5 - Employees must not depend on air brakes to hold equipment left standing.

3.6.6 - In areas of high vandalism, Timetable Special Instructions on securing locomotive may differ to allow the removal of removable brake handles.

3.7 FAILURE OF LOCOMOTIVE AIR BRAKES

3.7.1 - All locomotives must leave terminal points with the air brakes in operative condition.

3.7.2 - If a failure of locomotive brakes occurs en-route, a report must be made at the first point of communication to the Train Dispatcher who will issue instructions.

3.7.3 - Engineers must report defects in locomotive air brakes at the end of each trip on prescribed form (EL106A).

3.7.4 - In the event that locomotive brakes become inoperative while a locomotive is moving light, the following procedure should be used:

- (1) Locomotives equipped with dynamic brake should be stopped by use of dynamic brake and hand brake.
- (2) Locomotives not equipped with dynamic brake, rail cars and other equipment, must be stopped with the hand brake, if practicable.
- (3) If not practicable to stop with hand brake, locomotives may be stopped by "plugging the motors."

CAUTION: THIS MUST ONLY BE USED AS A LAST RESORT. THE RETARDING FORCE WILL BE SEVERE WHEN POWER IS APPLIED IN REVERSE ON A MOVING LOCOMOTIVE, CREWS MUST ANTICIPATE THIS FORCE AND PROTECT THEMSELVES FROM INJURY.

To "plug the motors":

- a. Place throttle lever in IDLE position.
- b. Place reverse lever in position opposite to direction of movement.

- c. Move throttle lever to first notch.
- d. Locomotive must be secured with hand brakes immediately after movement is stopped, chocking the wheels if necessary.

NOTE: On Conrail SD80MAC alternating current (AC) locomotives, traction motors cannot be plugged by moving the reverser lever while in motion. Changing the position of the reverser while the locomotive is in motion will cause the locomotive computer to command full dynamic braking. Greater control can be achieved by using the locomotive's dynamic brake controls. This instruction may not apply to AC locomotives of other railroads.

3.8 LOCOMOTIVE AIR BRAKES - GENERAL

3.8.1 - Locomotive Brake Cylinder Gauge will indicate air pressure developed in the brake cylinders on only one truck, the truck nearest the gauge.

3.8.2 - To assure a complete release of all locomotive brakes on a multiple unit consist when the automatic brake is applied, the Independent Brake Valve Handle must be depressed in RELEASE position 4 seconds for each unit in the consist.

3.8.3 - An emergency brake application can be made by quickly opening the Emergency Brake Valve. This valve is located in the cab and labeled "Emergency Brake Valve".

3.8.4 - After an emergency brake application from any cause, the Automatic Brake Valve handle must remain in LAP position (EMERGENCY position with 26/30 equipment) for sixty (60) seconds before attempting to release the brakes.

3.9 PRESSURE MAINTAINING FEATURE TEST

3.9.1 - Where a test of the pressure maintaining feature is required, it shall be made in the following manner:

With the brake valve cut in (pressure maintaining cut in on 24 RL equipment) and the brake system charged:

- (1) Make an approximately 10 pound per minute brake pipe leak by slowly opening the cab emergency brake valve or brake pipe angle cock at end of locomotive until pressure begins to escape.
- (2) Make a 10 pound brake pipe reduction with the automatic brake valve.
- (3) Note that equalizing reservoir and brake pipe pressures do not increase or decrease during a test of 1 minute.
- (4) Close the cab emergency brake valve or brake pipe angle cock at end of locomotive and recharge brake pipe.
- (5) Note that main reservoir pressure is maintained during test.

3.10 - ELECTRIC PARKING BRAKE

3.10.1 - Conrail SD80MAC alternating current (AC) locomotives are equipped with an Electric Parking Brake in place of the traditional hand brake.

To operate this brake:

- (1) Make certain that the Parking Brake circuit breaker on the circuit breaker panel is in the ON position.
- (2) Locate the Parking Brake Switch and the Parking Brake Meter on the Engine Control Panel.

3.10.2 - APPLICATION:

- (1) Rotate the collar of the Parking Brake switch clockwise to align the indicator mark to the position marked APPLY.
- (2) Press and hold the push-button until the needle on the Parking Brake Meter moves to the extreme right position and moves into the yellow APPLIED ZONE. The parking brake application is complete when the needle remains steady in the indicated zone.

IMPORTANT: Do not hold the push-button in for more than 15 seconds after the indicator remains steady in the Applied Zone.

- (3) Inspect brake shoes at the number 2 and number 3 axle positions on the left side of the locomotive to ensure that brakes are properly applied. The Parking Brake Meter may be incorrect if the brake rigging is damaged or obstructed by debris or severe icing.

3.10.3 - RELEASE:

- (1) Rotate the collar of the Parking Brake switch counter-clockwise to align the indicator mark to the position marked RELEASE.
- (2) Press and hold the push-button until the needle on the Parking Brake Meter moves to the extreme left position and moves into the blue RELEASE ZONE. The parking brake is fully released when the needle remains steady in the indicated zone.

IMPORTANT: Do not hold the push-button in for more than 15 seconds after the indicator remains steady in the Release Zone.

- (3) Inspect brake shoes at the number 2 and number 3 axle positions on the left side of the locomotive to ensure that brakes are properly released. The Parking Brake Meter may be incorrect if the brake rigging is damaged or obstructed by debris or severe icing.

3.10.4 - MANUAL APPLICATION:

- (1) **IMPORTANT:** Before manually operating the parking brake system, the circuit breaker **MUST** be placed in the OFF position.
- (2) Locate the hand crank and apply it to the manual drive shaft of the parking brake unit. This hand crank is stored in a container mounted adjacent to the parking brake unit. This unit is located on the front truck on the left side of the locomotive.
- (3) Rotate the hand crank clockwise to apply.
- (4) Remove and store hand crank.

3.10.5 - MANUAL RELEASE:

- (1) **IMPORTANT:** Before manually operating the parking brake system, the circuit breaker **MUST** be placed in the OFF position.
- (2) Locate the hand crank and apply it to the manual drive shaft of the parking brake unit. This hand crank is stored in a container mounted adjacent to the parking brake unit. This unit is located on the front truck on the left side of the locomotive.
- (3) Rotate the hand crank counter-clockwise to release.
- (4) Remove and store hand crank.

4. POSITIONING LOCOMOTIVE AIR BRAKE EQUIPMENT

4.1 GENERAL INSTRUCTIONS

4.1.1 - When more than one locomotive unit is coupled to a train, all automatic brake valves must be cut out except the one from which the train brakes are operated.

4.1.2 - On all trailing units, brake valve handles must either be secured in the proper positions or removed.

4.1.3 - When changing operating stations, the change must be made without delay and precaution must be taken to insure that locomotives do not move while change is being made.

4.1.4 - After positioning air brake equipment for single, multiple unit or double-heading service, the engineer must know that the locomotive air brakes will apply and release before proceeding.

4.1.5 - On cut-out cocks and valves: OPEN or IN will mean the same, and CLOSED or OUT will mean the same.

4.2 POSITIONING 26/30 EQUIPMENT

4.2.1 - To set up 26/30 brake equipment for LEAD position in a multiple unit consist or for a single unit,

place handles and cocks in the following positions in the sequence listed:

- (1) Insert the Independent Brake Valve Handle and place in FULL APPLICATION position.
- (2) Place the MU-2-A Valve in LEAD OR DEAD position or the Dual-Ported Cut-Out Cock in the IN or OPEN position. Brake Cylinder pressure will increase to Independent Brake Valve Setting.
- (3) Insert the Automatic Brake Valve Handle and place in RELEASE position.
- (4) Allow Equalizing Reservoir to charge to Regulating Valve setting, then depress and turn the Brake Valve Cut-Off valve to IN position. Brake Pipe will charge to Equalizing Reservoir pressure.

4.2.2. - To set up 26/30 brake equipment for TRAIL, place handles and cocks in the following positions in the sequence listed:

- (1) Place the Independent Brake Valve Handle in FULL APPLICATION position.
- (2) Place Automatic Brake Valve Handle in SUPPRESSION position and wait for the brake pipe exhaust to stop blowing.
- (3) Place the MU-2-A Valve in proper TRAIL position or Dual-Ported Cut-Out Cock in OUT or CLOSED position.
- (4) Depress and turn the Brake Valve Cut-Off Valve to OUT position.
- (5) Return the Independent Brake Valve Handle to RELEASE position and remove handle.
- (6) Place the Automatic Brake Valve Handle in HANDLE OFF position and remove handle.
- (7) Before leaving cab, check that Brake Cylinder pressure holds steady.

4.3 POSITIONING EPIC EQUIPMENT - EMD LOCOMOTIVES

4.3.1 - To set up EPIC brake equipment for LEAD position in a multiple unit consist or for a single unit, place handles and operate integrated display keys in the following sequence:

- (1) Independent Brake Valve handle to FULL APPLICATION position.
- (2) Automatic Brake Valve handle to RELEASE position.

PRESS INTEGRATED DISPLAY KEYS:

- (1) Press AIR BRAKE SETUP.
- (2) Press LEAD TRAIL for Lead (Cuts in Independent Brake)
- (3) Press ACCEPT NEW - press twice. (Equalizing Reservoir increases.)
- (4) Press AIR BRAKE SETUP
- (5) Press CUT IN CUT OUT for CUT IN (Cuts in Automatic Brake)
- (6) Press Accept New - press twice.

Continue if Equalizing Reservoir must be adjusted:

- (7) Press AIR BRAKE SETUP
- (8) Press EQ RES SETUP
- (9) Use preset key for 80, 90, 100 or 110 PSI setting.
- (10) Press ENTER
- (11) Press ACCEPT NEW - press twice.

4.3.2 - To set up EPIC brake equipment for TRAIL position in a multiple unit consist or for a single unit, place handles and operate integrated display keys in the following sequence:

- (1) Independent Brake Valve handle to FULL APPLICATION position.

- (2) Automatic Brake Valve handle to FULL SERVICE position.

PRESS INTEGRATED DISPLAY KEYS:

- (1) Press AIR BRAKE SETUP
- (2) Press LEAD TRAIL for TRAIL (Cuts out Independent & Automatic Brakes)
- (3) Press ACCEPT NEW - press twice.
- (4) Move Automatic Brake Valve handle to HANDLE OFF position.
- (5) Move Independent Brake Valve handle to RELEASE position.
- (6) Note that brake cylinder pressure holds.
- (7) Press the EXIT Key to return to the Function Menu.

4.4 POSITIONING EPIC EQUIPMENT - GE LOCOMOTIVES

4.4.1 - To set up EPIC brake equipment for LEAD position in a multiple unit consist or for a single unit, place handles and operate integrated display keys in the following sequence:

- (1) Independent Brake Valve handle to FULL APPLICATION position.
- (2) Automatic Brake Valve handle to RELEASE position.

PRESS INTEGRATED DISPLAY KEYS:

- (1) Press AIR BRAKE SETUP
- (2) Press CHANGE SETUP
- (3) Press LEAD TRAIL for LEAD (Cuts in Automatic Brake Valve)
- (4) Press SAVE SETUP
- (5) Press DO IT (Equalizing Reservoir increases)

- (6) Press CHANGE SETUP
- (7) Press CUT IN CUT OUT for CUT IN (Cuts in Automatic Brake.)
- (8) Press SAVE SETUP
- (9) Press DO IT

If Equalizing Reservoir must be adjusted:

- (10) Press CHANGE SETUP
- (11) Press FEED VALVE SET
- (12) Use Up or Down Arrow Keys to adjust pressure setting.
- (13) Press SAVE SETUP
- (14) Press DO IT

4.4.2 - To set up EPIC brake equipment for TRAIL position in a multiple unit consist or for a single unit, place handles and operate integrated display keys in the following sequence::

- (1) Independent Brake Valve handle to FULL APPLICATION position.
- (2) Automatic Brake Valve handle to FULL SERVICE position.

PRESS INTEGRATED DISPLAY KEYS:

- (1) Press AIR BRAKE SETUP
- (2) Press CHANGE SETUP
- (3) Press LEAD TRAIL for TRAIL (Cuts out Independent & Automatic Brakes)
- (4) Press SAVE SETUP.
- (5) Press DO IT.
- (6) Move Automatic Brake Valve handle to HANDLE OFF position.
- (7) Move Independent Brake Valve handle to RELEASE position.

- (8) Note that brake cylinder pressure holds.
- (9) Press the EXIT Key to return to the Function Menu.

4.5 POSITIONING 24RL EQUIPMENT

4.5.1 - To set up 24 RL brake equipment for LEAD position in a multiple unit consist or for a single unit, place handles and cocks as follows in the sequence shown:

- (1) Insert Independent Brake Valve Handle and place in FULL APPLICATION position.
- (2) Turn Rotair Valve Handle to PASS position. Brake Cylinder pressure will increase to Independent Brake Valve setting.
- (3) Insert the Automatic Brake Valve Handle in RUNNING position.
- (4) Slowly move the Brake Valve Cut-Out Cock (Double-Heading Cock) to OPEN position pausing momentarily in mid position. Equalizing Reservoir and Brake Pipe will charge to Feed Valve Setting.

4.5.2 - To set up 24RL brake equipment for TRAIL position, place handles and cocks as follows in the sequence shown:

- (1) Place Independent Brake Valve Handle in FULL APPLICATION position.
- (2) Make a FULL SERVICE reduction with the Automatic Brake Valve.
- (3) Turn the Rotair Valve Handle to PASS LAP position.
- (4) Close the Brake Valve Cut-Out Cock (Double Heading Cock).
- (5) Automatic and Independent Brake Valve Handles must be removed in RUNNING and RELEASE positions, respectively.
- (6) Before leaving cab, check that Brake Cylinder pressure holds steady.

4.6 POSITIONING NOS. 6 AND 14 EQUIPMENT

4.6.1 - To set up No. 6 or 14 brake equipment for LEAD in a multiple unit consist or for a single unit, place handles and cocks as follows in the sequence shown:

- (1) Place the Independent Brake Valve Handle in FULL APPLICATION position.
- (2) Place Dual-Ported Cut-Out Cock in IN position, or if equipped with an MU-2-A Valve, in LEAD OR DEAD position. Brake Cylinder pressure will increase to Independent Brake Valve setting.
- (3) Insert Automatic Brake Valve Handle in LAP position.
- (4) Place the 2-position or 3-position Cut-Out Cock in LEAD or IN position.
- (5) Place the Automatic Brake Valve Handle in RUNNING position. Equalizing Reservoir and Brake Pipe will charge to Feed Valve setting.

4.6.2 - To set up No. 6 or 14 brake equipment for TRAIL place handles and cocks as follows in the sequence shown:

- (1) Place the Independent Brake Valve Handle in FULL APPLICATION position.
- (2) Make a FULL SERVICE reduction with the Automatic Brake Valve and place handle in LAP position.
- (3) If the unit is equipped with a 3-position Cut-Out Cock, place cock in TRAIL position. Remove or secure Automatic Brake Valve Handle in LAP position.
- (4) If the unit is equipped with a 2-position Cut-Out Cock, place the cock in CLOSED position. Remove or secure Automatic Brake Valve Handle in LAP position. Remove or secure Automatic Brake Valve Handle in LAP position.
- (5) If the unit is equipped with an MU-2-A Valve,

place the valve in TRAIL position or if equipped with a Dual-Ported Cut-Out Cock, place in OUT position.

- (6) Independent Brake Valve Handle must be removed or secured in RELEASE position.
- (7) Before leaving cab, check that Brake Cylinder pressure holds steady.

4.7 POSITIONING AIR BRAKE EQUIPMENT ON HELPER LOCOMOTIVE AT REAR OF TRAIN

4.7.1 - After coupling is made and BEFORE angle cocks are opened, a FULL SERVICE brake pipe reduction must be made on the helper locomotive.

4.7.2 - After exhaust stops blowing, air brake equipment must be set up as follows:

- (1) 26/30 Equipment - Place Automatic Brake Valve Handle in FULL SERVICE position and Brake Valve Cut-Off Valve in OUT position.
- (2) Other types of equipment - Place Brake Valve Cut-Out Cock in OUT position and Automatic Brake Valve Handle in RUNNING position.

4.7.3 - Hoses are to be coupled between rear car and helper locomotive and angle cocks opened SLOWLY.

4.7.4 - Independent Brake Valve must remain cut IN and handle placed in RELEASE position.

4.7.5 - Brakes on helper locomotive will be controlled from leading locomotive.

4.7.6 - After helper is coupled to rear of train, a Road Test of the brakes, as prescribed in Rule 13.2, must be made before proceeding.

4.8 POSITIONING AIR BRAKE EQUIPMENT ON HELPER OR DOUBLE — HEADING LOCOMOTIVE AT FRONT OF TRAIN.

4.8.1 - Air brakes shall be controlled from the leading unit in the direction of movement.

4.8.2 - On the controlling unit of the locomotive next to the train, air brake equipment must be set up as follows:

- (1) 26/30 equipment - Place Automatic Brake Valve Handle in FULL SERVICE position and Brake Valve Cut-Off Valve in OUT position.
- (2) Other types of equipment - Place Brake Valve Cut-Out Cock in OUT position and Automatic Brake Valve Handle in RUNNING position.
- (3) Independent Brake Valve Handle in RELEASE position and Dual-Ported Cut-Out Cock in OPEN or IN position. (MU-2-A Valve in LEAD OR DEAD position.)

4.8.3 - After helper or double header is coupled at front of train a Road Test of the brakes, as prescribed in Rule 13.2, must be made before proceeding.

4.9 COUPLING UNITS IN MULTIPLE

4.9.1 - When coupling MU air hoses, care must be exercised to insure that compatible hoses are connected, that Independent Application and Release (A&R) hoses and Actuating (ACT) hoses are not crossed.

4.9.2 - Condensate should be blown from hoses before coupling.

4.9.3 - A visual inspection of hoses and hose gaskets for defects should be made prior to coupling.

4.9.4 - When coupling No. 6 equipment (not equipped with Actuating hose) to 26/30 or 24RL equipment:

- (1) Brake Cylinder Equalizing hose must be connected to the A&R hose.
- (2) Main Reservoir hose connected to Main Reservoir hose.
- (3) Actuating hose on 26/30 equipment NOT connected and end cocks closed.

4.9.5 - After coupling units in multiple, a test must be made to determine that brakes apply and release properly.

AIR BRAKE EQUIPMENT POSITIONS 26/30

MODE OF OPERATION	AUTOMATIC BRAKE VALVE		INDEPENDENT BRAKE VALVE	
	HANDLE	CUT-OUT COCK	HANDLE	MU-2-A VALVE (3-POSITION)
LEAD OR SINGLE	RELEASE	IN (OPEN)	RELEASE	LEAD OR DEAD
TRAILING	HANDLE OFF & REMOVED	OUT (CLOSED)	& REMOVED	RELEASE * TRAIL
HELPER (Leading Unit)	FULL SERVICE	OUT(CLOSED)	RELEASE	LEAD OR DEAD
				DUAL-PORTED COCK (2-POSITION)
				IN (OPEN)
				OUT (CLOSED)
				IN (OPEN)

* Must be in "Trail 24" when two (2) pipes are trainlined through to unit: the APPLICATION & RELEASE (or Brake Cylinder Equalizing) pipe and the ACTUATING pipe.

