

### M50 SERIES RATIO RELAYS for SANITARY SYSTEMS

**A** Ratio Relay is a pneumatic multiplier/divider used to translate an input pressure, pneumatic or hydraulic, in an exact proportion to a desired pneumatic output for gauging, recording or control purposes. For example, in the case of Tank Mate Sanitary gauging systems with the 8½" master gauge the desired pneumatic input is 0-15 PSI (0-100% full scale). Depending on the variables of the installation, the sensor alone may not furnish that exact output. The ratio relay, acting as an intermediate air to air transmitter between the sensor and the gauge, can be used to fine tune the accuracy of the sensor system to within 0.50% or better.

Ratio relays are frictionless, using a stacked diaphragm construction to transmit or output an air pressure that is an accurate ratio to the input air pressure. They contain no links, levers, bearings or springs (see fig. 1).

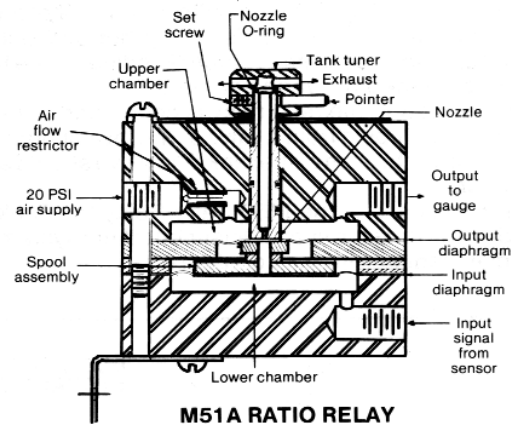
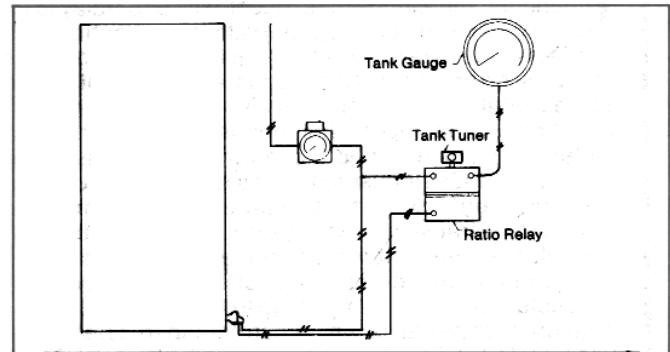
Note that the unit has two opposing diaphragms of differing effective areas. In the illustration the input diaphragm assembly has an effective area four times greater than the output diaphragm assembly. An input pressure of 1 PSI from the sensor will require an opposing pressure of 4 PSI in the output chamber to achieve balance.

Pressure in the upper chamber is furnished by a 20 PSI regulated input that is moderated to approximately 1 CFH by the air flow restrictor. As air flows into the upper chamber on one side it has two possibilities for escape: 1. Through the output to gauge opening, and/or 2. Through the exhaust. As the pressure in the lower chamber is increased, the force transmitted through the spool assembly to the upper diaphragm closes off the nozzle exhaust. This causes the pressure in the upper chamber to increase. The pressure will continue to increase until sufficient force is created to open the nozzle and permit the air to again escape. When the spool assembly is in balance, the relation between the two pressures will be an exact function of the diaphragm area ratio. The output signal to the gauge will rise and fall in proportion to the input pressure from the sensor.

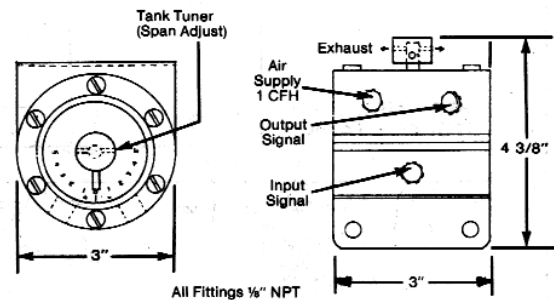
#### Tank Tuner

The diaphragm area ratio can be affected by the axial positioning of the nozzle. Therefore, by rotating the nozzle, calibration can be affected. By raising or lowering the nozzle  $\pm\frac{1}{4}$  turn of the knob, the span will be changed approximately  $\pm 5\%$ . This is a span (upscale) adjustment and has little or no effect on the zero reading.

