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**Panel mounting process indicators / controller**

## **IL-P and IJ-P**

**Connection details, scaling and general information**

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Digital Scaling and calibration  
User friendly, time-saving design  
Fast installation and commissioning

This manual relates to meters with software Versions PL1.2 and PJ1.2

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# Introduction

Please contact us if you need help, if you have a complaint, or if you have suggestions to help us improve our products or services for you.

If you contact us about a product you already have, please tell us the full model number and serial number, so that we can give you accurate and fast help.

This product has a 2 year warranty. We will put right or replace any meter which is faulty because of bad workmanship or materials. This warranty does not cover damage caused by misuse or accident.

## ***IMPORTANT***

If this equipment is important to your process, you may want to buy a spare to cover possible failure or accidental damage in the future.

This is because at some times, for example during our factory shutdown periods, you may have to wait several weeks for an equivalent replacement. Or, we may have no stock at the time you urgently need it.

You may also need to pay extra carriage charges if you want a fast, guaranteed courier service. Warranty repairs or replacements are normally returned with a standard courier service.

We do not offer any compensation for losses caused by failure of this instrument.

If you do not agree with these conditions, please return this item now, in unused, clean condition, in its original packaging and we will refund the purchase price, excluding any carriage paid.

We thought you'd prefer to know about possible delays and extra charges now, rather than during a panic.

We always try to improve our products and services, so these may change over time. You should keep this manual safely, because future manuals, for new designs, may not describe this product accurately.

We believe these instructions are accurate, and that we have competently designed and manufactured the product, but please let us know if you find any errors.

# Warnings



**Please carefully read all warnings and ONLY install the meter when you are sure that you've covered all aspects.**

- \* Connect the meter according to current IEE regulations and separate all wiring according to IEC1010.
- \* Power supplies to this equipment must have anti-surge (T) fuses at 125mA for 230V supply, 250mA for 110V supply or 1A for DC supplies in the range 11-30VDC.
- \* Check that the model number and supply voltage suit your application before you install the meter.
- \* Don't touch any circuitry after you have connected the meter, because there may be lethal voltages on the circuit board.
- \* We designed this meter for Installation class II service only. This means it has exposed electrical and power terminals, so you must install it in an enclosure to protect users from electric shock.
- \* We designed this meter for Pollution-Degree 2 environments only. This means you must install it in a clean, dry environment, unless it has extra protection from a splashproof cover, such as our SPC4
- \* Only adjust on-board switches or connections with the power turned off
- \* Make sure all screw terminals are tight before you switch the meter on.
- \* Only clean the meter with a soft damp cloth. Only lightly dampen with water. Do not use any other solvents.

***Safety First .....Don't assume anything..... Always double check. If in doubt, ask someone who is QUALIFIED to assist you in the subject.***

## General Description

The INTUITIVE Junior and Lite digital panel meters are simple versions of the popular “Intuitive” process meter family.

They use a dual slope integration method to give +/- 30,000 count resolution of +/-20mA or +/-10V analogue input signals. This allows for normal 4-20mA and 0-10V process signals with at least 20,000 count resolution, and 1-5V process signals with at least 10,000 count resolution.

You can scale the meter in engineering units to give up to -19 999 or +99 999 display range, with selectable decimal point position.

You can either scale the meter theoretically, using stored calibration figures, or directly, using signals generated from the process system itself.

An excitation supply gives you loop power for 4-20mA process transmitters.

These meters have some features of their parent “Intuitive” meters :

- \* Digital signal filtering
- \* Last digit rounding (count by 1, 2, 5, 10, 20, 50)
- \* Minimum (valley) and maximum (peak) reading memory
- \* Display taring
- \* Two setpoint alarm relays (Junior only) with latching or adjustable hysteresis.

We offer two power option models 95-265 VAC or 11-30VDC

Our operating software is bilingual for all display prompts - English is supplied as standard, but the meter can be set for French prompts. Please ask the factory for details of how to do this. We also print all operating manuals in French as an option.

