

# PI-F Programmable Isolating Frequency Transmitter.

Programmable, Isolating Frequency Input to DC Current or DC Voltage Output Transmitter.

## Features.

- Field Programmable Input and Output Ranges.
- Bi-Polar Output Ranges.
- Fast Response Time, Allowing Accurate Control.
- Impedance Matching on Input.
- Contact Closure Selection.
- Crystal Locked Period Measurement.
- Input to Output Isolation 1.0kV.
- High Accuracy 0.1%.
- Universal AC/DC Power Supply.
- Compact DIN Rail Mount Enclosure.
- Available Standard or Special Calibration.



Other PI- models include:  
 PI-B Bridge / Strain gauge;  
 PI-D DC; mA, mV, V.  
 PI-F Frequency;  
 PI-K Resistance;  
 PI-M Maths Computing;  
 PI-N RTD Differential Pt100;  
 PI-P Potentiometer;  
 PI-R RTD Pt100;  
 PI-S Relay Dual Setpoint;  
 PI-T Thermocouple.

## Ordering Information.

PI-F-X Standard Calibration: Input 0~100Hz; Output 4~20mA;  
 High Voltage Power Supply.

PI-F -  -  -  - Special Range Special Range Calibration.  
 IR OR PS

| INPUT RANGES        |    | OUTPUT RANGES        |    |          |    |
|---------------------|----|----------------------|----|----------|----|
| Frequency           | IR | Voltage              | OR | Current  | OR |
| 0~0.4Hz             | 1  | 0~500mV              | A  | 0~1mA    | 1  |
| 0~0.5Hz             | 2  | 0~1V                 | B  | 0~2mA    | 2  |
| 0~1Hz               | 3  | 0~2V                 | C  | 0~5mA    | 3  |
| 0~2Hz               | 4  | 0~3V                 | D  | 0~10mA   | 4  |
| 0~4Hz               | 5  | 0~4V                 | E  | 0~16mA   | 5  |
| 0~5Hz               | 6  | 0~5V                 | F  | 0~20mA   | 6  |
| 0~10Hz              | 7  | 0~6V                 | G  | 1~5mA    | 7  |
| 0~20Hz              | 8  | 0~8V                 | H  | 2~10mA   | 8  |
| 0~40Hz              | 9  | 0~10V                | I  | 4~20mA   | 9  |
| 0~50Hz              | 10 | 0~12V                | J  | -1~1mA   | 10 |
| 0~100Hz             | 11 | 1~5V                 | K  | -2~2mA   | 11 |
| 0~200Hz             | 12 | 2~10V                | L  | -5~5mA   | 12 |
| 0~400Hz             | 13 | -1~1V                | M  | -10~10mA | 13 |
| 0~500Hz             | 14 | -2~2V                | N  | -20~20mA | 14 |
| 0~1kHz              | 15 | -5~5V                | O  |          |    |
| 0~2kHz              | 16 | -10~10V              | P  |          |    |
| 0~4kHz              | 17 | -12~12V              | Q  |          |    |
| 0~5kHz              | 18 |                      |    |          |    |
| 0~10kHz             | 19 |                      |    |          |    |
| 0~20kHz             | 20 |                      |    |          |    |
| 0~40kHz             | 21 |                      |    |          |    |
| Special Input Range | Z  | Special Output Range |    |          | Z  |

| POWER SUPPLY                            | PS |
|---|----|
| High Voltage Power Supply: 85~264Vac/dc | H  |
| Mid Voltage Power Supply: 22~85Vac/dc   | M  |
| Low Voltage Power Supply: 10~28Vac/dc   | L  |

Note: Power supply H is field selectable for M, and M for H. Power supply L must be ordered separately.

## Ordering Examples.

- 1/ PI-F-15-1-L 0~1kHz Input; 0~1mA Output; Low Voltage Power Supply.
- 2/ PI-F-Z-P-H-0/28Hz 0~28Hz Input; -10~10V Output; High Voltage Power Supply.

## Quality Assurance Programme.

The modern technology and strict procedures of the ISO9001 Quality Assurance Programme applied during design, development, production and final inspection grant long term reliability of the instrument.