A ratio relay provides a precise ratio between two pressures with high linearity and repeatability. The output capacity is limited, but is sufficient to operate dead end devices such as pressure gauges, switches, recorders and controllers. If a greater capacity is required, a volume booster relay will be necessary.



#### MODEL M50 RATIO RELAY



### SPECIFICATIONS

#### M50 Series Air-to-Air Transducers

**Materials of Construction** Body - Aluminum  
Diaphragms - Buna-N

**Static Pressure Rating** 100 PSIG

**Air Supply** 20-25 PSI

**Air Flow (restrictor in body)** 1 CFH

**Zero Output** 1.0" W.C. Max

**Standard Output** 0 to 15 PSIG

**Temperature Limits** -20°F to 150°F (-28.9°C to 65.6°C)

**Pressure Ratios\***

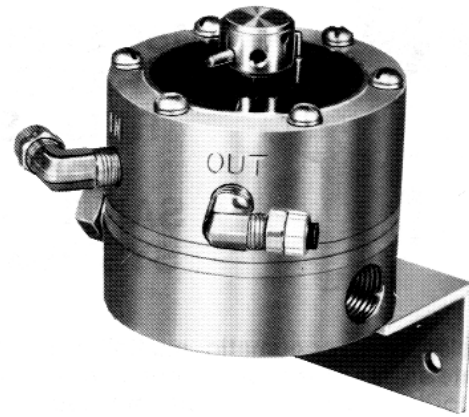
\*Increments from 2:1 to 1:14.7 selected by the Engineering Dept. based on sensor output for product and tank size specified.

In function the M80 Series Industrial Ratio Relay is identical to the M50 (previous page) with the exception that provision is made to take the actual liquid being gauged into the input (lower) chamber of the instrument instead of the air pressure signal from a sensor. It is also slightly different in construction... the input chamber is 316L stainless steel instead of aluminum, and the lower diaphragm is Teflon.

Thus, the M80 (industrial) series ratio relays act as liquid-to-air pressure transducers to produce a pneumatic signal output to be transmitted to a gauge, or when combined with suitable pressure switches the signal can be used to activate alarms or control devices. This series is designed to gauge products in tanks from 2 feet high to 100 feet high, and is suitable only for products which can be piped safely from the vessel into the liquid chamber of the instrument. The M80 series is not applicable for use with products that are very viscous, have suspended solids, or are hot and will congeal. Also, it shouldn't be used in batch blending where the vessel must be cleaned between batches.

The  $\frac{3}{8}$ " port in the ratio relay is connected to the tank by means of  $\frac{3}{8}$ " tubing from a valve at the lowest practical point on the side or bottom of the tank. The valve should also be  $\frac{3}{8}$ " or larger.

As in the case of the M50 Ratio Relay the Tank Tuner is used to fine tune the span adjustment of the system to match the dial reading with tank contents.



## SPECIFICATIONS

### M80 Series Liquid-to-Air Transducers

#### Materials of Construction

**Wetted Parts** Chamber - 316L stainless steel  
Lower Diaphragm - Teflon

**Upper Diaphragm** Buna-N

**Static Pressure Rating** 100 PSIG

**Air Supply** 20-25 PSI

**Air Flow (restrictor in body)** 1 CFH

**Zero Output** 1.0" W.C. Max

**Standard Output** 0 to 15 PSIG

**Temperature Limits** -20°F to 250°F  
(-28.9°C to 121.1°C)

#### Pressure Ratios\*

\*Increments from 2:1 to 1:14.7 selected by the Engineering Dept. based on tank dimensions and product specified.

