



# Installation Instructions

## M-21 & M-22 ANTILOCK MODULATOR INSTALLATION

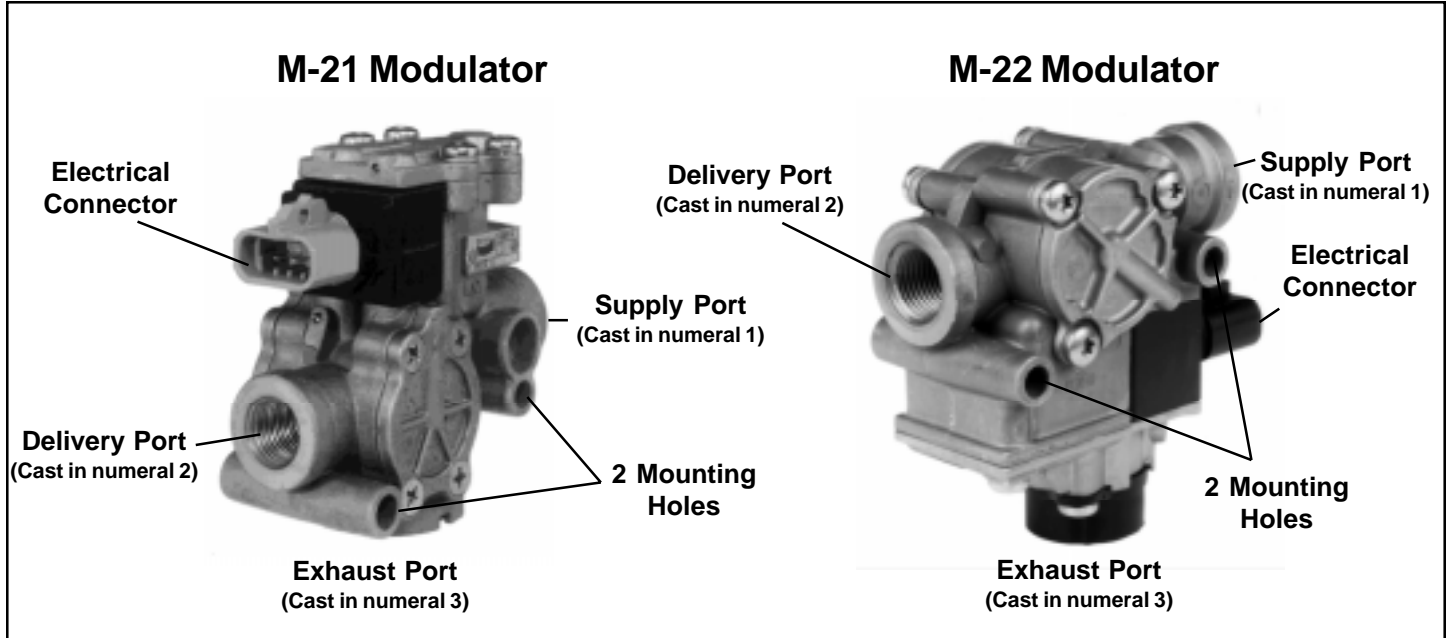


Figure 1 M-21 and M-22 Antilock Modulators

### ABOUT THE M-21 & M-22 MODULATOR

There were two Bendix antilock modulators used by Bendix, the older M-21 and the newer M-22. The M-22 is interchangeable with the older M-21 with some minor mounting and wiring considerations.

### **IMPORTANT! PLEASE READ AND FOLLOW THESE INSTRUCTIONS TO AVOID PERSONAL INJURY OR DEATH:**

When working on or around a vehicle, the following general precautions should be observed at all times.

1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels.
2. Stop the engine when working around the vehicle.
3. If the vehicle is equipped with air brakes, make certain to drain the air pressure from all reservoirs before beginning ANY work on the vehicle.
4. Following the vehicle manufacturer's recommended procedures, deactivate the electrical system in manner that removes all electrical power from the vehicle.
5. When working in the engine compartment the engine should be shut off. Where circumstances require that the engine be in operation, **EXTREME CAUTION** should be used to prevent personal injury resulting from contact with moving, rotating, leaking, heated, or electrically charged components.