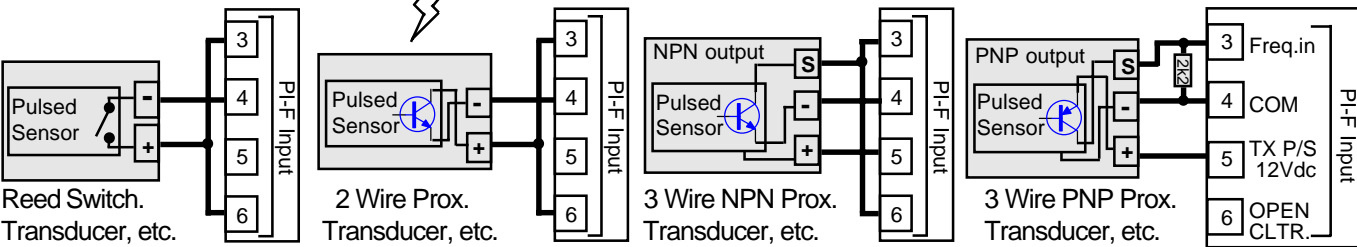
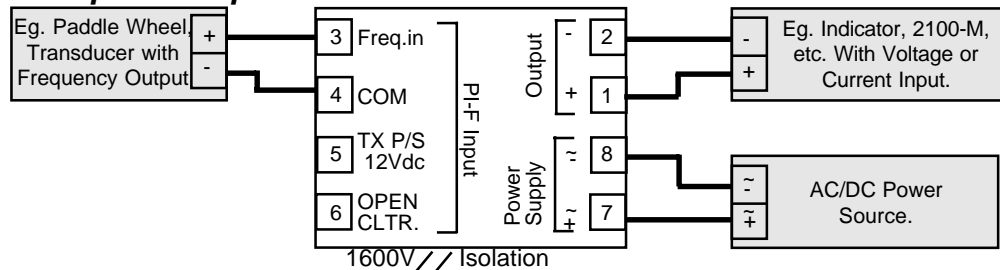
# PI-F Rev2 Specifications.

|                                  |  |
|----------------------------------|--|
| Frequency Input                  | 2 Wire Sine / Square / Pulse, Uni-polar / Bi-polar. (Signals < 2Vpp Bipolar Only.)<br>Minimum Input Signal = 15mVpp.<br>Maximum Input Signal = 100Vpp.<br>Field Programmable Span From 0.4Hz to 40kHz. (60Hz Max. for Contact Input.)<br>Adjustable Input Impedance From 1200Ω to 100kΩ.<br>Open Collector Output, Limited to 12Vdc @ 10mA.<br>Time-out to 0% after: 200÷(Frequency X Prescale) sec.<br>Cut-off Frequency at 0.5% FSO. |
| -Transmitter P/S                 | 12Vdc±8% Common to COM. (Terminal 4.)<br>Max Load = 50mA.  |
| Output - Voltage                 | Field Programmable From 500mVdc to ±12Vdc.<br>Maximum Output Drive = 10mA.   |
| - Current                        | Field Programmable From 1mA to ±20mA.<br>Maximum Output Drive = 10Vdc. (500Ω @ 20mA.)  |
| Power -H                         | 85~264Vac/dc; 50/60Hz; 5VA.  |
| -M                               | 22~85Vac/dc; 50/60Hz; 5VA. 32Vac Min. When Using 12V TX. P/S.  |
| -L                               | 10~28Vac/dc; 50/60Hz; 5VA.   |
| -Circuit Sensitivity             | <±0.001%/V FSO Typical.  |
| Accurate to                      | <±0.1% FSO Typical.  |
| Linearity & Repeatability        | <±0.1% FSO Typical.  |
| Ambient Drift                    | <±0.01%/C FSO Typical.   |
| Noise Immunity                   | 125dB CMRR Average. (1000Vdc Limit.)   |
| EMC Compliances                  | Emissions EN 55022-A. Immunity EN 50082-1, <1% Effect FSO Typical.   |
| Safety Compliance                | EN 60950   |
| Mains Isolation                  | 250Vac.  |
| Isolation Test Voltages          | Mains to Input/Output 3kVac 50Hz for 1min; Input to Output 1kVdc for 1min.   |
| Response Time                    | (1/(FREQUENCY x PRESCALE)) + 0.2sec. Typical. (Except Time-out to 0%.)   |
| Operating Temperature & Humidity | 0~60C. (Storage Temp. -20~80C.) 5~85% RH Max. Non-Condensing.  |
| Dimensions and Mounting          | L=80, W=50, H=120mm. Mounts on 35mm Symmetrical Mounting Rail.   |

**Product Liability.** This information describes our products. It does not constitute guaranteed properties and is not intended to affirm the suitability of a product for a particular application. Due to ongoing research and development, designs, specifications, and documentation are subject to change without notification. Regrettably, omissions and exceptions cannot be completely ruled out. No liability will be accepted for errors, omissions or amendments to this specification. Technical data are always specified by their average values and are based on Standard Calibration Units at 25C, unless otherwise specified. Each product is subject to the 'Conditions of Sale'.