Must be in "Trail 6" when only one (1) pipe, the BRAKE CYLINDER EQUALIZING is trainlined through to unit.

AIR BRAKE EQUIPMENT POSITIONS 24/RL

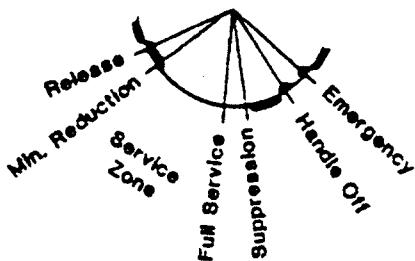
MODE OF OPERATION	AUTOMATIC BRAKE VALVE		INDEPENDENT BRAKE VALVE	
	HANDLE	CUT-OUT COCK	HANDLE	ROTAIR VALVE
LEAD OR SINGLE	RUNNING	IN	RELEASE	PASSENGER
TRAILING	RUNNING Handle Removed	OUT	RELEASE Handle Removed	PASSENGER LAP
HELPER	RUNNING	OUT	RELEASED	PASSENGER

AIR BRAKE EQUIPMENT POSITIONS 6 BLC, 6 SL, 6 BL & 14 EL

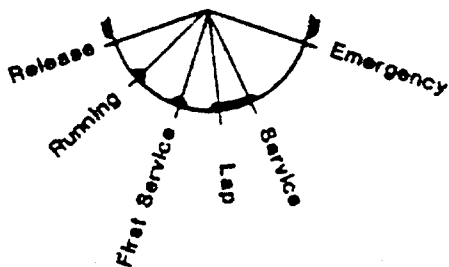
MODE OF OPERATION	AUTOMATIC BRAKE VALVE		INDEPENDENT BRAKE VALVE	
	HANDLE	2-POSITION CUT-OUT COCK	3-POSITION CUT-OUT COCK	HANDLE (3-POSITION)
LEAD OR SINGLE	RUNNING	OPEN	LEAD	RELEASE IN
TRAILING WITH 2-POSITION CUT-OUT COCK	RUNNING Handle Secured	(CLOSED)		RELEASE OUT
TRAILING WITH 3-POSITION CUT-OUT COCK	LAP Handle Removed		TRAIL	RELEASE IN
HELPER (Leading Unit)	RUNNING	CLOSED	DEAD	RELEASE IN

HANDLE POSITIONS

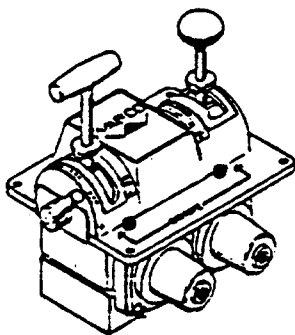
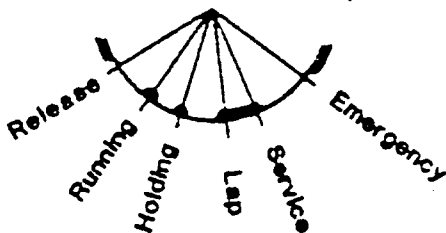
26/30



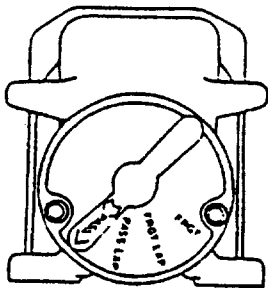
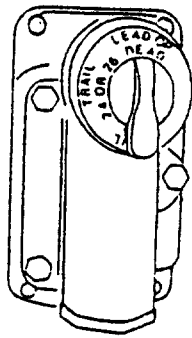
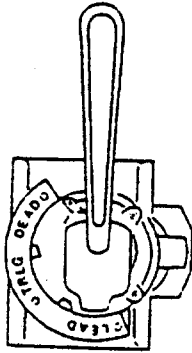
24RL



No. 6 & 14



30A-CDW Brake Valve



IN - OUT
 TRAIL 24
 A & R
 ACT
 W F - 1
 W/O F - 1

Positions of DUAL - PORTED CUT - OUT COCK

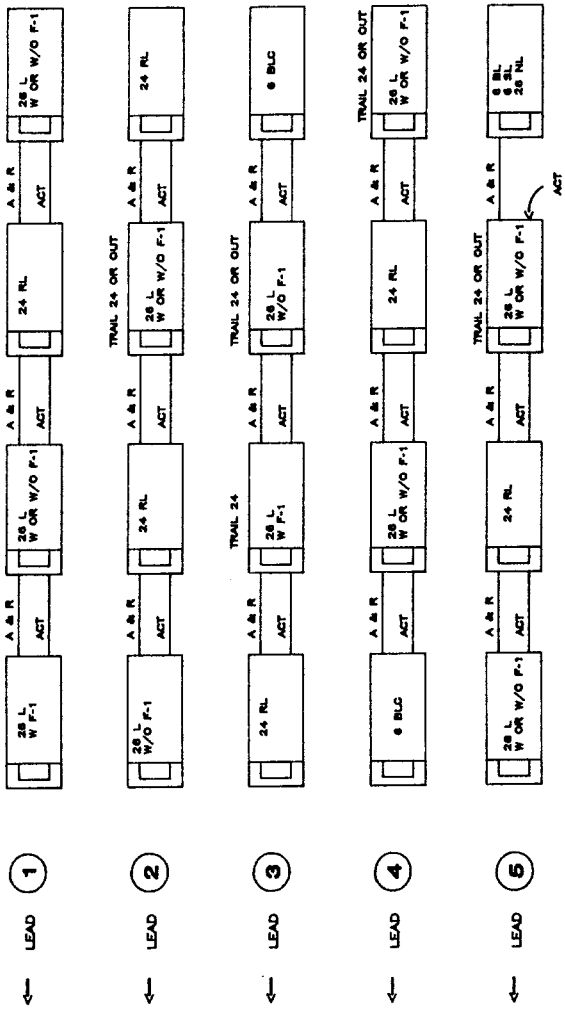
MU-2-A VALVE position

Independent APPLICATION & RELEASE PIPE or BRAKE CYLINDER EQUALIZING PIPE

ACTUATING PIPE

With F - 1 SELECTOR valve

Without F - 1 SELECTOR valve



NOTE:

Standard 6 BL or 6 SL Air Brake Equipment should not be coupled in multiple ahead of 24 RL equipment.

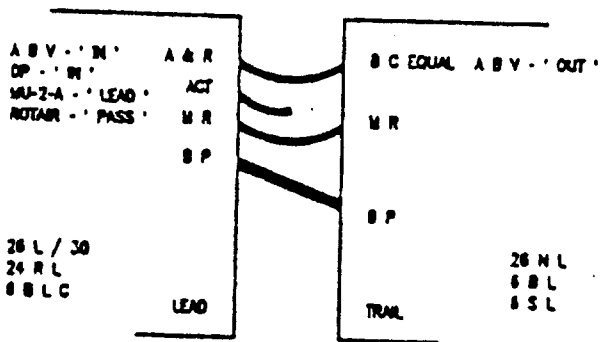
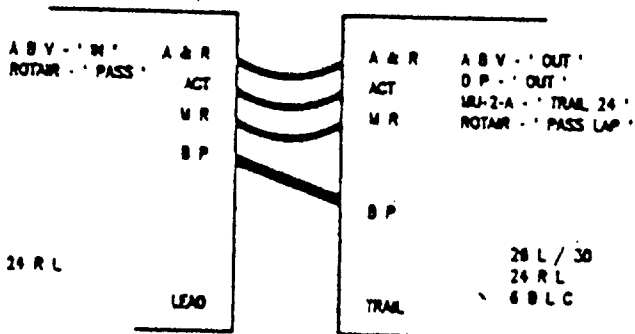
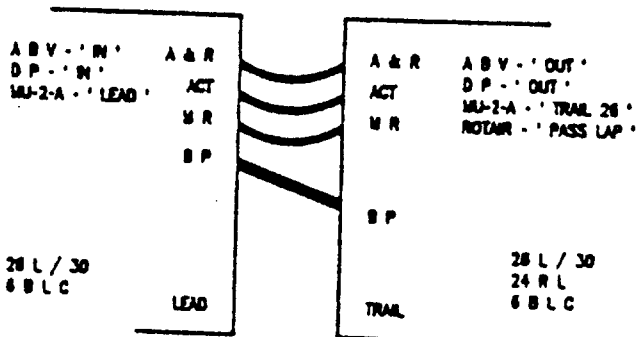
In combination 5, with 6 BL, 6 SL or 26 NL equipment in the consist, when an Automatic brake application has been "balled-off" and the independent brake is reappplied, it may be necessary to again "ball-off" when releasing to insure release of the 6 BL, 6 SL, or 26 NL brakes.

M U Combinations for Independent Brake Control

MULTIPLE UNIT AIR HOSE CONNECTIONS

LEGEND

- A & R INDEPENDENT APPLICATION & RELEASE
- ACT ACTUATING
- M R MAIN RESERVOIR
- B P BRAKE PIPE
- A B V AUTOMATIC BRAKE VALVE
- D P DUAL PORTED CUT-OUT COCK



5. HAULING DEAD LOCOMOTIVES.

5.1 - CONDITIONS

5.1.1 - A "dead locomotive" is a locomotive that does not have any traction device supplying tractive effort. It does not cease to be a locomotive because its propelling motors are inoperative or because its control jumper cables are not connected.

5.1.2 - All locomotive units dispatched dead must have the air brakes operative.

5.1.3 - Dead units must not be coupled consecutively unless it is known that all units are equipped with vent valves.

5.1.4 - Refer to NORAC Operating Rules and Time table Special Instructions for other conditions or restrictions.

5.2 DETERMINING SET UP

5.2.1 - The manner in which a dead locomotive unit is set up for TOW will be determined by the MU connections that can be made from the hauling locomotive and whether the air compressor is operating or not.

5.2.2. - This allows for three (3) methods of setting up units to be hauled dead:

- (1) Dead-in-Consist
- (2) Dead-in-Train (Main Reservoir pressure available)
- (3) Dead-in-Train (Main Reservoir pressure NOT available)

5.2.3 - A unit set up "Dead-in-Consist" must, in addition to the Brake Pipe, have all three (3) MU HOSES (Main Reservoir, Actuating, and Application & Release) connected to the hauling locomotive consist and cocks open.

5.2.4 - A unit set up "Dead-in-Train (Main Reservoir Available)" must have the Brake Pipe connected and either the air compressor operating or the Main Reservoir hoses connected to the hauling locomotive consist.

5.2.5 - A unit must be set up “Dead-in-Train (Main Reservoir. NOT available)” when only the Brake Pipe connection can be made and the air compressor is not operating.

5.3 SET UP “DEAD-IN-CONSIST”

5.3.1 - Brake Pipe hoses coupled and cocks open.

5.3.2 - All MU hoses (3) properly coupled and cocks in proper position for train lining.

5.3.3 - Automatic Brake Valve cut OUT.

5.3.4 - Independent Brake Valve cut OUT by placing Dual-Ported cut-out cock in OUT or CLOSED position, or by placing MU-2-A Valve in “Trail 24-26” position.

5.3.5 - Remove or secure Automatic and Independent Brake Valve Handles. (Secure No. 6 Automatic Brake Valve Handle in Running Position.)

5.3.6 - Unit may be set up in this manner whether air compressor is operating or not.

5.4 SET UP “DEAD-IN-TRAIN (MAIN RESERVOIR AVAILABLE)”

5.4.1 - Brake Pipe hoses coupled and cocks open.

5.4.2 - Air compressor must be operating or Main Reservoir hose must be coupled to hauling locomotive consist to provide main reservoir pressure for dead unit.

5.4.3 - Automatic Brake Valve cut OUT.

5.4.4 - Independent Brake Valve cut IN by placing Dual-Ported cut-out cock in IN or OPEN position or by placing MU-2-A Valve in LEAD OR DEAD position.

5.4.5 - Dead Engine cock CLOSED.

5.4.6 - Remove or secure Automatic and Independent Brake Valve Handles. (Secure No. 6 Automatic Brake Valve Handle in Running position.)

5.4.7 - Except for 26/30 equipment, brake cylinder

pressure must be limited to 30 pounds by adjustment of safety valve on distributing valve or control valve.

5.5 SET UP "DEAD-IN-TRAIN (MAIN RESERVOIR NOT AVAILABLE)"

5.5.1 - Brake Pipe hoses coupled and cocks open.

5.5.2 - Automatic Brake Valve cut OUT.

5.5.3 - Independent Brake Valve cut IN.

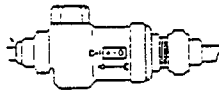
5.5.4 - Dead Engine Cock must be OPEN. (After Main Reservoir pressure has been reduced below 25 pounds.)

5.5.5 -All air operated devices except the brakes must be cut OUT.

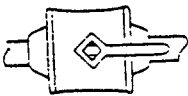
5.5.6 -Remove or secure Automatic and Independent Brake Valve Handles. (Secure No. 6 Automatic Brake Valve Handle in RUNNING position.)

5.5.7 - Actuating and Application & Release pipe cocks at ends of unit must be open, preferably with hoses removed. Brake Cylinder Equalizing pipe (on single pipe system) must have cocks closed on both ends of unit.

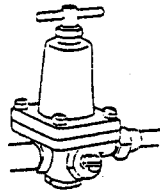
DEAD ENGINE FEATURES



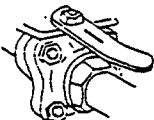
Spring-Loaded Check Valve.



Dead Engine Cock



Pressure Regulator



Dead Engine Cock

6. MAKING UP TRAINS

6.1 GENERAL

6.1.1 - Before connecting yard air supply or locomotive, condensation must be blown from the pipe from which air pressure is supplied.

6.2 CONNECTING BRAKE PIPE

6.2.1 - Air hoses must be coupled properly between all cars.

6.2.2 - Angle cocks must be opened slowly and locked.

6.2.3 - Open angle cock nearest locomotive or yard air supply first.

6.3 COUPLING LOCOMOTIVE

6.3.1 - When cars that have been standing on charge are disconnected from the yard air supply, make a heavy service brake pipe reduction by SLOWLY opening the angle cock before coupling locomotive or other cars.

6.3.2 - When sufficient reduction is made, close the angle cock SLOWLY to avoid an unintentional release of brakes.

6.3.3 - After coupling locomotive to train, the couplers between locomotive and train should be stretched to see that coupling is made. Open angle cocks SLOWLY.

6.3.4 -While the train is being made up and charged, locomotive brakes must remain applied.

6.4 CHARGING TRAIN FROM LOCOMOTIVE.

6.4.1 - During initial charging, the output of the air compressor may be increased by moving the throttle to Run-3. (Not required on C40-8, B40-8, C40-8W or SD80 MAC locomotives account equipped with electric motor driven air compressor.)

6.4.2 -Before opening the throttle, the generator field switch must be placed in OFF position and the reverse lever in NEUTRAL.

6.4.3 - When main reservoir pressure increases to 20 pounds above brake pipe pressure, throttle setting should be reduced.

6.4.4 - Throttle should be in idle when main reservoir pressure exceeds brake pipe pressure by 30 pounds.

6.5 CHARGING FROM YARD AIR SUPPLY

6.5.1 - When a yard air supply is available, it should be used to charge the train before the locomotive is attached.

6.5.2 - The yard air supply should be connected to the end which will be nearest to the hauling locomotive.

6.6 APPROXIMATE CHARGING TIME TO 90 PSI

6.6.1	— Single Car	— 7 minutes
	— 50 cars	— 8 -11 minutes
	— 100 cars	— 18-25 minutes
	— 150 cars	— 35-50 minutes

Times based on 50 ft. uncharged cars. Shorter times shown are for minimum brake pipe leakage, longer times are for maximum allowable brake pipe leakage.

6.6.2 - Pressure indicated at rear of train will determine state of charge.

6.7 ADDING CARS TO REAR OF TRAIN

6.7.1 - Where yard locomotives make up and add cars to rear of trains, brake pipe pressure on cars to be added must not exceed 80 pounds. (At least 10 pounds below standard pressure for Road Freight.)

6.7.2 - After cars are coupled, stretch coupling.

6.7.3 - Before air hoses are coupled, make a full service reduction on added cars.

6.7.4 - After reduction is completed, SLOWLY close angle cocks between yard locomotive and added cars.

6.7.5 - Couple air hoses between added cars and road freight train and SLOWLY open angle cocks.

6.7.6 - Road engineer must make proper test of air brakes.

7. TRAIN AIR BRAKE INSPECTIONS

7.1 BRAKE PIPE AND CONNECTIONS

7.1.1 - Brake pipe hoses must be properly coupled and in condition for service.

7.1.2 - Angle cocks and cut-out cocks must be positioned properly.

7.1.3 - Reservoir drain valves must be closed.

7.1.4 - Air brake system must be charged to required pressure.

7.1.5 - Examination must be made for leaks and necessary repairs made to reduce leakage to a minimum.

7.1.6 - Employees must have with them, tools and materials necessary for changing defective air hoses, hose gaskets, and tightening leaks.

7.2 RETAINING VALVES

7.2.1 - Retaining valves and pipes must be in condition for service.

7.2.2 - Handles must be positioned properly.

7.3 BRAKE RIGGING

7.3.1 - Brake rigging must not bind or foul.

7.3.2 - All parts of brake equipment must be properly secured and at least 2-3/4 inches above top of rail.

7.4 HAND BRAKES

7.4.1 - Hand brakes must be released unless needed to secure cars.

7.5 PISTON TRAVEL

7.5.1 - At Initial Terminal, piston travel of body mounted brake cylinders which is less than 7 inches or more than 9 inches must be adjusted to nominally 7 inches.

7.5.2 - Maximum piston travel of truck mounted brake cylinders must not exceed 6 inches. Minimum piston travel must be sufficient to provide proper brake shoe clearance when brakes are released.

7.5.3 - On cars equipped with other than standard single capacity brake, the piston travel must be adjusted as indicated on a badge plate or stenciling near brake cylinder on car.

7.5.4 - Before adjusting piston travel or working on brake rigging, the car brake must be cut out and released as described in 8.3.2, except when a side-vented cut-out cock is provided in brake cylinder pipe, this cock only may be closed and reservoirs need not be drained.

8. INOPERATIVE BRAKES EN ROUTE

8.1 PERCENT OF OPERATIVE BRAKES

8.1.1 - Under no circumstances may the number of operative brakes in the train be less than 85% of all cars in the train.