6. Never connect or disconnect a hose or line containing pressure; it may whip. Never remove a component or plug unless you are certain all system pressure has been depleted.
7. Never exceed recommended pressures and always wear safety glasses.
8. Do not attempt to install, remove, disassemble or assemble a component until you have read and thoroughly understand the recommended procedures. Use only the proper tools and observe all precautions pertaining to use of those tools.
9. Use only genuine Bendix replacement parts, components, and kits. Replacement hardware, tubing, hose, fittings, etc. should be of equivalent size, type, and strength as original equipment and be designed specifically for such applications and systems.
10. Components with stripped threads or damaged parts should be replaced rather than repaired. Repairs requiring machining or welding should not be attempted unless specifically approved and stated by the vehicle or component manufacturer.
11. Prior to returning the vehicle to service, make certain all components and systems are restored to their proper operating condition.

## VEHICLE PREPARATION

1. Park the vehicle on a level surface, apply the parking brakes, and always block the wheels.
2. Stop the engine.
3. Drain the air pressure from all reservoirs before beginning ANY work on the vehicle.
4. Locate the M-21 or M-22 modulator that will be replaced and clean the exterior.

## MODULATOR REMOVAL

1. Identify and mark or label all air lines and their respective connections on the modulator to facilitate ease of installation (refer to figure 1).
2. Disconnect both air lines and the electrical connector.
3. Remove the modulator from the vehicle.
4. Remove all air line fittings and plugs. These fittings will be reused in the replacement modulator.

## CLEANING & INSPECTION

1. Clean the mounting surface on the vehicle.
2. Inspect the condition of the electrical connector including the weather proofing seals, contact terminals, and wire condition, making certain that all components are capable of reuse. Replace questionable components.
3. Clean thread sealing material from the fittings removed from the modulator.

## MODULATOR INSTALLATION

### Like For Like Replacement

#### (M-21 with M-21 or M-22 with M-22)

1. Install all air line fittings and plugs in the replacement modulator making certain thread sealing material does not enter the valve.
2. Install the assembled modulator on the vehicle.
3. Reconnect both air lines to the valve using the identification made during VALVE REMOVAL step 1.
4. Reconnect the electrical connector to the modulator.
5. After installing the modulator, perform the operation and leakage tests before placing the vehicle back in service.

