Mid-Continent Railway

North Freedom, WI

Air Brake/Train Handling Rulebook

June 1, 1995

This book belongs to:

_____

I understand and agree to abide by the rules and guidelines contained within this book.

Signed: _____

Date: _____

Contents

First Printing, May 1995

1.0 AIR BRAKE RULES

1.1 Introduction

1.1.1 Scope
Air Brake Rules outlined in this handbook are intended for Mid-Continent Railway operations. Any conflict with Federal Regulations (49 CFR) is unintentional. In the case of such conflict, if any, Federal Regulations will govern.

1.1.2 Air Test
Members of train crew are responsible for the proper tests of air brakes as outlined herein except that at points or terminals designated in the timetable or by other special instructions, examination and testing of air brake apparatus can be performed by other employees and members of the train crew will be relieved of such duties. At such points or terminals, after engine has been coupled to train and air cut in, an automatic brake application and release test of air brakes on rear car must be made.

1.1.3 Effective Condition
Each train must have the air brakes in effective operating condition, and at no time shall the number of operative air brakes be less than 85% of the total number of air brakes in the train. When piston travel is in excess of 10½ inches, the air brakes cannot be considered in effective operating condition.

1.1.4 Supersede
The rules contained within this Air Brake/Train Handling manual supersede timetable special instructions and the *Consolidated Code of Operating Rules* (Edition of 1980).

1.1.5 Condensation
Condensation must be blown from the pipe from which air is taken before connecting yard line or engine to train.

1.1.6 Dispatcher Not on Duty
In the application of MCRY Air Brake/Train Handling Rules contained in this manual, in the absence of an on-duty "train dispatcher," crews shall refer to the Supt. of Operations or general manager, if not available.

1.2 Initial Terminal Road Train Air Brake Tests

1.2.1 Where Tests Are Required:
Each train must be inspected and tested as specified in this section by a qualified person at points:

1. Where the train is originally made up (initial terminal);
2. Where train consist is changed, other than by adding or removing a solid block of cars, and the train brake system remains charged; and
3. Where the train is received in interchange if the train consist is

changed other than by:

a. Adding or removing a solid block of cars from the head end or rear end of the train;
b. Changing engines;
c. Removing or changing the caboose; or
d. Any combination of the changes listed in (a), (b), and (c) of this subparagraph.

1.2.3 Performing Test

Train air brake system must be charged to required air pressure, angle cocks and cut-out cocks must be properly positioned, air hose must be properly coupled and must be in condition for service. An examination must be made for leaks and necessary repairs made to reduce leakage to a minimum. Retaining valves and retaining valve pipes must be inspected and known to be in condition for service.

1. The brake system on a freight train will be charged to within 15 pounds of the setting of the feed valve on the engine, but not less than 60 pounds as indicated by an accurate gauge at the rear of the train and on a passenger train to not less than 70 pounds.
2. Upon receiving the signal to apply the brakes for test, a minimum of a 20 pound, not to exceed full service, brake application must be made.
3. After the blow at the brake valve has ceased, the automatic brake stand will be cut out, wait 45 seconds, then observe that brake pipe leakage does not exceed 5 pounds per minute as indicated by the brake pipe gauge.
4. Inspect train brakes to determine that the angle cocks are properly positioned, that the air brakes are applied on each car, and that the piston travel is correct, the brake rigging does not bind or foul, and that all parts of the brake equipment are properly secured. All parts of brake equipment must be at least 2½" above top of rail.
5. After inspection has been completed and proper signal is received, the automatic brake valve will first be placed in "running" position and then cut in to release the brakes. Each brake must be inspected to see that all have released.
6. Each train leaving initial terminal must have air brakes in effective operating condition on all cars.

1.2.4 Piston Travel:

At initial terminals, piston travel of body mounted brake cylinders which is less than 7 inches or more than 9 inches must be adjusted to nominally 7 inches. On passenger cars, piston travel of body mounted brake cylinders which is less than 6 inches or more than 8 inches must be adjusted to nominally 6 inches.

Minimum brake cylinder piston travel of truck mounted brake cylinders must be sufficient to provide proper brake shoe clearance when brakes are released.

Piston travel of brake cylinders on freight cars equipped with other than standard single capacity brake, must be adjusted as indicated on

badge plate or stenciling on car located in a conspicuous place near brake cylinder.

1.2.5 Inspection of Both Sides of Car:
On cars with a centersill or car structure which obstructs a view of the brake cylinder and associated moveable brake equipment from one side of car, brake inspection must be made from both sides of train as required to observe position of brakes on all cars.

1.2.6 Hand Brakes:
Hand brakes must be released unless needed to secure cars.

1.2.7 Securing Unattended Train:
When a car, block of cars, or train is left unattended without locomotive attached, it must be secured by setting a sufficient number of handbrakes, blocking wheels, or a combination of both. Air brakes must not be relied upon to hold cars unattended.

1.2.8 Performed by Other Qualified Employee:
When test of air brakes has been completed, the engineer and conductor must be advised that train is in proper condition to proceed.

A qualified person participating in the test and inspection, or who has knowledge that it was made, shall notify the engineer that the initial terminal road train air brake test has been completed. The qualified person shall provide the notification in writing if the road crew reports for duty after the qualified person goes off duty.

1.2.9 Signs Given:
During standing test, brakes must not be applied or released until proper signal is given.

1.2.10 Yard Air:
When train air brake system is tested from a yard test plant, an engineer's brake valve or suitable test device must be used to provide increase and reduction of brake pipe air pressure at the same or a slower rate as with engineer's brake valve and yard test plant must be connected to the end which will be nearest to the hauling road locomotive.

When yard test plant is used, the train air brake system must be charged and tested as prescribed by Rules 1.2.3 (Performing Test) and when practicable should be kept charged until road engine is coupled to train, after which, an automatic brake application and release test of air brakes on rear car must be made.

If after testing the brakes as prescribed above the train is not kept charged until road engine is attached, the brakes must be tested as prescribed by Rule 1.2.3 (Performing Test).

1.2.11 Adjustments:
Before adjusting piston travel or working on brake rigging, cut-out

cock in brake pipe branch must be closed and air reservoirs must be drained. When cut-out cocks are provided in brake cylinder pipes, these cut-out cocks only may be closed and air reservoirs need not be drained.

1.2.12 Car Added:

When a train adds cars not previously tested, it must be determined that the brakes on the car(s) picked up apply and release. It must also be determined that the brakes on the rear car of the train apply and release.

1.3 Intermediate Terminal Road Train Air Brake Tests

1.3.1 Passenger and Freight Trains:

Before engine is detached or angle cocks are closed on a train:

1. A full service application of the automatic brake valve must be made.
2. Enginemen must wait until exhaust has ceased at automatic brake valve before signalling brakeman with whistle signal 15(a) that application has been made.
3. Brakeman must not close angle cock on engine until receiving signal from engineman.
4. Brake pipe on train to be left standing must be allowed to go into "emergency."
5. On freight trains only, when required to have angle cock on lead car closed, wait at least two minutes after brake pipe reduction before closing.

After recoupling:

1. Brake system must be recharged to required air pressure.
2. Before proceeding and upon receipt of proper request or signal, application and release tests of brakes on rear car must be made from engine.
3. Inspector or trainman must determine that brakes on rear car of train properly apply and release.

1.3.2 Bottling Air:

Bottling air is prohibited on all passenger trains. When engine is not coupled to train, at least one angle cock must be open to keep brake pipe vented to atmosphere.

1.3.3 Points where Cars are Set Out or Engine Changed:

At a point other than an initial terminal where:

1. An engine or caboose is changed, or
2. Where one or more consecutive cars are cut off from the rear end or head end of a train with the consist otherwise remaining intact.

After the train brake system is charged to within 15 pounds of the regulating valve setting on the engine, but not less than 60 pounds as indicated at the rear of a freight train and 70 pounds on a passenger train:

1. A 20-pound brake pipe reduction must be made.

2. It must be determined that the brakes on the rear car apply and release.
3. As an alternative to the rear car brake application and release test, it shall be determined that brake pipe pressure of the train is being reduced as indicated by a rear car gauge or device and then that brake pipe pressure of the train is being restored as indicated by a rear car gauge or device.

1.3.4 Cars Added:

1. Cars added to a train must receive an initial terminal air brake test.
2. When a solid block of cars, which has received an initial terminal test is added to a train, it must be determined that the brakes on the rear car of the train apply and release.
3. As an alternative to the rear car application and release test, it shall be determined that brake pipe pressure of the train is being reduced as indicated by a rear car gauge or device and then that brake pipe pressure of the train is being restored as indicated by a rear car gauge or device.

1.3.5 Pressure Reduced/Restored:
Brake pipe pressure of the train is "being reduced" means a pressure reduction of at least 5 pounds and the phrase "brake pipe pressure of the train is being restored" means a pressure increase of at least 5 pounds.

1.4 Transfer Test:

Transfer train or yard train movements not exceeding 20 miles, must have the air brake hose coupled between all cars, and after the brake system is charged to not less than 60 pounds, a 20 pound service brake pipe reduction must be made to determine that the brakes are applied on each car before releasing and proceeding.

Transfer train and yard train movements exceeding 20 miles must have an initial terminal air brake test.

1.5 Inoperative Air Brakes Enroute:

A car on which the air brake becomes defective enroute may be handled to the next repair point. However, at no time shall the number of operative brakes be less than 85% of the total number of air brakes in the train. If the air brakes on any car become defective after leaving a terminal and before reaching a repair point, the conductor will promptly notify the train dispatcher, giving nature of defect, car initials and number, and location in train.

Unless specifically authorized not more than two consecutive cars shall be operated in a train with the air brakes cut out. Movement may not be authorized beyond the nearest point where cars can be repositioned in train, set out, or to the nearest repair point, whichever occurs first.

Exceptions:
The above will not apply when handling a "Hospital" or "Wrecking" train under the direct supervision of a Car Department Supervisor, nor will it apply for movements which special instructions are in effect.

Passenger Trains:
Occupied passenger cars MUST have operative brakes. Revenue passenger trains MUST have 100% operative brakes. If the air brakes on any occupied passenger car become defective after leaving a terminal and before reaching a repair point, passengers will be moved to another car with operative brakes.

1.6 Running Tests-Passenger Trains:

A running test of air brakes must be made on all passenger trains:

1. After leaving an initial terminal.
2. From any point where locomotive, engine crew, or train crew has been changed.
3. From any point where a brake pipe angle cock has been turned or train consist changed.
4. Where required by Timetable Special Instructions.