8.1.2 - Each locomotive unit except the leading unit shall be counted as one car in determining percentage of operative brakes.

8.1.3 - When piston travel is more than 10-1/2 inches, the air brakes cannot be considered operative.

8.1.4 - In order to maintain 85% operative brakes, the maximum number of cars with inoperative brakes must not exceed the following ratio:

INOPERATIVE BRAKES	TOTAL CARS IN TRAIN
1	7
2	14
3	20
4	27
5	34
6	40
7	47
8	54
9	60
10	67
11	74
12	80
13	87
14	94
15	100

8.1.5 - When calculating percentage of operative brakes on articulated equipment with more than one control valve, each control valve will be counted as one car.

8.1.6 - When an air brake defect is discovered en-route, the engineer must be notified of the nature of the defect and the location of the car in the train. The Train Dispatcher must be notified at the first opportunity.

8.2 HANDLING OF CARS WITH INOPERATIVE BRAKES

8.2.1 - Cars on which the air brakes become inoperative en route may be hauled without change of position in the train, provided not more than two (2) cars with brakes cut out are in consecutive order. Cars may be taken to the next repair point where the necessary repairs must be made or the car set out.

8.2.2 - If brake is damaged en route, and a *run around hose is available*, cars may be hauled in the train without change of position provided:

- (1) Run around hose assembly is properly applied and connected to brake pipe hoses of adjoining cars.
- (2) Cars with run around hoses must not be coupled to cars with inoperative brakes, or with cars equipped with brake pipe only, such as scale test cars.
- (3) Brakes are cut out in accordance with Rule 8.3.
- (4) Defective car must not be rear car of train, except as provided in Rule 8.2.3.

8.2.3 - If brake pipe becomes damaged enroute and a *run around hose is not available*, car must be coupled to the rear of the train as follows:

- (1) Brake pipe hoses connected.
- (2) Angle cock closed on leading end of damaged car.

- (3) Air pressure turned into the hoses.
- (4) Car properly secured against separation.

8.2.4 - In case of emergency, such as movement of livestock or perishable freight, a freight car with an inoperative brake may be permitted to leave a terminal or pass a designated repair point under the following conditions:

- (1) Movement must be authorized by the Superintendent.
- (2) Brake pipe hoses must be connected and angle cocks opened. If brake pipe is damaged, car must be coupled as described in Rule 8.2.2. or Rule 8.2.3.

8.2.5 - Cars picked up en route with inoperative brakes at a location where repairs can not be made, may be hauled to the next repair point. Defective air brake form (EC100) must be attached to the branch pipe cut out cock. Not more than two (2) cars with brakes cut out may be in consecutive order.

8.2.6 - A car having the hand brake or air brake inoperative must never be the last car in the train except as provided in Rule 8.2.3. A car set off with hand brake inoperative must be accompanied by at least one car with operative hand brake.

8.2.7 - Any vehicle equipped with brake pipe only, such as a scale test car, must be placed immediately ahead of rear car and air brake must be operative on the rear car. Not more than two (2) such vehicles are to be included in any train.

8.2.8 - On articulated cars equipped with more than one control valve, two (2) consecutive control valves must not be cut out. If two (2) consecutive individual control valves on one car are inoperative, the car must be set out. Also, if an end control valve on an articulated car must be cut out, it must not be coupled to an adjacent car with the control valve cut out.

8.3 CUTTING OUT CAR BRAKES

8.3.1. - Air Brakes must be cut out on a car when

brakes do not release properly because of binding or fouling brake rigging or defective control valve. Brakes must also be cut out on a car being moved with an overheated journal.

8.3.2 - To cut out the brakes on a freight car:

- (1) Close cut-out cock in branch pipe to control valve. (Place handle in-line with pipe.)
- (2) Release air pressure from reservoirs by pulling reservoir release rod out to limit and holding until all pressure has exhausted.
- (3) Check that piston rod has retracted to insure that cylinder pressure has released.
- (4) Check that brake shoes are released from wheels.

8.3.3. - Defective air brake form (EC-100) must be attached to the brake pipe branch pipe cut out cock.

8.4 NULLIFYING BRAKE PIPE VENT VALVE

8.4.1 - If a brake pipe vent valve should fail to reset en route after an emergency brake application resulting in a continuous blow at the exhaust port, the valve must be plugged.

8.4.2 - This is accomplished by removing the vent protector and inserting the plug, which is an integral part of the vent protector, into the exhaust port.

8.4.3 - Defective air brake form (EC-100) must be attached to brake pipe branch pipe cut out cock.

8.5 FAILURE TO MAINTAIN ADEQUATE PRESSURE

8.5.1 - When brake pipe pressure required for the safe handling of a train cannot be maintained, the train must be stopped and promptly secured.

8.5.2 - If main reservoir pressure drops 5 pounds below the standard brake pipe pressure, the train must be stopped, a full service brake pipe reduction made and sufficient hand brakes applied promptly to secure the train.

9. PASSENGER EQUIPMENT

9.1 - MAKING UP PASSENGER TRAINS

9.1.1 - The release feature on all passenger carrying cars should be set for GRADUATED RELEASE.

9.1.2 - The release feature on all mail, baggage and express cars should be set for DIRECT RELEASE.

9.1.3 - When performing switching operations within a passenger terminal, air brake hoses must be coupled between all cars and the brake system must be charged to at least 80 pounds.

9.2 MIXED CONSISTS

9.2.1 - Railroad passenger or rapid transit cars either loaded on flat cars or traveling on their own wheels must not be moved in revenue freight trains unless these cars are moved in accordance with written instructions from the Conrail Clearance Bureau or authorized by the Division Transportation Superintendent.

9.2.2 - The number of cars with passenger type brake equipment must not exceed 5 in any freight train unless otherwise specified.

9.2.3 - When moving passenger cars in a freight train, the release feature must be set for DIRECT RELEASE and the water raising system cut out.

9.2.4 - When moving business cars in a freight train, the release feature must be set for DIRECT RELEASE.

9.3 COMMUNICATING SIGNAL SYSTEM

9.3.1 - Communicating signal system must be tested before leaving initial terminal.

9.3.2 - If necessary for a train to proceed with communicating signal inoperative, train crew and engineer must be notified.

9.4 BRAKE TEST (PASSENGER)

9.4.1 - The Initial Terminal Test must be made on a passenger train under the same conditions and in the same manner as a freight train, with the following exceptions:

- (1) Passenger trains must be charged to not less than 90 pounds before starting test.
- (2) If train is to be operated in electro-pneumatic brake operation, that system must be tested after testing the automatic air brake.
- (3) Electro-pneumatic brake is tested by making a 20 pound E-P application, inspecting to see that all brakes have applied properly, then have released properly.

9.4.2 - A Running Test (as described in Rule 15) must be made on all passenger trains after leaving:

- (1) An initial terminal.
- (2) Any point where locomotive, engine crew or train crew has been changed.
- (3) Any point where a brake pipe angle cock has been turned or train consist changed.
- (4) Any point where electro-pneumatic brake circuit cables between locomotive units and/or cars have been disconnected.
- (5) Where required by Timetable Special Instructions.

10. TRAIN AIR BRAKE TESTS - GENERAL

10.1 - CONDITION OF BRAKES

10.1.1- Each train must have the air brakes in effective operating condition, and at no time shall the number of operative brakes be less than 85% of the total number of cars in the train.

10.1.2 - Trains leaving initial terminals or 1,000 mile inspection points must have the air brakes on all equipped cars in effective operating condition. At all other times, cars on which the air brakes become inoperative may continue in train, provided not less than 85% of the cars in the train have operative brakes.

10.2 RESPONSIBILITY

10.2.1 - Supervisors are jointly responsible with inspectors, engineers and trainmen for the proper testing of air brake equipment on locomotives and cars.

10.2.2 - They are responsible for detecting defects that can be disclosed by the required air brake tests.

10.2.3 - The required train air brake tests are:

INITIAL TERMINAL TEST - RULE 11

This test is made before the train is started, to determine that brakes on each car are in suitable condition to make the trip.

TRANSFER TRAIN AND YARD TRAIN TEST - RULE 12

This test applies only to trains that are to be moved a short distance and require the use of air brakes.

ROAD TEST - RULE 13

This test determines that the brakes throughout the entire train can be controlled from the leading locomotive.

INTERMEDIATE BRAKE TESTS - RULE 14

These tests are to be made at intervals of 1,000 miles or less, or each time cars are added to the train.

RUNNING TEST - RULE 15

This test is made while the train is in motion to determine that the brakes are capable of slowing the train.

10.2.4 - While air brake tests are being made, trains are under the jurisdiction of employees making such tests and must not be moved until authorized to do so by them.

10.3 SIGNAL FOR BRAKE APPLICATION

10.3.1 - During standing tests, brakes must not be applied or released until the proper signal is given or understanding is obtained.

10.4 AIR FLOW METHOD BRAKE TEST (AFM)

10.4.1 -All trains whose controlling locomotive is equipped with operating:

- (1) 26/30 or EPIC Locomotive Brake equipment.
- (2) Air flow indicator
- (3) End of train device (EOT)

Will use the air flow method train brake test when required.

10.4.2 - The AFM will be conducted as follow:

- (1) Charge the brake system to within 15 pounds of the feed or regulating valve setting as indicated by an accurate gauge or EOT device at rear of train.
- (2) Observe brake pipe flow indicator and note that indicator pointer is at or to the left of the 60 CFM mark.
- (3) After receiving the proper signal, make a 20 pound brake pipe reduction. (Do not cut-out brake valve cut-out cock). Employees assisting the test will observe the car or cars of the train for the application of brakes as required by the type of test being performed. After the proper signal, the engineer will release the brakes and the release will be observed as prescribed in Rule 11.6 of EC-99. Train may proceed upon indication that brakes on the rear car have released and air flow indicator pointer is returning toward the left.

10.4.3 - If at any time the air flow indicator becomes inoperative, engineer will revert to a brake pipe leakage test as prescribed in Rule 10.5.

10.4.4 - During train operation, if the air flow indicator movable pointer does not return to the limits established in the initial terminal air brake test (60 CFM or less) within a reasonable time or the 15 pounds brake pipe gradient cannot be maintained, the train crew must notify the Train Dispatcher who will arrange to have train inspected and, if any leaks found, repaired.

10.5 BRAKE PIPE LEAKAGE TEST

10.5.1 - Where a brake pipe leakage test is made from a locomotive, it shall be made in the following manner:

- (1) Charge the brake pipe system to within 15 pounds of the feed or regulating valve setting as indicated by an accurate gauge or EOT device at rear of train.
- (2) Reduce brake pipe pressure 20 pounds.
- (3) Wait for exhaust to stop blowing.
- (4) Cut out the pressure maintaining feature (if equipped). On 26/30, place brake valve cut-off valve in OUT position.
- (5) Wait an additional 60 seconds for brake pipe pressure to settle throughout the train.
- (6) Check brake pipe leakage for one minute as shown on the brake pipe gauge.

10.5.2 - Brake pipe leakage must not exceed 5 pounds per minute.

10.5.3 - After noting brake pipe leakage and upon receiving signal to release the brakes, place automatic brake valve handle in RELEASE or RUNNING position then cut in the pressure maintaining feature (if equipped). On 26/30 place the brake valve cut-off valve in the IN position.

10.6 HAND BRAKES

10.6.1 Hand brakes must be released on all cars and locomotive units before the train departs.

10.7 FUNCTIONAL TEST OF END OF TRAIN TELEMETRY DEVICE (EOT)

10.7.1 - When an EOT system device is installed, it shall be determined that the identification code entered into the front unit is identical to the last 5 digits of the identification code on the rear unit.

10.7.2 - After charging the train, the pressure displayed on the front unit must be compared with the pressure displayed on the rear unit when the TEST button is pressed.

10.7.3 - The difference between the two readings shall not exceed three (3) pounds.

10.7.4 - Where mechanical forces are on duty at point of installation, mechanical forces must bench test both RDU and STU units, prior to being armed, to determine that the device is capable of initiating an emergency application at the rear of a train.

10.7.5 - Before departure, the engineer must be informed that the Two-Way EOT Device has been so tested.

10.7.6 - Where the Two-Way EOT Device has not been previously bench tested, Train and Engine service employees must arm the device and test the emergency function using the procedure shown below.

- (1) Employee at rear of train must request and receive 3 Step Protection from engineer.
- (2) Arm the Two-Way EOT Device per Rule 19.7.10.
- (3) Close angle cock between rear car and STU.
- (4) Signal engineer to initiate emergency brake application using toggle switch on RDU or on the engineer's console.
- (5) Determine that air exhausts from STU and that pressure decreases to zero psi., as indicated by the gauge on the STU and on the display on the RDU or integrated display screen.
- (6) Employee at rear of train must slowly open angle cock that was closed, after
 - 1) employee observes that exhaust has stopped blowing at STU AND
 - 2) employee has been advised by the engineer that "EMERGENCY" message is no longer displayed on RDU or integrated display screen.

NOTE: "EMERGENCY" message appears until STU signals RDU that emergency application has been initiated. While "EMERGENCY" message is being displayed, the RDU continues to signal STU to open its emergency valve.

- (7) Release 3-Step Protection.
- (8) Before proceeding, it must be known that brake pipe pressure is being restored at rear of train.

11. INITIAL TERMINAL TEST AND INSPECTION

11.1 - WHERE REQUIRED

11.1.1 - Where train is originally made up (Initial Terminal).

11.1.2 - Where train consist is changed other than by adding or removing a solid block of cars and the train brake system remains charged.

11.1.3 - Where train is received in interchange if the train consist is changed other than by:

- (1) Removing a solid block of cars from the head end or rear end.
- (2) Changing locomotives.
- (3) Removing or changing the caboose.
- (4) Any combination of these changes.

11.2 TRAIN BRAKE INSPECTION

11.2.1 - An examination of the train air brake system must be made as prescribed in Rules 7.1 through 7.4, inclusive.

11.3 CHARGE REQUIRED FOR FREIGHT TRAIN

11.3.1 - Train air brake system must be charged to within 15 pounds of the setting of the feed or regulating valve on the locomotive.

11.3.2 - This pressure shall be indicated by an accurate gauge or EOT device at rear of train.

11.3.3. - Brakes must not be applied for test until signal is received.

11.4 PERFORMANCE OF BRAKE TEST

11.4.1 - All trains whose controlling locomotive is equipped with:

- (1) 26/30 or EPIC Locomotive Brake equipment.
- (2) Air flow indicator
- (3) End of train device (EOT)

Will perform the air flow method (AFM) train brake test as prescribed in Rule 10.4.

11.4.2 - On trains not equipped per Rule 11.4.1, the brake pipe leakage test per Rule 10.5 will be performed.

11.5 INSPECTION OF BRAKE APPLICATION

11.5.1 - Train brakes must be inspected to determine that:

- (1) Angle cocks are properly positioned.
- (2) Brakes are applied on each car and locomotive unit.
- (3) Piston travel complies with Rule 7.5.
- (4) Brake rigging does not bind or foul.
- (5) All parts of the brake equipment are properly secured.

11.6 INSPECTION OF BRAKE RELEASE

11.6.1 - After application inspection is completed, release signal must be given and brakes released.

11.6.2 - It must be seen that all brakes have released properly. Where conditions permit, a roll-by release inspection may be made.

11.7 TEST MADE FROM A YARD AIR SUPPLY

11.7.1- When train air brake system is tested from a yard air supply, an engineer's brake valve or standard test device must be used.

11.7.2 - The test device must be connected to the end which will be nearest to the hauling locomotive.

11.7.3 - The train air brake system must be charged to not less than 65 pounds as indicated by an accurate gauge at the opposite end from the test device.

11.7.4 - When properly charged, make a 20 pound brake pipe service reduction.

11.7.5 - Wait 60 seconds for the brake pipe pressure to settle throughout the train.

11.7.6 - Observe brake pipe leakage for one minute. Leakage must not exceed 5 pounds per minute.

11.7.7 - If brake pipe pressure has not reduced to 57 pounds, further reduce the pressure to this amount.

11.7.8 - Inspect the train brakes as specified in Rule 11.5.

11.7.9 - After application inspection completed, release brakes and make inspection as specified in Rule 11.6.

11.7.10 - When practicable, train air brake system should be kept charged until the road locomotive is coupled to the train.

11.7.11 - If after testing the brakes, the train has been off charge for more than two (2) hours, an initial terminal test must again be performed.

11.7.12 - At the initial terminal, when a train has been given the initial terminal test and kept charged until the road locomotive is coupled, a brake test as prescribed in Rule 10.4 or Rule 10.5 must be made by the engineer. A visual observation must be made of the application and release of the rear car brakes.

11.8 NOTIFICATION OF COMPLETION OF TEST

11.8.1 - When test of air brakes has been satisfactorily performed, the engineer must be notified that train is in proper condition to proceed.

11.8.2 - This notification must be made by a qualified person participating in the test or by one who has knowledge that it was made.

11.8.3 - When practicable, notification should be in writing on form MP 261-C.

11.8.4 - Notification must be in writing if:

- (1) The employee making the test goes off duty before the road crew reports for duty, or

- (2) The train is to be moved over 500 miles without being subjected to another test.

12. TRANSFER TRAIN AND YARD TRAIN TESTS

12.1 WHERE MOVEMENT DOES NOT EXCEED 20 MILES

12.1.1 - Couple air brake hoses between all cars.

12.1.2 - Charge brake system to within 15 pounds of the setting of the feed valve or regulating valve.

- a. To determine state of charge of brake system, in the absence of a rear car gauge or device:
 1. Allow time for brake system to charge per number of cars within train as outlined in EC-99 Rule 6.6.1.
 2. Cut-out the Pressure Maintaining Feature (if equipped). On 26/30 equipment, place Brake Valve Cut-Off Valve in OUT position. Wait an additional 60 seconds for brake pipe pressure to settle throughout the train.
 3. Check Brake Pipe gauge on locomotive. If pressure indicated on gauge is within 15 pounds of the setting of the Feed Valve or Regulating Valve, the system is charged. Cut-in pressure maintaining feature and continue.

12.1.3 - Make a 20 pound service brake pipe reduction.

12.1.4 - Determine that brakes are applied on each car.

12.1.5 - Observe that all brakes are released either prior to movement or while cars are passing.

12.2 WHERE MOVEMENT EXCEEDS 20 MILES

12.2.1 - Train must be given an Initial Terminal Test and Inspection.

13. ROAD TEST

13.1 WHERE REQUIRED

13.1.1 - Where locomotive or caboose is changed.

13.1.2 - Where blocks of cars are cut-off from or added to the train with consist otherwise remaining intact.

13.1.3 - After an angle cock is closed on a freight train for any reason and then reopened, except when adding or changing an EOT device.

13.1.4 - When adding or changing an EOT device, test per Rule 10.7 will be performed.

