COX INSTRUMENTS
FLOW MEASUREMENT

Proven Performance for Over 50 Years

HOOK-UP INSTRUCTIONS – MODEL 106-255
SIGNAL CONDITIONER, MODULATED CARRIER, METER MOUNTED

APPLICATION

The Model 106-255 Meter Mounted Modulated Carrier Signal Conditioner is intended for use with the wide range Cox Series ANC and LFC Turbine Flowmeters. The signal conditioner is designed to be mounted directly to the flowmeter and when installed in this way is contained in an explosion-proof housing. The following describes the available options for installation and connection to peripheral instrumentation.

INSTALLATION

Figures 1A and 1B illustrate the most commonly used methods for electrically interfacing to the signal conditioner. Figure 1A is referred to as the TWO WIRE INTERFACE while Figure 1B illustrates the typical THREE WIRE INTERFACE. In both instances, a regulated DC power source is required as is some type of frequency meter or programmed rate indicator, used to process or display the flowmeter signal. The regulated DC power source should provide an output of between 15 and 28 volts DC with a minimum output current capability of 100 milli-amperes. Also, in either configuration the flowmeter pick-off is connected directly to the terminals labeled “A” and “B”.

TWO WIRE INTERFACE

In general, the advantage to the Two Wire Interface is the inherent higher noise immunity, especially when connected over long distances. It also offers a simpler interconnect with fewer wires. In the Two Wire Interface the signal conditioner is connected to the regulated power supply through a series dropping resistor. The pulsing action of the signal conditioner causes a modulating current flow through the series resistor, producing a near symmetrical square wave signal output.

Figure 2 illustrates the typical output signal produced by the two wire interface. Note that the minimum excursion of the output signal does not return to a zero volt or ground reference. This characteristic of the two wire interface may cause some difficulty in selection of the frequency counter or rate indicator. A typical “TTL” compatible interface requires that the minimum signal excursion be near zero volts. Some indicators may require the signal to pass through zero, going negative. A level shifting device or DC blocking capacitor may be required to remove the unwanted DC component. If these are not possible alternatives, the Three Wire Interface should be considered.

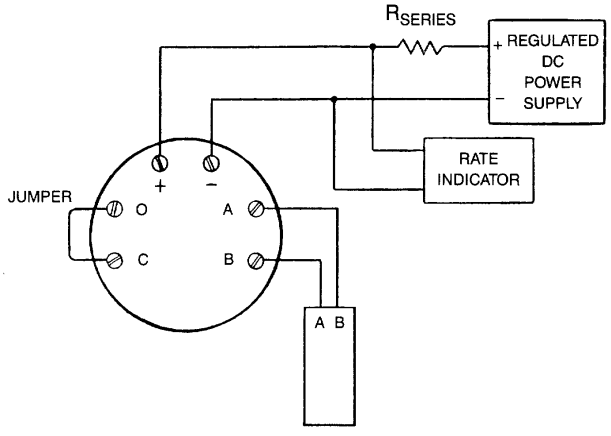

Figure 1A. *Typical hook-up for a Two Wire Interface. Connect flowmeter pick-off terminals “A” and “B”. Jumper terminals “O” and “C” as indicated. Select R_{series} and supply voltage according to instructions.*

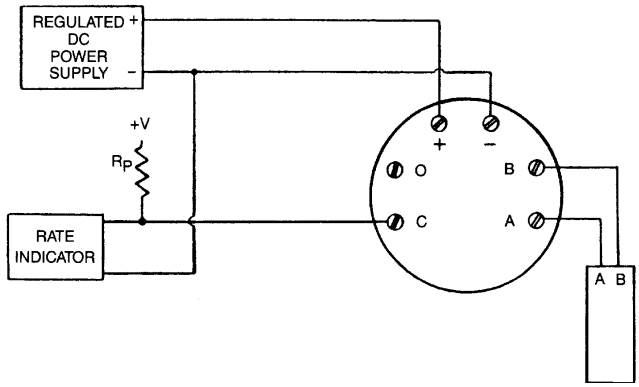

Figure 1B. *Typical Three Wire Interface. Connect flowmeter pick-off at terminals “A” and “B” as shown. No connection to terminal “O”. Pull-up resistor R_p selected according to instructions.*

Selection of the power supply level and series resistor value in Figure 1A is not critical, however, certain guidelines should be followed. The signal conditioner is designed to operate at supply voltages between 15 and 28 volts DC. The maximum current drawn by the signal conditioner is determined by the selection of power supply voltage and resistor. A supply with a minimum output current capability of 100 milli-amperes should be provided to assure stable signal output. The resistor value selected should not be so large as to limit operating current to the signal conditioner. Figure 3 graphs the maximum resistor vs. supply voltage. In using this graph, select the minimum expected value of supply voltage and read the corresponding maximum value that may be selected for the series resistor. For example, if the minimum expected supply output is 22 volts, the maximum valued resistor that should be used is approximately 330 ohms. For most installations, a 1 watt carbon composition resistor will be adequate.