Running test must be made, as soon as speed of train permits, by use of automatic brake. Throttle must not be shut off unless required and running test must be made by applying train air brakes with sufficient force to ascertain whether or not brakes are operating properly. Locomotive independent brake valve must be "bailed off" to prevent run in of slack. If air brakes do not properly operate, train must be stopped, cause of failure ascertained and corrected and running test repeated.

A running test of air brakes on a passenger train must be made, when practicable, one mile from meeting points, junctions, railroad crossings, drawbridges, and other points where failure of the brakes to operate properly would result in hazard.

Running tests are not required on freight trains.

1.7 Back Up Movement:

A back-up hose, or its equivalent, must be used for backing passenger trains, whether loaded or empty. A trainman must be at the rear of the car.

When a trainman controlling a back-up movement of a passenger train sees a signal to stop or necessity for stopping, a brake test must be made to assure himself that he has full control of train. If he is required to leave rear end of the train for any cause, the valve on the back-up hose, or its equivalent, must be left open sufficiently to prevent train from being moved until he returns.

1.7.1 Brake Pipe Free of Obstruction:
The cut-out cock in the brake pipe at the rear of the train must be opened and hose blown out thoroughly before coupling on the back-up hose to know the brake pipe is free from ice, snow or any other substance.

1.7.2 Back-up Hose:
A back-up hose must have a valve with a 3/4 inch minimum opening and warning whistle.

1.7.3 Movement Controlled with Back-up Hose:
When back-up movement is to be made with brakes controlled by use of back-up hose, or its equivalent, air brake test must be made as follows:

1. A brake pipe reduction must be made so as to insure that brakes apply on rear car of movement (opposite end). The engineer will require this test to be made before backing up the train.
2. Immediately after back-up movement has started, a running test must be made. In making this test, brakes must be applied with sufficient force to ascertain brakes are operating properly and engineer can observe same on air gauge. If this is not done the engineer must stop movement and standing test must be repeated before again starting back-up movement.
3. During back-up movements, when the brakes are not being applied from engine, automatic brake valve must be in "RUNNING" position.

1.7.4 Stopping with Back-up Hose:
When making a slow down or stop with the back-up hose, or its equivalent, the brakes must be applied gradually until the train slows down sufficiently, or is stopped, as required. In case of emergency, the valve in the back-up hose, or its equivalent, must be opened quickly to initiate an emergency brake application.

2.0 ENGINE INSTRUCTIONS

2.1 Locomotive Brake Tests

The engineer, when taking charge of a locomotive must know that the brakes are in operative condition by making the following tests:

2.1.1 Brake Pipe leakage Test (required for daily inspection only)

1. Make a ten (10) Pound service brake pipe reduction.
2. Cut out the automatic brake valve.
3. Brake pipe leakage must not exceed five (5) Pounds per minute.

2.1.2 Standing Locomotive Brake Test
This test must be made:

1. When initially taking charge of a light locomotive.

2. After changing control stations on a locomotive.
3. After cutting off or adding units.

To determine effectiveness of brakes:

1. Release independent brake and observe all brakes release.
2. Apply automatic brake with a 10 pound reduction and observe all brakes apply.
3. "Bail off" independent brake handle to release brakes.
4. Make an additional 10 pound reduction of the automatic brake to reapply brakes.
5. Release automatic brake and observe all brakes release.
6. Apply independent brake to full application position.

2.1.3 Running Locomotive Test

This test must be made as soon as operating conditions permit, and immediately after initial movement of light locomotive. To determine effectiveness of brakes while the locomotive is moving:

1. Apply independent brake sufficiently to develop noticeable brake cylinder pressure. Check appropriate retarding effort.
2. Release independent brake and make a minimum 10 pound service application with automatic brake. Observe brake cylinder pressure and retarding effort.
3. "Bail off" independent brake handle and observe that brake cylinder pressure releases and locomotive rolls free.
4. Make an additional 10 pound reduction with automatic brake to reapply brakes. Check brake cylinder pressure retarding effort.
5. Release automatic brake and observe that brake cylinder pressure releases and locomotive rolls free.

2.1.4 Air Gauges

It should be noted that the air gauges have been tested within three months and there is no leakage with automatic brake valve in "release" position. The hands on gauges indicating main reservoir and brake pipe pressures will indicate the same if all are correct. Variation of more than 3 pounds must be reported on daily inspection report.

2.1.5 Pressure Regulating Devices

Reducing and feed valves should be adjusted to maintain within 2 pounds of specified pressures. They must not permit a total fluctuation (variation over time) of over 3 pounds.

2.1.6 Change of Crew

Engineers taking charge of locomotives will ascertain from incoming engineer either verbally or on Daily Locomotive Inspection Report that locomotive brakes are in operative condition.

2.1.7 Securing Locomotives Left Unattended

1. When a locomotive is to be left unattended it will be the responsibility of the engineer to know that units are properly secured and the doors and windows are closed.
2. Independent brake must be cut in and in full application position.

3. Automatic brake cut in, a 20 pound reduction made, and automatic brake valve left in "lap" position.
4. Hand brake applied, or wheels blocked or chained.
5. Diesel Locomotives: The generator field switch must be placed in "off" position and reverser removed.
6. Steam Locomotives: Throttle must be tightly closed, cylinder cocks opened, and reverser lever centered.
7. Air brakes must not be relied on to hold unattended locomotives.

2.1.8 Failure of Locomotive Air Brakes

1. All locomotives must leave terminal points with the air brakes in operative condition.
2. If a failure of locomotive brakes occurs enroute, a report must be made at the first point of communication to the Train Dispatcher who will issue instructions.
3. Engineers must report defects in locomotive air brakes at the end of each trip on their Daily Locomotive Inspection Report.
4. In the event that locomotive brakes become inoperative while locomotive is moving LITE, the procedure should be as follows:
   a. Locomotives must be stopped with the hand brake, if practicable.
   b. Steam Locomotives: With throttle closed, move reverser (Johnson Bar) in reverse position of movement and gradually open throttle.
   c. Diesel Locomotives: If hand brake is not practicable, locomotive may be stopped by "reversing the motors"

   CAUTION: THIS MUST ONLY BE USED AS A LAST RESORT. THE RETARDING FORCE WILL BE SEVERE WHEN POWER IS APPLIED IN REVERSE ON A MOVING LOCOMOTIVE CREWS MUST ANTICIPATE THIS FORCE AND PROTECT THEMSELVES FROM INJURY. THIS PROCEDURE COULD ALSO RESULT IN REPLACEMENT OF ALL TRACTION MOTORS AND SWITCH GEARS.

   To "reverse the motors":
   1. Place throttle lever in "idle" position.
   2. Place reverse lever in position opposite direction of movement.
   3. Move throttle lever to run 1 position.
   4. Locomotive must be secured with hand brakes immediately after movement is stopped, blocking the wheels if necessary.

2.2 Draining Main Reservoir:

Water and foreign matter must be drained from main reservoir at the end of each day's work and, also, enroute when opportunity permits and as conditions require. This rule does not apply on locomotives equipped with automatic drain valves, except enginemen must ensure that automatic drain valves are functioning properly.

2.3 Brake Cylinders and Pistons:

1. Brake cylinder leakage: With a full service application of brakes and with communication to the brake cylinders closed, the brakes must remain applied not less than five minutes,
2. Minimum brake cylinder piston travel must be sufficient to provide proper brake shoe clearance when brakes are released.
3. Maximum brake cylinder piston travel, when engine is standing, must not exceed the following:
   a. Driving wheel brake: 6 inches
   b. Swivel type truck brakes on more than one truck operated by one brake cylinder: 7 inches
   c. Swivel type truck brakes equipped with one brake cylinder: 8 inches
   d. Swivel type truck brake equipped with two or more brake cylinders: 6 inches
   e. Body mounted engine brake cylinder: 6 inches
   f. Steam Locomotive tender brake: 8 inches

2.4 Air Pressure Regulating Devices:

Air pressure regulating devices must be adjusted for the following pressures:

1. Air Compressor Governors (Diesel): 120-130 Pounds
2. Air Compressor Governors (Steam "single-top"): 110 Pounds
3. Air Compressor Governors (Steam "double-top"): 110 Pounds low pressure; 130 Pounds high pressure
4. Brake Pipe Regulating Valves
   a. Passenger Service: 80 Pounds
   b. Freight Service: 80 Pounds
   c. Yard Service: minimum 70 Pounds
5. Reducing Valves
   a. Control Air: 90 Pounds
   b. Independent Brake Valves
      1. Steam Locomotives: 35-45 Pounds
      2. Diesel Locomotives: 35-45 Pounds

2.5 Engine Flat Spots:

1. Engineer receiving an engine with flat spots will notify the train dispatcher and make entry on Enroute Inspection Report.
2. If the flat spots occur while engineer is in charge of unit, report must be made indicating time, location and cause.
3. Engineers must not make adjustments to the independent brake cylinder pressure. If independent brake cylinder pressure is not correct, it must be reported to mechanical forces for correction.
4. To prevent jackknifing and flat spots on units, the independent brake must never be used for stops or slow downs of trains (road service) when the same results can be obtained by use of the automatic brake valve.

2.6 Back Up Movements:

When shoving cars or trains, extreme care must be exercised. The brakes must be released prior to shoving.

2.7 Helper Service:

1. A "helper engine" is defined as an engine in "helper service" coupled to the rear of a train for assistance. Other cars, except a caboose when necessary, must not be coupled to it. Helper engine must be between train and caboose when practical. When necessary to assist from behind the caboose, the caboose must not be occupied.
2. When necessary to perform helper service without radio, the procedures to follow must be understood between engineers prior to moving. The engineer on the front of the train is in charge.
3. Couplers must be stretched twice after helper engine is coupled to train. Prior to cutting in the air, the regulating valve must be reduced to at least 10 p.s.i. below train line setting. Brake pipe must be cut out by placing brake pipe cut out cock in cut-out position. Independent brake valve must be left cut-in, and in "release" position to prevent damage to wheels when automatic brakes are set.
4. A 20 lb. brake pipe reduction must be made on the engine on the front of the train after brake system is charged, to determine that brakes on helper engine apply and release. The gauges must be observed to see that reduction was made and the brake pipe pressure is restored upon completion of test.
5. Minimum throttle settings must be used on the helper engine. The engine on the front of the train must be in a higher throttle setting, except when in the full throttle setting. The helper engine must be the first to reduce throttle settings.
6. The helper engine must be placed in "idle" (throttle closed) when a brake pipe reduction is observed on the helper engine unless information from the engineer on the front of the train dictates otherwise.
7. Helper engine must not be cut off from train while in motion.