13.2 PROCEDURE

13.2.1 - After the train is reassembled, charge the brake pipe system to within 15 pounds of the feed or regulating valve setting as indicated at the rear of train by a rear car gauge or EOT device.

13.2.2 - Test for brake pipe continuity must be made in the following manner:

- (1) Make a 20 pound brake pipe reduction.
- (2) Determine that brake pipe pressure is being reduced at least 5 pounds at rear of train as indicated by a rear car gauge or EOT device.
- (3) Release brakes.
- (4) Determine that brake pipe pressure is being increased at least 5 pounds at rear of train as indicated by a rear car gauge or EOT device.
- (5) Before proceeding, it must be known that brake pipe pressure is being restored at rear of train.

13.2.3 - When brake pipe has been interrupted but no change is made in the train consist, including the locomotive and caboose, the requirements of a Road Test are fulfilled when it is known that brake pipe pressure is being restored at the rear of train as indicated by a rear car gauge or EOT device. In the

absence of a rear car gauge or EOT device, a visual observation must be made of the application and release of the rear car brake.

14. INTERMEDIATE BRAKE TESTS

14.1 1,000 MILE INSPECTION

14.1.1 - Through trains must be given an inspection at intermediate points designated in the Timetable Special Instructions, to determine that:

- (1) A Brake Test is performed as prescribed in Rule 10.4 (AFM) or Rule 10.5 (Brake Pipe Leakage).
- (2) Brakes apply on each car from a 20 pound service brake pipe reduction
- (3) Brake rigging is properly secured and does not bind or foul.
- (4) Piston travel does not exceed 10-1/2 inches.
- (5) All brakes release.

14.1.2 - The release inspection may be made either while standing or as train departs when speed is held suitable to allow inspection of entire train.

14.2 TEST OF CARS ADDED TO A TRAIN

14.2.1.- Where cars which have been previously given the Initial Terminal Test are added to a train, a Road Test as prescribed in Rule 13.2 must be made before proceeding.

14.2.2 - When cars which have not been previously charged and tested are added to a train, the Initial Terminal Test may be made on these cars:

- (1) When placed in the train, or
- (2) At the next terminal where facilities are available for such attention.

14.2.3 - When cars are to be given the initial terminal inspection at the next terminal, the air brakes must be tested in the following manner before departure from the location where the cars are placed in the train:

- (1) Charge train brake system to within 15 pounds of the feed or regulating valve setting as indicated at or from the rear of train.
- (2) A Brake Test is performed as prescribed in Rule 10.4 (AFM) or Rule 10.5 (Brake Pipe Leakage).
- (3) Determine that brakes on each of the added cars will apply from a 20 pound brake pipe reduction.
- (4) Determine that air brakes and hand brakes on all added cars release.

14.2.4 - Road Test, as prescribed in Rule 13.2, shall be made at the same time the added cars are tested.

14.3 CHANGE OF CREW - NO CHANGE OF CONSIST

14.3.1 - The engineer taking charge of the train may ascertain from the incoming engineer, either personally or from prescribed form (MP-261-C) that the brakes are in operative condition.

14.3.2 - When the condition of the brakes cannot be ascertained from the incoming engineer and the prescribed form is not available, the engineer taking charge of the train will make a Road Test of the brakes as per Rule 13.2 before proceeding.

15. RUNNING TEST

15.1 WHERE REQUIRED

15.1.1 - During inclement weather conditions which may cause snow or ice build up to occur between brake shoes and wheels, periodic running tests must be performed to insure proper braking effort is being provided.

15.1.2 - Whenever snow is up to or above the top of the rail or during weather conditions listed in rule 15.1.1, when trains are approaching meeting or waiting points or receive a signal indication which re-

quires the train to approach a location prepared to stop, the engineer must make an automatic brake application sufficiently in advance of that location to determine that brakes are working properly.

15.1.3 - If brakes do not provide sufficient braking effort, the train shall be stopped by a full service brake application with dynamic brake fully applied. (If, in the engineer's judgment, circumstances require an emergency brake application, this is to be done without hesitation.) After stop is made, train will be inspected to determine that brake shoes are free of snow and ice buildup before proceeding.

15.1.4 - Additional running tests on freight trains may be required as specified in Timetable Special Instructions.

15.2 PROCEDURE

15.2.1 - The running test is made by applying the train air brakes with sufficient force to determine whether or not the brakes respond properly.

15.2.2 - Total brake pipe reduction must not be less than 10 pounds before releasing.

15.2.3 - If the air brakes do not respond properly, train must be stopped, cause of failure determined, corrected and running test repeated.

16. BRAKE RULES - GENERAL

16.1 CUTTING OFF CARS OR LOCOMOTIVES FROM TRAIN

16.1.1 - Make a total brake pipe reduction of 20 pounds.

16.1.2 - The engineer must verbally communicate to appropriate employees when exhaust from the brake valve has stopped blowing and when Three Step Protection has been provided.

16.1.3 - Securing cars left unattended:

- (1) Employees must not depend on air brakes to hold equipment left standing.
- (2) Unless otherwise instructed, crew members will use the table shown below to determine the number of hand brakes to apply when securing cars left unattended.

- (3) A minimum of 10% of any cars left unattended must have hand brakes applied.

Cars Left Standing	Hand Brakes to Apply
1	1
2 - 10	1
11 - 20	2
21 - 30	3
31 - 40	4
41 - 50	5
51 - 60	6
61 - 70	7
71 - 80	8
81 - 90	9
91 - 100	10
101 - 110	11
111 - 120	12

Note: This table represents the minimum number of hand brakes required on cars left standing. Other factors, such as grade, rail condition, and weather conditions must be considered. **Additional hand brakes and/or wheel chocks may be required.** Locomotives left unattended must be secured according to Rule 3.6.

- (4) When securing cars on a grade, hand brakes must be applied starting at the lowest level of the grade.
- (5) When ready to proceed, hand brakes must remain applied until the air brake system is charged and the proper test has been made.
- (6) Hand brakes are to be released starting from the highest level of the grade.

16.1.4 - At the location where the cut is to be made, close the angle cock on the end of the cars that will remain attached to the hauling locomotive.

16.1.5 - Leave angle cock open on the cars left standing.

16.1.6 - Make the cut allowing the brakes to apply in emergency on portion of the train left standing.

16.1.7 - The angle cock on the cars left standing must be left open and brake pipe hose inspected to assure that it is hanging freely and not obstructed.

16.2 BRAKE APPLICATION FROM TRAIN

16.2.1 - Indications of a brake application from the train are:

- (1) Drop in brake pipe pressure.
- (2) Sound of excessive feed or regulating valve operation.
- (3) Movement of brake pipe flow indicator hand to right.
- (4) Decrease in speed or increase in amperage without a known cause.

16.2.2 - If the train air brakes apply at a service rate, make a 6 to 8 pound brake pipe reduction, followed by further reductions as needed to stop safely.

16.2.3 - If the train air brakes apply in emergency, place the brake valve handle in Handle Off or Lap position.

16.2.4 - When an emergency brake application occurs, it is necessary to regulate the locomotive brake cylinder pressure to prevent wheels from sliding or excessive buff forces from developing.

When regulating locomotive brake cylinder pressure to prevent excessive forces, the engineer must consider the number of locomotives in the consist (the more locomotives in the consist the more likely excessive buff forces will develop), train make up (empty cars in forward position of train are more likely to jackknife than loaded cars), curvature, grade and condition of slack. Depending on these conditions, it may be necessary to reduce brake cylinder pressure to a low value.

16.2.5 - When undesired emergency brake application occurs with train in draft (SLACK STRETCHED):

1. Move the Independent Brake Valve Handle to bail-off position. Hold the handle in this position until the train comes to a stop. This will result in the locomotive brakes remaining released.
2. Sufficient power must be maintained to insure

that slack action is minimized and the train remains stretched until it comes to a stop. Throttle must be reduced as amperage increases from the effect of the brake application.

16.2.6 - When undesired emergency brake application occurs with train in buff (SLACK BUNCHED):

- (1) The locomotive brakes should be allowed to apply, but brake cylinder pressure must be regulated to prevent sliding wheels. This can be accomplished by moving the Independent Brake Valve Handle into the Application Zone then into the bail-off position until the desired brake cylinder pressure is reached.
- (2) The handle must be held in this position to maintain a constant brake cylinder pressure during the emergency application.

16.2.7 - Most Conrail road locomotives are equipped with Type 1 Power Knockout. This feature allows the locomotive to maintain power during a train line initiated emergency brake application. Power will remain applied until the throttle is reduced to Idle or the Automatic Brake Valve is placed in Emergency Position. Power is lost in a penalty brake application from any safety control device, such as Alerter, Cab Signal or the Locomotive Speed Limiter System.

A small number of Conrail road locomotives are equipped with Type 2 Power Knockout. This feature causes the locomotive to lose power from any train line initiated emergency, automatic brake valve emergency, emergency brake valve emergency or penalty brake application.

Conrail locomotives equipped with Type 2 Power Knockout are listed in Timetable Special Instructions. Locomotives of other railroads may lose power immediately for a train line initiated emergency application or may retain power for a predetermined amount of time.

16.2.8 - After the train has stopped, to assist in locating leakage, place the automatic brake valve handle in RELEASE or RUNNING position.

16.2.9 - If the train has broken in two:

- (1) Close the angle cock on the rear end of car immediately in front of the break;
- (2) After releasing brakes and recoupling, close angle cock on rear portion of train.
- (3) Couple hoses and open the angle cock nearest to locomotive to test hoses before turning air pressure into the rear portion.
- (4) After the brake system is properly charged, make a Road Test as prescribed in Rule 13.2.3.

16.3 EMERGENCY APPLICATION

16.3.1 - If necessary to make an emergency brake application, the brake valve handle must be moved quickly to EMERGENCY position and remain there until the train stops.

16.3.2 - Locomotive brakes should be allowed to apply but brake cylinder pressure should be regulated to prevent sliding wheels or harsh slack action.

16.3.3 - After an emergency brake application from any cause, no attempt must be made to release the brakes until:

- (1) Train has stopped.
- (2) Automatic Brake Valve Handle has been in EMERGENCY position for 60 seconds (LAP position for other than 26/30 equipment).

16.3.4 - After an emergency application, regardless of cause, it must be known that brake pipe pressure is being restored at the rear of train before proceeding.

16.4 STICKING BRAKES

16.4.1 - Train and engine crews must keep a look out for brakes sticking on their train and on trains being met or passed.

16.4.2 - They must advise one another as to location or portion of train on which indications are found of brakes sticking.

16.4.3 - Probable causes of brakes sticking are:

- (1) Hand brake not fully released.
- (2) Overcharged brake system.
- (3) Retaining valve not in release position.
- (4) Binding or fouled brake rigging.
- (5) Excessive brake pipe leakage.
- (6) Defective control valve.
- (7) Improper handling of automatic brake valve, such as, failure to make at least a 10 pound reduction before releasing, or, by releasing before the brake pipe exhaust has stopped blowing.

16.4.4 - If brakes are stuck from improper handling of the automatic brake valve, after stopping train, a full service brake pipe reduction and release will usually correct the condition.

16.4.5 - Conditions that may cause an overcharged brake system are:

- (1) Adding a block of cars which have been previously charged to a pressure higher than required.
- (2) Attaching locomotive to opposite end of train.
- (3) Combining two trains or doubling two or more tracks to makeup a train.
- (4) Recoupling after a separation in train.
- (5) Changing the hauling locomotive.

NOTE: In situations (1), (3) and (4) the overcharge may be avoided by making a full service brake pipe reduction before coupling air hoses.

16.4.6 - To reduce an overcharged brake system, while the train is standing:

- (1) Adjust the feed or regulating valve to the desired brake pipe pressure setting.
- (2) Place the automatic brake valve handle in Emergency position for sixty (60) seconds.

- (3) Place the brake valve handle in RELEASE (RUNNING) position until pressure at the rear end of train shows 20 pounds.
- (4) Place the brake valve handle in HANDLE OFF (LAP) position and allow the brake pipe pressure to exhaust for one (1) minute.
- (5) Place the automatic brake valve handle in RELEASE (RUNNING) position and recharge the train. This method can be used to reduce reservoir pressure 10 pounds below the initial pressure.

16.5 UNDESIRABLE RELEASE

16.5.1 - ABD and ABDW control valves have an Accelerated Release Feature that is very sensitive to increases in brake pipe pressure. A slight increase in air pressure causes the valve to move to release and it will serially transmit the release rapidly through the train.

16.5.2 - The accelerated release feature, combined with a maintaining type automatic brake valve, can result in undesired brake releases if the following rules are not observed:

- (1) In no case shall the INITIAL brake pipe reduction be less than six (6) pounds.
- (2) If an application is required before the train brake system is fully recharged, the amount of reduction (at least 6 pounds) must be measured from the instant at which the brake pipe exhaust begins.
- (3) The emergency brake valve on the locomotive is to be used only in an emergency situation. Under no circumstances should an attempt be made to make a brake application other than emergency with this valve as it may result in an undesired release of an automatic service application on the train.
- (4) After moving the handle of the caboose valve to any application position, IT MUST NOT BE RETURNED TO THE CLOSED OR RELEASE POSITION UNTIL AFTER THE TRAIN HAS

STOPPED. The handle must be moved to the extreme application position before moving to CLOSED or RELEASE position.

- (5) If the 26-C brake valve is equipped with a three (3) position cut-off valve (FRT-PASS-OUT), it must never be placed in PASS position when hauling a freight train.

16.6 DOUBLE HEADING AND HELPING LOCOMOTIVES

16.6.1 - When more than one locomotive is attached to a train in double-heading or helper service, the engineer on the leading locomotive in direction of movement shall operate the train air brakes.

16.6.2 - On all locomotive units in the train except the leading unit, the brake valve cut-out cock must be closed, and all cocks and brake valve handles shall be positioned as specified in Rule 4.

16.6.3 - In case it becomes necessary for the lead ing locomotive to give up control of the train short of its destination, a Road Test of the brakes must be made to determine that train air brakes are operative from the automatic brake valve on the locomotive unit taking control of the train.

16.6.4 - After a helper locomotive is coupled to the train and the air brake system is charged, the engineer controlling the air brakes will make a Road Test as prescribed in Rule 13.2. Engineer must note that the brake pipe exhaust stops blowing.

16.6.5 - When an emergency application of the air brakes occurs, engineers of helper locomotives must reduce throttle to Idle immediately.

16.6.6 - In case of emergency, the brakes can be applied from a locomotive having the brake valve cut-out cock closed, by moving the handle of the automatic brake valve to EMERGENCY position (except on No. 6 equipment) or by operating the emergency brake valve.

16.6.7 - Helper engineers will operate their locomotives under the direction of the engineer of the lead locomotive. Communications will be maintained between the hauler and helper engineers to coordi-

nate starting, stopping, accelerating, slowing, approaching and cresting grades and at other locations where throttle position may be changed.

16.6.8 - When descending grades helper engineers will not be in a run throttle position higher than Throttle 1 unless otherwise instructed by the engineer of the lead locomotive.

16.6.9 - When train is on level or undulating grade, helper throttle will not be in position higher than Run 2 if helper power is not needed to maintain track speed, unless otherwise instructed by the engineer of the lead locomotive.

16.6.10 - Helper engineers will be informed by the engineer of the lead locomotive as to the number of loads, empties, tons and any restrictions for the train.

16.6.11 - Helper engineers will pay close attention to the load meter and air brake gauges to avoid excessive load forces. Throttle will be reduced as Amps increase and speed decreases when train is slowing or stopping.

17. INBOUND BRAKE EQUIPMENT INSPECTION

17.1 INSPECTION OF TRAINS

17.1.1 - To be made at locations where inspectors are employed to make a general inspection of trains upon arrival at terminal.

17.1.2 - Visual inspection must be made of:

- (1) Retaining valves
- (2) Retaining valve pipes
- (3) Release valves and rods
- (4) Brake rigging and shoes
- (5) Safety supports
- (6) Hand brakes
- (7) Brake hoses
- (8) Position of angle cocks and branch pipe cut-out cocks.

17.1.3 - Necessary repairs should be made promptly where practicable.

17.1.4 - Any cars that cannot be repaired promptly must be marked for repair tracks.

18. FREIGHT TRAIN HANDLING

18.1 GENERAL INSTRUCTIONS

18.1.1 - The engineer must handle the train in a safe and fuel efficient manner, taking full advantage of throttle modulation and dynamic braking where conditions permit.

18.1.2 - Train braking must be handled in a manner that will prevent damage to cars and lading, keeping brake shoe and wheel wear to a minimum.

18.1.3 - The engineer must be familiar with the physical characteristics of the territory and plan ahead for the action to be taken.

18.1.4 - The following factors will affect the slowing and stopping ability of freight trains: Speed, Weight and Length of Train, Grade, Weather Conditions, Brake Pipe Leakage and Gradient.

18.1.5 - Where conditions permit, slowdowns or stops should be made with not more than 15 pounds total brake pipe reduction. This reduces in-train forces and provides reserve braking effort should a shorter stop be required.

18.1.6 - The prolonged use of locomotive air brakes or excessive brake cylinder pressure, especially at high speeds, is prohibited. Such action will cause burned and damaged brake shoes and overheated wheels.

18.1.7 - During switching operations, when relying entirely on the locomotive brakes to control speed, careful consideration must be given to rail conditions, weight of cars, grade, distance required for stopping, type of locomotive and brake equipment. The throttle and independent brake must be handled in a manner that will permit slack to be adjusted smoothly. When the locomotive brake alone is not sufficient to control movements, a sufficient number of cars adjacent to the locomotive must have brake

pipe hoses coupled, angle cocks open and air brakes operative to safely control movements.

18.1.8 - The use of the locomotive Regulating or Feed Valve in making train air brake applications or releases is prohibited.

18.2 STARTING FREIGHT TRAINS

18.2.1 - Power must not be applied until sufficient time has elapsed to insure the release of brakes.

18.2.2 - The approximate time required to release the brakes following a full service application is:

100 cars — 2 minutes
150 cars — 4 minutes
200 cars — 6 minutes

Add 2 minutes to these times if brake has been applied in emergency.

18.2.3 - A train must be started in the lowest throttle position possible.

18.2.4 - Do not advance the throttle while the load meter indicates increasing amperage.

18.2.5 - If the train does not start after applying reasonable power, the throttle must be returned to IDLE and the cause determined. Further advance of the throttle may cause train separation, damage to traction motors or rail burn.

18.2.6 - When necessary to take slack to start a train, the slack must be taken carefully to avoid harsh action and roll-back.

18.2.7 - While the train is being started, locomotive speed must be kept slow and uniform until entire train is moving.

18.2.8 - When starting a train on a curve, avoid high amperage that could cause string-lining.

18.3 USE OF SAND

18.3.1 - When necessary to use sand, the No. 1 truck (or Lead Axle) sand switch should be used to prevent slipping of locomotive wheels.