**Warning: These products are not designed for use in, and should not be used for patient connected applications. In any critical installation an independent fail-safe back-up system must always be implemented.**

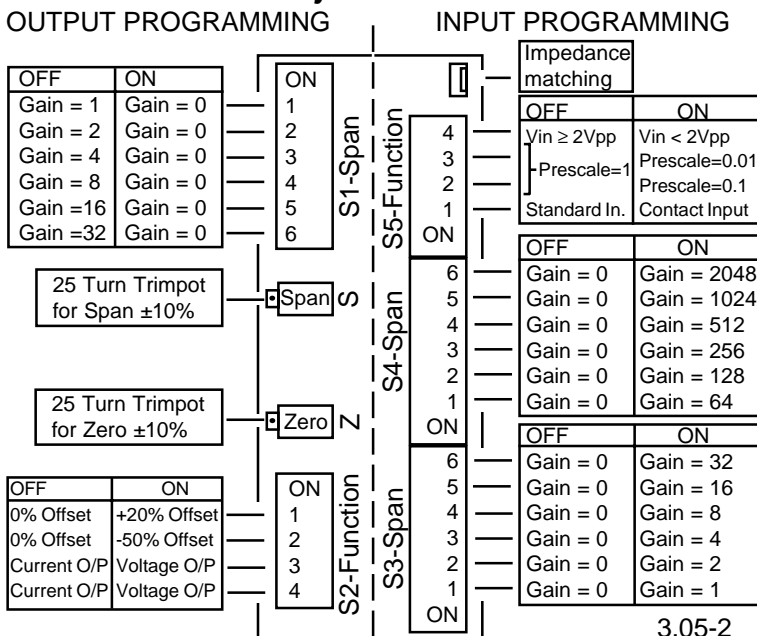
## Examples of Input Connection.



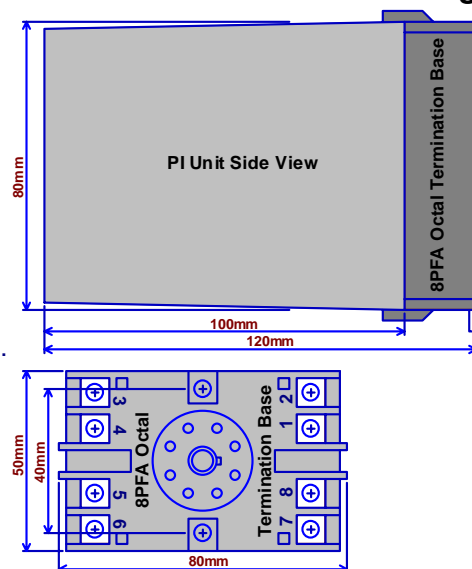
## Terminations.

|        |                   |
|--------|-------------------|
| Output | 1 +Ve             |
|        | 2 -Ve             |
| Input  | 3 Frequency Input |
|        | 4 COM             |
|        | 5 12Vdc Tx. P/S   |
|        | 6 Open Collector  |
| P/S    | 7 Neutral/+DC     |
|        | 8 Phase/-DC       |

## Plan View of PI-F Adjustments.



## PI-F Dimensions and Mounting.



**PI-F Input Programming.**

Always set **OUTPUT range first**, then INPUT range.  
 If the input range is not listed in the programming table, use the following formulae to work out the Span DIP switch settings for gain.

$$\text{Span Gain} = \frac{1600}{\text{FREQUENCY} \times \text{PRESCALE}}$$

Enter the Span gain value into the appropriate Span DIP switch.  
 DIP switches and Pots are accessed by removing the small rectangular lid on the top of the PI-F enclosure

| INPUT RANGE | S5-2 | S5-3 | PRESCALE |
|-------------|------|------|----------|
| 0.4Hz~400Hz | 0    | 0    | 1        |
| 400Hz~4kHz  | 1    | 0    | 0.1      |
| 4kHz~40kHz  | 0    | 1    | 0.01     |

Note: Only one of S5-2 or S5-3 may be 'ON' at any one time.

