Freight Car and Locomotive Components and Charts and Glossary

MARCH 25, 2019
104.0 Freight Car and Locomotive Components and Charts

104.1 Freight Car End and Platform Identification
Identify car ends as follows:
- On cars with one hand brake, the “B” end of the car is the end with the hand brake. The other end is the “A” end.
- On cars with more than one hand brake, the letters “A” and “B” are stenciled on the appropriate ends of the car.
- On cars with more than one platform, each section if stenciled. Example: A five-platform articulated spine car is designated with an “A” platform on one end and the adjacent platform is designated as “C” then “D”, then “E” and then “B” on the opposite end.

104.2 Wheel and Journal Identification on Cars
To determine the correct wheel numbers on cars:
1. Face the “B” end of the car.
2. From the “B” end of the car, identify the designation of wheels, journals, and axles as follows:
   - Axles are designated from the “B” end of the car with “1” for the axle closest to the “B” end.
   - Wheels and journals are designated left or right as viewed from the “B” end.
   - Specific wheels are identified using the axle and wheel designation.

104.3 Coupler Assemblies
North American railroads use three types of coupler assemblies. Each coupler head and knuckle is marked with a letter indicating its type. E, F and H

104.4 Freight Car A-1 Reduction Relay Valve
Some long cars have an A-1 reduction relay valve that helps transmit a service or emergency brake pipe reduction by compensating for the added brake pipe length of the car.
The relay valve functions as follows:
- Service brake reductions are assisted through the B-1 quick service portion.
- Emergency brake pipe reductions are transmitted by the No. 8 vent valve portion.
If the No. 8 vent valve fails to reset after an emergency brake application, causing a continuous blow at the exhaust port, plug the valve by removing the vent protector and
screwing in the threaded plug.

The following freight cars are equipped with the relay valve:

- Cars with AB or ABD control valves and more than 75 feet of brake pipe between hose couplings.
- Cars with ABDW control valves and more than 100 feet of brake pipe between hose couplings.

**Note:** Cars with ABDW control valves having between 75 and 100 feet of brake pipe have a No. 8 vent valve added.

### 104.5 Freight Car Automatic Vent Valve

Some multi-platform cars are equipped with an automatic vent valve (AVV), which is simply an emergency portion of a control valve that is used only to propagate an emergency brake application through the brake pipe. Should an AVV become defective, the cutout cock is used to cut it out.

### 104.6 Retaining Valves

The retaining valve on each car controls the brake cylinder pressure exhaust. All freight cars have retaining valves located at the “B” end of the car or at the side near the control valve. The retaining valve can be positioned to function as follows during a brake release:

- Allow the exhaust of brake cylinder pressure to atmosphere.
- Retain brake cylinder pressure while the system is recharged.

#### Three-Position Retaining Valve

The three-position retaining valve includes these positions.

- **DIRECT EXHAUST (EX)**—Exhausts all brake cylinder pressure. Handle is turned down.
- **HIGH PRESSURE (HP)**—Exhausts brake cylinder pressure to 20 psi. Handle is 45 degrees below horizontal.
- **SLOW DIRECT EXHAUST (SD)**—Exhausts brake cylinder pressure for a blow down time of approximately 86 seconds and continues to exhaust until all pressure is vented. Handle is 45 degrees above horizontal.

#### Four-Position Retaining Valve

The four-position retaining valve includes the positions listed above and one additional position:

- **LOW PRESSURE (LP)**—Exhausts brake cylinder pressure to 10 psi. Handle is horizontal.
104.7 Locomotive Brake Equipment

Description of the various automatic and independent brake valve positions and their function. (Brake valve handle positions are described from left to right, or from front to back if desktop mounted.)

104.7.1 Automatic Brake Valves

**H6 Automatic Brake Valve**

The H6 automatic brake valve is a non-maintaining, non-self-lapping type automatic brake valve normally found on older locomotives and some switch engines. Handle positions include:

RELEASE—Charges the brake system and releases the brakes.

LAP—Prevents air from leaving or entering the brake pipe at the automatic brake valve. All ports in the brake valve are closed. Brake pipe leakage will continue to reduce brake pipe pressure at the same rate as the leakage. This position is also used for conducting brake pipe leakage tests and recovering from a penalty application.

SERVICE—Reduces equalizing reservoir pressure and brake pipe pressure at a service rate.

EMERGENCY—Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate.

**24RL-MC Automatic Brake Valve**

The 24RL-MC automatic brake valve is a maintaining, non-self-lapping automatic brake valve. This brake valve maintains in LAP. Therefore, cut out the maintaining feature during brake pipe leakage tests. Handle positions include:

FULL RELEASE—Releases the train and locomotive brakes and charges the brake pipe through the regulating valve, preventing overcharge. When the handle is in this position, air is heard exhausting at the brake valve.