## Getting Started

First, check that the meter will suit your application and the available power source (either 95-265 VAC or 11-30 VDC).

If you asked us to configure the meter for you, please check that the scaling and settings agree with your requirements.

We fully tested and calibrated your meter for you, but a pre-installation test may be useful to check that everything works as needed.

Check that your panel cutout is correct, 92mm wide, 45mm high. You must fit the meter in a protective enclosure for installation class II service. Remove the 2 screws holding the U clamp at the rear of the case and all the connectors. Slide the meter into the cutout and re-fit the U clamp and screws. Tighten the screws just enough to hold the meter firmly in place.

Connect the signal and power cables (and relay connections for the Junior), to the appropriate screw terminal connectors. See our connection drawing to check that you are using the correct terminals.

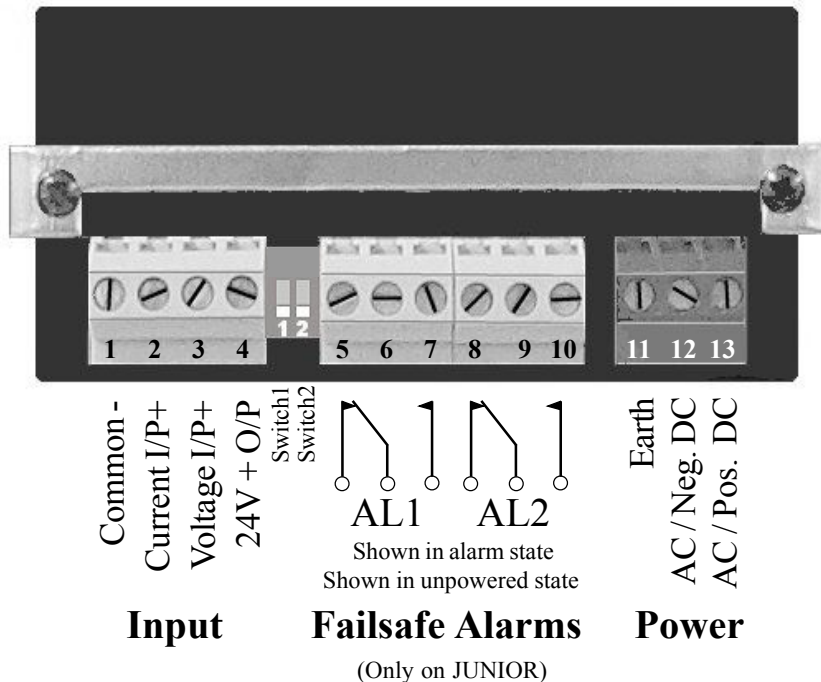
Check, before switching on, that the power is suitable for the unit.

Switch on, and the display should show 'P-J X.X' (process junior) or 'P-L X.X' (process lite) for a second or two. (where X.X is the software version). Units with custom software will have a different prompt.

Next, 'CAL XX' will appear for a second or two the XX value increases each time a calibration is completed. The display should then show a steady reading relating to zero input signal; for the factory default 4-20mA scaling, this should be between -24.95 and -25.05.

# Connections and rear switches

We supply detachable screw terminal connectors to make installation as easy as possible for you. We suggest you use multistrand insulated wire with ferrules to DIN46228/1. You can use stripped wire with cross sectional area from 0.5 to 2.5mm<sup>2</sup>. Strip back insulation 7mm.



## Switches:

*Switch 1-calibration method*

ON = Theoretical method

OFF = Direct autocal

*Switch 2 - lockout*

ON = Meter locked

OFF = Meter unlocked

Always set switch 2 ON when you have finished calibration.

