## BNSF Railway Safety Vision

We believe every accident or injury is preventable. Our vision is that BNSF Railway will operate free of accidents and injuries. BNSF Railway will achieve this vision through:

**A culture** that makes safety our highest priority and provides continuous self-examination as to the effectiveness of our safety process and performance...

**A work environment,** including the resources and tools, that is safe and accident-free where all known hazards will be eliminated or safe-guarded...

**Work practices and training** for all employees that make safety essential to the tasks we perform...

**An empowered work force,** including all employees, that takes responsibility for personal safety, the safety of fellow employees, and the communities in which we serve.

BNSF RAILWAY

# Air Brake and Train Handling Rules

**No. 9**

In Effect at 0800
Central, Mountain and Pacific
Continental Time
**May 1, 2026**


A Serious Injury or Fatality (SIF) event is an incident or near miss that has the potential to, or does, result in a fatal or life-altering injury or illness. Where this icon is displayed, it represents a rule that has been identified to mitigate risk of a SIF for all BNSF employees.

TOC Home

# Table of Contents

TOC Home

TOC Home

TOC Home

TOC Home

# 100.0 Train Air Brake Tests and Inspections

## 100.1 Compliance with FRA Regulations

Inspect and test brake equipment on locomotives and cars according to Federal Railroad Administration (FRA) regulations contained within these rules. At all on-duty stations, BNSF provides instructions regarding air brake tests and inspections previously conducted or required before departure.

**Who is Responsible for Performing Inspections/Tests**

Unless otherwise instructed, inspection and testing of brake equipment is the responsibility of:

- Any crew that assembles a train.
- Any crew that performs enroute work requiring another inspection/test.

**Requirements of Crews Relieved before Completing Inspections/Tests**

- If a crew is relieved before completion of a required inspection/test, they must communicate the status of the inspection/test to the relieving crew verbally or in writing.
- Written communication must be left in the cab of the controlling locomotive.

## 100.2 General Requirements for Safety Inspection of Freight Cars

*References: GCOR 1.33*

All cars at the initial terminal or that are added enroute must be given a safety inspection.

- Exception: Safety inspection of freight cars is not required when combining two extended haul trains.

**Inspect Equipment as Required by GCOR 1.33**

- Visual inspection of equipment must be performed on both sides.
- Roll-by inspections may only be utilized to determine all brakes have released and may not be used to perform any other inspection requirement(s) for either side of the train.

**Who is Qualified to Perform Inspections/Tests**

Inspections and air brake tests may be performed by either a Qualified Person or a Qualified Mechanical Inspector:

- Qualified Person: Trainman given fundamental training on freight car inspections and air brake tests.
  - All trainmen are Qualified Persons in the application of these rules.
- Qualified Mechanical Inspector: Person (such as a carman) given extensive training that provides for more detailed inspections and extended distances between inspections.

## 100.3 Coupling and Securing Air Hoses

Before coupling air hoses between locomotives and/or cars:

- Shake debris out of the hoses.
- Blow all condensation from the locomotive brake pipe or yard air source.

Secure air hoses during movements (whenever possible) to prevent the hoses and glad hands from dragging and becoming damaged.

## 100.4 Train Brake Requirements

*References: GCOR 1.33, ABTH 102.7, ABTH 102.9*

- Air brakes on all cars must be operative, unless being moved for repairs or due to failure enroute.
- Scale test cars are not required to have air brakes, but if they are present, they must be operative.

**Requirements for Including Cars with Defective Air Brakes in a Train**

- Cars with failed brakes that are being moved for repairs and are properly tagged:
  - Qualified Mechanical Inspectors provide three defect tags for each defective car to train crews.
  - Crews place one tag on each side of defective cars; the third tag is retained in the locomotive.
- Cars with air brakes that fail enroute and are cut out:
  - Crews must contact the NOC Mechanical Help Desk:
    1. Follow their instructions on where to set out the car.
    2. Write the instructions on the Train Profile.
    3. If relieved prior to setting out the car as directed, communicate the instructions to the relieving crew in writing. Place written instructions in the controlling locomotive cab's form holder.
    4. Cars will be cut out and tracked in the BNSF database.
    5. Defect tags are not required.
- At least 95% of the cars in a train must have operative brakes under all circumstances.
- Train documents prepared for relieving crews must include information about any cars with cut out air brakes being moved to setout locations for repairs.

## 100.5 Person in Charge of Air Brake Test

- The person performing the air brake test is in charge of the train while the test is being conducted.
- Before permission is given to apply or release the brakes, the person in charge must determine that all employees are safely positioned.
- The employee at the controls of the locomotive must not apply or release train brakes without permission from the person performing the air brake test.

## 100.6 Standard Brake Pipe Pressures

Regulating valve must be set as follows:

- Yard or freight service – 90 psi.
- Trains consisting entirely of business or passenger cars – 105 psi.

Exceptions: Commuter service trains operating on BNSF track must have regulating valves set as follows:

- Chicago – 90 psi.
- Seattle and Minneapolis – 110 psi.
- Amtrak is governed by their instructions regarding brake pipe pressure.

## 100.7 Charging Air Brake System

Charge the air brake system to ensure that the system functions properly. When charging the system:

- Do not charge with more than one automatic brake valve cut in unless utilizing distributed power (DP) locomotives.
- Do not increase diesel engine RPM to maintain main reservoir pressure unless pressure fails to stay 10 psi above the regulating valve setting.
- If engine RPM must be increased, do not exceed throttle position 4.

  Note:

  - Consists with a single locomotive equipped with an electric air compressor (examples: GE C40-8, C44-9) may only require advancing the throttle to RUN 1 position to increase charging speed.
  - Some EMD locomotives (example: SD70MAC) automatically increase engine speed as needed to maintain main reservoir pressure.

In yards where trains are made up, unattended locomotives may be used to charge the brake system when ambient temperature requires additional charging time.

## 100.8 Measuring Brake Pipe Pressure

*References: ABTH 100.8.1*

When an air brake test requires that brake pipe pressure be restored or that an air brake system be charged to a specified pressure at the rear of a train, this can be determined by any of the following:

- A gauge verified to be accurate.
- An ETD (end-of-train device).
- A DP locomotive consist.

When an air brake test requires an inspection to determine that the brakes apply and release on the rear car of the train, this requirement is considered fulfilled when either an ETD or a DP unit attached to the rear of the train indicates:

- Brakes apply with brake pipe pressure decrease of at least 5 psi.
- Brakes release with brake pipe pressure increase of at least 5 psi.

### 100.8.1 Verifying Accuracy of Handheld Gauges

Handheld gauges used for air brake testing must be verified accurate within the last 92 days.

**Steps to Verify Accuracy of a Handheld Gauge**

1. Utilizing a locomotive brake pipe gauge, have the engineer place the automatic brake valve handle in the RELEASE position and charge the brake pipe to 90 psi.
2. Attach a handheld gauge to the brake pipe of the controlling locomotive.
3. Compare handheld gauge reading to locomotive brake pipe gauge reading.
4. If handheld gauge reading is within 3 psi of locomotive brake pipe gauge reading, handheld gauge may be used to conduct air brake tests.
   - If handheld gauge reading is not within 3 psi of the locomotive brake pipe gauge reading, it must not be used to conduct air brake tests and must be turned in to the Mechanical Department for repair or recalibration.
5. Date of most-recent verification must be noted either:
   - On a sticker applied to the gauge.
   - On a document in the user’s possession.

TOC Home

# 100.9 Brake Pipe Leakage Test

*References: ABTH 100.10, ABTH 100.10.2, ABTH 100.12, ABTH 105.2*

### A. Requirements and Options for Brake Pipe Leakage Test

- A brake pipe leakage test is required when:
  - Conducting a Rule 100.10 Class 1 Air Brake Test.
  - Conducting a Rule 100.10.2 Class 1 Air Brake Test From Yard Test Plant.
  - Conducting a Rule 100.12 Class 1A Air Brake Test.
  - Adding cars that have not been pre-tested to a train.
- Brake system leakage can be tested using either:
  - Air Flow Method — preferred method when required equipment is present.
  - Brake Pipe Leakage Method.

### B. Air Flow Method (AFM)

**Equipment Required**

- Controlling locomotive has a maintaining-type automatic brake valve.
- Train has a gauge or device at the rear of the train.
- Locomotive has an air flow meter measured in increments no greater than 10 cubic feet per minute (CFM).
  - Some locomotives (without digital air flow displays) have air flow gauges that do not show results in CFM. These gauges may not be used for conducting an AFM brake pipe leakage test.
- Air flow meter must function within calibration requirements.
  - If air flow meter does not appear to be functioning properly due to extreme cold conditions or other unknown defect, use the Brake Pipe Leakage Method.

**Steps to Conduct an AFM Test**

1. Charge the brake system to within 15 psi of the regulating valve setting as indicated by a gauge or device at the rear of the train.
2. When air flow does not exceed 60 CFM, test is complete.
   - If air flow exceeds 60 CFM, train must be inspected for leakage.
3. For DP trains: when combined air flow readings of DP lead and DP remotes do not exceed 90 CFM, test is complete.
   - If air flow exceeds a combined reading of 90 CFM, train must be inspected for leakage.

### C. Brake Pipe Leakage Method

Use this method if train does not meet AFM test equipment requirements. For trains equipped with DP or an air turbine ETD, see the notes below.

**Steps to Conduct a Brake Pipe Leakage Method Test**

1. Charge brake system to within 15 psi of regulating valve setting as indicated by gauge or device at rear of train.
2. Wait for signal to apply brakes.
3. When signal is received, reduce brake pipe pressure by 20 psi.
4. Allow brake pipe exhaust to stop.
5. Wait 1 minute.
6. Cut out automatic brake valve.
7. Wait an additional 1 minute for brake pipe pressure to equalize.
8. Monitor brake pipe leakage for 1 minute:
   - If leakage does not exceed 5 psi, test is complete.
   - If leakage exceeds 5 psi, train must be inspected for leakage and re-tested.
9. When signal is received to release brakes, move automatic brake valve handle to RELEASE position and cut in automatic brake valve.

Notes:

- **Trains equipped with an air turbine ETD:** If using this method with only a few cars, brake pipe pressure may drop at a rate greater than 5 psi in 1 minute. If this occurs:
  - Perform Step 1 above.
  - Close the angle cock between the last car and the air turbine ETD.
  - Perform Steps 2 – 9 above.
  - After the test is successfully completed, open the angle cock.
- **Trains equipped with DP:** Do not use the steps above. Use the Rule 105.2 Distributed Power Brake Pipe Leakage Test.

TOC Home

# 100.10 Initial Terminal and Road Air Brake Test (Class 1 Air Brake Test)

*References: GCOR 1.33, ABTH 100.9B, ABTH 100.9C, ABTH 100.11, ABTH 100.12, ABTH 100.13, ABTH 100.14, ABTH 100.15, ABTH 100.17*

## A. Test Requirements

### Who Must Perform Inspections/Tests

- Qualified employee.
  - MAY NOT perform Class 1 Air Brake Tests and inspections on passenger commuter trains.
- Qualified Mechanical Inspector.
  - MUST perform Class 1 Air Brake Tests and inspections on passenger commuter trains.

### What Must be Inspected/Tested

- Air brake and safety appliances must be inspected.
  - The brake application and release test may be performed from one side of the train if all moving parts of the brake system can be seen.
  - For freight cars, safety inspection must be performed on both sides of the train as outlined in GCOR 1.33.
- Brake pipe integrity must be tested.

### When Inspection/Test is Required

- A train is originally assembled (initial terminal).
- A consist (excluding locomotives) is changed, other than by adding and/or removing a car or solid block of cars, or by removing defective cars.
  - Repositioning a car or solid block of cars within a train is considered the same as adding and/or removing a car or solid block of cars.
- A unit or cycle train has traveled 3,000 miles since its last Class I Air Brake Test.
- An interchange train is received and its consist is changed, with the exception of any one or a combination of the following:
  - Removing a solid block of cars.
  - Adding a previously tested car or a previously tested solid block of cars to the train.
  - Changing motive power.
  - Removing or changing a caboose.

- On a portion of a train as specified:
  - One or more cars added that have not been pre-tested.
  - Any portion of a train that has not been kept charged (off air over 24 hours).
  - A solid block of cars added comprised of cars from more than one previous train.
  - Any portion of cars that have been switched for train makeup and/or hazardous material car placement compliance.
    - A Class 3 Air Brake Test must be performed on the cars that remained consecutively coupled and were pre-tested.
  - Any portion of cars that have been rearranged when repositioning cars at one location in any combination that exceeds what is outlined above.
    - A Class 3 Air Brake Test must be performed on the cars that remained consecutively coupled and were pre-tested.
  - Any solid block of cars from only one previous train whose cars have not been kept together or whose train line has been disconnected. Exceptions NOT requiring inspection:

    A. Removal of defective cars.

    B. A solid block of cars from only one train that is divided into smaller segments due to track space constraints, then coupled back together in the same order, is still considered a “solid block”.

**B. Test Procedure**

**Before or During the Test**

- Inspect the angle cocks and verify that they are properly positioned.
- Inspect the air hoses and verify that they are in good condition for service and properly coupled.
- Inspect the system for leakage.
- Make necessary repairs to minimize leakage.
- Inspect the retaining valves and verify that they are in EXHAUST.

**Steps to Conduct a Class 1 Air Brake Test**

1. Charge the air brake system to within 15 psi of the locomotive regulating valve setting as indicated by a gauge or device at the rear of the train.
2. When using the preferred Air Flow Method to perform a leakage test, conduct the test as outlined in Rule 100.9 B Air Flow Method.
   - If unable to perform an AFM leakage test due to equipment malfunction or availability, perform Step 3 below, then utilize Rule 100.9 C Brake Pipe Leakage Method.
3. When employee conducting the test signals to apply the brakes, make a 20-psi brake pipe reduction.
4. Inspect to determine that:
   - Brakes are applied and remain applied on each car and piston travel meets requirements of Rule 100.17 Piston Travel Limits until notification is received to release.
     A. Make sure 100% of the train brakes are operative before departing.
     B. Any car whose brakes release prematurely may be retested once to determine whether the brakes will remain applied for a minimum of 3 minutes.
        - Brake rigging does not bind or foul.
        - All brake equipment is properly secured.
5. When test and inspection of the air brake application is complete and the proper notification has been received to release the brakes:
   - Place the automatic brake valve handle in RELEASE position.
   - Notify the inspector that the brakes have been released.
   - Inspect each brake to make sure all brakes have released. This inspection may be made as the train departs at a speed not exceeding 10 MPH.

Note: To verify brake application and release on previously-tested cars, look for an ETD pressure drop and rise of 5 psi during the air brake test.

### C. Provide Record to Engineer

**Crew Responsibilities**

- Written or electronic record of Class 1 Air Brake Tests performed at the train's origin and at any 1500 mile Extended Haul inspection location must be provided to the engineer and retained on the locomotive until the train arrives at its destination.
  - Crews may not be informed when trains are designated as Extended Haul trains. Unless told otherwise, crews should assume that any trains inspected by Qualified Mechanical Inspectors may be Extended Haul trains, and should retain all Inspection Forms 15287 on the locomotive until the train arrives at its destination.
- The written or electronic record shall contain the following:
  - Statement that the test was completed satisfactorily.
  - Person's name or employee ID.
  - Date.
  - Time.
  - Location.
  - Number of cars inspected.
- Written or electronic record is NOT required for Class 1 Air Brake Test of cars picked up, inspected, and air tested enroute.

**Engineer and Conductor Responsibilities**

- Engineers receiving written or electronic record of the Class 1 Air Brake Test must:
  - Accept the record as authority that the test was completed satisfactorily.
  - Retain the record of the Class 1 Air Brake Test and all Inspection Forms 15287 in the locomotive cab's form holder until the train arrives at its destination.
- Conductor must utilize Voice Train Reporting (VTR) or Mobile Train Reporting (MTR) to report:
  - Class 1 Air Brake Tests performed at the train's origin.
  - Class 1A Air Brake Tests performed at all locations enroute.

**Documentation Requirements**

- Written or electronic record of the initial terminal inspection and Class 1 Air Brake Test may be provided to the engineer by any one of the following methods:
  - On Form 15287 at the initial terminal.
  - By documenting in the space provided on the Train Profile, either written or electronic.
- Electronic records of Class 1 Air Brake Tests on the Train Profile are only to be used in the absence of the originals. Should a discrepancy occur, the original will be used as the official record.
  - Trains operating under FRA-2020-0033 combo-waiver may utilize the electronic record of Class 1 Air Brake Tests on the Train Profile. Original written record, if equipped, will be maintained on each lead locomotive of previous train.
- The number of cars indicated on the Class 1 Air Brake Test documentation may not correspond with the number of cars on the train due to cars being added or removed enroute.
- Changing a train identification (symbol) enroute does not require another Class 1 Air Brake Test be conducted. The symbol change and location should be noted on Form 15287 and/or on the Train Profile.

**D. ETD Emergency Test Record**

- Provide ETD test information to the outbound crew if no members of the crew were present for the test.

**E. Cycle Trains**

- Unit bulk commodity trains (coal, grain, taconite, etc.) that remain intact are considered Cycle Trains and may be operated up to 3,000 miles before an additional Class 1 Air Brake Test is required.
- This does not exclude the requirement for Class 1A Air Brake Test.
- Loading or unloading locations and/or train symbol changes on cycle trains have no bearing on where inspection and brake tests are required.

**F. Interchange Trains**

- Crews accepting interchange trains from foreign railroads must be provided a Class 1 Air Brake Test record for that train.
  - That record must be maintained in the controlling locomotive cab to destination.
  - Prior to departure or as soon as possible thereafter, train crews must contact the NOC Mechanical Help Desk to report the information documented on foreign railroad inspection forms.
  - NOC Mechanical Help Desk will enter the information into the BNSF database, which may be used to produce paperwork for other crews handling that train.
- When a foreign railroad does not provide the required Class 1 Air Brake Test record, the train crew must contact the NOC Mechanical Help Desk prior to departure and be governed by the manager's instructions.
- Class 1 Air Brake Test records must be provided to foreign railroads when BNSF trains are delivered in interchange.

## Air Brake Test Record Requirements

| Type of Air Brake Test | Written record required | VTR/MTR Record Required |
|---|---|---|
| Initial Terminal Air Brake Tests (Rule 100.10, Class 1) | Yes, where train is originally made up, whether Qualified Mechanical Inspector or crew performed. Also, for all inspections performed by Qualified Mechanical Inspector enroute when Form 15287 is provided to crew. | Yes, where train is originally made up and when performed by train crew only |
| Transfer Train Brake Test (Rule 100.11) | No | No |
| Intermediate Air Brake Test (Rule 100.12, Class 1A) | No | Yes, if performed by crew |
| Running Air Brake Test (Rule 100.13) | No | No |
| Air Brake Test when Cutting Off and Recoupling (Rule 100.14) | No | No |
| Application and Release Air Brake Test (Rule 100.15, Class 3) | No | No |

### 100.10.1 Inspection/Test Requirements for Extended Haul Trains

Trains designated as Extended Haul must have a Class 1 Air Brake Test performed by a Qualified Mechanical Inspector at the initial terminal. After passing inspection and testing performed by a Qualified Mechanical Inspector, train may be operated more than 1,000 miles but may not exceed 1,500 miles (unless otherwise noted on the Train Profile) before an additional Extended Haul Class 1 or Class 1A Air Brake Test is required.

To apply the extended distance:

- Train may not make more than one pick-up and more than one setout between designated Class 1 and Class 1A Air Brake Test inspection points performed by a Qualified Mechanical Inspector.
  - The combining or splitting of two extended haul trains does not count as a pick-up or setout.
  - This excludes any setout of defective equipment discovered en route.
  - Any cars or solid blocks of cars added en route must be pretested by a Qualified Mechanical Inspector.
  - Train must not move any cars with defective equipment, unless cleared through the NOC Mechanical Help Desk.

### 100.10.2 Test Requirements after Attaching Locomotive to Train Previously Tested with Yard Test Plant

*References: ABTH 100.9, ABTH 100.10, ABTH 100.15*

The following tests must be performed when a locomotive is coupled to a train that had its Class 1 Air Brake Test performed with a yard test plant:

- If train has been off air **24 hours or less and yard air pressure setting is the same as** locomotive regulating valve, perform air test as outlined in Rule 100.15 Application and Release Air Brake Test.
- If train has been off air **24 hours or less and yard air pressure setting is less than** locomotive regulating valve:
  1. Charge air to regulating valve setting.
  2. Perform a leakage test as specified in Rule 100.9 Brake Pipe Leakage Test.
  3. Perform a Rule 100.15 Application and Release Air Brake Test.
- If train has been off air **more than 24 hours**, perform a Rule 100.10 Initial Terminal and Road Air Brake Test on the entire train.

Note: All BNSF yard test plants utilize a pressure setting of 90 psi for air brake tests.

## 100.11 Transfer Train Air Brake Test

**When Test is Required**

- On any train making a transfer train and yard movement that does not exceed 20 miles in one direction.
  - Intermediate switching is permitted on transfer train movements.
- After adding cars during a transfer train and yard movement.

**Steps to Conduct a Transfer Train Air Brake Test**

1. Couple brake pipe hoses between all cars.
2. Charge the brake system to at least 60 psi as indicated by a gauge or device at the rear of the train.
3. Make a 15-psi brake pipe reduction.
4. Verify that the brakes apply and remain applied on each car until release signal is given.
   - Any car whose brakes release prior to signal being given may be retested once:
     - Car must be charged to within 15 psi of the regulating valve setting, then make a 20 psi brake pipe reduction instead of 15 psi.
     - To pass the retest, brakes must remain applied for no less than 3 minutes.

TOC Home

## 100.12 Intermediate Air Brake Test (Class 1A Air Brake Test)

*References: ABTH 100.9*

**Steps to Conduct an Intermediate Air Brake Test at Designated Locations**

1. Perform a Rule 100.9 Brake Pipe Leakage Test.
2. With the automatic brake valve, make a 20-psi brake pipe reduction and verify that brakes apply and remain applied on each car until release signal is given.
   - Any car whose brakes release prior to signal being given may be retested once.
     - To pass the retest, brakes must remain applied for no less than 3 minutes.
3. Verify that brake rigging is properly secured and does not bind or foul.
4. Verify that 100% of air brakes are operative before proceeding.

## 100.13 Running Air Brake Test

*References: ABTH 100.15*

A Running Air Brake Test must be conducted for:

- All passenger trains.
- All trains consisting entirely of business cars.
- All trains during inclement weather.
- All trains prior to descending mountain grades as described below.

**All Passenger Trains / Trains Consisting Entirely Of Business Cars**

Conduct the test when:

- Train leaves the initial terminal.
- Locomotive, engine crew, train crew, or operating ends have been changed.
- Any angle cocks or cutout cocks have been closed.
  - However, the running test is not required when cars are cut off from the rear end of the train only.
- Standing air brake test has been conducted.
- Train reaches points designated by the timetable or general order.
- Train has struck debris on the track.

**All Trains During Inclement Weather**

Conduct the test during winter weather that may cause snow or ice build-up between brake shoes and wheels. To ensure brakes are working properly, periodic Running Air Brake Tests must be performed when:

- Snow is up to or above the top of the rail.
- Icing conditions may exist and train is approaching:
  - A meeting, passing, or waiting point.
  - A signal which will require the train to stop.
    - Engineer must make a brake pipe reduction sufficiently in advance of that location to determine that the brakes are working properly.

**All Trains Prior To Descending Mountain Grades**

- Conduct the test at locations indicated in System Special Instructions Item 2(A) when:
  - Snow has accumulated above the top of the rail.
  - Snow is blowing within 10 miles of descending mountain grades.
- If unable to perform the test due to grade and/or train tonnage, as the train enters the crest use the following procedure to test the effectiveness of the brakes prior to the entire train entering the descent.

**Steps to Conduct a Running Air Brake Test**

1. Begin the running test of the brakes as soon as train speed is high enough to prevent stalling.
2. While using enough power to keep the train stretched:
   - Apply the train brakes with enough force to verify a noticeable retarding effect.
   - Keep the locomotive brakes released during the test.
3. If the train brakes are operating properly, release the brakes and proceed.

**Brakes Not Operating Properly**

If the train brakes are not operating properly, stop the train immediately utilizing all available braking including dynamic braking, a full service brake application and, if necessary, an emergency brake application. Then:

1. Inspect the brakes to identify and correct the problem.
   - If inclement weather conditions exist, inspect to ensure brake rigging and shoes are free of snow and ice before proceeding.
2. Conduct a Rule 100.15 Application and Release Air Brake Test.
3. Once the train is proceeding, immediately repeat the Running Air Brake Test.

## 100.14 Air Brake Test When Cutting Off and Recoupling

*References: ABTH 100.10*

- When a train is uncoupled, unchanged, and then recoupled in less than 24 hours, determine that brake pipe pressure is being restored as indicated by gauge or device at the rear end of the train before proceeding.
- If the cars are recoupled in more than 24 hours, conduct a Rule 100.10 Class 1 Air Brake Test on those cars that did not remain charged.

## 100.15 Application and Release Air Brake Test (Class 3 Air Brake Test)

**When Test is Required**

- Any change is made to a locomotive consist.
- A caboose is changed.
- After picking up a block of previously-tested cars that have not been off air for more than 24 hours.
- Helper locomotives are added anywhere in the train or removed from other than the rear end of the train.
- One or more consecutive cars are set out of the train.
- In passenger service using push/pull equipment, when changing controlling ends for operating in the opposite direction.

**Steps to Conduct a Class 3 Air Brake Test**

1. Charge the brake system to within 15 psi of the regulating valve setting as indicated by a gauge or device at the rear of the train.
2. Make a 20-psi brake pipe reduction with the automatic brake valve.
3. Verify that brakes on the rear car apply.
4. Place the automatic brake valve handle in RELEASE position.
5. Verify that the brakes on the rear car release.

## 100.16 Inbound Train Inspection

At terminals where facilities are available for immediate air brake inspections and repairs:

1. Secure cars with hand brakes as required.
2. Place the automatic brake valve handle in HANDLE OFF/CONT SVC position, to reduce brake pipe to near 0 psi.
3. When the brake pipe reduction is complete and the air has stopped exhausting, close the angle cock on the locomotive or on the cars that will be detached with the locomotive.
4. Make sure the angle cock is left open on the portion of the train or cars left standing.

## 100.17 Piston Travel Limits

Follow the piston travel requirements as outlined by stencil or badge plate. If no stencil or badge plate is available, piston travel must be within the following guidelines:

- Truck-mounted brake cylinders.
  - Piston travel must provide brake shoe clearance when brakes are released.
  - Piston travel must not exceed 4 inches where the piston acts directly on the brake beam.
- Body-mounted brake cylinders.
  - At the initial terminal:
    - Piston travel must be adjusted to between 6 and 9 inches.
  - At intermediate inspection points:
    - Piston travel must not exceed 10½ inches.

## 100.18 Inoperative Dynamic Brake Requirements

- Each locomotive discovered to have inoperative dynamic brakes must have a locomotive defect tag attached to its isolation switch.
  - This requirement does not apply to dynamic brakes that are cut out to comply with dynamic brake axle limitations.
- An additional defect tag must be left in the cab of the controlling locomotive to inform the engineer.
- Tags indicating inoperative dynamic brakes should include the following information:
  - Locomotive number.
  - Name of discovering railroad.
  - Location and date condition discovered.
  - Signature of person discovering the condition.
- Inoperative dynamic brake information may also be provided to the engineer electronically on the Train Profile under “locomotive information,” (will show whether dynamic brake is operative for each locomotive).

## 100.19 Controlling Dynamic Brakes on Multiple-Unit (MU) Consists from the Lead Controlling Locomotive

On trains equipped with dynamic brakes, the lead controlling locomotive must have the ability to control the dynamic brakes of trailing locomotives, as well as be equipped with either:

- An operative dynamic brake

  or

- An operative accelerometer (displays current change in speed or predicted change in speed in miles per hour per minute)

Note: These requirements do not apply to train movements not requiring the use of dynamic braking (examples: low speed yard and transfer movements on level or near level grade).

This page left blank intentionally.

# 101.0 Locomotive Air Brake Tests and Inspections

## 101.1 General Requirements

When locomotive inspection personnel are not available, an engineer taking charge of a locomotive consist must confirm that the brakes are operative.

**Engineer Responsibilities:**

1. If possible, stand in a location from which a roll-by inspection of an incoming locomotive consist can be conducted.
2. Keep the side and end doors of the locomotive closed when the doors are not being used.
3. Keep cab windows and doors of unoccupied trailing locomotives closed.
4. Keep the locomotive's high-voltage cabinets closed during operation.
5. Check for sliding wheels at frequent intervals if:
   - Locomotive is isolated.
   - Any locomotive traction motors are cut out.
   - Speed sensor is cut out on any powered axle.

Note: Do not cutout traction motor(s) or speed sensor(s) unless directed by Mechanical personnel or Mechanical Help Desk. If directed by field Mechanical personnel, contact Mechanical Help Desk and be governed by instructions provided.

6. Verify that brake pipe exhaust ports are not plugged or obstructed.
7. Verify that the independent brake valve handle is not blocked in the ACTUATE position.
8. Verify that the reverser is centered to engage the low idle feature when the locomotive is not moving.
9. Verify that the brake shoes are thick enough to last until the next maintenance or through the shift in yard service.

TOC Home

# 101.2 Locomotive Daily Inspection

*References: ABTH 101.7.*

## A. Inspection Requirements

### General Inspection Responsibilities/Requirements

- Engineers are responsible for ensuring that each locomotive in their charge, including locomotives picked up enroute, is inspected each day the locomotive is in service.
  - "In service" includes locomotives being moved through freight service that are isolated or shut down for fuel conservation or other than non-complying defects.
  - Locomotives tagged as non-complying locomotives moving to repair facilities require no daily inspection enroute.
- Determine if a locomotive needs to be inspected by checking the FRA Rule 229.21 Daily & Mid-Trip Inspection form (locomotive cab card) in each locomotive cab. The card will indicate the date and time of the last inspection. Exceptions:
  - On a multiple locomotive consist, it may be assumed that all trailing and distributed power locomotives were inspected on the same date as the cab card in the controlling locomotive.
  - An inspection is not required on a locomotive that is left standing (idling or shutdown) and will not be used as a working locomotive.
- File the Locomotive Daily Inspection Report electronically whenever possible.
  - ALL locomotive defects must be verbally reported to the NOC Mechanical Help Desk, unless local instructions say otherwise.

### Inspected Previous Calendar Day

- If the locomotive cab card indicates that the locomotive was inspected the previous calendar day, complete the current day's inspection before 2359 hours to ensure the locomotive remains in service.
  - Engineers that operate locomotives any time after 1200 hours of the due date must perform the inspection before completing his/her tour of duty unless relieved by proper authority or local instruction.
  - If tour of duty will go beyond 2359 hours, conduct the locomotive daily inspection before 2359 hours. Contact the dispatcher, yardmaster, or other proper authority to determine where to complete the daily inspection.
  - If arriving at the final terminal before 2359 hours, inspect the locomotive at that terminal, unless informed that the Mechanical Department or the relieving engineer will inspect the locomotive before 2359 hours.
  - When securing locomotives online prior to 1200 hours of the due date, conduct the locomotive daily inspection unless relieved by proper authority.

### NOT Inspected Previous Calendar Day

- If the locomotive cab card indicates that the locomotive was not inspected during the previous day, or if there is no record on the locomotive, inspect the locomotive before it is placed into service.

### Locomotive Picked Up Enroute

- When picking up locomotives enroute, the engineer must determine which locomotives will require a daily inspection.
  - No locomotive in the resulting consist may have a date older than the lead controlling locomotive.

**Locomotive Set Out Enroute**

- When setting out a locomotive enroute that was inspected on the previous calendar day, inspect the locomotive unless notified that:
  - Locomotive will be inspected by the Mechanical Department.
  - Locomotive will be picked up by another train before 2359 hours.

**B. Conducting a Locomotive Daily Inspection**

Not all defects are non-complying conditions. However, the following items are non-complying conditions if they do not function properly during the daily inspection. Inspect these three areas of each locomotive daily.

**Control Compartment/Cab**

Ensure that:

1. FRA Form F 6180-49A (blue card) is displayed in the cab of each locomotive under a transparent cover.
2. Sanders are operative to deposit sand in front of each locomotive's lead wheels when the reverser position determines the direction.
3. Each air gauge registers correctly and is within 3 psi of the required pressure; see Rule 101.7 Standard Air Pressures.
4. At least one headlight bulb is operative on each end of the locomotive consist.
5. Two ditch lights (if equipped) are operative in the direction of travel.
   - If not equipped or when operated as a remote control locomotive, may be used as leading locomotive if 20 MPH is observed over all public road crossings.
   - Inspection of ditch lights is not required during daily inspection on locomotive being used as remote control locomotive.
6. Horn operates.
7. Bell operates.
8. Gauge lights and engineer's overhead cab light illuminate.
   - If burned out and other available lighting is sufficient to allow visibility from the crew's normal position, report as a defect but not a non-complying condition.
9. Speed indicator functions accurately, if equipped.
   - After a daily inspection, if a speed indicator failure is identified on the lead locomotive as soon as it begins moving, the failure is considered a non-complying condition discovered during the daily inspection. Exceptions:
     - A locomotive not equipped with speed indicator or operated as a remote control locomotive is not considered to have a non-complying defect and may be used as controlling locomotive only if operated at speeds not exceeding 20 MPH.
     - Inspection of speed indicator is not required if locomotive is being used as a remote control locomotive.
10. Locomotive cab is free of stumbling or slipping hazards.
11. Windows provide a clear view.
    - Small cracks that do not obscure view must be reported as a defect, but not a non-complying condition.
12. No traction motors have been cut out.
    - Exceptions:
      - On GE AC, GE-8 DC, GE-9 DC & EMD AC locomotives, one or more traction motors/trucks may be cut out and not considered a non-complying condition.

13. Cab seats are properly secured.
    - Special care should be given to prevent undesired emergency applications caused by locomotive engineer seats striking the automatic brake valve handle on trailing and DP remote locomotives.
    - Secure the seat and/or automatic brake valve handle with locking pins, when provided.
    - If seat adjustments allow, also move the seat to a position that does not allow it to swing and come in contact with the automatic brake valve handle.
14. Lead unit has an operating sanitary toilet facility.
    - Locomotive with defective or unsanitary toilet facility may not be used as lead unit, unless:
      - No other suitable locomotives are available for use.
      - It is not possible to switch another locomotive into lead position.
      - Location is not equipped to clean or repair the toilet facility.
    - Toilet facilities (required or not) on all locomotives must be part of the daily locomotive inspection. Any toilet found to be defective or unsanitary must be reported.
    - Toilet facilities are not required on locomotives used in switching or transfer service when facilities are provided outside the locomotive at frequent intervals.
    - Unoccupied locomotives in trail position are not required to have operative or sanitary toilets.
15. Head-of-train devices (HTDs) are disarmed:
    - If daily inspection is performed at the train's final terminal.
    - On trailing (non-controlling) locomotives.

Note:

- Locomotives with defect items 5, 6, 7, 8, 9 and 11 above may be used in power as trailing units.
- These defects must always be reported, but are considered non-complying only when the locomotive is positioned in a locomotive consist as the lead controlling locomotive.

**Walkway and Engine Compartment**

Inspect both sides of each locomotive to ensure that:

- Walkways and walk-in compartments (car body type locomotives) are clear of debris, tools, and accumulated oil or grease that present a hazard to the crew.
- Handrails, hand holds, steps, ladders, safety chains, and guards are secured and ready for service.
  - Inspect for broken, bent, damaged, or loose equipment.
  - Make sure safety chains are connected high enough for safe passage.
- All electrical and rotating equipment guards are in place.
- The diesel engine has no apparent exhaust, oil, water, or fuel leaks.
- The hand brake is operative.

**Ground Level**

Inspect exposed areas for defects, but do not crawl under or between locomotives to make the visual inspection. Set hand brakes, if necessary, and inspect both sides of the locomotive to ensure that:

- Sand is deposited on the rails in front of the lead wheels of each locomotive in the consist.

  Exceptions:
  - Road service:
    - As lead locomotive, if sanders are found to be defective enroute, the locomotive may continue in service until it is placed in a repair facility, but under no conditions for more than 14 calendar days.
    - As a trailing locomotive, if sanders are found to be defective enroute, the locomotive may continue in service until it is placed in a repair facility.
  - Yard switching service:
    - If a sand delivery system is not available, the locomotive may remain in service for no more than 7 calendar days.
    - If a sand delivery system is available, the locomotive may only be used under power until the next time the locomotive daily inspection is due.
- Fuel tank is not leaking.
- No defects such as cracks and broken or missing parts exist on:
  - Trucks.
  - Wheels.
  - Gear cases.
  - Draft gears.
- Brake cylinder piston travel is:
  - Minimum: Sufficient to provide brake shoe clearance when the brakes are released.
  - Maximum: 1.5 inches less than the travel entered on FRA Form F 6180-49A (blue card) in the locomotive's cab.
- Cut-out cocks for the Dynamic Weight Management System (DWM) on C4 locomotives are cut in on both ends of the locomotive (Engineer's side).
- Foundation brake rigging is secured and all components other than wheels and sand hoses are at least 2.5 inches above the top of the rail.
- Snowplow, pilot, and endplate are properly secured between 3 inches and 6 inches above the top of the rail.
- Brake shoes are secured and approximately in line with the tread of the wheel.
  - Make sure the shoe has no obvious lips or overhangs.
- No part of the electrical cable is lying on the coupler.
- Unused electrical cables are stowed, or the disconnected ends are placed into a dummy receptacle or a multiple-unit cable holder.