RELEASE—Releases the train and locomotive brakes and charges the brake pipe through the regulating valve.

FIRST SERVICE—Reduces the equalizing reservoir 6 to 10 psi at a service rate, then continues to reduce brake pipe pressure at a slow rate.

LAP—Maintains brake pipe pressure at the same level as equalizing reservoir pressure.

SERVICE—Reduces equalizing reservoir and brake pipe pressures at a service rate.

EMERGENCY—Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate.
24RL-MC1 Automatic Brake Valve

The 24RL-MC1 automatic brake valve is a maintaining, non-self-lapping automatic brake valve. This brake valve maintains in MAINTAINING. Use LAP during brake pipe leakage tests. Handle positions include:

FULL RELEASE—Releases the train and locomotive brakes and charges the brake pipe through the regulating valve, preventing overcharge. When the handle is in this position, air is heard exhausting at the brake valve.

RELEASE—Releases the train and locomotive brakes and charges the brake pipe through the regulating valve.

MAINTAINING—Maintains brake pipe pressure at the same level as equalizing reservoir pressure. After making a brake pipe reduction, maintain brake pipe pressure by returning the automatic brake handle to MAINTAINING without pausing in LAP.

Note: Pausing in LAP may allow leakage to reduce brake pipe pressure below equalizing reservoir pressure. The brakes will release when you return the handle to MAINTAINING if equalizing reservoir pressure is above brake pipe pressure.

LAP—Prevents air from leaving or entering the brake pipe at the automatic brake valve. All ports in the brake valve are closed. Brake pipe leakage will continue to reduce brake pipe pressure at the same rate as the leakage. This position is also used for conducting brake pipe leakage tests and recovering from a penalty application.

SERVICE—Reduces the equalizing reservoir and brake pipe pressures at a service rate.

EMERGENCY—Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate.

26C, 30CDW, Knorr CCB and WABCO EPIC Automatic Brake Valves

These maintaining, self-lapping brake valves regulate brake pipe pressure, controlling both locomotive and train brakes.

Brake Valve Features—These automatic brake valves have these features:

- The maintaining feature maintains constant brake pipe pressure unless the cutout valve is in OUT.
- The regulating valve controls the supply of air pressure to the equalizing reservoir, which regulates brake pipe pressure.

Handle Positions—Handle positions include:

RELEASE—Charges the brake pipe to the regulating valve setting and releases the locomotive and train brakes.

MINIMUM REDUCTION—Reduces equalizing reservoir and brake pipe pressures 6 to 8 psi.
SERVICE ZONE—Gradually reduces equalizing reservoir and brake pipe pressures in increasing amounts as the brake handle is moved to the right. Moving the brake handle to the left with the brake valve cutout valve in PASS will increase equalizing reservoir and brake pipe pressures. Use extreme care when operating freight trains with the automatic brake valve cutout valve in PASS.

FULL SERVICE POSITION—Reduces equalizing reservoir and brake pipe pressures to near equalization.

SUPPRESSION—Restores control of the locomotive after a safety control (penalty) brake application. To recover control, leave the brake handle in this position for 60 seconds.

HANDLE OFF/CONTINUOUS SERVICE—Reduces equalizing reservoir and brake pipe pressures at a service rate. Use this handle position for:

- Trailing locomotives
- Locomotives hauled dead-in-train

EMERGENCY—Vents brake pipe pressure directly to the atmosphere, causing brakes to apply at an emergency rate.

104.7.2 Automatic Brake Valve Cutout Valve

The automatic brake valve cutout valve determines how and when the automatic brake controls brake pipe pressure. There are two-position and three-position cutout valves. Because the cutout valve handle is spring-loaded, push it in before changing positions.

**Note:** EMERGENCY is always available regardless of the position of the automatic brake valve cutout valve.

**Two-position cutout valve**

The two-position cutout valve has these positions:

IN—Provides control of brake pipe pressure from the automatic brake valve. Equalizing reservoir and brake pipe pressures will increase when the automatic brake valve is in RELEASE.

OUT—Disconnects control of brake pipe pressure from the automatic brake valve. Use this position when:

- Not using the automatic brake valve to control brake pipe pressure (trailing locomotives or locomotives hauled dead-in-tow).
- Conducting brake pipe leakage tests.

**Three-position cutout valve has these positions:**

FRT—Same as IN position described in two-position cutout valve above.

OUT—Same as OUT position described in two-position cutout valve above.

PASS—Provides control of brake pipe pressure from the automatic brake valve. Equalizing reservoir pressure and brake pipe pressure will increase from any
movement of the brake handle toward RELEASE—Use this position when operating passenger or commuter trains to utilize the graduated release feature.

