TRAIN BRAKES AT SVRY
CHAPTER 1

Introduction

This chapter is meant to be a simplistic view of brake operations at SVRy. As such it does not extensively describe locomotive brake operations, except as it might be helpful for the train crew to understand how the train brakes operate. This description is focused only on air brakes at SVRy. The discussion that follows is based on use of locomotive No. 19. Locomotive No. 19 uses a 6-BL brake stand whereas No. 3 uses a 6A. The principal difference between No. 19 and No. 3 is, No. 3 does not apply locomotive brakes when applying train brakes, whereas the 6-BL does. It also is based on use of the "K" Triple Valve, the most common triple in use at SVRy.

The Basics of SVRy Train Air Brakes

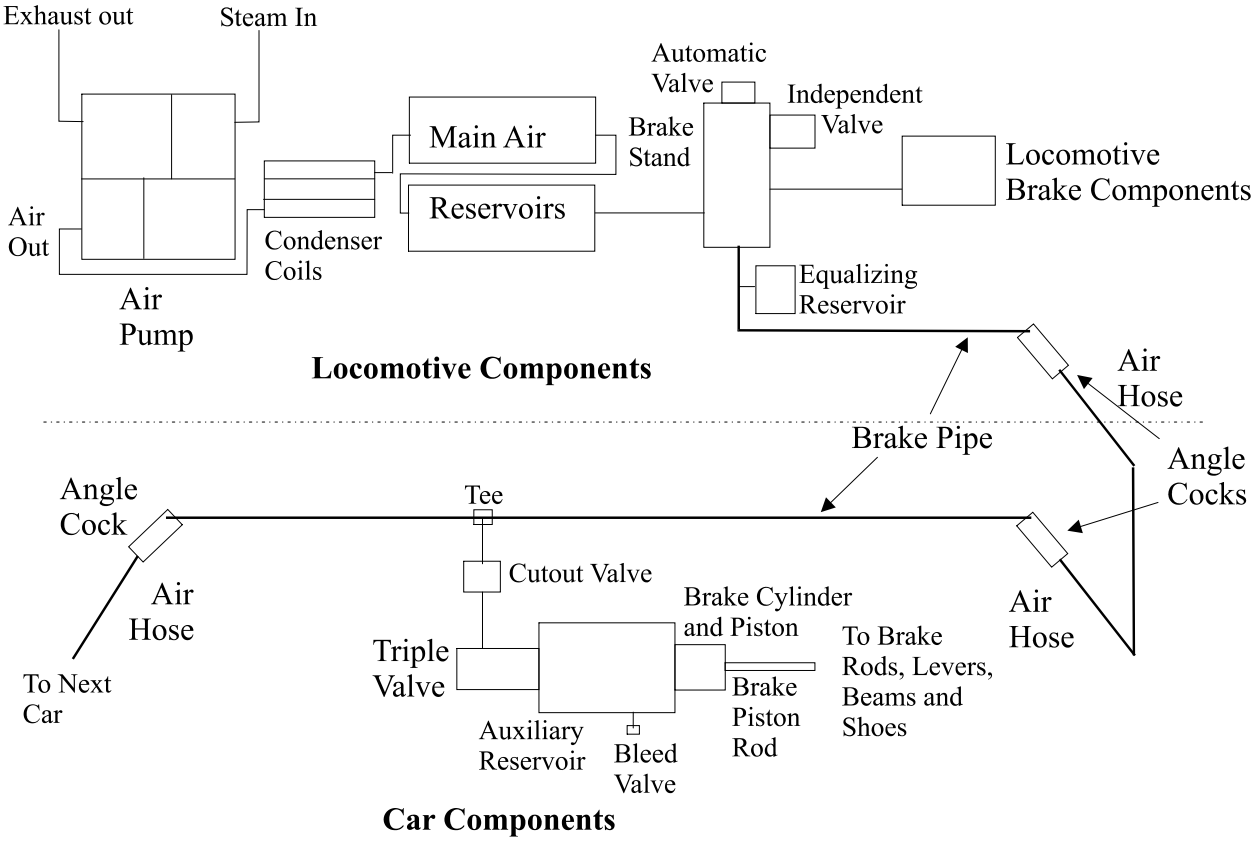
Trains use compressed air to apply brakes for slowing, controlling slack and stopping. The locomotive provides the source of compressed air for the train brakes. When the locomotive air source is decreased in pressure, brakes are applied throughout the train. This may seem contradictory at first, but will be described as follows.