2.8 Double Heading Service:

1. When double heading, the engineer of the lead unit shall operate the brakes.
2. On all other units in the train the brake pipe cut-out cock to the automatic brake valve must be closed, the maximum main reservoir pressure maintained, and independent brake valve handles placed in "release" position.
3. Engineers in trailing units must monitor independent brake valve action for sticking brakes on their locomotive and take actions necessary to prevent or minimize sticking brakes.
4. If it becomes necessary for the lead unit to give up control of the train, a test of the brakes must be made to see that the brakes are operative from the automatic brake valve of the engine taking control.

2.9 Hauling Dead Locomotives

2.9.1 Conditions

1. A "dead locomotive" is a locomotive that does not supply tractive effort to the rail. It does not cease to be a locomotive because its propelling motors or power-generating boiler are inoperative.
2. All locomotive units dispatched dead in a road train must have air brakes operative.
3. Dead units must not be coupled consecutively unless it is known that units are equipped with a #8 vent valve.

2.9.2 Set-Up for "Dead in Train"

1. Brake pipe hose coupled and angle cocks open.
2. Automatic Brake Valve cut OUT on Dead locomotive(s).
3. Independent Brake Valve cut IN on Dead Locomotive(s).
4. Dead engine cock must be OPEN (position handle crosswise to the pipe).
5. On diesel locomotives equipped with M.U. connection, application & release and actuating pipe cocks at end of unit must be open.

2.10 Daily Engine Inspections:

Engines in service must be inspected once each calendar day.

Steam Locomotives:

A written report of the inspection shall be made on Form 602, "Locomotive Inspection Report." This report shall contain the initial and number of the engine, place, date and time of the inspection, a description of any defects disclosed by the inspection and the signature of the employee making the inspection.

Diesel Locomotives:

A written report of the inspection shall be made on Form 303A, "Daily Locomotive Inspection Report." This report shall contain the initial and number of the engine, place, date and time of the inspection, a description of any defects disclosed by the inspection and the signature of the employee making the inspection. In addition to filling out the Inspection Report, the daily cab card must also be filled out. The location, date, time and signature must correspond on both the daily cab card and the inspection report.

2.11 Engine Cab:

Enginemen need not accept engines when the cabs which they will occupy are cluttered with debris. When cab is cluttered with debris, engineer will bring it to the attention of the proper authority for an assessment of the situation. Enginemen are responsible for the cleanliness of the cab upon completion of tour of duty. Upon tie-up, they must see that cab doors and windows are closed.

2.12 Engine Radio:

Engineers must also check radios (if engine is so equipped) when making engine inspection. When a radio is defective, damaged or missing, they must report to the train dispatcher and record it on enroute work report. The radio receiver (if so equipped) is an

integral part of the engine and is under the responsibility of engineer. If engine is not equipped with radio, engineer must obtain portable radio and is responsible for that radio's care and use. Portable radios must be returned to charger upon completion of tour of duty. Portable radios must be turned off while in charger.

2.13 Engine Tie Up-Cold Weather Instructions:

Steam Locomotives:

When temperature is expected to drop below freezing overnight and engine is tied-up, fire and water level must be maintained and engine kept "hot" unless engine is placed inside heated enginehouse for banking. Enginemen must not leave engine until relieved by another crew or hostler who will assume responsibility for locomotive.

Diesel Locomotives:

When temperature is expected to drop below freezing, locomotive must be left running in "idle." If temperature is expected to drop below 0 degrees Fahrenheit, throttle must be left in No. 3 position. Good judgement must be used when temperatures are at or near the above parameters. Move the generator field switch to the "off" position, center reverser, and close doors and windows and leave electrical cabinet door open if not sealed.

3.0 GENERAL AIR BRAKE INSTRUCTIONS

3.1 Air Gauge Observance

3.1.1 When enginemen use air gauge to check trainline leakage, Brake Pipe Pressure gauge must be used. Do not read Equalizing Reservoir gauge.

3.1.2 The engineman should school himself in observing the air gauges frequently to guard against the pressure becoming to high or leaking away unnoticed. Instances have been known in which air was lost and the fact not discovered until it was necessary to stop and the resulting air brakes were inoperative.

3.1.3 The engineman should observe the gauges during brake operations to note the effect of the brakes with different brake pipe reductions and the amount and effect of brake pipe reductions as well as brake pipe leakage. The engineman should also note the amount and rate of rise in brake pipe pressure when releasing the brakes.

3.2 Brake Application from Train

3.2.1 Indications of a brake application from the train are:

1. Drop in brake pipe pressure.
2. Sound of excessive regulating valve operation.
3. Unaccounted decrease in train speed.

3.2.2 If the train air brakes apply with an "undesired emergency" application due to opening of conductors valve, train parting, defective triple valve, or other reason:
1. Close throttle slowly.
2. Open sanders.
3. Place automatic brake valve in lap position to prevent escape of main reservoir pressure.
4. Leave automatic brake valve in lap until train comes to a complete stop.
5. Limit excessive build-up of engine brake cylinder pressure, if necessary, by manipulating independent brake valve between release ("bail off") and lap position to prevent sliding wheels, flat spots, and excessive slack action.

3.2.3 If the train air brakes apply at a service rate, make a 5 to 7 p.s.i. brake pipe reduction, followed by further reductions as needed to stop safely.

3.2.4 If power is being used, gradually close the throttle, avoiding any increase in sound of stack exhaust (steam) or increase in amperage (diesel).

3.2.5 When necessary, reduce locomotive brake cylinder pressure to prevent sliding wheels or harsh slack action.

3.2.6 After the train has stopped, to assist in locating leakage, place the automatic brake valve handle in "Running" position.

3.2.7 If the train has broken in two, after the brake system is properly charged, make a Road Test as prescribed in Rule 1.3.1 (After Recoupling).

3.3 Emergency Application

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

3.3.2 Locomotive brakes should be allowed to apply but brake cylinder pressure should be regulated to prevent sliding wheels.

3.3.3 After an emergency brake application from any cause, no attempt must be made to release the brakes until:
1. Train has stopped.
2. Automatic Brake Valve Handle has been in "Emergency" position for one minute.

3.3.4 After an emergency application, regardless of cause, it must be known that brake pipe pressure is being restored at the rear of train before proceeding. If the emergency brake application was caused by a "Kicker or Dynamiter," the train may proceed without an inspection.

3.4 Sticking Brakes

3.4.1 Train and engine crews must observe their train and trains being met or passed for sticking brakes.

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

3.4.3 Probable causes of brakes sticking are:

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

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

3.4.5 Conditions that may cause an overcharged brake system are:

1. Adding a block of cars which have been previously charged to a pressure higher than required.
2. Combining two trains.
3. Recoupling after a separation in train.
4. On 6ET and A1 steam locomotive air brake equipment, leaving automatic brake valve in "release" position (handle to the far left) for more than a few seconds.
5. Attaching locomotive to opposite end of train.
6. Changing the hauling locomotive.

NOTE: In situations 1, 2, and 3, the overcharge may be eliminated by making a 20 p.s.i. brake pipe reduction before coupling air hoses.

3.4.6 Reducing Overcharge of 10 p.s.i. or less from brake system (while train is standing):

1. Make a full service brake pipe application.
2. After brake pipe exhaust has ceased, place automatic brake valve in "running" position.
3. Immediately adjust the regulating valve to the desired pressure.

3.4.7 Reducing Overcharge in excess of 10 p.s.i. from brake system while train is standing:

1. Adjust the feed valve to the desired pressure.
2. Place automatic brake valve in Emergency position for one minute.
3. Place automatic brake valve in Running position until brake pipe pressure indicates 20 p.s.i. on rear of train.
4. Place the automatic brake valve in the Service position for one minute.
5. Place automatic brake valve in "running" position.

3.5 Undesired Release

3.5.1 Freight car brakes of the AB type are particularly sensitive to increases in brake pipe pressure. A slight increase in air pressure causes the control valve to move to release and it will serially transmit the release rapidly through the train.

3.5.2 The following rules must be followed to help prevent an undesired release on freight and passenger trains:

1. In no case shall the INITIAL brake pipe reduction be less than a minimum reduction (5 to 7 p.s.i.).
2. If an application is required before the train brake system is fully recharged, the amount of reduction (at least 6 p.s.i.) must be measured from the instant at which the brake pipe exhaust begins.
3. Never close an angle cock on a train while brake pipe pressure is being reduced through trainline.
4. Never close an angle cock from the end of a train if air is exhausting through said angle cock from an emergency application (e.g. when brake hose connection is broken).
5. Bottling air on passenger trains is prohibited. Bottling the air may result in an undesired release due to leakage back into the trainline from the auxiliary and/or emergency reservoir(s) via the control valve. With a slight increase in brakepipe pressure, the control valve may therefore release the brakes. Bottling air must be avoided.
6. The emergency brake valve located on the left side of locomotive cab is to be used only in an emergency situation. Under no circumstances should an attempt be made to make a brake application other than emergency with this valve as it may result in an undesired release of an automatic service application on the train.
7. After moving the handle of the conductor's valve to any application position IT MUST NOT BE RETURNED TO THE CLOSED OR RELEASE POSITION UNTIL AFTER THE TRAIN HAS STOPPED. The handle must be moved to the extreme application position before moving it to closed or release position.

3.6 Failure to Maintain Adequate Pressure

3.6.1 When the pressure required for the safe handling of train cannot be maintained, the train must be stopped and secured.

3.6.2 If main reservoir pressure drops 5 p.s.i. below the standard brake pipe pressure, the train must be stopped, a full service brake pipe reduction made and hand brakes applied to secure the train.

3.7 Air Gauge 92-Day test

3.7.1 The accuracy of conductor's air gauges, whether portable or part of a tail hose, used in train air brake tests must be verified every 92 days by coupling the unit to the brake pipe hose on a locomotive with in-date air brake equipment (i.e. locomotive gauges must have been tested in 3 months or less).

3.7.2 A comparison between the brake pipe gauge on the locomotive and the reading on the air gauge device must be within plus or minus 3 p.s.i.

3.7.3 A record of the inspection must be recorded and attached to the outside of the device.

3.7.4 Units failing the 92 day test must be removed from service.

3.7.5 Employee removing unit from service must notify immediate supervisor who will arrange for repairs.

3.8 Passenger Equipment

3.8.1 The release feature on all passenger carrying cars may be set for GRADUATED RELEASE if a passenger train is made up entirely of cars capable of graduated release.

3.8.2 Mixed Consists: When moving passenger cars in a freight train, the release feature must be set for DIRECT RELEASE.

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

3.9 Break-in-Two:

If a train parts while running, forward portion must be kept moving, if possible, until rear portion has stopped. When necessary to replace knuckle or perform any work under or between separated portions of train, angle cock on both portions of train must be left open until work is complete and train is ready to be moved or recoupled. Sufficient number of hand brakes must be applied on both portions of train if standing on a grade.

