INSTALLATION & OPERATION MANUAL

Analog Signal Conditioner
Rev. C

GENERAL DESCRIPTION:

The frequency to current/voltage converter is designed to be a general purpose signal conditioner. The signal conditioner may be used as a frequency to currency (F/I), or a frequency to voltage (F/V) converter. The signal conditioner has been factory calibrated to the customer request of conversion methods (F/I or F/V), and to the desired turbine flow meter. This manual may be used for either method of conversion, and is split into two sections, F/I and F/V.

When the signal conditioner is used as a F/I converter, it is designed to linearly convert a frequency input signal into an equivalent4 – 20, or 10 – 50 mA current output signal. The signal conditioner is to be used with a turbine flow meter equipped with a magnetic pick-up. The frequency input to the signal conditioner is proportional to the rate of flow through the turbine flow meter. The signal conditioner will translate that input signal into a linear current output signal. Example. For a unit set on the 4 –20 mA setting: a 4 mA output signal represents no flow, and a 20 mA output signal represents the maximum rated flow of the turbine flow meter. Data transmission in a current form exhibits excellent noise immunity and the capability for long distance transmission.

When the signal conditioner is used as a F/V converter, it is designed to linearly convert a frequency input signal into an equivalent 0 – 5, or 0 – 20V voltage output signal. The signal conditioner is to be used with a turbine flow meter equipped with a magnetic pick-up. The frequency input to the signal conditioner is proportional to the rate of flow through the turbine flow meter. The signal conditioner will translate that input signal into linear voltage output signal. Example. For a unit set on the 10 Volt setting: a 0 V output signal represents no flow, and a 10 V output signal represents the maximum rated flow of the turbine flow meter.

GENERAL SPECIFICATIONS: ①

Supply Voltage: Minimum	11.0 VDC
Maximum	38.0 VDC
Supply Current: Standard	4.3 mA
Input Protection:	
Frequency Input Range: ②	
High Range, max. full scale	12.8 KHz
min. full scale	1300 Hz
Low Range, max. full scale	1200 Hz
min. full scale	115 Hz
Input Sensitivity	±22 mV to ±50 V
Output Protection: Short to +VDC or Common	Continuos
Output Setting Time, full scale change to 95% of final value	1.8 sec.
Output Ripple and Noise	5 mV peak to peak
	<2 mV rms., .05% of FS
Linearity	0.2% of full scale
Temperature Coefficient, 25 to 40° C	0.13%/C°
	13 mV/V° on 10V range
Operating Temperature, Standard	-28 to 160 F°
special	-40 to 250 F°
Zero / Span adjustment Interaction:	<1%

① Typical performance. Unless specified, measurements are made under the following conditions: 25° C, 12 VDC supply, 10 Volt output setting, High Frequency Range, calibrated at 2 KHz full scale.
② Max. Full scale is defined a 1 turn from extreme end of potentiometer. Further range is available, but linearity is degraded to > 0.5%.

CURRENT MODE SPECIFICATINS:

3 Wire Output Version:		20 mA Range	50 mA Range
minimum Output Current:		0.07 mA	0.19 mA
Maximum Output Current, (Full Scale Min. Cal, Zero Cal set to 4 mA and 10 mA)		24.1 mA	61.2 mA
Load resistance <(+V – 6v)/full scale output	=V=12V	<300 ohms	<120 ohms
	+V=24V	<900 ohms	<360 ohms

BENCH CALIBRATION FOR CURRENT MODE

Bench calibration is not necessary if the unit was factory assembled, or if the module was calibrated, at the factory, for the specific turbine meter. Bench calibration, however, is necessary for field replacement or up grade to an existing unit.

Required Equipment:

12 Volt (DC) power supply, digital multi-meter, frequency generator, and a screw driver (.100 flat tip).

Jumper Terminal 1 & 3 for current mode.

Jumper Selection: three jumper settings need to be determined and set before bench calibration can commence.

1. Frequency Jumper: The frequency jumper is set according to the max. frequency the signal conditioner will encounter. This frequency is equal to the "K" factor of the meter times the maximum rated flow rate of the turbine meter, in gallons per minute (GPM). If this number is less than 13oo Hz the jumper is set to the low setting. If the number is greater that 1000 Hz, the jumper is set to the high setting (see FIGURE 2.).

