

# Averaging Relay CR-103

## GENERAL DESCRIPTION

The Model CR-103 Averaging Relays are proportioning units designed for use in industrial pneumatic control systems where the application requires averaging 2, 3, 4, 5, 6 or 7 input pressure signals to obtain one output pressure signal.

For example: Where two or more transmitters (or controllers) are measuring a common variable, the output pressures of the transmitters (or controllers) can be averaged according to the equation:

$$\text{Output pressure of Averaging Relay} = \frac{\text{Sum of input pressure signals} \pm \text{spring bias}}{\text{Number of input pressure signals}}$$

Unused ports must be left open to atmospheric pressure.

## SPECIFICATIONS

### DESIGN DATA

#### Input Pressure Range:

- 0-20 psig (0-1.4 bar) nominal
- 0-50 psig (0-3.5 bar) maximum

#### Output Pressure Range:

- 0-20 psig (0-1.4 bar) nominal
- 0-50 psig (0-3.5 bar) maximum

#### Supply Pressure:

- 30 psig (2.1 bar) nominal
- 50 psig (3.5 bar) maximum

**Biasing Adjustment:** .....  $\pm 18$  psig divided by the number of input signals.

**Ambient Temperature Limits:**..... -40 to 180 F. (-40 to 82°C)

**Connections:** ..... 1/4" female NPT.

#### Weight:

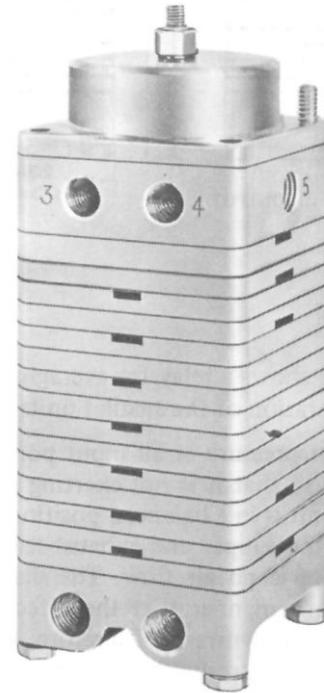
- 2 input signals ..... 2 lbs. (0.91 Kg)
- 7 input signals ..... 3.5 lbs. (1.59 Kg)

## PERFORMANCE DATA

**Ultimate Sensitivity:** ..... 0.01 in. H<sub>2</sub>O.

**Supply Pressure Effect:** ..... Change in output pressure for a 5 psig (0.35 bar) supply pressure change - less than 1% of full range.

**Ambient Temperature Effect:** ..... Change in output for a 75° F (24° C.) change in ambient temperature - 0.5% of full range.



**Air Consumption:** ..... Maximum - 6.0 SCFH

#### For Maximum Flow:

- Supply output capacity* ..... 3.0 SCFM nominal
- Exhaust output capacity* ..... 3.0 SCFM nominal

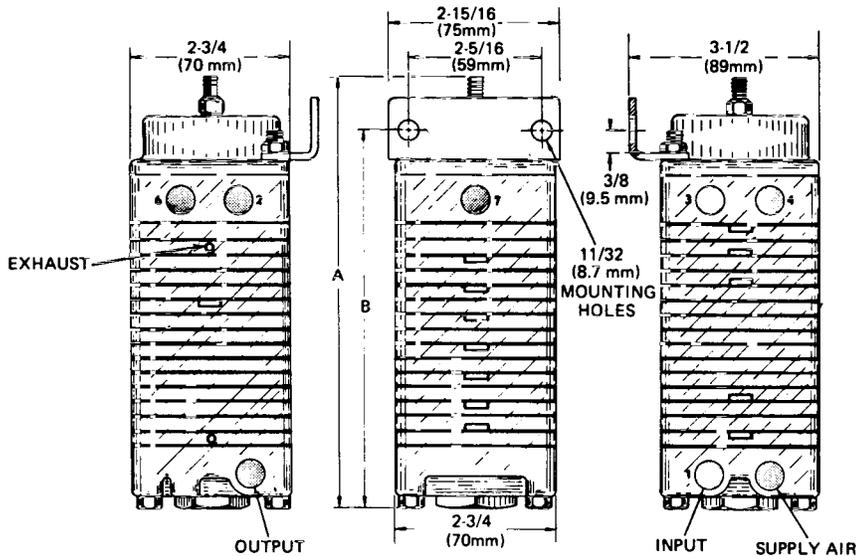
## ORDERING INFORMATION

### Specify:

Model or Catalog No. and Description.

