# OPERATING INSTRUCTIONS GG-1 ELECTRIC LOCOMOTIVES WITH TRAIN CONTROL

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# THE WESTINGHOUSE AIR BRAKE CO.

WILMERDING, PA.

# **GG-1 ELECTRIC LOCOMOTIVE WITH TRAIN CONTROL**

The brake equipment on this locomotive is similar to that used with Diesel locomotives except that the #8 distributing valve is substituted for the control valve. The operation of the DS-24-H brake valve, S-40-F, independent brake valve and K-2 rotair is exactly the same as on the Diesel locomotive. The GG-1 locomotive is a double end cab arrangement, but since most Diesel locomotives are composed of two units with a cab at each end of the locomotive, the operation of the GG-1 will be very similar to that of a double "A" unit Diesel.

As in former designs, the locomotive brake may be used with or independently of the train brakes. The locomotive brake may be applied with any desired pressure between minimum and maximum, and this pressure will be automatically maintained in the locomotive brake cylinders regardless of leakage and of variation in piston travel until released by the brake valve. This type of independent brake valve is known as a self-lapping brake valve.

## PARTS OF THE EQUIPMENT

DS-24-H Brake Valve, one in each cab. (See Figures 1 & 2). This is a pedestal type brake valve on which are mounted the various valve portions. All the pipe connections are made to the pipe bracket face beneath the floor by means of Wabcotite fittings. In addition, the pipe bracket portion has a face on which the D-24-B feed valve is mounted.

Just above the pipe bracket is the filling piece which contains the equalizing piston portion, first service cutout cock and the brake pipe cutout cock. The brake pipe cutout cock is used to cut out the automatic brake valve and train control functions in the non-operative cab.

In closed position of the brake pipe cutout cock, the automatic brake valve supply is cut off from the brake pipe preventing an automatic brake valve service application, and the brake application piston is cut off from the train control devices so that these do not function. Thus, the control of brake operation is transferred from one end of the cab to the other on which the brake pipe cutout cock is open. An emergency application can be made with the brake pipe cutout cock closed by placing the automatic brake valve handle in emergency position.

The brake pipe cutout cock is so designed that it cannot be moved from closed to open position without a pause in mid-position. The cock handle is provided with a spring latch which engages a lug when turning, requiring that the handle be pulled to compress the spring in order to clear the lug before completing the handle movement. This provides a short pause when cutting in the valve and permits proper charging of the application pipe from main reservoir to avoid a quick reduction in pressure in the chamber on top of the application piston, which would cause the higher air pressure below the application piston to move the piston and application valve and cause an application. The cock is opened with the handle down (horizontal position) and closed with the handle up (vertical position).

The equalizing piston valve portion is attached to the filling piece. Its function is to control the rate of brake pipe reduction in first service and service positions of the brake valve handle. The chamber above the equalizing piston is connected to the equalizing reservoir, and the chamber beneath it to the brake pipe. In release and running positions of the brake valve handle, both chambers charge equally and the brake pipe exhaust is cut off by the rotary valve. When the brake valve handle is moved to service position, pressure above the piston and in the equalizing reservoir is reduced through the preliminary exhaust port of the automatic brake valve. Brake pipe pressure in the lower chamber then raises the piston, unseating the equalizing discharge valve, past which the brake pipe air escapes to the brake valve exhaust. When the brake pipe reduction equals that made in the equalizing reservoir, the piston moves downward, terminating the brake pipe reduction. This feature thus accomplishes the automatic brake pipe reduction at a controlled rate regardless of train length. The engineman makes the desired reduction in equalizing reservoir pressure and the equalizing piston portion automatically reduces the brake pipe pressure a corresponding amount.