| Gain Value           | 1 | 2 | 4 | 8 | 16 | 32 | Gain Value           | 64 | 128 | 256 | 512 | 1024 | 2048 |
|----------------------|---|---|---|---|----|----|----------------------|----|-----|-----|-----|------|------|
| <b>S3 Switch No.</b> | 1 | 2 | 3 | 4 | 5  | 6  | <b>S4 Switch No.</b> | 1  | 2   | 3   | 4   | 5    | 6    |

e.g. If a gain value of 280 is required, put DIP Switch S3 - No. 4 & No.5, and DIP switch S4 - No.3 ON, and all the other DIP switches OFF. (i.e. Gains of 8 + 16 + 256 = 280)

**S5-1 Contact Closure Selection.**

For contact closure inputs such as reed switches and relay contacts, put S5-1 ON. This will limit the maximum input frequency to 60Hz. For particularly noisy contacts it might be necessary to place a 1µF non-polarised metal film capacitor directly across the contacts to suppress noise. Ensure the voltage rating of the capacitor is more than the voltage across the contacts. (Minimum of 16V.)

**S5-4 Voltage Input Range Selection.**

Note: The low voltage option is only available for bipolar signals.  
 For low voltage input signals < 2Vpp (eg. from a paddle wheel) S5-4 should be put in the ON position.  
 For voltage input signals ≥ 2Vpp S5-4 should be put in the OFF position.

**Impedance Matching.**

For noisy inputs use the trimpot marked 'I.M.' to tune the input impedance to equal the source impedance.  
 To do this:

- (i) install and commission transmitter as described on the following page;
- (ii) slowly turn the trimpot anticlockwise, until the output becomes steady.

**PI-F Input Range Programming Table.**

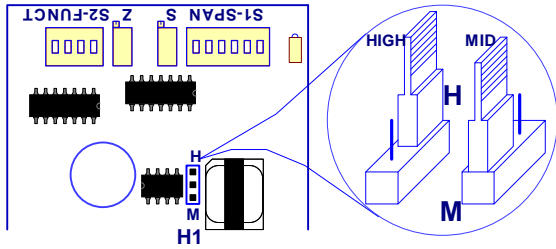
Notes: Switch Status 1 = ON, 0 = OFF.

| INPUT FREQUENCY | S3-SPAN |   |   |   |   |   | S4-SPAN |   |   |   |   |   | S5-FUNCT |   |
|-----------------|---------|---|---|---|---|---|---------|---|---|---|---|---|----------|---|
|                 | 1       | 2 | 3 | 4 | 5 | 6 | 1       | 2 | 3 | 4 | 5 | 6 | 2        | 3 |
| 0~0.4Hz         | 0       | 0 | 0 | 0 | 0 | 1 | 0       | 1 | 1 | 1 | 1 | 1 | 0        | 0 |
| 0~0.5Hz         | 0       | 0 | 0 | 0 | 0 | 0 | 0       | 1 | 0 | 0 | 1 | 1 | 0        | 0 |
| 0~1Hz           | 0       | 0 | 0 | 0 | 0 | 0 | 1       | 0 | 0 | 1 | 1 | 0 | 0        | 0 |
| 0~2Hz           | 0       | 0 | 0 | 0 | 0 | 1 | 0       | 0 | 1 | 1 | 0 | 0 | 0        | 0 |
| 0~4Hz           | 0       | 0 | 0 | 0 | 1 | 0 | 0       | 1 | 1 | 0 | 0 | 0 | 0        | 0 |
| 0~5Hz           | 0       | 0 | 0 | 0 | 0 | 0 | 1       | 0 | 1 | 0 | 0 | 0 | 0        | 0 |
| 0~10Hz          | 0       | 0 | 0 | 0 | 0 | 1 | 0       | 1 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~20Hz          | 0       | 0 | 0 | 0 | 1 | 0 | 1       | 0 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~40Hz          | 0       | 0 | 0 | 1 | 0 | 1 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~50Hz          | 0       | 0 | 0 | 0 | 0 | 1 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~100Hz         | 0       | 0 | 0 | 0 | 1 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~200Hz         | 0       | 0 | 0 | 1 | 0 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~400Hz         | 0       | 0 | 1 | 0 | 0 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 0 |
| 0~500Hz         | 0       | 0 | 0 | 0 | 0 | 1 | 0       | 0 | 0 | 0 | 0 | 0 | 1        | 0 |
| 0~1kHz          | 0       | 0 | 0 | 0 | 1 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 1        | 0 |
| 0~2kHz          | 0       | 0 | 0 | 1 | 0 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 1        | 0 |
| 0~4kHz          | 0       | 0 | 1 | 0 | 0 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 1        | 0 |
| 0~5kHz          | 0       | 0 | 0 | 0 | 0 | 1 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 1 |
| 0~10kHz         | 0       | 0 | 0 | 0 | 1 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 1 |
| 0~20kHz         | 0       | 0 | 0 | 1 | 0 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 1 |
| 0~40kHz         | 0       | 0 | 1 | 0 | 0 | 0 | 0       | 0 | 0 | 0 | 0 | 0 | 0        | 1 |