**Note:** In freight service, if the equalizing reservoir is leaking, PASS may be used only if it is necessary to maintain constant brake pipe pressure during an automatic brake application. Because of the possibility of an undesired release, placing the three-position cutout valve in PASS position must only be done with the automatic brake valve handle in RELEASE position.

### 104.7.3 Independent Brake Valves

The following describes the positions and functions of all independent brake valves including:

- **LA6-P** (Used with H6 automatic brake valves)
- **S40** (Used with all 24RL brake equipment)
- **SA26** (Used with 26C automatic brake valves)

**RELEASE/ACTUATE**—Normal position to release the locomotive brakes. To release the locomotive brakes while an automatic brake application is in effect, depress the handle (or lift actuating ring) while it is in the RELEASE position (actuate).

**APPLICATION ZONE**—All handle movements between RELEASE and FULL APPLICATION increase or decrease locomotive brake cylinder pressure as follows:

1. Increase by moving the brake handle to the right (or forward).
2. Decrease by moving the brake handle to the left (or back towards operator).

**FULL APPLICATION**—Position for creating maximum locomotive brake cylinder pressure from the independent brake system.

### 104.7.4 MU-2A/Double-Ported Cutout Cock

The handle for the MU-2A cutout cock is spring-loaded; push it in before changing positions.

The MU-2A valve has three positions:

**LEAD or DEAD**—Engages control of the independent brakes. Use when a locomotive is a single unit, a controlling unit, or is being hauled dead-in-tow.

**TRAIL 6 or 26**—Disconnects control of the independent brakes from the independent brake valve. Use when a locomotive is a trailing unit in a multiple-unit consist.

**TRAIL 24**—Disconnects control of the independent brakes from the independent brake valve. Use when a locomotive is a trailing unit in a multiple-unit consist.

The double-ported cutout cock has two positions:

**IN**—Engages control of the independent brakes on a single locomotive or on the controlling locomotive of a multiple-unit consist.

Use IN also when a locomotive is hauled dead-in-tow.

**OUT**—Disconnects control of the independent brakes from the independent brake
valve.
Use OUT when a locomotive is trailing in a multiple-unit consist.

104.10 Air Flow Meter
The air flow meter measures the rate in cubic feet per minute (CFM) that air flows into the brake pipe. The Air Flow Method (see Rule 100.9) uses this meter to determine brake pipe leakage.

Air Flow Meter Readings
The air flow meter provides the following brake pipe flow information:
- As the brake system begins charging, a high flow into the brake pipe is indicated by:
  a. Higher numbers (more than 60 CFM).
  or
  b. The pointer moving to the right.
- As the brake system charges, a lesser air flow into the brake pipe is indicated by:
  a. Lower numbers (less than 60 CFM).
  or
  b. The pointer moving to the left.
- If the air flow meter shows a reading (less than 60 CFM or left of the calibration mark) that is stabilized, the brake system is charged.

The air flow meter also provides the following information about the train’s brake system:
- After a brake application and release, the air flow meter will indicate high flow. As the brake system recharges, the brake pipe flow rate will decrease until the air flow pointer reaches the reference value, indicating that the brake system is recharged.
- Air flow less than the reference value may indicate a closed angle cock.
- Air flow greater than the reference value may indicate increased leakage to the brake system.
- With a brake application in effect, a decrease in air flow may indicate that an unintentional brake release is occurring.

Engineer Responsibilities
Once the air flow meter shows a constant reading, the engineer should:
1. Note the rate of flow and use this number as a reference to determine when the brake system is charged.
2. If the air flow meter is equipped, adjust the reference pointer to agree with the flow pointer.

Note: This reading is a reference value to use to monitor fluctuations in air flow to the brake pipe.
104.11 Charging Time Chart

When the brake system is uncharged and not equipped with an air flow meter, use the following chart to determine the minimum and maximum charging times:

<table>
<thead>
<tr>
<th>Brake Pipe Length (in feet)</th>
<th>Minimum Charging Time (in minutes)</th>
<th>Maximum Charging Time (in minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2500 or less</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>3,000</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>4,000</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>5,000</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>6,000</td>
<td>26</td>
<td>55</td>
</tr>
<tr>
<td>7,000</td>
<td>35</td>
<td>65</td>
</tr>
<tr>
<td>8,000</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>9,000</td>
<td>57</td>
<td>100</td>
</tr>
<tr>
<td>10,000</td>
<td>71</td>
<td>125</td>
</tr>
<tr>
<td>11,000</td>
<td>80</td>
<td>160</td>
</tr>
</tbody>
</table>

104.12 Electronic Alertness Device

An electronic alertness device stops the train with a service rate brake application if the engineer does not respond properly.