2. Range Jumper: The range jumper is set according to the desired conversion method, as follows: (see FIGURE 2).
   - 20 mA if the desired output signal is to be 4 20 mA
   - 50 mA if the desired output signal is to be 10 – 50 mA

3. Mode Jumper: The mode jumper is set according to the desired conversion method, as follows: (see FIGURE 2).
   - V for frequency to voltage conversion.
   - C for frequency to current conversion.

Bench Calibration Procedure: (see FIGURE 2).

1. Connect digital multi-meter positive lead to the power supply positive, and the negative multi-meter lead to location #1 on the terminal strip on the signal conditioner. Set the function of the multi-meter to mA DC.

2. Connect the power supply negative lead to location #2 on the terminal strip on the signal conditioner.

3. Connect the frequency generator positive lead to location #4, and the negative lead to location #5 on the terminal strip on the signal conditioner. Adjust the signal amplitude of the frequency generator to 50mV, and the frequency to the maximum desired point (full scale frequency).

4. Adjust the frequency generator amplitude to zero (turn it off), adjust the zero pot, so that the

digital multi-meter reads 4.00 mA (using the 4 – 20 mA setting, or 10 mA using the 10 – 50 mA setting).

5. Turn the power supply, multi-meter, and the frequency generator on adjust the span pot. so that the digital multi-meter reads 20.00 mA (using the 4 –2- mA setting, or 50 mA using the 10 – 50 mA setting).

6. Readjust the frequency generator to the desired maximum frequency, (turn it back on) adjust the span pot. so that the digital multi-meter reads 2.00 mA (using the 4 – 20 mA setting, 0r 50 mA using the 10- 50 mA setting).

7.Repeat steps 4 through 6 until no adjustment to zero or span is required.

8. Record the maximum frequency and current on the data record (Figure 1).

9. Adjust the frequency of the frequency generator to exactly 50% of the maximum frequency, the digital multi-meter should read 12.00 mA ±.06 (30 mA on 10 – 50 mA setting).

10. Repeat step 9 for 25% and 75% and record data (Figure 1.). the multi-meter should read 8 mA and 16 mA respectively (20 mA and 40 mA on 10 –50 mA setting).

To check linearity at any point incorporate the following formula:

((F/F max.) X 16) = +4 mA for 4-20 mA setting
((F/F max.) X 40) = +10 mA for 10–50 mA setting

Example: (4 – 20mA setting)
Assume maximum frequency = 2000 Hz (20 mA point)
Check for linearity at 750 Hz.
((750/2000) X 16) + mA = 10.00 mA. Therefore, the multi-meter should read 10.00 mA at 750Hz input frequency.

Figure 1

Model No._____
Serial No. _____
“K” Factor _____

Current (4 –20)	Current (10 –50)	Frequency (Hz)	G.P.M.	L.P.M.
4 mA	10 mA			
8 mA	20 mA			
12 mA	30 mA			
16 ma	40 mA			
20 ma	50 ma			

VOLTAGE MODE SPECIFICATIONS:

	5 Volt Range	10 Volt Range
VOUT min. (Freq. input + 0 Hz), at full scale max, freq. cal	5.1 mV	10.5 mV
VOUT min. at full scale max. freq. cal	21 mV	43 mV
VOUT max. at Vsupply = + 12 Vdc	6.8 V	11.3 V
VOUT max. at Vsupply = + 24 Vdc	6.8 V	13.7 V
Minimum Load resistance	50 ohm, 1/2W	100 ohm, 1W
(OUTPUT CURRENT LIMIT = 100 Ma)		
Maximum Load resistance	Open	Open

BENCH CALIBRATION FOR VOLTAGE MODE:

Bench calibration is not necessary if the unit was factory assembled, or if the module was calibrated, at the factory, for the specific turbine meter. Bench calibration, however, is necessary for field replacement or up grade to an existing unit.

Required Equipment:

12 Volt (DC) power supply, digital multi-meter, frequency generator, and screw driver (.100 flat tip).

Jumper Selection: Three jumper settings need to be determined and set before bench calibration can commerce.