Figure 4 gives the output peak to peak voltage vs. the series resistor value for a range of power supply voltages. The shaded area to the left exceeds the maximum resistor selection and is excluded from the useable range. Figure 5 provides the minimum value signal excursion or DC component. Peak to peak and minimum signal are illustrated in Figure 2.

The jumper indicated between terminals “O” and “C” is required for proper output. This connection enables the internal switching transistor which produces the modulation of the supply current.

THREE WIRE INTERFACE

The Three Wire Interface illustrated in Figure 1B provides an output signal which can be directly connected to counters or indicators defined as being TTL compatible. Unlike the signal output from the Two Wire Interface, the signal output from this configuration will provide a near zero minimum signal excursion. The maximum or peak output signal is determined by the user. An additional wire is required and, depending on the requirements of the external system, a second power supply level may be needed.

As in the two wire interface, the flowmeter pick-off is connected directly to terminals “A” and “B”. The power supply required can be at any voltage level between 15 and 28 volts and should be capable of supplying a minimum 100 milli-amperes. This is connected directly to terminals “+” and “-“ as illustrated.

No connection is made to terminal “O”. Terminal “C” provides the output signal to the frequency counter or rate indicator. As this output is from an “open collector” source, a pull-up resistor Rp is required. The pull-up resistor must be connected to a positive supply level generally equal to the maximum desired signal excursion. If interfacing directly to logic

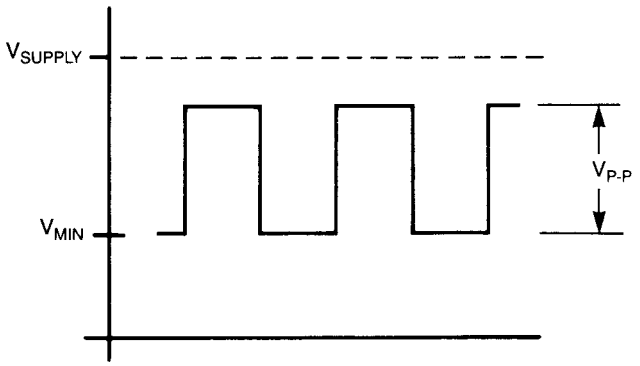

Figure 2. *Typical output signal for the Two Wire Connection. V_{min} is a positive level on which the signal rides. V_{p-p} is the peak to peak swing of the output signal.*

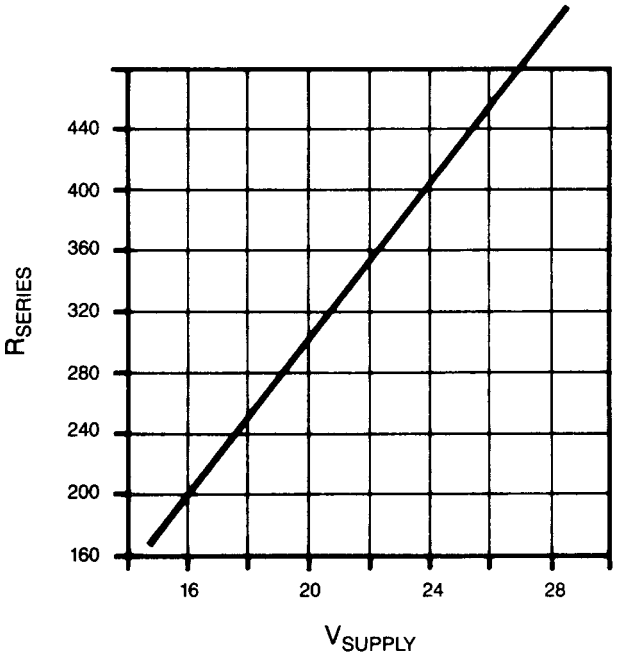

Figure 3. *Maximum value for R_{series} in ohms vs. power supply voltage.*

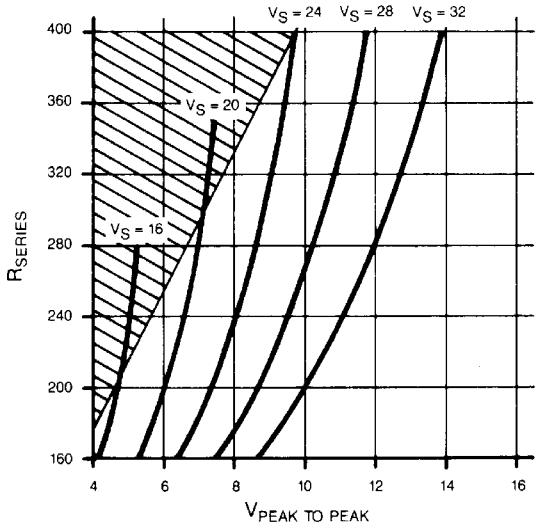

Figure 4. *Output peak to peak voltage vs. R_{series} and V_{supply}. The shaded area indicates R_{series} greater than maximum allowed from Figure 3.*

