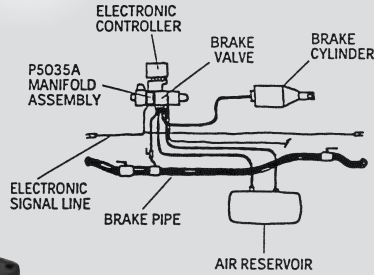
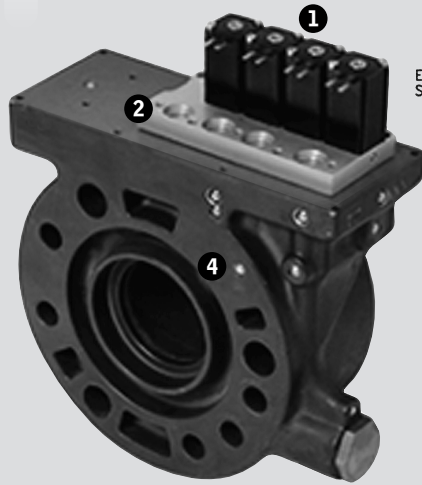


When an engineer applies the standard bleed-type railroad air brakes the signal can take 15 seconds or longer to move sequentially through the brake pipe from the locomotive to the last car. This makes controlled braking extremely difficult, especially because equal braking force is applied to both loaded and empty cars.



With the new electro-pneumatic braking system, the engineer sends a simultaneous application signal electronically to each car, causing the brakes to be applied proportionally to the car's weight. This gives the engineer complete braking control for greater safety and reduced damage to the freight cars and their contents. Plus, the system charges continuously during braking to maintain maximum braking capacity.

- ① Four 3-way Pilot Valves Combined In One Module
- ② Custom die-cast manifold incorporates all air passageways
- ③ Wide Temperature Range: -40°F to +185°F
- ④ Custom Port Locations
- ⑤ Humphrey assembles and 100% tests all modules

## Custom Manifold Assembly for Railroad Air Brake System Controller Delivered Proven Reliability Throughout a Range of Environmental Extremes

### THE CUSTOMER'S PRODUCT:

- The customer, a young and growing railroad service company, developed new type of railroad air brake system controller.
- The positive pressure brake system is controlled by an electronic signal that is applied simultaneously to all cars in the train.
- Braking force applied to each car is proportional to the car's weight.

SIC: 3743



### THE REQUIREMENTS:

- Manifold assembly must be absolutely reliable across wide range of environmental conditions.
- Meet critical performance specifications
- Simple and compact.
- Unit must be compatible with existing pneumatic braking system and its fail-safe operation.

### THE HUMPHREY ENGINEERED SOLUTION:

- Engineered Solutions team utilized a standard Humphrey poppet type cartridge insert valve because of its proven reliability in temperature and environmental extremes.
- The insert valves were pilot-operated by low current consumption Humphrey solenoid
- Four 3-way valves were installed in a custom manifold.
- Air passageways and port locations were mated with the existing air brake control system.
- Humphrey assembled and 100% tested all assemblies prior to shipping, saving the customer fabrication and assembly costs.
- Provided a compact, reliable package easily retrofitted into existing train air systems.

## THE SOLUTION:

To help refine the prototype, the customer contacted Humphrey's Engineered Solutions team. They chose a standard Humphrey poppet type cartridge insert valve because of its proven reliability in temperature and environmental extremes.

The insert valves, pilot operated by low current consumption Humphrey solenoid valves, were installed in a custom manifold. Air passageways and port locations were mated with the existing air brake control system. Placing the valves inside the manifold reduced the total package size and protected the valves from environmental hazards to further ensure safety and reliability.

## THE PROCESS:

The Humphrey Engineered Solutions team began with the customer's request to help the customer refine a prototype railroad train brake control valve as part of their new brake control system. As always, a Humphrey engineer was assigned to work directly with the customer's engineering department.

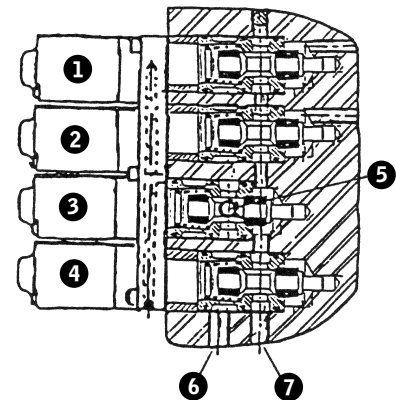
In this case, a thorough understanding of the application was required in order to ensure the optimal solution. The railroad air brake system has been improved over the past 100 years, but it was still fundamentally a bleed system with a fail-safe emergency feature.

In normal operation, the engineer applies the brakes by bleeding air from the train's supply pipe. As the pressure drop moves back through the train line (at the speed of sound), a control valve on each car releases a proportional amount of air from the car's reservoir to its brake cylinder.

Since braking is applied sequentially, the front cars on a long train literally can be stopped while the rear cars are still moving, causing cars to slam together. In addition, if the brakes are applied too frequently the reservoirs cannot re-pressurize and the system runs out of air -- with disastrous consequences.

Recognizing the need for a better approach, the customer developed a positive pressure system that could be controlled by an electronic signal. But the pneumatic valve assembly had to meet critical requirements, including reliability, simplicity, compact size and retention of the existing pneumatic braking system and its fail-safe operation.

After supplying a prototype assembly that was approved, Humphrey shipped tested, ready-to-install manifolds that saved the company fabrication and assembly costs. Plus, the pre-assembled manifold assembly provided a compact, reliable package that was easily retrofitted into existing train air systems.



- ① Emergency Valve
- ② Fill Valve
- ③ Vent Valve
- ④ Cutout Valve
- ⑤ Vent
- ⑥ IN
- ⑦ To Brake Cylinder

**Humphrey**<sup>®</sup>  
BUILD ON OUR EXPERIENCE