It functions as follows:

1. The device begins functioning when locomotive brake cylinder pressure falls below 25 psi.
2. At this point, the device monitors the operator’s alertness.
3. It resets when the operator changes the position of or operates one of these locomotive controls:
   - Throttle
   - Horn
   - Bell
   - Dynamic brake
   or
   - Device reset button
4. If the device is not reset within the reset cycle (varies relative to speed):
   a) A warning light flashes.
   b) A warning horn sounds off and on for 10 seconds and then continuously for 10 seconds.
5. If the device is not reset within 20 seconds after the warning light and horn begin operating, the train brakes will automatically be applied at a service rate (Penalty Brake).
6. Test the devise by applying hand brakes, releasing all air brakes, and ensuring that the warning sounds and a penalty brake application occurs.

104.13 Over-speed Control

The over-speed control prevents the train from running at speeds higher than the safe mechanical limits of the traction motors. It functions as follows:

· If train speed increases to an unsafe level, the safety control device sounds a warning.

· If the train does not slow within 6 to 12 seconds of the first warning sound, the over-speed control device applies the train brakes and trips the PC switch.

Slow Train

To slow the train when the safety control device sounds a warning, comply with the following:

1. On locomotives with 26L, 30CDW, and CCB brake equipment, move the automatic brake handle to SUPPRESSION within the 6- to 12-second warning period.

2. On locomotives with other brake equipment, reduce the brake pipe pressure 6 to 8 psi, or more if necessary.

Recover

To recover when the over-speed control applies the train brakes:

1. On locomotives with 26L, brake equipment, move the automatic brake handle to SUPPRESSION.

2. On locomotives with other brake equipment, move the automatic brake handle to LAP.

3. Move the throttle to IDLE and wait 60 seconds.

4. After the train stops, move the automatic brake handle to RELEASE and note that:

   · Brake pipe pressure is restored.
   · PC light goes out.
   · Brakes release.

Note: Some locomotive equipment has been modified to slow the train during the warning period with the automatic brake valve in MINIMUM REDUCTION. Unless the engineer knows that the locomotive being operated includes this modification, the SUPPRESSION position should be used.

104.14 Reserved

104.15 Defect Detectors

In Canada, trains may not be operated in excess of 60 miles, or move past 2 consecutive non-operational hot box detectors without having been inspected on each side of the entire train. These inspections must be performed by:

(i) hot box detectors; or
(ii) pull-by inspection by crew members of the train; or
(iii) passing train inspection by:

   · wayside employees, or
   · crew members of other trains.
Passing train inspections must be conducted by 2 employees on opposite sides of the train when practicable.

104.15.1 Defect Detector Message and Required Action

<table>
<thead>
<tr>
<th>DETECTOR MESSAGE</th>
<th>TRAIN CREW ACTION</th>
<th>ADDITIONAL INSTRUCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Defects</td>
<td>Proceed</td>
<td>NONE</td>
</tr>
<tr>
<td>Detector malfunction, or no message is heard</td>
<td>Contact RTC</td>
<td>Report detector malfunction to the RTC</td>
</tr>
<tr>
<td>A warning tone (a defect has been detected)</td>
<td>Reduce Speed to LESS THAN 20 MPH.</td>
<td>NONE</td>
</tr>
<tr>
<td>“...First Hot Box West Rail, XXX From Head of Train.”</td>
<td>STOP THE TRAIN Inspect car involved and 20 axles ahead and 20 axles behind Notify the RTC</td>
<td>Detector Alarm Message may identify more than one defect. Inspect train for all reported defects</td>
</tr>
</tbody>
</table>

Defect detector radio readouts count axles from the head end to the rear of train. Crews must carry a 200 degree temperature testing stick while on duty. On roller bearing cars, to determine when the bearing is overheated and the car must be set out, be governed by the following:

The temperature of suspect roller bearings must be tested using a temperature testing stick by making a mark approximately 3 inches long on the outside of the bearing (not the bearing cap). If the mark melts, the car must be set out.

When inspections are required, employees must inspect for other car defects, such as sticking brakes, hot journal bearings and broken or extensively cracked wheels. If the defect is sticking brakes, be sure the hand brake is in full release and the retainer valve is in direct release. It may be necessary to cut out air brakes on a suspected car. If the defect is a cracked or broken wheel, brake rigging dragging or wheel with bad flat spots, precaution must be taken to remove car or locomotive from train. It may be necessary to leave the car or locomotive standing until assistance can be received. The RTC must be notified of the condition.

A train that passes 2 detectors in sequence giving malfunction messages must be stopped and an inspection performed for possible defects.

When a car is reported twice by a defect detector, and no defect is found, the car must be set out at the first available point, not exceeding 25 MPH from the second inspection site to the set out site.

When a train sets a car out for any reason, the car should be placed at a location that will best allow the mechanical department access to effect repairs. The car should be tagged in the area of the defect, and the RTC or mechanical department notified of the car number, location, and a description of the problem.