18.3.2 - Slipping of locomotive wheels causes severe stress to draft systems and damage to rails and should be avoided.

18.3.3 - Do not apply sand while wheels are slipping. Throttle must be reduced to stop wheel slip, then start sanding and advance throttle slowly.

18.3.4 - Where conditions require, sand should be used as the train is stopping to avoid slipping when starting.

18.4 ACCELERATING FREIGHT TRAINS

18.4.1 - Throttle must be advanced on position at a time.

18.4.2 - Ample time should be allowed between throttle movements. Throttle must not be advanced to the next higher position until the amperage has stabilized from the last throttle advance.

18.4.3 - Engineers of consists with more than 20 traction motors on line must not use full power in pulling below 12 MPH and must use care in applying power at speeds below 20 MPH.

18.5 BRAKING FREIGHT TRAINS

18.5.1 - Where conditions permit, the dynamic brake or throttle reductions must be used in lieu of power braking to reduce train speed.

18.5.2 - INITIAL REDUCTIONS OF LESS THAN SIX (6) POUNDS MUST NOT BE ATTEMPTED. Reductions of less than 6 pounds may result in unintentional release of train brakes.

18.5.3 - Braking should be started at a sufficient distance from the objective point to allow use of a split reduction.

18.5.4 - When conditions permit, Minimum Reduction position shall be used for the initial reduction.

18.5.5 - If conditions permit, wait 20 seconds after the brake pipe exhaust stops blowing from the initial reduction, then follow with additional reductions as required.

18.5.6 - When braking freight trains with power off:

- (1) The throttle should be reduced slowly to IDLE, allowing the slack to bunch gradually.
- (2) If necessary, the dynamic brake (or independent brake if dynamic brake is not available) may be used to bunch slack prior to the initial reduction.

18.5.7 - When braking freight trains with power applied:

- (1) The initial reduction should be made before reducing throttle.
- (2) Locomotive brakes should not be permitted to apply.
- (3) Engineer must observe amperage at time of initial reduction.
- (4) As amperage increases from effect of brake application, throttle must be reduced.
- (5) Only enough power should be maintained to control slack.

18.5.8 - When braking Mail or Trail Van Trains operating at authorized speeds in excess of 59 MPH, and it is necessary to reduce speed in compliance with Approach Signal Indication (Rule 285) or Approach Sign (Rule 297), the following will apply:

- (1) An initial reduction of not less than 26 pounds must be made.
- (2) The throttle must be reduced gradually to idle within 25 seconds.
- (3) The locomotive brakes may be permitted to apply, limiting locomotive brake cylinder pressure if necessary to prevent wheel sliding.

18.5.9 - When braking freight trains operating at authorized speeds in excess of 50 MPH, and it is necessary to reduce speed in compliance with Approach Signal Indication (Rule 285) or Approach Sign (Rule 297), the initial reduction should not be less than 15 pounds.

18.5.10 - When braking loaded grain and mineral trains operating at authorized speeds in excess of 40 mph, and it is necessary to reduce speed in compliance with Approach Signal Indication (Rule 285) or Approach Sign (Rule 297), the initial reduction should not be less than 15 pounds.

18.6 RELEASING BRAKES

18.6.1 - Brake applications must not be released while the brake pipe exhaust is blowing.

18.6.2 - After the desired braking has been accomplished, brakes may be released, providing:

- (1) No less than a 10 pound brake pipe reduction has been made.
- (2) Brakes on the entire train will be released before train speed is reduced to 10 MPH.

18.6.3 - If train slack is bunched when the brake valve is moved to release position, the dynamic brake (or independent brake) must be used to prevent run-out of slack until the train brakes are fully released.

18.6.4 - If the power is applied when brake valve is moved to release position, the engineer should note the amperage reading and must handle the throttle so as not to exceed that reading until train brakes are completely released.

18.7 STOPPING FREIGHT TRAINS

18.7.1 - When conditions permit, the dynamic brake must be used to reduce train speed prior to stopping.

18.7.2 - At a sufficient distance to insure stopping at the desired point, make a minimum brake pipe reduction of 6 to 8 pounds following with additional brake pipe reductions as required.

18.7.3 - When train speed is reduced to the point where the dynamic brake is no longer effective, the independent brake should be applied lightly to prevent slack run-out and the dynamic brake released.

18.7.4 - A final reduction should be made when the train is stopping. Brake pipe exhaust must be blowing as the train stops.

18.8 GRADE BRAKING - GENERAL

18.8.1 - When descending heavy grades, the "Pressure Maintaining Method" of braking shall be used to equalize braking force through-out the train. Locomotives must be equipped with operative Pressure Maintaining Feature and Dynamic Brake.

18.8.2 - When locomotives are not equipped with operative Pressure Maintaining Feature, train must be handled in accordance with "Non-Equipped Method" of braking unless specified in Timetable Special Instructions.

18.8.3 - When using the "Pressure Maintaining Method" of braking and this feature fails, stop must be made and train handled in accordance with Timetable Special Instructions.

18.8.4 - A partial release of the train brakes must never be attempted. Brakes must either be completely released or the train stopped.

18.8.5 - When stop is made on heavy descending grade, Rule 16.6 must be complied with.

18.9 PRESSURE MAINTAINING METHOD

18.9.1 - When using this method of braking, the dynamic brake should be used to bunch slack prior to making the initial reduction.

18.9.2 - The amount of initial reduction will depend on the percent of grade, weight and speed of the train, but must not be less than 6 pounds.

18.9.3 - Further light reductions should be made when required to control speed of the train. These reductions should be made in small increments in order to avoid over braking the train.

18.9.4 - The total brake pipe reduction should be sufficient to permit the value of the dynamic brake to be varied for control of slight speed changes due to physical characteristics of the railroad.

18.10 NON-EQUIPPED METHOD

18.10.1 - When using this method of braking, retain-

ing valves must be set according to Timetable Special Instructions.

18.10.2 - The initial brake pipe reduction should be made as soon as practicable after passing the summit.

18.10.3 - The amount of this reduction will depend on the percent of grade weight and speed of the train, but must not be less than 6 pounds.

18.10.4 - Further reductions may be made as required to properly control the speed of the train.

18.10.5 - When making brake applications, the brake valve handle should be moved promptly from RELEASE to the desired SERVICE position. Hold the reductions until speed is reduced below the desired speed to be maintained. At this point, the brakes may be released.

18.10.6 - Proper control of train speed involves frequent applications and releases. Retaining valves will act to hold the speed to a slow rate of increase to allow time for the brake system to recharge.

18.11 DEPLETED BRAKE PRESSURE

18.11.1 - During grade braking operation, should it become evident to the engineer that the brake is not controlling the train effectively, the train must be stopped and secured.

18.11.2 - If pressure cannot be restored, the conductor and engineer will be responsible for reporting to the Train Dispatcher who will issue instructions.

19. OPERATION OF EQUIPMENT

19.1 DYNAMIC BRAKE

19.1.1 - When available, the dynamic brake should be used to reduce speed, to bunch slack, and to hold the slack in while releasing train brakes on a moving train.

19.1.2 - Care must be exercised when applying and releasing the dynamic brake to prevent harsh run-in or run-out of the slack.

NOTE: Due to their greater dynamic brake capabilities and for the purpose of determining power on line for train handling, Conrail SD80MAC alternating current (AC) locomotives are considered equipped with 9 traction motors. AC locomotives of other railroad, for example EMD model SD70MAC and General Electric model C44-9W, must also be considered as 9-axle locomotives.

19.1.3 - Throttle must be in IDLE for 10 seconds before moving controls to set up the dynamic brake.

19.1.4 - The dynamic brake must be applied slowly and smoothly.

19.1.5 - When releasing the dynamic brake, the same precautions should be observed as specified for dynamic brake applications.

19.1.6 - Heavy dynamic braking must be avoided when negotiating turnouts, crossovers or sharp curves.

19.1.7 - The dynamic brake may be used independently or in conjunction with the train air brakes.

19.1.8 - When the dynamic brake is applied and it becomes necessary to stop the train, the automatic brake must be used.

- (1) Make an initial reduction of not less than 6 pounds.
- (2) Follow with additional brake pipe reductions as required.
- (3) Gradually reduce dynamic brake until completely off.

19.1.9 - The independent brake must not be applied while the dynamic brake is applied on the locomotive, as this may cause the wheels to slide.

19.1.10 - The independent brake handle must be depressed frequently when the automatic brake is applied in conjunction with the dynamic brake to avoid wheel sliding. Do not depend on dynamic brake interlock (DBI) to release brakes on trailing units as locomotives from other railroads may not be equipped.

19.1.11 - When dynamic braking force becomes ineffective, independent brake may be applied gradually while moving the dynamic brake control to OFF position.

19.1.12 - Trains other than solid loaded grain or mineral freight having 3 six-motor units equipped with extended range dynamic braking must reduce to 1/2 position on dynamic brake control at speeds below 15 miles per hour.

19.1.13 - Trains having 4 six-motor units equipped with extended range dynamic braking must reduce to 1/2 position on dynamic brake control below 20 miles per hour.

19.2 SELECT-A-POWER FUEL SAVER DEVICE

19.2.1 - The fuel saver device enables the engineer to subtract or add power on an individual trailing unit rather than reduce or increase power on all units in the consist.

19.2.2 - Each time the fuel saver "Subtract" button is pressed, power is reduced to Run-1 position on an equipped trailing unit, starting from the rear of the consist. Power is restored to units in the reverse order when the "Add Power" button is pressed.

19.2.3 - The fuel saver device is nullified when the reverse lever is placed in neutral.

19.2.4 - The dynamic brake is operative on all units in the consist regardless of fuel saver mode. When returning to power, each unit will return to the previous fuel saver setting.

19.2.5 - The fuel saver device must be utilized to the fullest extent when full power is not required to maintain normal speed.

19.3 BACK-UP HOSE

19.3.1 - Back-up hoses of authorized design only are to be used and must be examined prior to each use to see that they are in fit and safe condition.

19.3.2 - Back-up hose must not be used as a substitute for hand signals or radio communication.

19.3.3 - The use of the back-up hose is permitted for car spotting operations providing that proper communication is maintained with the engineer to insure safety of the movement.

19.3.4 - Before starting any operation in which back-up hose is used to control the spotting of cars, the trainman and engineer must communicate to insure that both understand the moves to be made.

19.3.5 - After hose is attached, angle cock opened and brake system charged, brake test must be made before movement is started, as follows:

- (1) Engineer must cut out brake valve on locomotive.
- (2) Trainman will partially open the control valve by turning the handle slowly toward a position crosswise of the hose and observe that brakes apply on car.
- (3) Engineer, after noting brake pipe reduction, will give trainman proper signal and will cut brake valve in.

19.3.6 - Engineer will control movement in accordance with signals from trainman.

19.3.7 - Promptly after backup movement is started, trainman will make an application of the brakes to determine effective braking force.

19.3.8 - If such application is not observed, engineer must stop movement and ascertain reason.

19.3.9 - Service application of brakes is made by slowly opening the valve until desired braking effect is obtained.

19.3.10 - Valve should not be opened more than two-thirds unless emergency application is desired.

19.3.11 - If the desired braking is not obtained by service application, valve must be moved quickly to fully open position and movement stopped.

19.3.12 - Emergency application of brakes is made by opening valve quickly, so that handle is cross-

wise of hose, and left in this position until movement stops.

19.3.13 - Engineer must cut out brake valve on locomotive prior to approaching the vicinity where stop is to be made.

19.4 CABOOSE VALVES

19.4.1 - Brakes must not be applied from the train except in case of emergency, or in making back up and switching movements.

19.4.2 - Whenever possible, trainmen must endeavor to attract the engineer's attention by radio or signals before applying the brakes from the train.

19.4.3 - To make a service application with the caboose valve:

- (1) Move the handle clockwise to Position 2.
- (2) Leave handle in this position for AT LEAST 20 SECONDS.
- (3) Move handle to Position 3.
- (4) Leave handle in this position until train stops.

19.4.4 - If speed of train is not being satisfactorily reduced with handle in Position 3 after one minute, move handle quickly to the extreme application position and leave it there until train stops.

19.4.5 - To make an emergency application, move the handle quickly from release to the extreme application position and LEAVE IT THERE UNTIL TRAIN HAS STOPPED.

19.4.6 - After the handle has been moved to any application position. IT MUST NOT BE RETURNED TO THE CLOSED (OR LAP) POSITION UNTIL AFTER TRAIN HAS STOPPED.

19.4.7 - The handle must be moved to the extreme application position before moving it to CLOSED (OR LAP) position.

19.5 BRAKE PIPE FLOW INDICATOR

19.5.1 - The air flow indicator can be used for determining the following information.

- (1) Train Air Brake Qualification (Refer to Rule 10.4 for AFM test procedure).
- (2) When the brake system is charged.
- (3) When brakes are released on rear of train.
- (4) When brakes are being applied from the train.
- (5) Heavy brake pipe or system leakage.
- (6) Parted or burst air hose.

19.5.2 - The numerals on the flow indicator dial indicate the rate of air flow into the brake pipe. **THE NUMERALS DO NOT INDICATE BRAKE PIPE LEAKAGE** in pounds per minute.

19.5.3 - The position of the indicator pointer should be noted at time of departure.

19.5.4 - Any movement of the indicator pointer to the **RIGHT** of this reference mark indicates a greater air flow into the brake pipe which could be caused by a burst air hose, broken pipe, or brakes being applied from the train.

19.5.5 - When it is indicated that brakes are being applied from the train, the throttle and brake valves must be handled as described in Rule 16.2.

19.6 RETAINING VALES

19.6.1 - Retaining valves will be used where specified in the Timetable Special Instructions and at any time on a grade when, in the judgment of the engineer or conductor, their use is necessary to properly control the train.

19.6.2 - When retaining valves are not being used they must be placed in **DIRECT EXHAUST** position, handle vertically downward.

19.6.3 - Trainmen will be responsible for the proper positioning of retaining valves on cars that are added to a train en route.

19.6.4 - There are 2 types of retaining valves used on freight cars, the 3-position type and the 4 position type. The handle positions and functions are as follows:

EXHAUST - Handle vertically downward.

Brake cylinder pressure exhausts normally and no pressure is retained.

HIGH PRESSURE - Handle 45° below horizontal.

Brake cylinder pressure exhausts slowly to 20 pounds which is retained until handle is turned to exhaust.

LOW PRESSURE - Handle horizontal. (This position is found only on the 4-position type).

Brake cylinder pressure exhausts slowly to 10 pounds which is retained until handle is turned to exhaust.

SLOW DIRECT EXHAUST - Handle 45° above horizontal. Brake cylinder pressure exhausts slowly and no pressure is retained.

19.7 END OF TRAIN SYSTEM (EOT)

19.7.1 - The End of Train Telemetry Device (EOT) is a system consisting of a head end or Receive - Display Unit (RDU) and a rear end or Sense - Transmit Unit (STU). This device is capable of monitoring air pressure at the rear of the train, motion, marker and battery condition and transmitting this information to the locomotive cab for display. On devices capable of two-way operation, an emergency brake application at the rear of the train can be made from the locomotive cab.

Any train equipped with a Two-Way End of Train (EOT) Device must not depart its initial terminal until the device is armed and the engineer has been informed that the Two-Way EOT Device has been tested at the point of installation.

The device must remain armed and operable until the train reaches its destination.

Arming the device permits the engineer to initiate an emergency brake application at the rear of the train. Arming the device requires the coordinated action of

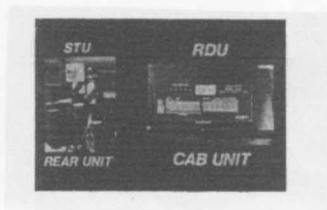
two qualified people, one at the head unit (RDU) and one at the rear unit (STU).

If the arming procedure fails after three attempts, the train crew must contact the proper authority for instructions.

Where an inoperative device cannot be repaired or replaced, the train crew must contact the proper authority for instructions.

19.7.2 - When properly connected, the End of Train Device will provide the following information in the locomotive cab:

- (1) Continuous display of brake pipe pressure at the rear of train.
- (2) A warning when pressure at the rear falls below 45 pounds.
- (3) A warning when a NO COM condition exists in the device. (FR NOCOM or RF NOCOM)
- (4) Motion of rear end (STU) unit.
- (5) STU battery charge condition. (DEAD BAT or REPL BAT)
- (6) STU emergency valve circuit failure. (VALVFAIL)
- (7) System armed status. (ARMD or DISARMD)
- (8) High Visibility Marker condition. (HVM ON or OFF)
- (9) Command for emergency brake application initiated. (EMERGENCY)



19.7.3 - Identification of Two-Way Equipment

- (1) A head unit (RDU) equipped to operate in a two-

way telemetry device can be recognized by its toggle switch, protected by a red cover and identified by the word EMERGENCY, adjacent. This toggle switch is located on the right side of the front face of the RDU. On locomotives equipped with integrated display screen systems, the toggle switch is located on the engineer's console.

- (2) A rear unit (STU) equipped to operate in a two-way telemetry device can be recognized by the 1-1/2 inch diameter hose used to couple to the brake pipe on the rear car.

19.7.4 - The rear unit (STU) must be securely attached to the trailing coupler of the rear car, brake pipe hose connected to unit and angle cock opened slowly.

19.7.5 - Each rear STU is factory coded with a unique identification (ID) number which is included in each radio transmission. The RDU is provided with an ID selector to receive transmissions from only the specified unit.

19.7.6 - The last 5 digits of the ID number displayed on the STU must be selected or dialed on the RDU. Once communication is assured between ends of the train, the ID selector on the RDU must not be changed.

19.7.7 - The STU is provided with a means of visually displaying the brake pipe pressure measurement. This display may be used to comply with the requirement that pressure be indicated by an accurate gauge at rear of train.

19.7.8 - After receiving a low pressure warning on the RDU display, and brake pipe pressure remains less than 45 pounds or a NO AIR warning is displayed, the train must be stopped promptly for inspection. In certain territories, Time Table Special Instructions may be more restrictive.

19.7.9 - Failure En Route - On a train where the device fails en route, the crew must promptly notify the Train Dispatcher. The train speed must be reduced not to exceed 30 MPH until communication within the device has been restored, or until the train reaches the next point where any defective unit can be repaired or replaced. **However, such train must not operate in "Heavy Grade Territory", as specified in Time Table Special Instructions, except as provided in NORAC Rule 25.**

An EOT Device has failed when any of the following messages is displayed:

- DEAD BAT
- REPL BAT
- VALVFAIL
- DISARMD
- FR NOCOM

Note: Message RF NOCOM does not indicate a failure of the device.

Any of these messages indicates that the device is unable to initiate an emergency application at the rear of the train from the controlling locomotive.

