SHOP AB TEST RACK, OPERATOR INSTRUCTION

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OVERVIEW

• THE AB TEST RACK IS A PNEUMATIC TEST STAND USED FOR PRODUCTION TESTING AND FAILURE ANALYSIS OF PNEUMATIC BRAKE COMPONENTS. IT’S A TEMPLATE OF A TYPICAL FREIGHT CAR PNEUMATIC SYSTEM WITH ADDITIONAL COCKS AND GAGES THAT ENABLE TESTING AND DIAGNOSTIC OF INDIVIDUAL INTERNAL PARTS. THE NAMES OF THE VARIOUS GAGES, RESERVOIRS AND THEIR SIZE, ALONG WITH THE PIPING PORT NUMBERS ALL REFLECT THE NAMES USED BY THE INDUSTRY ON A TYPICAL FREIGHT CAR.

• THE FUNCTIONAL PERFORMANCE OF BRAKE COMPONENTS IS OBSERVED AND MEASURED AGAINST SPECIFICATION REQUIREMENTS DETAILED IN TEST CODES FOR EACH BRAKE COMPONENT.

• THE TEST RACK IS DESIGNED AND CONSTRUCTED SO THAT AIR MAY BE APPLIED TO A SINGLE PORT OF A BRAKE COMPONENT OR TO ALL PORTS AT THE SAME TIME.

• BY APPLYING AIR TO A SINGLE OR SELECTED PORTS, THE FUNCTION OF INDIVIDUAL INTERNAL PARTS SUCH AS O-RINGS, CHECK VALVES AND BUSHINGS CAN BE CONFIRMED.

• BY APPLYING AIR TO A SERIES OF SELECTED PORTS, THE INTERACTION OF THE PARTS CAN BE CONFIRMED AGAINST THEIR REQUIRED FUNCTION ON A TYPICAL FREIGHT CAR.
OVERVIEW (Cont…)

• TESTING ON THE AB TEST RACK CONFIRMS THE FOLLOWING:

  • QUALITY
    IF PARTS ARE NOT TO PRINT SUCH AS SPRING LOADS WHICH COULD RESULT IN INCORRECT GAGE READINGS.

  • ASSEMBLY
    WERE THE CORRECT PARTS INSTALLED IN THE CORRECT MANNER, SUCH AS BUSHINGS PRESSED TO THE CORRECT HEIGHT, OR A CHECK VALVE LEFT OUT.

  • DESIGNED FUNCTION
    THAT THE COMPONENT FUNCTIONS WILL GIVE THE REQUIRED BRAKE SYSTEMS PERFORMANCE AS INSTALLED ON A FREIGHT CAR.
TOP VIEW COMPONENT DESCRIPTIONS

- Pressure Gages
- Test Head
- Test Plate
- Manometer
- Valve A
- Valve B
- Diaphragm
- cocks
The diaphragm cock utilizes a diaphragm to open or close connections to various passageways.

It may contain a choke for the purpose of controlling the rate of air flow.

The Quick opening handle design is due to the cam shape that contacts the piston.

The lever ratio from the handle to pin and pin to piston is such that a big movement in the handle creates a small movement of the piston. This allows the diaphragm to be moved a very small distance away from the seat thus allowing small and/or slow pressure increases or decreases.
PRESSURE GAGES

- Pressure gages read air pressure in pounds per square inch (psi) of the circuit they are connected to.

- They are designed with a “mirror back.” The proper way to read them is to line up the needle with the image in the mirror so only one needle is visible.

- Temperature effect can slowly change gage pressures due to the friction in the air that’s generated when reservoirs are rapidly charged or exhausted.
• The Flowrator is an instrument that measures airflow in cubic inches per minute. As used on the AB test rack it measures the flow of air leaking to atmosphere.

• It consists of a sapphire ball (float) or indicator inside a precision ground tapered glass tube and the flow of air to be measured is admitted into the bottom of the tube. The rate of flow is then measured direct by the height the air caused the float to rise in the tube.

• A graduated scale either on the tube itself or located on the right side of the tube, indicates this rate of flow in cubic-inches of free air per minute and is read from 0 to 32. Free air is defined as air at atmospheric pressure (14.7 psi) and temperature (70º F). By observing the graduation at which the top of the float balances in a stationary position, the rate of flow can be determined.
The Manometer is a mechanical device used to measure small pressure differences in psi acting on opposite surfaces of components. For example the difference between the top and bottom of a piston-diaphragm assembly. The readable range is from 0-3 psi. The Manometer is connected to the rack piping by Valve B.
Valve “B” is a spool type valve used to connect the Manometer to the rack piping. When it is pushed in the valve is closed, and when it is pulled out the valve is open and the Manometer will register a reading. It is connected to the Brake Pipe Reservoir and the Auxiliary Reservoir circuit.
SUPPLY FEED VALVE

- The Supply Feed Valve regulates the supply of air pressure from the shop line to the test rack.