3.10 Cutting Out Air Brakes

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

3.10.2 To cut out brakes on a freight car:

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

3.10.3 To cut out brakes on a passenger car:

1. Close cut-out cock located between branchpipe tee and control

valve. (Place handle in-line with pipe.)
2. Release air pressure from reservoir(s) by opening drain cock on bottom of auxiliary reservoir. Passenger cars equipped with UC brakes have more than one air reservoir.
3. Check that piston rod has retracted to insure that cylinder pressure has released.
4. Check that brake shoes are released from wheels.

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

4.0 TRAIN HANDLING

4.1 General Instructions

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

4.1.2 The comfort and safety of passengers riding passenger trains is of utmost importance. Train braking must be handled in a manner that will prevent abrupt starts and stops, jolts, or other severe movement that might injure or discomfort passengers.
1. Light applications of the automatic brake are preferred, if conditions allow.
2. Train slack must be controlled to prevent jarring motion. Always keep train "stretched" by working power as necessary to maintain train speed.
3. When automatic brake application is made, independent must be "bailed off" to prevent run in of slack.
4. Except in emergency, locomotive independent brake valve should never be used to control speed of or stop a passenger train.

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

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

4.1.5 The following factors will affect the slowing and stopping ability of trains:
1. speed
2. weight of train
3. length of train
4. grade
5. weather conditions
6. brake pipe leakage
7. gradient
8. types of cars in train

4.1.6 Passenger cars have more braking power than freight cars as passenger cars are equipped with two brake shoes per wheel (i.e. "double clasp") as opposed to freight cars with one brake shoe per wheel.
1. Engineers must use judgement in handling of trains with both types of equipment to prevent slack action.
2. Engineers must take into account type of cars in train when determining amount of brake reduction to make. As a general rule, passenger cars require lighter applications than freight cars for equivalent braking action.

4.1.7 Engineers must avoid sliding passenger car wheels with heavy automatic brake applications during slippery rail conditions.

4.1.8 When making an emergency stop with a "LITE" Locomotive, independent brake should be fully applied first followed by moving the automatic brake valve handle to emergency position. This method allows for a faster development of brake cylinder pressure. NOTE: The term "LITE Locomotive" indicates a Locomotive or a locomotive with only one freight car attached for the purpose of this rule.

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

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

4.1.11 During switching operations, throttle and independent brake must be handled in a manner that will permit slack to be adjusted smoothly.

4.2 Starting Trains

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

4.2.2 The approximate time required to release the brakes following a full service application (assuming a train made up of five cars or less):
1. For passenger trains, approximately 10-15 seconds.
2. For freight trains, approximately 20-30 seconds.
3. Time required for release increases with longer train lengths.

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

4.2.4 Starting passenger trains with steam locomotive:
1. Wait for brakes to release (indicated by brake pipe gauge).
2. Open throttle gradually.
3. Cylinder cocks should be open to allow condensation to escape if conditions allow or require.
4. Use sand when necessary to prevent drivers from slipping.

4.2.5 On occasion, steam locomotives may become "stuck on center" such that the train cannot be started. When necessary to take slack to start a train, the slack must be taken carefully to avoid harsh action and roll-back. With a steam locomotive:

1. Close throttle.
2. Apply independent brake.
3. Reverse the locomotive.
4. Gradually release the independent brake.
5. Use steam if necessary to close in slack on first car.
6. Reverse locomotive again and open throttle to start train.
7. Care must be taken to use minimal slack required to start passenger trains when using this method.

4.2.6 If train must be backed to a more favorable spot for starting:

1. Before reaching a point where stop is to be made AND while working steam, make a brake reduction of 6-8 pounds.
2. Continue to work steam moderately until stop is completed so as to have all slack closed in.
3. Reverse the locomotive.
4. Release train brakes.
5. At the time that experience indicates that holding power of the rear brakes is ending, promptly use steam to start train, carefully as to minimize damaging shocks.

4.2.6 While a train is being started, locomotive speed must be kept slow and uniform until entire train is moving. Enginemen should watch for signals from rear train crew, especially when leaving a depot platform.

4.2.7 On diesel locomotives, do not advance the throttle while the load meter indicates increasing amperage.

4.2.8 If the train cannot be started, the throttle must be closed or returned to idle and the cause determined. Further advance of the throttle may cause train separation, damage to traction motors or running gear, or rail burns.

4.3 Use of Sand

4.3.1 When necessary to use sand, the No. 1 truck (or leading axle) sand switch (or valve) should be used to prevent slipping of locomotive wheels.

4.3.2 Slipping of locomotive wheels causes severe stress to draft systems and damage to rails and must be avoided.

4.3.3 Do not apply sand while wheels are slipping. Throttle must be reduced to stop wheel slip, then start sanding and advance throttle. On diesel locomotives only, the independent brake may also be used to control wheel slip.

4.3.4 Where conditions require, sand should be used as the train is stop-

ping to avoid slipping when starting.

4.4 Accelerating Trains

4.4.1 Throttle must be advanced gradually or one position at a time.

4.4.2 Ample time should be allowed between throttle movements. On diesel locomotives, throttle must not be advanced to the next higher position until the amperage has stabilized.

4.5 Braking Trains

4.5.1 Where conditions permit and consistent with good train handling, throttle reductions must be used in lieu of power braking to reduce or control train speed.

4.5.2 Maximum power must not be used with heavy brake applications. Instead, consistent with good train handing, make lighter brake applications and reduce throttle to obtain required speed.

4.5.3 Initial reductions of less than minimum reduction (5 to 7 p.s.i.) MUST NOT be attempted. Reductions less than 5 to 7 p.s.i. may result in undesired release of train brakes.

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

4.5.5 When conditions permit, a minimal reduction shall be used for the final reduction.

4.5.6 If conditions permit, wait 10 seconds after the brake pipe exhaust from the initial reduction ceases, then follow with additional light reductions as required. These reductions should be made in small increments in order to avoid overbraking the train.

4.5.7 Descending Grade (Cycling Method):

1. When cresting grade and beginning a descent, initial brake pipe reduction should be made as soon as practicable after passing the summit.
2. The amount of reduction will depend on the percent of grade, weight and speed of train, but must not be less than minimum reduction of 5-7 p.s.i.
3. Further reductions may be made as required to properly control the speed of the train.
4. Hold reductions until speed is reduced below the desired speed to be maintained. At this point, brakes may be released.
5. Proper control of train speed involves frequent applications and releases.
6. If heavier applications are made too frequently, train may not completely recharge between applications. This will be evident when repeated reductions result in reduced or no braking action.
7. During use of "Cycling Method," should it become evident to the

engineer that the brake is not controlling the train effectively, the train must be stopped and secured.

4.5.8 When braking with power off (FREIGHT TRAINS ONLY):
1. The throttle should be reduced slowly to closed position or idle allowing the slack to bunch gradually.
2. If necessary, the independent brake may be used to bunch slack prior to the initial reduction.

4.5.9 When braking trains with power applied:
1. The initial reduction should be made before reducing throttle.
2. Locomotive brakes should not be permitted to apply. "Bail off" independent brake.
3. Engineer must observe sound of stack exhaust (or amperage on diesel locomotive) at time of initial reduction.
4. As exhaust slows (or amperage increases) from effect of brake application, throttle must be reduced.
5. Only enough power should be maintained to control slack.

4.6 Releasing Brakes

4.6.1 After the desired braking has been accomplished, brakes may be released, providing;
1. No less than a 5-7 p.s.i. brake pipe reduction has been made.
2. Brakes on the entire train will be released before train speed is reduced to 5-10 MPH.

4.6.2 On steam locomotives equipped with 6ET or A1 brake equipment, automatic brake valve MUST NEVER be placed in "release" position (handle all the way to the left) for more than a few seconds. If handle is left in this position, train brakes will become overcharged and may not release after a brake application.

4.6.3 If train slack is bunched when the brake valve is moved to "running" position, the independent brake must be used to prevent run-out of slack until the train brakes are fully released.

4.6.4 If power is applied when brake valve is moved to "running" position, the engineer should note the sound of steam locomotive exhaust (or amperage reading on diesel locomotive) and must handle the throttle so as not to exceed that sound or reading until train brakes are completely released.

4.7 Stopping Trains

4.7.1 At a sufficient distance to insure stopping at the desired point, make a minimum brake pipe reduction of 5 to 7 p.s.i. followed with additional brake pipe reductions as required.

4.7.2 The final reduction should be made when the train is no less than one to two car lengths from desired point to stop.

4.7.3 Passenger trains should be stopped with as minimal a total reduction as possible. Good judgement and experience will allow stopping a passenger train accurately without jolting passengers.

4.7.4 If a passenger train spot is overshot or train stalls before reaching spot, confirm that no passengers have begun boarding or alighting before attempting to move train again to spot.

4.7.5 At points where train stop is made to detrain passengers;
1. After train stops, Rule 1.3.1 must be complied with.
2. Trainmen must not allow passengers to board or alight until engineer has sounded whistle signal 15(a).

5.0 STEAM LOCOMOTIVE SPECIAL INSTRUCTIONS

5.1 To Start the Air Compressor:
1. Check that all drain cocks are open and all water drained out of compressor or compressors.
2. Fill automatic oil cups once a day with steam cylinder oil (NOT superheat oil).
3. Open steam valve enough to start the compressor slowly, but not enough to cause the compressor to pound.
4. When dry steam shows at the drain cocks, close the drain cocks.
5. With hydrostatic lubricator, feed 10-15 drops of oil to the steam cylinders, then regulate the feeds to two drops per minute for each compressor steam cylinder.
6. After 30 pounds of air pressure has accumulated in the main reservoir to provide an air cushion, the steam valve may be opened sufficiently to run compressor(s) at the proper speed according to circumstances, BUT never faster than is necessary to do the work required.
7. A swab well oiled is essential on each piston rod.
8. With two compressors, see that both are operating.

5.2 Compressor governor should be observed to ensure:
1. It stops the compressor when the maximum air pressure has been obtained.
2. It starts compressor with a reduction of not more than 3 pounds in main reservoir pressure.
3. That the air port is open.
4. That leakage at the vent is not excessive.
5. That the governor and its pipe connections are free from leakage.

5.3 To Stop Air Compressor:
1. Close the feed on hydrostatic lubricator.
2. Close steam valve.
3. Open all drain cocks on the compressor.
4. Main reservoir drain cock should be left open when compressor is stopped for any length of time.
5. Locomotive should be chained or blocked to prevent movement.
6. The compressor should always be stopped while ash pan is being

cleaned to prevent ashes and dust from being drawn into the air cylinders and clogging air strainers.