Crew members operating Key Trains are reminded to consult US Hazardous Materials Instructions and/or Canadian Dangerous Goods Instructions for Rail when Hot Bearing Alarms are received.
104.15.2 Special Dangerous Commodities

Timetable Special Instructions indicate mandatory inspection points for trains carrying special dangerous commodities.

Defect detectors which report a normal inspection are sufficient to allow the movement to proceed.

If a train carrying SPECIAL dangerous commodities passes a defect detector identified in Special Instructions and any one of the following conditions is reported:

- the defect detector is withdrawn from service,
- the defect detector reports a malfunction or is otherwise known to be inoperative,
- any part of the movement passes the HBD at 8 MPH or less,
- no message is received or heard

Stop the train within one mile and perform a pull by (not exceeding 5 MPH) or walking inspection of both sides of the train up to and including 8 axles behind the last Special Dangerous Commodity car.
Glossary

**Accelerometer**
An indicator that displays in MPH per minute the rate of increase/decrease of speed.

**Actuating**
Using of feature of the independent brake valve to charge the actuating pipe from the main reservoir and prevent or release a locomotive brake application from a brake pipe reduction.

**Air Brake**
A system of compressed air devices, controlled manually, electronically or pneumatically, that make the car or locomotive slow down or stop.

**Air Brake Equipment**
The equipment that supplies and exhausts air to and from the brake cylinders, but does not include foundation brake gear and hand brakes.

**Air Brake Hose**
A reinforced tubing. On each car or engine, the tubing is attached to a nipple that screws into the angle cock at the end of the brake pipe. The other end of the hose includes a coupling (glad hand) that fits into an identical coupling on the adjoining car. The complete arrangement connects air between the brake pipes of the cars and the locomotives throughout the train.

**Air Brake System**
All of the devices for operating air brakes to control the speed of and stop a locomotive or train. The system includes the operating devices, pipes, hoses, fittings, and foundation brake gear.

**Air Compressor**
A locomotive device, powered by the diesel engine or an electric motor, that compresses air for operating the air brakes and all other air-operated devices on locomotives and cars.

**Air Compressor Control Switch**
A device that controls the loading and unloading of the compressor at the proper main reservoir pressures.

**Air Flow Indicator (AFI)**
An instrument that indicates the volume of the air flowing through the automatic brake valve into the brake pipe.

**Air Gauge**
An instrument that indicates air pressure in pounds per square inch (psi).

**Alignment Control Coupler**
Specially equipped couplers, installed on most locomotives that only allow the coupler in buff to move laterally within certain limits. This equipment minimizes rail turnover, wheel climb and jackknifing.

**Ampere (Amperage, Amps)**
The standard unit for measuring electric current.

**Angle Cock**
A manually operated device located at each end of the brake pipe on locomotives and cars to permit or prevent air flow.

**Articulated Multi-platform Car**
A car with multiple units (segments) that have articulated couplings and which the units share a common truck.

**Automatic Brake Valve**
A manually operated electronic controller or pneumatic valve on the locomotive that controls the train and engine brakes.
Auxiliary Reservoir
A storage volume, charged from the brake pipe, to receive and store air to apply brakes on a car or locomotive. In freight car equipment, the auxiliary reservoir and emergency reservoir are combined in one structure.

“B” End (of car)
The end where the hand brake is located unless otherwise identified.

Back-up Valve or Hose
A device, either portable or permanently connected to the brake pipe, that controls brakes from the car that it is attached to. The device can apply the brakes with a service or emergency application.

Balanced Braking
Controlling train speed by making enough of a brake pipe reduction to stabilize speed on a grade, then allowing the automatic brake valve pressure maintaining feature to hold the brake application constant regardless of brake pipe leakage. This ordinarily is accomplished in combination with dynamic braking.

Bleed (Bleed-off)
Venting air pressure to the atmosphere, such as venting air pressure from the brake cylinder of individual cars, by using the release valve.

Brake Application
A brake pipe pressure reduction (no matter how made) that causes the control or distributing valve to move to the service or emergency position.

Brake Cylinder
A metallic cylinder containing a piston. Compressed air forces the piston outward to apply the brakes. When the air pressure is released, the piston returns to its normal position by a release spring coiled around the piston rod inside the cylinder.

Brake Pipe
The section of air brake piping of a car or locomotive that supplies the reservoirs. It also connects the piping to allow the locomotive engineer to control the car brakes. The pipe is 1-1/4 inches in diameter and extends from one end of the car to the other. At the ends, flexible hoses connect the cars. When a train is made up and all brake pipes on the cars are joined together, the entire pipe line is called the brake pipe.