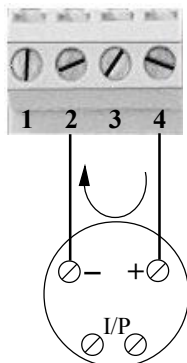
## Power:

DC powered meters will draw a peak current of up to 1Amp. at switch-on. Your power supply must be able to cope with this surge.

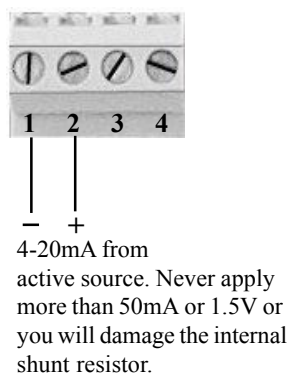
Use screened cable for the input signal and connect the screen to power earth at the meter end of the cable only. For best performance, keep the signal cable well away from the power and alarm cables, which could carry electrical noise likely to interfere with your measurement.

## Input Connection Examples:

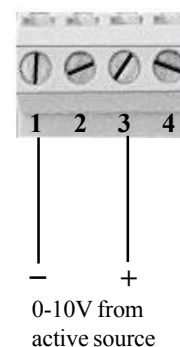
Loop powered 2 wire  
4-20mA transmitter



Direct 4-20mA I/P



Direct 0-10V I/P



# Calibration Methods

There are two ways you can calibrate your meter, either by typing-in theoretical calibration values, or by connecting the meter to your system and making the meter's readings agree with known conditions in the system.

## **1) Calibration without the need for an input signal.**

*This is known as the 'THEORETICAL' Calibration method*

If you know the input signal range, and the display values required, you can tell the meter what to read for two known signal levels. Let's assume that you have a sensor giving 4-20mA for a pressure range of 0 to 250 bar. Select the 'THEORETICAL' calibration switch position on rear of the meter.

You need to tell the meter what 0% input signal level will be (4mA) and then what 0% reading value will be (0). Next, you'd tell it what 100% input signal level will be (20mA) and what 100% reading value will be (250).

## **2) Calibration by injecting signals into the meter, either from a calibrator or a sensor already installed in a system.**

*This is known as the 'DIRECT' calibration method. **Signals must be stable.***

This can give the best system precision, because real signals are used as your reference, and any errors in the meter or sensor will be allowed for in the calibration process. You'd need to select the 'DIRECT' calibration switch position on the rear of the meter.

Now apply 0% of signal range. (If the signal comes from a sensor, you don't need to know the value of signal itself, only what the meter *should* read at that time. Let's assume you have a pressure sensor covering 0-250 Bar) Using the buttons on the meter, you'd tell the meter what it should read now (ie with no pressure applied to the sensor, should read 0).

Next apply 100% of signal range (If the signal comes from a sensor, apply 250 Bar to the sensor or a lesser known pressure. The accuracy of calibration will be better with higher applied signals).

Using the buttons you'd adjust for a reading of 250, or the lesser pressure you applied.

A separate, dedicated page covers this calibration method in detail.

# **‘THEORETICAL’ Calibration**

**Set switch 1, near the input connector ON and switch 2 OFF**

## **1) How to set SPAN and DECIMAL POINT**

Press the SPAN button for 3 seconds. You’ll see ‘dC V’ or ‘dC A’ if the meter is set for DC Voltage or DC current. Use the up or down arrow to change, if needed and then press OK.

You’ll now see ‘In HI’ briefly, then a value, with one digit brighter than the other. This is 20.000 for a 4-20mA input signal, or 10.000 for a 0-10V input signal, 5.000 for a 1-5V input signal and so on. If the value is correct, press the ‘OK’ button, otherwise use the ‘DIGIT’ key to select digits, and the ‘UP’ or ‘DOWN’ arrow keys to alter. When correct, press the ‘OK’ button.