In first service position, the pressure above the equalizing piston is reduced at a controlled rate into the reduction limiting reservoir. The maintaining value is held on its seat by a spring and the chamber beneath it is connected through the rotary value to feed value pressure. If brake pipe pressure reduction occurs at a faster rate than equalizing reservoir reduction, the higher equalizing reservoir pressure above the piston moves the latter down into contact with the spring back stop at the end of the piston stem, depressing the operating lever and unseating the maintaining value. Sufficient feed value air is supplied past the value to limit the rate of brake pipe reduction to that of the controlled equalizing reservoir reduction. This is the uniform brake pipe reduction feature for long trains and is similar to that employed in the 8-EL equipment.

During recharge of the brakes, should equalizing reservoir pressure exceed brake pipe pressure approximately 2 lbs., the resistance of both maintaining valve and piston stop springs is overcome and the piston moves to its lower position, uncovering ports in the piston bushing leading to the brake pipe chamber. This allows the excessive equalizing reservoir pressures to be reduced by air flowing into the brake pipe. During an emergency application, the equalizing piston is moved to its extreme lower position. Equalizing reservoir air from the top of the piston by-passes the piston and flows to the chamber below where it connects with brake pipe air that is vented to atmosphere.

The first service cock portion is attached to the side of the filling piece and is used for cutting out the first service feature when desired. The cock portion consists of the body, cock key, spring, handle, ball check, check valve, and check valve spring.

The cock key cuts in the first service feature when the handle is turned to the position marked "IN" and cuts out the first service feature when the handle is in "OUT" position. The ball check and check valve provide the means of reducing the reduction limiting reservoir pressure when it is desired to make a reduction on top of any control application when the first service feature is cut out by the first service cock in closed position.

The service application portion is located just above the filling piece portion and provides a service brake application when initiated from a train control application. Otherwise, the piston is held in release position and this portion has no effect on the braking as controlled from the automatic or independent brake valve.

When the air pressure on top of the piston is reduced from an application, the air pressure under the piston moves the piston and slide valve to application position.

The brake valve portion includes the rotary valve seat and thus controls the automatic brakes by movement of the brake valve handle which has six positions. Movement of the handle is transmitted through the rotary valve key to the rotary valve which is thereby rotated to establish port connections according to its position. The DS-24-H brake valve has an internal quadrant which positions the brake valve handle. The quadrant which is keyed to the rotary valve shaft provides the notches into which the quadrant latch moves for locating the brake handles in its six positions.

Manual sanding is accomplished by depressing the handle on the sanding bail.

The brake valve handle can be inserted or removed only in running position. The handle is inserted in the slot in the drive shaft housing and is pushed forward until the curved lip slips beneath the cam roller. This latches the handle to the drive shaft housing to which a keyway is pinned. The end of the rotary valve key is keyed to fit into the keyway so that as the handle is rotated the movement is transmitted through the drive shaft housing to the rotary valve key and rotary valve. Lubrication of the drive shaft housing is supplied through an oil ball valve on top of the brake valve and oil holes in the bushing around the housing. A plunger spring acts upward on a plunger and roller so that the handle is tilted upward when not held down. The safety control on diesels is suppressed by holding the automatic brake valve handle down, but on the GG-1 locomotives the safety control feature is suppressed by controller handle position.

A complete description of the DS-24-H brake valve can be found in pamphlet 2606-1. For cutout cock positions on the brake valve, refer to the photograph enclosed.

**D-24-B Feed Valve.** The D-24-B feed valve has a large capacity and is extremely sensitive and less susceptible to the effects of foreign matter in the air supply than any preceding model of feed valve. The body encloses the parts of the regulating and supply portions of the feed valve. Complete description of this feed valve is covered in descriptive leaflet No. 2470-1.

#### S-40-F BRAKE VALVE (See Fig. 3)

The S-40-F independent brake valve is of the self-lapping design. It provides gradual increase or decrease of braking pressures with increased smoothness as well as maintenance of pressure depending upon handle position. The locomotive brake can be applied to any degree by the movement of the brake valve handle, forward in the application zone, or decreased by movement of the handle back toward release. The brake application can be increased or decreased in this manner without fanning the brake valve since the lapping function is an automatic feature with this type of brake valve. Leakage is automatically maintained by the self-lapping brake valve which insures that the brake will not release due to leakage.