19.7.10 - Setting or Changing the ID Code

- (1) For PULSE units, simply rotate each thumbwheel switch until the desired number is displayed.
- (2) For US&S Digitair units, follow these steps:
 - (a) Press and Release the SET button. The first digit of the five digit ID will flash continuously.
 - (b) Press and Release the DIM^ button to change the value of this digit. Press and Release this button as often as necessary to select the required digit.
 - (c) To advance to the next digit, Press and Release the ODOM OR COMM > button. That next digit will then flash continuously.
 - (d) To change the value of that digit, repeat instruction (b), above.
 - (e) Repeat steps (b) and (c) until all digits correspond to the ID number desired.
 - (f) After proper ID number is displayed, Press and Release the SET button.
- (3) For Locomotives with Integrated Display Screens:
 - (a) Press and Release EOT Ident Button;
 - (b) Enter desired number using soft keys;
 - (c) Press and Release the Enter ID key.

19.7.11 - Arming the Device

Before attempting to arm the device, the employee at the head end is to:

- (1) Enter the ID code "00000" following the instructions in Rule 19.7.10.
- (2) On Pulse units, Press and Release the COMMUNICATIONS TEST/ARM button.
On Digitair units, Press and Release the COMM ARM button.
On locomotives with Integrated Display Screens enter "00000". Pressing another key is not required. The system disarms as soon as "00000" is entered.

This disarms the RDU from any previous assignment.
- (3) Employee at the head end then is to enter the ID code of the STU assigned to the train.
- (4) Employee assisting at rear of train, after communicating with the head end, will Press and Release the TEST button on the STU. An alarm will sound on RDU or integrated display screen and message "ARM NOW" will be displayed for five (5) seconds.
- (5) Employee at head end is to immediately Press and Release the COMM TEST/ARM button on the RDU or ARM NOW button on the integrated display screen. Message displayed on the RDU or screen will read "ARMD" and "EMERG ENABLED" indicator will be lighted. The device is now armed. On integrated display screens, the message displayed may be "ENABLED" or "EM ENABLED."

NOTE: If, after completing Step 3 above, the message display indicates "NOT ARMD" or the "EMERG DISABLED" indicator is on, the procedure must be repeated. On integrated display screens, the message displayed may be "SYSTEM NOT ARMED," "DISABLED" or "EM DISABLED."

19.7.12 - To initiate an emergency brake application at the rear end of the train:

Lift the red cover over the "EMERGENCY" toggle switch and push the switch up.

Operation of the EMERGENCY toggle switch will activate the emergency valve on the equipped STU, resulting in an emergency brake application from that unit.

The message "EMERGENCY" will briefly appear in the message display and brake pipe pressure reading will quickly drop to 0 PSI.

Note that the "LOW PRES" message will also be displayed while the last car air pressure is below 45 PSI.

19.7.13 - The two-way EOT Device **MUST** be disarmed when:

- (a) Train arrives at final terminal or destination;
and
- (b) It has been determined that communication between RDU and STU is not required;
and
- (c) Locomotive consist has been removed from train.

This rule also applies any time a controlling locomotive, an RDU or an STU is changed for any reason.

19.7.14 - Disarming the Device

IMPORTANT: The Device remains **ARMED** until it is specifically disarmed using the following procedure:

- (1) Engineer is to enter the ID code "00000" using the RDU thumbwheel or the soft keys of the integrated display screen.
- (2) Then the Engineer is to press the **COMMUNICATIONS TEST/ARM** button.

Message displayed on the RDU reads "DISARMD", the "EMERG ENABLED" indicator will be turned off and the "EMERG DISABLED" displayed indicator will be turned on. On integrated display screens, the message displayed may be "SYSTEM NOT ARMED", "DISABLED" or "EM DISABLED."

Message Displays

ARMD - System armed

DEAD BAT - Dead battery indication

DISARMD - System disarmed

EMERGENCY - Emergency brake application initiated from RDU

FR NOCOM - Front to rear communications failure

LOW PRES - Low brake pipe pressure indication

REPL BAT - Weak battery indication
RF NOCOM - Rear to front Communications failure.
VALVFAIL - Emergency valve circuit failure in STU

20. AIR BRAKE FORMS

20.1 FORM MP-261-C (INITIAL TERMINAL AIR BRAKE TEST)

20.1.1 - This form will be used, as specified in Rule 11.8, to notify the engineer that the Initial Terminal Air Brake Test has been satisfactorily performed.

20.1.2 - Where practicable and without delay to the train, this form will be issued to all trains at the completion of the Initial Terminal Air Brake Test.

20.1.3 - A form MP-261-C must be issued to trains that will be moved more than 500 miles without being given another air brake test, or, if the inspector making the test goes off duty before the road crew reports.

20.1.4 - MP-261-C forms are to be made out in duplicate: One copy for the engineer and one copy to be kept on file for 30 days at the mechanical department office at the location where the test is made.

20.1.5 - When the EOT rear unit (STU) is properly coupled to the rear of the train and communication (telemetry) is established with the locomotive, the last 5 digits of the STU device ID number must be entered on form MP-261-C.

20.1.6 - If the EOT rear unit (STU) is changed en route, the ID number must be changed on the form MP-261-C to correspond to the new rear unit ID number.

20.2 FORM EC-100 (DEFECTIVE AIR BRAKE)

20.2.1 - This form will be used to identify defective air brake equipment.

20.2.2 - The form must be properly filled out on both sides and attached to the brake pipe branch pipe cut out cock.

20.2.3 - This form must be removed after repairs have been made to the air brake equipment, then turned in to the supervisor in charge at the location where repairs were made.



**The Initial Terminal Air Brake Test
Has Been Satisfactorily Performed On:**

Train No. _____

Date _____

At _____
(Location)

By _____
(Employee Making Test)

ID No. End of Train Device _____ ①

_____ ② _____ ③



DEFECTIVE AIR BRAKE

Car No. _____ Initials _____ Date _____

Card Applied At _____ Train No. _____

By _____ Conductor

DEFECTS

Note — Check necessary blocks to designate the defects.

- Brake Pipe.
- Brake will not apply.
- Brake will not release
- Triple leak at exhaust.
- Retainer valve pipe
- Undesirable quick action in service.
- Crossover Pipe.
- Brake cylinder.
- Release valve.
- Brake leaks off.
- Train pipe clamps.
- Brake rigging.
- Angle cock.

Tie a card properly filled out to the brake pipe at the branch pipe cut out cock.

APPENDIX A

DAILY TEST OF ALERTERS

The Alerter promotes safe train operation by monitoring various operator movements to ensure the alertness of the engineer. If a proper control movement is not detected within a predetermined time period, an alarm sequence including audible and visual alarms is started. Failure to acknowledge the alarm during this time will result in a penalty brake application. This action will command a full service brake application, bringing the locomotive or train to a stop.

I. SET UP

- A. Handbrake on lead unit applied. Handbrakes applied on trailing units as required to prevent movement during test.
- B. Automatic Brake Valve cut in and handle in RELEASE OR RUNNING position.
- C. Independent Brake Valve cut in and in APPLIED position
- D. Reverser lever in NEUTRAL
- E. Isolation switch in RUN position
- F. Alerter circuit breaker in ON position.
- G. Air cut-out cock locked in OPEN position.

II. TEST:

- A. Move Independent Brake Valve handle to RELEASE.
 - (1) Allow alerter system to go through a 25-second timing cycle. Do not reset and note that a penalty brake application occurs at end of cycle.

When no reset occurs, penalty sequence is as follows:

- (1) Light and horn pulsate with increasing frequency for approximately ten (10) seconds.
- (2) Light and horn are active continuously for approximately ten (10) seconds.
- (3) Magnet valve is de-energized, resulting in a penalty brake application.

- B. To recover, place the Automatic Brake Valve handle in SUPPRESSION position until the PCS light goes out. The alerter system is now reset. Release brakes when desired.

III. RETURN TO NORMAL OPERATION

Should alerter system be found in TEST MODE. The system must be returned to normal operation as outlined below:

- A. Pulse Train Sentry System (Stand Alone):

Hold reset (whisker) switch in ON position until red C/S light goes out (approximately ten (10) seconds).

- B. Quantum System (Stand Alone):

Hold red test button on end of light/horn box until green test light goes out (approximately three (03) seconds).

- C. EMD Integrated Systems:

Press EXIT key to advance out of each screen level until reaching normal function screen.

- D. GE Integrated Systems:

Press EXIT key to advance out of each screen level until reaching normal function screen.

APPENDIX B

DAILY TEST OF SAFETY CONTROL (Deadman Feature):

I. SET UP:

- A. Handbrake on lead unit applied. Handbrakes applied on trailing units as required to prevent movement during test.
- B. Automatic Brake Valve cut IN and handle in RELEASE or RUNNING position.
- C. Independent Brake Valve cut IN and in RELEASE position.
- D. Reverser in NEUTRAL.
- E. Isolation switch in RUN position.
- F. Air cut-out cock locked in OPEN position.

II. FUNCTIONAL TEST:

- A. Initiate a penalty brake application by releasing the Safety Control Pedal.
- B. Note that equalizing air reduces at a service rate and that brakes apply on the locomotive.
- C. Recover the penalty application by moving the Automatic Brake Valve handle to the SUPPRESSION (26/30 equipment) or LAP position (6, 14 or 24 equipment). Depress the Safety Control Pedal and, after 30 seconds, return the Automatic Brake Valve handle to RELEASE or RUNNING position.
- D. Note that the brakes release.

APPENDIX C

LOCOMOTIVE SPEED LIMITER (LSL) DEPARTURE TEST

A test of the LSL system on each locomotive operating in LSL designated territory shall be made either on departure of the locomotive from its initial terminal or, if the apparatus was cut out at the time of departure from initial terminal, prior to the time the locomotive enters LSL designated cab signal territory, including Amtrak's Northeast Corridor. Only one departure test shall be required in any 24-hour period, provided that the apparatus has not been cut out since the previous test.

I. DEPARTURE TESTS ARE REQUIRED AS FOLLOWS:

- A. On a single locomotive unit equipped for operation in the forward direction, the test must be made for operation in the forward direction only.
- B. On a consist of two or more locomotives, test must be made on both ends of the consist.

II. SET UP - LEAD UNIT:

- A. Automatic Brake Valve cut IN and handle in RELEASE position.
- B. Independent Brake Valve in APPLIED position.

- C. Reverser in FORWARD position.
- D. Generator Field switch in ON position (GE locomotives only).
- E. Isolation switch in RUN position.
- F. Air cut-out cock locked in OPEN position.
- G. ATC breaker in ON position.
- H. Logic box cut-out switch in ON or LSL/CS position and locked.

III. SET UP - TRAIL UNIT(S):

- A. Automatic Brake Valve cut OUT, handle removed.
- B. Independent Brake Valve cut OUT, handle removed.
- C. Reverser in NEUTRAL position, handle removed.

IV. Perform LSL System self-test by pressing the Mode Switch to advance the indicator to "Self Test" mode.

NOTE 1: When "do Air" message is displayed, the LSL SYSTEM will wait indefinitely until engineer recovers the air by moving Automatic Brake Valve handle to RELEASE and Independent Brake Valve to APPLIED position.

NOTE 2: Test mode cannot be exited without running a successful self-test.

The LSL will run its self-test, which takes about 30 seconds. During this test, the LSL will do the following:

Display software version number for five (5) seconds (Version 2.00 or higher). **(Make a note of this number.)** . Display any faults from prior running for two (2) seconds for each fault. DO NOT press the Mode button at this time. This will cause the system to abort the test and go the "Cab Signal Test" mode

Light all LED's one at a time, check brightness, and then turn them off one at a time. Watch for burned out lights and digit segments.

Test the LSL alarm.

Test the Logic Box electronics.

<u>Test No.</u>	<u>Test</u>	<u>Fault No. Displayed</u>
03	Horn Test (Audible Warning Sounds)	-
04	RAM Test (Electronics Self Test)	08
05	System Watchdog (Electronics Self Test)	29

De-energize magnet valve causing a penalty brake application. Engineer must recover from penalty in normal manner. (See NOTE 1).

When the System LSL self-test has been completed and the system is free of faults, the display will read "run", indicating that the system passed the self-test. The unit will automatically exit to the "Non-Cab" mode in five (5) seconds.

If the LSL fails any test during self-test, it will display an associated fault code and an error code "err" upon completion.

If a fault appears, make a note of the fault code on the EL 106-A report.

CRITICAL FAULTS (Display "C"):

If the fault is a **Critical Stop** fault, the locomotive will receive a **penalty brake application** if an attempt is made to move.

If the fault is a **Critical Limited Fault** the locomotive must be run at **Restricted Speed (15 MPH)** regardless of cab signal indication.

FAULT CODES AND THEIR LEVEL OF SEVERITY ARE ON NEXT PAGE AS FOLLOWS:

FAULT SEVERITY			
	SOFTWARE	VERSION	APPLIES
	2.09	2.13	2.01
	2.18	4.13	2.02
FAULT NO.	4.18	4.13	3.04
01	Limited	Limited	Limited
02	Limited	Limited	Limited
03	STOP	NA	Limited
04	Limited	STOP	Limited
05	Limited	STOP	Limited
06	Limited	STOP	Limited
07	Limited	STOP	Limited
08	STOP	STOP	STOP
09	STOP	Limited	Limited
10	NA	Limited	Limited
11	NA	Limited	Limited
12	Limited	Limited	Limited
13	Limited	Limited	Limited
14	Limited	Limited	Limited
15	Limited	Limited	Limited
16	STOP	STOP	Information
17	Information	Information	Information
18	STOP	NA	Limited
19	NA	NA	Limited
20	Limited	Limited	Information
21	NA	Information	Information
22	STOP	STOP	Information
23	STOP	STOP	STOP
24	NA	NA	Information
25	Limited	STOP	STOP
26	Limited	STOP	Limited
27	Limited	STOP	Limited
28	NA	Limited	STOP
29	NA	STOP	Limited
30	Limited	Limited	Limited
31	STOP	STOP	STOP
32	NA	Limited	Limited
33	NA	Limited	Limited
34	NA	Limited	Limited
35	NA	Limited	Limited
36	NA	Limited	Limited
37	NA	Limited	Limited
38	STOP	STOP	STOP
39	STOP	STOP	NA
40	STOP	STOP	NA
41	STOP	STOP	NA

RECORD ALL FAULT NUMBERS ON EL 106-A

Repeat the self-test to clear the fault by pushing the mode button once. Fault cannot be cleared without running a self-test. Test mode cannot be exited without running a successful self-test.

Move the Automatic Brake Valve handle to the SUPPRESSION position and the Independent Brake Valve to RELEASE position. Push the mode button to the "Self-Test" mode.

The display should show software version and a "do Air" message will appear. The "do Air" message will continue to be displayed until the Automatic Brake Valve handle is moved to RELEASE and the Independent Brake Valve is APPLIED.

Return the Automatic Brake Valve handle to the RELEASE or RUNNING position and apply the Independent Brake, LSL will run another self-test. Upon completion, it will exit to "Non-Cab" mode.

APPENDIX D

DEPARTURE TEST OF CAB SIGNALS AND AUTOMATIC TRAIN STOP:

I. SET UP:

- A. Visually inspect the pickup bars for physical damage and to insure they are not distorted.
- B. Automatic Brake Valve cut IN and handle in RELEASE or RUNNING position.
- C. Independent Brake Valve cut IN and in FULL APPLICATION position.
- D. Reverser in direction of travel for test.
- E. Isolation switch in RUN position.
- F. Circuit breaker in CUT IN position.
- G. Air cut-out cock locked in OPEN position.

II. TEST FROM TRACK SIDE APPARATUS TEST LOOP

A. CAB SIGNAL TEST:

1. Set the test apparatus to give a CLEAR signal. The audible indicator should not sound.

2. Change to APPROACH MEDIUM signal. Audible indicator should sound until acknowledgment is made.
3. Change to APPROACH signal. Audible indicator should sound until acknowledgment is made.
4. Change to RESTRICTING signal. Audible indicator should sound until acknowledgment is made.

B. AUTOMATIC TRAIN STOP TEST:

1. On change from APPROACH to RESTRICTING, do not acknowledge. After the expiration of a time period not exceeding eight (8) seconds, observe that a penalty full service brake application occurs.
2. To reset place Automatic Brake Valve handle in SUPPRESSION or LAP position until PCS is reset.
3. After PCS is reset, acknowledge Cab Signals.
4. Brakes can be released when desired.

III. DEPARTURE TEST FOR LOCOMOTIVES EQUIPPED WITH CAB SIGNAL SELF TEST:

A. LSL EQUIPPED UNITS:

Cab signal test can be performed in either "CS Only" mode or "LSL/CS" mode.

NOTE: Cab Signal Test mode cannot be exited without running a successful cab signal self-test.

1. To enter the cab signal self-test, the Automatic Brake Valve must be in the RELEASE or RUNNING position, the Independent Brake must be APPLIED. If the locomotive air is not set up properly, the LSL will display a "do Air" message until air handles are moved to proper position. The reverser must be in FORWARD and the Generator Field switch must be in ON position (GE units ONLY).

2. Press the Mode Button to advance into "Cab Signal Self-Test."

The LSL display will display the following:

- a. Software version CR 2.0 or higher.
- b. "PS NOR" (press mode button once to advance).
- c. "PS LO" (press mode button once to advance).
- d. "50 CLR" ("90 CLR" on E8 locomotives only).
- e. "30-A" (acknowledge cab signal change).
- f. "20 APP" (acknowledge cab signal change).
- g. "20 RES" (acknowledge cab signal change).
- h. "50 CLR" ("90 CLR" on E8 locomotives only).
- i. "50 LO" - ("90 LO" on E8 locomotives only)
- Do not acknowledge cab signal change.
- j. Locomotive goes into penalty braking after the expiration of a time period not exceeding eight (8) seconds.
- k. LSL displays "do Air."

NOTE: The "do Air" message will be displayed indefinitely until engineer recovers air.

- l. Engineer must place automatic brake valve handle in SUPPRESSION or LAP position until PCS is reset and acknowledge Cab Signals.
- m. Air is recovered, test continues.
- n. "-1-(receiver bar coil resistance test).
- o. "run."
- p. Automatically exit to Non Cab Mode.

3. If any faults were encountered during this test (faults 32 through 37), an error message will be displayed at the end of the cab signal self-test. Make a note of the faults and repeat the cab signal self-test by pushing the mode button once.
4. When no faults are found, the display will read "run" on completion of the self-test. System will automatically exit to Non Cab Mode.
5. Form EL-108 must be completed, dated, and signed indicating that the Cab Signal System was tested and functioned properly.