‘rd HI’ appears briefly, then a value, with one digit brighter than the other. This is what will be displayed for the IN HI input. If the value is correct, press the ‘OK’ button, otherwise use the ‘DIGIT’ key to select digits, and the ‘UP’ or ‘DOWN’ arrow keys to alter. The *Decimal point* position may be set after the most significant digit has been selected. When correct, press the ‘OK’ button.

## **2) How to set the Filter Time constant - Press OK Button**

You will see ‘FIL’ with the present time constant, in seconds. You can change this by pressing the ‘UP’ or ‘DOWN’ arrow keys. Press ‘OK’ when done.

## **3) How to Select Last Digit Round Up / Count by Value - Press OK Button**

‘LSt’ appears, with the present count-by number. Use the UP or DOWN buttons to select rounding to the nearest 1, 2, 5, 10, 20 or 50. Press OK when done.

## **4) How to set ZERO**

Press the ZERO button for 3 seconds. You’ll see ‘IN LO’ briefly, then a value, with one digit brighter than the other. This is 4.000 for a 4-20mA input signal, 0.000 for a 0-10V input signal, 1.000 for a 1-5V input signal etc. If already correct, press the ‘OK’ button. Or, use the ‘DIGIT’ key to select digits, and the ‘UP’ or ‘DOWN’ arrow keys to change. When correct, press the ‘OK’ button.

You’ll now see ‘LO rd’ briefly, then a value, with one digit brighter than the other. This is what will be displayed for the IN LO input. If already correct, simply press the ‘OK’ button. Or, use the ‘DIGIT’ key to select digits, and the ‘UP’ or ‘DOWN’ arrow keys to change. When correct, press the ‘OK’ button.

**Now, please set the LOCKOUT switch 2 ON to protect your settings**

# **‘DIRECT’ Calibration**

**Please set switches 1 and 2 next to the input connector to OFF**

You must have the meter connected to power and a steady input signal before you start. Please leave the meter powered for 15 minutes before you start, to allow it to reach normal operating temperature.

## **How to set the Span Calibration and Decimal Point position**

- 1) Apply 100% Cal. signal, and ensure it is steady before proceeding
- 2) Press the SPAN Button for 3 seconds
- 3) The SPAN LED should flash
- 4) Set the display to read your desired fullscale for the signal you're injecting by pressing UP/DOWN Keys . To change the decimal point position, use the DIGIT button to brighten the left-hand digit. Then, one more push of the DIGIT button will allow you to move the decimal point with the UP/DOWN buttons.
- 5) When display correctly set, press OK

## **How to adjust the amount of Filtering - Press OK button**

The display now shows ‘FIL’ (Filter time constant) with the present time constant, in seconds. You can change this by pressing the ‘UP’ or ‘DOWN’ arrow keys. Press ‘OK’ when done

## **How to Select Last Digit Round Up / Count by Value - Press OK button**

The display now shows ‘LSt’ (Last Digit Roundup) with the present roundup. Use the UP or DOWN buttons to select a roundup to the nearest 1, 2, 5, 10, 20 or 50. Press OK when done.

## **How to calibrate Zero**

- 1) Apply the Lowest cal. signal and ensure it is steady before proceeding
- 2) Press the ZERO Button for 3 seconds
- 3) The ZERO LED should flash
- 4) Set the display to read 0 , or the desired reading for this signal, by pressing DIGIT SELECT and the UP/DOWN Keys
- 5) Press OK when done

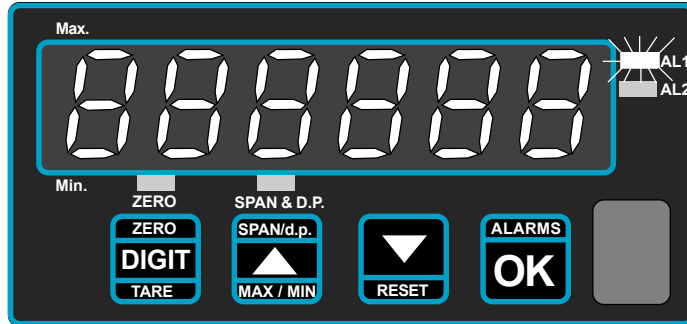
That completes the calibration of your meter.