Brake Pipe Gradient
The difference in brake pipe pressure between the locomotive (or source of supply) and the rear car of the train. Brake pipe gradients may be:

- Normal Gradient. The gradient that exists when the system is fully charged.

  or

- False Gradient. The temporary gradient that exists when the system is less than fully charged (for example, the exaggerated difference between the head end and rear end after a release).

  or

- Inverse Gradient. The temporary condition when the brake pipe pressure is higher at the rear of the train than at the head end of the train (for example, during a service brake application).

Brake Pipe Pressure
The amount of pressure in pounds per square inch (psi) in the brake pipe (commonly expressed in pounds).
**Brake Valve Cutoff Valve**
A device on locomotives that can cut out the charging and service functions of the automatic brake valve. This valve also properly positions the brake valve for passenger or freight operation.

**Branch Pipe Cutout Cock**
A device on locomotives and cars that isolates the control valve from the brake pipe.

**Control Valve**
A device on locomotives or cars that charges the reservoirs and applies or releases brake cylinder pressure when brake pipe pressure reduces or increases.

**DC Locomotive**
DC locomotives are equipped with DC traction motors and are affected by maximum continuous current ratings or short time operating ratings.

**Dead Engine Feature**
A device near the locomotive control valve that is used when the unit is handled dead-in-train. When the dead engine cutout cock is opened, the main reservoirs are charged from the brake pipe to operate the engine brakes.

**Disturbed Track**
A section of passable track that has a temporary speed restriction imposed because various defects or track maintenance has affected the integrity of the track.

**Draft Gear**
The connection between the coupler rigging and the center sill. This connection receives and cushions the shocks associated with in-train forces or coupling.

**Drawbar Forces (In-train Forces)**
Forces at the couplers between cars and/or locomotives that may be either draft (stretched) or buff (compressed), depending on train operation.

**Dynamic Brake**
An electrical device that converts some of the energy developed by a moving locomotive into an effective retarding force.

- **Dynamic Brake Holding Feature**
  A feature of the lead, controlling locomotive that allows dynamic braking effort when a PCS open condition exists.

- **Dynamic Brake Interlock (DBI)**
  A device that will automatically keep the locomotive brakes from applying when automatic brakes are applied during dynamic braking.

- **High Capacity Dynamic Brakes** – provide approximately 13,500 lbs. of effort per axle instead of 10,000 lbs. per axle as other dynamic brake systems.

- **Flat (Grid Control) Dynamic Brake System** – a dynamic brake system that provides retardation that is controlled solely by the position of the dynamic brake lever. Maximum retardation occurs at Position 8.

- **Taper (Speed Control) Dynamic Brakes** – a dynamic brake system that provides retardation relative to both speed and dynamic brake handle position. The higher the speed, the greater the retarding force developed for a given handle position. At higher speeds, full dynamic brake effort is reached at Position 4.
Electronic Alertness Control
A safety control system that senses the activity of the engineer. As the engineer goes about normal activities, any such changes will reset the control and start a timing circuit. If, during the timing period, no additional activity is detected, an audible and/or visual alarm occurs. If activity still doesn’t occur for another period, approximately 6 seconds, a penalty brake application is initiated.

Emergency Application
A rapid reduction of brake pipe pressure that causes the control valves to move to the emergency position and the vent valves to open. This equalizes auxiliary reservoir, emergency reservoir, and brake cylinder pressures.

Emergency Brake Valve
A manually operated device on equipment that initiates an emergency brake application.

Emergency Reservoir
A storage volume, charged from the brake pipe, to receive and store air used during emergency brake applications and certain recharge features.

Empty Bulk Commodity Unit Train
A train made up entirely of empty cars used to transport coal, grain, ore, potash, molten sulfur, soda ash, phosphate rock, oil, taconite or other bulk commodities.

End of Train Telemetry System (Telemetry Components)
End-of-train telemetry devices is a radio end-of-train telemetry system that consists of:

- End-of-train device (ETD) mounted on the trailing coupler of the last car.
- Head-of-train device (HTD) mounted in the locomotive.

An ETD that has not been armed to, provides:

- Last car brake pipe pressure monitoring.
- Last car motion status (moving or stopped).
- Marker light status (on or off).
- ETD battery status.

An ETD that has been armed to (emergency enabled), provides capability to initiate an emergency brake application at the rear of the train. Both the HTD and ETD must be equipped for two-way communication and the HTD must be armed to the ETD (emergency enabled). An Emergency toggle switch associated with the HTD cab display is used to activate the ETD emergency valve.

A system of components that determines the rear car brake pipe pressure and transmits that information to the display on the controlling unit.

A 2-way ETD transmits and receives information between the head-end and rear-end units. The additional purpose of a 2-way ETD is to provide a way to initiate from the locomotive an emergency brake application at the rear of the train. For this to happen, both the head-end and the rear-end units must be equipped for two-way communication and armed (emergency enabled). An Emergency toggle switch associated with the ETD cab display is used to activate the ETD emergency valve located on the rear-end unit.