When the locomotive is coupled to the train and air connections have been made, air at a regulated pressure of 70 PSI is supplied by the locomotive and distributed to all cars via the Brake Pipe and Air Hoses located on all cars. Auxiliary Reservoirs on each car become charged to 70 PSI. Once the reservoirs are initially fully charged, which may take a few minutes, brake applications can be made. The Engineer, using the Automatic Brake Valve, decreases the Brake Pipe pressure in a controlled manner from 70 PSI to a lower value. A Triple Valve located on each car senses a pressure difference between Brake Pipe pressure and Auxiliary Reservoir pressure. (See the diagram below.) The Triple Valve moves an internal slide valve allowing air to pass from the Auxiliary Reservoir passes through the Triple Valve to the Brake Cylinder until the Auxiliary Reservoir and Brake Pipe pressures are equal. Once the pressures are equal the Triple Valve maintains constant pressure in the Auxiliary Reservoir and the Brake Cylinder. The air transferred to the Brake Cylinder moves the Brake Piston, Sleeve, Piston Rod and a system of levers, rods, links and beams to apply brakes to the wheels.

To release the brakes, the Engineer charges the Brake Pipe once again to 70 PSI using the Automatic Valve. The Triple Valve again senses the pressure difference between the Brake Pipe and Auxiliary Reservoir and allows air to exhaust from the Brake Cylinder to the atmosphere,

and simultaneously recharges the Auxiliary Reservoir to 70 PSI in preparation for the next brake application. With air in the Brake Cylinder exhausted, the brakes are released, and a coil spring in the Brake Cylinder forces the Brake Piston to retract and relieve pressure on the Piston Rod in preparation for another brake application.

Emergency braking is accomplished with a rapid decrease in Brake Pipe pressure. Once initiated, the Triple Valves speeds the emergency braking process by quickly passing air from the Auxiliary Reservoir to the Brake Cylinder. Also, the Triple Valve allows air from the Brake Pipe to pass through to the Brake Cylinder forcing the brakes to quickly set, and rapidly discharging the Brake Pipe, thus aiding in quickly setting up brakes on all cars in the train.



Emergency braking can be initiated at the locomotive Automatic Brake stand or by any crew member using a Conductor's Valve. Conductor Valves are located on cars throughout the train and are connected directly to the Brake Pipe. The Fireman also has access to an emergency valve. Once the brakes are set into emergency, the air may be completely exhausted from the Brake Pipe and the Conductor's Valves no longer have air, and therefore no longer function.

Following an Emergency application, the Brake Pipe and Auxiliary Reservoirs must be recharged to 70 PSI before the train can proceed.

6-BL Brake operations[1]

The six positions and descriptions of the 6-BL Automatic Brake Valve are, beginning at the extreme left: ***Release, Running, Holding, Lap, Service, and Emergency.***

Release Position. The purpose of this position is to provide a large and direct passage from the main reservoir to the brake pipe. It is used under some circumstances to speed up the release of train brakes. However, its value is limited and many railroads have abandoned its use entirely. If allowed to remain in this position for any length of time, the brake system would be charged to the main reservoir pressure (approximately 110 PSI) and potentially damage car brake systems. This position is not used at SVRy and should be avoided at all times.

Running Position. This is the proper position of the Automatic Brake for charging and releasing the train brakes. In this position a large direct passage connects the Feed Valve (located in the Brake Stand) to the Brake Pipe, so that the latter charges up under Feed Valve Control and cannot attain a pressure above that for which the Feed Valve is adjusted. The Feed Valve Control is the large hemispherical knob located below the Independent Valve.

Service Position. This position give a gradual reduction of the Brake Pipe to cause a service application.

Lap Position. This position is used while holding the brakes applied after a service application until it is desired either to make a further Brake Pipe reduction or to release them. (Lap = all ports closed.)

Holding Position. This position is so named because the locomotive brakes are held applied while the train brakes are being released and their auxiliary reservoirs recharged to Feed Valve pressure.