**Now, please set the LOCKOUT switch 2 ON to protect your settings**

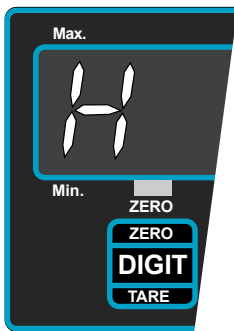
# How to View and Set Alarms (Junior Model only)

## How to View Alarms

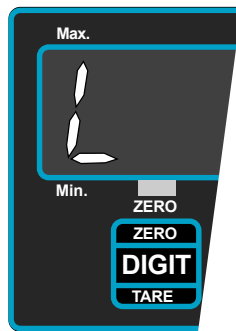
Press the ALARMS button at any time to view the alarm levels and alarm action (whether HIGH or LOW or latched). One of the alarm LEDs will flash to tell you which alarm settings you are looking at.



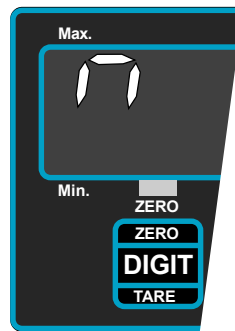
You can tell what type of alarm action is set. Look at the left hand character...



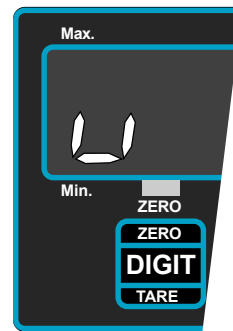
HI Alarm



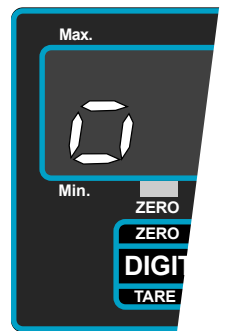
LO Alarm



Latching HI



Latching LO

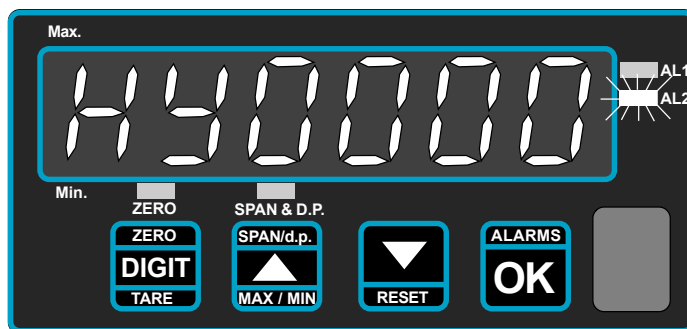


No Alarm

The other characters are the actual numeric setpoint value.

## To change Alarms

Choose an alarm to change, then press the ALARMS button for more than 3 seconds. You will see one digit brighter than the others. You can change its value with the UP/DOWN button, and select other digits with the DIGIT button. When set, press OK.



HY is the hysteresis value. This is the difference between the point an alarm occurs and when it resets. You can set this to separate the alarm and reset points, to reduce alarm chatter, or to smooth the control action. Press OK when set. You can reset latched alarms if you press the RESET button for 3 seconds.

# Features

## Automatic Zero-Drift Compensation

Useful where the meter reads zero most of the time. It cancels long-term zero drift due to ageing, temperature drift, etc. If the reading is within 7 counts of zero for around 100 seconds, the reading will go to zero without changing basic calibration. The correction is **not** stored when the meter is switched off and is cleared if you press the front panel RESET button for 2 to 3 seconds. To activate this feature, set the display value at 0% input to MINUS ZERO ( -0)

## Peak and Valley Detection (Maximum/Minimum Reading View)

The meter stores the lowest and highest reading values in memory. You can see them by briefly pressing the MAX/MIN front panel button. The first press shows peak, with the upper left hand indicator bar lit. The second press shows valley, with the lower left hand indicator lit. The display returns to the running value after 2 or 3 seconds. To reset the memory, press the RESET button for more than 3 seconds. Peak and Valley values are not stored if you switch the meter off.