5.4 Governor Control:
On steam locomotives equipped with SF type compressor governor (twin top), with automatic brake valve in running position, main reservoir should indicate pressure at which low pressure governor top is set. The high pressure top controls main reservoir pressure when automatic brake valve is in lap, service, or emergency position.

5.5 Compressor Failure:
If one compressor fails on a steam locomotive equipped with two, the defective compressor must be immediately cut out by closing cutout cock in discharge pipe between air compressor and reservoir and closing steam supply valve to same.

5.6 Use of Cylinder Cocks:
Cylinder Cocks must be opened when necessary to remove condensation from steam cylinders. To prevent personal injury, enginemen must use judgement to close cylinder cocks when close to or in the vicinity of bystanders.

5.7 Use of Boiler Blowdown:
Boiler blowdowns must be used at least once per trip to clear impurities from boiler water. Blowdowns must not be opened in the vicinity of bystanders in order to prevent personal injuries. Enginemen will be responsible for using good judgement in the use of blowdowns to avoid blowing dirt and debris upon engine running gear. Class R-1 locomotives equipped with blowdown mufflers should be blown down on bridges when possible.

6.0 DIESEL LOCOMOTIVE SPECIAL INSTRUCTIONS

6.1 Traction Motor Damage:
Under no circumstances will power be applied while train is at standstill unless attempt is being made to start train. Extensive damage to traction motors will occur if power is applied to hold train at standstill.

6.2 Cab Heaters:
During cold weather, cab heaters must be turned onto the fan position with heater supply valves open to maintain at least 40 degrees in the cabs to prevent heaters or air equipment from freezing.

6.3 MILW 988

6.3.1 Pre-Start List

1. Check sump for water. Remove plug from sump drain and catch all oil in coffee can or similar cup. If water is present in oil, drain all water only oil flows. Replace plug and tighten. If water is drained from sump, report on daily inspection report.

2. If engine has been shut down for three days or more, engine must be pre-lubed. Open #3 right inspection cover and stick suction hose through hole in screen. Open valve on oil header and plug pump into 110-volt line using yellow double male ended cord (kept in short hood). Run pump until oil is dripping off connecting rods. Oil pressure gauge in cab should read 4-5 pounds pressure.
3. Check water level in sight glass. 2/3 a glass is adequate. If water is added, treatment must also be added. One pound of Culligan #105 for every 40 gallons water must be used. A coffee can equals about 2 pounds treatment. Remember, for diesel water treatment, it is better to overtreat than undertreat.
4. Check air compressor oil level. Add SAE #40 oil (same as engine lube oil) as needed.
5. Uncover exhaust stack.
6. Inspect entire engine for loose parts or tampering.

6.3.2 Engine Start

1. Close battery switch.
2. CLOSE all breakers on Control Compartment Panel EXCEPT Aux. Gen., Aux. Gen. Field, M-G Set, and Electric Cab Heaters.
3. CLOSE control stand breakers "Control" and "Fuel Pump."
4. Select Engine Control Switch (EC Switch) to "Idle." Alarm bell will ring.
5. Bump engine by engaging engine start switch just enough to roll crankshaft over. Repeat bumping engine over until crankshaft has rolled over several times. If engine locks up or fails to turn over, DO NOT attempt to start. Report condition to supervisor.
6. If engine rolls freely, move Selector handle to position 1.
7. Hold Engine Start Switch ON until oil pressure has built up to at least 20 pounds (alarm bell will stop ringing). If engine fails to keep running, repeat cranking ONLY after rotation has stopped. This step may take longer in colder weather.
8. After engine is running, CLOSE Aux. Gen. and Aux. Gen. Field breakers to recharge batteries.
9. While engine is warming up, inspect unit for leaks, check journal oil, fill out Daily Inspection Form.
10. Check crankcase oil on dipstick. Add makeup oil as needed. Use only SAE #40 diesel lube oil.

6.3.3 Moving Engine after Warm-up

1. CLOSE M-G Set breaker.
2. Move EC Switch to "Run."
3. CLOSE Generator Field breaker on Control Stand.
4. Make sure Selector Handle is in position 1.
5. Water temperature should be at least 120 degrees.

6.3.4 During Operation

1. Operate Eddy Current Fan and open and close shutters as needed to maintain engine temperature between 140 and 165 degrees.
2. If engine is shut down at any time, it must be bumped over before restarting.

6.3.5 Shutting Down Engine

1. Move Throttle to "Idle," shut off Gen. Field switch, move EC Switch to "Idle," OPEN M-G Set, Aux. Gen., and Aux. Gen. Field breakers.
2. To shut down unit, OPEN Fuel Pump breaker.
3. OPEN all breakers on Control Compartment EXCEPT the Crankcase Exhauster. Exhauster must run for several minutes to clear fumes from crankcase.
4. OPEN Crankcase Exhauster breaker, remove Reverser, and OPEN Battery Switch.
5. Drain condensate from main air reservoirs, close shutters, close stack cover.
6. Close and block cab windows, lock short hood doors.

6.4 PS 4 (Commonly referred to as the "GE")

6.4.1 Pre-Start List

1. Check engine lube oil level (both ends).
2. Check air compressor lube oil level (both ends).
3. Check engine coolant (radiator) level.
4. Disconnect any battery charger or engine block heater cords connected to locomotive.

6.4.2 Engine Start

1. CLOSE Battery Switch in electrical cabinet.
2. CLOSE Control switch, TURN ON both engine switches (on control stand).
3. With throttle at idle, and reverser centered, PUSH engine start button for one end. After engine starts, release button. Start the opposite end. Both engines are not needed to run locomotive, but horsepower and air brake capacity are greatly reduced if only one end is running.

6.4.3 Moving Engine

1. After air is pumped up and engines have warmed up, TURN Control Key Switch (on top of control stand) to right (horizontal position).
2. Engage reverser and open throttle.
3. Load meter is switchable to indicate either end by moving toggle switch located below load meter.

6.4.4 Engine Shut Down

1. Center Reverser, Throttle in "Idle," TURN Control Switch Key to left (vertical position), SHUT OFF Control Switch and both engine switches. Engines should stop running after several seconds.
2. CLOSE Battery Switch in electrical cabinet. Air brake handles should be removed from air stand and placed inside electrical cabinet. Remove Control Switch Key and place with air brake handles. Lock electrical cabinet.
3. If engine is shutdown for overnight and is located near a 110-volt electrical outlet, battery charger should be plugged in using plug underneath engine.

6.5 Restarting Engines:

Engine protective devices sometimes cause engine shutdowns because of momentary events. In many cases, if the device is reset, and the engine is restarted, no further problems will be encountered.

1. Check engine water sight glass. Water level should be near the Full (Engine Dead) mark. If water is not visible in sight glass, DO NOT ATTEMPT TO RESTART THE ENGINE.
2. Check that the overspeed trip lever is not in the tripped position. Lever should be angled to the left while facing the front of the engine. If the lever is angled to the right, it is tripped and should be reset by pushing over to the left.
3. Check the low oil trip plunger on the governor (if equipped). Push in to reset.
4. Check the engine protective device (if equipped) to see if either the low water or crankcase button is tripped. The lower water may be reset by pushing in. Crankcase pressure button may not be reset. If crankcase button is tripped DO NOT attempt to restart engine.
5. Check the governor oil sight glass.
6. Check around the engine and air compressor for obvious damage caused by failed components. Do not attempt a restart if damage is evident.
7. Check that the Battery Switch is closed and that all required circuit breakers are turned on.
8. If the unit is a single unit or is leading a consist, only the Control and Fuel Pump Switch should be on.
9. Place the throttle in idle. Restart engine.
10. If the engine will not crank and is at operating temperature (160 degrees), wait 5-10 minutes and try again. If the engine has been shut down for more than 15 minutes and still will not crank, do not attempt further restarts.
11. Observe the Low Water and Crankcase Pressure buttons (if equipped). The Low Water Detector will often trip during engine starting and must be reset or the engine will die. If the Crankcase Pressure Detector trips DO NOT attempt to restart the engine.
12. Observe the engine oil pressure gauge. If pressure does not build within a minute, the Low Oil Detector on the governor will trip (if equipped). If the trip is reset quickly, the engine will not die. If oil pressure does not build up within two minutes, check the engine water temperature gauge. Allow a hot engine (above 212 degrees F) to cool before another start is attempted. If the engine is not overheated and there is a danger of freezing, drain the engine cooling water and report the failure.
13. Recheck the fuel return sight glass. If the glass fails to remain full, check to see if the fuel pump is running. If not, check the Fuel Pump circuit breaker and the Aux. Gen. circuit breaker.
14. If an engine shuts down again after restarting, do not attempt any further restarts. Report condition to mechanical personnel.

6.6 Excessive Cranking

Under no circumstances should an engine be cranked longer than 30

seconds. If the engine fails to fire, wait a few minutes to allow the starter coils to cool before attempting another start. If the engine fails to crank, check the starting fuse.

6.4 Draining Units:

Caution: Before opening any pressure cap be sure pressure is released by opening vent valve. Failure to do so could cause hot water to blow out.

This rule applies to diesel locomotives NOT equipped with antifreeze.

It should be noted that the draining of the cab heater and engine water pumps is of equal importance. To drain the engine water pumps, remove pipe plug from bottom of pump housing. Engine block is drained by opening drain cock on bottom of engine block. Report drained locomotives to mechanical personnel promptly.

7.0 COLD WEATHER OPERATIONS

7.1 Caution must be used when starting trains and using train air brakes during cold weather to prevent failure of drawbars and/or knuckles. During cold weather metal is known to withstand less stress and air brakes take longer to set up and release. Taking a little more time and exercising patience during running releases and starting trains will help reduce train separations. When in doubt about a running release of brakes, stop train, then proceed when released.

7.2 When an obstruction or frozen train line is suspected reduce brake pipe pressure from rear of train if practicable. The train must be stopped until engineer is assured that air is in proper working order.

7.3 It is important to keep water out of air system by assuring that main reservoir blow-downs are working properly and use manual blow-downs on both main drums and air compressors whenever possible. Air hose on engine should be blown out prior to coupling to train.

7.4 To prevent freezing of air horn (diesel locomotives) and sanders, they should be used frequently during heavy moisture conditions.

7.5 Extreme care should be taken where flat spots are encountered on either engine or cars, as risk of breaking rail is increased during cold weather.

7.6 When air trouble is encountered, look closely for partially closed angle cocks between cars. An angle cock opened slightly can cause air problems in cold weather.