Equalizing Reservoir
A small reservoir connected to a piston or diaphragm chamber and used in automatic air brake operations. It is only cut in on the controlling unit. The reservoir’s purpose is to add a volume of air to one side of the chamber, which can be accurately controlled.
When a brake pipe reduction occurs, air is drawn from the equalizing reservoir. The reservoir then automatically draws the proper amount of air from the brake pipe. For this reason, the brake pipe pressure and the equalizing reservoir pressure are always the same, except when they are equalizing after a brake pipe reduction or a brake pipe charging operation.

**Foundation Brake Gear**
The levers, rods, brake beams, etc. that connect the brake cylinder piston rod to the brake shoes so that when air pressure forces the piston out, the brake shoes are forced against the wheels.

**Full Service Application**
A brake pipe reduction made only to the point at which the auxiliary reservoir and brake cylinder pressures equalize. Any further reduction in the brake pipe pressure, except an emergency application, will not affect the amount of pressure in the brake cylinder. Therefore, air is being wasted from the brake pipe (over reduction).

The chart below shows the reduction needed for a full-service application for various initial brake pipe pressures. Also listed is the brake cylinder pressure at full service for various initial brake pipe pressures:

<table>
<thead>
<tr>
<th>Initial Brake Pipe Pressure</th>
<th>Service Equalization Pressure</th>
<th>Brake Pipe Reduction to Obtain Equalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 psi</td>
<td>64 psi</td>
<td>26 psi</td>
</tr>
<tr>
<td>105 psi</td>
<td>75 psi</td>
<td>30 psi</td>
</tr>
<tr>
<td>110 psi</td>
<td>78 psi</td>
<td>32 psi</td>
</tr>
</tbody>
</table>

**Grade (of Track)**
Grade is other than level track and is usually expressed as a percentage. The percentage is the number of feet the track rises or falls in a distance of 100 feet. For example, a 1-percent ascending grade means that the track rises 1 foot in elevation for every 100 feet the equipment travels on the track. Unsecured rail equipment may roll on a grade.

Grade designations include the following:
- Light Grade: Less than 1.0 percent.
- Heavy Grade: At least 1.0 percent for a distance of 3 miles or more.
- Mountain Grade: 2.0 percent or greater for a distance of 2 miles or more.

**Hand Brake**
A mechanical arrangement of levers, chains, rods, gears, and fulcrum. When applied manually by wheel or lever, the hand brake forces the brake shoes against the braking surfaces (wheel tread or disc) to control car or locomotive movement.

**Head of Train Device (HTD)**
A radio device located in the locomotive cab that communicates with an End of Train Device (ETD). The HTD displays:
- Last car brake pipe pressure.
- Last car motion status (moving or stopped).
- Marker light status (on or off).
- ETD battery status.
- Communication Status with ETD
- 2-Way Armed Status
- Distance measurement referenced to locomotive movement.
And provides:
- Audible alarms pertaining to status changes
- Arming capability to a selected 2-way ETD.
- Interface for Manual and Automatic initiated ETD emergencies

**Helper**
Distributed power or manned helper added to a train to assist movement.

**High Risk Location**
A track, or portion of a track, other than a main track, subdivision track, or siding; identified in special instructions, on which unattended equipment requires the application of Rule 112(a).

**Horsepower Per Trailing Ton (HPT)**
The total horsepower of all working locomotives divided by the total trailing weight of the train in tons. For example, a train powered by 15,000 horsepower and having a trailing weight of 4,285 tons has a 3.5 horsepower per trailing ton ratio (15,000 HP divided by 4,285 tons).

**Independent Brake Valve**
A brake valve that controls the locomotive brakes independent of the automatic brake valve handle position.

**Independent Pressure Switch (IPS)**
A device on a locomotive that cancels the extended range portion of dynamic braking or all dynamic braking when a sufficient independent brake application occurs. This switch prevents the locomotive wheels from sliding because of excessive braking.

**Interchange**
A location where railroads exchange rolling equipment.

**Intermodal Equipment**
Equipment designed to carry trailers, containers, automobiles.

**Intermodal Trains**
Trains made up of entirely of intermodal equipment.

**Isolation Switch**
A switch on diesel electric locomotives that has two or three positions. In the RUN position, the unit is "on the line," responds to control, and develops power. In the ISOLATION (or Stop-Start) position, the unit is isolated from the consist and does not develop power or respond to control.

**Linking**
The process of electronically connecting the controlling lead unit to the controlling distributed power unit on a distributed power train.

**Light Locomotive**
One or more units, with or without a caboose, not coupled to cars.

**Loaded Bulk Commodity Unit Train**
A train made up entirely of loads of coal, grain, ore, potash, molten sulfur, soda ash, phosphate rock, oil, taconite or other bulk commodities.