## Tare Command

You can force the reading to zero by pressing the front panel tare switch for 2 to 3 seconds. Following readings will be the 'net' value, offset by the reading at the time the tare switch was operated. The tare value is stored in non-volatile memory, and is 'remembered' when the meter is switched off. A front panel warning LED, marked 'ZERO' shows when the tared 'nett' value is displayed. Press the front panel reset switch for 2 to 3 seconds to cancel the tare value.

## Digital Filtering

A simple digital filter gives 'R-C' type time constants in the range 0 to 5 seconds. A value of 1 second gives a settling to 1% in around 5 seconds for a small step input. The filtering averages ripple in the input signal. For 'large' steps of signal input the filtering is bypassed, to give a fast initial response. Press the OK button 3 times and then use the UP or DOWN buttons to change the value. Press OK when done.

## Last Digit Rounding

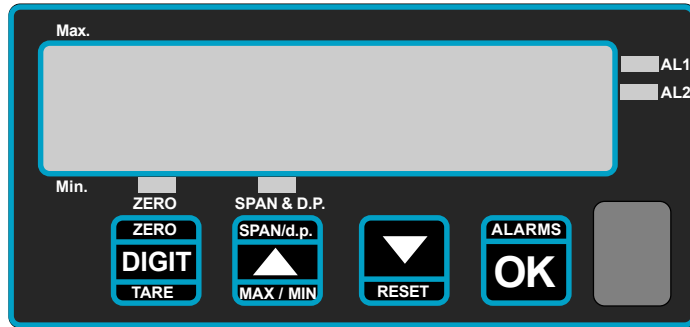
You can set the meter to count, or round-up by 1,2,5,10,20 or 50 so that uncertain, unnecessary or misleading least significant counts can be obscured. Press the OK button 4 times and then use the UP or DOWN buttons to change the value. Press OK when done.

## Calibration Counter / Tamper detector

A internal totaliser counts each calibration. The 'CAL XX' value appears for a second or two after switch-on. The number starts at 00 and can go up to FF (255 counts). It doesn't count changes of setpoints on the Junior, or changes of filter value or count-by value. It stores the total in non-volatile memory which can't be reset, useful for keeping track of the meter's calibration history.

# Front panel controls

Control Type	4 pushbutton switches located behind flexible overlay
Function	Depends on mode (whether locked or in setup mode)
Option	A plain overlay without printed buttons is available.



## Normal running mode (Locked)

TARE	Press for 3 seconds to tare the reading to zero. The Zero LED lights to indicate the displayed reading is nett.
MAX / MIN	Selects max/min/current readings, in turn.
RESET	Press for 3 seconds to reset alarms if outside alarm condition & any tared value, max., min. and filter history.
ALARMS	Each press cycles through the setpoint values (Junior only). Press for 3 seconds at desired setpoint to change setpoint value, alarm action and hysteresis.

## Setting mode (unlocked)

ZERO	Press for more than 3 seconds. Lets you adjust the meter zero.
SPAN/d.p.	Press for more than 3 seconds. Lets you adjust the meter span, decimal point position, filter time constant and count-by last digit roundup.
ALARMS	When pressed for more than 3 seconds allows you to adjust the alarm setpoint, action and hysteresis.
DIGIT	Chooses a digit to be changed on the display, while adjusting.
UP arrow	Each press increases a chosen digit value, while adjusting.
DOWN arrow	Each press decreases a chosen digit value, while adjusting.
OK	Confirms any changes made or skips to next step.