- It is set 20lbs higher than the test rack feed valve to provide driving head when charging reservoirs.

- It is an adjustable feed valve and a clockwise turn of the handle results in an increase of air pressure.

- It is located on the back of the test rack.
The Test Rack Feed Valve regulates the pressure setting in the test rack. The value it is set at is determined by the component being tested and its test code.

- It is an adjustable feed valve and a clockwise turn of the handle results in an increase of air pressure.

- It is located under the table-top of the test rack.
The test head serves as a connection point between the test plate, component being tested and the AB test rack. The numbered piping circuits from the test rack connect to the corresponding numbered ports in the test head.
Test plates serve as adaptors for connecting brake devices on the test head. Test plates are brake device specific due to mounting bolt pattern and port configuration.
Valve “A” is a rotary type valve used for charging and exhausting of brake pipe reservoir. Valve “A” contains 8 detented positions. Each position contains a drill passage for controlling the rate of air flow. The exception is Position 3 which neither charges or exhausts because its function is to “bottle up” air pressure.

- Position 1 is for fast charging.
- Position 2 is for slow charging.
- Position 3 is “LAP.”
- Positions 4-8 are exhausts from slowest to fastest.
VALVE “A” (Cont…)

- Valve “A” contains two plates on the inside. The bottom plate is stationary and has the connections for rack piping. The upper plate is moveable and contains drill passages for charging and exhausting. Handle movement lines up passages from moveable to stationary to charge or exhaust air to the different circuits.

- The drawing shows the layout of drilled passages in the moveable plate.

- It is possible to be partially into a position and air flow will then be partially restricted due to the slight misalignment due to the handle not being completely in the detent. A typical situation would be trying to slightly increase or decrease pressure to compensate for temperature effect.
BOTTOM VIEW COMPONENT DESCRIPTIONS

- COCK C
- COCK 23
- COCK B
- COCK 10
- PRESSURE REGULATOR
- COCK 22
- COCK A
The reservoirs are storage tanks used for compressed air. Main reservoir is a 1550 cubic inch reservoir fed by the test rack feed valve. It supplies the test rack circuits and reservoirs. The main reservoir also provides an opportunity for the air to adjust to the thermal effect created when rapidly charging reservoirs.
This combined reservoir contains a separation plate internally that makes it two reservoirs. On the left side is the 2500 cubic inch Auxiliary reservoir which feeds the Auxiliary circuit. On the right side is the 3500 cubic inch Emergency reservoir which feeds the Emergency circuit. These reservoirs represent the combined Auxiliary / Emergency reservoir on a freight car.
The Quick Action Chamber reservoir is a 145 cubic inch storage tank. It supplies the Quick Action Chamber circuit and is located on the back of the test rack. It represents Quick Action Chamber volume in the pipe brackets of control valves used on freight cars.
The Brake Cylinder reservoir is 800 cubic inches. It supplies the Brake Cylinder circuit. It represents the volume that a Brake Cylinder creates when it extends on a freight car.
Brake Pipe Reservoir is a 435 cubic inch reservoir that supplies the Brake Pipe circuit. It represents the Brake Pipe on a freight car.
The Pressure Regulator is used to set and regulate a pressure to the Brake Pipe circuit different from the test rack feed valve setting. The supply comes from Main reservoir and is maintained at 90 psi through the pressure regulator.
Cock “B” is a ball valve that connects the Pressure Regulator to the Brake Pipe circuit. When opened, it cuts-in the pressure regulator which is set to maintain 90 psi.
“A” Reservoir is a combination of reservoirs totaling approximately 510 cubic inches. They are connected to Brake Pipe reservoir through cock “A”. Their purpose is to provide an increased Brake Pipe volume that represents a freight car with 75’ of Brake Pipe.
Cock “A” is a ball valve that connects “A” reservoir to Brake Pipe reservoir.
“C” reservoir is approximately 1730 cubic inches. It is connected to Brake Pipe reservoir by cock “C” and provides an increase to the Brake Pipe reservoir that represents a freight car with approximately 155’ of Brake Pipe.
Cock “C” connects the “C” reservoir to Brake Pipe.
COCK DESCRIPTIONS
COCK 15

• Cock 15 is a 3/8” diaphragm cock.