## PI-F H1 Power Supply Jumper Settings.



**WARNING: High Voltages Maybe Present.**  
Only adjust jumper with power disconnected.



| Power Supply Jumper Settings |                             |
|------------------------------|-----------------------------|
| H1                           | Power Supply Voltage Range  |
| H                            | Link for High: 85~264Vac/dc |
| M                            | Link for Mid: 22~85Vac/dc   |

Notes:

- 1/ H1 is approx 4cm (1½") behind the 'S' trimpot.
- 2/ Exceeding voltage ranges may damage the unit.
- 3/ Ensure the enclosure label is correctly labelled for the jumper position.
- 4/ Adjust H1 jumper with a pair of needle nose pliers.
- 5/ Low Voltage Power Supply version is fixed, and has no jumper.  
This must be ordered separately.

## PI-F Output Range Programming Table.

Notes: 1/ Switch status 1 = ON 0 = OFF.  
2/ Output ranges with '\*' beside them reverse the polarity of the output connections.

| Output Range (V) | S1-SPAN |   |   |   |   |   | S2-Function |   |   |   | Output Range (I) | S1-SPAN |   |   |   |   |   | S2-Function |   |   |   |
|------------------|---------|---|---|---|---|---|-------------|---|---|---|------------------|---------|---|---|---|---|---|-------------|---|---|---|
|                  | 1       | 2 | 3 | 4 | 5 | 6 | 1           | 2 | 3 | 4 |                  | 1       | 2 | 3 | 4 | 5 | 6 | 1           | 2 | 3 | 4 |
| 0~500mV          | 0       | 1 | 1 | 1 | 1 | 1 | 0           | 0 | 1 | 1 | 0~1mA            | 0       | 1 | 1 | 1 | 1 | 1 | 0           | 0 | 0 | 0 |
| 0~1V             | 1       | 0 | 1 | 1 | 1 | 1 | 0           | 0 | 1 | 1 | 0~2mA            | 1       | 0 | 1 | 1 | 1 | 1 | 0           | 0 | 0 | 0 |
| 0~2V             | 1       | 1 | 0 | 1 | 1 | 1 | 0           | 0 | 1 | 1 | 0~5mA            | 0       | 1 | 0 | 1 | 1 | 1 | 0           | 0 | 0 | 0 |
| 0~3V             | 1       | 0 | 0 | 1 | 1 | 1 | 0           | 0 | 1 | 1 | 0~10mA           | 1       | 0 | 1 | 0 | 1 | 1 | 0           | 0 | 0 | 0 |
| 0~4V             | 1       | 1 | 1 | 0 | 1 | 1 | 0           | 0 | 1 | 1 | 0~16mA           | 1       | 1 | 1 | 1 | 0 | 1 | 0           | 0 | 0 | 0 |
| 0~5V             | 1       | 0 | 1 | 0 | 1 | 1 | 0           | 0 | 1 | 1 | 0~20mA           | 1       | 1 | 0 | 1 | 0 | 1 | 0           | 0 | 0 | 0 |
| 0~6V             | 1       | 1 | 0 | 0 | 1 | 1 | 0           | 0 | 1 | 1 | 1~5mA            | 1       | 1 | 0 | 1 | 1 | 1 | 1           | 0 | 0 | 0 |
| 0~8V             | 1       | 1 | 1 | 1 | 0 | 1 | 0           | 0 | 1 | 1 | 2~10mA           | 1       | 1 | 1 | 0 | 1 | 1 | 1           | 0 | 0 | 0 |
| 0~10V            | 1       | 1 | 0 | 1 | 0 | 1 | 0           | 0 | 1 | 1 | 4~20mA           | 1       | 1 | 1 | 1 | 0 | 1 | 1           | 0 | 0 | 0 |
| 0~12V            | 1       | 1 | 1 | 0 | 0 | 1 | 0           | 0 | 1 | 1 | -1~1mA           | 1       | 0 | 1 | 1 | 1 | 1 | 0           | 1 | 0 | 0 |
| 1~5V             | 1       | 1 | 1 | 0 | 1 | 1 | 1           | 0 | 1 | 1 | -2~2mA           | 1       | 1 | 0 | 1 | 1 | 1 | 0           | 1 | 0 | 0 |
| 2~10V            | 1       | 1 | 1 | 1 | 0 | 1 | 1           | 0 | 1 | 1 | -5~5mA           | 1       | 0 | 1 | 0 | 1 | 1 | 0           | 1 | 0 | 0 |
| -1~1V            | 1       | 1 | 0 | 1 | 1 | 1 | 0           | 1 | 1 | 1 | -10~10mA         | 1       | 1 | 0 | 1 | 0 | 1 | 0           | 1 | 0 | 0 |
| -2~2V            | 1       | 1 | 1 | 0 | 1 | 1 | 0           | 1 | 1 | 1 | -20~20mA         | 1       | 1 | 1 | 0 | 1 | 0 | 0           | 1 | 0 | 0 |
| -5~5V            | 1       | 1 | 0 | 1 | 0 | 1 | 0           | 1 | 1 | 1 | 0~-10mA *        | 1       | 0 | 1 | 0 | 1 | 1 | 0           | 0 | 0 | 0 |
| -10~10V          | 1       | 1 | 1 | 0 | 1 | 0 | 0           | 1 | 1 | 1 | 0~-20mA *        | 1       | 1 | 0 | 1 | 0 | 1 | 0           | 0 | 0 | 0 |
| -12~12V          | 1       | 1 | 1 | 1 | 0 | 0 | 0           | 1 | 1 | 1 |                  |         |   |   |   |   |   |             |   |   |   |
| 0~-5V *          | 1       | 0 | 1 | 0 | 1 | 1 | 0           | 0 | 1 | 1 |                  |         |   |   |   |   |   |             |   |   |   |
| 0~-10V *         | 1       | 1 | 0 | 1 | 0 | 1 | 0           | 0 | 1 | 1 |                  |         |   |   |   |   |   |             |   |   |   |