1. Frequency Jumper: The frequency jumper is set according to the max. frequency the signal conditioner will encounter. The frequency is equal to the "K" factor of the meter times the maximum rated flow rate of the turbine meter, in gallons per minute (GPM). If this number is less than 1300 Hz the jumper is set to the low setting. If the number is greater that 1300 Hz, the jumper is set to the high setting (see Figure 2).

2.Range Jumper: The range jumper is set according to the desired conversion rang, as follows: (see FIGURE 2).

- 5 Volt if the desired output signal is to be 0 – 5 Volt
- 10 Volt if the desired output signal is to be 0 – 10 Volt

3. Mode Jumper: The mode jumper is set according to the desired conversion method, as follows (see FIGURE 2).

- V for frequency to voltage conversion.
- C for frequency to current conversion.

Bench Calibration Procedure: (see FIGURE 2).

1. Connect the digital multi-multi positive lead to terminal strip location #3, and the negative lead to location #2 on the terminal strip on the signal conditioner, and set the function on the multi-meter to DC Volts.

2. Connect power supply positive lead to terminal strip location #1, and the negative lead to terminal strip location #2 located on the signal conditioner.

3. Connect the frequency generator positive lead to terminal strip located # 4, and the negative lead to terminal strip location # 5. Set the output of the frequency generator to sine wave and the amplitude to zero.

4. Turn on the power supply, multi-meter, and the frequency generator, the digital multi-meter should read 0 Vdc.

5. Adjust the zero potentiometer so that the multi-meter reads .00 V.

6. Adjust the amplitude of the frequency generator to 20 mV and the frequency to the desired maximum point (full scale frequency).

7. Adjust the span potentiometer to 5.00 V, or 10.00 V digital multi-meter indication.

8. Repeat steps #5 – 7, until no zero or span adjustment are necessary.

9. Record the maximum frequency generator and voltage on the data record (Figure 4).

10. Adjust the frequency of the frequency generator to exactly 50% of the maximum frequency, the digital multi-meter should read 2.50 V (5.00 V on the 0 – 10 V setting).

11. Repeat step #10 for 25% & 75% and record data (Figure 4). The multi-meter should read 1.25 V & 3.75 V respectively (2.50 V & 7.50 V on the 0 – 10 V setting).

To check linearity at any point incorporate the following formula:

F/F max.) X full scale output + Volts

Example:

Assume maximum frequency + 2000 Hz and full scale output voltage = 10.00 V.
Check linearity at 750 Hz.
(750/2000) X 10 = 3.75 V. Therefore, the digital multi-meter should read 3.75 V at 750 Hz input frequency.

Figure #4

Model No._____
Serial No._____
"K" Factor_____

Voltage (0-5)	Voltage (0-10)	Frequency (Hz)	G.P.M.	L.P.M.
0.00 V	0.00 V			
1.25 V	2.50 V			
2.50 V	5.00 V			
3.75 V	7.50 V			
5.00 V	10.00 V			

WIRING INSTRUCTIONS:
CURRENT MODE

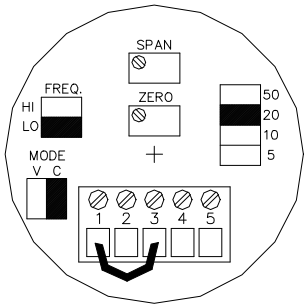
FREQUENCY TO CURRENT (F/I) MODE 4-20mA OUT

Terminal description for the magnetic pick-up signal conditioner.

Terminal location	1	Loop in (+)
	2.	Loop in (-)
	3	Out
	4	Mag Pick-up Signal In (+)
	5	Mag Pick-up Signal In (-)

Note: A jumper wire has to be placed between terminals 1 & 3.

*See diagram at the end of this manual for complete Frequency to Current mode wiring instructions.



FREQUENCY TO CURRENT (F/I) MODE 10-50mA OUT

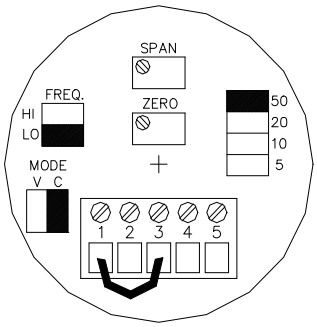
Terminal description for the magnetic pick-up signal conditioner.