- Automatic drains (if equipped) have valve handles turned fully counterclockwise to the automatic position with the stem extending beyond the valve handle.
  - If not equipped with automatic drains, manually drain oil and water from main reservoirs.

  Exception: During the months of November through March, manually drain oil and water from main reservoirs that are equipped with automatic drain valves by doing the following:

  1. From the automatic position, turn the valve knob clockwise a ¼ turn or until valve begins exhausting.
  2. After all moisture is drained, return the valve to the automatic position.
     - To return to automatic operation, turn the valve knob fully counterclockwise (stem in center of knob will stick out in automatic position).
  3. Ensure the drain operates automatically by waiting for a periodic exhaust of air each time the air compressor cycles on/off.

**C. Complete Required Daily Locomotive Inspection Reports**

- Complete these reports for each locomotive inspected:
  - FRA Rule 229.21 Daily Inspection card.
  - Electronic Locomotive Inspection Report.
- Include this information on the Daily Inspection Card:
  - Date.
  - Location.
  - Time.
    - If a non-complying defect is found during the inspection, write “NC” in the “Time” column.
  - Signature.

### 101.2.1 Locomotive with Non-Complying Condition Safe to Move

*References: ABTH 101.10.*

If during the locomotive daily inspection you find non-complying conditions, determine if the locomotive is safe to move. If the locomotive is safe to move, it may be moved only:

- As a single locomotive under power not attached to cars.
- In a locomotive consist not attached to cars.
- Isolated or shut down when attached to cars.

Exceptions:
- Controlling locomotive found with defective speed indicator may be operated under power attached to cars not exceeding 20 MPH.
- A locomotive found with the following defects may be operated under power attached to cars as a trailing locomotive:
  - Inoperative headlights.
  - Inoperative horn.
  - Inoperative bell.
  - Defective speed indicator.
  - Window cracks that obscure view.
  - Cab seats not properly secured.
  - Both ditch lights inoperative.
  - Inoperative safety devices (see Rule 101.10 Locomotive Safety Devices).
  - Inoperative or ineffective automatic or independent brake controls.

**Prior to moving a non-complying locomotive, complete these steps:**

1. Complete a non-complying locomotive tag and attach it to the isolation switch of the non-complying locomotive. The following must be written on the tag:
   - “Non-complying locomotive”.
   - Locomotive initials and number.
   - Name of the inspecting railroad.
   - Inspection location and date.
   - Description of the defect.
   - Movement restrictions, if any.
   - Destination.
   - Signature of the employee making the inspection.
2. Secure a copy of the non-complying locomotive tag to the control stand of the controlling locomotive.
3. Make sure the engineer in charge of the locomotive movement receives written notification of the non-complying locomotive (a copy of a non-complying locomotive tag meets this requirement).
   - The engineer must inform all other crew members of the non-complying unit and of any restrictions.
4. Notify the dispatcher/NOC Mechanical Help Desk, yardmaster, or other proper authority.

Exception: A locomotive may be moved without completing Steps 1, 2, and 3 above as a single locomotive or dead within a yard solely for repairs and at no more than 10 MPH.

### 101.2.2 Locomotive with Non-Complying Condition Not Safe to Move

If during the locomotive daily inspection you find non-complying conditions and determine the locomotive is not safe to move, complete these steps:

1. Notify the dispatcher/NOC Mechanical Help Desk, yardmaster, or other proper authority.
2. Complete a non-complying locomotive tag and attach the tag to the isolation switch of the non-complying locomotive. The following must be written on the tag:
   - "Non-complying locomotive".
   - Locomotive initials and number.
   - Name of the inspecting railroad.
   - Inspection location and date.
   - Description of the defect.
   - Signature of the employee making the inspection.

## 101.3 Defects Other Than Non-Complying Conditions

If a defect or problem is found that is not a non-complying condition, complete these steps:

1. Complete a Locomotive Daily Inspection Report for each locomotive in the consist with a defect or problem.
2. Report any locomotive not producing power to the NOC Mechanical Help Desk.

**Examples of Defects or Problems that Are Not Non-Complying Conditions:**

- Weather stripping is defective.
- Windshield wipers are not working.
- One headlight bulb is burned out.
  - When a locomotive is discovered with a single operative headlight bulb, immediately contact the NOC Mechanical Help Desk for instructions.
- Ground relay is tripped.
- Safety valve on the air compressor or main reservoir is popping off.

## 101.4 Non-Complying Condition Found Enroute

*References: ABTH 101.11.*

A locomotive that develops a non-complying condition enroute may continue operating if the engineer or other qualified employee determines the locomotive is safe to move and completes the Electronic Locomotive Inspection Report. The locomotive may then be operated at normal speed until the next daily inspection or until it reaches the nearest point where repairs can be made, whichever occurs first.

**Engineer/Qualified Employee Must**

1. Report any non-complying conditions on the Electronic Locomotive Inspection Report.
2. Report non-complying conditions to the dispatcher/NOC Mechanical Help Desk as soon as possible.
3. Verbally notify the relieving engineer of any non-complying conditions when possible.
4. Apply a Non-Complying Locomotive Tag to the isolation switch on the non-complying locomotive and the controlling locomotive.

**Examples of Non-Complying Conditions Found Enroute**

- While performing a speed indicator check, an employee determines that the speed is not accurate to within:
  - ±3 MPH at speeds up to 30 MPH, or
  - ±5 MPH at speeds above 30 MPH.
  - Refer to Rule 101.11 Operative Speed Indicator when defective speed indicator is found enroute.
- While moving, crew members detect flat spots and inspection determines:
  - One or more flat spots are 2.5 inches or more in length, or
  - Flat spots of 2 inches or more are adjoining.
  - If a locomotive has flat spots as described above:
    - Set it out at the first available point.
    - Limit speed to 10 MPH until the setout destination is reached.

## 101.5 Major Internal Defects Found Enroute

If a locomotive enroute has a major internal defect, complete the following steps:

1. If possible, isolate the locomotive.
2. Shut down the diesel engine immediately if noise indicates an internal mechanical defect in:
   - Diesel engine.
   - Turbocharger.
   - Components related to either.
3. If engine has been shut down, do not restart the engine until it has been inspected and can be operated without damaging the locomotive.
4. Report the condition to dispatcher/NOC Mechanical Help Desk.
   - If the defect requires that the locomotive be set out, leave the locomotive where Mechanical personnel can access it.
5. Fill out an Out of Service Tag and attach it near the engine starting control.

TOC Home

# 101.6 Locomotive Air Brake Test

*References: ABTH 101.13, 104.12.*

**When Locomotive Air Brake Test On Multiple-Unit Consists is Required**

- Making up a locomotive consist.
- Adding locomotives to a consist.
- Removing locomotives from a consist, other than when rear locomotives are removed.
- Rearranging locomotives in consist.

Note: Refer to Rule 101.13 Moving Locomotive for locomotive brake test requirements after changing operating ends of a locomotive consist.

**Steps to Conduct Locomotive Air Brake Test Procedure**

- If necessary, apply hand brakes to secure the consist before beginning brake test.
- If a locomotive in the consist has a hand brake applied, observe only the pistons at the end opposite the hand brake on that locomotive to determine if brakes apply and release.

From a ground position, observe one side of the multiple-unit consist to confirm that all locomotive brakes apply and release as specified in each step below:

1. Place the independent and automatic brake valve handles in RELEASE positions.
2. Fully apply the independent brake.
3. After confirming brakes apply on each locomotive, fully release the independent brakes.
4. When brakes are released on all locomotives, make a 10-psi brake pipe reduction using the automatic brake valve.
5. After brakes apply on all locomotives, ACTUATE and confirm the independent brakes release on all locomotives.
6. When brakes are released on all locomotives, reduce brake pipe pressure an additional 10 psi with the automatic brake valve and confirm that all locomotive brakes reapply.
7. Cut out the automatic brake valve.
8. Observe gauges to verify that the equalizing reservoir indicates no leakage and that brake pipe leakage does not exceed 5 psi per minute.
9. Move automatic brake valve handle to RELEASE position and cut in the brake valve.
10. Confirm that all brakes release.
11. Fully apply independent brakes upon successful completion of this test.

**Electronic Alertness Device Test (Alerter)**

In connection with the locomotive air brake test when a consist is originally made up, or when the lead controlling locomotive changes enroute, the alerter on the lead controlling locomotive must be tested by allowing the warning timing cycle to expire that results in a penalty application of the locomotive brakes.

Steps for conducting alerter test:

1. Secure the locomotives if necessary.
2. ISOLATION SWITCH must be in the RUN position.
3. Fully release the automatic and independent brakes.
4. Allow the alerter timing cycle to begin.
5. At the end of warning cycle, verify that a penalty brake application has initiated.
6. Immediately recover penalty brake application by placing the automatic brake handle in SUPPRESSION.

Note:
- If penalty brake application does not occur, do not use as a lead controlling locomotive.
- Does not apply to yard switching operations.

## 101.6.1 Single Person Helper Air Brake Test

*References: ABTH 101.13.*

1. Apply all locomotive hand brakes.
2. Fully apply independent brakes with automatic brake valve handle in RELEASE position and confirm that brakes on each locomotive are applied.
3. Check independent brake release by placing the automatic brake valve handle in SUPPRESSION position, wait for brake pipe exhaust to stop, then release and ACTUATE the independent brake.
4. Fully apply, then fully release and ACTUATE the independent brake.
5. Confirm that brakes are released on each locomotive.
6. Check automatic brake application by moving the automatic brake valve handle into the over-reduction zone until cylinder pressure develops on the gauge, then confirm that brakes are applied on each locomotive.
7. Check automatic brake release:
    a. Place the automatic brake valve handle in RELEASE position; wait for brake cylinder pressure to reduce to 0 psi.
    b. Cut out the automatic brake valve, then place the automatic brake valve handle in SUPPRESSION position.
    c. Confirm that brakes are released on all locomotives.
    d. Check the gauges and verify that equalizing reservoir indicates no leakage and that brake pipe leakage does not exceed 5 psi per minute.
    e. Cut in the automatic brake valve.
    f. After reapplying the brakes, release the hand brakes.
8. Conduct test specified in Rule 101.13 Moving Locomotive on the automatic and independent air brakes as soon as speed and conditions permit.

TOC Home

### 101.6.2 Air Brake Test for Locomotives Conditioned as Dead-in-Tow (DIT)

*References: ABTH 101.17, ABTH 101.18.*

When instructed to pick up locomotives that have been conditioned dead-in-tow, perform the following air brake test. (Refer to Rules 101.17 and 101.18 regarding placement in train).

1. Couple the brake pipe only and charge the brake system. It may take several minutes if the system is depleted.
2. Make a 20-psi brake pipe reduction.
3. Confirm that brakes apply.
4. Cut out the automatic brake valve.
5. Check gauges to verify that brake pipe leakage does not exceed 5 psi per minute.
6. Move the automatic brake valve handle to RELEASE position and cut in the brake valve.
7. Confirm that all brakes release.

## 101.7 Standard Air Pressures

Ensure that air pressures are as follows for freight locomotives:

- Brake pipe pressure is:
  - Yard or freight service: 90 psi
  - Trains consisting entirely of business cars or passenger equipment: 105 psi
- Main reservoir pressure is 120 to 140 psi
- Independent brake cylinder pressure is:
  - Switch locomotives with 10- or 11-inch brake cylinders: 35 psi
  - Switch locomotives with 9-inch brake cylinders: 45 psi
  - Locomotives with clasp-type brake shoe rigging (2 shoes per wheel): 45 psi
  - Locomotives with single shoe per wheel brake rigging: 72 psi

Note: Foreign line locomotives may require different main reservoir and independent brake cylinder pressures.

The following pressures apply to commuter passenger locomotives/control cars operating on BNSF:

- Chicago:
  - Main reservoir pressure: 130 to 140 psi.
  - Brake pipe pressure: 90 psi.
  - Control car independent brake cylinder pressure: 35 psi.
  - Independent brake cylinder pressure (F40PHM-2 and F40PH-2): 72 psi.
- Seattle:
  - Main reservoir pressure: 135 to 145 psi.
  - Brake pipe pressure: 110 psi.
  - Control car independent brake cylinder pressure: 35 psi.
  - Independent brake cylinder pressure (F40PHM-2 and F40PH-2): 72 psi.
- Minneapolis:
  - Main reservoir pressure: 135 to 145 psi.
  - Brake pipe pressure: 110 psi.
  - Control car independent brake cylinder pressure: 35 psi.
  - Independent brake cylinder pressure (F40PHM-2 and F40PH-2): 72 psi.

Note: Amtrak passenger equipment is operated under Amtrak guidelines.

## 101.8 Reducing Locomotive Overcharge

1. Adjust the regulating valve to the desired setting.
2. Make an automatic brake pipe reduction to at least 20 psi below the regulating valve setting.
3. Allow pressure to equalize in the brake system.
4. Move the automatic brake valve handle to RELEASE.
5. Verify that the equalizing reservoir pressure is at the required setting.

## 101.9 Control Switches

Position electrical switches and control equipment in the cab according to instructions on the badge plate or stencil.

## 101.10 Locomotive Safety Devices

- To the extent possible, make sure these locomotive safety devices are cut in and operating at all times:
  - Alerters.
    - Consider defective if device fails to provide visual and audible warnings.
  - Automatic cab signals (ACS).
  - Automatic train stop equipment (ATS).
  - Automatic train control equipment (ATC).
  - Event recorder equipment.
  - Positive Train Control (PTC).
    - Exception: The PTC system may be inoperable or cut out in compliance with rules listed in GCOR 18.0.
- Safety devices do not have to be operating:
  - On non-controlling locomotives.
  - On distributed power remote controlled locomotives.
  - During drag loading/unloading operations under 5 MPH.
- When a safety device becomes defective enroute, inform the dispatcher and NOC Mechanical Help desk as soon as possible.
  - Note: For PTC related defects, contact the PTC Help Desk.
- Do not cut out, tamper with, or defeat a safety device without proper authorization.
  - When a locomotive is enroute, this authorization may only come from the NOC Mechanical Help Desk for non-PTC related defects. For PTC related defects, authorization must come from the PTC Help Desk, Train Dispatcher, or other supervisor.

### 101.10.1 Cab Signal Equipment—Foreign Locomotives

- When possible, cab signal equipment on foreign locomotives should be cut out when operating on BNSF track.
- If cab signal equipment cannot be cut out, it may inadvertently activate and cause a penalty application if no action is taken by the engineer.
  - These false activations are often related to the additional electrical current in the rails when a train is near road crossings equipped with automatic warning devices.
- Should cab signal equipment inadvertently activate, press the Cab Signal Acknowledge button during the warning period to prevent a penalty application.
- If a penalty application occurs, press the Cab Signal Acknowledge button before moving the automatic brake valve handle from SUPPRESSION position to recover from the penalty brake application.

## 101.11 Operative Speed Indicator

A locomotive used as a controlling unit at speeds above 20 MPH must be equipped with an operative speed indicator. When leaving the terminal, the engineer must test the speed indicator of the controlling locomotive.

1. Test speed indicator accuracy using identified test miles or mile posts.
2. Conduct the speed check in the 10 to 30 MPH range.
   - ±3 MPH at speeds between 10 and 30 MPH is acceptable.
3. Conduct the speed check as near to maximum speed as conditions permit.
   - ±5 MPH at speeds above 30 MPH is acceptable.
4. A speed indicator that exceeds the above tolerances must be handled as a non-complying condition found enroute.
   - If a speed indicator on a controlling locomotive fails enroute, the locomotive may continue as a controlling locomotive at normal track speed only to the next facility where repairs can be made or until the locomotive is due a daily inspection, whichever occurs first.
   - Movement beyond a facility where repairs can be made or location where daily inspection was conducted must not exceed 20 MPH.

## 101.12 Event Recorder

Access to the event recorder is restricted. Only authorized personnel may remove the event recorder data.

TOC Home

# 101.13 Moving Locomotive

*References: ABTH 101.6, ABTH 101.6.1, , ABTH 101.17.*

**A. Initial Movement of a Locomotive Consist Not Coupled to Other Equipment**

Follow these steps prior to making the initial movement of a locomotive consist outside designated Mechanical Department limits:

1. Ensure locomotive air brakes are applied on each locomotive during visual inspection.
2. Confirm that sufficient main reservoir pressure is present.
3. Verify that hand brakes are released on all locomotives.
4. Ensure air hoses are coupled between all locomotives including brake pipe, main reservoir, actuation, and application and release.
5. Position cutout cocks and valves for multiple-unit operation.

Perform these steps as soon as operating conditions permit when changing operating ends of a locomotive consist previously tested as per Rule 101.6 Locomotive Air Brake Test, Rule 101.6.1 Single Person Helper Air Brake Test, or during the initial movement of a locomotive consist.

1. At a speed of 1 to 3 MPH, allow the locomotive to drift with the throttle in IDLE.
2. Check that brakes or other defects do not restrict the locomotive's movement.
3. Increase speed to approximately 10 MPH, then make a service brake pipe application sufficient to develop brake cylinder pressure.
4. When speed decreases to approximately 5 MPH, ACTUATE to make sure the brakes release.

**B. Initial Movement of a Locomotive Consist Coupled to Other Equipment**

When making the initial movement of a locomotive consist, perform these steps:

1. Before speed exceeds 10 MPH, ACTUATE for 5 seconds per locomotive in the consist to determine if brakes apply on trailing locomotives.
2. If actuating results in brakes applying on trailing locomotives or a sudden change in slack is noted, stop and check multiple-unit hose connections. (Lines may be crossed between actuation and application/release).
3. If multiple-unit hoses are not properly connected, correct the problem and then perform Rule 101.6 Locomotive Air Brake Test.

Note:

- Instructions regarding coupling multiple-unit air hoses between locomotives in this rule and under Rule 101.17 Locomotives Equipped for Multiple-Unit (MU) Operation are intended to mean only one coupling is required for main reservoir, actuation, and application and release hoses.
- Duplicating the coupling of any of these hoses on both sides of the locomotive is not required.

**C. Hostling Locomotives Utilizing Brake Pipe Only to Control Air Brakes**

- Multiple locomotive consists may be moved within a terminal area with only the brake pipe connected provided speed does not exceed 10 MPH.
- When handling locomotives in this manner, main reservoir charging must be maintained on locomotives with brake pipe only connected and either an operative air compressor or the dead engine fixture cut in to provide main reservoir charging from the brake pipe.

Perform the following inspection and test before initial movement of locomotives coupled together and whenever locomotives are added or the controlling locomotive is changed:

1. Ensure brake pipe is connected and angle cocks are open between each locomotive.
2. Cut out automatic brake valve and place independent brake valve in TRAIL position with handle in RELEASE position on all locomotives coupled together except the controlling locomotive.
3. Allow brake pipe to charge.
4. Perform a standing brake test as follows:
    a. Make a 10-psi service brake application.
    b. Ensure brakes are applied on each locomotive with brake pipe only applied.
    c. Place the automatic brake valve handle in RELEASE position.
    d. Ensure brakes release on each locomotive with brake pipe only applied.
5. Release all hand brakes.

**D. Moving Locomotives Within Mechanical Department Limits**

1. Charge and properly position brake equipment before moving the controlling locomotive.
2. Apply and release locomotive brakes to verify on controlling locomotive that brake cylinder pistons are operating and brake cylinder lines to trucks are not cut out.
3. Do not move on or off a turntable unless correctly lined and locked.
4. When hostling locomotives with inoperative brakes, a minimum of 1 locomotive with operative brakes must be used per 6 locomotives with inoperative brakes.

## 101.14 Moving Light Locomotive Consists

Operate a light locomotive consist from the cab nearest the direction of travel when any of the following conditions exists:

- Distance to be traveled exceeds 2 miles.
- A member of the same crew does not control movement using hand signals or radio.
- Visibility is impaired.

## 101.15 Locomotive Air Brake Equipment

Place air brake valves in the proper position on freight and helper locomotives. Position brake valves and cutout cocks as indicated in the following table.

| 26 and 30 CDW Brake Equipment Positions | | | |
|---|---|---|---|
| | **Lead** | **Trail** | **Helper** |
| Automatic Brake Valve | Release | Handle Off/Continuous Service | Release |
| Independent Brake Valve | Applied Full | Release | Release |
| Automatic Brake Valve Cutout Valve | Frt/In | Out | Out |
| MU-2A Valve or Double-Ported Cutout Cock | Lead or Dead | Trail | Lead or Dead |
| | In | Out | In |

| CCB Brake Equipment Positions | | | |
|---|---|---|---|
| | **Lead** | **Trail** | **Helper** |
| Automatic Brake Valve | Release | Handle Off/Continuous Service | Release |
| Independent Brake Valve | Applied Full | Release | Release |
| Air Brake Setup | Lead/Cut in | Trail | Lead/Cut out |

| 6BLC Brake Equipment Positions | | | | |
|---|---|---|---|---|
| | | **Lead** | **Trail** | **Helper** |
| Automatic Brake Valve | | Release | Handle Off/Continuous Service | Release |
| Independent Brake Valve | | Applied Full | Release | Release |
| Automatic Brake Valve Cutout Cock | 2 Pos. | Open Lead | Closed Trail | Closed Trail |
| MU-2A Valve or Double-Ported Cutout Cock | | Lead or Dead | Trail | Lead or Dead |
| | | In | Out | In |

| 24RL Brake Equipment Positions | | | |
|---|---|---|---|
| | **Lead** | **Trail** | **Helper** |
| Automatic Brake Valve | Release | Release | Release |
| Independent Brake Valve | Applied Full | Release | Release |
| Automatic Brake Valve Cutout Valve | Open | Closed | Closed |
| Rotair Valve | Frt | Frt Lap | Pass or Frt |
| MU-2A Valve | Lead or Dead | Trail | Lead or Dead |

## 101.16 Separating Locomotives

1. Apply hand brakes on all locomotives to be left standing.
2. Disconnect electric jumper cables.
3. Plug the jumper cables into a dummy receptacle.
4. Close cutout cocks.
5. Disconnect walkway safety chains and reposition chains to provide safe passage.
6. Disconnect fuel tender hoses (if equipped).
7. Separate locomotives.
8. Attach air hoses to the dummy couplings or place them in the pockets.

## 101.17 Locomotives Equipped for Multiple-Unit (MU) Operation

*References: ABTH 101.6*

**A. Locomotives Equipped with Alignment Control Couplers**

When placing locomotives with alignment control couplers in a train with the diesel engine isolated or shut down, follow these steps:

1. Couple the locomotives at any position directly behind the lead locomotive at the head end of the train.
   - Exception(s):
     - Does not apply to isolated locomotives in DP consist.
     - Switch engine models SW and MP must be placed second in the locomotive consist, one per train, when handling cars.
2. Set up air brake equipment as a trailing unit.
3. Couple all hoses.
4. Connect MU jumper cables.
5. Open all cutout cocks between the operating locomotive consist and the units that will be moved.
6. Perform a Rule 101.6 Locomotive Air Brake Test.

If it cannot be determined whether a locomotive is equipped with an alignment control coupler, locomotive must be moved as described in Part B below.

**B. Locomotives Not Equipped with Alignment Control Couplers**

- BNSF locomotives without alignment control couplers may be identified with stenciling.
- These units may also be identified on the Train List.
- The following units are not equipped with alignment control couplers, and must be placed second in the locomotive consist, one per train, when handling cars:
  - Most SW1200, SW1500, MP15, GP7, GP9, SD7 and SD9 locomotives.
  - Waybilled locomotives.
  - Some foreign line road and switch engines.
  - Some Amtrak and other commuter locomotives.
- Mechanical inspectors must ensure that coupler swing limiting devices are in place before these units move in freight trains. Coupler swing limiting devices do not make the coupler an alignment control coupler.

### C. High/Low Horsepower (HP) Locomotives

- Locomotives that must not be used as power in a mixed high/low HP consist:
  - Models GP28 thru GP40.
  - Models SD32 thru SD39.
  - Model SW.
- Locomotives (with control systems that provide the ability to limit overloading the traction motors) that may be used as power in a mixed high/low HP consist:
  - Model B40-8.
  - Model B40-8W.
  - Model GP50.
  - Model GP60.
  - Model GP60M.
  - Models SD40-2 and SD40-3.
  - Model SD60.
  - Model SD75.

# 101.18 Locomotives Not Equipped for MU Operation

**A. Placement in Train**

**Steps for Non-MU Locomotives Equipped with Alignment Control Couplers**

1. Shut down locomotives that are:
   - Not equipped for MU operation.
   - Have inoperative MU equipment.
2. Couple them directly behind the locomotive consist.

**Steps for Non-MU Locomotives Not Equipped with Alignment Control Couplers**

1. Shut down the locomotives.
2. Place locomotives between 5 and 10 cars from the rear of the train, with at least one car separating locomotives.
3. No more than 2 locomotives may be placed in a train.
4. Mechanical inspectors must ensure that coupler swing limiting devices or truck bolster movement limiting devices are in place before these units are moved in freight trains.
5. Distributed power consists or manned helpers must be cut in ahead of locomotives not equipped with alignment control couplers.
6. Place locomotives with bolted or temporary drawbars no more than 5 cars from the rear of the train.

Note: Locomotives that are not equipped with alignment control couplers may be identified on the Train List. BNSF locomotives without alignment control couplers may be identified with stenciling.

**B. Setup Procedure**

1. Make sure the dead-engine feature cutout cock is open or “dead”.
2. Reduce main reservoir pressure to below 90 psi.
3. Cut out the automatic brake valve and place the handle in HANDLE OFF/CONTINUOUS SERVICE position.
4. Cut in the independent brake valve and place the handle in the RELEASE position.
5. Close the cutout cocks in the main reservoir equalizing pipe.
6. Make sure the cutout cocks in the actuating pipe and independent application and release pipe are open.

TOC Home

# 101.19 Changing Operating Ends

*References: ABTH 101.13, 101.6, 104.12.*

To change operating ends on a locomotive consist:

A. Cut out the operating controls on the controlling end.

**1. Steps to Cut Out Operating Controls**

a. Unless coupled to secured equipment, apply a sufficient number of hand brakes to the locomotives to prevent movement.

b. Place the throttle in IDLE.

c. Place the reverse lever in NEUTRAL and remove the handle.

d. Fully apply the independent brake valve.

e. Make a 20-psi brake pipe reduction.

f. Cut out the independent brake valve and move the handle to RELEASE.

g. Cut out the automatic brake valve and move the handle to HANDLE OFF/CONTINUOUS SERVICE.

h. Place the generator field switch in the OFF position.

i. Disarm two-way ETD, if equipped.

B. Go immediately to the opposite end and restore operating controls.

**2. Steps to Restore Operating Controls**

a. Replace the reverse lever.

b. Fully apply the independent brake valve.

c. Cut in the independent brake valve.

d. Place the automatic brake valve handle in RELEASE position.

e. Cut in the automatic brake valve.

f. Place the generator field switch in the ON position.

g. Place the engine run switch in the ON position.

h. Place the control/fuel pump switch in the ON position.

i. Release the locomotive hand brakes.

j. Conduct the test specified in Rule 101.13 Moving Locomotive.

k. If required, test the Alerter as specified in Rule 101.6.

## 101.20 Changing to Opposite Controls in the Same Cab on Dual Control Locomotives

*References: ABTH 101.13.*

Follow this procedure to change to opposite controls in the same cab.

**Controlling Brake Valve**

1. Fully apply the independent brake valve.
2. Make a 20-psi brake pipe reduction.
3. Return the automatic brake valve handle to LAP and remove the brake handle.
4. Fully release the independent brake.
5. Move to the opposite set of air brake controls.

**New Controlling Brake Valve (Opposite Side of Locomotive)**

1. Remove the automatic brake valve handle with the stop plate attached and place it on the non-controlling automatic brake valve in LAP.
2. Insert the automatic and independent brake valve handles.
3. Fully apply the independent brake.
4. Move the automatic brake valve handle to RELEASE.
5. Check the air gauges and verify that the proper pressures are being maintained.
6. Conduct the test specified in Rule 101.13 Moving Locomotive.

## 101.21 Locomotive Camera Systems

*References: ABTH 101.2.*

**Locate and Inspect Outward/Inward Facing Cameras**

- Outward Facing.
  - Positioned in the windshield.
- Inward Facing.
  - May be positioned in the forward/back overhead portion of the cab.
- Inspect the cameras to ensure that any in-cab items will not block or cause possible distortion of the camera's view.
  - If the camera's views are obstructed:
    - ○ Clear the obstruction if possible.
    - ○ Verbally inform the NOC Mechanical Help Desk if the obstruction cannot be cleared.
    - ○ Report the issue electronically as required in Rule 101.2 Locomotive Daily Inspection.

**Position Locomotives with Outward/Inward Facing Cameras for Freight Service**

- When assembling a consist for freight service:
  - Place camera-equipped locomotives in the lead controlling position (short hood facing the direction of travel), when this can be accomplished without turning the locomotives.
  - Locomotives must also have all other required qualifications for the lead position.

This page left blank intentionally.

# 102.0 Train Operations

## 102.1 Securing Equipment against Undesired Movement

*References: ABTH 104.14.*

Crew members are responsible for securing standing equipment with hand brakes to prevent undesired movement. The air brake system must not be depended upon to prevent an undesired movement.

- Where to apply hand brakes when setting out cars on a grade:
  - When slack is bunched, apply hand brakes on the low end of the cut of cars.
  - When slack is stretched, apply hand brakes on the high end of the cut of cars.
- Determining the number of hand brakes or cars to be secured depends on:
  - Grade and adhesion.
  - Number of loaded and empty cars.
  - Weather conditions (wind and temperature).
- Refer to Rule 104.14 for guidance.
- To verify that applied hand brakes will prevent movement when not utilizing Car Secured Chart in ABTH 104.14, release all air brakes.

Exception: Release of air brakes and/or utilizing Car Secured Chart in ABTH 104.14 is not required when complying with Division Securement Supplemental Instructions listed in Division General Order.

- All retainer valves must be in EXHAUST position.

### 102.1.1 Securing Unattended Train or Portion of Train with Locomotive Attached

*References: ABTH 102.3, ABTH 104.14.*

Steps to Secure a Train/Portion of a Train with the Lead Locomotive Consist/Portion of the Lead Locomotive Consist Attached.

1. Secure equipment against undesired movement.
   - In addition to applying required train hand brakes, all locomotive hand brakes on the lead consist/portion of the lead consist must be applied.
   - When determining the minimum number of hand brakes to be applied or cars to be secured when securing a train, the locomotive hand brakes should be counted toward the total.
     - You may use the chart provided in ABTH 104.14 to determine the required number of hand brakes or cars secured.
   - It is not required to apply hand brakes on conditioned distributed power remote consists as outlined in ABTH 102.3 when the train is otherwise properly secured.
2. Release all air brakes to ensure hand brakes will prevent movement unless the Car Secured Chart in ABTH 104.14 was utilized for securement.
   - Exception: Release of air brakes or utilization of Car Secured Chart in ABTH 104.14 is not required when complying with Division Securement Supplemental Instructions listed in Division General Order.
3. Secure the locomotive consist as outlined in ABTH 102.3.
   - Exception: When making changes to lead consist by setting out and/or picking up locomotives and leaving a portion of the lead consist attached to the train, that portion left attached to the train may be left in a trailing status and does not require controls to be set up as lead.
   - Do not bottle air or maintain air pressure in the brake pipe when locomotives are left standing in the trail position.

## 102.1.2 Securing an Unattended Train before Detaching Locomotives

*References: ABTH 100.16, ABTH 104.14.*

When any part of a train will be unattended and train brake inspection is not required, do not depend on the air brake system to secure the cars.

**Steps for Detaching Locomotives or Locomotives and Cars**

1. Secure equipment that will be unattended against undesired movement.
   - You may use the chart provided in ABTH 104.14 to determine the required number of hand brakes or cars secured.
2. Release all air brakes to ensure hand brakes will prevent movement unless the Car Secured Chart in ABTH 104.14 was utilized for securement.

Note: When leaving the rear portion of train releasing the air may not be practical. Utilize Car Secured Chart in ABTH 104.14.

- Exception: Release of air brakes or utilization of Car Secured Chart in ABTH 104.14 is not required when complying with Division Securement Supplemental Instructions listed in Division General Order.

3. Make a 20-psi brake pipe reduction.
   - If operating a Distributed Power (DP) train, crew must have a briefing and ensure steps for SETOUT MODE are properly followed.
4. Close the angle cock on rear locomotive or last car to be detached.
   - Leave the angle cock open on portion left unattended.
     - Exception: If lead and remote unit(s) are equipped with LXA, the brake valve will remain Cut In and the angle cock will need to be CLOSED as outlined in ABTH 105.6.5.
5. Allow brakes on any standing portion to apply in emergency.
   - When available, use the end-of-train telemetry device to make sure that brake pipe pressure drops to 0 psi.
     - Exception: If lead and remote unit(s) are equipped with LXA, the consist will not go into emergency. It will maintain brake pipe pressure at time of separation.
6. Do not bottle air or maintain air pressure in the brake pipe when locomotives are detached or yard air is uncoupled.
   - After the brake pipe pressure has completely exhausted, the angle cock on the unattended portion of the train may be closed to allow:
     - Immediately switching the cars from the opposite end.
     - Running around the train for the purpose of operating the train in the other direction.

Exception: When separating a train in temperatures below 0 F and the train is on a light grade (see Grade (of Track) in the Glossary), follow the steps in Rule 100.16 to prevent vent valves from sticking open.

## 102.1.3 Emergency Brake Application Resulting in Train Separation

*References: ABTH 104.14.*

**Steps if Train Separation Occurs**

1. Immediately secure detached portions utilizing the chart in Rule 104.14.
2. Close the angle cock on rear car of portion attached to the lead locomotive consist and, if operating conditions permit, recharge the air brake system.

Note: Additional hand brakes may be required on the low end before releasing air brakes to control slack or prevent undesired movement while recharging.

### 102.1.4 Securing a Single Car before Detaching Cars/Locomotives

Perform a single car securement test when car is left standing not coupled to other equipment to prevent uncontrolled movement.

After performing a single car securement test as outlined below, a single car may only be left standing when:

- Spotting a customer's facility or industry track.
- In a yard, siding, or auxiliary track.
- Temporarily left on a main track during switching operations.
- Mechanical Department has chained the car to the rail - if determined hand brake is inoperative.

Steps for Conducting a Single Car Securement Test:

1. Apply the hand brake on car to be set-out.
   - On cars with more than one hand brake, all hand brakes must be applied.
2. Release or bleed off air brakes.
3. Move the car a minimal distance (no more than 50 feet) to ensure hand brake is operational.
4. After uncoupling is made, observe movement does not occur with the car left standing.
5. If necessary, block the wheels or set out a second car.

## 102.1.5 Securing Equipment in Yard Operations

*References: GCOR 7.6, ABTH 102.1, ABTH 102.1.1, ABTH 102.1.2, ABTH 102.1.4, ABTH 102.3, ABTH 104.14.*

Steps to Secure a Train or Rail Equipment Before, During, and After Switching in Yards, not including Hump Operations.

1. Before switching begins, crew(s) must secure equipment against undesired movement for the equipment that is already in the track they will be switching into and equipment that has been handled.
   - Crews must utilize ABTH 102.1.2 to establish secured equipment on the opposite end of tracks. Cars to be utilized as opposite end securement must all be coupled together.
   - Prior to equipment being cut off in motion (kicked) into a track the minimum number of cars secured must be equal to the Cars Secured Chart requirements in ABTH 104.14 for the total tonnage of equipment to be in that track.

Note: A secured single car cannot be kicked into or provide end of track securement in any track. A single car left standing outside or separate from secured equipment on the end of a track must be secured per ABTH 102.1.4 once switching is completed.

2. During switching crews must utilize the following process:

   All equipment placed into a track with established secured equipment on the opposite end, will be considered attended while the crew is actively switching on the yard lead.
   - Crews must ensure equipment placed or kicked into track(s) does not roll back towards the lead they are working from.

Note: as tonnage increases additional cars secured may be required to prevent movement out the opposite end of track.

   - If the crew must leave the area to travel to a different location, take a break, or end switching operations, they must first verify all equipment switched into tracks to be left unattended is properly secured.