ACTION	MODEL NO.	ACTION	MODEL NO.
2 signal	CR103-A2	5 signal	CR103-A5
3 signal	CR103-A3	6 signal	CR103-A6
4 signal	CR103-A4	7 signal	CR103-A7

## DIMENSIONS



SIGNAL PORT 5 IS ON  
FACE OPPOSITE PORT 7

### DIMENSIONS

Model No.	A	B	Averages
CR 103-A2	4-7/8" (124 mm)	4" (102 mm)	2 input signals
CR 103-A3	5-3/8" (137 mm)	4 1/2" (114 mm)	3 input signals
CR 103-A4	5-7/8" (149 mm)	5-1/2" (127 mm)	4 input signals
CR 103-A5	6-3/8" (162 mm)	5-1/2" (140 mm)	5 input signals
CR 103-A6	6-7/8" (175 mm)	6" (152 mm)	6 input signals
CR 103-A7	7-3/8" (187 mm)	6-1/2" (165 mm)	7 input signals

NUMBERED PORTS ARE INPUT  
SIGNALS CONNECTIONS.

Figure 1

## OPERATION

The illustration shows a relay for averaging 7 input pressure signals. The operation of the smaller units is similar.

With zero input pressure at all input ports and the biasing spring adjusted so that it is not exerting any force in either direction, the unit is in a balanced position. In this balanced position, both the supply and exhaust seats of the valve are closed and there is no air flow. The diaphragm areas are related in such a manner that the effective force of any input pressure is downward. Therefore, with the unit in a balanced position, introduction of any input pressure will create a downward force which will move the center assembly down, opening the supply seat of the valve and permitting supply air pressure to flow into the output chamber. This output pressure is channeled into all of the balancing chambers. The diaphragms of the balancing chambers are related so that this output air pressure creates an upward force. As the output pressure approaches the average input pressure, the

center assembly will be returned to the balanced position, permitting the supply seat of the valve to close, throttling the flow of supply air.

Should any or all of the input pressure decrease, the upward force of the output pressure would be greater than the downward force of the input pressures. Then the center assembly would move upward, opening the exhaust seat and thereby exhausting the output air until the decreased output pressure again balances the input pressures.

The spring assembly permits biasing the output pressure to a maximum of  $\pm 18$  psig divided by the number of inputs. In the 6 input signal relay, this means that the output pressure may be biased  $\pm 3$  psig (0.21 bar). In the 2 input signal relay, it may be biased  $\pm 9$  psig (0.62 bar). This is accomplished by turning the adjusting screw in the top of the assembly to either extend or compress the spring.

## BIAS ADJUSTMENT

With normal supply pressure and input pressures applied, the Bias Adjusting Screw (Figure 2) may be turned clockwise to increase the output pressure or turned counterclockwise to decrease output pressure.

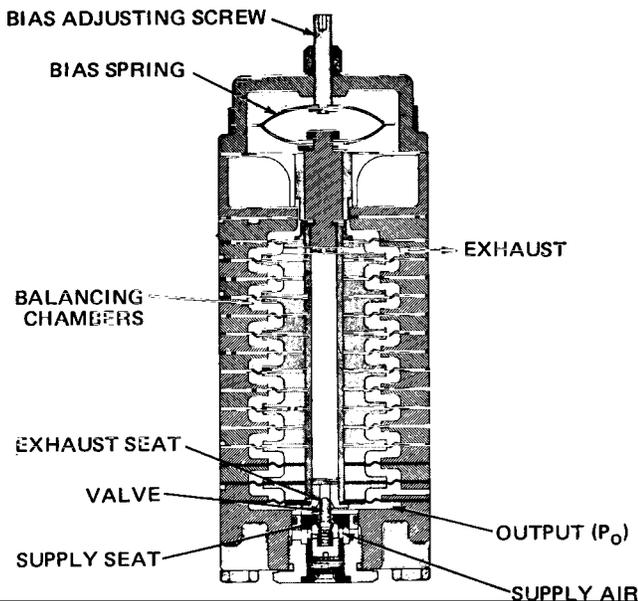


Figure 2

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