Terminal location

1.	Loop in (+)
2.	Loop in (-)
3.	Out
4.	Mag Pick-up Signal In (+)
5.	Mag Pick-up Signal In (-)

Note: A jumper wire has to be placed between terminals 1 & 3.

*See diagram at end of this manual for complete Frequency to Current mode wiring instructions.



WIRING INSTRUCTIONS

VOLTAGE MODE

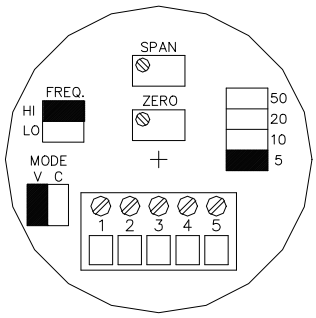
FREQUENCY TO VOLTAGE (F/V) MODE 0-5V OUT

Terminal description for the magnetic pick-up signal conditioner.

Terminal location

1. DC POWER (+)
2. GROUND
3. Signal out (+V)
4. Mag Pick-up Signal In (+)
5. Mag Pick-up Signal In (-)

*See diagram at end of this manual for complete Frequency to voltage mode wiring instructions.



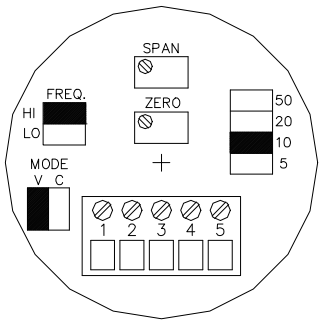
FREQUENCY TO VOLTAGE (F/V) MODE 0-10V OUT

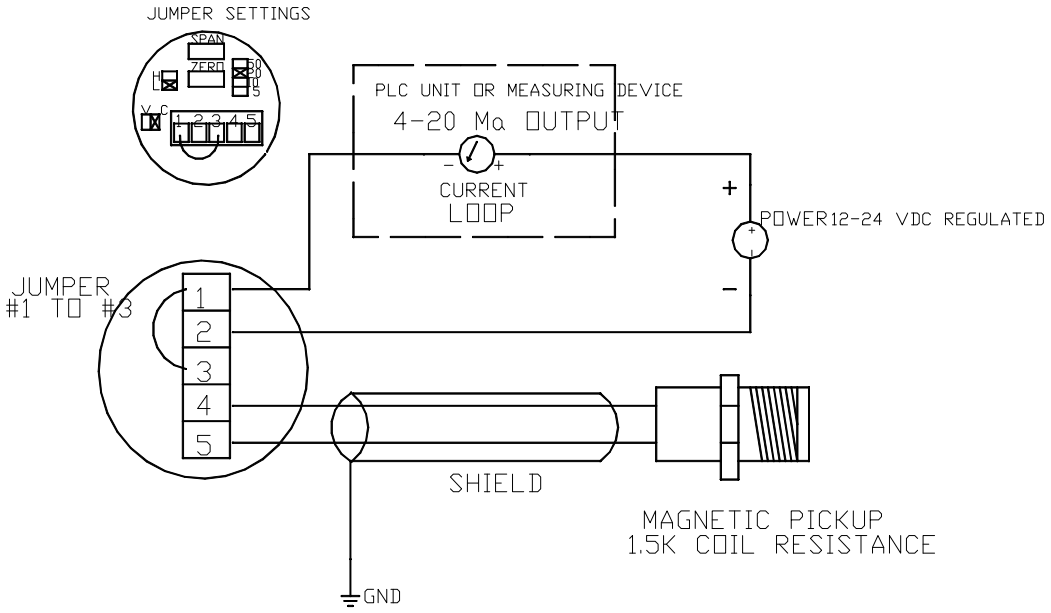
Terminal description for the magnetic pick-up signal conditioner.

Terminal location

1. DC POWER (+)
2. GROUND
3. Signal out (+V)
4. Mag Pick-up Signal In (+)
5. Mag Pick-up Signal In (-)

*See diagram at end of this manual for complete Frequency to Voltage mode wiring instructions.





NOTE: USE SHIELDED CABLE IF LONGER THEN 1 FT.