3. After switching operations are complete and prior to crew leaving the area, securement on cars switched into tracks must be performed in one of two ways:
   - Stretch the entire track or equipment crew handled to ensure all applicable equipment is coupled together. Crews cannot assume that all cars switched into tracks have coupled together. Once all cars are coupled, perform a release test per ABTH 102.1.1, ABTH 102.1.2, or Division Supplemental Securement Instructions listed in Division General Order, or
   - If all cars in the track are not stretched, each end must have an equal number of secured coupled cars on each end to hold the total tonnage in the track.

Note: The secured cars on each end must all be coupled together.

4. Secure locomotives as outlined in ABTH 102.3.

TOC Home

## 102.2 Releasing Hand Brakes

- Before moving cars or locomotives, fully release all hand brakes to prevent wheel damage.

  Exception: Hand brakes can be left applied for a minimal distance when spotting cars or performing a single car securement test. A roll by inspection can be used to identify cars with hand brakes that need to be released.

- Check at least 3 additional cars beyond the last applied hand brake to ensure that no other hand brakes are applied.
- If a hand brake is difficult to release, charge the air brake system and make a full service application of the car or locomotive brakes before attempting to release the hand brake again.
  - If the hand brake is still difficult to release, place the car or locomotive brake system into emergency.
- If the hand brake cannot be released using the above method, do not move the car except to set it out.
  - Car must be watched during entire setout movement.
  - Speed must be limited to 5 MPH if wheels are not turning freely.
  - Defect must be reported to NOC Mechanical Help Desk and dispatcher.

TOC Home

# 102.3 Unattended Locomotives

**Steps for Securing Unattended Locomotives**

(Excluding conditioned DP remote locomotives on secured unattended trains).

1. Place the throttle in IDLE.
2. Place the transition handle (if equipped) in the OFF position.
3. Place the generator field switch or the circuit breaker on the control stand (if equipped) in the OFF position.
4. Remove the reverser handle from the control stand and ensure all reversers are removed from each locomotive in the head-end consist.
5. Apply all hand brakes.
   - Exception: Light locomotive consists in yards and at mechanical facilities, apply a sufficient number of hand brakes to prevent undesired movement, but a minimum of one per locomotive consist on the lead controlling locomotive.
6. Release the air brakes to confirm the hand brakes will prevent movement.
7. When engine is running or if in an active Automatic Engine Start/Stop System (AESS) shutdown session, allow the brake system to charge.
8. Make a 20-psi brake pipe reduction.
9. Leave the automatic brake valve cut in.
10. Fully apply the independent brake.
11. Place engine control switch to ISOLATE on all locomotives.
12. Engage the PTC Park function (if controlling locomotive is PTC equipped).
    - Exception: Do not engage the PTC Park function when leaving locomotive(s) within mechanical limits.

**Additional Securement Guidelines for Unattended Locomotives Not Coupled to Other Equipment:**

- Must not be left unattended on a Main Track.
- When left unattended on all tracks other than Main Track, must be protected by derails or a facing point switch lined and locked to prevent movement to the Main Track.
- If grade exceeds 1%, block the wheels securely.

Exceptions:

- The following may be left unattended with all hand brakes applied at any location, even on Main Track:
  - DP remote locomotives when building or disassembling a DP train.
  - Single person helper consists when single person helper is performing duties that require temporarily leaving the locomotives.
- When inoperative locomotives (such as those dead due to defect or Bad Order status) are placed in storage or set out enroute, they are exempt from the requirements of Steps for Securing Unattended Locomotives above.
  - Each locomotive outside of a yard, must have a hand brake applied and tested when left unattended. Test the hand brake by moving the locomotive minimally to verify hand brake is operational.

### 102.3.1 Locking Locomotives

Before leaving locomotives unattended, lock cab doors of the lead controlling locomotive when the exterior front door is equipped with a D575-style locking mechanism as follows:

1. Lock the back door from inside the cab.
2. Exit the cab through the front door.
3. Lock the exterior front door from the outside.
    - Exceptions: Lead controlling locomotive cab doors may be left unlocked:
        - In a yard where an employee such as a yardmaster or Spvr Terminal Operations is on duty continuously.
        - On a track where employees regularly inspect, test, repair, or service rolling equipment (engine servicing area, Main Track fueling location, etc.).

After conditioning a DP remote consist, lock all locomotives in the remote consist equipped with a D575-style locking mechanism as outlined above.

## 102.4 Brakes Not Operating Properly

*References: ABTH 100.13, ABTH 100.15.*

1. Stop the train immediately.
2. Inspect the brakes to identify and correct the problem.
3. Before proceeding, conduct a Rule 100.15 Application and Release Air Brake Test.
4. Once the train is proceeding, conduct a Rule 100.13 Running Air Brake Test.

## 102.5 Sticking Brakes

Steps if Train Brakes Remain Applied after a Brake Release:

1. Stop the train as soon as possible.
2. Determine why the brakes are sticking. Some reasons for sticking brakes include:
   - Overcharged air brake system.
   - Hand brakes applied.
   - Retaining valve not in EXHAUST.
   - Leak in the air brake system.
   - Releasing a brake pipe reduction with brake pipe air still exhausting.
   - Brake pipe reduction insufficient to ensure proper release.
3. Correct the problem.
4. If necessary, cut out the control valve or set out the car.

### 102.5.1 Minimizing Sticking Brakes

To minimize the possibility of sticking brakes, observe the following:

- Do not overcharge the train air brake system.
- When handling cars to be placed on the rear portion of a freight train, regulating valve pressure setting must be 10 psi less than standard pressure for that train.
- When a running release of train brakes is to be made, if operating conditions permit, increase the brake pipe reduction to at least 10 psi and allow brake pipe exhaust to stop for at least 20 seconds before releasing.
- When the train air brakes are used to stop, when operating conditions permit, increase brake pipe reduction to at least 15 psi after stopping.
  - The brakes must not be released until at least 20 seconds after exhaust stops.

## 102.6 Reducing Pressure in Overcharged Train Brake Systems

1. Adjust the regulating valve to the desired pressure.
2. Make a full service brake pipe reduction with the automatic brake.
3. Wait at least 30 seconds after the brake pipe exhaust stops.
4. Move the automatic brake valve handle to RELEASE.
5. Charge the system to the required pressure.

## 102.7 Cutting Out Air Brake Equipment

Cut out control valves or other air brake devices only if they are defective or the brake rigging is being serviced.

- If air brake devices must be cut out enroute, notify the dispatcher and NOC Mechanical Help Desk of car numbers and any other pertinent information.

**A. Procedure to Cut Out Control Valve or Automatic Vent Valve**

1. Close the branch pipe cutout cock.
2. When cutting out a control valve, drain the air reservoirs completely by operating the brake cylinder release valve.

**B. Placement of Cars with Cut Out Air Brake Equipment**

Follow these requirements when air brakes must be cut out of multiple cars:

- No more than 2 cars with cut out air brakes may be consecutive in a train.
- If it is necessary to cut out air brakes on a third consecutive car, that car must be separated from the other 2 cars by at least one car with operative brakes.

**C. Inoperative Rear Car Brakes**

**Steps for Handling Inoperative Rear Car Brakes Enroute**

The rear car of a train must have operative air brakes. If rear car brakes become inoperative enroute, follow these steps:

1. Before moving the train, test the hand brake on the disabled rear car.
2. If the hand brake is inoperative, do not move the car until it is repaired and can be moved safely.
   - If one air brake device/control valve is cut out on a car with multiple control valves, consider the brakes on that car to be operative.
3. Chain, strap, or cable the disabled rear car to the car ahead.
4. Move directly to the first auxiliary track and move the disabled rear car ahead of at least one car with operative brakes, or set it out.

**Steps for Handling Broken Rear Car Brake Pipe Enroute**

Even though the disabled rear car has inoperative brakes, air must be cut in to the brake pipe. If the disabled rear car's brake pipe is broken, follow these steps:

1. Couple the air hoses between the disabled rear car and the car ahead.
2. Leave the angle cock closed on the disabled rear car.
3. Open the angle cock on the car ahead.
   - This will ensure an emergency application of the train's air brakes should the disabled rear car separate from the train.

### 102.7.1 Bleeding Off Cars

Bleed off cars only when:

- Repairing the brake system.
- Cutting out the brakes on a defective car.
- Switching.

## 102.8 Reporting Flat Spots on Wheels

*References: GCOR 1.34.*

Follow these steps to measure and report flat spots on wheels to the dispatcher and NOC Mechanical Help Desk so they can be repaired.

1. Determine the length of the flat area.
2. If the length of the flat area is more than 1 inch, report it.
3. In cases of flat spots on switch locomotive wheels, inform:
   - Maintenance facility.
   - Yardmaster.
   - Supervisor.

Note: See GCOR 1.34 for setout and speed restriction guidelines.

## 102.9 Setting Out Defective Cars

Set out a defective car whenever it cannot be safely moved to the next repair location, then do the following:

1. Report the situation to the dispatcher and NOC Mechanical Help Desk.
2. Set out the defective car where mechanical crews can access it.
3. If the journal is overheated and a mechanical crew is not available, inspect the underside of the car immediately.

## 102.10 Coupling Brake Pipe Connections

*References: GCOR 5.8.2 (2).*

Maintain brake pipe connections to enable the air brake system to function properly throughout the train. Angle cocks must never be left partially closed or partially open.

**Before Coupling Air Hoses to Charge Brake Pipe**

1. Make a 20-psi brake pipe reduction.
   - If on grade, to prevent an undesired release of the cars being coupled to, make a 40-psi brake pipe reduction.
2. Signal that the brake valve exhaust has stopped by sounding whistle signal per GCOR 5.8.2 (2), or using the radio.
3. Couple air hoses and open angle cocks slowly to prevent an emergency brake application.

**Adjusting Air Hose Height**

1. Couple the air hoses.
2. Verify that the brake pipe hose support is adjusted so that the glad hands are at least 4 inches above the top of the rail.

# 102.11 Helper Operations

Comply with these manned helper operating responsibilities:

- When adding helpers to other locomotives on a train, control of all locomotives coupled together must be transferred to the lead engineer by plugging in the MU cable, when required.
  - Locomotives using HelperLink must not plug in MU cable if coupling to other locomotives.
- When more than one locomotive is attached to a train, the engineer in the lead locomotive must control the train's air brakes.
- The engineer in the lead locomotive is in charge of train movement.
- The engineer in charge will communicate with and direct the helper locomotive engineer as follows:
  - Identify speed restrictions and locations where a stop is to be made at least 2 miles in advance.
  - Communicate the name or aspect of signals affecting the helper locomotive's movement as soon as the signals become visible or audible.
- When dynamic braking is used on both lead and helper locomotives:
  - The helper engineer should maintain constant dynamic braking force at the direction of the lead engineer.
  - The lead engineer should control variations in train speed.
- Do not cut off the helper locomotive while the train is moving (unless equipped with HelperLink).

## 102.11.1 Entraining or Coupling Manned Helper at Rear of Train

*References: ABTH 100.8.*

**Steps for Engineer on Manned Helper**

When a manned helper is cut in or coupled at the rear of the train and before the angle cocks are opened, the engineer on the manned helper must:

1. Make a 20-psi brake pipe reduction.
2. Cut out the automatic brake valve and place the handle in the RELEASE position.
3. Couple the brake pipe hoses.
4. Open the brake pipe angle cock on the locomotive first, then slowly open the brake pipe angle cock on the car.
5. Fully RELEASE the independent brake and ACTUATE to fully release the helper locomotive consist's brakes.

**Steps for Engineer on Lead Locomotive**

After the manned helper is cut in or coupled at the rear of the train, the engineer of the leading locomotive must:

1. Increase brake pipe reduction by at least 8 psi, but not to exceed a full service reduction.
   - Release and recharge the brake system before conducting the helper air brake test if:
     - Train will be continuing on a descending, heavy/mountain grade, and
     - Helper air brake test cannot be conducted without exceeding a 15-psi brake pipe reduction.
2. Instruct helper crew to visually inspect brakes on helper consist to ensure application.
3. After obtaining the desired reduction, place the automatic brake valve handle in the RELEASE position.
4. Confirm there is at least a 5-psi brake pipe increase at the rear of the train.

## 102.11.2 Removing a Cut In Helper

*References: ABTH 100.15.*

- After a cut in helper has been removed, conduct Rule 100.15 Application and Release Air Brake Test.
- This air brake test is not required when removing manned helpers from the rear of the train.

## 102.11.3 Adding Manned Helper to Head End of Train

*References: ABTH 100.8.*

When a manned helper is coupled on the head end of the train, transfer control of the air brakes (and throttle with MU cable) to the manned helper as follows:

**Steps for Engineer on Road Locomotive**

Before opening angle cocks between the road locomotive and the manned helper:

1. Make a brake pipe pressure reduction of at least 6 psi.
2. After brake pipe exhaust has stopped, cut out the automatic brake valve and place handle in the RELEASE position.
3. Tell the engineer on the manned helper the amount of the brake pipe pressure reduction.
4. Keep independent brake valve cut in.

**Steps for Engineer on Manned Helper**

1. Move the automatic brake valve handle into the service zone to reduce the equalizing reservoir pressure at least 2 psi below the brake pipe pressure reduction made by the engineer on the road locomotive.
2. Open the angle cocks between both locomotives.
3. Increase the brake pipe pressure reduction to at least 20 psi.
4. Verify a reduction of at least 5 psi at the rear of the train.
5. Place the automatic brake valve handle in the RELEASE position.
6. Verify that brake pipe pressure is being restored at the rear of the train by confirming a 5-psi increase in pressure.

Note: ETD may remain ARMED to original road locomotive during such head end helper movements. However, road engineer must remain on original road locomotive and maintain radio communication with helper locomotive engineer in order to operate ETD emergency valve, if necessary.

## 102.11.4 Removing Manned Helper from Head of Train

*References: ABTH 100.8.*

**Steps for Engineer on Manned Helper**

1. Make a brake pipe pressure reduction of at least 6 psi.
2. Tell the road engineer the amount of the brake pipe pressure reduction.
3. Detach manned helper.

**Steps for Road Engineer**

1. Move the automatic brake valve handle into the service zone to reduce the equalizing reservoir pressure at least 2 psi below the brake pipe pressure reduction made by the helper locomotive engineer.
2. Cut in the automatic brake valve.
3. Increase brake pipe pressure reduction to 20 psi.
4. Verify a reduction of at least 5 psi at the rear of the train.
5. Place the automatic brake valve handle in the RELEASE position.
6. Verify that brake pipe pressure is being restored at the rear of the train by confirming a 5-psi increase in pressure.

## 102.11.5 PTC Helper Operations

*References: SSI Item 17.*

The following instructions apply to PTC trains being helped based on:

- Position/placement of the helper consist.
- Locomotive configuration of train being helped.
- Airbrake configuration required by the applicable ABTH/Timetable Special Instructions procedure.

**Steps for Helper Applied to Rear End or Cut In, Conventional or DP Train (Helper Air Brake Lead Cut Out)**

On the helper locomotive:

- Cut out the helper locomotive's automatic brake valve.
  - PTC state automatically changes to CUT OUT.
  - BRK INTFC screen flag is present.
- Do not log off PTC on the helper (PTC state remains CUT OUT).

On the train being helped:

- PTC remains CUT IN.
- A consist update reflecting the additional units of the helper consist may arrive.

When helper operations are complete:

1. Cut in the automatic air brake valve on the helper.
2. Cut in PTC by depressing MENU 1, and then CUT IN.
3. Follow the prompts to verify the consist.
4. When ready to transition to Active, select the track location.

**Steps for Helper Applied to Head End, Conventional Train (Helper Air Brake Lead Cut In)**

On the road locomotive:

- Cut out the automatic brake valve.
  - PTC state automatically changes to CUT OUT.
  - BRK INTFC screen flag is present.
- Do not log off PTC on the road train.

On the helper locomotive:

- PTC must remain CUT IN because helper engineer has control of train's air brake and throttle via MU-cable.

Crew responsibilities:

1. Helper and road locomotive crews must job brief about combined train totals.
2. Helper crew edits the consist summary to include combined train totals.

When helper operations are complete:

1. Cut in the automatic air brake valve on the road train.
2. Cut in PTC by depressing MENU 1, and then CUT IN.
3. Follow the prompts to verify the consist.
4. When ready to transition to Active, select the track location.

**Helper Consist Applied to Head End of Stalled DP Train**

See Timetable Special Instructions for specific procedures.

PTC cannot currently be utilized in this configuration.

- DP road locomotive engineer must:
  - Soft Cut Out PTC after applying helpers to head end.
  - Notify the dispatcher.

## 102.11.6 HelperLink

**HelperLink Method**

Note: This method is to be used only when shoving a conventional train (ETD on Rear).

- Conditioning and Testing of "HelperLink" Before Attaching to Train:
  1. Coupler lift mechanism tested by using activation code on touch tone pad on locomotive radio.
     - Four-digit numeric activation codes specific to each system.
     - Code located on HelperLink Radio Control Module.
  2. Successful test will give radio tone-back along with engine alarm bell ringing while uncoupling lever is being lifted.
- Attaching Helpers to Train and Establishing Communications
  1. Train is coupled and stretched.
  2. ID code of ETD for train being assisted is dialed in on thumbwheels in HelperLink box.
  3. Communications are established by pressing "COMM Test/Arm" button on HelperLink.
     - If unable to pass a COMM test refer to ABTH 102.11.1.
  4. After waiting one minute, ABV (automatic brake valve) is cut-out and handle is moved to release position. Independent brake valve must be left cut-in.
  5. "Enable" button is pressed – at this point "HelperLink" maintains the same brake pipe pressures on both the helper consist and the train being helped.
  6. Helper air brake test performed per ABTH 102.11.1.
- Detaching Helpers and Ending HelperLink
  1. Verbal radio communications must be maintained between both road and helper engineer and a pre-determined detaching location must be established.
  2. Road engineer must be notified prior to helpers being detached and must not detach at speeds above 20 MPH.
  3. Coupler lift mechanism is activated by entering appropriate code on radio touch tone pad in helper locomotive cab.
  4. When "acknowledgment" tone is heard on radio and locomotive alarm bell sounds, independent or dynamic brakes can be applied, and helper consist is stopped as soon as possible.
  5. Road engineer must be notified of successful separation.

HelperLink is disabled by setting thumbwheels in Helper-Link box to all zeros and pressing "COMM Test/Arm" button – enabled light is no longer illuminated.

**HelperLink Alternative Method**

Note: This method is to be used only when shoving a distributed power train with DP on Rear.

- Apply ETD to front end of helper locomotive.
- Connect the brake pipe hose to the ETD. Do not connect to the HelperLink.
- Record number of ETD, this will be needed to communicate to the engineer on the lead unit of train.

• Conditioning and Testing of "HelperLink" Before Attaching to Train:

1. Coupler lift mechanism tested by using activation code on radio touch tone pad on locomotive radio.
   a. Four-digit numeric activation codes specific to each system.
   b. Code located on HelperLink Radio Control Module
2. Successful test will give radio tone-back along with engine alarm bell ringing while uncoupling lever is being lifted.

• Attaching Helpers to Train and Establishing Communications

1. Couple Helper unit into rear of train.
2. Communicate ETD number installed on helper locomotive, to the engineer on train being helped.
3. Engineer on train being helped must enter the ETD number and establish one-way communication with ETD. It must be communicated to helper engineer when communication has been established.
4. Helper crew must push the "ARM" button on the ETD installed on helper locomotive.
5. Engineer on train being helped must press the ARM NOW button on lead locomotive.
   - If NOT ARMD appears, the system did not accept the arming sequence. Repeat steps above
6. Helper engineer must leave the ABV (automatic brake valve) cut-in and the independent brake valve set to Lead with all brakes released on helper locomotives.
7. To test the ETD emergency function, road engineer must toggle EOT emergency switch and place helper power in emergency.
8. Helper crew verifies that helper locomotive brakes have applied.
9. Helper crew recovers air from emergency.
10. Helper crew verifies that brakes have released.

- Detaching Helpers and Ending HelperLink

  1. Verbal radio communications must be maintained between both road/helper engineer and a pre-determined detaching location must be established.
  2. Road engineer must be notified prior to helpers being detached and must not detach at speeds above 20 MPH.
  3. Coupler lift mechanism is activated by entering appropriate code on radio touch tone pad in helper locomotive cab.
  4. When “acknowledgment” tone is heard on radio and locomotive alarm bell sounds, independent or dynamic brakes can be applied, and helper consist is stopped as soon as possible.
  5. Road engineer must be notified of successful separation, and it is OK to disarm the ETD.

**Engineer Only Helper Operations**

- When notified of grade crossing signal failure/malfunction requiring flag protection at a crossing, occupying movement cannot be made until other available BNSF employees provide protection. Contact the dispatcher, in advance, to arrange for assistance from available employees working in the area.
- Temporarily Securing Locomotives - Prior to dismounting the locomotive consist for any reason, but not leaving unattended, make a 20 psi automatic brake pipe reduction and fully apply the independent brake. For the purpose of Engineer Only helper operations, the equipment will be considered attended if the locomotives have been secured as described above and the engineer is working on the ground in close physical proximity to the equipment and not separated from that equipment (example: by a passing train on an adjacent track). The handling of switches and derails, the adjusting of couplers, the opening of knuckles and all related work performed on the ground near the equipment, is permissible and not considered leaving the equipment unattended.

# 102.12 End-of-Train Device (ETD)

## 102.12.1 Installing ETD

1. ETD must be calibrated and its battery must be tested and confirmed up to standard. Check the stickers to confirm:
   - ETD has been calibrated within the last 365 days.
   - Battery tested within the last 60 days.
2. Determine if ETD's battery life (charge or "C") is at least 90%:

   Press the TEST button on the ETD.
   - Several messages will display, including the percentage of battery life that has been used (displayed as "C XX").
   - If the locomotive screen includes an electronic display of ETD information, this may appear as "% Battery Used".
   - If battery life used is greater than 10%, do not use the battery.

   Note: All ETD battery requirements do not apply to air turbine-driven ETDs. See B. Interpreting Charge Used (CU) Displays below.
3. Enter the ETD number on the HTD of the locomotive, then push the COMM TEST button to establish one-way communication with the ETD.
4. With brake pipe pressure present, compare pressure shown on ETD with pressure shown on HTD.
   - Do not use ETD if pressure readings differ by more than 3 psi.

**Air Turbine-Driven ETDs**

**A. Turning on the ETD.**

Some air turbine-driven ETDs do not automatically turn on after uprighting, installing, and applying air pressure. To turn on the device, press the START/ARM button before attempting to establish communications.

**B. Interpreting Charge Used (CU) Displays.**

The CU display varies by manufacturer. Check the train list to see which model is used, then use the following to interpret CU readings.

**Wabtec Air Turbine ETD**

- Identified by "ATX" on the ETD.
- The CU display shows only generator voltage that:
  - Normally varies between 30 and 39 with brake pipe pressure at approximately 90 psi.
  - Corresponds to air pressure—the lower the brake pipe pressure being provided, the lower the CU reading.
  - Will show "0" if no pressure is being provided to the ETD, which is normal.
    - If "0" CU is displayed while brake pipe pressure is being provided to the ETD, this is an indication of a failed generator.
- If no brake pipe pressure is provided or the generator fails, the ETD operates on its back-up battery.
  - As the back-up battery is depleted, Low Battery and Dead Battery alarms will be displayed, and are the only indicator available as to remaining battery life.

**Quantum Air Turbine ETD**

- The CU display shows the percentage of voltage used for the non-removable backup battery that:
  - Displays “0” when battery is fully charged and is being maintained by an air turbine generator.
  - Begins to increase (can go up to 99) when air pressure is removed or the generator has failed.
    - A CU count that is increasing while brake pipe pressure is being provided to the ETD is an indication of a failed generator.
- If this ETD is installed with an uncharged backup battery, the CU display may indicate “Low Battery” for a short time (5 – 15 minutes) after air pressure is applied. As the battery is charged, “Low Battery” will be replaced with numbers that count down until charging is complete.

## 102.12.2 Arming HTD/ETD

Two people are needed to arm the HTD/ETD.

- One person at the HTD.
- One person at the ETD.

**Steps to Arm the HTD**

1. On the ETD: Press the TEST button. This will cause **ARM NOW** to appear in the display of the HTD.
2. On the HTD: Immediately press the COMMUNICATIONS TEST/ARM button. This will cause **ARMD** to appear in the display of the HTD and the EMERG ENABLED LED to be lit.
   - If **NOT ARMD** appears in the HTD display, the system did not accept the arming sequence. Repeat the steps above.

Note:

- Some foreign HTD/ETD systems are self-arming when telemetry is established. Arming may be indicated by ***** displaying on the HTD.
- Some Canadian National Railroad HTD/ETD systems are self-arming and provide no indication of “Emerg Enabled” on the HTD’s display.
  - These locomotives are identified by decals in the cab.
  - If no decal can be found and there is no document confirming that telemetry devices have been tested and are functional, test and document the system’s two-way capability and leave that information in the locomotive’s cab for future crews.

## 102.12.3 Testing HTD/ETD: Emergency Application Capability

**Steps to Test Emergency Application Capability from Rear of Train for Battery-Operated ETD:**

1. Close the angle cock between the train and the ETD.
2. Initiate an ETD emergency from the lead locomotive HTD.
   - The brake pipe pressure on the ETD must reduce to 0 psi.
3. Allow the ETD emergency valve to automatically close (wait a minimum of 15 seconds) before opening the angle cock.
4. Open the angle cock between the ETD and the train.
5. Verify that brake pipe pressure is restored before proceeding.

**Steps to Test Emergency Application Capability from Rear of Train for Air Turbine ETD**

1. Close the angle cock between the rear 2 cars.
2. Initiate an ETD emergency from the lead locomotive HTD.
   - The brake pipe pressure on the ETD must reduce to 0 psi.
3. Allow the ETD emergency valve to automatically close (wait a minimum of 15 seconds) before opening the angle cock.
4. Open the angle cock between the rear 2 cars.
5. Verify that brake pipe pressure is restored before proceeding.

## 102.12.4 Disarming HTD/ETD

Disarming the HTD disables the emergency command for all ETD ID numbers. When a two-way ETD armed to an HTD are to be separated (such as when reaching the train's final terminal or when changing either an ETD or HTD enroute), the HTD must be disarmed as follows.

**Steps to Disarm the HTD**

1. Set the HTD ID code to 00000 (or follow the disarm procedures on the electronic display).
2. Press the COMMUNICATIONS TEST/ARM button.
3. Verify that:
   a. The HTD displays **DISARMD** in the message window.
   b. The EMERG ENABLED LED turns OFF or is shown on the electronic display.
   c. The EMERG DISABLED LED turns ON or is shown on the electronic display.

### 102.12.5 Emergency Switch

Once a system is armed, an emergency brake application can be made at any time.

**Steps to Initiate an Emergency Brake Application at End of Train**

1. Lift the red cover of the EMERGENCY SWITCH located on the right side of the HTD.
2. Push the toggle switch up.
3. Verify that:
   - The message EMERGENCY briefly appears in the display.
   - The brake pipe pressure reading quickly drops to 0 psi.
   - The LOW PRES message is displayed while the last car's pressure is below 45 psi.

Note:
- Immediately following a release of a service brake application, if the two-way end-of-train device is activated, an emergency application MAY NOT occur from the device.
- However, the brakes will apply on the rear end of the train at a service rate.
- If this condition occurs, it will only be during initial stages of the release (approximately 4 – 10 seconds).
- This will not affect emergency brake capabilities from the head end of the train.

## 102.13 Emergency Application Capability from Rear of Train

**A. Requirements**

All trains must have the capability to initiate an emergency brake application from the rear of the train. However, the following trains are exempt from this rule:

- Amtrak and commuter trains (covered by other requirements).
- Engines without cars.
- Locals, road switchers, work trains, and yard assignments (includes transfer jobs), provided:
  - They are traveling a distance that can normally be operated by a single crew in a single tour of duty.
  - If exceeding 4,000 tons, they do not operate over grades as follows:
    - 2% or steeper grades as listed in BNSF System Special Instructions, Item 2(A).
    - 1% or steeper grades that exceed 3 miles (refer to grade chart for subdivision in division timetable).

Note: Exemption does not apply to through freight trains and key trains.

**B. Providing Emergency Application Capability from Rear of Train**

Any one of the following methods fulfills the requirement for emergency application capability from the rear of the train:

- An operative two-way end-of-train telemetry system (HTD/ETD), which must be armed and tested at the point of installation.
- Distributed power placed on the rear of the train.
- Trains with a manned helper, caboose or passenger equipment at the rear of the train, equipped with an emergency brake valve and manned by an employee equipped with two-way voice radio communication with the engineer at the head of the train.

## 102.13.1 Loss of Emergency Application from Rear of Train

*References: ABTH 102.13 (A).*

Trains required to be equipped with rear-of-train emergency capability as outlined in Rule 102.13 (A) are considered to have an enroute failure when one of the following conditions occur:

- ETD or HTD indicates any of the following:
  - Loss of front-to-rear communication.
    - Message: **FR NOCOM** or **EOT COMM**, depending on HTD type.
  - Emergency valve not enabled.
    - Message: **NOT ARMD** and/or EMERG ENABLED LED goes OFF or **EMERG DISABLED** appears on the electronic display.
  - Emergency valve failure.
    - Message: **VALVFAIL** or **EOT VALVE.**
- Loss of communication exceeding 5 minutes as indicated by the control console for a lead controlling distributed power locomotive at the head end of a train.
- A loss of voice radio communication between a manned helper, caboose, or passenger equipment at the rear of a train and the lead controlling locomotive.

When an enroute failure occurs, observe the following:

- When an enroute failure occurs on tracks other than those identified in System Special Instructions Item 2(A), the train must not exceed 30 MPH until the failure is corrected or another method of compliance is secured.
- When an enroute failure occurs on tracks identified in System Special Instructions Item 2(A), the train must not proceed until the failure is corrected or another method of compliance is secured.
- In the event of a need to utilize the emergency feature of the ETD, the command to initiate an emergency must be attempted, even if no communications are indicated at the HTD.

Exceptions:

- When an enroute communication failure occurs due to a poor-communication area (tunnel, rock cut, overpass, etc.), the train may be moved a train length in an attempt to regain communication.
  - If communication cannot be restored after clearing the poor communication area, the train must be stopped, and the failure must be corrected or an alternative method of compliance must be secured.
- Should a train separation and/or locomotive failure occur while on the ascending grades referenced in the System Special Instructions which require the train to be moved in segments (doubling the hill), it is permissible to move the head portion of the train without emergency capability at the rear of that head portion.
- While descending a grade, if a loss of voice radio communication occurs between a manned helper, caboose, or passenger equipment at the rear of the train and the lead controlling locomotive, the train may continue until clearing the grade as long as the train is being properly controlled not exceeding 5 MPH above maximum authorized speed.

TOC Home

## 102.14 Dynamic Brake Warning Light

- If the dynamic brake warning light comes on, reduce the dynamic brake retardation until the light goes out.
- If the condition continues, cut out the dynamic brake on the affected unit.
- Report all dynamic brake defects to the dispatcher and the NOC Mechanical Help Desk.

TOC Home

# 102.15 Unusual Conditions

*References: ABTH 103.7.3.*

### A. Unusual Changes in Brake Pipe Pressure

Stop and secure the train if:

- An abnormal change in or loss of brake pipe pressure occurs with the train brakes released and a normal gradient established.
  - During cold weather (below freezing) when experiencing a sudden decrease in brake pipe pressure and an increase in flow either on the lead or DP remote consist, ensure emergency braking is in effect on entire train immediately after stopping by placing brake valve handle to the emergency position and operating the emergency switch if train is equipped with an ETD.
  - Refer to Rule 103.7.3 concerning minimum brake pipe pressure at rear of train.
- A brake application cannot be transmitted.

### B. Increased Air Brake System Leakage Enroute

Proceed not exceeding 20 MPH to a location where an inspection can be completed if:

- Brake pipe air flow or brake pipe gradient increases.
- Trains without distributed power (DP): Air flow pointer does not return to a reading below 60 CFM or below the calibration mark within the appropriate time.
- Trains with DP: Combined air flow readings of DP lead and DP remotes do not return to below a total of 90 CFM within the appropriate time.

Note: Train may not proceed from inspection location until the issue(s) are corrected.

The following rules will be in effect for all DP trains operating with a combined air flow rate between 60 and 90 CFM:

- DP trains with a combined air flow rate greater than 60 CFM will not be allowed to operate over any descending or ascending grades greater than 2.0 percent that exceed 3 miles.
- When a DP train's brake pipe exceeds a combined airflow rate of 60 CFM, the DP remote consists' brake valve must remain cut in at all times.
  - If for any reason a DP remote consist's brake valve is cut out, the train must be inspected for leaks within the train line.
  - The train may not proceed until the brake pipe airflow rate reaches 60 CFM or lower (similar to conventional train requirements).
- Other than during an intended brake application and/or brake release activity, when a DP train's brake pipe exceeds a combined airflow rate greater than 90 CFM for the entire train and/or more than 60 CFM for any one locomotive consist in the train when the automatic brake handle is in the RELEASE position.
  - The train may not proceed until the combined airflow rate reaches 90 CFM or lower.
- Brake pipe pressures must be within 15 psi of standard operating pressure when brakes are released and fully charged.
- If combined brake pipe airflow is greater than 60 CFM and any DP remote consist fails enroute and loses air compressors (source of air), the train must be stopped and not allowed to proceed until air compressors are repaired, a source of air is regained, or airflow reaches 60 CFM or lower.

- The engineer must notify the conductor of the train's operating condition. The conductor must:
  - Make the proper notation in the space provided on the Train Profile indicating the train operated as a 90 CFM Permanent Waiver Train.
  - Utilize the Voice Train Reporting (VTR) method to report as a 90 CFM Permanent Wavier Train.
    - If the Train Profile is already showing documented as a 90 CFM Permanent Waiver Train, additional VTR reporting is not required.

Note: If the brake system cannot be repaired to reduce leakage within the required limits, proceed only if the brake pipe pressure on the rear car is within 15 psi of regulating valve setting and only if authorized.

**C. Reporting Unusual Air Brake Conditions**

**Steps for Reporting Unusual Air Brake Conditions**

1. Notify the dispatcher and NOC Mechanical Help Desk immediately of any unusual air brake condition that affects safe train movement.
2. Dispatcher must then notify the appropriate supervisor.
3. Supervisor will determine if the train can be moved safely or if it must be held for inspection.

**D. Locomotive Trainline Alarms**

1. If alarms occur while train is moving, immediately notify the NOC Mechanical Help Desk to determine if train must be stopped for troubleshooting.
2. Stop train immediately and contact the NOC Mechanical Help Desk for one of the following;
   a. Locked axle/wheel slip alarms.
   b. Potential safety issue i.e. fire, etc.
   c. Continuous alarm bells.

## 102.16 Train Separation Report

After a train separation occurs:

1. Notify the dispatcher and NOC Mechanical Help Desk by radio.
2. Complete an electronic Engineer Unusual Condition/Incident Report and submit per process.

This page left blank intentionally.

# 103.0 Train Handling

Locomotive engineers must exercise judgment and plan ahead to operate their trains safely and efficiently. The engineer is responsible for properly controlling slack in the train. Good train handling requires the proper combination of throttle modulation, dynamic braking, and air braking to:

- Protect yourself and others from injury.
- Prevent damage to track structure and equipment.
- Protect lading.
- Use the most fuel-efficient method consistent with good train handling.

Controlling and limiting in-train forces is essential for safe train operation.

- Unless an emergency or other condition requires immediate speed reduction, change throttle positions and dynamic and air brake applications slowly to allow slack to adjust gradually.
- Many locomotives can produce higher tractive effort than the average train's draft gear and couplers can withstand.
- High retarding force during dynamic braking can cause excessive buff forces. To limit these forces, observe dynamic braking limitations.
- When operating business cars or passenger equipment in order to properly control slack and speed the following methods should be used in the preferred order when operating conditions allow: Air braking/stretch braking and throttle modulation.

Note:

- The train handling procedures described in this chapter are intended for freight service or when passenger equipment is operated using freight train handling techniques due to mixed equipment or the lack of passenger equipment features.
- These techniques do not apply to passenger service engineers operating all passenger equipment equipped with graduated release and/or blended braking features.

## 103.1 Train Status Information

- It is the engineer's responsibility to ensure slack changes are controlled through the use of the throttle and dynamic, automatic, and independent air brakes.
- It is the crew's responsibility to provide the engineer with information on train status and conditions affecting train movement, including the following:
  - Train makeup.
  - Train length.
  - Train tonnage.
  - Tons per operative brake (TOB).
  - Speed.
  - Grade severity.
  - Block signal spacing.
  - Type of dynamic brake and any associated axle limitations.
  - Temperature and weather conditions.
  - Throttle response.
  - Amount and type of slack in the train.