B. "EH" EQUIPPED UNITS:

1. Locate the push button marked "Departure" to the right of the reverser on the control stand. Apply the independent brakes and place the reverser handle in the FORWARD position. The automatic brakes should be released.
2. Push and hold the Departure Test Button. The red light below the aspect lights will light at the code rate being tested. The departure test button must be held in for approximately 90 seconds to complete the test.
3. After the aspect changes from CLEAR to APPROACH-MEDIUM to APPROACH, acknowledge with the foot pedal.
4. When the aspect changes from APPROACH to RESTRICTING, do not acknowledge. A full service brake application will occur. IT WILL NOT BE POSSIBLE TO RESET THE BRAKES FOR AT LEAST 70 SECONDS because of an electronic timing function.

APPENDIX E

SET UP PROCEDURES FOR LOCOTROL II EQUIPMENT (CONRAIL Locomotives 6050-6059)

Equipment Set-Up

Remote (Controlling Unit)

1. Automatic Brake Valve cut IN - handle in RELEASE and apply brake handle latch.
2. Independent Brake Valve cut IN and fully applied until Locotrol equipment is turned on and cut in.
3. Control & Fuel Pump and Dynamic Brake circuit breakers - **ON**.
4. Engine Run and Generator Field switches - **OFF**.
5. Isolation switch in **Run** and Reverser in **Neutral**.
6. Set **Lead/Remote** switch to **Remote**.
7. Set **Same-Lead/Opposite** Switch per relation with lead unit.
8. Set the finger wheel switches to the train's lead unit number.
9. Turn **ON** 3 circuit breakers.
10. Cut **IN** Air Brake manifold cut out valve in the short hood.
11. Turn **ON Locotrol** circuit breaker on the engine control panel.
12. Remote units will go into emergency - Place Independent Brake Valve handle in RELEASE position. (Make sure cylinder pressure holds).

LEAD UNIT

1. Automatic Brake Valve cut IN - Handle in RELEASE position and apply Brake Handle Latch.

2. Independent Brake cut IN and fully applied.
3. Set mode selector on control console to **Isolate**.
4. Set **Lead/Remote** switch to **Lead**.
5. Set **Same-Lead/Opposite** switch to **Same Lead**.
6. Set finger wheel switches to "0000".
7. Turn on 3 circuit breakers.
8. Cut IN Air Brake Manifold Cut Out Valve.
9. Turn on **Locotrol** circuit breaker on the Engine Control Panel.
10. Lead units will go into emergency.
11. All indicators on control console will be blinking with alarm.
12. Push the **Reset** key to silence the alarm. **Unlink** indicator is lit.

LINK UP

1. Enter the remote engine number on the control console.
2. Press **Link** and **Intlk** switches simultaneously.
3. **Link** indicator will light after several seconds. If not try again.
4. Observe that **PCS** and **IBA** indicators are lit.

REMOTE FEED VALVE CONTROL

1. Place mode selector in **Idle**.
2. Press **Independent Apply** button for at least **20** seconds (Not required in control mode).

3. Press Feed Valve key on control console and then pull UP on **Automatic** button.
4. The **IN** indicator should light.

CONTROL MODE

1. Press **Automatic** button and make 20 psi. brake pipe reduction.
2. The **Control** Indicator should illuminate within 35 seconds.

TRAIN CHECK TEST

The Train Check is used to check the brake pipe's continuity. This test is used anytime the train is stopped.

1. With the train stopped, if an automatic brake application has not been made, make a **10 psi.** brake pipe reduction and wait for the reduction to stabilize.
2. Cut out the automatic brake valve on the lead unit only by placing the automatic brake valve cut-out in the **OUT** position
3. Release the train brakes by pulling up on the **AUTOMATIC** button.
 - a. Observe that brake pipe is increasing at the head end of the train by observing the brake pipe gauge of the lead locomotive.
 - b. Observe that brake pipe is increasing at the rear of the train by observing the EOT pressure at the rear of the train.

NOTE: Failure of brake pipe pressure to increase at either the front or rear of the train indicates a deficiency in brake pipe continuity in that portion of the train.

4. Cut in the automatic brake valve of the lead locomotive by placing the automatic brake valve cut-out in the **IN** position.

EMERGENCY RECOVERY

1. Move Mode Selector to **Isolate** for at least one minute.

2. Throttle in IDLE and **Emergency** button reset (pulled).
3. Move mode selector to **Idle**. Both **Idle** lights must be lit steady; if they don't, go back to **Isolate**.
4. Press **Feed Valve** switch and then pull up **Automatic** button.
5. Observe Feed Valve indicates **IN**.
6. Note pressure is being restored at the rear of train.
7. Press **Independent Release** button before proceeding.

PENALTY RECOVERY

1. On lead unit, unlatch Automatic Brake Valve handle and place in SUPPRESSION position.
2. When **PCS** light goes OUT on lead unit, place Automatic Brake Valve handle in RELEASE position and relatch.
3. Insure **Penalty** indicator goes OUT on Control Console.
4. Pull up the **Automatic** button.

UNCOUPLING LEAD CONSIST FROM TRAIN

Cut off procedure (Ahead of remote consist)

1. Make 20 psi. brake pipe reduction.
2. After exhaust stops, place Mode Selector in **Isolate**.
3. Signal to train crewman that reduction is complete. Close angle cock closest to head end and leave other angle cock open. Cut away, allowing the portion left standing to apply in emergency. (Apply appropriate number of hand brakes).

4. Insure **PCS** and **IBA** are lit on control console.

RECOUPLING

1. Recouple and stretch.
2. Prior to opening angle cocks, make a full service brake pipe reduction.
3. After exhaust stops, open angle cocks.
4. Place mode selector in **Idle**.
5. Press **Feed Valve** switch and then pull up **Automatic** button.
6. Observe Feed Valve indicates **IN**.

SHUT DOWN LOCOTROL EQUIPMENT

1. Press **Automatic** button making 20 psi. brake pipe reduction.
2. After exhaust stops, place mode selector in **Isolate**. Feed Valve indicates **Out**.
3. Press **Unlink** and **Intlk** switches simultaneously.
4. Brakes will apply in EMERGENCY.

LEAD AND REMOTE

5. Cut OUT Air Brake Manifold cut out cock.
6. Turn OFF **Locotrol** circuit breaker and 3 breakers on system module.
7. Dial finger wheel switches on system module to "0000".
8. Remove Automatic Brake Handle Latch.

OPERATION

Air Brake Console

Emergency - Operation of the EMERGENCY button by pushing down will cause emergency on both the lead and remote consists. Button must be reset by pulling up.

Automatic Apply - The first momentary push of the AUTOMATIC button will cause a 7 psi. reduction. Each momentary push after that will cause a 2 psi. reduction. Heavier reductions can be made by pushing and holding the button down while measuring the reduction on the Equalizing Reservoir gauge.

Automatic Release - Momentarily pulling up on the AUTOMATIC button will release the brakes and charge the train from the lead and remote consists when the remote feed valve is IN.

Independent Apply - Push the INDEPENDENT APPLY button until desired brake cylinder pressure is reached. Once 45 psi. is reached, pressure will automatically increase to the maximum.

Independent Release - Momentarily pressing the INDEPENDENT RELEASE button will release independent applications and bail automatic applications.

CONTROL CONSOLE

Mode Selector - Used to control traction and dynamic braking on the remote consist.

Isolate - Remote consist will not respond to power or brake commands from the lead consist.

Idle - Remote consist will not respond to traction or dynamic brake but will respond to air brake commands with the remote feed valve IN.

MU - Remote consist will duplicate the traction and dynamic brake actions of the lead consist.

1-8 Allows remote consist traction and dynamic brake to be modulated differently from the lead consist.

AUTOMATIC BRAKE VALVE - The Automatic Brake Valve on the lead and remote locotrol equipped units must be cut

in and latched in the Release position during locotrol operation. Any movement of the handle away from Release during Locotrol operation will cause a penalty brake application.

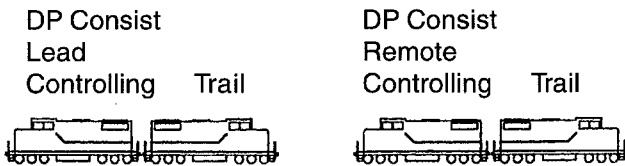
INDEPENDENT BRAKE VALVE - The Independent Brake Valve on the remote Locotrol unit must be cut in and released. Operation of the Independent Brake on the remote consist must be controlled by the **INDEPENDENT** buttons on the lead Locotrol unit. The Independent Brake Valve on the lead unit must also be cut in; however, the Independent Brake Valve may be used as it normally is to control the Independent Brake on the lead consist as in switching operations.

APPENDIX F

SET UP AND TEST PROCEDURES INTEGRATED DISTRIBUTED POWER (DP) SYSTEM Conrail SD80MAC Locomotives CR 4100 Through CR 4129

An operator controls each locomotive consist of the entire distributed power train from the LEAD Controlling Locomotive. The term REMOTE Controlling Locomotive applies to the controlling locomotive unit in a remote locomotive consist. Locomotives connected to LEAD or REMOTE controlling units with MU hoses and jumper cables for multiple unit service are referred to as Trail Locomotives.

A. Consist Configuration:



Before beginning the set up procedures, each LEAD and REMOTE DP consist or unit must be coupled together but without MU hoses and jumper cables connected between the consists. Each consist and/or unit should be running with the independent brakes fully applied. Hand brakes must be applied on each LEAD and REMOTE controlling unit. Brake pipe hoses between the LEAD and REMOTE consists must be coupled with angle cocks opened. (MU hoses between the LEAD and REMOTE consists must remain uncoupled and associated cut-out cocks closed.)

B. Entry To DP System:

1. The Distributed Power (DP) system is entered through the LIS display right screen. This screen has two different types of control menus:

Main Menu — Used to access data logs, initiate tests, select setup menus, set system modes and end DP operation.

Setup Menu — Used to setup each unit for lead or remote operation and to link the lead and remote units together.

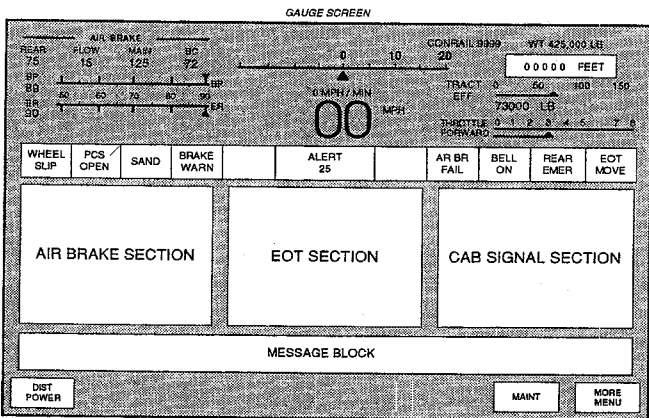
C. Equipment Set-Up:

1. **REMOTE Set-up** (Controlling Unit):

Set the following switches and handles as shown:

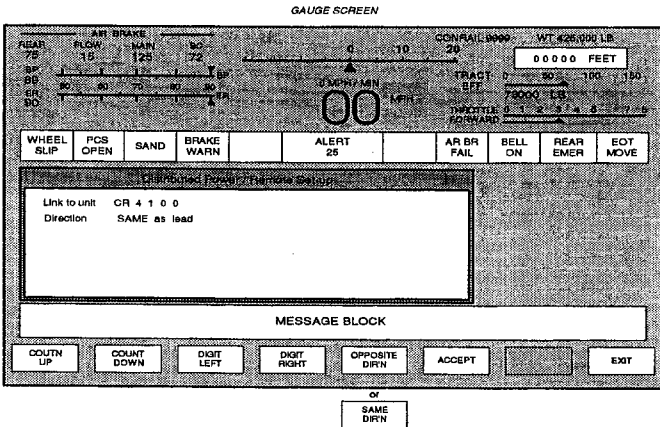
- (a) Air brake set-up: **LEAD CUT-IN**
- (b) Automatic brake valve handle: **RELEASE POSITION**
- (c) Independent brake valve handle: **FULLY APPLIED**
- (d) Reverser: **NEUTRAL** (handle removed)
- (e) Throttle Handle: **IDLE**
- (f) Control and Fuel Pump Switches: **ON**
- (g) Generator Field Switches and Engine Run: **OFF**
- (h) Dynamic Brake Circuit Switch: **CUT-IN**
- (i) Data Radios Circuit Breaker: **ON**
- (j) Unit Isolation Switch: **RUN**

Figure 1
LIS Operations Menu, Page 2



2. Select the **DIST POWER** key from the right ICE screen. If this key is not available, select **MORE MENU** until the key appears. The Distributed Power Main Menu will be displayed along with new key selection.
3. Select **REMOTE SET UP** key. The Distributed Power Remote Set-Up Menu will be displayed.

Figure 2 DP Remote Setup Menu



4. Enter the unit number of the unit that will be used as the **LEAD** distributed power locomotive.
5. Select either **SAME DIRECT** or **OPPOSITE DIRECT** key.

Note: If the unit you are on is facing the same direction as the lead unit on the head end of the train, select "SAME DIRECT." If the unit is facing in the opposite direction, select "OPPOSITE DIRECT."

6. Select **ACCEPT**, after unit number and direction have been correctly entered.

NOTE: This will cause a penalty brake application.

7. Move independent brake handle to **RELEASE** position. This action should cause no response from the air brakes. All other units in this locomotive consist should remain set up as conventional trailing units.
8. Move the automatic brake handle to the **Handle OFF** position.

NOTE: Repeat this process for any other **REMOTE** units that will be used as **REMOTES**.

9. After all **REMOTE** units are set up, move to the lead unit.

D. LEAD Set-up (Controlling Unit)

1. Set the following switches and handles as shown:
 - (a) Air brake set up: **LEAD CUT IN**
 - (b) Automatic brake handle: **RELEASE POSITION**
 - (c) Independent brake handle: **FULLY APPLIED**
 - (d) Reverser: **NEUTRAL**
 - (e) Throttle Handle: **IDLE**
 - (f) Control, Fuel Pump Switches and Engine Run: **ON**
 - (g) Generator Field Switch: **OFF**
 - (h) Dynamic Brake Circuit Switch: **CUT-IN**
 - (i) Data Radio Circuit Breaker: **ON**
 - (j) Isolation Switch: **RUN**
2. Select the **DIST POWER** key from the right **ICE** screen. If this key is not available, select **MORE MENU** until the key appears. The Distributed Power Main Menu will be displayed along with new key selection.
3. Select **LEAD SET UP** key. The Distributed Power Set Up Menu will be displayed.

E. Linking the Distributed Power System:

1. Enter the unit number of the first REMOTE controlling unit that will be controlled by this LEAD controlling unit.

Figure 3
DP LEAD Unit Setup Menu

GAUGE SCREEN

WHEEL SLIP	PCS OPEN	SAND	BRAKE WARN	ALERT 25	AIR BR FAIL	BELL ON	REAR EMER	EOT MOVE
------------	----------	------	------------	----------	-------------	---------	-----------	----------

Distributed Power / Lead Setup

Unit CR 4 1 0 0 Linked OK
Linked to unit CR 4 1 0 1

MESSAGE BLOCK

COUNT UP COUNT DOWN DIGIT LEFT DIGIT RIGHT LINK ACCEPT UNLINK EXIT

2. Select **LINK** key. The system will now attempt to establish radio communication between the lead and remote units. If successful, a message will appear next to the remote unit number that says Linked OK. Repeat this process for each additional REMOTE controlling unit. When all REMOTE controlling units have been entered and linked, continue to the next step.

Note: A Distributed Power Link Penalty will occur. Follow the prompt messages that appear on the screen to reset.
WARNING: Do not move the automatic brake handle to release position before prompted. This will restart a timing period that lasts approximately 60 seconds.

3. Select **ACCEPT**, which will end the lead set up.
4. The **Distributed Power Operation** screen that takes up the entire left ICE screen will come on showing up to four consists, designated as A, B, C and D. It will provide operating information for each consist (See Figure 4) The **Distributed Power System Log** menu will be displayed on the right screen.

Figure 4
Distributed Power Operation (Left Screen)

FUNCTION SCREEN

DISTRIBUTED POWER OPERATION

W SLIP ABCDE	PCS ABCDE	SAND ABCDE	BRK WARN ABCDE	SYS FAIL ABCDE	PENALTY ABCDE	ALM BELL ABCDE	SYSTEM ALARM
-----------------	--------------	---------------	-------------------	-------------------	------------------	-------------------	-----------------

RUN BACK

	FRONT	B-4102	C-4103
THROTTLE	IDLE	IDLE	IDLE
LOAD	OK	OK	OK
BRAKE PIPE	89	89	89
REMOTE	--	NORM	NORM
FLOW	11	15	17
REMOTE	--	IDLE	IDLE
EQUALIZING	88	88	88
CYLINDER	0	0	0
MAIN RES	125	130	130

B DP CREW MESSAGE AREA

SELECT REMOTE	IDLE	NORMAL	BK VALVE OUT	ISOLATE	SET OUT	ENGINE STOP	CONTROL MENU
------------------	------	--------	-----------------	---------	------------	----------------	-----------------

EXECUTE	CANCEL
---------	--------

5. Both the Right "Gauge Screen" and Left "Function Screen" will show the PCS open on all locomotives. Place the automatic brake handle in the Suppression Position. After the penalty time limit has expired, the Gauge Screen will display the following message: **"CHARGE TRAIN BEFORE RUNNING BRAKE PIPE TEST."**
6. After receiving the above message, move the automatic brake valve handle to the RELEASE position to

recover the penalty application on both the lead and remote consists.

7. As you are recovering from the penalty application, the Gauge Screen message will read "CHARGING TRAIN-WAITING FOR AIR LINE STABILIZATION."

When train line has stabilized, the message will change to read "PRESS BRAKE PIPE TEST KEY WHEN END OF TRAIN PRESSURE IS 75 PSI OR MORE."

8. You are now ready to proceed to the Brake Pipe Continuity Test. Important: The Brake Pipe Continuity Test is required only when linking the train.

F. Brake Pipe Continuity Test:

1. Before attempting this test, the air flow on each consist must be less than **40 CFM**, stabilized and nearly the same on each unit. When the air flow has stabilized and the train is charged:

- Press the **BRK PIPE TEST** soft key, then the **EXECUTE** key.

NOTE: The **EXECUTE** key must be depressed within 60 seconds.

2. Make a minimum automatic brake pipe reduction. After making reduction, the Gauge Screen will display "BRAKE PIPE TEST IN PROGRESS." The message "BP TEST OK" will appear when the test is satisfactorily completed.

- Move automatic brake handle to release position.

3. The Left Screen message will tell you to select the **MODE** screen, to do this:

- Press **DP MAIN MENU** soft key on the Gauge Screen.
- Press the **MODE** soft key.
- Push the **RUN** soft key, then the **EXECUTE** key. Remotes are now in Synchronous operation and will act in unison with the Lead Distributed Power consist.

4. You are now ready to begin the Brake Pipe Leakage Test.

NOTE: Recharging of the brake system is not required following the Brake Pipe Continuity Test, or before beginning the leakage test.