# Specifications

<b>Bezel size</b>	48mm high by 96 mm wide (1/8 DIN)	
<b>Panel Cutout</b>	45 mm high by 92 mm wide	
<b>Case Depth</b>	125 mm including connectors	
<b>Weight</b>	300 grammes	
<b>Case Material</b>	Black polycarbonate	
<b>Connectors</b>	Detachable Screw Terminal connectors	
<b>Operating Temp.</b>	0 to 50 degrees C, non condensing humidity	
<b>Storage Temp.</b>	-10 to 70 degrees C	
<b>Power supply</b>	95-265 VAC or 11-30 VDC optional	
<b>Power consumption</b>	4 watts maximum	
<b>Input Signal Ranges</b>	+/-20mA	+/-10V
<b>Operating Overload</b>	+/-22mA	+/-12V
<b>Maximum Overload</b>	+/-150mA	+/-100V
<b>Input Resistance</b>	33 Ohms +/-2%	1 Megohm nominal
<b>Display type</b>	High efficiency LED, red or green	
<b>Accuracy</b>	+/-0.05% of range +/-2 counts	
<b>Span tempco</b>	100ppm/Degree Celsius max	
<b>Zero Tempco</b>	50ppm/Degree Celsius	
<b>Excitation voltage</b>	24VDC +/- 20% rated at 30mA. Noise 200mV max (50Hz-100KHz)	
<b>Filtering</b>	Selectable time constants up to 5 secs in 0.5sec increments	
<b>Count-by (roundup)</b>	1, 2, 5, 10, 20 or 50	
<b>A/D conversion</b>	Dual slope +/-30,000 count maximum resolution	
<b>CMRR</b>	100dB 0-60Hz. 250V max.	
<b>NMRR</b>	60 db at 50/60 Hz.	
<b>Display update rate</b>	2.5 readings per second	
<b>Memory</b>	10 year data retention. No batteries required.	
<b>Alarm relays (Junior)</b>	2 relays SPCO . De-energise on trip (failsafe)	
<b>Contact rating</b>	5 Amperes at 250 VAC, resistive load	
<b>Precision</b>	+/- 1count max error	
<b>Hysteresis</b>	Settable from 0 to 9998 counts	
<b>Latching (if activated)</b>	Relay will stay in alarm until manually reset from front	
<b>Response speed</b>	500mS	
<b>Annunciation</b>	Red LED annunciator for each alarm. Lit = alarm	

## Record of Revisions

22 March 2001	Product released with software version P-L 1.0
14 March 2003	Clarified introduction and warnings
31 July 2003	Amended Declaration of conformity
30 October 2003	Amended software version to 1.1. Changed filtering and count-by setting methods
16 December 2003	Corrected minor typographical errors
22 March 2005	Clarified alarm setting procedure on page 9
22 November 2005	Alarm update action changed, new software 1.2 The relay status will immediately reflect new alarm settings, based on input signal level. Before the update, you would have had to reset or switch off the meter.

# Declaration of Conformity

Declaration Reference : INTUITIVE  
Issue Date : 9 October 1998 revised 31 July 2003  
Products Covered : INTUITIVE series  
Title : DOC-INTUITIVE

This is to confirm that the Product covered by this declaration have been designed and manufactured to meet the limits of the following EMC Standard :

EN61326-1:1997

and has been designed to meet the applicable sections of the following safety standards

EN61010-1:2001

## Conditions

The meters are permitted a worst case error of 1% of A/D range during electro-magnetic disturbance, and must recover automatically when disturbance ceases without the need for human intervention, such as resetting, power-down etc.

The meters covered by this certificate must be installed in adherence to the following conditions :-

Signal cabling shall be routed separately to power carrying cabling (includes relay output wiring)  
All signal cabling shall be screened. The screen shall only be terminated to the power earth terminal

Declared as true and correct, for and on behalf of London Electronics Ltd.

J.R.Lees Director