# 103.2 Dynamic Braking

- To allow for electrical current decay and prevent a surge of dynamic braking, pause for 10 seconds before changing from power to dynamic braking.
- Do not supplement the dynamic brake with the locomotive brakes unless in the process of starting or stopping and speed is below the effective range of the dynamic brakes.
- Do not use locomotive brakes to control speed. Use dynamic brakes.
- Extended-range dynamic brakes must be utilized to their fullest extent.

## 103.2.1 Dynamic Brake Limitations

High buff force generated by dynamic brake retarding force may cause a derailment or damage the track structure. Therefore, limit dynamic brake retarding force as follows:

- The preferred option is to cut out the basic dynamic brakes on trailing locomotives using the dynamic brake cutout switch or the dynamic brake selector switch on the control panel.
- Limit the total operative dynamic brake to 28 equivalent dynamic brake axles unless further restricted by another rule or special instruction.

  Exceptions:
  - Trains with remote and/or manned helper locomotive consists entrained or at the rear of the train may have the maximum allowable dynamic brake axles for each locomotive consist.
  - Trains may be operated with as many as 32 dynamic brake axles in the lead locomotive consist provided:
    - The first 25 cars are conventional (non-multiplatform), weighing a minimum of 100 tons each.
    - Or, if handling intermodal equipment, the first 25 platforms are solid loaded double-stack type equipment (car codes QY, QV, QW, QX, QT, QU and QK).
    - Or, a combination of both types of equipment are in the first 25 cars/platforms.
- When approaching and operating through turnouts or disturbed track areas with a train's air brakes released, use dynamic brake handle position 4 to limit retarding force to 50% of maximum.
  - Continue to limit the braking effort until at least half the train has passed the restricted area.
  - At speeds of 10 MPH or less, this limitation applies only if 12 axles or more of extended-range dynamic brakes are being utilized.

  Exception: Trains utilizing Energy Management Systems are exempt from the above requirement to use dynamic brake handle position 4 when in Auto Control only.

# 103.3 Using Automatic Brakes

*References: GCOR 14.7, ABTH 102.13, ABTH 105.5.*

### A. Applying or Reapplying Automatic Brakes

When applying or reapplying automatic brakes, make brake pipe reductions according to these guidelines:

- Initial brake pipe reduction - fully charged system.
  - At least 6 psi.
- Initial brake pipe reduction - uncharged system.
  - 5 psi below the previous reduction.
- Split brake pipe reductions for planned slowdowns and stops.
  - Make an initial reduction of 6–8 psi followed by additional reductions in 2–3 psi increments spaced 30 seconds apart.
- Brake pipe reductions for speed control.
  - 15 psi or less.
- Final brake pipe reduction, when operating conditions permit as train is nearing a stop to prevent a run-out of slack, results in brake pipe pressure exhausting as the train comes to a stop.

### B. Delayed Departure

Observe the following when the train is stopped and movement is delayed.

- When operating conditions allow, do not release the train brakes until ready to depart. If required to release brakes, such as during a train inspection, brakes must be reapplied and released prior to departing.
  - Example of an operating condition that may not allow brakes to remain applied until ready to depart or no increase in brake pipe reduction after stopping: When near a long, descending heavy or mountain grade and brake system requires full charge before proceeding.
- When operating conditions allow, increase brake pipe reduction to at least 10 psi.
- Closely observe equalizing reservoir pressure when brakes are applied. If leakage occurs, report the issue to the NOC Mechanical Help Desk.
- When a train is ready to depart and grade conditions allow train brakes to be released, brake pipe pressure must be restored to the rear of the train after releasing the brakes. If the ETD indicates brake pipe pressure is not being restored:
  - Movement must not exceed 10 MPH and the train’s length.
    - Distance may be extended to prevent blocking public crossings or bridges not equipped with walkways.
  - Check for ETD failure. Visual observation of a set and release of brakes at the rear car is sufficient to confirm that no blockage exists. Dispatcher must be notified of a failed ETD to avoid additional stops and delays.
    - Exception: Trains not required to have emergency application capability from the rear of train identified in Rule 102.13 are exempt from this requirement.
- If an ETD indicates a brake pipe pressure reduction at the rear of the train with no corresponding brake pipe reduction at the head of the train, there may be a blockage in the brake pipe or the ETD may have failed. Determine the cause of the issue, and follow all guidelines for operation, repair, and/or reporting before proceeding.
  - Refer to GCOR 14.7 regarding reporting clear of limits.
  - Refer to distributed power instructions for requirements concerning use of Rule 105.5 Train Check.

**C. Releasing Brakes**

Attempting a running release at very low speeds may damage equipment, lading, and track. To release the automatic brakes at slow speeds, use judgment and evaluate the following conditions before attempting a running release:

- Train speed.
- Train makeup.
- Temperature.
- Physical characteristics of territory.

**Steps to Release Brakes when Operating Conditions Allow**

1. Allow the exhaust at the automatic brake valve to stop before releasing the train brakes.

When a train brake application is in effect with pressure-maintaining equipment, do not move the automatic brake valve handle toward RELEASE unless a brake release is desired.

### 103.3.1 Using Automatic Brakes during Cold Weather Conditions

During extreme cold weather (below 0°F) when operating conditions permit, throttle manipulations and dynamic braking must be used instead of train air brakes in controlling and stopping freight trains.

## 103.4 Throttle Handling

To allow the train to absorb in-train forces gradually, follow these throttle handling rules:

- Make throttle changes one notch at a time. If transitioning from dynamic brake mode to power mode, wait 10 seconds in IDLE before advancing throttle to a power position.
- When moving at speeds of 25 MPH or more over a railroad crossing at grade (diamond):
  1. At least 8 seconds before the locomotive reaches the crossing, reduce the throttle to RUN 4 (or lower if the throttle is already positioned in RUN 4).
  2. Wait until the entire locomotive consist passes over the crossing before advancing the throttle.
- Do not apply power to hold a train stationary on a grade.
- Reverser handle must not be moved to any position other than in the direction of travel while locomotive is moving.
- Reverser must be centered when stopped.
- Generator field switch must never be closed or moved to ON position with the throttle open.
- If the wheel slip light comes on, use this procedure:
  1. If the light is on continuously, reduce the throttle on the locomotive until the light goes out.
  2. If the light does not go out, stop the locomotive immediately and make sure the wheels are rotating freely.
  3. If the wheels rotate freely and the wheel slip light remains on during throttle reduction, isolate the affected locomotive.
  4. If the wheels do not rotate freely, notify the dispatcher and set out the locomotive if safe to do so.

     **WARNING:**
     - A wheel slip light continuously illuminated for 6–8 seconds or longer at speeds above 15 MPH may indicate a locked wheel or a slipped pinion gear.
     - Should this occur, stop and make sure that all wheels rotate freely.
     - A slipped pinion gear is indicated by traction motor rotation while locomotive is stopped and under load.

## 103.4.1 Short Time Ratings

**A. Short Time Rating**

- Short time rating limits on DC locomotives apply to high amperage levels in any throttle position.
- A rating plate located near the load meter gives the time limits for operating locomotives at various amperage levels.
- Always stay within the time limits indicated by the rating plate on the controlling locomotive.
  - AC locomotives do not require short time rating protection.
  - Newer DC locomotives without short time rating plates are protected by a computer from overheating. Computer-protected locomotives include:
    - EMD-type GP/SD60 and above.
    - GE-type C/B40 and above.

**B. More Than One Consecutive Short Time Rating**

When operating a locomotive consist with more than one consecutive short time rating:

1. Do not operate the locomotive continuously for more than the maximum time of any one short time rating without stopping to cool traction motors.
   - Example: Do not operate a locomotive at the 1/4-hour rating for 1/4 hour, then at the 1/2-hour rating for 1/2 hour, then at the 1-hour rating for 1 hour, etc.
2. If the locomotive exceeds the short time rating indicated on the rating plate, stop the train and double the train over the grade or allow traction motors time to cool before continuing, unless otherwise instructed.
3. Sufficient cooling of traction motors is accomplished when allowing the locomotive a minimum of 20 minutes without a short time event.

## 103.4.2 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.

## 103.5 Independent Brake (Locomotive Brake)

When using the independent brake, do the following:

- Keep the independent brake valve cut in at all times on the controlling unit.
  - Make sure the handle is not blocked in the ACTUATE position.
- To prevent locomotive brakes from applying when initiating an automatic brake application or when making additional reductions (split reductions):
  - Actuate the independent brake valve a minimum of 2 seconds prior to a brake pipe reduction and continue until exhaust stops, but no less than 10 continuous seconds for each brake pipe reduction.
- The independent brake must not be applied while power or dynamic brakes are being used, except:
  - When starting or stopping and speed is below the effective range of the dynamic brakes.
  - To control wheel slips at speeds below 10 MPH.
- Control brake cylinder pressure to prevent:
  - Locomotive wheels from overheating or sliding.
  - Excessive slack action.
  - High in-train forces.
- During an emergency brake application:
  - Place the independent brake handle in a position in the application zone that will develop sufficient pressure without sliding the locomotive wheels.
  - At the same time, press the handle into the ACTUATE position.
  - When emergency brake cylinder pressure is desired, release the handle from the ACTUATE position.
- Helper locomotive engineers must closely observe the brake pipe gauge, and be prepared to control locomotive brakes after a service or emergency brake pipe reduction.
- Never exceed the maximum independent brake cylinder pressure limit.

Exception: When emergency braking is necessary to protect life or property, the above does not apply. Use maximum braking effort.

## 103.6 Train Handling Scenarios

- Use these train handling methods for starting, stopping, slowing, controlling, and unplanned stopping of trains.
- These methods are guidelines.
- Heavy tonnage, heavy grades, or specific locations may require other combinations of throttle modulation, dynamic braking, or air braking.

### 103.6.1 Starting Train Movement

Locomotives equipped with automatic start/stop engines may shut down after a period of inactivity. Before attempting to start a train, do the following:

1. Place reverser in the direction of travel.
2. Move the throttle to RUN 1 and return to IDLE to trigger start-up.
3. Wait at least 2 minutes before starting the movement.

To start the movement:

- Use the lowest throttle position possible to start the train moving.
  - It may be necessary to retard starting acceleration by using the locomotive brake.
- Allow the locomotive load to stabilize before advancing the throttle to the next higher position.
- Once the train is moving, do not increase the throttle until either the amperage or the tractive effort decreases.
- To accelerate, advance the throttle slowly, one notch at a time.
- In curved territory, use only enough power to start the train.
  - Regulate amperage to reduce the possibility of stringlining due to excessive lateral forces.

**A. Starting Movement on Level Grade**

1. Place the automatic brake valve handle in RELEASE position.
2. After the brakes have released on the entire train, move the throttle to RUN 1 and fully release the independent brake.
   - Use the lowest possible throttle position to minimize in-train forces.
   - If the train moves too rapidly in RUN 1, control surge with the independent brake.
   - If the train does not move, slowly advance the throttle.
   - If the train does not move in RUN 4, return the throttle to IDLE, apply the independent brake, and determine the cause.
3. After the train starts to move, check to see if the amperage or tractive effort levels are decreasing.
   - If these levels are decreasing, you may advance the throttle to the next higher position.

**B. Starting Movement on Ascending Grade**

1. Advance the throttle to RUN 1.
2. Reduce the independent brake.
3. Place the automatic brake valve handle in RELEASE.
4. As the brakes release toward the rear of the train, advance the throttle to RUN 2 or higher to start the train moving.
5. Slowly reduce the independent brake until it is fully released.
   - If the train will not start, consider doubling or getting helpers.
   - Applying power on a standing locomotive longer than necessary will damage DC traction motors.
6. After the train starts to move, check to see if the amperage or tractive effort levels are decreasing.
   - If these levels are decreasing, you may advance the throttle to the next higher position.
7. Observe the load meter and limit the throttle position, if necessary, to avoid high draft forces.

**C. Starting Movement on Descending Grade**

1. Ensure that the independent brake is fully applied.
2. Set the dynamic brake to full.
3. Put the automatic brake valve handle in RELEASE position.
   - Wait for all brakes to release and slack to adjust.
4. Reduce the independent brake until the train gradually begins to move.
5. Once the entire train is moving, gradually reduce the independent brake to avoid abrupt changes in slack.
6. Slowly release the independent brake when the dynamic brake becomes effective.

## 103.6.2 Cresting a Grade

On the lead locomotive consist, gradually reduce throttle to a position that will prevent acceleration until at least one-half of the train has crested the grade when:

- Speed is less than 20 MPH,

  and

- Using 16 or more equivalent axles of head-end power.

This reduction in throttle must also be applied to trains operated with remote or manned helpers.

### 103.6.3 Slowing or Controlling Speed

When slowing or controlling speed, the following methods should be used. They are listed in preferred order when operating conditions allow and for best fuel efficiency:

1. Throttle manipulation; coast braking when conditions allow.
2. Dynamic braking.
3. Dynamic braking supplemented with train air brakes.

When using dynamic and air brakes and the desired speed has been reached, maintain enough dynamic braking to control slack until air brakes are fully released.

When using the stretch braking method and the desired speed has been reached, reduce the throttle until air brakes are fully released.

When operating in curved territory, keep total braking effort at the lowest practical level.

**A. Slowing/Controlling Speed, Level or Descending Grade, with Dynamic Brakes, Slack Bunched**

1. If in power, gradually reduce the throttle to IDLE.
2. Wait 10 seconds.
3. Activate the dynamic brake and gradually bunch the slack.
4. Increase braking to the desired level. If the dynamic brake alone will slow or control speed sufficiently, do not use the train brakes.
5. At a sufficient distance from the speed restriction, actuate, then make a minimum brake pipe reduction.
6. Actuate and make additional split reductions as needed.
7. When speed is controlled and the automatic brake is released, maintain enough dynamic braking to keep the slack bunched until brakes release throughout the train.

**B. Slowing/Controlling Speed, Level or Descending Grade, without Dynamic Brakes, Slack Bunched**

1. If in power, gradually reduce the throttle to IDLE.
2. At a sufficient distance from the restriction, actuate, then make a minimum brake pipe reduction.
3. Actuate and make additional split reductions as needed.
4. When speed is controlled, release the automatic brakes.
5. As the train brakes release, keep the locomotive brakes released unless they are needed to avoid severe slack changes.

Note: Before attempting a running release, consider the train makeup and speed. You may need to stop completely or choose an alternate braking method.

**C. Slowing/Controlling Speed, Ascending Grade, Slack Stretched, Throttle Reduction**

1. Gradually reduce the throttle, one notch at a time.
2. Maintain a slack-stretched condition.
3. Allow the ascending grade to slow the train.

**D. Slowing/Controlling Speed While Cresting Grade, Throttle Reduction**

1. Reduce the throttle before the locomotive crests the grade.
2. Continue to reduce the throttle to keep the speed from increasing until at least half the train has crested the grade.

**E. Slowing or Controlling Speed, Undulating Grade or Sag, Throttle Modulation**

1. As you approach the sag, reduce the throttle as necessary to control train speed.
2. Reduce the throttle further as the head end of the train begins descending.
3. Just before the head end of the train reaches the ascending grade, increase the throttle.
4. Continue to increase the throttle as the train ascends the grade.
5. Reduce the throttle as the rear of the train approaches the ascending grade.

**F. Stretch Braking**

Stretch braking is permitted ONLY where more fuel efficient methods will not provide the necessary control of train speed. When it is necessary to use stretch braking, exceeding throttle position 4 is prohibited (referred to as “power braking”).

When it becomes necessary to apply the train brakes while in power, do the following:

1. Make the desired throttle adjustment sufficiently in advance to allow the slack to adjust.
2. After the slack has adjusted, actuate, then make a minimum brake pipe reduction.
3. Reduce the throttle when amperage or tractive effort increases from the effect of the brake pipe reduction. If a portion of the train is on a grade, the drawbar force may increase rapidly, requiring further throttle reduction(s).
4. Actuate and make additional split reductions as needed.

Note: If the entire train is on a descending grade and the train brakes must remain applied, it is permissible to use limited power to control train speed. Do not exceed throttle position 4, reducing throttle as necessary to prevent excessive amperage or tractive effort.

### 103.6.4 Stopping

**A. Stopping, Level or Descending Grade with Dynamic Brakes Available, Slack Bunched**

1. Gradually reduce the throttle to IDLE.
2. Wait 10 seconds.
3. Activate the dynamic brake and gradually bunch the slack.
4. Increase braking to the desired level.
5. At a sufficient distance from the stop, actuate, then make a minimum brake pipe reduction.
6. Actuate and make additional split reductions as needed.
7. As speed drops below dynamic brake range, supplement with the independent brake.
8. Make a final brake pipe reduction and allow the locomotive brakes to apply.

**B. Stopping, Level or Descending Grade, No Dynamic Brakes, Slack Bunched**

1. If in power, gradually reduce the throttle to IDLE.
2. Wait for the slack to adjust.
3. At a sufficient distance from the stop, actuate, then make a minimum brake pipe reduction.
4. Actuate and make additional split reductions as needed.
5. As the train comes to a stop, make a final brake pipe reduction and allow the locomotive brakes to apply.

**C. Stopping, Ascending Grade, Slack Stretched, Throttle Modulation Method**

1. Gradually reduce the throttle one notch at a time.
2. Maintain a slack-stretched condition and allow the ascending grade to slow the train.
3. When the train stalls, fully apply the independent brake.
4. Reduce the throttle to IDLE.
5. Apply train brakes as the train stops, or just before it stops if immediate movement after stopping is not anticipated.

### 103.6.5 Unplanned Stop

To stop in the shortest possible distance without using an emergency brake application (such as when encountering a sudden block signal change or when being signaled to stop by a flagman), follow these steps:

1. Make a brake pipe reduction.
2. After slack has adjusted, gradually reduce throttle to IDLE position.
3. Do not allow the independent brake to apply while still applying power.

## 103.6.6 Shoving Movements

During shoving movements:

- To avoid jackknifing, wheel climb, or rail turnover, use extreme care when applying tractive effort.
- When exceeding 12 equivalent axles of power, use only the minimum amount of tractive effort necessary to begin movement.

**A. Starting Reverse/Shoving Movement, Level or Ascending Grade**

1. Release the automatic brake.
2. Wait for all brakes to release and slack to adjust.
3. Reduce the independent brake and use the lowest possible throttle position to start the movement.
4. As speed increases, continue to reduce the independent brake until it is fully released.
5. If the load meter shows a significant increase or speed decreases without a change in throttle position, stop immediately and determine the cause.

**B. Starting Reverse/Shoving Movement, Descending Grade, Slack Stretched**

1. Ensure that the independent brake is fully applied.
2. Set the dynamic brake to full.
3. Place the automatic brake valve handle in the RELEASE position.
4. Wait for all brakes to release and slack to adjust.
5. Reduce the independent brake gradually as the train begins to move.
6. Slowly release the independent brake when the dynamic brake becomes effective.

**C. Starting Reverse/Shoving Movement, Descending Grade, Slack Bunched or Unknown**

1. Set the dynamic brake.
2. Reduce the independent brake by 50% to allow the locomotive to begin moving as slack adjusts.
3. Place the automatic brake valve handle in the RELEASE position.
4. Wait for all brakes to release and slack to adjust.
5. Continue to reduce the independent brake gradually as the train begins to move.
6. Slowly release the independent brake when the dynamic brake becomes effective.

**D. Stopping Reverse/Shoving Movement on Ascending Grade, Slack Bunched**

1. Use the lowest possible throttle position to maintain a slack-bunched condition.
2. At a sufficient distance from the stop, actuate, then make a minimum brake pipe reduction.
3. Actuate and make additional split reductions as needed.
4. Check the load meter throughout the process and reduce the throttle as necessary to avoid high buff forces.
5. As the train stops, fully apply the independent brake.
6. Reduce the throttle to IDLE.

**E. Stopping Reverse/Shoving Movement, Level or Descending Grade, Slack Stretched**

1. If in power, gradually reduce the throttle to IDLE and allow the slack to adjust.
2. Wait 10 seconds.
3. Activate the dynamic brake.
   - If the dynamic brake is unavailable or ineffective, use the independent brake to maintain a slack-stretched condition.
4. Gradually increase braking to the desired level.
5. At a sufficient distance from the stop, actuate, then make a minimum brake pipe reduction.
6. If needed, actuate and make additional split reductions.
7. As speed drops below the dynamic brake range, supplement with the independent brake.
8. Make a final brake pipe reduction and allow the locomotive brakes to apply.

TOC Home

# 103.7 Grade Operation

## 103.7.1 Operating on a Grade

Since train speed largely determines the amount of braking distance needed, control train speed in a grade operation as follows:

- Early in the braking process, achieve a balance between the level of dynamic brake and the level of air brake needed to control train speed on a descending grade.
- At speeds below 10 MPH, use extended-range dynamic brakes if available.
  - Extended-range dynamic brakes provide more retarding force than locomotive brakes.
- Do not exceed the speed limit.
- When conditions warrant, use all available braking power.
  - If you are not sure that a service brake application will control the speed of the train, make an emergency brake application.

## 103.7.2 Recharging on a Grade

If the independent brakes will not hold the train on a grade, recharge the air brake system as follows:

1. Secure a sufficient number of cars with hand brakes per ABTH 104.14.
2. Release the automatic brake.
3. Recharge the air brake system.
4. After recharging the system, make a sufficient brake pipe reduction to hold the train while releasing the hand brakes.

Note: Do not apply power to hold a train stationary on a grade.

## 103.7.3 Cresting a Mountain Grade

Before passing the summit of a mountain grade:

- Ensure that the rear car brake pipe pressure is within 15 psi of the regulating valve setting.
- Watch for:
  - Abnormal brake pipe pressure changes.
  - Loss of brake pipe pressure.
  - Abnormal increase in air flow reading.
  - Etc.
- If minimum brake pipe pressure or unusual conditions are noted, stop, secure the train, and correct the problem.

### 103.7.4 Balance Braking on Grade

When a constant level of braking is required for long distances, do the following:

- Make a minimum brake pipe reduction, then make additional reductions of 2 psi until the train maintains the desired speed.
- Limit the effective brake pipe reduction to 15 psi or less.
  - If a greater than 15-psi brake pipe reduction is required to control train speed, stop and inspect to determine the reason.
- If the equalizing reservoir leaks and pressure must be maintained for long distances, do the following:
  1. Place automatic brake valve handle in RELEASE position.
  2. Move automatic brake valve cutout valve from FRT to PASS.
     - When operating in PASS, use extreme care. Any movement of the automatic brake valve handle toward RELEASE will release the brakes throughout the train.

### 103.7.5 Regulating Valve Braking

Do not use the regulating valve to brake the train.

### 103.7.6 Retaining Valves

Use retaining valves when required by the timetable, general order, or when requested by the engineer.

**Steps for Setting Retaining Valves**

1. Stop the train.
2. Set the retaining valves as specified by the timetable or general order. If no quantity is specified, set all retaining valves.
3. Do NOT use SD (Slow Direct) position.
4. Use HP (High Pressure) position, except:
   - For empty cars (if equipped) use LP (Low Pressure) position.
5. Notify the engineer of the number of retaining valves set before proceeding.

**Operating With Retaining Valves**

- After the retaining valves are set, brake cylinder pressure is not retained until a brake pipe reduction and release has been made.
- After a minimum 10-psi brake pipe reduction has been made and released, brake cylinder pressure will be retained:
  - HP: 20 psi.
  - LP: 10 psi.
  - Further brake pipe reductions will add to the pressure in the brake cylinder.
- Do not exceed 15 MPH when operating with retaining valves set.
- When retaining valves are not in use, place them in EX (Exhaust).
- Ensure that cars picked up enroute have retaining valves set in EX.

## 103.8 Emergency Brake Applications

When conditions warrant, use an emergency brake application if any condition occurs in which there is doubt that service applications can control train speed and maximum authorized speed is exceeded by 5 MPH or more.

All crew members on a train operating on grades identified in the System Special Instructions must take action to stop the train with an emergency brake application should the train exceed 5 MPH over maximum authorized speed.

**To Make an Emergency Brake Application**

1. Move the automatic brake valve handle quickly to EMERGENCY position and leave it there until the train stops.
2. Lift the red cover of the EMERGENCY SWITCH and activate the emergency valve on the ETD, utilizing the HTD, if equipped.

**When Stopping from an Emergency Application**

1. Move the independent brake handle to a position that will develop the desired brake cylinder pressure without sliding wheels or developing excessive buff or draft forces.
2. Actuate and hold the handle in the ACTUATE position.
   - Take extra care to prevent sliding wheels if in dynamic brake mode at the time of the emergency application.
3. Adjust brake cylinder pressure by moving the independent brake valve handle into the application zone while actuating.
4. Maintain the current slack condition (bunched or stretched) by avoiding the development of excessive buff or draft forces.
   - Take extra care to prevent sliding wheels if in dynamic brake mode at the time of emergency application.
5. If in power, return throttle to IDLE.
6. When maximum brake cylinder pressure is desired, release the handle from the ACTUATE position.
7. After stopping and once freight car vent valves have closed (approximately 60 seconds), if operating conditions permit, place automatic brake valve handle in RELEASE position to release brakes.

### 103.8.1 Lead Unit Not Equipped with Dynamic Brake Holding Feature

The dynamic brake holding feature may not be available on foreign locomotives.

When operating with a foreign locomotive, to assure full dynamic braking effort during emergency applications on descending, heavy/mountain grades, follow this procedure:

1. Place automatic brake valve handle in EMERGENCY position.
2. Increase independent brake cylinder pressure to maximum without sliding wheels.
3. Move dynamic brake lever to OFF position (required on GE controlling locomotives only).
4. After waiting 30 to 50 seconds, move automatic brake valve handle to CONTINUOUS SERVICE (or HANDLE OFF) position to reset pneumatic control switch (PCS).
5. Return dynamic brake lever to FULL position.
6. Dynamic braking will be restored if independent brake is actuated and brake cylinder pressure is kept below 15 psi.

### 103.8.2 Emergency Brake Application by Crew Member

When conditions warrant, use an emergency brake application when:

- Loss of life, personal injury, or property damage is imminent.
- The engineer cannot be informed to reduce speed or stop.
- The engineer does not respond to warnings or signals to reduce speed or stop.

Trainmen must know the location of the emergency air brake valves, and when making the emergency brake application must:

1. Notify other employees that an emergency brake application is in effect.
2. Determine if the emergency brake application is in effect on the entire train.

### 103.8.3 Undesired Emergency Brake Application

When an undesired emergency (UDE) brake application occurs:

1. Move the automatic brake valve handle to EMERGENCY position.
2. Wait until the train stops.
3. If operating conditions permit, place the automatic brake valve handle in RELEASE position to release the brakes and help locate the air hose separation or other problem.

### 103.8.4 Reporting Emergency Brake Applications

*References: GCOR 2.10, GCOR 6.23.*

- All emergency brake applications that occur while moving, whether undesired or intentional, are considered an enroute delay and must be reported to the dispatcher.
- All undesired emergency brake applications that occur during normal service braking (commonly referred to as “kickers” or “dynamiters”) must be reported to the NOC Mechanical Help Desk as an air brake defect.
- Refer to GCOR 2.10 Emergency Calls and 6.23 Emergency Stop or Severe Slack Action that may also apply.

## 103.9 Unintentional Brake Release

If an unintentional brake release occurs while the brakes are applied, increase the brake pipe reduction at least 5 psi below the last effective brake pipe reduction and immediately reduce train speed to not exceed 20 MPH.

Contact the dispatcher and NOC Mechanical Help Desk to determine nearest location where an inspection can be completed.

Train must not be moved until a root cause has been identified, unless it is determined by the investigating officers and NOC Mechanical Help Desk that it is safe to move to a better location for further inspection.

## 103.10 Penalty Brake Application

A penalty brake application is initiated by one of the following safety control devices:

- Alertness device.
- Cab signal.
- Overspeed device.
- Distributed power failures.
- Positive Train Control (PTC).

When a penalty brake application occurs, follow these steps:

1. Move the automatic brake valve handle to SUPPRESSION position.
2. Control the amount of independent brake cylinder pressure desired, if any, by moving the handle into the application zone and actuating.
   - If in power, return throttle to IDLE position.
3. As with any full service brake pipe reduction, operating conditions may require stopping the train before releasing the brakes.
   - Signal indications, grade, train size/length, etc. must be considered before attempting a running release from a penalty brake application.
   - When operating conditions allow, move the automatic brake valve handle to RELEASE and make sure the PCS resets.

Note: A minimum of 2 minutes is required to reset the PCS on DP remote units. Therefore, DP trains incurring a penalty brake application must be stopped before moving the automatic brake valve handle to RELEASE position.

## 103.11 Switching Movements

When switching cars, follow these requirements:

- When starting or stopping switching movements, gradually stretch or bunch slack.
- When using multiple locomotives, limit buff and draft forces.
- Under normal conditions, make switching movements without using the automatic air brake system.
- If necessary, cut in sufficient freight car air brakes to control switching movements.
- Reverser handle must not be moved to any position other than in the direction of travel while locomotive is moving.
- The generator field switch must never be closed or moved to ON position with the throttle open.
  - Initial number of cars required to be cut in must be retained even as tonnage is being reduced while switching. Once cars with air cut in are required to be switched, bleed cars and complete switch moves.

## 103.12 Temporary Speed Restrictions

*References: ABTH 103.2.1.*

When moving through an area with a temporary speed restriction, do the following:

- If possible, release train air brakes and dynamic brakes before entering the restricted area.
- Use the lowest possible throttle position for running or starting.
- Avoid or minimize changes in speed or slack condition.
- Limit independent brake cylinder pressure as much as possible.
- Do not exceed the 50% limit for dynamic brakes as outlined in Rule 103.2.1.

This page left blank intentionally.

# 104.0 Freight Car and Locomotive Components and Charts

## 104.1 Freight Car End and Platform identification

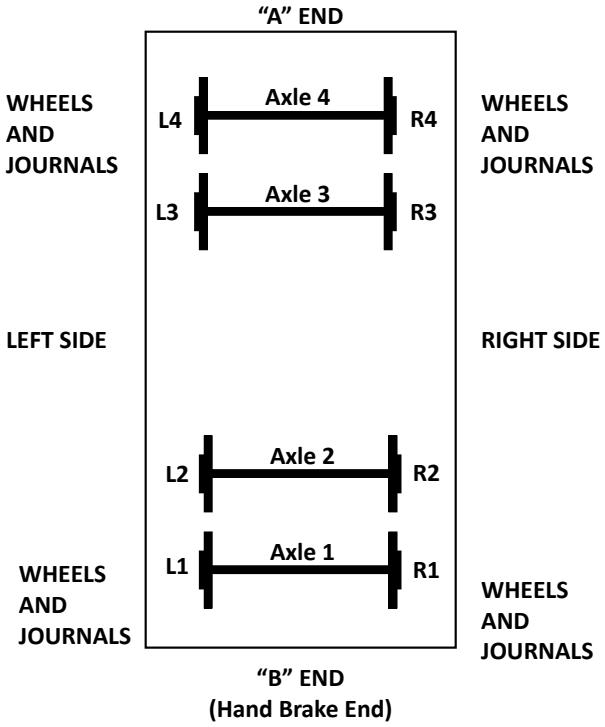
Identify car ends as follows:

- Cars with one hand brake.
  - "A" is the end without the hand brake.
  - "B" is the end with the hand brake.
- Cars with more than one hand brake.
  - "A" and "B" are stenciled on the appropriate ends of the car.
- Cars with more than one platform.
  - Each section will be designated with an "A" platform on one end and "B" on the opposite end.
  - Example: A five-platform articulated spine car is designated with an "A" platform on one end and, if stenciled, the adjacent platforms are designated as "E" then "D", then "C" and then "B" on the opposite end.

## 104.2 Wheel and Journal Identification on Cars

To determine wheel numbers:

1. Face the "B" end of the car.
2. From the "B" end of the car, identify the designations 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

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.

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.

Freight cars 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.
- Cars with ABDW control valves and 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 an emergency portion of a control valve.
- Is used only to propagate an emergency brake application through the brake pipe.
- Can be cut out using the cutout cock, if defective.

## 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. During a brake release, the retaining valve can be positioned to:

- Allow the exhaust of brake cylinder pressure.
- 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° below horizontal.
- Slow Direct Exhaust (SD).
  - Exhausts brake cylinder pressure for a blow-down time of approximately 86 seconds.
  - Continues to exhaust until all pressure is vented.
  - Handle is 45° 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

This section describes the various automatic and independent brake valve handle positions and their functions.

- Brake valve handle positions are listed from left to right, or from front to back if desktop-mounted.

## 104.7.1 Automatic Brake Valves

### A. H6 Automatic Brake Valve

**Features**

- Non-maintaining.
- Non-self-lapping.
- Normally found on older locomotives and some switch engines.

**Handle Positions**

- 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 rate of the leakage.
  - 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.

### B. 24RL-MC Automatic Brake Valve

**Features**

- Maintaining (in LAP)
  - Cut out the maintaining feature during brake pipe leakage tests.
- Non-self-lapping.

**Handle Positions**

- FULL RELEASE
  - Releases the train and locomotive brakes.
  - Charges the brake pipe through the regulating valve, preventing overcharge.
  - 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.

### C. 24RL-MC1 Automatic Brake Valve

**Features**

- Maintaining (in MAINTAINING)
  - Use LAP during brake pipe leakage tests.
- Non-self-lapping

**Handle Positions**

- FULL RELEASE
  - Releases the train and locomotive brakes and charges the brake pipe through the regulating valve, preventing overcharge.
  - 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 valve handle to MAINTAINING without pausing in LAP.
  - Pausing in LAP may allow leakage to reduce brake pipe pressure below equalizing reservoir pressure. The brakes will release when the handle is returned 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 rate of the leakage.
  - 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

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

**Features**

- Maintaining
  - Maintains constant brake pipe pressure unless the cutout valve is in OUT.
- Self-lapping.
- Regulates brake pipe pressure, controlling both locomotive and train brakes.
- Regulating valve controls the supply of air pressure to the equalizing reservoir, which regulates brake pipe pressure.

**Handle Positions**

- 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.
- The cutout valve handle is spring-loaded; push it in before changing positions.
- EMERGENCY is always available regardless of the position of the automatic brake valve cutout valve.

**Two-Position Cutout Valve 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 handle is in the RELEASE position.
- 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 Positions**

- FRT
  - Same as IN position in two-position cutout valve.
- OUT
  - Same as OUT position in two-position cutout valve.
- 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 valve handle toward the RELEASE position.
  - Use when operating passenger or commuter trains to utilize the graduated release feature.
  - 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, this must only be done with the automatic brake valve handle in the RELEASE position.

### 104.7.3 Independent Brake Valves

**Models**

- LA6-P (used with H6 automatic brake valves).
- S40 (used with all 24RL brake equipment).
- SA26 (used with 26C automatic brake valves).
- 30CDW.
- Knorr CCB.
- Wabco EPIC.

**Handle Positions**

- RELEASE/ACTUATE
  - Normal position to release the locomotive brakes.
  - To release the locomotive brakes while an automatic brake application is in effect, press the handle (or lift the actuating ring) while it is in the RELEASE position (actuate).
- Application Zone
  - All handle movements between RELEASE and FULL increase or decrease locomotive brake cylinder pressure as follows:
  - Increase by moving the brake handle to the right (or forward) toward FULL.
  - Decrease by moving the brake handle to the left (or back towards operator) toward RELEASE.
- FULL
  - Position for creating maximum brake cylinder pressure.

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

The handle 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 locomotive is:
    - A single unit.
    - A controlling unit of a multiple-unit consist.
    - 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 2 Positions**

- IN
  - Engages control of the independent brakes.
  - Use when locomotive is:
    - A single unit.
    - A controlling unit of a multiple-unit consist.
    - Being hauled dead-in-tow.
- OUT
  - Disconnects control of the independent brakes from the independent brake valve.
  - Use when a locomotive is trailing in a multiple-unit consist.

TOC Home

## 104.8 Electropneumatic Automatic and Independent Brake Valves

**Models**

- Knorr CCB
- WABCO EPIC
- WABTEC FASTBRAKE

**Setup Screen Options**

Electropneumatic automatic and independent brake valves are cut in or out through electronic display screens.

- Independent Brake
  - LEAD
  - TRAIL
- Automatic Brake Valve
  - PASS (passenger)
    - Used only in passenger service.
  - FREIGHT
  - CUT OUT

## 104.9 Locomotive Electronic Air Brake Computer Resets

If issues are encountered with the lead locomotive electronic air brake system:

- Contact the NOC Mechanical Help Desk and be governed by the manager's instructions.
- If unable to contact the NOC Mechanical Help Desk, faults may be cleared by following these steps.