• It’s most common use is to vent the port 11 circuit.
COCK 19

- Cock 19 is a 3/8” diaphragm cock.

- It’s most common use is to connect the port 5 circuit and the Auxiliary gage to the port 11 circuit.
Cock 20 is a 3/8” diaphragm cock.

It’s most common use is to connect the Quick Action Chamber and the gage to the Port 11 circuit.
Cock 13 is a 3/8” diaphragm cock.

It’s most common use is to connect Main Reservoir to the Brake Cylinder.
COCK 12

- Cock 12 is a 3/8” diaphragm cock.

- It’s most common use is exhaust Brake Cylinder.
Cock 3 is a 3/4” diaphragm cock.

It’s most common use is to connect Brake Cylinder to the Port 9 circuit.
COCK 4

• Cock 4 is a 3/8” diaphragm cock.

• It’s most common use is to exhaust the Port 9 circuit.
Cock 8 is a 3/8” diaphragm cock.

Its most common use is to exhaust the Port 10 circuit.
Cock 7 is a 3/8” diaphragm cock.

It contains a NO. 63 drill (0.037”) choke.

It’s most common use is to provide a controlled leakage rate of the Port 5 circuit.
COCK 18

- Cock 18 is a 3/8” diaphragm cock.

- It contains a NO. 73 drill (0.0240”) choke.

- It’s most common use is provide a controlled leakage rate of the Auxiliary reservoir.
Cock 14 is a 1/2" diaphragm cock.

- It contains a NO. 50 drill (0.070”) choke.

- It’s most common use is to create a controlled pressure increase to the Auxiliary Reservoir.
COCK 17

• Cock 17 is a 3/8” diaphragm cock.

• It contains a 0.1875” choke.

• It’s most common use is to provide a controlled flow from Auxiliary reservoir to the Port 9A circuit.
COCK 11

• Cock 11 is a 3/8” diaphragm cock.

• It most common use is to connect Brake Cylinder to the Port 9A circuit.
Cock 1 is a 3/4” diaphragm cock.

It’s most common use is to connect Brake Pipe and its gage to the Port 1 circuit.
COCK 16

- Cock 16 is a 3/8” diaphragm cock.
- It’s most common use is to connect Brake Pipe to the Port 5 circuit.
• Cock 2 is a 3/4” diaphragm cock.

• It’s most common use is to connect Auxiliary reservoir to the Port 5 circuit.
COCK 9

- Cock 9 is a 3/8” diaphragm cock.

- It’s most common use is to connect Main reservoir to Emergency reservoir.
Cock 5 is a 3/4” diaphragm cock.

Its most common use is to connect the Emergency reservoir and gage to the Port 2 circuit.
Cock 6 is a 3/8” diaphragm cock.

It’s most common use is to exhaust the Port 2 circuit.
Cock 24 is a 3/8” diaphragm cock.

It contains a NO. 56 drill (0.0465”) choke.

It’s most common use is to provide a controlled pressure increase to the Port 5 circuit.
COCK 22

- Cock 22 is a 3/8” diaphragm cock.

- It contains a NO. 29 drill (0.1360”) choke.

- Its purpose is to create a controlled rate of Brake Pipe exhaust that simulates the stability of a valve not to go into emergency.
Cock 23 is a 3/8” diaphragm cock.

It contains a NO. 28 drill (0.1405”) choke.

Its purpose is to create a controlled rate of Brake Pipe exhaust that simulates the sensitivity of a valve reacting to emergency.
• Cock 10 is a ball valve.

• It’s most common use is to provide a by-pass of the test rack feed valve to the pressure setting of the supply feed valve.
OPERATING THE AB TEST RACK

• Before starting a test:
  • The drain cocks to the reservoirs should be closed.
  • All numbered cocks should be open.
  • Valve A should be in position 8.
  • All gages should read zero.

• Starting a test:
  • Mount the appropriate test plate for the device being tested.
  • Mount the device to be tested.
  • Close all cocks.
  • Slowly open the supply line cock to charge Main reservoir.
  • Adjust the Supply Feed Valve to the setting specified in the test code.
  • Adjust the Test Rack Feed Valve to the setting specified in the test code.
OPERATING THE AB TEST RACK (Cont…)

• Diaphragm cocks and Valve “A”:
  • In some cases it is necessary or desirable to partially open the diaphragm cocks or to have Valve “A” partially into a position when trying to reach a specific pressure or to make adjustments for temperature effect.