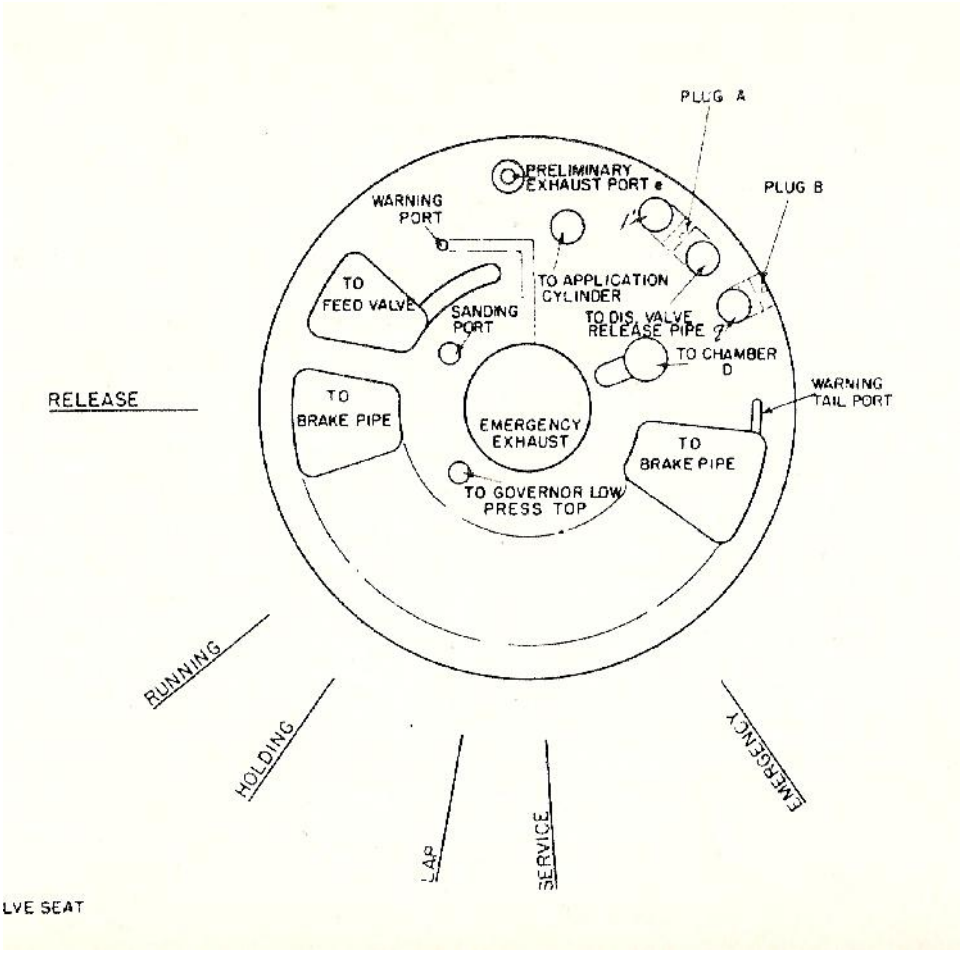
Emergency Position. This position is used when the most prompt and heavy application of the brakes is required. A large and direct communication is made between the Brake Pipe and atmosphere. This direct passage makes a sudden and heavy discharge of Brake Pipe air, causing the Triple Valves and Distributing Valve to move to the ***Emergency Position*** and give maximum braking force in the shortest possible time. In this position also, locomotive Brake Cylinder pressure is maintained against leakage.

Independent Valve.

The Independent Valve (diagram not shown) is a self-lapping type of valve, and controls the locomotive (and tender) Brake Cylinder pressure independently of the train brakes in accordance with position of the handle. It has two positions: *Release* and *Application.* There is a range of application between the end positions.

The Independent is used to control the locomotive brakes and should not be used alone to control train speed, as this will cause slack action and potentially cause harm and injury to crew, passengers and possibly damage equipment.

[1]Instruction Pamphlet No. 62 November, 1950; No. 6-BL Brake Equipment for Switching and Branch Line Locomotive. The New York Air Brake Company.



Questions and Answers

What is the function of the Auxiliary Reservoir?

To store compressed air for car brake applications.

What is the function of the Triple Valve?

To apply brakes, release brakes and charge the Auxiliary Reservoir on each car.

If any car's brake system becomes faulty, can the car be disabled or cut out of the air system?

Yes, by using the Cutout Valve. With the Cutout Valve handle at 90 degrees to the branch pipe, the car is active.

What is the function of the Brake Cylinder, Brake Piston, Sleeve and Piston Rod?