Movement of the brake valve handle to full application position opens the controlled emergency pipe to exhaust and thus nullifies the controlled emergency feature.

The brake valve handle is hinged and is held upwards by a spring. An independent release is obtained by depressing the brake valve handle on the bail. The S-40-F brake valve is covered in detail in pamphlet 2606-1.

#### K-2 ROTAIR VALVE (See Fig. 4)

The K-2 rotair valve (one in each cab) is a selector valve with three positions: freight, passenger, and lap. The position in which the valve is set is indicated by a pointer on the handle and an escutcheon plate indicating the positions. Freight position is obtained by placing the pointer on the handle over the raised letters "FRGT". The rotair valve is used in this position on long freight trains when it is desired to have the controlled emergency feature operative. A split reduction is available in this position.

Passenger position is obtained by placing the pointer on the handle over the raised letters "PASS". The rotair valve is used in this position on passenger trains and short freight trains where it is desired to have the controlled emergency inoperative and no split reduction.

Lap position is obtained by placing the pointer on the handle over the raised letters "LAP". The rotair value is placed in this position on the non-operative end of the locomotive. This places the controlled emergency feature under the control of the engineman operating the brakes. This position also cuts out the independent brake value on the non-operative end. Complete description of the K-2 rotair value is covered in pamphlet 2606-1.

#### **#8-A DISTRIBUTING VALVE**

The #8-A distributing valve, when actuated by the brake valve, operates to permit air to flow to the brake cylinders, maintain any desired pressure in the brake cylinders, and permits the air pressure to exhaust from the brake cylinders. This distributing valve is described in pamphlet #5032-1.

#### FIRST SUPPRESSION RESERVOIR (1 At Each End of Locomotive)

This reservoir is connected to the timing value for the purpose of providing a time interval between the first and second reduction of a split reduction of brake pipe pressure during a train control application. It also provides temporary suppression of a train control application in first service position of the brake value. The reservoir is cut in when the K-2 rotair is positioned in freight and is cut out when positioned in passenger.

> TIMING RESERVOIR (1 At Each End of Locomotive)

The timing reservoir is connected to the A-1 suppression valve when the K-2 rotair valve is in freight position. The reservoir provides continued automatic brake valve partial suppression of a train control brake application by means of successive manual brake pipe reductions of a moderate amount.

### SECOND REDUCTION RESERVOIR (1 For Each Brake Valve)

The second reduction reservoir limits the brake pipe reduction to that required to obtain a full service brake application during a train control application, providing the brake valve handle is moved to lap position when the application has begun.

## VOLUME RESERVOIR & CHECK VALVE (1 At Each End of Locomotive)

The volume reservoir and check valve with a choke is located in the #10 pipe to the automatic brake valve and stabilizes the operation of the brake valve service application piston during train control operation when the timing valve is de-energized for short intervals.

# TIMING VALVE (1 At Each End of Locomotive)

The timing valve automatically causes the brake application valve to function when a restrictive indication is received in train control territory and operates the timing valve whistle and fireman's call signal circuit controller. The timing valve consists of a pipe bracket on which is mounted a magnet for receiving the train stop or cab signal indication, the timing valve portion with its control piston and valves for operation of the brake valve service application piston, and a signal whistle which blows when the timing valve operation is initiated.

In service, the magnet is energized which seats the exhaust valve, thus connecting reducing valve air past a valve and ball check to the chamber below the piston. When the magnet is deenergized by a train stop indication, the magnet supply valve is unseated and the exhaust valve is unseated. This causes the air from the actuating chamber of the brake valve application piston to vent which actuates the application piston and applies the locomotive brakes.

# A-1 SUPPRESSION VALVE (1 At Each End of Locomotive)

The A-1 suppression valve permits both temporary and permanent suppression of a train control application.