1. Ensure locomotive and/or train is secure.
2. Close end cocks on affected unit, including main reservoir line.
3. Cycle the circuit breaker for the air brake computer.
4. Verify that air brake computer circuit breaker (CCB) is closed and remove reverser handle.
5. Set unit air brake setup to TRAIL.
   - ○ If unit will not go to TRAIL, select LEAD; save and confirm.
   - ○ Try Step 5 again.
6. Place automatic brake valve handle in EMERGENCY position.
7. Place independent brake valve handle in RELEASE position.
8. Wait at least 60 seconds, then place the automatic brake valve handle in RELEASE position.
9. Change air brake setup to LEAD-CUT IN, and charge brake pipe to 90 psi.
10. Place automatic brake valve handle in SUPPRESSION position for 10 seconds.
11. Return automatic brake valve handle to RELEASE position.
    - Allow equalizing reservoir and brake pipe to fully charge.
    - Allow brake cylinder pressure to go to 0 psi.
12. Fully apply the independent brakes.
13. Fully release the independent brakes.
14. ACTUATE (bail) for 10 seconds.
15. Place automatic brake valve handle in EMERGENCY position.
16. Wait at least 60 seconds, then place the automatic brake valve handle in RELEASE position.
17. Fully apply the independent brakes.
18. Faults should be cleared. If faults do not clear, follow message instructions on operator's display.
19. Notify NOC Mechanical Help Desk of actions taken.

TOC Home

# 104.10 Air Flow Meter (AFM)

*References: ABTH 100.9.*

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

- On trains equipped with distributed power (DP), air flow is a combined reading from the DP lead and remotes.

**Air Flow Meter Readings**

- Brake pipe flow information:
  - As the brake system begins charging, a higher flow into the brake pipe is indicated by:
    - Higher numbers (more than 60 CFM), or
    - The pointer moving to the right.
  - As the brake system becomes charged, a lesser air flow into the brake pipe is indicated by:
    - Lower numbers (less than 60 CFM), or
    - The pointer moving to the left.
  - If the air flow meter shows a reading (less than 60 CFM) that is stabilized, the brake system is charged.
    - For DP trains, the combined air flow between the DP lead and DP remotes must not exceed 90 CFM.
- Brake system information:
  - 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 in 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.
   - This reading is a reference value to use to monitor fluctuations in air flow to the brake pipe.

## 104.11 Charging Time Chart (AFM Not Equipped)

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:

| Minimum and Maximum Charging Times When Brake System is Empty | | |
|---|---|---|
| **Brake Pipe Length** (in feet) | **Minimum Charging Time** (in minutes) | **Maximum Charging Time** (in minutes) |
| 2,500 or less | 8 | 25 |
| 3,000 | 10 | 30 |
| 4,000 | 15 | 35 |
| 5,000 | 20 | 40 |
| 6,000 | 26 | 55 |
| 7,000 | 35 | 65 |
| 8,000 | 45 | 75 |
| 9,000 | 57 | 100 |
| 10,000 | 71 | 125 |
| 11,000 | 80 | 160 |

## 104.12 Electronic Alertness Device (Alerter)

All controlling locomotives operated at speeds in excess of 25 MPH must be equipped with a functioning alerter. An alerter stops the train with a penalty brake application if the engineer does not respond properly.

- The device begins monitoring the operator's alertness when locomotive brake cylinder pressure falls below 25 psi.
- It resets when any of these are used:
  - Throttle.
  - Horn.
  - Bell.
  - Dynamic brake.
  - Device reset button.
  - Radio transmit (on some alerter types).
- If the device is not reset within the reset cycle (varies relative to speed):
  - A warning light flashes.
  - A warning horn sounds off and on for 10 seconds and then continuously for 10 seconds.
  - If the device is not reset within 20 seconds after the warning light and horn begin operating, a penalty brake application will occur.

### 104.12.1 Deactivating Device Temporarily

To temporarily deactivate the electronic alertness device for unit train loading/unloading, the following procedures must be used (listed in preferred order).

**Procedure 1**

- Newer BNSF and UPRR locomotives are equipped with the following alerter deactivation procedure.
- This is the preferred procedure for setting a locomotive consist for unattended unloading operations involving a car positioner.
- The alerter will remain deactivated as long as speed remains below 2 MPH.
- To deactivate the alerter:
  1. Close the throttle.
  2. Center the reverser.
  3. If DP train, place remote consists in REMOTE MODE – IDLE.
  4. ISOLATE the controlling locomotive.
  5. Fully release the independent brakes when ready for movement.

**Procedure 2**

- The alerter will remain deactivated as long as speed remains below 4 MPH.
- To deactivate the alerter:
  1. WARNING: If DP train, first place remote consists in REMOTE MODE – IDLE.
     - Will prevent undesired loading of remote consist during loading/unloading operation.
  2. ISOLATE all units in the lead consist except the controlling unit.
     - Controlling unit will be isolated after completing Steps 3–5.
  3. On the Operating screen, select Slow Speed Control. Set to slowest available speed or 0 MPH.
  4. Move reverser to the direction of travel.
  5. Open throttle as commanded if using Slow Speed to load or Run 1 to deactivate alerter during automatic car positioner unloading operation.
  6. ISOLATE controlling unit. (Only if deactivating alerter with Slow Speed feature active).
  7. Fully release the independent brakes when ready for movement.

**Procedure 3**

- Use only on 26C and 30CDW equipped locomotives.
- If Procedure 1 or 2 does not deactivate the alerter, follow these steps:
  1. WARNING: If DP train, first place any remote consists in REMOTE MODE–ISOLATE.
     - Will prevent undesired loading of remote consist during loading/unloading operation.
     - Will allow adjustment to regulating valve setting at lead DP unit.
  2. Cut out the automatic brake valve.
  3. Adjust the regulating valve to 114 psi or highest setting available.
  4. Move the automatic brake valve handle to SUPPRESSION.
  5. Cut in the automatic brake valve cutout valve to PASS.
  6. Make sure brake pipe pressure is at the required 90 psi.
  7. Fully release the independent brakes when ready for movement.
- To reactivate the alerter:
  1. Cut out the automatic brake.
  2. Move the automatic brake handle to RELEASE.
  3. Adjust the regulating valve to the required pressure.
  4. Cut in the automatic brake.

## 104.13 Overspeed Control

The overspeed control device prevents the train from running at speeds higher than the safe mechanical limits of the traction motors. The device:

- Sounds a warning if train speed increases to an unsafe level.
- Applies the train brakes and trips the PCS if the train does not slow within 6 to 12 seconds of the first warning sound.

**Slowing the Train**

To slow the train when the overspeed control device sounds a warning, do the following:

1. Move the automatic brake handle to SUPPRESSION within the 12 second warning period.

**Recovering**

1. Move the automatic brake handle to SUPPRESSION.
2. Move the throttle to IDLE.
3. Wait 60 seconds.
4. As with any full service brake pipe reduction, operating conditions (signal indication, grade conditions, train size/length, etc.) may require stopping the train before releasing the brakes. When operating conditions allow, move the automatic brake handle to RELEASE and confirm that:
   - Brake pipe pressure is restored.
   - PCS light goes out.
   - Brakes release.

**Cutting Out Overspeed**

- If an improper overspeed setting causes penalty brake applications at 10 MPH lower than the maximum authorized speed, inform the NOC Mechanical Help Desk as soon as possible and be governed by their instructions.

## 104.14 Cars Secured Chart

The number of cars requiring hand brakes depends on:

- Grade and adhesion.
- Car types and number of loaded and empty cars.
- Weather conditions (precipitation, temperature and wind).

Use the following chart to determine the minimum number of cars requiring hand brakes to be applied when:

- The number required is unknown.
- Testing of the hand brakes by releasing the air brakes is not possible.

In addition:

- Cars with multiple hand brakes must have all hand brakes applied to count as 1 car.
  - Exception: Automax equipment (car kinds: M2D, M3D, M2F and M3F) counts as half a car when both hand brakes are applied.
- Autorack equipment counts as half a car when utilizing the chart below for determining the number of cars requiring hand brakes.

| Tons | Grade (%) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | <0.25 | 0.25-0.49 | 0.50-0.74 | 0.75-0.99 | 1.00-1.24 | 1.25-1.49 | 1.50-1.74 | 1.75-1.99 | 2.00-2.24 | 2.25-2.49 | 2.50-2.74 | 2.75-2.99 | ≥3.00 |
| <1,000 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 |
| 1,000-1,999 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 2,000-2,999 | 2 | 4 | 5 | 7 | 8 | 10 | 11 | 13 | 14 | 16 | 17 | 19 | 20 |
| 3,000-3,999 | 3 | 5 | 7 | 9 | 11 | 13 | 15 | 17 | 19 | 21 | 23 | 25 | 27 |
| 4,000-4,999 | 3 | 6 | 8 | 11 | 13 | 16 | 18 | 21 | 23 | 26 | 28 | 31 | 33 |
| 5,000-5,999 | 4 | 7 | 10 | 13 | 16 | 19 | 22 | 25 | 28 | 31 | 34 | 37 | 40 |
| 6,000-6,999 | 4 | 8 | 11 | 15 | 18 | 22 | 25 | 29 | 32 | 36 | 39 | 43 | 46 |
| 7,000-7,999 | 5 | 9 | 13 | 17 | 21 | 25 | 29 | 33 | 37 | 41 | 45 | 49 | 53 |
| 8,000-8,999 | 5 | 10 | 14 | 19 | 23 | 28 | 32 | 37 | 41 | 46 | 50 | 55 | 59 |
| 9,000-9,999 | 6 | 11 | 16 | 21 | 26 | 31 | 36 | 41 | 46 | 51 | 56 | 61 | 66 |
| 10,000-10,999 | 6 | 12 | 17 | 23 | 28 | 34 | 39 | 45 | 50 | 56 | 61 | 67 | 72 |
| 11,000-11,999 | 7 | 13 | 19 | 25 | 31 | 37 | 43 | 49 | 55 | 61 | 67 | 73 | 79 |
| 12,000-12,999 | 7 | 14 | 20 | 27 | 33 | 40 | 46 | 53 | 59 | 66 | 72 | 79 | 85 |
| 13,000-13,999 | 8 | 15 | 22 | 29 | 36 | 43 | 50 | 57 | 64 | 71 | 78 | 85 | 92 |
| 14,000-14,999 | 8 | 16 | 23 | 31 | 38 | 46 | 53 | 61 | 68 | 76 | 83 | 91 | 98 |
| 15,000-15,999 | 9 | 17 | 25 | 33 | 41 | 49 | 57 | 65 | 73 | 81 | 89 | 97 | 105 |
| 16,000-16,999 | 9 | 18 | 26 | 35 | 43 | 52 | 60 | 69 | 77 | 86 | 94 | 103 | 111 |
| 17,000-17,999 | 10 | 19 | 28 | 37 | 46 | 55 | 64 | 73 | 82 | 91 | 100 | 109 | 118 |
| 18,000-18,999 | 10 | 20 | 29 | 39 | 48 | 58 | 67 | 77 | 86 | 96 | 105 | 115 | 124 |
| 19,000-19,999 | 11 | 21 | 31 | 41 | 51 | 61 | 71 | 81 | 91 | 101 | 111 | 121 | 131 |
| 20,000-20,999 | 11 | 22 | 32 | 43 | 53 | 64 | 74 | 85 | 95 | 106 | 116 | 127 | 137 |
| 21,000-21,999 | 12 | 23 | 34 | 45 | 56 | 67 | 78 | 89 | 100 | 111 | 122 | 133 | 144 |
| 22,000-22,999 | 12 | 24 | 35 | 47 | 58 | 70 | 81 | 93 | 104 | 116 | 127 | 139 | 150 |
| 23,000-23,999 | 13 | 25 | 37 | 49 | 61 | 73 | 85 | 97 | 109 | 121 | 133 | 145 | 157 |
| 24,000-24,999 | 13 | 26 | 38 | 51 | 63 | 76 | 88 | 101 | 113 | 126 | 138 | 151 | 163 |

TOC Home

| Tons | Grade (%) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | <0.25 | 0.25-0.49 | 0.50-0.74 | 0.75-0.99 | 1.00-1.24 | 1.25-1.49 | 1.50-1.74 | 1.75-1.99 | 2.00-2.24 | 2.25-2.49 | 2.50-2.74 | 2.75-2.99 | ≥3.00 |
| 25,000-25,999 | 14 | 27 | 40 | 53 | 66 | 79 | 92 | 105 | 118 | 131 | 144 | 157 | 170 |
| 26,000-26,999 | 14 | 28 | 41 | 55 | 68 | 82 | 95 | 109 | 122 | 136 | 149 | 163 | 176 |
| 27,000-27,999 | 15 | 29 | 43 | 57 | 71 | 85 | 99 | 113 | 127 | 141 | 155 | 169 | 183 |
| 28,000-28,999 | 15 | 30 | 44 | 59 | 73 | 88 | 102 | 117 | 131 | 146 | 160 | 175 | 189 |
| 29,000-29,999 | 16 | 31 | 46 | 61 | 76 | 91 | 106 | 121 | 136 | 151 | 166 | 181 | 196 |
| 30,000-30,999 | 16 | 32 | 47 | 63 | 78 | 94 | 109 | 125 | 140 | 156 | 171 | 187 | 202 |
| 31,000-31,999 | 17 | 33 | 49 | 65 | 81 | 97 | 113 | 129 | 145 | 161 | 177 | 193 | 209 |
| 32,000-32,999 | 17 | 34 | 50 | 67 | 83 | 100 | 116 | 133 | 149 | 166 | 182 | 199 | 215 |
| 33,000-33,999 | 18 | 35 | 52 | 69 | 86 | 103 | 120 | 137 | 154 | 171 | 188 | 205 | 222 |
| 34,000-34,999 | 18 | 36 | 53 | 71 | 88 | 106 | 123 | 141 | 158 | 176 | 193 | 211 | 228 |
| 35,000-35,999 | 19 | 37 | 55 | 73 | 91 | 109 | 127 | 145 | 163 | 181 | 199 | 217 | 235 |
| 36,000-36,999 | 19 | 38 | 56 | 75 | 93 | 112 | 130 | 149 | 167 | 186 | 204 | 223 | 241 |
| 37,000-37,999 | 20 | 39 | 58 | 77 | 96 | 115 | 134 | 153 | 172 | 191 | 210 | 229 | 248 |
| 38,000-38,999 | 20 | 40 | 59 | 79 | 98 | 118 | 137 | 157 | 176 | 196 | 215 | 235 | 254 |
| 39,000-40,000 | 21 | 41 | 61 | 81 | 101 | 121 | 141 | 161 | 181 | 201 | 221 | 241 | 261 |

This page left blank intentionally.

TOC Home

# 105.0 Distributed Power (DP)

This chapter presents rules, general instructions, and requirements for operating and conditioning locomotives equipped with remote control systems. These systems are referred to as distributed power or DP.

## 105.0.1 Introduction

- There are two DP remote control operating systems:
  - Locotrol III system, referred to as LIII.
  - Locotrol IFC, LEB and LSI systems, referred to as Integrated Distributed Power (IDP).
- The systems have different operator interfaces, equipment setup steps, and consist limitations.
- The systems provide the same control of air brakes, throttle, and dynamic braking.
- The following foreign railroad LIII/IDP systems are currently interoperable with BNSF:
  - CREX
  - CP
  - KCS - excluding SD60 locomotives.
  - CSX
  - IAIS (Iowa Interstate)
  - NS
  - UP
  - FXE (Ferromex): Only EMD and GE EVO series locomotives.
  - CN
- BNSF locomotives can be used either as the lead or remote unit.
- The systems provide synchronous and independent control of one to four remote consists (LIII/IDP). These remote consists plus the lead consist provide power, dynamic braking, and air braking as follows:
  - The system controls the remote units by radio signals transmitted from the lead unit.
  - During the initial setup and linking of the equipment and continuously during operation, a series of checks and comparisons detects equipment status, communication errors, and procedure sequence errors.
  - For safety, this equipment becomes operational only when it is properly conditioned, a brake pipe continuity test is confirmed, and the radio links the lead controlling unit and the remote controlled units.
- An engineer controls each locomotive consist in the DP train from the lead unit.
  - The term “remote unit” applies to the controlling locomotive unit in a remote consist.
  - Locomotives connected through the train lines for multiple unit service to the lead and remote units are called “trail locomotives”.

# 105.1 Preparing for DP Service

*References: ABTH 101.2, ABTH 101.6, ABTH 105.4, ABTH 105.5, ABTH 105.8.5.*

**Inspect and Condition Equipment**

- Before setting up and linking locomotives for DP operation, ensure that the locomotives in each consist (lead and remote) have passed these inspections:
  - Federal locomotive daily inspection - see Rule 101.2 Locomotive Daily Inspection.
  - Locomotive brakes - see Rule 101.6 Locomotive Air Brake Test.
- Secure consists to prevent movement during conditioning.

## 105.1.1 Locomotive Conditioning Sequence

Condition locomotives for DP in the following order:

1. Set up the remote units.
2. Set up the lead unit.
3. Link to remotes from the lead unit.
4. Perform a brake pipe continuity test.

Follow this sequence for both IDP and LIII systems. Complete the applicable procedures for the system equipped on each locomotive.

## 105.1.2 Conditioning Remote IDP Unit

*References: ABTH 102.3.1.*

**A. Switch and Handle Positions**

- Data radio circuit breaker - ON.
  - GE IDP locomotives do not have Data radio breakers. Instead, turn the Distributed Power/TIM or MTB breaker ON.
- Isolation switch - RUN.
- Dynamic brake circuit breaker - ON.
- Control and fuel pump switch - ON.
- Engine run switch - ON.
  - Some EMD units require switch OFF; follow prompts from screen.
- Generator field switch - OFF.
- Reverser - Centered (handle removed).
- Throttle handle - IDLE.
- Automatic brake valve handle - CONTINUOUS SERVICE/HANDLE OFF.
- Independent brake valve handle - fully applied (at this time).
- Air brake setup - Lead (freight) CUT IN.

**B. IDP Setup Procedure**

Ensure that the PCS and all air brake faults are reset before starting this setup procedure.

On the right (#1) ICE screen or either screen on GE Locotrol IFC:

1. Select the MORE Menu.
2. From the menu options, select the DIST POWER key.
3. From the Distributed Power Main Menu, choose the REMOTE SETUP key.
4. Enter the lead IDP (or DP) unit number.
5. Designate the direction of the remote unit as either SAME as or OPPOSITE of the lead unit.
6. Press ACCEPT.
7. Verify LEAD CUT IN and DP ENABLED (or DP REMOTE).
8. Place the independent brake valve handle in RELEASE.
9. Do not attempt to reset the PCS.

This unit is now set up as a remote unit.

**C. After Conditioning DP Remote Consists**

1. Remove reversers from all locomotives.
2. Lock all locomotives in the remote consist as outlined in Rule 102.3.1 Locking Locomotives.

## 105.1.3 Conditioning Remote LIII Unit

*References: ABTH 102.3.1.*

**A. Switch and Handle Positions**

- Distributed power circuit breaker - OFF (at this time).
- Isolation switch - RUN.
- Dynamic brake circuit breaker - ON.
- Control and fuel pump switch - ON.
- Engine run switch - ON.
- Generator field switch - OFF.
- Reverser - Centered (handle removed).
- Throttle handle - IDLE.
- Air brake setup - Lead (freight).
- Automatic brake valve handle - CONTINUOUS SERVICE/HANDLE OFF.
  - UP LIII with air brake button control console - place ABV in RELEASE position.
- Independent brake valve handle - Fully applied (at this time).

**B. LIII Setup Procedure**

Ensure that the PCS and all air brake faults are reset before starting the setup procedure.

At the LIII setup module in the nose compartment of the unit:

**ALL LIII**

1. Set the thumb wheels to the lead LIII unit number.
2. Set the LEAD/REMOTE switch to REMOTE.
3. Using the SAME/OPPOSITE switch, designate the direction of the remote unit as either SAME as or OPPOSITE of the lead unit.

**UP LIII only**

4. Set the dual port air brake valve to CUT IN (on units so equipped).
5. Set Locotrol/conventional switch to Locotrol (on units so equipped).

**ALL LIII**

6. Turn ON the three circuit breakers labeled Elec, Relay, and Radio.

**At the engine control panel:**

7. Turn the distributed power circuit breaker ON.

**At the control stand:**

8. Place the independent brake valve handle in RELEASE.
9. Verify that the air brake message block reads “DIST PWR REMOTE” (if IFC screen-equipped).
10. Do not attempt to reset the PCS.

This unit is now set up as a remote unit.

Note:
- If the incorrect lead DP unit is identified or the SAME/OPPOSITE switch is in the wrong position, turn the distributed power breaker on the engine control panel OFF.
- After making the correct settings, turn the distributed power breaker ON.

**C. After Conditioning DP Remote Consists**

1. Remove reversers from all locomotives.
2. Lock all locomotives in the remote consist as outlined in Rule 102.3.1 Locking Locomotives.

## 105.1.4 Conditioning Lead IDP Unit

*References: ABTH 105.1.6.*

Before starting the setup procedure, ensure that:

- Equalizing reservoir is adjusted to the required pressure.
- PCS and all air brake faults are reset.

Condition the controlling IDP unit as follows.

**A. Switch and Handle Positions**

- Data radio circuit breaker - ON.
  - On GE Locotrol IFC locomotives, the Distributed Power/TIM or MTB breakers must be turned ON in lieu of the Data radio circuit breaker.
- Isolation switch - RUN.
- Dynamic brake circuit breaker - ON.
- Control and fuel pump switch - ON.
- Engine run switch - ON.
- Generator field switch - OFF (until ready to move).
- Reverser - Centered (handle removed).
- Throttle handle - IDLE.
- Automatic brake valve handle - CONTINUOUS SERVICE/HANDLE OFF.
- Independent brake valve handle - Fully applied.
- Air brake setup - Lead (freight) CUT IN.

**B. IDP Setup Procedure**

On the right (#1) ICE screen or either screen on GE Locotrol IFC:

1. Select the MORE Menu.
2. From the menu options, select the DIST POWER key.
3. At the Distributed Power Main Menu, select the LEAD SETUP key.

This unit is now conditioned and is ready to begin the linking process (see Rule 105.1.6 Linking to Remote Consists from Lead IDP Unit).

## 105.1.5 Conditioning a Lead LIII Unit

*References: ABTH 105.1.7.*

Before starting the setup procedures, ensure that:

- Equalizing reservoir is adjusted to the required pressure.
- PCS and all air brake faults are reset.

**A. Switch and Handle Positions**

- Distributed power circuit breaker - OFF (at this time).
- Isolation switch - RUN.
- Dynamic brake circuit breaker - ON.
- Control and fuel pump switch - ON.
- Engine run switch - ON.
- Generator field switch - OFF (until ready to move).
- Reverser - Centered (handle removed).
- Throttle handle - IDLE.
- Air brake setup - Lead (freight).
- Automatic brake valve handle - CONTINUOUS SERVICE/HANDLE OFF.
- Independent brake valve handle - Fully applied.

**B. LIII Setup Procedure**

At the LIII setup module in the nose compartment of the unit:

**ALL LIII**

1. Set the thumb wheels to the lead LIII unit number.
2. Set the Lead/Remote switch to LEAD.
3. Set the Same/Opposite switch to SAME/LEAD.

**UP LIII only**

4. Set dual port air brake valve to CUT IN (on units so equipped).
5. Set Locotrol/conventional switch to LOCOTROL (on units so equipped).

**ALL LIII**

6. Turn ON the three circuit breakers labeled Elec, Relay, and Radio.

**At the engine control panel:**

7. Turn ON the distributed power circuit breaker.

**At the control stand:**

8. On units so equipped, verify that the IFC displays an air brake message block indicating “DPC Penalty, Place handle in Supp”.

Note: The system LIII console should now begin cycling through a self-diagnostic mode.

- Verify that all lights are working before proceeding to the linking operation.
- Press any button on the LIII console to stop the diagnostic cycling.

This unit is now conditioned and is ready to begin the linking process (see Rule 105.1.7 Linking to Remote Consists from Lead LIII Unit).

## 105.1.6 Linking to Remote Consists from Lead IDP Unit

*References: ABTH 105.1.4 (B), ABTH 105.1.8.*

After completing Step 3 of Rule 105.1.4 (B) Conditioning Lead IDP Unit, start the linking process by entering the remote consist controlling unit number. If there is more than one remote consist, enter the number of the controlling unit nearest the lead consist first.

Perform the following:

1. Enter the number of the remote DP unit to be linked and select LINK.
   - The system will perform a short test.
     - Check the system display for “LINKED”, which means this step was successful.
       - If the system display responds with “LINK FAIL”, check and re-enter the number of the controlling remote unit. If this step fails again, check the setup of the remote unit.
2. Repeat step 1 for each remote consist. Verify that all remotes are linked, then press the ACCEPT key.
   - Once the consists are accepted, the DP Main Menu will appear on the right screen and the DP Operation will appear on the left screen.
   - On GE Locotrol IFC locomotives, the DP Main Menu may be displayed on either screen, and the DP Operation will then be displayed on the opposite screen.
3. Perform the brake pipe continuity test (see Rule 105.1.8 Brake Pipe Continuity Test from IDP Lead Unit).

Note: The Distributed Power system is equipped with two sets of radios: “A” and “B” as redundant backup systems.

## 105.1.7 Linking to Remote Consists from Lead LIII Unit

*References: ABTH 105.1.9.*

Start the Linking Process:

1. Enter the controlling unit number of the remote consist nearest the lead consist.
   - If the LIII console indicator lights are cycling, press any soft key to reset and display the prompt, then repeat Step 1.

Perform the Following:

1. Use the arrow keys to select the number and move the cursor.
2. After the proper unit number is displayed, press the LINK soft key.
   - The status of the linking process will be displayed to the right of the unit number. Examples: “TESTING,” “LINK OK,” “RADIO FAIL A or B,” “LINK FAIL”.
     - Ensure that “LINK OK” is displayed to the right of the remote before proceeding to Step 3.
     - If “LINK FAIL” is displayed, re-enter the unit number and press the LINK soft key. If “LINK FAIL” is displayed again, check that the remote unit is properly set up.
     - If a “RADIO FAIL A OR B” message is received, unlink and then re-link with remote. If a “RADIO FAIL A OR B” message is again received, continue with linking process. Report the radio defect.
3. If the train has more than one remote consist, repeat steps 1 and 2 for each consist.
4. After entering all controlling remote engine numbers, press the DONE soft key.
5. Ensure that the automatic brake valve handle is in SUPPRESSION and wait until the penalty clears (about 2 minutes).
6. When the PCS and air brake message clears (on IFC-equipped units), you may move the automatic brake valve handle to RELEASE to charge the brake system.
7. Perform the Brake Pipe Continuity Test (see Rule 105.1.9 Brake Pipe Continuity Test from LIII Lead Unit).

Note: The Distributed Power system is equipped with two sets of radios: “A” and “B” as redundant backup systems.

## 105.1.8 Brake Pipe Continuity Test from IDP Lead Unit

*References: ABTH 100.9, ABTH 105.1.6, ABTH 105.3.1.*

- Perform the Brake Pipe Continuity Test (BP test) after linking the remote consists (see Rule 105.1.6 Linking to Remote Consists from Lead IDP Unit) and before moving the locomotive or the train.
- After linking to remotes, the DP Control screen will appear.

**Steps to Perform the BP Test**

1. Ensure that the IDP system mode is IDLE.
2. When the message “CHARGE TRAIN BEFORE RUNNING BRAKE PIPE TEST” appears, place the automatic brake valve handle in RELEASE.
3. Confirm that automatic brake valves on remotes cut in, and all DP units show air flow.
4. Wait until flow values drop to 20 CFM on lead and remote units before proceeding with Step 5. This may take several minutes.
   - Exception: In extreme cold temperatures, the test may be initiated when brake pipe charging is stabilized. If the air flow rate does not reduce to 20 CFM and if there is no further decrease in flow rate for a period of at least 90 seconds, then the flow rate is considered to be stabilized and the test may be initiated.
5. Press the BRK PIPE TEST key followed by the EXECUTE key.
6. When prompted, move the automatic brake valve handle to MINIMUM REDUCTION.
   - Moving beyond MINIMUM REDUCTION will void the test.
7. If the console shows “BP TEST OK,” the test was satisfactorily completed.
8. If the system screen shows “BP TEST FAIL,” release the train brakes and recharge. Return to Step 2, wait until the flow has stabilized, and repeat the test.

**Additional Things to Do Before Departing**

- Brake system leakage must be successfully tested per Rule 100.9 Brake Pipe Leakage Test.
- See Rule 105.3.1 Changing System Operating Modes on IDP Controlling Unit for steps to change the system operating mode to RUN.

## 105.1.9 Brake Pipe Continuity Test from LIII Lead Unit

*References: ABTH 100.9, ABTH 105.1.7, ABTH 105.3.2.*

Perform the Brake Pipe Continuity Test (BP test) after linking the remote consists (see Rule 105.1.7 Linking to Remote Consists from Lead LIII Unit) and before moving the locomotive or the train.

**Steps to Perform the BP Test**

1. Press the BP TEST soft key.
2. When the BP TEST key begins to flash (this is usually a prompt to press the EXECUTE or CANCEL soft key):
   a. Do not press EXECUTE or CANCEL at this time.
   b. Check the flow values for the lead and remote consists displayed on the LIII console screen and wait until these values are below 20 CFM. This may take several minutes.
      - Exception: In extreme cold temperatures, the test may be initiated when brake pipe charging has stabilized. If the air flow rate does not reduce to 20 CFM and if there is no further decrease in flow rate for a period of at least 90 seconds, then the flow rate is considered to be stabilized and the test may be initiated.
3. Once the air flow indicated on the lead and remote consists is below 20 CFM, press the EXECUTE soft key to initiate the BP test.
   - Some LIII systems automatically reduce to MINIMUM REDUCTION at this time.
4. When prompted on the LIII control console, move the automatic brake valve handle to MINIMUM REDUCTION.
   - Moving beyond MINIMUM REDUCTION will void the test.
   - The BP test will continue automatically and may take up to 30 seconds to complete.
5. If the LIII control console shows “BP TEST OK,” the test was satisfactorily completed.
6. If the test fails, release the train brakes and recharge. Wait until the flow has stabilized to a lower flow value than previous attempt, return to Step 1, and repeat the test.

**Additional Things to Do Before Departing**

- Brake system leakage must be successfully tested per Rule 100.9 Brake Pipe Leakage Test.
- See Rule 105.3.2 Changing System Operating Modes on LIII Controlling Unit for steps to change the system operating mode to RUN.

TOC Home

## 105.2 Distributed Power Brake Pipe Leakage Test

*References: ABTH: 100.9, ABTH 105.2.1, ABTH 105.2.2.*

On distributed power equipment, brake system leakage can be tested by utilizing either the **Air Flow Method** (AFM) or the **Brake Pipe Leakage Method** as outlined in Rule 100.9 Brake Pipe Leakage Test.

- The **Air Flow Method** is the **preferred method** when required equipment is available.
- If it is necessary to use the **Brake Pipe Leakage Method**, follow the instructions in **Rules 105.2.1 and 105.2.2.**
  - The DP Brake Pipe Leakage Test reduces the steps required to cut out the brake valves on the lead and remote consists.
  - The leakage test is automated.
  - The required 20-pound brake pipe reduction will be made and the timing will be measured for brake pipe cutout and leakage.
  - The amount of leakage is displayed at the end of the test on the system screen.
  - The test sequence requires at least 3 minutes to complete.

### 105.2.1 DP Brake Pipe Leakage Test Performed from IDP Controlling Unit

*References: ABTH 105.3.1.*

- The LEAKAGE TEST soft key is located on the #1 or right screen.
- The leakage test function will be displayed as a soft key on the system screen only when the train is stopped and the automatic brake valve handle is in RELEASE or MINIMUM REDUCTION.
- If the leakage test function is requested while the system is in RUN mode, the mode will change to IDLE.

**Steps to Perform the Test**

1. Press the LEAKAGE TEST key.
2. Press the EXECUTE key.
   - During the test, several messages will display, showing the progress of the test, including “STABILIZING AIR LINE,” “BRAKE VALVE OUT,” and “TIMING.”
3. When the test has been completed, follow the message prompts displayed.
   - The test results will be displayed in the system log as leakage in psi.
4. Move the automatic brake handle to FULL SERVICE.
5. Move the automatic brake handle to RELEASE when the inspection is complete.
6. Change the system mode to RUN to enable remote power and dynamic brake functions. (See Rule 105.3.1 Changing System Operating Modes in IDP Controlling Unit).

### 105.2.2 DP Brake Pipe Leakage Test Performed from LIII Controlling Unit

*References: ABTH 105.3.2.*

- The LEAKAGE TEST soft key is accessed from the system console display.
- The option to perform a leakage test is displayed only when the train is not moving and the automatic brake valve handle is in RELEASE or MINIMUM REDUCTION.

**Steps to Perform the Test**

1. Press the LEAKAGE TEST soft key.
2. Press the EXECUTE soft key.
3. When prompted by the system at the end of the test, move the brake valve handle to FULL SERVICE.
4. When the prompt changes to “RELEASE BRAKES to COMPLETE TEST,” do not release the train brakes until the inspection is complete.
   - The system will display the amount of brake pipe leakage in psi.
5. Change the system mode to RUN to enable power and dynamic brake functions. (See Rule 105.3.2 Changing System Operating Modes in LIII Controlling Unit).

## 105.3 Distributed Power System Operating Modes

After completing a Brake Pipe Continuity Test or a Brake Pipe Leakage Test in IDLE mode, change the system mode to RUN to enable the remote distributed power traction and dynamic brake functions.

### 105.3.1 Changing System Operating Modes on IDP Controlling Unit

1. Select DP MAIN MENU.
2. Select MODE.
3. Select RUN or IDLE.
   - The RUN or IDLE status appears in the upper left corner of the #2 or left ICE screen.
4. Press EXECUTE.

### 105.3.2 Changing System Operating Modes on LIII Controlling Unit

1. Select the MODE display.
2. Select RUN or IDLE.
   - The RUN or IDLE status appears in the upper right corner of the DP control console.
3. Press EXECUTE.

## 105.4 Brake Pipe Continuity Test

*References: ABTH 105.5.*

- When to perform:
  - Train is originally made up.
  - Train consist is changed, including changes made within a locomotive consist
- Features:
  - Accessed through a soft key (BP TEST or BRK PIPE TEST) on the DP system Main Menu when the automatic brake valve is in the RELEASE position.
  - Provides the ability to perform a DP Brake Pipe Continuity test whenever required.
  - Eliminates the need to unlink and repeat the initial conditioning procedures.
  - Saves time.
    - Examples: When power is pre-tested prior to placing in a train at origin or when a train consist is changed enroute.
- When the automatic brake valve is at a 10-psi reduction or greater, BRK PIPE TEST will not be available on the DP Setup display, and will be replaced with TRAIN CHECK (see Rule 105.5 Train Check).
- A DP Brake Pipe Continuity Test may be used instead of TRAIN CHECK if departure immediately follows completion of the test.

## 105.5 Train Check

The train check operating feature verifies that the brake pipe is open and unrestricted between the lead consist and the remote consist(s).

Perform the train check operation in the following instances:

- To secure a train to be left unattended, except when temperature is below 0°F.
  - When temperature is below 0°F, initiate Train Check just prior to departure.
- Just before movement anytime the train has been stopped or the train's brake pipe may have been compromised.

Train Check is not required:

- On descending grades where train handling techniques require automatic air brakes to remain applied when initiating movement.
- After building, conditioning, and performing air tests on train at origin, followed by immediate brake release and movement to depart.
- When required to stop very briefly for signal indications or line switches such as, entering or departing a yard track or siding followed by an immediate movement.

### 105.5.1 Performing Train Check from IDP or LIII Unit

- The conditions and procedure for this brake pipe system check are identical for both types of distributed power equipment.
- During extremely cold temperatures, do not initiate the train check until just before departure.

**Steps to Perform Train Check**

1. Ensure that the train is stopped.
2. Apply the train air brakes.
   - Make at least a 10-pound brake pipe reduction.
3. Wait until the brake pipe exhaust has ceased.
4. On the system display, select TRAIN CHECK.
5. Select EXECUTE.
6. Verify that the brake valves cut out on the remote consists by:
   - Checking the status of the remotes, or
   - Seeing the prompt appear to release the brakes.
7. Move the automatic brake handle to RELEASE when ready to depart.
   - The results of the Train Check will appear on the display as “PASS” or “FAIL”.
   - The check may take up to 2 minutes. During this time, the Locotrol system is expecting brake pipe pressure to increase on the remote consists.
     - If it does not detect this increase, if the increase comes up too slowly, or if communication is interrupted, the result will be a FAIL indication.
   - The train may be started while waiting for the Train Check result; however, the result must be “PASS” before:
     - Train speed exceeds 10 MPH.

       AND
     - Train movement exceeds the train’s length unless the entire train is visually inspected or the changing brake pipe pressure readings from the remotes or ETD indicate that the brake pipe is not obstructed.

## 105.5.2 Responding to Train Check Fail

*References: ABTH 105.5.1.*

The system will report a Train Check failure by:

- Showing “FAIL” on the screen.
- Sounding three chimes.

Causes of a Train Check failure could be:

- Brake pipe blockage.
- Excess brake pipe leakage.
- An interruption in communication between the lead and remotes.