Compressed air entering the Brake Cylinder moves the Brake Piston, Piston Sleeve and Piston Rod. Levers, rods and beams attached to the Piston Rod force the Brake Shoes against the wheels.

Are there any means by which the train crew can make controlled brake applications?

No, The Conductor's Valves located throughout the train are instended only for emergency applications. Controlled application should be made only from the Automatic Brake stand in the locomotive.

Once the train is set into emergency can another brake application be made?

Yes, once the Brake Pipe is recharged, each car's Auxiliary Reservoir is fully charged and the Brake Cylinder is fully exhausted, thus releasing the car brakes. This may take one to two minutes or longer, depending on the length of the train.

What other means can set the train brakes into emergency?

Anything that causes a rapid reduction in Brake Pipe pressure can initiate an emergency application. The Engineer has an Emergency position on the Automatic Brake Valve. The

Fireman has an emergency valve and Conductor Valves (sometimes called "dump" valves) are located throughout the train. A broken Brake Pipe, ruptured Air Hose, a faulty Triple Valve, faulty Automatic Brake Valve or uncoupling, and thus disconnecting the Air Hoses, can initiate an emergency application.

When uncoupling occurs, can the whistle on the Conductor's Valve on the train be used to signal the locomotive?

No, because the whistle and Conductor's Valve are connected directly to the Brake Pipe, which is no longer charged with air pressure. The engineer knows that an emergency setting has occurred because the locomotive brakes will set on No. 19.

How does the Engineer know there has been an emergency setting of the brakes? What does the Engineer do?

The locomotive brakes will set up (on No. 19). Air gauges will indicate Brake Pipe air pressure has dropped. The Engineer places the Automatic Brake to the Lap position in order to stop discharging of the Brake Pipe, and engages the Locomotive Independent Brake. The Angle Cock on the Locomotive must be closed before recharging the Brake Pipe and preparing to re-couple.

If the train uncouples while running should the train crew open a Conductor's Valve?

No. However, the train crew should apply Hand Brakes immediately after first contacting any extra trains of the situation, and sending a Brakeman out to protect the rear of the train.

Why is the Brake Pipe pressure reduced to 50 PSI before uncoupling the train from the locomotive?

To reduce the impact of the brake application as the air discharges from the Auxiliary Reservoirs.

Is uncoupling without discharging the Brake Pipe acceptable? Why?

No. Leaving air "bottled" in the Brake Pipe is not allowed. Discharging the Brake Pipe and Auxiliary Reservoirs purges water and debris from the brake system. Called "Dynamiting the brakes", this must be done each time uncoupling is necessary on the train.

Should the train air brakes be used to hold the train in position after uncoupling?

No, the air can escape from the Brake Cylinder and Reservoir over time, thus releasing the brakes. Hand brakes must be set in accordance with operating rules.

List the steps following coupling to the locomotive to activate the train air brakes.

1. Connect the locomotive Air Hose to the car Air Hose.
2. Open the Angle Cock on the locomotive and check for leaks on the Air Hoses and hose connector gaskets.
3. Slowly open the Angle Cock on the car. Opening the valve too quickly can cause an Emergency application.

What must be done before the train consist can be moved by motive power with no air supply, such at the 110 diesel?

Air must be discharged from the Brake Cylinders by using the Bleed Valve on each car.

What is the function of the sleeve and rod extending from the Brake Cylinder?

The sleeve is attached to the Brake Piston. The Brake Rod may be loose or attached within the sleeve. Both move during brake applications and releases.

What causes the Piston Rod and sleeve to retract into the Brake Cylinder?

When brakes are released, a coil spring located around the sleeve inside the Brake Cylinder retracts the piston and sleeve to the back wall of the Brake Cylinder, reducing the cylinder volume to near zero. When brakes are applied, the spring is compressed as the Brake Piston moves.

How much travel is allowed on the Brake Piston and Sleeve?

The limits are 6” to 8”.

How much pressure decrease in the Brake Pipe is typically used to slow, control slack or stop the train?

The decrease in pressure varies depending on several factors. The numbers of cars, conditions of car brakes system and grade (slope) of the track. Obviously with only one car a large

application is needed and the engine brakes may need to remain applied. A long train with many cars will exhibit better braking with smaller applications. A steeper grade will call for more braking power and thus a larger decrease in Brake Pipe pressure. The range is 5 to 20 PSI reduction.

What is the minimum brake application?