**Main Reservoir**
An air reservoir on the locomotive for storing and cooling compressed air.

**Minimum Continuous Speed**
Minimum continuous speed is the slowest speed at which a DC locomotive can operate continuously in Throttle 8. Locomotive traction motors operating under these conditions develop the highest amperage possible before overheating. The minimum continuous speed varies and is indicated by the rating plate on the locomotive.
Minimum Reduction
The first position of the automatic brake valve that initiates a service application of 6 to 8 psi.

Manned Helper
A helper controlled by an engineer in the controlling unit of the locomotive helper consist.

MU Cutout Cock (MU-2-A, Dual-Ported Cutout Cock)
A device for cutting in or out the independent brake valve.

Non-articulated Multi-platform Cars
A car with multiple units (segments) that are connected with solid drawbars. Each unit is a stand-alone unit and does not share a common truck with another unit.

Off Air
Not connected to a continuous source of compressed air.

Overcharge
Brake equipment charged to a higher pressure than the regulating valve is adjusted for or can maintain. In such a condition, brakes on a portion of the train may not release.

Penalty Brake Application
An automatic full service brake application caused by various safety devices.

Pneumatic Control Switch (PCS)
An air-operated switch, activated by an emergency or penalty brake application, that drops the engine speed to idle on EMD locomotives or throttle notch 1 on GE locomotives.

Pressure Maintaining Braking
Controlling train speed by making enough of a brake pipe reduction to stabilize speed on a grade, then allowing the automatic brake valve pressure maintaining feature to hold the brake application constant regardless of brake pipe leakage.

Pressure Maintaining Feature
A system designed to overcome brake pipe leakage both in the RELEASE and SERVICE positions of the automatic brake valve. This allows a constant brake application to be held as long as needed.

Reduction (of the brake pipe)
A decrease in brake pipe pressure at a rate and of an amount sufficient to cause a train brake application to be initiated or increased.

Reduction Relay Valve
A device on long cars that helps brake pipe pressure reduce during service and emergency brake applications. The valve compensates for the added length of brake pipe on long cars.

Regulating Valve
The valve that reduces air pressure from the locomotive’s main reservoir to the desired pressure in the brake pipe. The regulating valve will automatically maintain that pressure when the automatic brake valve is in the RELEASE position.

Retaining Valve
A manually operated valve used on cars to exhaust brake cylinder pressure completely or to maintain a predetermined pressure.

Safety Inspection location - a location designated by the Company, and recorded with Transport Canada, where persons are employed for the purpose of performing safety inspections on cars and/or locomotives.
**Service Application**
When brake pipe pressure exhausts at a service rate to apply the train brakes.

**Slack Action**
Movement of part of a coupled train at a different speed than another part of the same train.

**Solid Block (of cars)**
Two or more freight cars coupled together and added to, or removed from a train as a single unit.

**Thermal Cracks (in wheels)**
Cracks in a railroad wheel, normally caused by heat generated on the tread and flange of the wheel from excessive braking.

**Throttle Modulation**
The action of adjusting the throttle one notch at a time between idle and position 8 to control train speed without the application of air brakes.

**Tons per Dynamic Brake Axle**
The total gross trailing tonnage of the train divided by the number of axles of locomotives, including helper locomotives, operating in dynamic brake. (Refer to locomotive data tables in system special instructions for dynamic brake axle ratings.

When making this calculation, include in the gross trailing tonnage the weight of any locomotive, including a helper locomotive, not operating in dynamic brake or with dynamic brake cut out.

**Tons per Operative Brake**
The gross trailing tonnage of the train divided by the total number of cars having operative brakes. For example, a 100-car train with all brakes operating, having a total train weight of 6,000 tons, has 60 tons per operative brake (6,000 tons divided by 100 cars).

- Train lists showing average tons per car or platform will equal tons per operative brake when:
  - The train list is current (no additional pickups or setouts have been made).
  - No brakes have been cut out.
  - There is one brake per car or platform (Note: This is not the condition for some equipment, such as articulated intermodal cars).

**Transfer Train Movement**
A train that travels between a point of origin and a point of final destination not exceeding 20 miles. Such trains may pick up or deliver freight equipment while en route to destination.

**Unattended**
Means cars and/or locomotives left standing and unmanned in such a manner that the brake system of the cars and/or locomotives cannot be readily controlled.

**Vent Valve**
A valve attached to the brake system of a car or locomotive. The valve responds to an emergency brake pipe pressure rate of reduction by venting the brake pipe at each vehicle to the atmosphere. As a result, the emergency application spreads throughout the train.

**Wheel Sliding**
When the wheel rotates slower than lengthwise movement dictates.

**Wheel Slipping**
When the wheel rotates faster than lengthwise movement dictates.

**Yard Test Plant**
A system of piping and fittings that supplies air at convenient locations to charge and to test cars without a locomotive.