7.7 Advise train dispatchers of extreme weather conditions, particularly heavy snow conditions.

7.8 Use extra care when getting on or off engines during slippery conditions.

7.9 Be sure snow packed switches are thoroughly cleaned out.

7.10 Be sure knuckle is closed on lead unit to prevent it from becoming packed with snow.

8.0 DEFINITIONS

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

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

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

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

BAIL-OFF
In reference to a locomotive independent brake valve, holding the handle in the "release" position such that the locomotive air brakes kick off and release fully despite position or action of the automatic brake valve.

BOILER
A steam-generating apparatus mounted on top a locomotive frame. Boiler components include the boiler barrel, a smokebox, firebox, and ashpan.

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

BRAKE PIPE REDUCTION

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

BRAKE VALVE CUT-OUT COCK

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

BRANCH PIPE CUT-OUT COCK

A device used to cut out the control valve on a locomotive unit or car. The handle is perpendicular (i.e. 90 degrees) to the pipe when the cock is open.

CHARGING

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

CONTROLLING UNIT

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

CONTROL VALVE

An air operated valve on locomotives or cars which controls the charging of reservoirs and the application and release of brakes in response to reductions or increases in brake pipe pressure. Commonly referred to as the "triple valve."

DEAD ENGINE FEATURE

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

DEAD LOCOMOTIVE

A locomotive unit not capable of providing tractive power.

DIRECT RELEASE

The normal method of release of freight car brake equipment, and a selectable method of release for passenger equipment. Once the control valve is moved to release position by an increase in brake pipe pressure, all brake cylinder pressure is released.

DOUBLE HEADER

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

DUMMY COUPLING

A device used to secure and protect unused hoses and couplings.

EMERGENCY APPLICATION

A rapid, uncontrolled reduction of brake pipe pressure which causes control valves to move to emergency position and vent valves to open. An emergency application produces about 17% more braking effort than full service.

EMERGENCY BRAKE VALVE

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

ENGINE

An internal combustion power plant mounted under the long hood of a diesel-electric locomotive unit that drives the generators and auxiliary equipment on the unit. The term "Engine" is also used to refer to a locomotive in general.

EQUALIZATION PRESSURE

The pressure at which auxiliary reservoir and brake cylinders are equal. This is the maximum braking effort that can be obtained in service applications. Samples:

brake pipe pressure	equalization pressure	full service reduction	brake cylinder pressure developed
70	50	20	50
80	57	23	57
90	64	26	64
100	71	29	71
110	78	32	78

EQUALIZING RESERVOIR

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

FEED VALVE

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

FINAL REDUCTION

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

FREIGHT TRAIN

Shall be any train made up entirely of freight cars. A caboose shall be considered a freight car.

FULL SERVICE REDUCTION

A reduction of brake pipe pressure at a service rate, sufficient in amount to cause equalization pressure.

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

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

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

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

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

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

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

LITE LOCOMOTIVE
A locomotive operated without a train.

LOAD METER (AMMETER)
A meter located on the control stand of a diesel locomotive that indicates amperage in one traction motor. The load meter indicates pulling power.

LOCOMOTIVE
A self-propelled unit of equipment designed for moving other equipment operated from a single control stand.

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

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

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

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

PASSENGER TRAIN
Shall be any train made up entirely of passenger cars, or containing at least one passenger car in combination with other types of cars.

REDUCING VALVE
A valve which reduces main reservoir pressure for use in various air operated devices. Also known as a "Feed Valve."

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

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

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

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

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

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

THROTTLE MODULATION
Varying the throttle position (power) to allow grade and rolling

resistance to reduce train speed.

TRAINLINE
See Brake Pipe.

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

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

UNIT
A single Locomotive, usually a diesel.

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

YARD AIR SUPPLY
A compressor and system of pipes and hoses located throughout a yard so that trains may be charged and tested before arrival of the road locomotive.

YARD LOCOMOTIVE
A locomotive assigned and operated in yard service. Class or horsepower does not affect this status. Pressure regulating devices may be adjusted as prescribed for yard service.

Mid-Continent Railway Equipment
Air Brake Schedules

Steam Locomotives

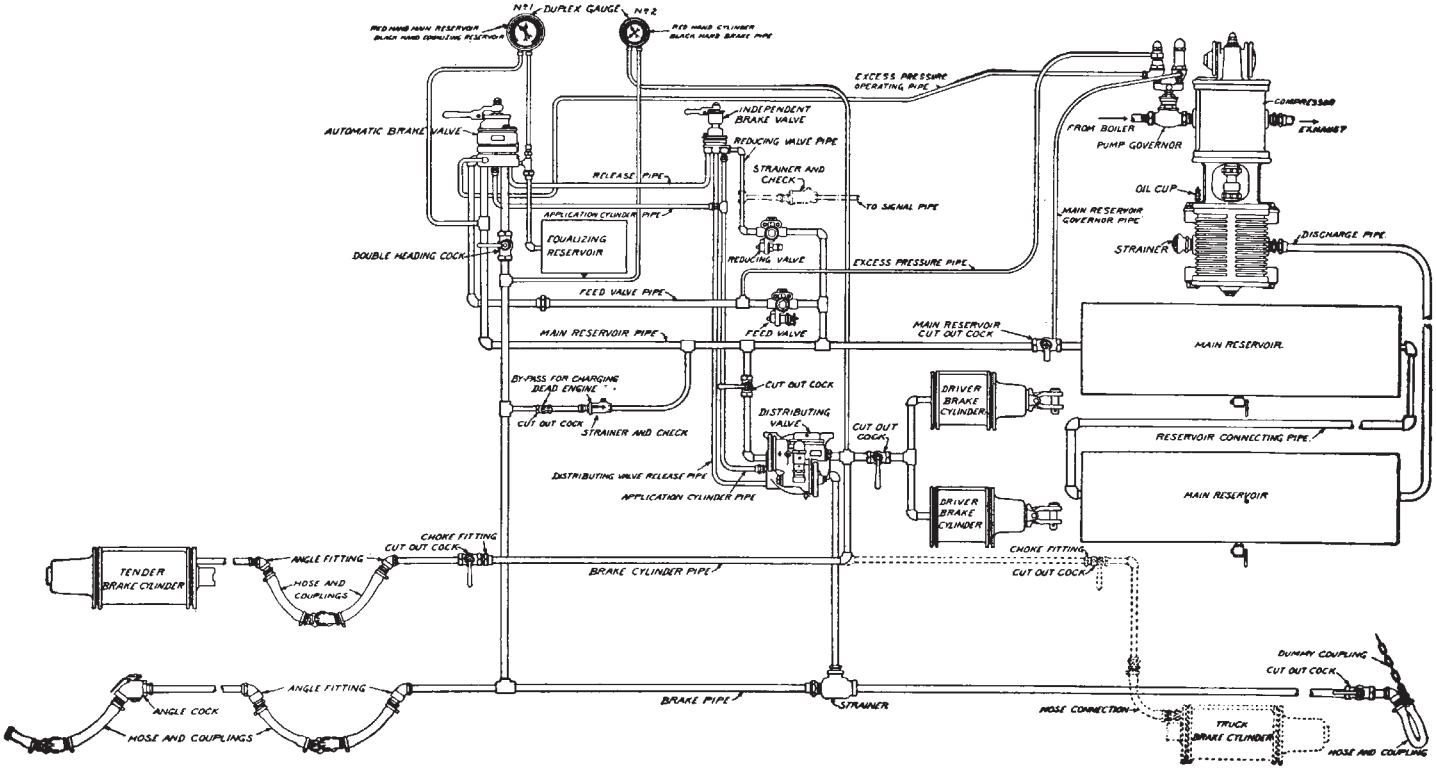
C&NW 1385	**6ET**
D&R 9	**A-1**
STCo. 2	**6ET**
WC&C 1	**A-1**
W&OV 1	**A-1**
GB&W 49	**6ET**

Diesel Locomotives

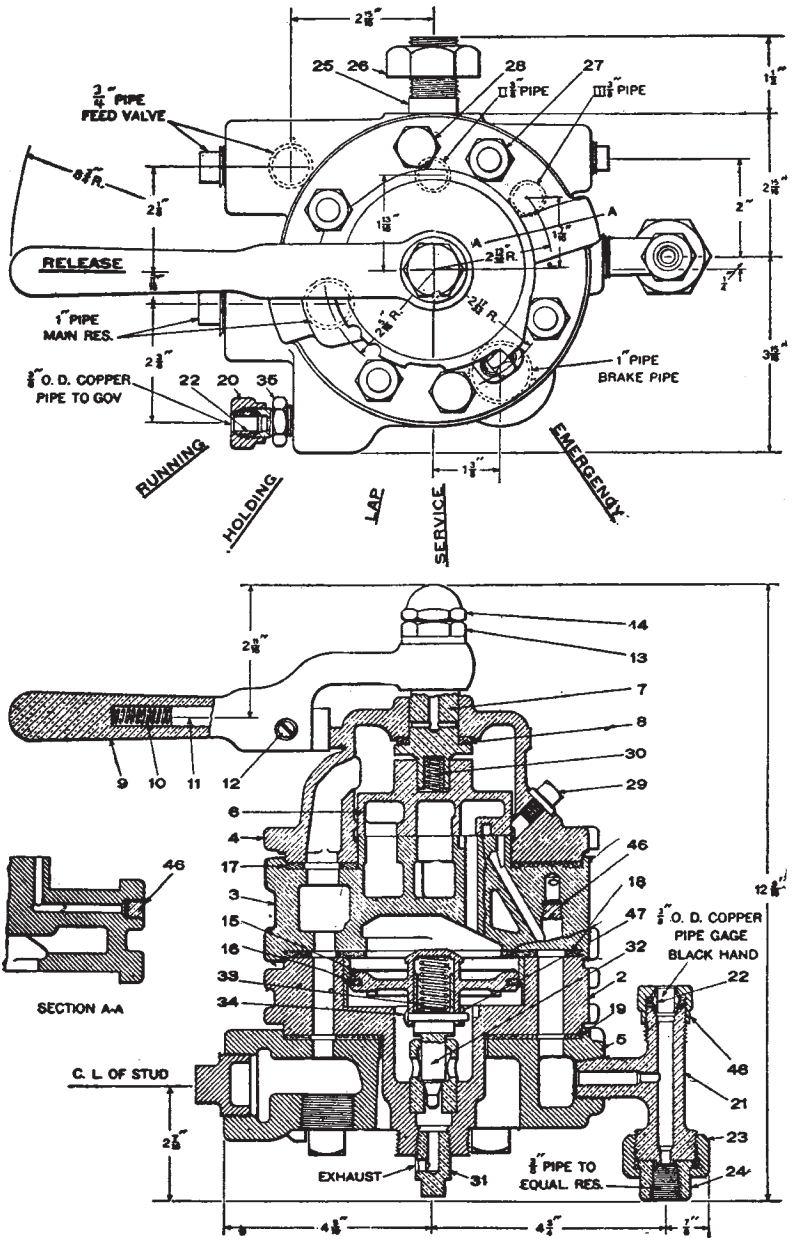
MILW 988	**6BL**
PS 4	**14**
Hall Printing Co.	**14**
Nekoosa Papers 21	**26L**