Typically, with the passenger train of 4 to 6 cars, on a level track or slight incline, 5 PSI reduction (70 to 65 PSI) in the Brake Pipe will set the car brakes, control slack and slow the train. Anything less may not be enough to overcome friction forces, and any additional reduction will slow the train more quickly. On steep grades and short trains larger applications are necessary.

What is the maximum brake application?

Approximately a 20 PSI reduction (70PSI reduced to 50 PSI) will apply maximum braking. Additional reductions greater than 20 PSI are ineffective and a waste of compressed air.

How much pressure is actually applied to the Brake Piston with a 5 PSI reduction in the Brake Pipe?

It depends on the travel of the Brake Piston, the shorter the travel, the greater the braking pressure. Because the volume of the Brake Cylinder is smaller than the Auxiliary Reservoir volume, a transfer of air from the Auxiliary Reservoir to the Brake Cylinder can produce 2.5 times as much pressure on the Brake Piston. For a 5 PSI reduction in the Brake Pipe, and thus Auxiliary Reservoir, the Brake Piston can see a pressure of 12.5 PSI. If the piston travel is large, and therefore the Brake Cylinder volume becomes large, and the force can be as little as 5 PSI. With a 20 PSI Brake Pipe reduction the pressure on a Brake Piston with a normal range of motion may be as large as 50 PSI.

Why won't Automatic Valve applications greater than 20 PSI be effective.?

Due to the 2.5 amplification factor previously mentioned, a 20 PSI reduction becomes 50 PSI in the Brake Cylinder. The Brake Pipe becomes 50 PSI and the Auxiliary Reservoir will contain 50 PSI. Further reductions will only produce less pressure in the Brake Pipe than the Brake Cylinder and Auxiliary Reservoirs contain.

After releasing train brakes, can the Engineer immediately make another application?

No, it takes about 30 seconds to a minute for the Auxiliary Reservoirs to become fully charged again, dependent upon the Brake Pipe reduction. A small application of 5 PSI requires less time to charge the reservoirs than a heavy application. Additional applications made too quickly after releasing may not be effective at all, and rapidly repeated applications will cause loss of air brakes altogether.

What does it mean when the Engineer has lost the air?

If inadequate time is allowed between multiple brake applications, the Auxiliary Reservoir does not become fully charged between applications, and the pressure progressively drops until insufficient air remains for transfer to the Brake Cylinder. For example, if only 50 PSI remains in the Auxiliary Reservoir after repeated applications, a reduction in the Brake Pipe will not facilitate a transfer of air to the Brake Cylinder and brakes will not be applied.

What are retainers? Does SVRy use them?

Retainers are connected to the Triple Valve and typically located on the end of each car. They keep a constant pressure reduction applied to the Brake Cylinder, and are used on steep grades. SVRy does not presently use retainers.

What is the purpose of the Automatic Brake Valve? Where is it located?

The Automatic Brake Valve is located next to the Engineer's seat and is used to slow the train, control slack and stop the train. The Automatic Brake has a position for emergency application.

When is the Release position of the Automatic Valve used?

The Release position is not used at SVRR.

When is the Holding position of the Automatic Valve used?

The Holding position is not used at SVRR.

What is the purpose of the Independent Brake?

To slow or stop the locomotive. On No. 19 when an Automatic Brake application is made, the locomotive brakes are also applied, and the Engineer has to "bail" or release the Independent so that the locomotive will continue to move the train. Or, the Engineer may elect to leave the

Independent Brake applied for a short period of time to add additional braking to the train if needed.

When performing a Terminal Brake Test, what must be inspected?

Each car must be inspected for piston sleeve travel (use the scale on the back page of the Time Tables). Inspect for air leaks. Cutout Cocks on each car are in the open position (90 degrees to the branch pipe). Brakes engage and disengage. Brake shoes are attached to the Brake Beams. Triple valve release port is clear (wasps like to build nests in the openings). All linkages, pins and cotter keys are in place on the rods and linkages. All linkages are loose between applications. Air Hoses are connected. Angle cocks are open, except on the B end of the last car.

What might the result be if the train departs the station with one or more car hand brakes applied?

Locomotive 19 has more than enough power to easily pull the SVRy passenger train with a car's hand brakes, and the Engineer may or may not feel the additional load from hand brakes set. The car wheels may not rotate, and traveling very far will produce a flat area on the wheels. It is important to see that all hand brakes are released before departure.