When operating in passenger service (K-2 rotair in "PASS"), a temporary suppression can be made by moving the automatic brake valve handle to "Service" position for a light reduction. Successive light reductions will continue to hold the suppression valve closed until a total of approximately 20# service reduction is made. After the 20# service reduction, the A-1 suppression valves provide a permanent suppression and further reduction of brake pipe is unnecessary for suppression purposes.

When operating in freight service (K-2 rotair valve in "FRGT"), a temporary suppression can be made by placing the automatic brake valve handle in "First Service" position. This provides a temporary suppression for approximately 20 seconds after which further suppression must be obtained by moving the brake valve handle to service position. As in passenger service, a 20# brake pipe reduction will provide a permanent suppression.

When a train enters a restricted territory or the authorized speed is exceeded, either a temporary or permanent suppression can be made. Under these conditions, the brake may be released in the usual manner when the speed is reduced or the signal has cleared. If a train control application has taken effect, the A-1 suppression valve will not permit making a suppression and when a clear signal is given, the brake valve handle must be moved to "Lap", "Service", or "Emergency" so that the brake application valve can be returned to release position. The brakes are then released in the usual manner.

# SUPPRESSION RESERVOIR (1 At Each End of Locomotive)

The suppression reservoir provides a permanent suppression of a train control brake application when a manual automatic brake application of a prescribed amount is in effect.

### STOP RESERVOIR (1 At Each End of Locomotive)

The stop reservoir is connected to the timing value and to the brake value and is used to insure that the brakes are applied for a sufficient length of time to stop the train after a train control application takes effect.

#### NS-1 REDUCING VALVE

The NS-1 reducing valve regulates the air pressure for use in the train control system and the signal system. The reducing valve consists of a pipe bracket on which is mounted check valve portion housed in a body, cutout cock portion and the reducing valve portion. The check valve portion permits reducing valve air to flow to signal system, but prevents any backflow. The cutout cock provides means of cutting off the air supply to the signal system and the reducing valve portion reduces the supply of air to a predetermined pressure. With the NS-1 reducing valve controlling the pressure to the train control timing valve, it is not necessary to have a safety valve associated with the timing valve since the reducing valve maintains the pressure called for by means of self-lapping.

# **PROCEDURE FOR CHANGING ENDS (See Fig. 5)**

When changing ends, make a 20# brake pipe reduction with the automatic brake valve, after which move the brake valve handle to lap position, move the independent brake valve handle to release position and observe that the brakes are still applied. Close the brake pipe cutout cock and place the K-2 rotair valve in lap position. Move the automatic brake valve handle to running position and remove both handles.

Control at the opposite end should be taken without delay, as follows: First insert the brake valve handles, place the rotair valve in passenger or freight position depending on the locomotive service, move the independent brake valve handle to full application position, open the brake pipe cutout cock and leave the automatic brake valve handle in running position, depress the controller handle to nullify the safety control, check gages to insure the brake pipe and main reservoirs are fully charged, after which the independent brake may be released if it is desired to proceed.

#### DOUBLE HEADING

When preparing for double heading, make a full service application on the trailing locomotive, then close the brake pipe cutout cock. Leave the K-2 rotair valve in "FRGT" or "PASS" position, depending upon the service intended. The brakes are then controlled from the lead locomotive but the engineman on the second locomotive can make an emergency application by moving the automatic brake valve handle to emergency position and can release the brakes on that unit by depressing the independent brake valve handle.

# HAULING LOCOMOTIVE DEAD IN TRAIN

Close the brake pipe cutout cock and remove the automatic brake valve handle (in running position). Change the dead engine cap on the distributing valve so that the word "DEAD" on the cap is over the word "ENG" on the distributing valve body. This provides for charging the main reservoirs from the brake pipe. Open the brake pipe branch pipe cock to charge the distributing valve.

Remove the independent brake valve handle in release position. Position the K-2 rotair valve in "PASS" position.

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Figs. 1 & 2

# DS-24-H BRAKE VALVE



Fig. 3

# 8-40-F INDEPENDENT BRAKE VALVE







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