• At the end of the day:
  • Valve “A” should be in position 8.
  • All cocks should be open.
  • All pressure in rack drained.
  • All reservoirs should be drained.
CALIBRATION

• AB Test Rack:
  • In order to obtain reliable test results, the AB Test Rack must be calibrated.
  • If the rack is in daily use, it must be tested a minimum of every 30 days.
  • If the rack is used only periodically and has been idle for more than a week (5 working
    days), it must be tested before any valves are placed on it for testing.
  • If the rack is moved, it must be tested before any valves are placed on it for testing.
  • The rack must be tested using test code T-1246-S.

• Manometer:
  • Must be removed once a year from the test rack to be cleaned and calibrated by the
    standards / calibration department.
Preventative maintenance should be performed on a daily basis to prolong the life of the AB test rack and its components.
The handle position can be adjusted to the desired angle by loosening three set screws in the handle fulcrum and rotating handle and fulcrum around the clamping coupling. The three set screws must be re-tightened to hold the handle in place and to permit operation of the diaphragm.
To adjust the diaphragm tension (or deflection), loosen the cap screw, which serves to clamp the split coupling on the threaded portion of the cover. Screw down or back off the coupling to increase or decrease the diaphragm deflection until the force imparted to the diaphragm by the cam portion of the handle (through the medium of plunger and disc) is just sufficient to prevent leakage past the diaphragm with the handle in closed position. The clamping cap screw should be tightened when the desired tension on the diaphragm is obtained. Avoid adjusting the tension too tightly as premature diaphragm failure can result.
To remove the diaphragm cock handle assembly for diaphragm maintenance, the four mounting bolts need to be removed.
After removing the mounting plate, the diaphragm will be visible.

The diaphragm should be check for wear. Wear can be tears to the surface or ply separation of the rubber. The diaphragm pictured here has excessive wear present and should be replaced. The part number for the diaphragm is located right on the diaphragm.

After checking the diaphragm, it should be removed to check the housing.
• The center seat area should be checked for wear or “nicks”. If excessive wear is present, you should consult appropriate repair personnel to make the repairs.

• The valve housing should be clean and free of contaminates.

• The radius of the center seat area should be smooth and free of sharp edges.

Diaphragm cock housing without a choke
For a diaphragm cock with a choke in the center seat area, an additional requirement is that the choke should be free of contaminates.

The choke may need to be removed to assure of cleanliness.
• The rotary valve may be lubricated with ATF (automatic transmission fluid) or AAR Spec M-912 triple valve oil by removing the plug.

• **WARNING:**

**DO NOT OVER LUBRICATE.**

If it is over lubricated, the excess lubrication will be carried throughout the test rack and the device being tested.

No more than 3 drops of lubricant should be applied.

• After applying the lubricant, the handle should be moved from position 8 to 1 several times to evenly distribute lubrication over the surface of the rotary valve.
The gaskets should be check for cleanliness and damage. Replace as needed.
The test head on some test racks have a piston stem access cover. If present, its seal should be checked.

To check or replace the seal, turn the handle and it will pivot down so the cover will come off.
• Check the rubber hose and nozzle to make sure there is proper sealing i.e. no cracks or splits on surfaces.

• The nozzle should be free of any contaminates.

• Make sure the float rises smoothly and doesn’t stick.

• If any maintenance or calibration needs to be performed, the flowrator should be sent the standards / calibration department.
SAFETY

• WARNING:
HIGH PRESSURE AIR IS PRESENT IN THE TEST RACK. PRESSURE WILL VENT FROM COCKS AND/OR EXHAUST PORTS WHEN TEST RACK COCKS ARE MANIPULATED OR WHEN CONTROL DEVICES ARE OPERATED. TO MINIMIZE THE RISK OF PERSONAL INJURY FROM PRESSURE EXHAUSTING, ENSURE THAT ALL PERSONS STAND CLEAR OF THE EXHAUST PATH AND THAT HEARING PROTECTION AND EYE PROTECTION ARE WORN AT ALL TIMES.

• CAUTION:
IN SOME CASES ELECTRICAL POWER (AC AND/OR DC) IS PRESENT. TO MINIMIZE THE RISK OF PERSONAL INJURY FROM ELECTRICAL SHOCK, ENSURE THAT POWER AND/OR SWITCHES ARE TURNED OFF PRIOR TO MAKING ANY ELECTRICAL CONNECTIONS / DISCONNECTIONS.
Thank you for your attention

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