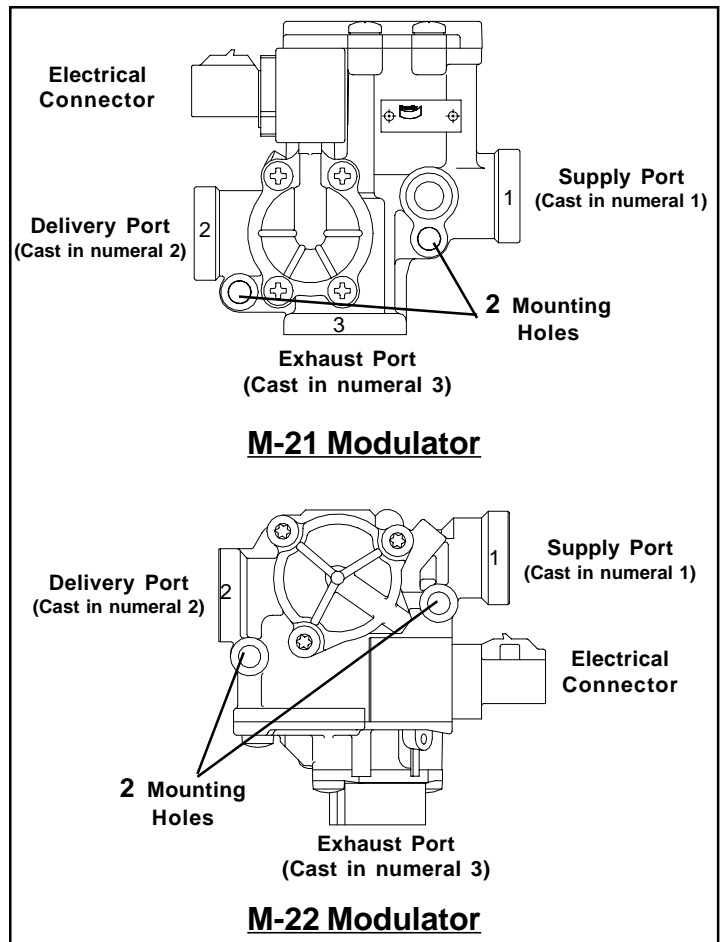


Figure 2 M-21 and M-22 Antilock Modulators

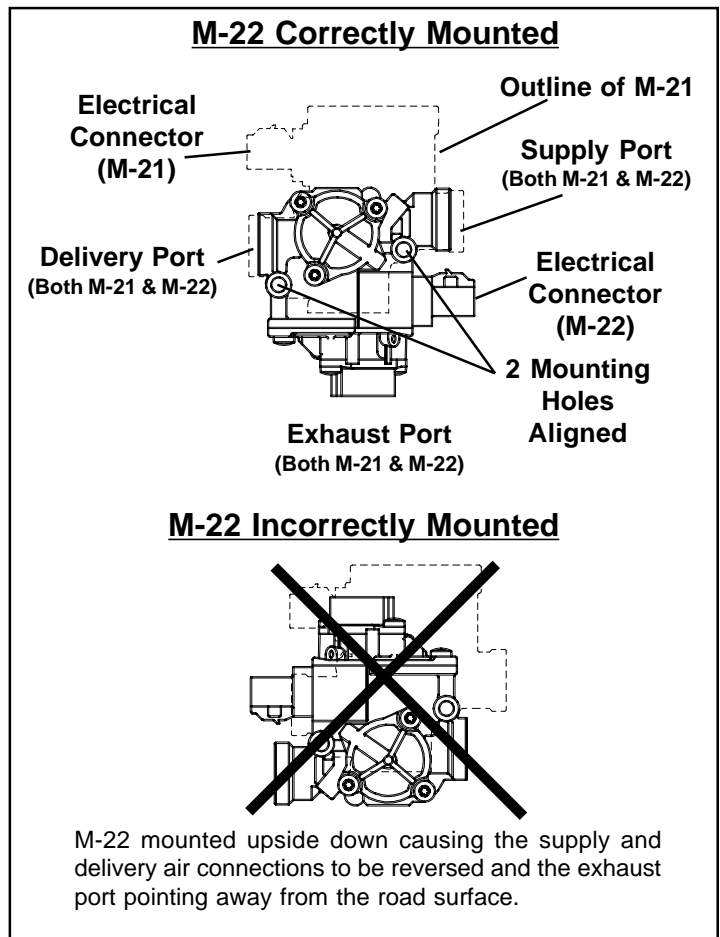


Figure 3 M-21 and M-22 Antilock Modulator Interchange

## MODULATOR CHANGE OVER (Replacing a M-21 with a M-22)

When replacing a M-21 modulator with a M-22 modulator the following must be considered during the installation process.

1. Study figures 1, 2 & 3 and note where the exhaust port is located on both the M-21 and M-22. **The exhaust on both modulators must be directed toward the road surface when mounted on the vehicle.**
2. Note that the delivery port (to the brake chamber) for the M-21 is on the same side as the electrical connector. The M-22 is exactly reverse of this with the delivery port on the opposite side from the electrical connector.  
Note: The position of the Supply Port, Delivery Port, and the modulator Exhaust Port determine how the valve must be mounted NOT THE ELECTRICAL CONNECTOR.
3. In all cases the electrical wire harness will need to be rerouted, reconnected to the M-22 and securely fastened. IMPORTANT: Do not STRAIN the wire harness. A two inch radius must be maintained in the wire harness to assure it will not pull out of the connector or allow water to enter the connector. Early issues can be expected if the wire harness does not have adequate strain relief.
4. Perform the operation and leakage tests before placing the vehicle back in service.