Train Check or the Alternative Method for Determining Brake Pipe Continuity below must be successfully completed before allowing the train to proceed at maximum authorized speed.

**A. Second Attempt of Train Check**

If the train was started and is moving when the Train Check FAIL is received, stop the train and retry the train check. (See Rule 105.5.1 Performing Train Check from IDP or LIII Unit.

- If “PASS” is the result, proceed at maximum authorized speed.
- If another “FAIL” is the result, perform the Alternative Method for Determining Brake Pipe Continuity.

**B. Alternative Method for Determining Brake Pipe Continuity**

If there are no indications of communication interruptions between the remotes and/or the ETD and the lead unit, perform the alternative method:

1. Make a 10-psi brake pipe reduction with the automatic brake valve handle.
2. Cut out the brake valves on all remotes by placing each in BV OUT mode.
3. After confirming that all remote brake valves are cut out, return the remotes to NORMAL mode.
4. Move the automatic brake valve handle to RELEASE.
5. Using a remote DP at the rear of the train or an ETD, verify a brake pipe pressure increase of at least 5 psi at the rear of the train.
6. If any remote brake valves do not cut in with a brake pipe pressure increase of at least 4 psi, report that the remote DP unit is defective to the NOC Mechanical Help Desk.
7. If the brake pipe is unrestricted between the lead unit and the rear of the train, proceed at maximum authorized speed.
   - If brake pipe pressure does not increase or decrease in a normal amount of time, visually inspect the train. Correct and report any defects found.

**C. Communication Interruption During Train Check or Alternative Method**

If there are indications of a communication interruption between the remotes and/or ETD and the lead unit, perform these steps:

1. If needed and if movement can be made safely, proceed one train length at no more than 10 MPH to try to improve radio reception.
2. Successfully complete the Train Check or the Alternative Method before allowing the train to proceed at maximum authorized speed.

## 105.5.3 Securing Train Using Train Check

*References: ABTH 102.1, ABTH 102.1.1, ABTH 102.1.2, ABTH 104.14, ABTH 105.6.5.*

- Use train check when securing a distributed power train left unattended, except during extreme cold temperatures.
- If the temperature is below 0°F, make a 20-psi brake pipe reduction and leave the brake valves cut in on the lead and remote units.

**A. Securing a DP Train Kept Intact**

1. Secure the train with hand brakes as required in Rule 102.1.
2. Fully apply the locomotive brakes.
3. Make a 20-pound brake pipe reduction.
4. After the brake pipe exhaust stops, select TRAIN CHECK from the system display.
5. Select EXECUTE.
6. Wait until the brake valves are cut out on the remote consists.

**B. Securing a DP Train Not Kept Intact**

1. Secure what will be the detached portion as required by Rule 102.1.2 Securing an Unattended Train before Detaching Locomotives.
2. Use the SET OUT mode as outlined in Rule 105.6.5 Remote Mode SET OUT (S/O) on each remote consist that will not be attached to the head portion of the train (lead consist).
3. Leave the rear portion of the train standing in emergency and leave the angle cock open.
4. Use Train Check to condition the head portion of the train if it contains remote consists.
5. Secure the head portion of the train as required by Rule 102.1.1 Securing an Unattended Train or Portion of Train with Locomotive Attached.

TOC Home

## 105.6 Remote Operating Modes

The system mode and the individual remote modes determine how each remote unit responds to the commands from the lead unit for throttle, air brake conditions, and other operator inputs.

Use the REMOTE display on the lead locomotive to select limiting modes for the individual remote units. The remote modes are:

- NORMAL
  - All remote traction and dynamic brake functions are enabled for control.
  - All remote air brake functions are enabled, and the brake valve may be cut in.
- IDLE
  - The remote throttle remains in IDLE.
  - All remote air brake functions are enabled, and the brake valve may be cut in.
- BV OUT
  - All remote traction and dynamic brake functions are enabled for control.
  - The emergency and independent air brake functions are enabled for control.
  - The remote automatic air brake functions are restricted by cutting out the brake valve.
- ISOLATE
  - The remote throttle does not respond to commands and remains in IDLE.
  - The remote’s emergency air brake application function and independent brake functions are enabled for control.
  - All other brake functions are disabled, and the brake valve is cut out.
- SET OUT (S/O)
  - The remote throttle does not respond to commands and remains in IDLE.
  - The remote’s emergency brake application is enabled for control.
  - The independent brakes are fully applied (72 psi).
  - All other air brake functions are disabled, and the brake valve is cut out.
- STOP
  - The remote’s throttle is set to ENGINE STOP (train-line stop).
  - All other remote functions are in ISOLATE.
  - These modes may be selected from the REMOTE display.

## 105.6.1 Remote Mode NORMAL

*References: ABTH 105.6.5.*

When the distributed power system is linked and the brake pipe leakage test is complete, the remote consists are in NORMAL.

**A. Returning a Remote Consist to NORMAL Mode**

Exception: See Rule 105.6.5 Remote Mode SET OUT (S/O) for instructions to return to NORMAL from SET OUT mode.

If a remote is in other than SETOUT mode, return it to NORMAL as follows:

1. Select NORMAL from the remote display.
   - Units in STOP must be placed into ISOLATE to be restarted and then may be returned to NORMAL.
2. After changing the remote consist to NORMAL, you may cut in the automatic brake valve.
   - A change to NORMAL can be made while the train is moving or stopped.

**B. Cutting In the Automatic Brake Valve on a Remote**

To cut in an automatic brake valve on a remote unit that is in NORMAL or IDLE:

1. Make at a minimum a 10-psi brake pipe reduction with the automatic brake valve.
2. Wait for the brake pipe exhaust to stop.
3. Move the automatic brake valve handle to RELEASE.

With the lead unit's automatic brake valve handle in RELEASE, the remote's brake valve will cut in when its brake pipe pressure increases at least 4 psi.

## 105.6.2 Remote Mode IDLE

- IDLE mode allows the remote consist to use all air brake functions, but disables all power or dynamic braking.
- This mode can be changed while the train is moving or stopped.
- If the mode is changed while moving, care must be taken to ensure that slack adjustment is not affected by loss of power or dynamic brakes.

## 105.6.3 Remote Mode BV OUT

*References: ABTH 105.5.2 (B), ABTH 105.8.2.*

- The BV (brake valve) OUT mode can be used when troubleshooting air brake problems and when making a brake pipe continuity check as outlined in Rule 105.5.2 (B).
- A remote consist operated in BV OUT mode will not continue to operate in power or with dynamic brakes (no override) following a communication interruption of 45 seconds or more (see Rule 105.8.2 Remote Unit Communication Interruption).

To cut in an automatic brake valve on a remote unit that is in NORMAL or IDLE:

1. Make at a minimum a 10-psi brake pipe reduction with the automatic brake valve.
2. Wait for the brake pipe exhaust to stop.
3. Move the automatic brake valve handle to RELEASE.
   - With the lead unit automatic brake valve handle in RELEASE, the remote unit's brake valve will cut in when its brake pipe pressure increases at least 4 psi.
   - BV OUT mode may be changed while the train is moving or stopped.

## 105.6.4 Remote Mode ISOLATE

*References: ABTH 105.8.2.*

- The remote's mode changes to ISOLATE when a communication loss idle down has occurred (see Rule 105.8.2 Remote Unit Communication Interruption).
- ISOLATE mode can be changed while the train is moving or stopped.

## 105.6.5 Remote Mode SET OUT (S/O)

*Reference; ABTH 100.16.*

- SET OUT mode is used to condition and help secure a remote consist left standing uncoupled from the front portion of a train operating in distributed power.
- S/O mode must only be changed when the train is stopped.

**A. Separating from Remote Consist to be Left Standing**

To separate the remote consist from the train:

1. Stop the train.
2. Fully apply the independent brakes.
3. Make a 20-psi brake pipe reduction.

   When instructed to prepare the train for an inbound inspection, comply with Rule 100.16 Inbound Train Inspection and place the automatic brake valve handle in the HANDLE OFF/ CONTINUOUS SERVICE position to reduce brake pipe to near 0 psi.
4. From the REMOTE display:
   a. Use the cursor to select the remote consist to be left standing.
   b. Select S/O.
   c. Select EXECUTE.
   d. Wait for the status to change to S/O.
   e. Repeat steps 4a through 4d for each remote consist to be left standing.
5. Close the angle cock on the last car of the head portion of the train to be moved.
6. Separate the train when ready.
   a. Leave the angle cock OPEN on the detached portion of the train.

   Exception: If lead and remote unit(s) are equipped with LXA the brake valve will remain Cut In and the angle cock will need to be CLOSED.

   b. Ensure that the detached portion of the train goes into emergency.

   Exception: If lead and remote unit(s) are equipped with LXA the consist will not go into emergency. It will maintain brake pipe pressure at time of separation.

**B. Returning Remotes to NORMAL After Recoupling Train**

To return the remotes to NORMAL after using the SET OUT mode to separate the train:

1. Recouple and secure the train.
2. Do not open the angle cock to recharge the rear portion of the train at this time.
3. Make a 20 psi brake pipe reduction.
4. From the remote display:
   a. Select the remote consist to be returned to NORMAL.
   b. Select NORMAL and then EXECUTE.
   c. Ensure that the remote consist status changes from S/O to NORMAL before continuing.
   d. Repeat Steps 4a through 4c for each remote consist recoupled.
5. Open the angle cock.
6. Place the automatic brake valve handle in RELEASE.
   - After a PCS open condition has occurred on remote consists, the following conditions are required before tractive effort will be available:
     • PCS on remotes has reset.
     • Automatic brake valve on remotes has cut in.
     • A minimum brake pipe pressure of 25 psi has been restored on the remote consists.

## 105.6.6 Remote Mode STOP

Use STOP mode to shut down units in a consist only if an emergency condition exists from a:

- Heavy impact.
- Fire.
- Hazardous material leak.
- Stop in a tunnel.

Execute STOP mode to shut down all units in a selected remote consist as follows:

1. Select the remote consist to be shut down from the remote display.
2. Select STOP and then EXECUTE.

To restart a selected remote consist:

1. Select the remote consist to be restarted.
2. Select ISOLATE and then EXECUTE.
3. Restart each unit in the remote consist. Restarting cannot be done remotely.
4. When ready for remote consists to cut in the automatic brake valve with a minimum 4-psi rise in brake pipe pressure and provide tractive effort, select NORMAL and then EXECUTE.

## 105.7 Unlinking from Remote Consists (Ending DP Operation)

1. Stop and secure the train.
2. End DP on the lead consist.
3. Follow the appropriate procedure below to unlink an IDP (105.7.1) or LIII (105.7.2) lead unit.

### 105.7.1 Unlinking IDP Lead Unit from Remote Consists

1. Stop the train.
2. Fully apply the independent brake.
3. Place the throttle in IDLE.
4. Make a 20-psi automatic brake pipe reduction.
5. From the DP Main Menu:
   a. Select the SYSTEM DISPLAY key.
   b. Press the END DIST PWR key followed by the EXECUTE key.
      - A penalty brake application will reduce brake pipe pressure to 15 psi.
6. Wait for:
   - Brake pipe exhaust to stop.
   - DP backup emergency valve to drop the brake pipe pressure rapidly to 0 psi.
     - Exception: Locotrol LEB IDP lead unit does not perform DP backup emergency valve test. To return to conventional operation, recover penalty application and end DP.

You may now operate the lead consist using normal operating procedures. Be sure to condition remote units for normal operation.

Note:

- Some foreign locomotives with DP equipment unlink with an immediate emergency application and no penalty application.
- End distributed power on these units after the emergency application.
- On UP IDP locomotives, the END DIST POWER key should appear after backup emergency valve check without returning to DP main menu.

### 105.7.2 Unlinking LIII Lead Unit from Remote Consists

1. Stop the train.
2. Fully apply the independent brake.
3. Place the throttle in IDLE.
4. Make a 20-psi automatic brake pipe reduction.
5. From the system display, select UNLK and then EXECUTE.
   - A penalty brake application will reduce brake pipe pressure to approximately 9 psi.
   - UP LIII systems will initiate an emergency application.
6. Wait for:
   - Brake pipe exhaust to stop.
   - DP backup emergency valve to drop the brake pipe pressure rapidly to 0 psi.
7. Turn OFF the DP breaker located on the engine control panel.
8. At the DP setup module in the nose of the unit:
   a. Set thumb wheels to 0000.
   b. Turn OFF the three circuit breakers on the DP switch panel labeled ELEC, RELAY, and RADIO.
9. Follow the instructions in the air brake message block to recover the locomotive brakes.

You may now operate the lead consist using normal operating procedures. Be sure to condition remote units for normal operation.

Note:

- Some foreign locomotives with LIII equipment unlink with an immediate emergency application and no penalty application.
- End distributed power on these units after the emergency application.

### 105.7.3 Ending Distributed Power on Remote IDP Units

End distributed power on each remote IDP unit only after it has been unlinked from the lead unit.

On the remote unit:

1. Select the DISTRIBUTED POWER key.
2. Select END DISTRIBUTED POWER.
3. Turn the DATA RADIO circuit breaker (or DP and TIM breakers) OFF.

Condition the locomotive brakes for normal operation.

### 105.7.4 Ending Distributed Power on Remote LIII Units

End distributed power on each remote LIII unit only after it has been unlinked from the lead unit.

On the remote unit:

1. Turn OFF the DP breaker located on the engine control panel.
2. At the DP setup module located in the nose of the unit, set the thumb wheels to 0000.
3. Turn OFF the three circuit breakers on the DP switch panel labeled ELEC, RELAY, and RADIO.

Note: You may need to save and confirm LEAD CUT OUT before changing the air brake system to the desired operation.

## 105.8 Special Operating Conditions

This section describes special operating conditions and procedures for:

- Lead/remote communication interruption.
- Communication loss override.
- Adding or removing units while linked.
- Handling remote consists with brake pipe only.
- Restarting the diesel engine of a lead or remote unit.
- Alarm warning from remote unit.
- Loss of rear DP remotes.

Every few seconds, the distributed power system checks the radio and onboard computer communication on the lead and remote units. If a communication check fails, the system will:

- Attempt to operate the lead and remote backup radios.
- Declare a communication interruption at the lead and at the remote unit.

### 105.8.1 Lead Unit Communication Interruption

If a lead unit fails to receive an expected reply from a remote unit:

- IDP: A yellow COMM light will come on.
- LIII: The COMM light will flash.

The lead unit will declare a communication interruption:

- If no reply is received from a remote unit in 45 seconds, or
- In 10 seconds if an automatic brake application is made.

The following will occur when a communication interruption is declared:

- IDP: Lead unit will sound 2 chimes and COMM light will continue to remain yellow.
- LIII: The COMM light will be constantly lit (no flashing).
- On both units, a double chime alarm will sound.

Note: The status displayed for the remote consists will not change during the COMM interruption and will continue to indicate the remote status at the time of the failure.

## 105.8.2 Remote Unit Communication Interruption

*References: ABTH 105.6.1, ABTH 105.6.3.*

When radio communication is interrupted, the last throttle command and brake pipe pressure being maintained by the DP remotes remain in effect.

One of the following is necessary to signal the remotes:

- A 20-psi brake pipe initial reduction (with no split in the reduction).
- A 20-psi greater reduction (if brakes were already applied before the communication interruption occurred).

**WARNING:** If the brake system is not fully charged at the time of a communication interruption, make a brake pipe reduction (with no split in the reduction) sufficient to reduce brake pipe pressure at least 10 psi below the last brake pipe reduction.

If a radio communication has been interrupted, and no changes occur in brake pipe pressure, each remote consist:

- Will continue to operate on the last throttle and air brake commands received via the radio for up to 90 minutes.
- At the end of the 90-minute override (if radio communication has not been re-established), will drop the throttle to idle at a rate of 3 seconds per throttle position, and the automatic brake valve will cut out.

When in dynamic braking, the remote locomotive consist(s) will maintain the current dynamic brake level during a communication loss idle-down.

In addition to maintaining the dynamic brake level, each remote locomotive consist shall go to throttle IDLE when the consist stops moving. This will allow the train to be pulled out of a communication loss situation without the remote consist applying dynamic braking.

Note: During a communication interruption:

- The remote consist's brake valve must be cut in to allow it to operate in override.
- Operating a DP train without the remote consist's brake valve cut in should be avoided, if possible, as it may result in an immediate undesired idle down.
- Any undesired loss of power on remote consists while under heavy load, such as when operating on ascending grade, may result in a severe run-out of slack and train separation.

**A. Remote Unit Senses Brake Application or Release Without Command**

If a remote unit senses a brake application or release via the brake pipe without receiving a radio command to reduce brake pipe pressure or to release the brakes, the unit will try to check with the lead unit via radio:

1. If no response is received, the unit will:
   a. Step the throttle or dynamic brake to IDLE at 3 seconds per step.
   b. Cut out the brake valve on the remote.
   c. Limit to an ISOLATE mode.
2. If a communication interruption (45 seconds) is declared while the brake valve is cut out, the unit will:
   a. Step the throttle or dynamic brake to IDLE at 3 seconds per step.
   b. Limit to an ISOLATE Mode.

Note: The engineer uses the brake pipe as a backup communication tool to eliminate tractive effort or dynamic braking. As a result:

- Ensure that the brake pipe is unobstructed between the lead unit and remote units.
- Always use Train Check just before moving:
  - After being stopped for any length of time.
  - Anytime the brake pipe may have been tampered with.

**B. Radio Communication**

When radio communication is reestablished, at the lead unit:

1. Return the remote to NORMAL mode as outlined in Rule 105.6.1 Remote Mode NORMAL.
   - This will restore the throttle and dynamic brake functions.
2. Cut in the automatic brake valve as outlined in Rule 105.6.3 Remote Mode BV OUT.

## 105.8.3 Operation during Loss of Communication

*References: ABTH 102.13.*

During a communication interruption between the lead and remotes, keep the train moving, if possible, to a location where communication might improve.

When Rule 102.13 Emergency Application Capability from Rear of Train is applied (while using a remote DP unit at the rear of the train without a two-way ETD), a communication interruption that exceeds 5 minutes should be considered an enroute failure.

## 105.8.4 Adding or Removing Units in Lead or Remote Consist While Linked

*References: ABTH 101.6, ABTH 105.7*

**A. Controlling Locomotives**

Locomotives may be added or removed from the lead or remote consist while linked except the controlling locomotive of each consist. If it is necessary to change out the controlling locomotive of a remote or lead consist:

1. Unlink the distributed power. See Rule 105.7 Unlinking from Remote Consists (Ending DP Operation).
2. Properly condition the new controlling locomotive and link it to the other consists in the train.

**B. Trailing Locomotives**

Trailing locomotives may be added or removed while the train is stopped and linked. When adding or removing locomotives, except when removing the rear locomotives of the consist, perform Rule 101.6 Locomotive Air Brake Test.

- The air brake test may be performed on the remote consist by the engineer operating from the lead consist.
  - Crew members or mechanical forces must observe from the ground that the locomotive brakes apply and release on the consist that has been changed.
- Do not operate (move) remote consists from the lead consist unless the brake pipe between them is connected and open.

## 105.8.5 Handling Remote Consists with Brake Pipe Only

DP remote consists that have been conditioned for service may then be handled like a freight car (using brake pipe pressure to apply and release the brakes) under either of these conditions:

**A. Remote Consist is Unlinked**

1. Stop any movement.
2. Unlink remote consist to be moved.
3. Wait a minimum of one minute.
4. Couple remote consist to brake pipe of the same lead controlling DP unit or any other locomotive.
5. Perform set and release to verify air brake control using only the brake pipe.

**B. Remote Consist Communication Interruption**

(To be used when DP is disabled due to communication loss).

1. Confirm that communications loss with remote is continuous.
2. Make an emergency application of the brakes (unless train already has an emergency application in effect).
3. Wait a minimum of one minute.
4. Release train brakes and confirm brakes release on remote consist.
5. Perform a set and release of the train brakes to verify brake control using only the brake pipe.

   Exception: If physical characteristics of the location prevent reaching the remote consist to perform brake test as per Step 5, the train may be moved, but may not exceed 5 MPH for the distance necessary to perform the test.

Notes:

- Under all other conditions, DP systems do not allow another train or engine to move the remote units while linked in distributed power operation.
- If remote units must be moved or switched when not coupled to the same portion of the train to which the lead unit is attached, the remote units should be unlinked and conditioned for normal operation.

## 105.8.6 Restarting Diesel Engine or Lead or Remote Unit

- Do not attempt to restart or crank a lead or remote unit operating in distributed power while the train is moving.
- It may be necessary to re-link the distributed power system after restarting the units.

## 105.8.7 Alarm Warning from a Remote Unit

- Alarms in the lead DP display are triggered by a trainline alarm from the remote consist.
  - The defect may be on any unit in that consist.
- For a wheel slip alarm that is continuous (alarm stays highlighted on display and audible alarm is continuous), the train must be stopped immediately and the cause must be determined.
  - A rolling inspection of the remote consists involved is required before proceeding.
- All other alarms must be investigated at the first opportunity.

### 105.8.8 Loss of Rear DP Remote Units

If a single remote unit or the entire remote consist at the rear of a train shuts down or loses air compressor functionality and still maintains the DP link, the train may continue to the closest point of repair. Follow these steps:

1. Crew must notify dispatcher and NOC Mechanical Help Desk of situation.
2. DP system must remain linked during any movement.
   - If the rear DP remote unit becomes unlinked or a communication interruption is declared:
     - Stop the train.
     - Place the train into conventional mode.
     - Condition the rear DP units for dead-in-tow.
     - Contact the NOC Mechanical Help Desk for further instructions.
3. Cut out the brake valve on the rear remote DP unit by placing in BV OUT mode.
4. Using the DP main screen (not the combined), engineer must continuously monitor rear DP remote unit main reservoir and brake cylinder pressures.
   - If main reservoir pressure drops below 50 psi:
     - Stop the train.
     - Contact dispatcher and NOC Mechanical Help Desk for further instructions.
   - If main reservoir pressure remains above 50 psi:
     - Continue only to a location where repairs can be made or train can be placed into conventional mode.

## 105.9 Using Remote DP Unit as ETD

Remotely controlled equipment may be used as a two-way ETD when a remote consist is placed at the rear of the train.

### 105.9.1 Providing Alternative Marker

*Reference: GCOR 5.10.2.*

When a remote DP locomotive consist is at the rear of a train and no ETD is being used, provide an alternative marker using one of these methods:

1. Plug an operative locomotive marker into the MU receptacle at the rear of the new locomotive. (The marker will flash constantly after being plugged in), or
2. Place the headlight at the rear of the rear locomotive on dim.

Note: If either the headlight or locomotive marker fails enroute, comply with GCOR Rule 5.10.2.

# 105.10 Distributed Power Train Handling

The following train handling rules can be applied to both types of equipment (IDP/LIII) and are intended to be generic. The train handling techniques are the same for both types of equipment even though the steps and indications may vary.

**A. Cautions**

- Remote units always have the generator field circuit energized regardless of the position of the generator field switch of the lead unit.
- The reverser on the lead unit must be centered while the train is standing, until the train is ready to move.
- Before initially moving a distributed power train after linking, ensure that the SAME/OPPOSITE switch is in the proper position by starting the train with power from only a remote consist (if possible).

**B. Synchronous Mode (Front Group)**

- After a distributed power train has been conditioned and placed in RUN mode, the system is:
  - Configured with all remote units in the front group (synchronous mode).
  - Controlled from the lead unit's throttle.
- If possible, operate with all remote units in the front group (synchronous mode) when the train is running on:
  - Near-level or gentle undulating grades.
  - Continuous descending or ascending grades without severe undulation.

**C. Independent Control (Back Group)**

- Operate with all remote units in the back group (independent control) when the train is:
  - Running on severely undulating grades.
  - Cresting a grade.
- Use the independent control function only when the train is operating in RUN mode.
- Control the independent operation for remote consists using function keys displayed on the Summary screen.
  - Only the consists displayed in the back group will respond to throttle and dynamic brake commands initiated from the Summary screen.
  - Consists in the front group respond to throttle and dynamic brake commands from the lead unit controller.
- If a train is running on undulating terrain, improve train handling or slack action by operating the remote consists at a power setting different from the front portion of the train.

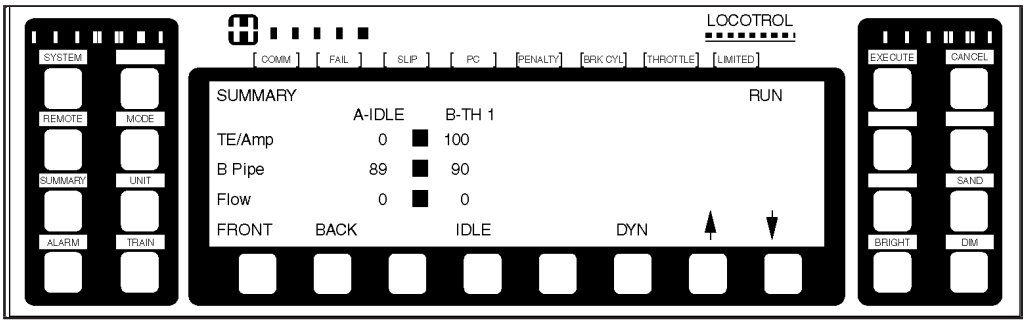
  To do this:
  - Move the remote consists into the back group.

    AND
  - Provide independent control of the throttle or dynamic braking by pressing the BACK soft key on the Summary screen.

### D. Summary Screen

- On the Summary screen, a fence (bar) separates the front and back consists.
  - All consists to the right of the fence are in the back group.
  - All consists to the left of the fence are in the front group.
  - To reassign a remote consist from the front group to the back group, press the BACK soft key.
  - To reassign a remote unit from the back group to the front group, press the FRONT soft key.

*LIII Console (Summary screen) Shown With Remote Consist in Back Group Throttle 1*




- To control the throttle or braking of the units in the front group, use the lead unit throttle controller.
- If rear remote consists are operating in power or dynamic braking (synchronous) when moved to the back group, they will remain at that power setting until changed using the soft keys on the Summary screen.
- If the rear remote consists are in IDLE when moved to the back group, it is necessary to select THROTTLE/TRACTION or DYN/BRAKE, and to execute the command to take independent control of the back group. Once executed, the throttle or dynamic brake will move to Position 1.
- Control the remote consists in the back group as follows:
  - From an IDP lead unit, press more or less TRACTION/BRAKING.
  - From a LIII lead unit, press the up or down arrows for more or less THL or DYN.
- The Summary screen continuously displays both the front and back throttle positions.
  - A remote unit moved to a new group will immediately begin changing throttle or dynamic brake positions to match its new group assignment.

### E. Reassigning Remote DP Units to Front Group When in Different Modes

When reassigning units from the back group to the front group while the front group is in DYNAMIC BRAKE mode, the back group is in THROTTLE mode, and the reverser is in the forward direction:

1. Press the FRONT soft key to initiate the back-to-front transition. The following occurs:
   a. The selected remote steps down in throttle at 3 seconds per step. When it reaches IDLE, it pauses.
   b. The Summary screen indicates that the front group is in DYNAMIC BRAKE mode, the selected remote is in IDLE, and the back group is in THROTTLE mode.
2. When additional braking in the front group is required as more of the train crests the grade, press the FRONT soft key again. The following occurs:
   a. The remote configures for dynamic braking and advances at 3 seconds per step to match the lead unit.
   b. The Summary screen indicates that the selected remote is operating in DYNAMIC BRAKING mode.

Note: Having the front group in THROTTLE mode and the back group in DYNAMIC BRAKE mode is an invalid condition, unless the front group's reverser switch is in the reverse setting. Then, the sequences in Steps 1 and 2 apply.

## 105.10.1 Starting

**A. Level or Ascending Grade Less Than 1%**

**Starting with Remote Units in Front Group**

To start a train with all DP remote units in the front group (synchronous mode), use conventional train handling methods in most cases.

**Starting with Remote Units in Back Group (Independent Control)**

Note: When using this method to start a train with a single remote DP unit, verify that the SAME/OPPOSITE switch is properly positioned.

1. Place the desired number of remotes in the back group.
2. Move the automatic brake valve handle to RELEASE and use the independent brake valve handle to reduce brake cylinder pressure to near 0 psi.
   - The brake cylinder pressure is the same on all DP consists and should be reduced according to grade conditions, train makeup, and number of units in each consist.
3. Apply sand if conditions warrant.
4. Press the THL or TRACTION soft key and ensure that “TH 1” is displayed for the remotes in the back group.
5. Ensure that the train moves as soon as possible to prevent traction motor stall burns.
6. If THL 1 does not close the slack and start the train, advance the control selector switch slowly, one position at a time.
7. While observing the ground to judge speed and slack control, slowly release brake cylinder pressure using the independent brake valve handle.
   - Be careful to prevent run-out of the head portion of the train.
8. Advance the lead’s throttle and control selector switch one position at a time.
   - During acceleration, limit remotes in the back group one or two notches above the front group.

**B. Ascending Grade of 1% Percent or More**

Starting a Train in Independent Control:

1. Place all remotes in the back group.
2. Release the independent brake to the desired amount (as determined by the grade condition and locomotive consist).
3. Apply sand as conditions warrant.
4. Press the THL or TRACTION soft key and ensure that “TH 1” is displayed for the remotes.
5. Advance THL or TRACTION one position at a time until enough power is developed to prevent the rear of the train from rolling back.
6. Release the train’s automatic brakes.
7. Advance the lead’s throttle and the remotes’ throttle one position at a time to start the train as the brakes release.
   - Ensure that the train moves as soon as possible to prevent traction motor stall burns.

### C. Undulating Grade

Starting a Train on Grades that Require Continued Braking:

1. Place the desired number of remotes in the back group during the ascending grade.
2. Place the lead consist (front group) in full dynamic braking before starting.
3. Reduce the independent brake cylinder pressure to the desired amount and release the automatic brake.
   - On severely undulating territory, leave the train brakes applied until the remotes in the back group develop enough tractive effort to prevent a rollback.
4. Apply sand as conditions warrant.
5. Press the THL or TRACTION soft key and ensure that “TH 1” is displayed for the remotes in the back group.
6. If Position 1 does not close slack and start the train, advance the throttle slowly, one position at a time, to close the slack and start the train.
7. Control brake cylinder pressure with the independent brake valve to prevent the wheels from sliding and the train slack from running out.
   - Do this until the train reaches a speed where the dynamic brake would be effective.
   - Then, move the independent brake valve handle to RELEASE.
   - Ensure that the train moves as soon as possible to prevent traction motor stall burns.

### D. Cresting Grade

1. Prior to reaching the crest, place all remote consists in the back group.
2. As the lead consist crests the grade, reduce the throttle and maintain a constant speed until at least one half the train has passed the crest.
3. If continuing on a descending grade and braking is required, apply dynamic braking to the lead DP consist.
4. As the remote consists reaches the crest, the throttle on the remote consists must be reduced:
   - To no greater than three notches above the THL position of the lead consist, or
   - If lead consist is in dynamic brake mode.

**E. Descending Grade of 1% or More**

1. Place all remotes in the front group.
2. Place the lead consist in maximum dynamic brake.
3. Release the automatic brakes and slowly reduce the independent brake cylinder pressure to allow gravity to start the train.
4. Apply sand as conditions warrant.
5. Control brake cylinder pressure with the independent brake valve handle to prevent the wheels from sliding and the train slack from running out.
   - Do this until the train reaches a speed where the dynamic brake would be effective.
   - Then, move the independent brake valve handle to RELEASE.
6. When the dynamic brake is in maximum and the train speed cannot be maintained within the prescribed limits, use the train air brakes to supplement the dynamic brake to maintain a uniform speed.

## 105.10.2 Slowing or Controlling Speed and Slack

When possible, use the dynamic brake to control or reduce train speed.

To slow or control speed on level or light undulating territory with all DP remote units in the front group (synchronous mode), use conventional train handling methods.

To slow or control speed and slack in severely undulating territories, use independent control (remotes in back group):

1. Slowly reduce power on the lead consist and remotes by limiting the remotes to one or two notches above the lead, until the lead is in IDLE or dynamic brake.
2. Apply the dynamic brake on the lead consist to regulate speed and allow the slack to adjust gently:
   a. Control the speed by varying the dynamic braking effort on the lead consist.
   b. Apply power on the remotes to keep the slack closed between them and the lead.
   c. If the maximum dynamic brake on the lead consist cannot control the speed, slowly reduce the remotes' THL or TRACTION to IDL, and wait 10 seconds.
3. Select DB and confirm that "DB 1" is displayed.
4. Slowly increase dynamic braking on the remotes to the desired braking effort.
5. Place the lead consist's dynamic brake in MAXIMUM and control the speed by varying the dynamic braking effort on the remotes. If grade conditions prevent the lead and remotes from controlling speed with the maximum dynamic brake:
   a. Actuate the independent brake valve to prevent brake cylinder pressure from developing on all consists. Move the automatic brake valve handle to MINIMUM.
   b. Make additional reductions as necessary to maintain or reduce train speed. Allow enough time between reductions for the slack to adjust.
   c. Actuate to prevent brake cylinder pressure from developing on all consists from each brake pipe reduction.
6. When releasing the train brakes, ensure that the dynamic brake on the lead consist is in MAXIMUM. Then, release the train brakes. After the train brakes are released, you may again manipulate the dynamic brake on the remotes to control speed.
   - Never apply the dynamic brake on the lead consist to a lesser degree than the dynamic brake on the remotes.

## 105.10.3 Stopping

### A. Level or Descending Grade Less than 1%

**Remote Units in the Front Group**

To stop on level or light grade with all DP remote units in the front group (synchronous mode), use conventional train handling methods.

**Remote Units in the Back Group**

To stop a train operating in independent control:

1. Slowly reduce power on the lead consist and remotes by limiting the remotes to one or two notches above the lead until lead is in IDLE or dynamic brake.
2. Apply the dynamic brake on the lead consist, allow the slack to adjust gently, then slowly increase to maximum dynamic braking effort.
3. Slowly reduce the remotes to IDLE using the control console and wait 10 seconds.
4. Select DB or BRAKE for the back group and slowly increase to maximum braking effort.
5. Actuate the independent brake and move the automatic brake valve handle to MINIMUM.
6. Make additional brake pipe reductions using the automatic brake valve handle to complete the stop at the desired point.
7. Allow time between brake pipe reductions for the slack to adjust.
8. Actuate to prevent brake cylinder pressure from developing on all consists from each brake pipe reduction.
9. As dynamic braking becomes ineffective near the stopping point, turn on the sand and develop enough brake cylinder pressure with the independent brake valve to prevent forward surge.
10. Make a final brake pipe reduction to complete the stop with the service exhaust blowing at the stopping point.
11. After stopping, move the dynamic brake controller to OFF and reduce the remotes' DB to IDLE.
12. Fully apply the independent brakes and turn off the sand after the stop is completed.

### B. Descending Grade of 1% or More

#### Remote Units in the Front Group

To stop on a descending grade of 1% or more with all remotes in the front group, use conventional train handling methods. However, use independent control if desired.

#### Remote Units in the Back Group

To stop a train operating in independent control when the dynamic brake is being supplemented by automatic brake applications to control speed:

1. Make additional brake pipe reductions using the automatic brake valve handle to stop at the desired point.
2. Allow time between reductions for the slack to adjust.
3. Actuate to prevent brake cylinder pressure from developing on all consists from each brake pipe reduction.
4. When the dynamic brake effort required is less than maximum, reduce the dynamic brake on the remotes before reducing the dynamic brake effort on the front group.
5. As dynamic braking becomes ineffective near the stopping point, turn on the sand and develop enough brake cylinder pressure with the independent brake valve to prevent forward surge.
6. Move the dynamic brake controller to OFF.
7. Make a final brake pipe reduction to complete the stop with the service exhaust blowing at the stopping point.
8. When the train is stopped, fully apply the independent brakes and turn off the sand.

To stop a train operating in independent control when the dynamic brake is controlling speed and the train brakes are needed to stop the train at the desired location:

1. Actuate the independent brake valve to prevent brake cylinder pressure from developing on all consists. Move the automatic brake valve handle to MINIMUM.
2. Make additional brake pipe reductions using the automatic brake valve handle to stop at the desired point.
3. Allow time between reductions for the slack to adjust.
4. Actuate to prevent brake cylinder pressure from developing on all consists from each brake pipe reduction.
5. When the dynamic brake effort required is less than maximum, reduce the dynamic brake on the remotes before reducing the dynamic brake effort on the front group. If operating in power on remote, limit throttle to Run 3 while in dynamic brake on front group.
6. As dynamic braking becomes ineffective near the stopping point, turn on the sand and develop enough brake cylinder pressure with the independent brake valve to prevent forward surge.
7. Move the dynamic brake controller to OFF.
8. Make a final brake pipe reduction to complete the stop with the service exhaust blowing at the stopping point.
9. When the train is stopped, fully apply the independent brakes and turn off the sand.