## The Proper Installation & Maintenance of PI-F.

Note. All power and signals must be de-energised before connecting any wiring, altering any jumpers or DIP switches, or inserting or removing the PI unit from it's base.

### MOUNTING.

- (1) Mount in a clean environment in an electrical cabinet on 35mm Symmetrical mounting rail.
- (2) Draft holes must have minimum free air space of 20mm. Foreign matter must not enter or block draft holes.
- (3) Do not subject to vibration or excess temperature or humidity variations.
- (4) Avoid mounting in cabinets with power control equipment.
- (5) To maintain compliance with the EMC Directive the PI-F must be mounted in a fully enclosed metal, electrical cabinet, with appropriate input / output entry points, cabling, and filtering.

### WIRING.

- (1) A readily accessible disconnect device and a 1A, 250Vac overcurrent device, must be in the power supply wiring.
- (2) All cables should be good quality overall screened INSTRUMENTATION CABLE with the screen earthed at one end only.
- (3) Signal cables should be laid a minimum distance of 300mm from any power cables.
- (4) For 2 wire current loops, 2 wire voltage signals or 2 wire current signals, Austral Standard Cables B5102ES is recommended. For 3 wire transmitters Austral Standard Cables B5103ES is recommended.
- (5) It is recommended that you do not ground current loops and use power supplies with ungrounded outputs.
- (6) Lightning arrestors should be used when there is a danger from this source.
- (7) Refer to diagrams for connection information.

### COMMISSIONING.

- (1) Once all the above conditions have been carried out and the wiring checked apply power to the PI-F loop and allow five minutes for it to stabilize.
- (2) If the output of the transmitter is fluctuating, follow the procedures outlined in 'Input Programming; Contact Closure Selection', 'Voltage Input Range Selection', and 'Impedance Matching'.
- (3) Take a low (approx. 10%) and a high (approx. 90%) reading of the variable being measured by the transducer supplying the signal to the PI-F, and ensure that this agrees with the level being indicated by the PLC or indicator, etc. the PI-F is connected into. Adjust for any difference using the Zero and Span Pots in the top of the PI-F enclosure with a small screw driver until the two levels agree. (Clockwise to increase the output reading and anti-clockwise to decrease the output reading.)

### MAINTENANCE.

- (1) Repeat (3) of COMMISSIONING.
- (2) Do it regularly - at least once every 12 months.

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