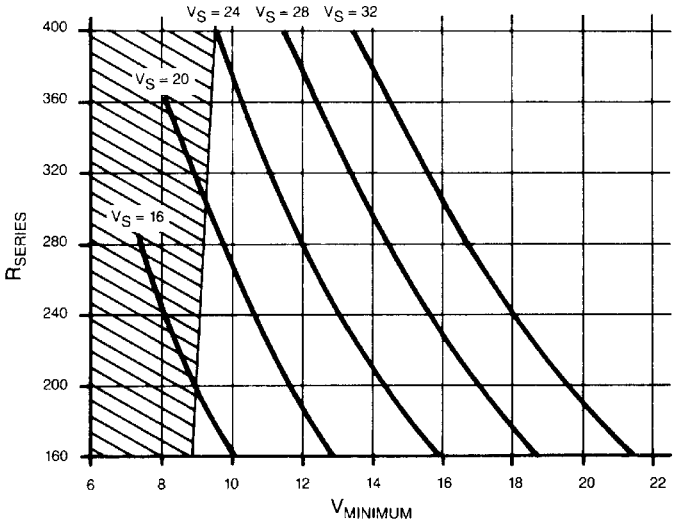

Figure 5. *Minimum level of output signal. DC component on which the signal rides. Max supply current is (V_{supply} – V_{min}) /R_{series}.*

elements (gates, flip-flops, etc.) that level would be equal to the logic supply voltage. The maximum voltage level to be used for this purpose is +40 volts. The resistor value is not critical and is determined in a manner which minimizes power consumption while insuring sufficient rise and fall times given the shunt capacitance. For example, if the total expected shunt capacitance due to all contributors is 1000 picofarads, the maximum pull-up should not exceed 20,000 ohms. For a total shunt capacitance of 10,000 picofarads, the maximum pull-up would be reduced to 2,000 ohms.

INTRINSIC SAFETY BARRIERS

A variation of the Two Wire Interface is illustrated in Figure 6 which uses Intrinsic Safety Barriers to satisfy the requirements typical of operation in hazardous or potentially explosive environments. By appropriate selection of the barrier, the series resistor common to the Two Wire Interface is replaced by the barrier device. Barriers are available which provide series resistance from a few ohms up to several hundred ohms. By returning the modulation signal to the rate indicator via a second safety barrier, the instrumentation is effectively isolated from the hazardous area and satisfies the requirements for an intrinsically safe design.

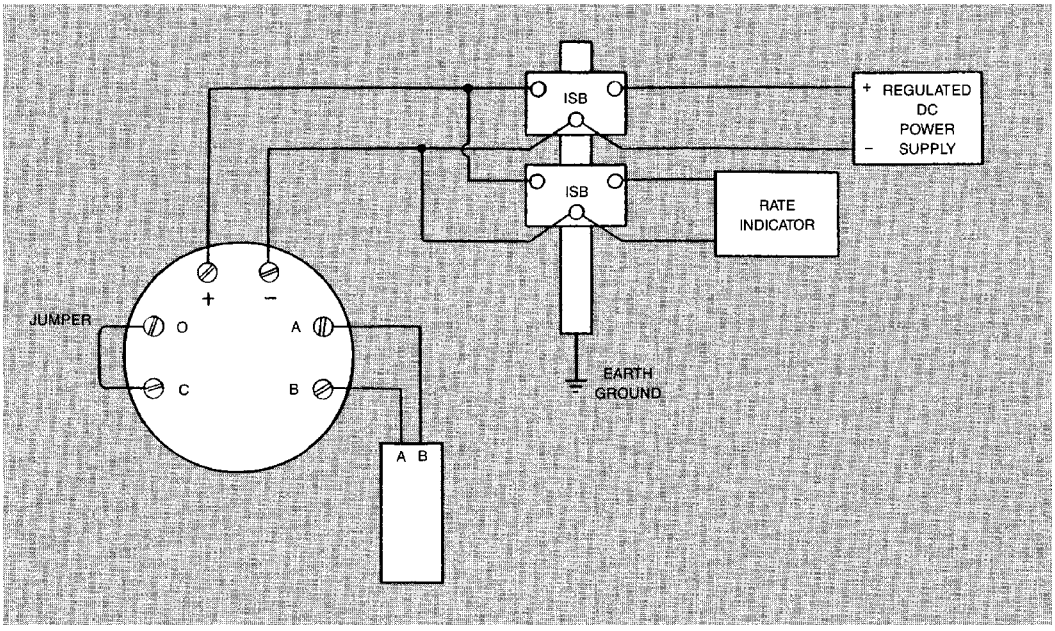

Figure 6. *Interconnect using Intrinsic Safety Barriers for operation in hazardous potentially explosive environments. Instrumentation located in "safe" area; flowmeter and signal conditioner are located in the hazardous area. Safety Barrier isolates the two.*