Passenger Equipment

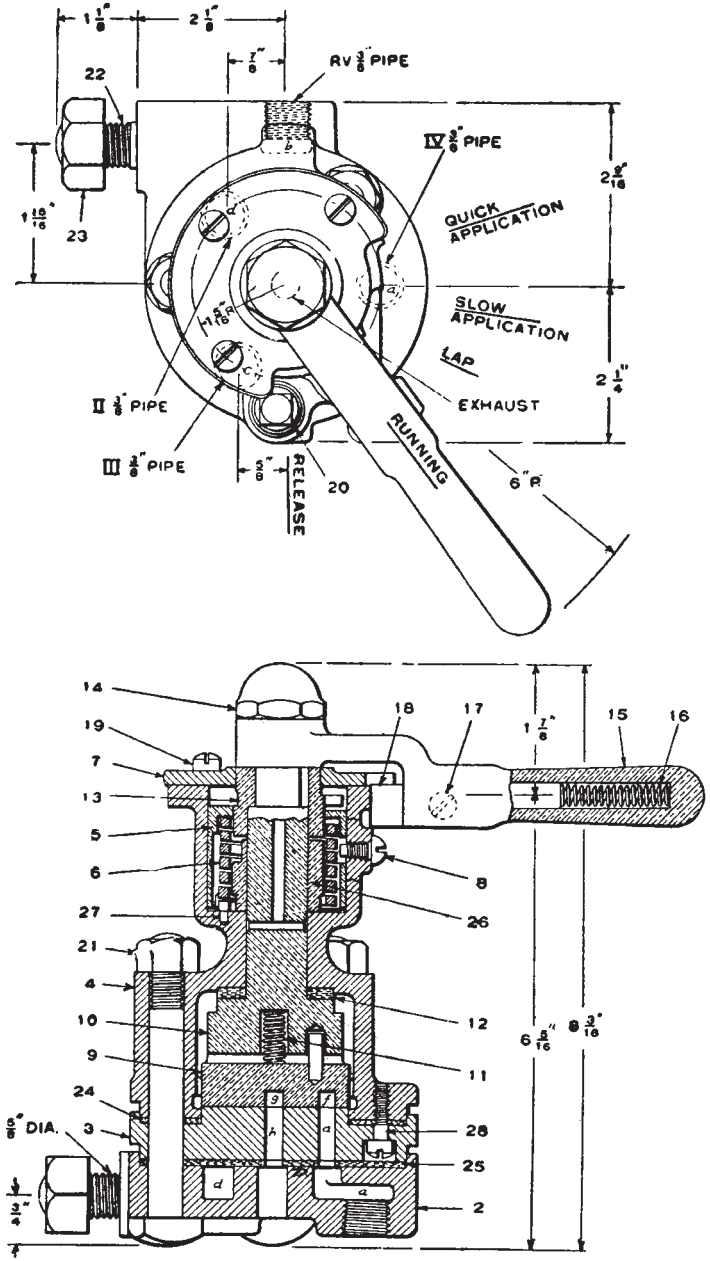
DLW 425	**PM**
DLW 557	**PM**
DLW 563	**PM**
DLW 595	**PM**
C&NW 7409	**PM**
C&NW 440	**UC**
SOO 2017	**LN**
GN 271	**AB**
WC 63	**LN**
Oak Park	**LN**
Mt. Harvard	**UC**
C&NW 10802	**AB**



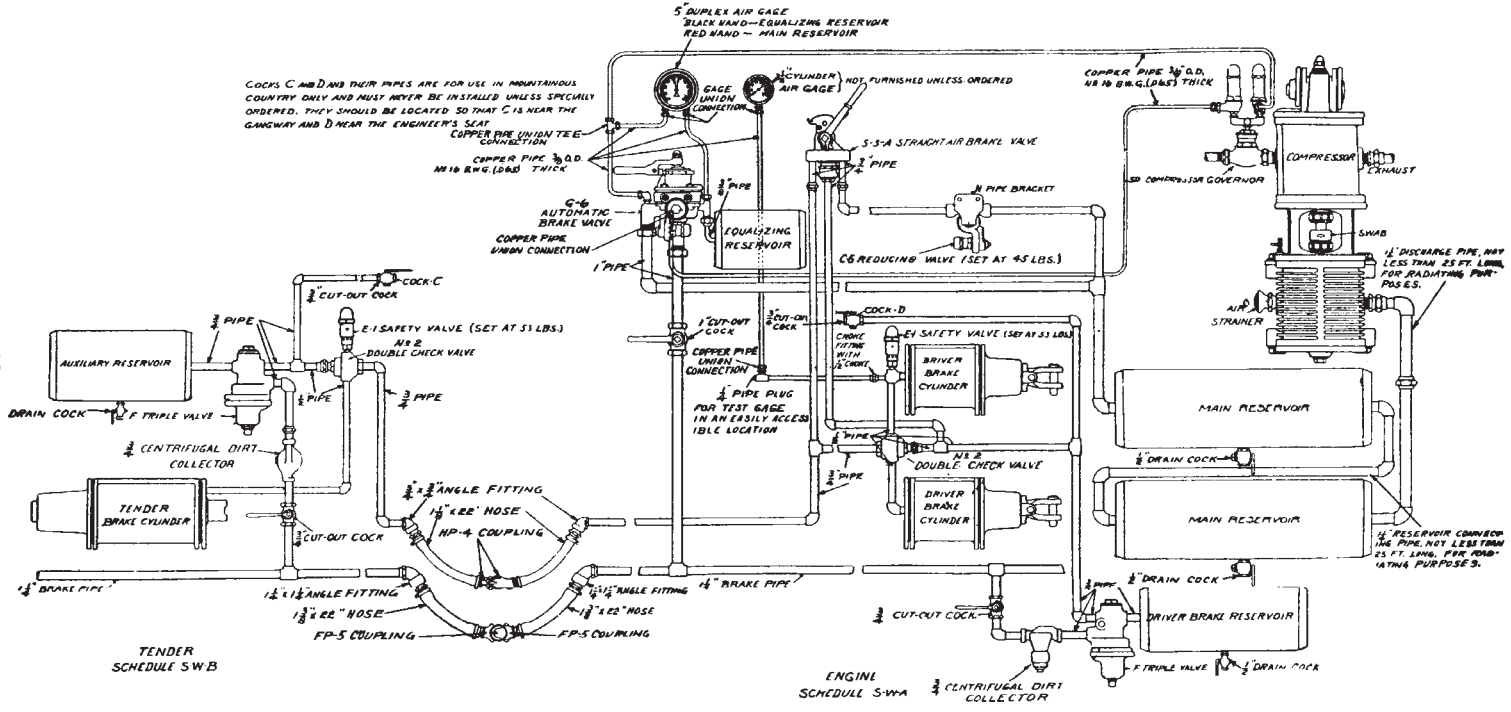
"6ET" Locomotive Air Brake Equipment



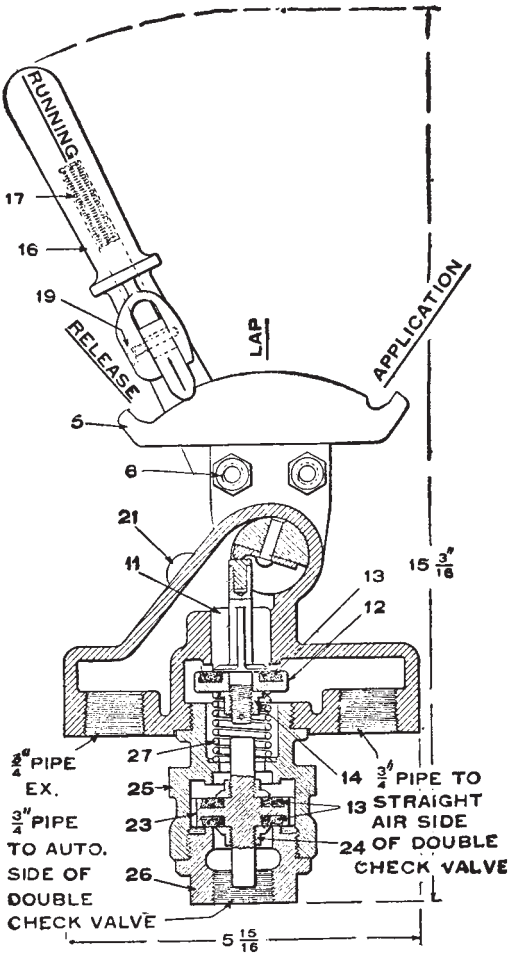
"H6" Automatic Brake Valve
(used in 6ET Air Brake Schedule)