G. Brake Pipe Leakage Test:

1. Depress DP main menu button.
 - Depress System button.
2. To initiate the leakage test:
 - Push the **LEAKAGE TEST** soft key then the **EXECUTE** key.
3. With the push of the **EXECUTE** soft key, a proper leakage test will be performed.
 - A 20 lb. brake pipe reduction will occur automatically whether the brake handle is still in the Minimum Application Position or in the Release Position.
 - The Left Screen message block will update as it goes through the THREE one-minute waits.

Important: Do not move the Automatic Brake handle during the test or the test will be canceled.

4. Upon completion of the test you will be prompted to place the Automatic Brake handle in Full Service Position.
5. The Distributed Power system log will show "LEAKAGE TEST OK" along with the amount of leakage. If the leakage is greater than 5 PSI/minute, the system will show "LEAKAGE TEST FAIL" along with the amount of leakage. The leakage problem must be corrected before attempting to perform the leakage test again.

H. Train Check:

The Train Check Test is used to check the continuity of brake pipe. This test is to be used anytime the train is stopped.

1. To initiate the Train Check Test, from the System screen:
 - With the train stopped, if an automatic brake application has not been made, make a 10 PSI. brake pipe reduction and wait for the reduction to stabilize.
 - Press the **TRAIN CHECK** soft key, then the **EXECUTE** key.
2. The Train Check Test will cut-out the brake valve on each remote that is in "NORMAL" or "IDLE" mode.

When train is ready to move: Release the automatic brakes.

3. As each remote senses a four-pound brake pipe rise, it will cut in its brake valve.
4. If all remotes in the train report that they have cut-in their brake valves, the functional display screen will show "Train Check OK." If any remote fails to sense a four-pound brake pipe rise, and brake pipe cut in within 75 seconds of the release: the "SYSTEM" screen will display "TRAIN CHECK FAIL."
5. Check the "REMOTE" screen to determine the last remote that sensed the brake pipe rise and cut in its brake valve.

The brake pipe behind that remote must be checked for continuity by noting that EOT pressure is increasing.

I. Set Out (S/O):

The Set Out function is used when any Remote(s) or any portion of a train is left unattended for any period of time, such as when setting out or picking up cars or performing station switching.

1. With the train stopped and the independent brake applied:

- Push the **REMOTE MENU** soft key.
 - Select the remote consist being set out by pressing the **SELECT REMOTE** soft key on Operational Screen.

2. This will change the highlighted letter that is directly above the **SELECT REMOTE** soft key.

NOTE: If you only have one remote consist, there will not be a **SELECT REMOTE** soft key displayed.

3. When the Remote consist to be left standing is high lighted on the screen:

- Press the **SET OUT** button, then the **EXECUTE** key.

4. Repeat the above process for any additional remotes that will be left standing:

- In the "S/O" mode, remote units will not respond to throttle movements.
- On each remote, the Automatic Brake Valve is Cut Out and the Independent Brake is fully applied.

5. Close the angle cock on the head portion of the train, and leave the angle cock OPEN on the portion to be left standing.

6. When switching has been completed and the train is coupled back together:

- Make a 20 PSI automatic brake pipe reduction.
- Select the "REMOTE" screen.
- Move the cursor to the first remote that was set-out. Press the "NORM" soft key, then the **EXECUTE** key.

7. Repeat this process for each remote that was "S/O". "NORMAL" will then be displayed for each remote:

- Release the automatic brakes, and recharge the train.

8. After each remote has sensed at least a four-pound rise in the brake pipe, the brake valves on

the remotes will cut in and a flow rate will be shown at the remotes.

J. Emergency Application:

During an emergency application, the following occurs:

1. All locomotives go to Idle.
2. Actuation of the independent brakes:

The LEAD Locomotive consist can be bailed off by the engineer;

The Remote Locomotive consist(s) can not be bailed off, but will be limited to 45 PSI of brake cylinder pressure. Remotes will not fully release until emergency is reset.

The engineer is to move the automatic brake handle to the emergency position and follow the screen prompts.

3. PCS is tripped on each consist; an indicator warning light will illuminate and a chime will sound.
4. The type of Emergency application is then displayed in the message block of the gauge screen and an alarm chime will sound.

K. Recovery From Emergency:

1. When train has stopped, the electronic cab display will instruct you when to move the automatic brake handle to the Release Position to reset the PCS and recharge the train.
2. If an emergency application has occurred as a result of a train separation or brake-in-two, the remote consist(s) must be placed in **Set Out (S/O)** before attempting to move or re-couple the train.

L. Penalty Brake Application:

1. The Gauge Screen display will instruct you to move the automatic brake handle to Suppression Position and will indicate the penalty source. If the train was moving, the handle is to remain in the suppression position until the train stops.

2. When the instruction box disappears, you will be able to move the automatic brake handle to the release position to release the brakes and recharge the train.

M. Unlinking and Disassembling the Train:

Lead (Controlling) Locomotive:

1. The following procedure should be used to shut down the DP equipment on a LEAD unit:
 - With the train stopped, and the lead unit throttle is in Idle Position, push the **DIST POWER** soft key.
 - Push the **SYSTEM** soft key.
 - Push the **UNLINK** soft key, then the **EXECUTE** key.
2. At this point a service brake application will be initiated. The Left Screen display will read "UNLINKING - APPLYING AUTOMATIC BRAKE-WAIT:"
 - Move the Automatic Brake handle to Suppression Position.
 - Push the **END DIST POWER** soft key, then the **EXECUTE** key.
 - When the red bordered message on the Gauge Screen disappears, put the Automatic Brake handle in the Release Position.

Remote Controlling Locomotive:

1. The following procedures should be used to shut down the DP equipment on the REMOTE units.
 - Push the **DIST POWER** soft key, then the **EXECUTE** key.
 - Push the **END DIST POWER** soft key, then the **EXECUTE** key.
2. This will remove the DP REMOTE ENABLED indication on the Gauge Screen display and set the air brake system to "TRAIL".

N **Alarms:**

1. The Gauge Screen display is much like other computers in that it can have multiple screens open at the same time. These screens will be one on top of the other and can be confusing when an alarm sounds and you need to silence it.
2. The silencing of an alarm is very easy when you know how to "FOLLOW THE YELLOW BRICK ROAD." When an alarm sounds, one of the soft keys on the Gauge Screen display will turn **YELLOW**.
3. Press the **YELLOW** soft key to either silence the alarm or move to the next screen.
 - Push each succeeding **YELLOW** soft key until the alarm is silenced.
4. By pressing a **YELLOW** soft key that appears when an alarm sounds, it will either silence the alarm or direct the engineer to the screen where the alarm originated.

DEFINITIONS

ACCELERATED SERVICE RELEASE - A brake release feature of ABD and ABDW freight brake equipment which speeds up the release after a service application. Air pressure from the fully charged emergency reservoir is directed into the brake pipe at each car to increase brake pipe pressure and transmit release rapidly through the train.

AUTOMATIC AIR BRAKE - A brake system in which air pressure must be maintained in a brake pipe extending throughout the train to keep brakes released. A reduction in brake pipe pressure will apply the brakes, an increase in brake pipe pressure will release the brakes.

AUTOMATIC AIR BRAKE VALVE - A manually operated valve in the locomotive cab used to control the flow of air pressure into or out of the brake pipe for charging, applying and releasing brakes on locomotives and cars.

BACK-UP HOSE - A length of hose with a manually operated valve and warning whistle on one end and a standard brake pipe hose coupling (glad hand) on the other. Used for applying the brakes from the rear of a train when making a back-up movement.

BRAKE PIPE - A system of piping, including branch pipes, angle cocks, cut-out cocks, dirt collectors, hoses and hose couplings, which conducts air pressure to the car reservoirs and is the sole means by which the engineer can control the car brakes.

BRAKE PIPE REDUCTION - A reduction of brake pipe pressure to cause a brake application or to increase a brake application. Brake pipe pressure may be reduced at a normal (service) rate or at a rapid (emergency) rate. A REDUCTION IS NOT COMPLETE UNTIL THE BRAKE PIPE EXHAUST HAS STOPPED COMPLETELY.

BRAKE VALVE CUT-OUT COCK (CUT-OFF VALVE or DOUBLE-HEADING COCK).

A manually operated valve used to cut out or cut in the automatic brake valve on a locomotive.

BRANCH PIPE CUT OUT COCK - A device used to cut out the control valve on a locomotive unit or car. The handle is crosswise to the pipe when the cock is open.

CHARGING - The flow of air pressure into the brake pipe system to raise pressure in the reservoirs to the required amount.

CONSIST (LOCOMOTIVE) - Two or more locomotive units coupled in multiple control and operated from a single control stand.

CONTROLLING UNIT - The locomotive unit from which the engineer operates the locomotive consist or consists under his control.

CONTROL VALVE - An air operated valve on locomotives or cars which controls the charging of reservoirs and the application and release of brakes in response to reductions or increases in brake pipe pressure.

DEAD ENGINE FEATURE - A system found on all locomotive units through which main reservoirs can be charged from the brake pipe when the air compressor is not operating.

DEADMAN / ALERTER DEVICE - A device which will cause an automatic brake application to be initiated when the engineer becomes incapacitated.

DIRECT RELEASE - The normal release of freight car brake equipment. Once the control valve is moved to release position by an increase in brake pipe pressure, all brake cylinder pressure is released.

DISTRIBUTING VALVE - A device which applies and releases the brakes on a locomotive from either the automatic or independent brake operation. Used with No. 6 equipment.

DOUBLE HEADER - Two locomotive consists coupled together and located on the head end of a train. Power and the independent brake are controlled separately by the engineer of each locomotive.

DUAL-PORTED CUT-OUT COCK - A manually operated cock in the locomotive cab used to cut out the independent brake valve when the unit is set up for trailing in a multiple consist.

DUMMY COUPLING - A device used to secure and protect unused hoses and couplings.

DYNAMIC BRAKING - A method of slowing the locomotive and train by changing the locomotive traction motors into generators.

EMERGENCY APPLICATIONS - A rapid, uncontrolled reduction of brake pipe pressure which causes control valves to move to emergency position and vent valves to open. An emergency application produces about 15% to 20% more braking effort than full service.

EMERGENCY BRAKEVALVE - A valve located in the locomotive cab, in addition to the automatic brake valve, which will cause an emergency brake application when opened quickly.

END OF TRAIN TELEMETRY DEVICE (EOT) - A system consisting of a head end or Receive - Display Unit (RDU) and a rear end or Sense - Transmit Unit (STU). This device is capable of monitoring air pressure at the rear of the train, motion, marker and battery condition and transmitting this information to the locomotive cab for display. On devices capable of two-way operation, an emergency brake application at the rear of the train can be made from the locomotive cab.

ENGINE - An internal combustion power plant mounted under the long hood of a diesel-electric locomotive unit that drives the generators and auxiliary equipment on the unit.

EQUALIZATION PRESSURE - The pressure at which auxiliary reservoir and brake cylinder(s) are equal. This is the maximum braking effort that can be obtained in service applications.

EQUALIZING RESERVOIR - A small reservoir of air pressure controlled directly by the engineer when moving the automatic brake valve handle. Equalizing reservoir pressure is duplicated in the brake pipe.

EXTENDED RANGE (DYNAMIC BRAKE) - A supplement to the standard dynamic brake system which maintains maximum dynamic braking strength between the normal peak speed of about 25 MPH and 6 MPH.

F-1 SELECTOR VALVE - A device which automatically arranges the brake equipment on the locomotive to lead or trail other types of brake equipment as directed by the MU-2-A valve.

FEEDVALVE - A manually adjusted valve that reduces main reservoir pressure for delivery to the equalizing reservoir and brake pipe.

FLOW INDICATOR (BRAKE PIPE) - An instrument which indicates the rate of flow of air pressure through the automatic brake valve to the brake pipe.

FINAL REDUCTION - A service reduction made as a train moving forward is nearing completion of stop. It provides a retarding force to the head portion of the train.

FULL SERVICE REDUCTION - A reduction of brake pipe pressure at a service rate, sufficient in amount to cause equalization of pressures between auxiliary reservoir and brake cylinder.

GRADIENT - The difference in brake pipe pressure between the front and rear of the train.

GRADUATED RELEASE - A feature of passenger brake equipment whereby brake cylinder pressure may be reduced in steps proportional to increments of brake pipe pressure build-up. The feature may be nullified to direct release by positioning a release cap on the control valve.

HAND BRAKE - A mechanical arrangement, applied manually by wheel or lever, to force the brake shoes against the wheel tread to hold cars or locomotives at a state of rest.

HELPER LOCOMOTIVE - A manned locomotive other than the one controlling the train air brakes. It can be the second locomotive of a double header or a locomotive within the train or on the rear of a train.

INDEPENDENT BRAKEVALVE - A manually operated valve that provides control of the locomotive brakes regardless of the automatic brake valve handle position.

INDEPENDENT CUT-OUT COCK - see Dual-Ported Cut-Out Cock.

INITIAL REDUCTION - The first reduction of brake pipe pressure during a service brake application.

INITIAL TERMINAL - The location where a train is originally made up or classified. It is not necessarily the location where the crew goes on duty.

LIGHT LOCOMOTIVE - A locomotive operated without a train.

LOAD METER (AMMETER) - A meter located on the control stand that indicates amperage in one traction motor. The load meter indicates both pulling power and dynamic braking effort.

LOCAL TRAIN - Local train means a train assigned to perform switching en route which operates with 4,000 trailing tons or less and travels between a point of origin and a point of final destination, for a distance that is no greater than that which can normally

be operated by a single crew in a single tour of duty.

LOCOMOTIVE (CONSIST) - A self-propelled unit or units of equipment designed for moving other equipment operated from a single control stand.

LOCOMOTIVE SPEED LIMITER (LSL) - Used in conjunction with the existing locomotive cab signal system. The locomotive speed limiter is a speed control system which visually and audibly warns the locomotive operator if an overspeed condition exists. The system automatically applies the brakes if the operator fails to correct the overspeed within the predetermined braking guidance profile.

MINIMUM REDUCTION - The first position to the right of release on the 26C automatic brake valve which produces a determined amount of brake pipe reduction.

MULTIPLE UNIT CONTROL (MU) - Two or more locomotive units coupled in such a manner that full control of power and braking can be obtained from a single control stand.

MU-2-A VALVE - A manually operated valve in the locomotive cab used for cutting in or cutting out the independent brake valve on some 26L equipped units.

NOMINALLY - Near or close to; within a reasonable tolerance of.

OVERCHARGE - A situation in which the brake equipment of cars or locomotives is charged to a higher pressure than the maximum brake pipe pressure that can normally be achieved in that part of the train.

OVER-REDUCTION - A service brake pipe reduction to a pressure lower than equalization.

PRESSURE MAINTAINING - A feature designed to maintain the brake pipe pressure at the desired level during service reductions initiated with the automatic brake valve. With this feature, a brake application of a desired amount can be held for long periods of time.

PSI (POUNDS PER SQUARE INCH) - A unit of measurement of air pressure. One PSI means that one pound of pressure is exerted on each square inch of area on the inner surface of the container, such as a cylinder or reservoir.

RECEIVE - DISPLAY UNIT (RDU) - The head end unit of the End of Train Telemetry System. A self contained telemetry receiver/transmitter which provides the engineer with

the displays and controls needed to monitor and operate the associated STU unit. In systems capable of two-way operation, an emergency brake application at the rear of the train can be made from the RDU.

REDUCING VALVE - A valve which reduces main reservoir pressure for use in various air operated devices.

REGULATING VALVE - An integral part of an automatic brake valve which is manually adjusted to reduce main reservoir pressure for charging the equalizing reservoir. The regulating valve differs from a feed valve in that it does not deliver pressure to the brake pipe and that it can be used to reduce equalizing reservoir pressure as well as increase it.

RELEASE ROD - A rod extending to the side sill of a car which is operated to vent air pressure from brake cylinders, auxiliary and emergency reservoirs. Construction of the valve is such that by pulling out only partially on the release rod vents auxiliary reservoir; pulling out fully vents both auxiliary and emergency reservoirs, and a momentary pull vents brake cylinder pressure.

RETAINING VALVE - A device used on freight cars when descending heavy grades to retain a portion of the brake cylinder pressure while car reservoirs are being recharged.

ROTAIR VALVE - A device used with 24RL equipment to cut in or cut out the independent brake valve.

SENSE - TRANSMIT UNIT (STU) - The rear end unit of the End of Train Telemetry System. A self-contained telemetry transmitter/receiver attached to the rear car coupler and brake pipe. The STU monitors certain end of train conditions and transmits that information to the RDU for display. In systems capable of two-way operation, an emergency brake application at the rear of the train can be made from the RDU.

SERVICE APPLICATION - A brake application of one or more brake pipe reductions made at a service rate. A service brake application begins with the initial reduction and ends when the brake valve handle is placed in release position.

SPLIT REDUCTION - A brake application made by using a minimum reduction followed about 20 to 30 seconds later with additional reductions to the desired amount.

STANDARD SINGLE CAPACITY BRAKE - A brake system which provides constant braking force whether the car is empty or loaded.

STRINGLINING - A term used to describe the tendency of cars to pull off the inside of curves, trying to approach a straight line when the train is in draft.

SUPPRESSION - The preventing of a penalty brake application from occurring. Also, a position of the automatic brake valve handle on 26/30 equipment.

THROTTLE MODULATION - Varying the throttle position (power) to allow grade and rolling resistance to reduce train speed.

TONS PER OPERATIVE BRAKE - The result of dividing the gross tonnage of the train by the total number of cars with operative brakes.

TRAILING TONS - Trailing tons means the sum of the gross weights—expressed in tons—of the cars and the locomotives in a train that are not providing propelling power to the train.

TRAINLINE - The connection of similar air lines between units of a locomotive consist so that brake functions on each unit may be controlled from the leading unit.

UNDESIRED EMERGENCY - Any emergency application of the train brakes not made with a brake valve.

UNDESIRED QUICK ACTION (UQA) - An emergency application of the train brakes when a service application is intended.

UNIT - A single, self-propelled vehicle capable of moving other equipment. A locomotive may consist of one or more units, coupled in multiple so that all are controlled from one location.

VENTVALVE - An automatically operated valve or valvular portion of a car or locomotive brake system which responds to emergency brake applications to vent brake pipe pressure locally.

WORK TRAIN - Work train means a non-revenue service train of 4,000 trailing tons or less, used for the administration and upkeep of the railroad.

YARD AIR SUPPLY - A compressor and system of pipes and hoses located throughout a yard so that trains may be charged and tested before arrival of the road locomotive.

YARD LOCOMOTIVE - A locomotive assigned and operated in yard service. Class or horsepower does not affect this status. Pressure regulating devices must be adjusted as prescribed for yard service.

NOTES

NOTES

NOTES

(

(

(