## OPERATION & LEAKAGE TESTS

### Leakage Testing

1. Park the vehicle on a level surface and block or chock the wheels. Release the parking brakes and build the air system to full pressure.
2. Turn the engine OFF and make 4 or 5 brake applications and note that the service brakes apply and release promptly.
3. Build system pressure to governor cutout and turn the engine OFF.
4. Make and hold a full service brake application.
  - A. Apply a soap solution to the exhaust port of the modulator. Leakage should not exceed a one inch bubble in less than 3 (three) seconds. If leakage exceeds the specified maximum, replace the modulator.
  - B. Apply a soap solution around the solenoid assembly (top and bottom). Leakage should not exceed a one inch bubble in less than 3 (three) seconds. If leakage exceeds the specified maximum, tighten the solenoid cap screws and retest. If the leakage remains excessive after retesting, replace the modulator.
  - C. Apply a soap solution around each diaphragm cover. Leakage should not exceed a one inch bubble in less than 3 (three) seconds. If leakage exceeds the specified maximum, tighten the diaphragm cap screws and retest. If the leakage remains excessive after retesting, replace the modulator.

## Operational Test

To properly test the function of the modulator will require 2 service technicians.

1. Park the vehicle on a level surface and block or chock the wheels. Release the parking brakes and build the air system to governor cutout.
2. Turn the engine ignition key to the OFF position then make and hold a full brake application.
3. With the brake application held and a service technicians posted at one of the modulators, turn the vehicle ignition key to the ON position. ONE OR TWO SHORT bursts of air pressure should be noted at the modulator exhaust. Repeat the test for each modulator on the vehicle. If at least a single burst of exhaust is not noted or the exhaust of air is prolonged and not short, sharp and well defined, perform the Electrical Tests.

## ELECTRICAL TESTS

1. Before testing the solenoid assembly of a "suspect" modulator, its location on the vehicle should be confirmed using the Trouble Shooting or Start-Up procedure for the specific antilock controller in use. (See the Service Data Sheet for the antilock controller for this procedure.)

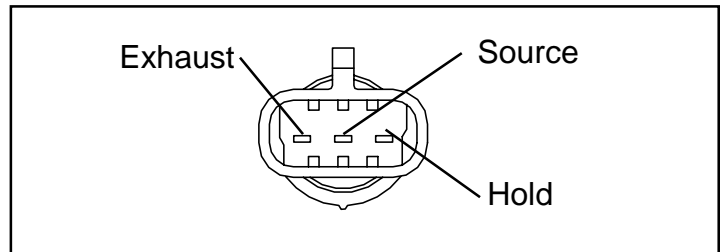


Figure 4 M-21 and M-22 Modulator Connector (on Modulator)

2. Proceed to the modulator in question and inspect its wiring connector. Disconnect the connector and test the resistance between the pins ON THE MODULATOR. Refer to figure 4.
  - A. HOLD to SOURCE: Read 3.5 to 5 OHMS
  - B. EXHAUST to SOURCE: Read 3.5 to 5 OHMS
  - C. EXHAUST to HOLD: Read 7 to 10 OHMS
  - D. Individually test the resistance of each pin to vehicle ground and note there is NO CONTINUITY.If the resistance readings are as shown, the wire harness leading to the modulator may require repair or replacement. Before attempting repair or replacement of the wire harness, refer to the test procedures specified for the antilock controller in use for possible further testing that may be required to substantiate the wire harness problem. If the resistance values are NOT AS SHOWN ABOVE, replace the modulator.