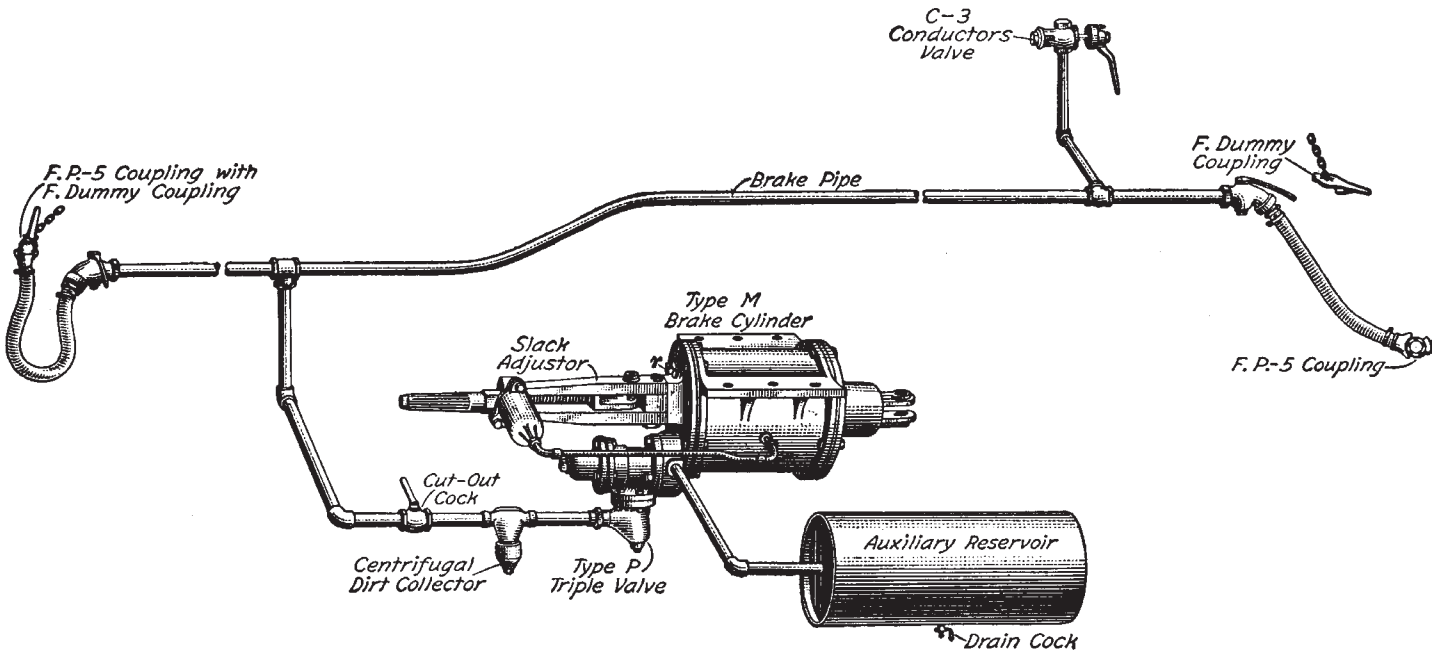
"S6" Indepedent Brake Valve
(used in 6ET Air Brake Schedule)



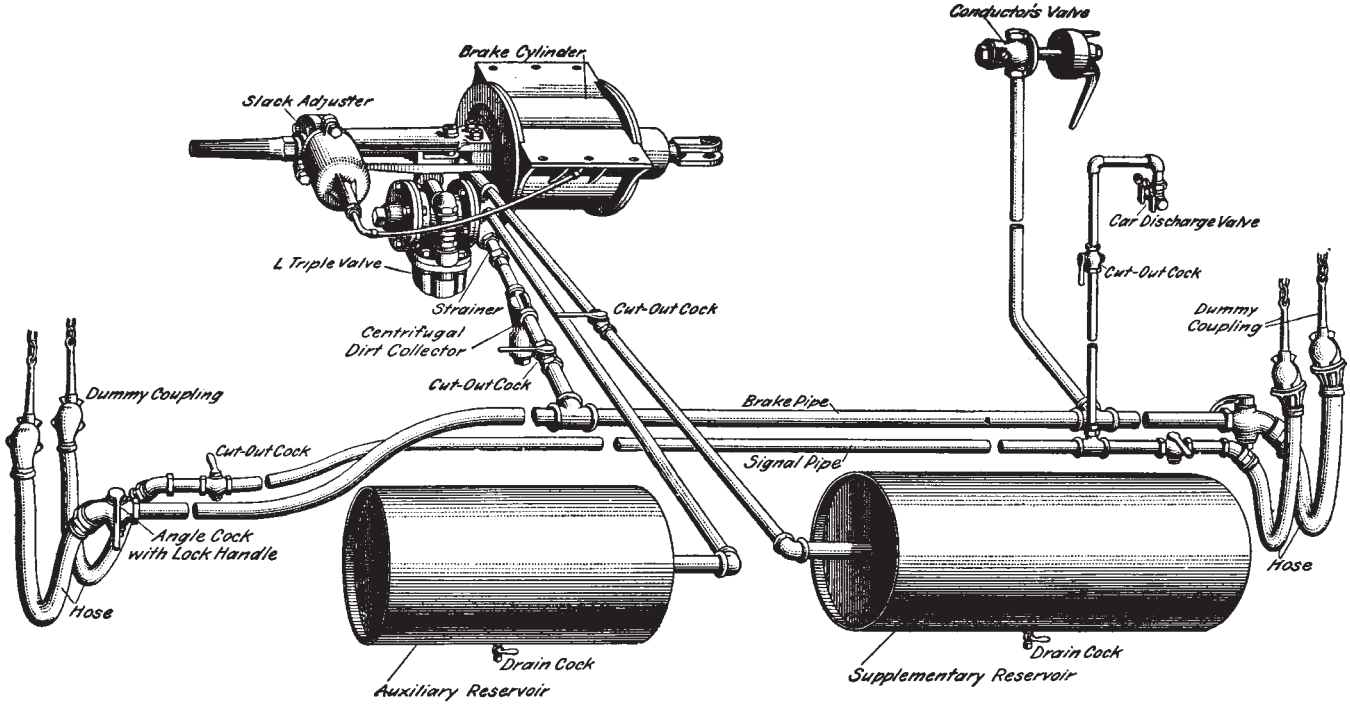
"A-1" Schedule Locomotive Air Brake Equipment



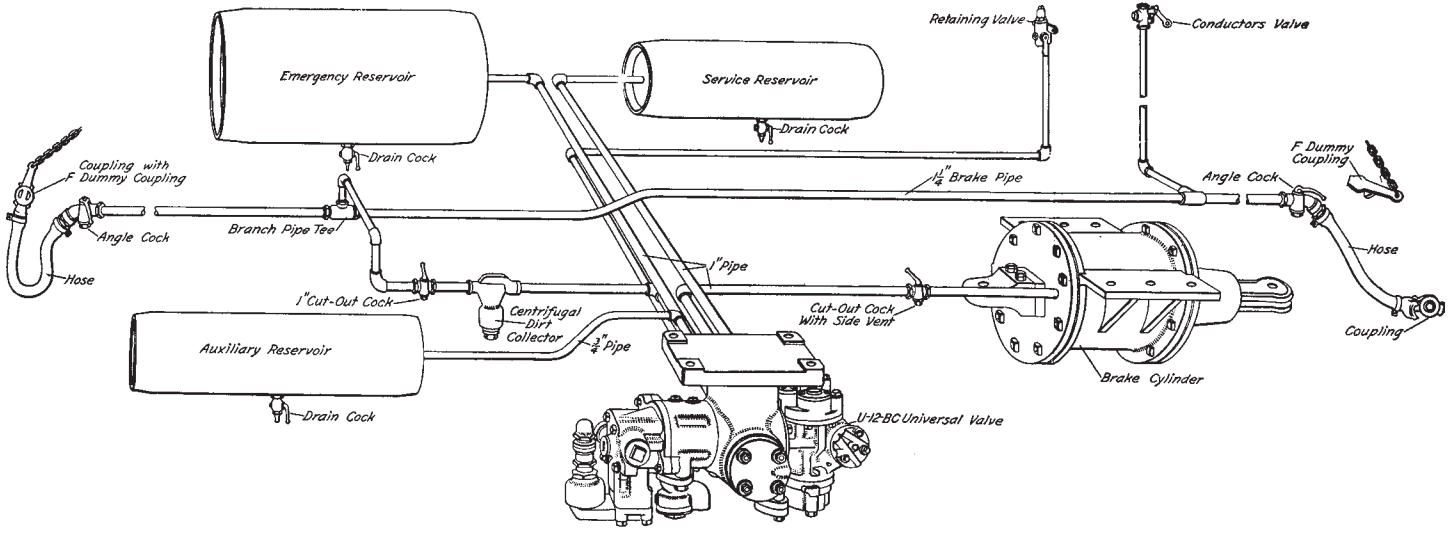
"S-3-A" Independent Brake Valve
(used in A-1 Air Brake Schedule)



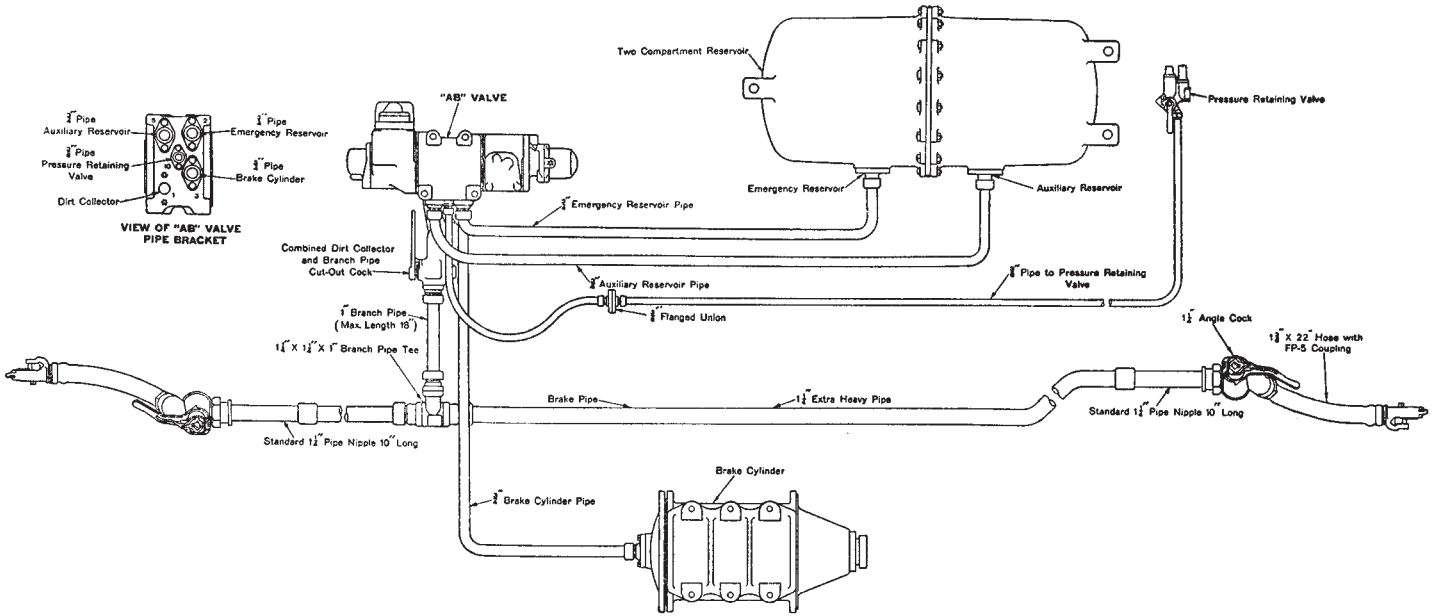
"PM" Passenger Air Brake Equipment



"LN" Passenger Air Brake Equipment



"UC" Passenger Air Brake Equipment



"AB" Freight Brake Equipment