### 105.10.4 Penalty Brake Application

If a penalty brake application occurs during distributed power operation:

1. Control the lead consist's brake cylinder pressure to prevent excessive buff or draft forces.
   - The remote consists' brake cylinder pressure is automatically regulated to maintain 45 psi during a penalty brake application and cannot be controlled by the lead unit.
2. Move the automatic brake valve handle to SUPPRESSION.
3. Place the lead and remote throttles in IDLE.
   - If in dynamic braking and it is desired to maintain retarding force, DB holding will maintain remote dynamic braking as commanded by a lead.
     - Remote DB holding is only applicable during penalties or emergencies.
     - In synchronous operation, the lead DP unit will continue commanding the remote consist(s) to the same DB level as the lead locomotive.
     - In independent operation, the lead unit will continue commanding the remote unit to the current independent DB setting.
     - During a radio communication loss while experiencing a penalty braking event, a remote unit will maintain its current dynamic brake setting. During the communication loss, if the loco speed reduces to 0, the throttle will reduce to IDLE.
4. All penalty brake applications require stopping before releasing when involving DP equipment.
   - After the PCS has reset on the lead and remote units (approximately 2 minutes), move the automatic brake valve handle to RELEASE.
   - The remote brake valve will cut in and begin charging the brake pipe after sensing a brake pipe pressure increase.

### 105.10.5 Emergency Brake Application

If an emergency exists or an emergency brake application occurs during distributed power operation:

1. Move the automatic brake valve handle to EMERGENCY.
2. Control the lead consist's brake cylinder pressure to prevent excessive buff or draft forces.
   - The remote consists' brake cylinder pressure is automatically regulated to maintain 45 psi during an emergency brake application and cannot be controlled by the lead unit.
3. Place the lead and remote throttles in IDLE.
   - If in dynamic braking and it is desired to maintain retarding force, DB holding will maintain remote dynamic braking as commanded by a lead.
     - Remote DB holding is only applicable during penalties or emergencies.
     - In synchronous operation, the lead DP unit will continue commanding the remote consist(s) to the same DB level as the lead locomotive.
     - In independent operation, the lead unit will continue commanding the remote unit to the current independent DB setting.
     - During a radio communication loss while experiencing an emergency braking event, a remote unit will maintain its current dynamic brake setting. During the communication loss, if the loco speed reduces to 0, the throttle will reduce to IDLE.
4. After the train has stopped and the PCS has reset on the lead unit (approximately 1 minute), move the automatic brake valve handle to RELEASE.
   - The remote brake valve will cut in and begin charging the brake pipe after sensing a brake pipe pressure increase.

This page left blank intentionally.

# 106.0 Fuel Conservation

- To accomplish maximum fuel efficiency, use the most efficient method consistent with good train handling.
- Unless other local isolate/shut down instructions apply, locomotives of the following type must be the first locomotives isolated or shut down when meeting maximum tractive horsepower-per-ton guidelines:
  - SW 10
  - SW 12
  - SW 15
  - MP 15
  - SD 9
- These locomotives are the least fuel-efficient types and may be prone to produce sparks and become a fire hazard.
- If they must be placed online enroute, contact the NOC Mechanical Help Desk or dispatcher for authorization.
- When utilized, employees must watch these locomotives closely and isolate or shut them down if spark emissions are detected.

# 106.1 Regulating Tractive Horsepower per Ton (THPT)

*References: ABTH 103.2.1, SSI 47(A).*

**A. Train Profile Instructions**

- Isolation:
  - Locomotives must be isolated or shut down according to the outbound (OB) locomotive isolation instructions provided on the current Train Profile.

    Note: Z trains may be instructed by the NOC Remote OPS Desk to place additional locomotives online. These changes must be reported via VTR or MTR.
- Voice Train Reporting (VTR).
- Mobile Train Reporting (MTR).
  - Any locomotive operational status inaccuracies shown in the Outbound Isolation Status column on the current Train Profile must be reported via VTR or MTR.
  - Any changes to locomotive consists made enroute must also be reported via VTR or MTR.
- Dynamic Brake Only Mode:
  - Dynamic Brake (DB) Only mode may be utilized to maintain maximum dynamic braking capability while complying with isolation instructions for fuel conservation.
  - Refer to Rule 103.2.1 Dynamic Brake Limitations.
  - When utilizing DB Only mode and the Train Profile indicates the locomotive is isolated, VTR/MTR reporting is not required.

**B. Train Profile Instructions Unavailable/Unknown**

- When outbound isolation instructions are unknown or the Train List or Profile does not indicate scheduled THPT, consider 1.5 THPT (or minimum required THPT for territory if specified) and isolate or shut down locomotives to get as close to without going below.
  - Exceptions:
    - On DP trains, excluding empty bulk commodity unit trains, isolate excess trailing units within the lead consist only. Refer to maximum rated powered axels (RPA) restrictions and RPA differential limitations between lead and remote consists as described in SSI 47(A).
    - Locomotives not equipped with DB Only mode are not required to be isolated or shutdown if the locomotive consist will exceed 400 tons per operative dynamic brake axle.
- Under the above conditions, any change to a locomotive's isolation status must be reported via VTR or MTR.
- Phone numbers for VTR registration and LIR use:
  - 817-593-7670
  - 800-327-2330
  - 8-593-7670

## 106.2 Isolating or Shutting Down Locomotives Enroute

When isolating or shutting down a locomotive enroute for fuel conservation purposes, only the following will apply:

1. Temperature 40°F or above.
   - Locomotive must be isolated.
     - If locomotive is NOT AESS equipped, shut down; do not drain.
2. Temperature below 40°F.
   - Locomotive must be isolated; do not shut down.
3. Temperature below 0°F.
   - Locomotive must be isolated in WINTER/ISOLATE position (if equipped).

Exceptions:

- DP lead controlling unit, and all locomotives in remote consists must not be manually shut down for fuel conservation purposes.
- If necessary, isolate DP remotes in remote mode IDLE.
  - This eliminates throttle activity and continues to provide air brake functions in the remote consist.
  - Continue to perform DP Train Check as required.

## 106.3 Shutdown Requirement for Locomotives Not Being Utilized

At ALL points, shut down locomotives when:

- They will not be used for one hour or more,

  and

- Current and expected ambient temperature is 40°F or above.

Exceptions:

- Locomotives maintaining a train's air brake pipe system.
- Occupied locomotives kept running to maintain air conditioning.
- Locomotives with Automatic Engine Start/Stop Systems (AESS).

  Note: Manual shutdown is required on all locomotives when not on a train, even if equipped with AESS.

  - Identified by labels and instructions inside the cab and at the engine start/stop station.
  - Green "Enabled" light is positioned on the engineer's control stand on some automatic start/stop systems, referred to as "Smart Start".
  - AESS system may be utilized to maintain a train's air brake system, since they are designed to automatically shut down and restart as conditions (including maintaining necessary main reservoir and brake pipe pressures) require.
  - Small warning horns or bells sound inside the cab and outside the locomotive before an automatic shut down or restart occurs.
  - Do not defeat or disable AESS/Smart Start systems.

    Exceptions:

    ○ Lead locomotives without an override feature may be disabled for the purposes of maintaining air conditioning or heating while occupied.

    ○ An AESS/Smart Start system that becomes defective enroute may be disabled, provided the NOC Mechanical Help Desk is notified to record a defect. A defect tag must be placed on the isolation switch of the affected locomotive.

  Note: Using the AESS "override" feature on equipped locomotives is not considered disabling or defeating the AESS system.

  Locomotives not equipped with AESS must be shut down manually.

  When in doubt as to the temperature or the length of time locomotives will not be used, contact the dispatcher or local supervisor.

## 106.4 Fuel Conservation Shutdown Procedures

*References: ABTH 106.1.*

Note: DP lead or remote consist locomotives, whether in lead controlling or trailing position, must not be shut down for fuel conservation.

Locomotives with automatic start/stop systems that are manually shut down must be manually restarted:

1. Isolate the engine.
2. Press the Engine Stop button.
3. Immediately attempt to restart unit.
   - Exceptions:
     - Some computer-equipped locomotives require a 2 minute wait after shutdown before successful restart can be made.
     - On all locomotives with electronic operator displays, wait for displays to shut down before restarting.
       - ○ If unit fails to restart, notify the NOC Mechanical Help Desk or the dispatcher immediately and place a defect tag or note on the isolation switch.
       - ○ If restart is successful, press the Engine Stop button again and proceed with Step 4.
4. Turn OFF or OPEN all necessary switches and circuit breakers on the engine control panel in the following order to conserve battery life, except those outlined in Steps 5 and 6 below.
   1. Open the PTC breakers first.
   2. Open the BCCB or Computer Control breaker.
   3. Follow with the remaining breakers.
   4. Finally, open the battery knife switch.
   - Note: Battery knife switch may only be opened on the following locomotives after electronic operator display screens have shut down:
     - All GE locomotives.
     - EMD locomotives: GP28, GP38, GP50, GP60, SD60, SD70, and SD75.
5. On locomotives unused and left standing, leave the following switches and circuit breakers ON or CLOSED:
   - Auto water drain on all engines equipped.
   - Auxiliary turbo lube oil pump circuit breaker on EMD turbocharged engines.
   - Battery knife switch on all EMD locomotives not listed in Step 4.
6. On trailing locomotives shut down within a locomotive consist per Rule 106.1 Regulating Tractive Horsepower per Ton (THPT), leave the following switches/circuit breakers ON or CLOSED in addition to those listed in Step 5:
   - Control circuit breake.r
   - Local control circuit breaker.
   - Computer control circuit breaker (if equipped).

## 106.5 Locomotive Starting

The following are basic instructions for all locomotives:

1. Close the battery knife switch.
2. Turn ON engine run, control, and fuel pump switches on control stand.
3. Turn ON all necessary switches and circuit breakers on the engine control panel in the following order.

   1.Close the battery knife switch.

   2.Close the BCCB or Computer Control breaker.

   3.Follow with the remaining breakers.

   4.After the displays have been fully powered up, close the PTC breakers.
4. Place the engine control switch to START, and then manually start the locomotive.
   - Computer-equipped GE locomotives will have a 5- to 10-second delay before the diesel engine begins to turn over.
5. If locomotive fails to start, contact the NOC Mechanical Help Desk for assistance.
6. Crews must not attempt to jump start locomotives, unless under the direction of the Mechanical Team.

## 106.6 Cold Weather Protection for Locomotives

When the temperature is below or expected to drop below 32°F, the following precautions must be followed to prevent locomotive freezing.

**A. Locomotives Set Out for Service**

1. Secure locomotive; do not shut down.
2. If equipped, place engine control switch in WINTER/ISOLATE position.
3. Notify dispatcher, advising setout location and fuel readings.

**B. Locomotives Set Out Due to Defects**

1. Secure locomotive per existing rules.
2. Notify dispatcher, advising setout location and fuel readings.
3. If defect requires the locomotive to be shut down, manually drain the cooling water system.
4. When a defect occurs, contact the NOC Mechanical Help Desk.

Note: Do not set out locomotives for defects unless a safety issue exists or under direction of the NOC Mechanical Help Desk.

**C. Locomotives Developing Enroute Defects**

Manually drain locomotive cooling system when the locomotive has defects causing a shutdown condition and it cannot be restarted.

- Care should be taken to spot the locomotive so that if the cooling water system must be drained, it will not go into a waterway or onto a public roadway.
- In addition, contact the NOC Mechanical Help Desk and explain actions taken and if the cooling water system has been drained or if it drained automatically. Advise if a waterway was impacted.

**D. Locomotive Fuel Level Reporting**

During cold weather when trains are left between terminals, crews must contact dispatcher, advising fuel readings of all locomotives in consist.

- Fuel gauges on both sides of locomotives and electronic readouts must be compared and the lowest reading provided.

## 106.7 Speed Reduction for Fuel Conservation

If actual THPT exceeds scheduled THPT after isolation instructions are followed, a train may receive additional throttle limiting instructions listed on the Train Profile. These instructions may limit throttle to notch 5, 6 or 7 without going below scheduled THPT.

A train may exceed the above throttle limitations only when at least one of the following conditions applies:

- Train is a D, F, O symbol train or light locomotive consist or Geo cars.
- Train is utilizing Energy Management in Auto Control.
- Speed is below 15 MPH while on an ascending grade.
  - Once the train reaches the crest of the ascending grade the throttle limit may no longer be exceeded.
  - Expedited Service Banner appears on the Train Profile.

Trains must not exceed power throttle 5 when operating at a speed above 50 MPH on any subdivision (5/50).

Note: All non-Z symbols using Energy Management in Auto Control may automatically adhere to power throttle 5 limit when operating at a speed above 50 MPH.

A train may exceed 5/50 only when at least one of the following conditions applies:

- Train is a D, F, O, Z symbol train or light locomotive consist or Geo cars.
- Train is utilizing Energy Management in Auto Control.
- Expedited Service Banner appears on the Train Profile.

On specific subdivisions, trains must not use power (Throttle Notch 1 - 8) when traveling at a speed over 40 MPH (0/40). Affected trains will be governed by instructions provided on the work order.

A train may exceed 0/40 only when at least one of the following conditions applies:

- Train is a D, F, O, Z symbol train or light locomotive consist or Geo cars.
- Train is operating in idle or dynamic brake.
- Train is utilizing Energy Management in Auto Control.
- Expedited Service Banner appears on the Train Profile.
- Geo cars are exempt from all throttle restrictions.

The NOC Remote OPS Desk may exempt trains from speed reductions for fuel conservation (throttle limiting, 5/50, 0/40 and Energy Management) based on the expedited service needs.

## 106.8 Movement of Light Engines and Caboose-Only Moves

To conserve fuel, isolate excess units in a consist to handle movement as follows:

- Only one axle of power per each 120 tons of consist may be on line.
- When operating on sustained grades exceeding 2%, only one axle of power per each 90 tons of consist may be on line.
  - Do not isolate excess units if doing so will drop the locomotive consist below the minimum dynamic brake requirements for that mountain grade subdivision.

Note: This rule is intended to limit excess tractive effort only. It is a best practice to use the Dynamic Brake Only feature (if equipped) when complying with this rule.

## 106.9 Energy Management (EM)

*References: ABTH 103.3.1, ABTH 106.7.*

- EM systems are programs installed on select locomotives to assist engineers with fuel-efficient train operation.

  The programs:

  - Use GPS to synchronize train location with track characteristics such as grades, track curvatures, speed limits (permanent and temporary), and Form B work zones.
  - Calculate a fuel-efficient trip plan while controlling in-train forces.
  - Are not a substitute for the engineer's experience and good judgment.
  - Safe operation of the train and compliance with rules and special instructions remain the engineer's first responsibility.
- EM systems can manipulate throttle and dynamic brake positions automatically to execute a calculated trip plan.
- EM systems in effect on BNSF are Trip Optimizer (TO) and Talos.
- EM equipped locomotives are identified on the TSS Train Profile by a "Y" in the EM column to the right of the locomotive list.
- Regardless of location, either enroute or at crew change, engineers must initialize, then validate active EM features, GTB restrictions, and train makeup data.
- Engineers must utilize EM to the fullest extent possible during the trip.
- All LETP Students must initialize EM at the beginning of every trip. After initializing, select End Trip to turn off EM.
  - Student engineers are to utilize Auto Control or prompting at the discretion of their Spvr Road & Train Operations while in training but must be used for a minimum of 2 round trips (4 starts).
- Any failure of an EM system during initialization/enroute or if Auto Control was not able to be used during the trip, it must be reported via the TY&E tie-up reporting tool no later than 48 hours after tie-up, or during the next tour of duty. Report all speedometer discrepancies to NOC Mechanical when unable to use Auto Control due to inaccurate speedometer.
- EM Systems in use will be identified in division timetables for each subdivision.
- BNSF engineers are prohibited from initializing EM on any foreign locomotive.
- Use of auto control is prohibited on light power consists operating on any train type.
- Any train operating with manned helpers is prohibited from utilizing Auto Control until the helpers are remove.

Displays:

- On BNSF locomotives, EM will not display any information on the PTC screen.
- All EM functions, indications, and displays are located on the locomotive screens.
- On DP trains in auto control, EM may operate the lead and remote consists with the fence either up or down. When a DP train has multiple DP consists, only one fence is available. EM places the fence between the lead and mid consist and runs all remote consists as one. When transitioning from Auto to Manual, EM may return control of the remote consist with the fence up. At this point, any changes to the DP consist must be made manually.

## 106.9.1 Trip Optimizer (TO)

- When Auto Control is engaged, the system's Power Limited feature may limit Tractive Horsepower (throttle) to adhere to scheduled THPT requirements when excess Tractive Horsepower must be kept online.
  - The Disable Power Limit softkey can only be selected when relieved of throttle restrictions by instructions provided on the Work Order or the NOC OPS Desk verbally or via PTC message..
  - Auto Control must continue to be used to the fullest extent possible when Power Limits are disabled.
- Trains identified as expedited service needs (from work orders or verbal instructions via radio) may select the Disable FCS (Fuel Conservation Speed) option in the Restrictions menu in order to utilize all throttle notches above 50 MPH.
  - The expedited service needs exemption does not apply to Z symbol trains because TO is already programmed to operate these trains using all available power notches at speeds above 50 MPH.
- Supported Train Types: B, C, E, G, H, L, M, Q, R, S, U, V, X, Z.
  - Exceptions: The following U trains are not approved to operate EM: Unit trains consisting entirely of Coiled Steel and GEO test cars.

**Trip Optimizer/PTC Interface Mode (TO/PTC-IM)**

TO/PTC-IM is software installed on select BNSF locomotives that enables Trip Optimizer to act upon critical train and operating data received directly from PTC.

**Identification**

Perform the following to determine if lead locomotive has active TO/PTC-IM software:

1. Always initialize PTC first.
   - PTC does not need to be active, but the initialization process must be complete.
2. Press the TRIP OPTIMIZER key on the locomotive screen.
3. The Welcome to Trip Optimizer screen will display one of two options for initializing:
   a. SETUP TO PTC TRIP key appears only if TO/PTC-IM is installed and active on the locomotive.
      - TO/PTC-IM will be inactive for some routes.
   b. NEW TRIP key appears if TO/PTC-IM is not installed or is installed but inactive for the trip.
      - TO will only operate in stand-alone mode.
      - Initialize and operate TO as outlined in stand-alone mode.

Note: In stand-alone mode, PTC and TO do not share critical train and operating data.

**Initialization**

1. Press the SETUP TO PTC TRIP key.
   a. Review all data on the Trip Setup screen. If correct, press the ACCEPT TRIP key.
   b. All locomotive power states are initially provided by PTC. Correct as necessary using the CHANGE POWER MODE key.
      - PTC cannot inform TO that a locomotive is DB Only or DB Cut Out.
      - If the consist has a locomotive in DB Only or DB Cut Out, the engineer must edit it here so TO knows the correct power states.
      - Any incorrect locomotive power state will lead to poor TO performance and increase the potential for PTC warnings and/or enforcements.
      - All train makeup data is provided by PTC via internal messaging.
2. When all locomotive power states are correct, press the ACCEPT TRAIN key.
   - During the trip, the ‘Change Power Mode’ screen may only be accessed to verify/update power modes. Exit ‘Change Power Mode’ screen promptly after verification/updates are complete, by selecting Accept or Cancel.
3. TO will transition to the Map screen, then display “Waiting for PTC” at the top.
   - Once PTC is in the Active state, the TO rolling map will display.
   - Initialization of TO/PTC-IM may be performed while moving. This feature is to be used only when it determined safe to do so.

**Operation**

- TO/PTC-IM is designated for use only on main tracks and controlled sidings on BNSF PTC track or TWC Plus territory.
- Do not comply with EM prompting or utilize auto control when any part of the train is on non-PTC track (as indicated by a grey track line on the PTC screen) i.e. departing a yard track or traversing from a non-PTC main track to a PTC main track.
- When PTC is in any state other than Active, TO will not display the rolling map or offer Auto Control.
- The minimum speed to enter Auto Control is 9 MPH.
- The minimum speed to stay in Auto Control is 7 MPH.
- TO/PTC-IM will require Manual Control 1 miles in advance of a PTC generated stop target.
- TO/PTC-IM:
  - Receives Form B (work zone) restriction information from PTC.
  - PTC manages in effect times.
    - Will not display Form A or B restrictions unless they are in effect.
  - TO/PTC-IM will require Manual Control 2 miles in advance of, within, and one entire train length beyond Form B limits.
  - Receives track location and routing from PTC.
    - TO/PTC-IM will not prompt for track location or routing at any point.
  - Can operate in Auto Control on CTC sidings.
    - Train must be operating on a signal greater than a Restricting indication.
- The Condition Speed feature, in the Restrictions Menu, should be used anytime the maximum authorized speed is reduced temporarily to further allow auto control utilization, e.g., key trains in HTUA limits, following a slower train, flash flood, high wind, temperature restrictions, etc.
  - The Condition Speed feature must never be utilized in a manner that would cause Auto Control to become unavailable.
  - Condition Speed must be suspended if the train is being operated in manual control at a faster speed than what is set.

**When Operating on CTC or TWC/ABS**

Auto Control is to be used when the entire train is operating on PTC track, with any signal more favorable than an Approach indication.

NOTE: Auto control may be maintained when the train is performing a “main to main” diverging move. Under these circumstances, TO can remain in auto control on a signal indication of approach limited, advance approach or approach medium into a diverging clear.

- When an Approach signal is communicated by PTC, TO/PTC-IM will execute a plan to pass that signal at a maximum of 40 MPH.
- TO/PTC-IM will require Manual Control 1 mile in advance of any PTC generated stop target.
- Once train has passed an Approach signal, TO/PTC-IM will not allow Auto Control again until the next governing signal is more favorable than Approach.

**When Operating on TWC**

Auto Control is to be used only when greater than 1 mile from the end of authority limits.

- Manual Control must be used when any part of the train is on a siding in TWC or on other-than-main track.

**Engaging Auto Control**

When train speed is above 9 mph the Auto Control Available message is displayed. Only when operating conditions are favorable, Auto Control may be engaged as follows:

1. Press Auto Control key.
2. Within 30 seconds, move the throttle handle to N8.
3. Auto Control Active message will display and the auto notch box appears below the throttle box.

Favorable operating conditions are defined as:

1. Entire train is on a main track.
2. Proceed authority:
   a. Signaled Territory more favorable than approach indication.*

      *See Auto Thru Divergence section.

   b. Auto Control is to be used only when greater than 1 mile from the end of the train’s authority limits.

**Disengaging Auto Control**

1. Move the throttle to match the Auto Notch position. This will immediately reinstate Manual Control, or
2. Press Manual Control key.
3. During the 30 second countdown, move the throttle to match the Auto Notch position as directed.

**Trip Optimizer Standalone Mode**

Stand-Alone Trip Optimizer plans a trip based only on data received during the trip initialization. It does not receive updates or know critical operating information such as signals, track authority or restrictions that are voided/added during your trip.

**Note: Engineers must re-initialize and validate all restrictions at any crew change including trains relieved in route due to HOS or crew swap.**

**Initialize New Trip**

1. Press Trip Optimizer key.
2. Press New Trip key.
3. Press Yes key.
4. Review trip information displayed and if correct, press Accept Trip key.
5. Confirm by pressing Yes key.
6. If trip information is incorrect, press Reject Trip key.

**Train Setup Verification**

1. Compare locomotive and train information displayed with train documentation received. If correct, press the Accept key.
2. Confirm by pressing the Yes key.

**If Locomotive or Train edits are required, they can be accomplished as follows:**

**Change Locomotives:** Change Locomotives allows a locomotive to be added, removed, or repositioned.

**Remove Locomotive:** To remove a locomotive, highlight that locomotive and press the Remove Locomotive key.

**Add Locomotive:** Enter the initials and number of the added locomotive. The default power mode of an added locomotive is Isolated. The default position of the added locomotive is 0. A new position must be entered to save changes to the locomotive consist.

To change the position of any locomotive, highlight that locomotive and use the number keys to enter the correct position.

**Note: On DP trains, it is critical that the position of the remote consist is accurately reflected on the Train Setup screen. Location is determined by line number, not Loads/Empties. Verify positioning and edit if necessary.**

When all edits are complete, press the Accept key. Train length and axle count will automatically be adjusted in the Train Data.

**Change Power Mode:** The Change Power Mode screen indicates the running status of each locomotive for the TO system. Power Modes are: DB Only, Running (power and DB cut in), Isolated and DB Cutout.
Use the Down Arrow and Up Arrow to highlight the desired locomotive, then press the appropriate key to change power mode.

When all changes are complete, press the Accept key to save changes and return to Train Setup.

The Cancel key discards all changes and returns to Train Setup.

**Change Train Data:** The Change Train Data screen allows editing of:

- Maximum train speed
- Railcars/Loads/Empties/Tons/Length/Axles
  - Only perform edits by using the set out/pick up functions.
  - Do not manually edit Railcar, Load, Empty, Tons, Length or Axle values by line item in the Train Setup screen.

**Use the Up and Down** arrows to navigate between items in the train data list. Number keys are used to enter new values for any given train data element. When all train data edits are complete, press the Accept key and TOB will automatically recalculate if necessary.

**Note: Accurate train data is critical to system performance. When changes are entered, ensure ALL necessary fields are edited, including maximum train speed. Inaccurate information can lead to poor system performance.**

**Verify Restrictions**
Form A and B restriction information will be displayed once the Train Setup has been accepted. Compare the restrictions displayed with the train documents received. Us the Page Down and Page Up keys if more than one page of restrictions have been received. It is only necessary to verify restrictions for the subdivision(s) the train will traverse. Restriction information for subdivisions the train will not traverse will not display.

1. If all restrictions are correct, press the Accept key. (Otherwise, press the Reject key and exit).
2. Press Yes key to confirm.
3. Press Start Trip key.

**Track Selection**
Once Initialization is complete, the rolling map will appear and the system will prompt for current track. Select the appropriate track to continue. When a train is initialized on other than main track, the appropriate track may not be listed. Select the main track option that the train will occupy upon entering the main.

**Engaging Auto Control**
Stand-alone TO is designated for use only on Main Tracks.

- Do not comply with prompting or utilize auto control when any part of the train is on a siding, other-than-main-track, or foreign railroad.

When train speed is above 9 mph, the Auto Control Available message is displayed. Only when operating conditions are favorable, Auto Control may be engaged as follows:

1. Press Auto Control key.
2. Within 30 seconds, move the throttle handle to N8.
3. Auto Control Active message will display and the auto notch box appears below the throttle box.

Favorable operating conditions are defined as:
1. Entire train is on a main track or controlled siding.
2. Proceed authority:
   a. Signaled Territory more favorable than approach medium indication.* See Auto Thru Divergence section.
   b. Auto Control is to be used only when greater than 2 miles from the end of the train’s authority limits.

**Disengaging Auto Control**

1. Move the throttle to match the Auto Notch position. This will immediately reinstate Manual Control, or
2. Press Manual Control key.
3. During the 30 second countdown, move the throttle to match the Auto Notch position as directed.

**Auto Through Divergence**

When approaching a main track divergence, approximately 1500ft before the approach signal, TO will prompt TRACK INFO NEEDED AHEAD. If a diverging route is selected, AUTO ACTIVE CALCULATING will appear. Once the calculations are complete, the rolling map and plan will update to accommodate the diverging route. The prompt will then display AUTO CONTROL ACTIVE.

If the system calculates that it cannot complete the diverging route in auto, TAKE MANUAL CONTROL NOW will appear.

NOTE: Auto control may be maintained when the train is performing a “main to main” diverging route. Under these circumstances, TO can remain in auto control on a signal indication of approach limited, advance approach, or approach medium into a diverging clear.

## 106.9.2 Talos (EM on EMD Locomotives)

- Talos only operates in PTC interface mode.

**Initialization**

1. Once PTC has been initialized and Talos has received the train consist, the Initialize Talos EM soft key will be available.
2. To initialize Talos, select the Initialize Talos EM soft key and confirm the consist information and mode of each locomotive.
3. After Talos initialization is complete and Talos has the train's current position, route from PTC, and has connected to the locomotive control system, then Talos will transition from the welcome screen to the rolling map display.

**Locomotive and Consist Confirmation**

4. Go to Consist Config screen to configure or confirm and consist either during Talos initialization or during a trip.
5. If a change is required to a locomotive mode, use the Next soft keys to navigate to the locomotive that needs updating.
   a. If the locomotive run status is Run, then the locomotive mode can be changed to DB Cutout.
   b. If the locomotive run state is Isolate, then the locomotive mode can be changed to DB Only.

      Note: Run/Isolate status can only be changed on the PTC screen.

**Operation**

1. Talos is designated for use only on BNSF PTC or TWC Plus territory.
2. Do not comply with EM prompting or utilize auto control when any part of the train is on non-PTC track (as indicated by a grey track line on the PTC screen) i.e. departing a yard track or traversing from a non-PTC main track to a PTC main track.
3. When PTC is in any state other than Active, Talos will not display the rolling map or offer Auto Control.
4. Talos will require Manual Control 1 mile in advance of a PTC generated stop target.

**Talos:**

1. Receives Form B (work zone) restriction information from PTC.
2. PTC manages in effect times.
   - Will not display Form A or B restrictions unless they are in effect.
3. Will require Manual Control 2 miles in advance of, within, and one entire train length beyond Form B limits.
4. Receives track location and routing from PTC.
   - Talos will not prompt for track location or routing at any point.
5. Can operate in Auto Control on CTC sidings.
   - Train must be operating on a signal greater than an Approach indication.

**Engaging Auto Control**

1. When the Talos state displays Auto Control, press Engage Auto.
2. Follow the prompts on the locomotive display below the map to complete engagement.
   a. If the throttle handle is in Notch 8, press Confirm Auto, or
   b. If the throttle handle is not in Notch 8, move the handle to Notch 8.
3. When engagement completes, the Talos state will display Auto Engaged.
   - The minimum speed to enter Auto Control is 9 MPH.
   - The minimum speed to stay in Auto Control is 7 MPH.

**Air Brake Prompting**

1. Talos will display a blue air brake zone on the rolling map in areas where it expects to request an air bake application.
2. If Talos needs an air brake application, it will initially request a minimum air brake reduction.
3. If Talos needs more than a minimum air brake reduction, it will request an additional 2 PSI or 3 PSI reduction.

**Disengaging Auto Control**

1. When Talos initiates a disengagement, Talos will go into the Auto Disengaging state.
2. To complete the disengagement, follow the prompts:
   a. If in dynamic brake, move the handle to match the current dynamic brake position.
   b. If in power, but at or below Notch 7, move the throttle handle to match the current throttle handle position.
   c. If in Notch 8, press Confirm to complete the disengagement.
3. If the disengagement does not complete within 20 seconds, Talos will transition to the Idle Down Hold DB state.
   a. If in power, the system will gradually bring the throttle to Idle.
   b. If in dynamic brake, the system will hold the current dynamic brake position.
   c. To complete the disengagement with Talos in Idle Down Hold DB, bring the throttle handle to Idle then match the current dynamic brake position, if required.

Note: When disengagement completes, the locomotive displays will automatically transition to the distributed power menu, if distributed power is inactive, the locomotive display will remain on the Talos menu.

**Diagnostic Screen**

1. To access the Talos Fault History screen, select the Diag soft key.
   a. Active faults will be highlighted in RED.
   b. Each fault will contain information about the date and time the fault was set or cleared, the fault ID, the name of the fault, and the current state of the fault.
2. To scroll through the fault history, use the Next soft keys to step through individual faults or the Page soft keys to step through each page of the fault history.

**Condition Speed**

To apply a conditional speed:

1. Select the Cond Speed key in the Diagnostic menu.
2. Select desired conditional speed.
3. Select Apply Cond Speed.

To suspend a conditional speed:

1. Select Cancel Cond Speed.

# 107.0 Remote Control Operation Instructions

Employees assigned to a remote control crew are governed by these instructions and must have a current copy accessible while on duty. All rules or instructions contained in other company publications will remain in effect unless specifically exempted in these instructions.

## 107.1 Transferring Control with Pitch and Catch

Remote control crew members must clearly understand which crew member will be controlling the movement. Before pitching control of the Operator Control Unit (OCU), the Controlling Remote Control Operator (RCO) must notify the receiving RCO. The receiving RCO must acknowledge that he/she is assuming control.

- This notification is completed on the GE and Cattron LCS-III systems when the receiving RCO acknowledges the message displayed on the OCU screen and accepts the incoming pitch.
- The Beltpack system requires the use of verbal communication.

## 107.2 Knuckles and ETDs

Controlling RCO must not install or remove knuckles or ETDs. These tasks may be performed by the Non-controlling RCO, who must:

- Turn OCU power OFF (or put in Sleep mode on GE) and then remove the OCU from operator before completing the task.
- Be clear of equipment before putting on the OCU and turning power ON (waking up from Sleep mode on GE) after completing the task.

When working in a single-OCU operation turn OCU power OFF (or put in Sleep mode on GE) and removed from the operator before installing or removing knuckles or ETDs.

## 107.3 Portable Radio

Each RCO must have an operative portable radio in their possession. The radio must be secured using a portable radio holder that does not require the RCO to hold the radio in hand. The radio microphone must be secured in a position near the head/neck area to allow for clear radio communication. The portable radio and microphone must be secured using BNSF approved equipment designed for this purpose.

## 107.4 Setup and Testing

Before operating a Remote Control System, each RCO must ensure their equipment is properly set up and tested in accordance with the rules outlined in this chapter. Additionally, each RCO must ensure that the following are in place on each Remote Control Locomotive (RCL):

A. Remote Control Tag - Must be placed on the control stand throttle when the locomotive is being used in remote control. The tag must be removed from the control stand throttle when the locomotive is returned to manual mode.

B. Flashing Amber Light - Each RCL must have an operable flashing amber light on top of the locomotive while in remote control.

## 107.5 OCU Attachment

OCUs will be attached as follows:

- A linked OCU must be properly secured to a BNSF approved RCO vest or belt except when in Sleep mode, dismissed, or powered OFF.

  Exception: During hump operations, the Non-controlling RCO may place the OCU on a desk while operating the hump operating system. The OCU must remain within arm's length of a crew member unless powered off and secured.

- Remote control vests and belts holding a linked OCU that is powered ON must be worn by the RCO until the OCU is disabled.
- "D" rings on the OCU must be properly attached to the RCO's vest or belt with only one clip per "D" ring to ensure the tilt feature functions as intended and activates when the operator tilts more than 45 degrees.
- OCUs may be powered OFF for breaks or meal periods but must remain attached to a vest or belt worn by or in the possession of the RCO, secured in the OMS cabinet, or secured in a location approved by local instruction.

## 107.6 Operating the Equipment

A. **Certification:** Only certified operators or students who have been trained in remote control operations may operate an OCU.

B. **Simultaneous Operation:** An RCO shall control only one locomotive consist at a time with an OCU and shall not operate simultaneously any other locomotive.

C. **Operating OCU's in Vehicles:** Operation of the OCU must not be performed from a vehicle.

D. **Coupling:** When using a remote control locomotive in "shared" or "pitch and catch" operations to make a coupling; the Remote Control Operator located at the coupling must be the Controlling Operator, unless a non-equipped qualified employee is making the coupling.

E. **Mode Transitions:** Transitioning the RCL from Remote mode to Manual mode while moving is prohibited.

F. **Unattended Equipment:** During remote control operations, "unattended" means the consist is not under the continuous oversight of a crew member in possession of an OCU linked to the RCL and capable of preventing movement.

Before completing each tour of duty, the RCO must place the locomotive in Manual mode in accordance with BNSF Remote Control Operating Procedures unless being relieved by another RCO.

## 107.7 RCO Down Response

When an RCO receives an "Operator Down" or "Tilt Timeout" notification via radio or the OCU screen and is associated with their job, the following steps must be taken:

1. Immediately confirm the safety of all crew members.
2. Stop movement on adjacent tracks, if necessary.
3. The RCL must remain stopped until the safety of all crew members is confirmed.

When any crew receives an "Operator Down" or "Tilt Timeout" notification via radio and if the notification is not associated with their job, movements on adjacent tracks must be made at a speed that allows stopping within half the range of vision until the safety of all members of the remote control crew is confirmed.

## 107.8 Remote Control Movements Approaching Locations Requiring Stop

Remote control movements approaching locations requiring stop must reduce speed to 4 MPH or less at a minimum of 250 feet before the intended stop location.

## 107.9 Powered Axles in Remote Control Operation

RCL consists are limited to 12 powered axles, unless otherwise designated by local instructions.

## 107.10 Reserved for Future Use

## 107.11 OCU Management System (OMS) Cabinet

All OCUs and batteries will be checked in and out through the OMS Cabinet. OCUs not checked out or linked will be kept in the OMS Cabinet with the power OFF and the battery removed and placed in a battery charger. If the OMS Cabinet is inoperable, contact local supervision for instructions.

- RCOs are responsible for checking in/checking out OCUs and batteries from the OMS Cabinet.
- Unserviceable OCUs and batteries will be reported through the OMS. A description of the issue will be written on a Bad Order Tag and the tag will be placed on the device.
- The employee checking in OCUs and batteries is responsible for entering any unserviceable events (if applicable) through the OMS Cabinet.

## 107.12 Controlling In-train Forces ♦

Excessive slack action can cause derailment or damage equipment and track structures. To minimize slack action:

- Change speeds gradually - let the cars adjust to one speed before moving up or down to another.
- When sending movement commands to the locomotive, change Speed selector positions slowly. Moving the Speed selector between the settings too quickly causes erratic power and brake commands and results in erratic movements of the locomotive.
- When starting a remote control movement at a location that requires an automatic train brake application to prevent undesired movement, do not exceed the MIN setting.
- Unless kicking, when initiating movement with cars attached to an RCL:
  1. Set the Speed selector to the COUPLE position (1 MPH).
  2. Once the cars are stretched (if pulling), or bunched (if shoving), move the Selector to the desired speed.
- When stopping with cars attached to an RCL:
  1. Adjust the Speed selector to a setting that allows the cars to bunch (or stretch if shoving).
  2. Once slack is gathered, continue decreasing speed until reaching the STOP position on the Speed selector.

## 107.13 Remote Control Locomotive (RCL) Pullback System

A pullback system is a safety overlay and must not be relied upon to stop an RCL from exiting the RCZ. A pullback system does not supersede any operating rules, including those related to shoving movements, remote control operations and RCZs.

The following will apply when a pullback system is being utilized:

- The RCL must be pullback-equipped.
- The pullback-equipped RCL must be one of the first two units of the consist (when practical, it should be on the leading end of the consist).

When a pullback-equipped RCL enters the pullback track in the pullout direction and passes over the transponders, a crew member must confirm that the pullback system is operational. Depending on the type of remote control system, confirmation will be a radio broadcast or message displayed on the OCU indicating the pullback system is operational. All crew members must brief each other when it is known pullback system is operational.

When a pullback-equipped RCL enters the pullback track in the pullout direction and passes over the transponders and neither crew member receives confirmation that the pullback system is operational, the movement must be stopped immediately. Before proceeding, the RCOs must determine how the movement will be protected to ensure movement does not exceed the limits of the activated RCZ and notify their supervisor.

The system must again be verified if pullback is overridden.

## 107.14 OCU-III Beltpack

### 107.14.1 Set Up—Beltpack 26-L Airbrake System

A. Condition Equipment:

1. With the Operator Control Unit (OCU) OFF, install a fully charged battery.
2. Turn OCU ON.
3. Verify (HUMP or FLAT) mode on OCU. If OCU is on the correct mode, proceed to step 4.
   a. To change mode:
      i. Press and hold the HUMP soft key for approx. 2.5 seconds until OCU Display reads “RELEASE AND PRESS AGAIN TO ACTIVATE FLAT/HUMP MODE”.
      ii. Then release the soft key. Within 5 seconds of release, press the HUMP soft key once to change mode.
      A. This change will be verified by the LED changing to appropriate designation and the OCU will display “FLAT/HUMP MODE ENABLED; RE-LINK OCU TO LOCO”.
4. Turn OCU OFF.
5. Secure the locomotive with the hand brake(s).
6. Ensure that the locomotive is running, and the Main Reservoir has a minimum of 110 PSI.

B. Set Up Control Stand:

7. Turn the Headlight switch(es) ON and set to DIM.
8. Turn the Engine Run and Control/Fuel Pump switches ON and the Generator Field switch OFF.
9. Place the Throttle in IDLE and display the Remote Control Tag on the Throttle handle.

10. Remove and properly secure the Reverser.
11. Verify that the Radio is ON and set to the appropriate channel.
12. Condition the brake system for REMOTE:
    a. Fully apply the Independent Brake handle.
    b. Move the MU-2A valve to TRAIL.
    c. Make a 20 PSI brake pipe reduction with the Automatic Brake handle.
    d. Cut the Automatic Brake valve OUT.
    e. Move the Automatic Brake handle to Continuous Service/Handle Off.
    f. Wait for the Equalizing Reservoir (ER) to reduce to 0 PSI.

C. Set Up Control Panel:

13. Turn the Number and Running Light switches ON.
14. Set the Headlight Control switch to the appropriate position.
15. Set the Isolation switch to RUN.
16. Turn the Remote Control Circuit breaker ON.

D. Set Up Locomotive Control Unit (LCU):

17. Set the Radio mode to A, A&B, or B.
18. After waiting for the ER to bleed to 0 PSI, turn the Changeover switch to Beltpack / Remote (this will trigger an emergency brake application).
19. If using an OCU(s) not currently linked to this locomotive, proceed to the next step. If using an OCU(s) already linked to this locomotive, Press the ON/OFF button once to turn the OCU ON and then proceed to Step 23.
20. On the Operator Parameter Programmer (OPP), select F1, F2, or F3, per local instructions.
21. On the OPP, select Prog A or Prog B.
22. With the OCU powered off, depress and hold either the left or right vigilance button and Press the ON/OFF button once. (The OCU will perform a start-up sequence that includes a test of all LEDs).
23. Release the vigilance button once you are prompted by the Alpha-Numeric screen on the OCU. (Holding the vigilance button for longer than 5 seconds after turning the OCU ON will abort the IR link up on the OCU).
24. Align the OCU with the infrared eye. The Alpha-Numeric screen on the OCU will display “IR LINK” and a beep will confirm connection. If the assignment is successful, the COM LED on the OPP will stop flashing and will remain lit.
25. If two OCUs are being assigned, repeat Steps 17 through 21.
26. Recover the OCU(s) from FULL on the Auto Brake selector (FULL LED will be flashing). B must recover first if operating in A&B mode.
27. Recover the OCU(s) from the emergency brake application. B must recover first if operating in A&B mode.
28. Wait to hear “brake recovery complete” broadcast over the portable radio.
29. Ensure that the amber light on the RCL is flashing.
30. Safety Time-out and Tilt Time-out Tests must now be performed on the OCU(s).

### 107.14.2 Set Up—Beltpack CCB-26 Airbrake System

A. Condition Equipment:

1. With the Operator Control Unit (OCU) OFF, install a fully charged battery.
2. Turn OCU ON.
3. Verify (HUMP or FLAT) mode on OCU. If OCU is on the correct mode, proceed to step 4.

   To change mode:

   i. Press and hold the HUMP soft key for approx. 2.5 seconds until OCU Display reads “RELEASE AND PRESS AGAIN TO ACTIVATE FLAT/HUMP MODE”.

   ii. Then release the soft key. Within 5 seconds of release, press the HUMP soft key once to change mode.

   This change will be verified by the LED changing to appropriate designation and the OCU will display “FLAT/HUMP MODE ENABLED; RE-LINK OCU TO LOCO”.
4. Turn OCU OFF.
5. Secure the locomotive with the hand brake(s).
6. Ensure that the locomotive is running, and the Main Reservoir has a minimum of 110 PSI.

B. Set Up Control Stand:

7. Turn the Headlight switch(es) ON and set to DIM.
8. Turn the Engine Run and Control/Fuel Pump switches ON and the Generator Field switch OFF.
9. Pace the Throttle in IDLE and display the Remote Control Tag on the Throttle handle.
10. Remove and properly secure the Reverser.
11. Verify that the Radio is ON and set to the appropriate channel.
12. Condition the brake system for REMOTE:
    a. Fully apply the Independent Brake handle.
    b. Make a 20 PSI brake pipe reduction with the Automatic Brake handle.
    c. Move the Electronic Brake valve to TRAIL.
    d. Move the Automatic Brake handle to HO.
    e. Wait for the ER to reduce to 0 PSI.

C. Set Up Control Panel:

13. Turn the Number and Running Light switches ON.
14. Set the Headlight Control switch to the appropriate position.
15. Set the Isolation switch to RUN.

16. Turn the Remote Control circuit breaker ON.

D. Set Up Locomotive Control Unit (LCU).

17. Set the Radio mode to A, A&B, or B.
18. After waiting for the ER to bleed to 0 PSI, turn the Changeover switch to Beltpack / Remote (this will trigger an emergency brake application).
19. If using an OCU(s) not currently linked to this locomotive, proceed to the next step. If using an OCU(s) already linked to this locomotive, Press the ON/OFF button once to turn the OCU ON and then proceed to Step 26.
20. On the Operator Parameter Programmer (OPP), select F1, F2, or F3, per local instructions.
21. On the OPP, select Prog A or Prog B.
22. With the OCU powered off, depress and hold either the left or right Vigilance button and Press the ON/OFF button once. (The OCU will perform a start-up sequence that includes a test of all LEDs).
23. Release the vigilance button once you are prompted by the Alpha- Numeric screen on the OCU. (Holding the vigilance button for longer than 5 seconds after turning the OCU ON will abort the IR link up on the OCU).
24. Align the OCU with the infrared eye. The Alpha-Numeric screen on the OCU will display “IR LINK” and a beep will confirm connection. If the assignment is successful, the COM LED on the OPP will stop flashing and will remain lit.
25. If two OCUs are being assigned, repeat Steps 20 through 24.
26. Recover the OCU(s) from FULL on the Auto Brake selector (FULL LED will be flashing). B must recover first if operating in A&B mode.
27. Recover the OCU(s) from the emergency brake application. B must recover first if operating in A&B mode.
28. Wait to hear “brake recovery complete” broadcast over the portable radio.
29. Ensure that the amber light on the RCL is flashing.
30. Safety Time-out and Tilt Time-out Tests must now be performed on the OCU(s).

### 107.14.3 Test—OCU Safety Tests When Initiating Remote and When Handing Off Linked OCUs Between Crews

A job safety briefing must be held between crews before handing off linked OCU(s). OCU(s) must be tested as described:

A. Perform Safety Time-out Test:

1. Move the Reverser to N.
2. Press the Vigilance button.
3. Move the Speed selector to COAST.
4. After approximately 50 seconds, a tone alarm will sound.
5. After approximately 10 seconds of alarm, a Safety Time-out fault will cause a full-service brake application.
6. Move the Speed selector to STOP.
7. Proceed to the Tilt Time-out Test.

B. Perform Tilt Time-out Test:

1. Tilt the OCU more than 45 degrees.
2. After one second a continuous tone alarm will sound and after 4 seconds a Tilt Time-out fault will cause an emergency brake application.
3. A Tilt Time-out transmission must be heard over the portable radio.
4. Return the OCU to an upright position and recover the emergency brake application.
5. Wait to hear “brake recovery complete” transmission over the portable radio.
6. If two OCUs are being used, pitch control to the Non-controlling RCO and repeat these two tests.

Note: If an OCU does not perform as required by the tests above DO NOT USE THAT OCU. Report the defect in the OMS Cabinet: Place a red out-of-service tag on the OCU and place it in the bottom drawer.

### 107.14.4 End—Beltpack 26-L Airbrake System

1. Turn the OCU(s) **OFF**.
2. Apply hand brakes on all locomotives.
3. Turn the Changeover switch to **Manual** (this will initiate an emergency brake application). Ensure that the flashing amber light on the RCL turns **OFF**.
4. Isolate all locomotives, unless conditions require winter protection as prescribed by ABTH Rules.
5. Leave the Remote Control circuit breaker **ON**.
6. Condition the brake system for **LEAD**:
   a. Fully apply the Independent Brake handle.
   b. Move the MU-2A valve to **LEAD**.
   c. Move the Automatic Brake handle to **Emergency**. Wait until ER goes to **0 PSI**.
   d. Cut the Automatic Brake valve **IN**.
   e. Move the Automatic Brake handle to **Continuous Service**. Verify that the PCS resets.
   f. Move the Automatic Brake handle to **RELEASE** to fully recharge the system.
   g. Release Independent Brake and verify release test per ABTH.
   h. After allowing the system to charge, Apply Independent Brake and make a **20 PSI** brake pipe reduction.
7. Remove the Remote Control Tag from the Throttle.
8. Turn the Headlights **OFF**.

### 107.14.5 End—Beltpack CCB-26 Airbrake System

1. Turn the OCU(s) **OFF**.
2. **Apply** hand brakes on all locomotives.
3. Turn the Changeover switch to **Manual** (this will initiate an emergency brake application). Ensure that the flashing amber light on the RCL turns **OFF**.
4. Isolate all locomotives, unless conditions require winter protection as prescribed by ABTH Rules.
5. Leave the Remote Control circuit breaker **ON**.
6. Condition the brake system for **LEAD**:
   a. Fully apply the Independent Brake handle.
   b. Move the Automatic Brake handle to **Emergency**.
   c. Move the Electronic Brake valve to **LEAD-IN**.
   d. Wait for the screen to display **Okay to Run**.
   e. Move the Automatic Brake handle to **RELEASE** to fully recharge the system.
   f. Release Independent Brake and verify release test per ABTH.
   g. After allowing the system to charge, Apply Independent Brake and make a **20 PSI** brake pipe reduction.
7. Remove the Remote Control Tag from the Throttle.
8. Turn the Headlights **OFF**.

# 107.15 Cattron LCS-III (Non-Talker)

## 107.15.1 Set Up—Cattron CCB-26 Airbrake System

A. Condition Equipment:

1. With the OCU OFF, install a fully charged battery.
2. Turn OCU ON.
3. Verify (HUMP or FLAT) mode on OCU. If OCU is on the correct mode, proceed to Step 4.
   a. To change mode:
      i. Press and hold the HUMP soft key for approx. 2.5 seconds until OCU Display reads “RELEASE AND PRESS AGAIN TO ACTIVATE FLAT/HUMP MODE”.
      ii. Then release the soft key. Within 5 seconds of release, press the HUMP soft key once to change mode.

A. This change will be verified by the LED changing to appropriate designation and the OCU will display “FLAT/HUMP MODE ENABLED, RE-LINK OCU TO LOCO”.

4. Turn OCU OFF.
5. Secure the locomotive with the hand brake(s).
6. Ensure that the locomotive is running and the Main Reservoir has a minimum of 110 PSI.

B. Set Up Control Stand:

7. Turn the Headlight switch(es) ON and set to DIM.
8. Turn the Engine Run and Control/Fuel Pump switches ON and the Generator Field switch OFF.
9. Place the Throttle in IDLE and display the Remote Control Tag on the Throttle handle.
10. Remove and properly secure the Reverser.
11. Verify that the Radio is ON and set to the appropriate channel.
12. Condition the brake system for REMOTE:
    a. Fully apply the Independent Brake handle.
    b. Make a 20 PSI brake pipe reduction with the Automatic Brake handle.
    c. Move the Electronic Brake valve to TRAIL.
    d. Move the Automatic Brake handle to HO.
    e. Wait for the ER to reduce to 0 PSI.

C. Set Up Control Panel:

13. Turn the Number and Running Light switches ON.
14. Set the Headlight Control switch to the appropriate position.
15. Set the Isolation switch to RUN.
16. Turn the Remote Control circuit breaker ON.

D. Set Up Locomotive Control Unit (LCU):

17. Set the Radio mode to A, A&B, or B.
18. After waiting for the ER to bleed to 0 PSI, turn the changeover switch to Remote (this will trigger an emergency brake application).
19. If using an OCU(s) not currently linked to this locomotive, proceed to the next step. If using an OCU(s) already linked to this locomotive, Press the ON/OFF button once to turn the OCU ON and then proceed to step 26.
20. On the OPP, select F1, F2, or F3, per local instructions.
21. On the OPP, select Prog A or Prog B.
22. With the OCU powered OFF, depress and hold either the left or right Vigilance button and Press the ON/OFF button once. (The OCU will perform a start-up sequence that includes a test of all LEDs).
23. Release the Vigilance button once you are prompted by the Alpha-Numeric screen on the OCU. (Holding the Vigilance button for longer than 5 seconds after turning the OCU ON will abort the IR link up on the OCU).
24. Align the OCU with the infrared eye. The Alpha-Numeric screen on the OCU will display “IR LINK” and a beep will confirm connection. If the assignment is successful, the COM LED on the OPP will stop flashing and will remain lit.
25. If two OCUs are being assigned, repeat Steps 20 through 24. If one OCU is being assigned, skip to Step 26.
26. Recover the Secondary OCU from emergency as prompted by the OCU and then within 3 seconds, release the full-service brake application from the automatic brake selector.
27. Recover the Primary OCU from emergency as prompted by the OCU and then within 3 seconds, release the full-service brake application from the automatic brake selector.
28. Wait for the prompt of “brake recovery complete” on the OCU display screen.
29. Ensure that the amber light on the RCL is flashing.
30. Safety Time-out and Tilt Time-out tests must now be performed on the OCU(s).

### 107.15.2 Test—OCU Safety Tests When Initiating Remote and When Handing Off Linked OCUs Between Crews

A job safety briefing must be held between crews before handing off linked OCU(s). OCU(s) must be tested as described.

A. Perform Safety Time-out Test:

1. Move the Reverser to N.
2. Press a Vigilance button.
3. Move the Speed selector to COAST.
4. After approximately 50 seconds, a tone alarm will sound.
5. After approximately 10 seconds of alarm, a Safety Time-out fault will cause a full-service brake application.
6. Move the Speed selector to STOP.
7. Proceed to the Tilt Time-out Test.

B. Perform Operator Down Test:

1. Tilt the OCU more than 45 degrees.
2. After one second a continuous tone alarm will sound and after 4 seconds an Operator Down fault will cause an emergency brake application.
3. The operator down transmission must be heard over the portable radio.
4. Return the OCU to an upright position, recover the emergency brake application, and within 3 seconds, release the full-service brake application from the automatic brake selector.
5. Wait for the prompt of “brake recovery complete” on the OCU display screen.

Note: If two OCUs are being used, pitch control to the Secondary RCO and repeat these two tests. If an OCU does not perform as required by the tests above DO NOT USE THAT OCU. Report the defect in the OMS Cabinet: Place a red out-of-service tag on the OCU and place it in the bottom drawer.

### 107.15.3 End—Cattron CCB-26 Airbrake System

1. Turn the OCU(s) OFF.
2. Apply hand brakes on all locomotives.
3. Turn the Changeover switch to Manual (this will initiate an emergency brake application). Ensure that the flashing amber light on the RCL turns OFF.
4. Isolate all locomotives, unless conditions require winter protection as prescribed by ABTH Rules.
5. Leave the Remote Control circuit breaker ON.
6. Condition the brake system for LEAD:
   a. Fully apply the Independent Brake handle.
   b. Move the Automatic Brake handle to Emergency.
   c. Move the Electronic Brake valve to LEAD-IN.
   d. Wait for the screen to display Okay to Run.
   e. Move the Automatic Brake handle to RELEASE to fully recharge the system.
   f. Release Independent Brake and verify release test per ABTH.
   g. After allowing the system to charge, Apply Independent Brake and make a 20 PSI brake pipe reduction.
7. Remove the Remote Control Tag from the Throttle.
8. Turn the Headlights OFF.

# 107.16 GE

## 107.16.1 Set Up—GE CCB-26 Airbrake System

A. Condition Equipment:

1. With the OCU OFF, install a fully charged battery.
2. Secure the locomotive with the hand brake(s).
3. Ensure that the locomotive is running, and the Main Reservoir has a minimum of 110 PSI.

B. Set Up Control Stand:

4. Turn the Headlight switch(es) OFF.
5. Turn the Engine Run and Control/Fuel Pump switches ON and the Generator Field switch OFF.
6. Place the Throttle in IDLE and display the Remote Control Tag on the Throttle handle.
7. Remove and properly secure the Reverser.
8. Verify that the Radio is ON and set to the appropriate channel.
9. Condition the brake system for REMOTE:
   a. Fully apply the Independent Brake handle.
   b. Make a 20 PSI brake pipe reduction with the Automatic Brake handle.
   c. Move the Electronic Brake valve to TRAIL.
   d. Move the Automatic Brake handle to HO.
   e. Wait for the Equalizing Reservoir to reduce to 0 PSI.

C. Set Up Control Panel:

10. Turn the Number and Running Light switches ON.
11. Set the Headlight Control switch to the appropriate position.
12. Set the Isolation switch to RUN.
13. Turn the Remote Control circuit breaker ON.

D. Prepare Setup Control Unit (SCU):

14. Turn the Remote/Manual switch to Remote.
15. Turn one OCU ON. The LEDs will light in sequence and the alarm will sound.
16. When the OCU Display shows GETSGS LOCOTROL RCL, the OCU is ready for linking to the SCU.
17. If the locomotive is properly set up for RCL operation, the SCU Display will show Setup Emergency or Standby.
18. Align the OCU infrared port with the SCU infrared port and press the Pitch / Catch button.
19. If the link is successful, the OCU Display will show the locomotive number.
20. Once the OCU says the locomotive ID, the SCU will display “Enter Employee ID”. Employee enters their seven-digit employee number.
21. The Controlling OCU Display will prompt the RCO with Pri Tilt Test Needed.
22. Press Tilt O/R and tilt the OCU more than 45 degrees until “tilt test complete” transmission is heard over a portable radio.
23. Set the Independent Brake Override on the Controlling OCU to EMER. (Leave the Independent Brake Override in EMER until Step 29). When working in a single-OCU operation skip to step 29. When working in a dual-OCU operation proceed to step 24.
24. Turn the Non-controlling OCU ON. When its Display shows GETSGS LOCOTROL, the OCU is ready to link.
25. Align the Non-controlling OCU infrared port with the SCU infrared port and press the Pitch/Catch button.
26. When the Controlling OCU displays Secondary OCU Link Request, the Controlling RCO has 5 seconds to press either Enable button.
27. Once prompted from the SCU, “Enter Employee Number”, Secondary employee enters their seven-digit employee number.
28. If the link is successful, the Non-controlling OCU Display will show the locomotive number. The Non-controlling RCO must then perform the Tilt Test when prompted by the OCU Display (Steps 21 and 22).
29. Move the Controlling OCU Independent Brake Override to REL.
30. Ensure that the amber light on the RCL is flashing.
31. Vigilance and Operator Down Tests must now be performed on the OCU(s).

### 107.16.2 Test—OCU Safety Tests When Initiating Remote and When Handing Off Linked OCU(s) Between Crews

A job safety briefing must be held between crews before handing off linked OCU(s). Both OCU(s) must be tested as described:

A. Perform Vigilance Test:

1. Move the Reverser to N.
2. Press the Enable button.
3. Move the Speed selector to COAST.
4. After approximately 50 seconds, a tone alarm will sound.
5. After approximately 10 seconds of alarm, a Vigilance fault will cause a full-service brake application.
6. Move the Speed selector to STOP.
7. Proceed to Operator Down Test.

B. Perform Operator Down Test:

1. Tilt the OCU more than 45 degrees.
2. A continuous tone alarm will sound for five seconds and an Operator Down fault will cause an emergency brake application.
3. Keep OCU tilted (approx. 10 seconds) until Operator Down transmission is heard over the portable radio.
4. Return the OCU to an upright position and recover the emergency brake application.
5. If two OCUs are being used, pitch control to the Non-controlling RCO and repeat these two tests.

C. At the first available opportunity operators, must re-link with the appropriate seven-digit employee number.

Note: If an OCU does not perform as required by the tests above DO NOT USE THAT OCU. Report the defect in the OMS Cabinet: Place a red out-of-service tag on the OCU and place it in the bottom drawer.

### 107.16.3 End—GE CCB-26 Airbrake System

1. Turn the OCU(s) OFF.
2. Apply the hand brakes on all locomotives.
3. Set the Remote/Manual switch to MANUAL. Ensure flashing amber light on the RCL turns OFF.
4. Isolate all locomotives, unless conditions require winter protection as prescribed by ABTH.
5. Leave the Remote Control circuit breaker ON.
6. Condition the brake system for LEAD:
   a. Fully apply the Independent Brake handle.
   b. Move the Automatic Brake handle to Emergency.
   c. Place the Electronic Brake valve to LEAD IN.
   d. Wait for the screen to display Okay to Run.
   e. Move the Automatic Brake handle to RELEASE to fully recharge the system.
   f. Release Independent Brake and verify release test per ABTH.
   g. After allowing the system to charge, Apply Independent Brake and make a 20 PSI brake pipe reduction.
7. Remove the Remote Control Tag from the Throttle.

# 107.17 OCU Securement Test

When leaving equipment left standing while operating in remote control, follow the steps outlined below to conduct a release test to ensure the hand brakes applied will prevent undesired movement.

## 107.17.1 Beltpack and Cattron RCL Systems

The Snow Brake feature must be disabled before attempting to conduct a securement test. This can be confirmed when the Snow Brake LED on the OPP is not illuminated.

1. Wait for all equipment coupled to the RCL to come to a stop and for slack to adjust.
2. Apply handbrakes.
3. Verify the Automatic Brake Selector is in the RELEASE position.
4. Move the Reverser Selector to either FWD or REV.
5. Press the Vigilance button.
6. Move the Speed selector to COAST.

Note: Any movement of the RCL will cause the brakes to apply prematurely. If this occurs the test must be conducted again.

7. Verify brakes are released on the RCL by observing the brake cylinder pistons.
8. Once sufficient time has passed to ensure the handbrakes will hold the equipment left standing, move the Speed selector the STOP position.

Note: Vigilance is active during the test.

## 107.17.2 Wabtec (GE) Legacy RCL System

1. Wait for all equipment coupled to the RCL to come to a stop and for slack to adjust.
2. Apply handbrakes.
3. Verify the Automatic Brake Selector is in the RELEASE position.
4. Move the Reverser Selector to N.
5. Press the Enable button.
6. Move the Speed selector to COAST.

Note: Any movement of the RCL will cause the brakes to apply prematurely. If this occurs the test must be conducted again.

7. Verify brakes are released on the RCL by observing the brake cylinder pistons or by observing the LED indicator of the Independent Brake Override Selector indicates REL.
8. Once sufficient time has passed to ensure the handbrakes will hold the equipment left standing, move the Speed selector the STOP position.

Note: Vigilance is active during the test.

# 107.18 Initial Movement of an RCL Consist

After completing initial setup and testing, follow these steps prior to making the initial movement of an RCL consist.

1. Ensure locomotive air brakes are applied on each locomotive during visual inspection.
2. Ensure air hoses are coupled between all locomotives, including brake pipe, main reservoir, actuation, and application & release.

Note: Duplicating the coupling of any of these hoses on both sides of the locomotive is not required.

3. Position cutout cocks and valves for multiple-unit operation.
4. The foreman must perform the following steps for their remote control system before the initial movement of an RCL Consist:

## 107.18.1 Beltpack and Cattron LCS III (Non-Talker) RCL Systems

1. Move the Reverser to FWD or REV.
2. Press the Vigilance button.
3. Move the Speed selector to COAST.
4. Verify, from the ground, the locomotive brakes release on all locomotives.
5. Set a MINIMUM with the Automatic Train Brake Selector. Verify, from the ground, the locomotive brakes remain released on all locomotives.
    a. If locomotive brakes apply, check multiple-unit hose connections.
    b If the multiple-unit hoses are not properly connected, correct the problem and then perform Rule 101.6 Locomotive Air Brake Test.
6. Move Automatic Train Brake Selector from MINIMUM to FULL. Verify, from the ground, the locomotive brakes apply on all locomotives. a. If locomotive brakes don’t apply, check brake pipe connections between locomotives. 7. Move the Speed selector to STOP.
    a. If locomotive brakes don’t apply, check brake pipe connections between locomotives.
7. Move the Speed selector to STOP.

## 107.18.2 GE RCL System

1. Move the Reverser to N.
2. Press the Enable button.
3. Move the Speed selector to COAST.
4. Verify, from the ground, the locomotive brakes release on all locomotives.
5. Set a MINIMUM with the Automatic Train Brake Selector. Verify, from the ground, the locomotive brakes remain released on all locomotives.
    a. If locomotive brakes apply, check multiple-unit hose connections.
    b. If the multiple-unit hoses are not properly connected, correct the problem and then perform Rule 101.6 Locomotive Air Brake Test.
6. Move Automatic Train Brake Selector from MINIMUM to FULL. Verify, from the ground, the locomotive brakes apply on all locomotives.
    a. If locomotive brakes don’t apply, check brake pipe connections between locomotives.
7. Move the Speed selector to STOP.

TOC Home

# Abbreviations

EMERG ..... Emergency
IND ..... Independent Brake Override Selector
LCU ..... Locomotive Control Unit
MED..... Medium
MIN ..... Minimum
OCU..... Operator Control Unit
OMS ..... OCU Management System
RCL ..... Remote Control Locomotive
RCO..... Remote Control Operator
RCZ ..... Remote Control Zone
REL..... Release
SCU ..... Setup Control Unit

TOC Home

# Glossary

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

**AC Locomotive**
Locomotives equipped with AC traction motors; they are not affected by maximum continuous current ratings or short time operating ratings.

**Actuating**
Using a 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 that is attached to a nipple that screws into the angle cock at the end of the brake pipe on each car or engine. The other end of the hose includes a coupling (glad hand) that fits into an identical coupling on the adjoining car. The complete arrangement carries 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 a diesel engine or an electric motor, that compresses air for operating 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 Meter (AFM)**
An instrument that indicates the volume of the air flowing through the automatic brake valve into the brake pipe.

Also referred to as an Air Flow Indicator.

**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, A)**
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 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, which 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 cylinders of individual cars, by using the release valve.

**Blended Brake (Amtrak)**
The combination of air and dynamic braking by making an automatic service brake application with the throttle in IDLE.

**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.

TOC Home

**Brake Cylinder**
A metal 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 on 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 1.25 inches in diameter and extends from one end of the car to the other. At the ends, flexible hoses connect the pipes. 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.
- 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).
- Inverse Gradient: The temporary condition when the brake pipe pressure is higher at the rear end 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.

**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.

**Changeover Station**
The changeover station is used to select the operating mode of the locomotive. Mounted on it are the following components.

**Combination Train**
Two individual trains, each made up of similar loaded and/or empty car types, consolidated into a single train. (e.g., an intermodal train consolidated with an empty bulk commodity train).

**Consist**
A term that usually refers to a set of locomotives coupled together to pull a train. The term may also be used to refer to an entire train—its locomotives and all its cars.

**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**
Locomotives equipped with DC traction motors; they 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-tow. When the dead engine's cutout cock is opened, the main reservoirs are charged from the brake pipe to operate the engine brakes.

**Dead-in-Tow (also referred to as dead-in-train)**
Refers to an inoperative locomotive that has been conditioned for its brakes to function using only brake pipe pressure. This is accomplished by utilizing the dead engine feature to charge the main reservoir from the brake pipe. (This conditioning is done by mechanical forces that will ensure the main reservoir is bled down to below brake pipe pressure before utilizing this feature).

**Dead-in-Train**
See Dead-in-Tow.

**Distributed Power (DP)**
One or more locomotive consists that are remotely controlled from the lead locomotive.

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

**Draft Gear**
The connection between the coupler rigging and the center sill that 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.

**Dual-Ported Cutout Cock**
See MU Cutout Cock.

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

TOC Home

**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.

**Dynamic Brakes — Flat (Grid Control)**
A dynamic brake system that provides retardation which is controlled solely by the position of the dynamic brake lever. Maximum retardation occurs at position 8.

**Dynamic Brakes — High Capacity**
A dynamic brake system that provides approximately 13,500 lbs. of effort per axle instead of the 10,000 lbs. per axle provided by other dynamic brake systems.

**Dynamic Brakes — Taper (Speed Control)**
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.

**Electronically Controlled Pneumatic (ECP) Brakes**
An air brake system that can be controlled electronically. The ECP systems that are being utilized are overlay brake systems. Overlay means the freight car brake system can be operated in either ECP or conventional pneumatic mode. All cars in the train must be equipped with ECP to operate in the electric mode.

**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 similar car types used to haul coal, grain, ore, potash, molten sulfur, soda ash, phosphate, rock, oil, ethanol, taconite, or other bulk commodities. This includes empty tank car trains with loaded buffer cars placed at either end of the train where locomotives are present.

**End-of-Train Device (ETD)**
- A radio 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 transmits the following information to the display on the controlling unit:
  - Last car brake pipe pressure.
  - Last car motion status (moving or stopped).
  - Marker light status (on or off).
  - ETD battery status.
- An ETD that has been armed to an HTD (emergency enabled) provides:
  - Capability from the locomotive to initiate an emergency brake application at the rear of the train.
  - Both the HTD and ETD must be equipped for two-way communication.
  - An Emergency toggle switch associated with the HTD cab display is used to activate the ETD emergency valve.

**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.

TOC Home

**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.

| Initial Brake Pipe Pressure | Service Equalization Pressure | Brake Pipe Reduction to Obtain Equalization |
|---|---|---|
| 90 psi | 64 psi | 26 psi |
| 105 psi | 75 psi | 30 psi |
| 110 psi | 78 psi | 32 psi |

**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% ascending grade means that the track rises 1 foot in elevation for every 100 feet the equipment travels on the track.

**Grade designations:**
- Light Grade: Less than 1%.
- Heavy Grade: At least 1% for a distance of 3 miles or more.
- Mountain Grade: 2% 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 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.
- 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.
  - Two-way armed status.
  - Distance measurement referenced to locomotive movement.
- The HTD provides:
  - Audible alarms pertaining to status changes.
  - Arming capability to a selected two-way ETD.
  - Interface for manual and automatic initiated ETD emergencies.

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

**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.

**In-Train Forces**
See Drawbar Forces.

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

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

TOC Home

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

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

**Loaded Bulk Commodity Unit Train**
A train made up entirely of:

- Similar car types weighing no less than 100 tons each, loaded with coal, grain, ore, potash, molten sulfur, soda ash, phosphate, rock, oil, taconite, or other bulk commodities.
- Loaded tank car trains containing loaded buffer cars weighing 75 tons or greater.

Trains with any cars weighing less than 100 tons (excluding loaded buffer cars weighing 75 tons or greater) are not considered loaded bulk commodity unit trains in the application of train makeup rules and/or in the application of GCOR 6.23 regarding visual inspection after an emergency stop or severe slack action.

**Locomotive Control Unit (LCU)**
A system onboard an RCL that receives, processes, confirms, and executes commands from the OCU via a radio link.

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

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

**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.

**Mobile Control Cabinet**
The Mobile Control Cabinet contains the computer and radio decoder. The computer accepts and processes the signals from the Controlling OCU. It will not respond to signals from another locomotive's OCU.

The BELTPACK radio mode selector switch, mounted on the front of the cabinet, determines which OCUs will be communicating with the computer and radio decoder.

**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 Car**
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**
Off air is a term used to describe a brake system that has not been connected to a continuous source of compressed air of at least 60 psi for a period of 24 hours or more. The "source" of compressed air is one or more locomotives or a yard air connection to the brake system. If brake pipe gradient is observed, no minimum brake pipe pressure at the opposite end of a brake system is required as long as 60 psi or more is being maintained at the charging end of the brake system.

**Operator Control Unit (OCU)**
A mobile unit that communicates via a radio link the commands for movement (direction, speed, braking) or for operations (bell, horn, sand) to an RCL.

**Overcharge**
Brake equipment charged to a higher pressure than the regulating valve is adjusted for or can maintain. When overcharged, 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 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.

TOC Home

**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 handle is in the RELEASE position.

**Remote Control Locomotive (RCL)**
A remote control locomotive that, through use of a radio link can be operated by a person not physically within the confines of the locomotive cab. For purposes of this definition, the term RCL does not refer to a locomotive or group of locomotives remotely controlled from the lead locomotive of a train, as in a distributed power arrangement.

**Remote Control Operator (RCO)**
A person who utilizes an OCU in connection with operations involving a RCL with or without cars.

**Remote Control Pullback Protection**
A function of a RCL that enforces speeds and stops in the direction of pulling movement.

**Remote Control Zone (RCZ)**
A portion of track(s) within definite limits designated in the timetable special instructions.

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

**Service Application**
When brake pipe pressure exhausts at a service rate to apply the train brakes.

**Setup Control Unit (SCU)**
The Setup Control Unit contains the equipment on a locomotive to allow for operator setup and system status display. It provides remote control system interfaces to on- and off-train equipment.

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

**Slug**
A unit with traction motors but no diesel engine and incapable of propelling itself. The unit receives electrical power through a power cable from an adjacent, specially-equipped locomotive. Slugs are used where low speeds and high tractive effort are needed.

**Solid Block (of cars)**
One 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 (TDBA)**
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 the 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 its dynamic brake cut out.

**Tons per Operative Brake (TOB)**
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).

**Tractive Horsepower Per Trailing Ton (THPT)**
The total Tractive Horsepower of all working locomotives divided by the total trailing weight of the train and isolated/inoperative locomotives in tons. For example, a train powered by 15,000 Tractive Horsepower and a train weight of 4,285 tons with two isolated locomotives weighing 400 tons has a 3.2 Tractive Horsepower per trailing ton ratio. (15,000 THP divided by 4,685 tons).

**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 enroute to a destination.

TOC Home

**Unattended**
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. The hand brake is considered to be part of the brake system of a car/locomotive.

**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.

**Wind Tower Train**
A train made up entirely of cars carrying windmill tower sections and empty idler cars.

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