STARTING UP NOTICE

BIF6040 Ratemeter / Totaliser

*Brevets N° :-

UK=GB9820695.6, EU = 99307553.0, USA 09/401738, Canada 2283378

this manual covers software version bAM1.1

IEC 1010

CE

89/336/EEC

Document Ref:Anfield/manuals/intuitif_FC_Bamo Revision: 2 dated: 03/07/2002

BAMO MESURES
13, rue Pasteur - 95816 ARGENTEUIL cedex - FRANCE
Tél : (+33) 01 30 25 83 20 - E-mail : info@bamo.fr
Fax : (+33) 01 34 10 16 05 - Site : http://www.bamo.fr

Alphabetic Index

Alarm board Configuration	14
Alarms, how to set	15
Analogue Output configuration	16
Analogue output, how to set	17
Connections	5 & 6
Declaration of Conformity	21
Error messages	12
Failsafe alarm setting	14
General description	3
Getting Started	4
Hysteresis adjustment	15
Installing options	13
Introduction	1
Input connection examples	6
Modes of operation	11
Peak / Valley detection and memory	10
Rate settings	7
Rate scaling examples	8
Reset command	10
Revisions record	20
Serial Communications	18
Specifications	19
Totaliser- simple single input	10
Warnings	2

Important Introductory Notes

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

If you contact us about a product you already have, please give us as much information as you can, so we can give you accurate and swift help.

Software Version: The display will show bAM X.X shortly after being switched on. The value X.X is the software version which you must quote when contacting us about technical matters.

Our products have a 2 year warranty, and we will put right or replace any meter found to be faulty through bad workmanship or materials. This warranty does not cover damage caused by misuse or accident.

IMPORTANT If the meter is a vital component in your process, you may wish to buy a spare to cover possible failure or accident, as we cannot guarantee instant repair or replacement. We always try to improve our products and services, so changes to instruments will occur. Please keep this manual safely for future reference, as future manuals, covering revised designs may no longer describe your product accurately.

We believe these instructions are accurate, and that we have competently designed and manufactured the product. We do not make any claims as to the suitability of this product for any particular application. The choice of product and responsibility for the choice lies with the User.

Our full terms and conditions of trading are available on request.

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 be anti-surge fused at 125mA for 230V supply, 250mA for 110V supply or 1A for DC supplies in the range 11-30VDC.

* Check that model number and supply voltage suit your application before you install the meter.

* Don't touch any circuitry when the meter is powered, because lethal voltages may be present on the circuit board.

* We have designed this product for Installation class II service.

* We have designed this product for use in Pollution-Degree 2 environments.

* Only adjust switches or connections with the power removed.

* Ensure all screw terminals are tight before applying power.

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

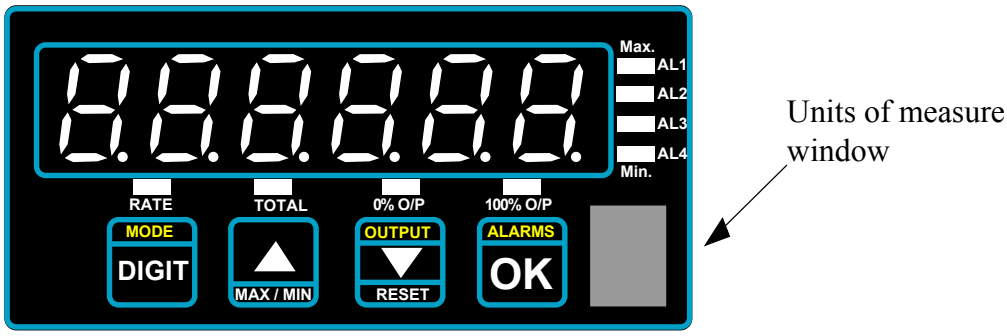
General Description

This meter can be configured as a scalable frequency/rate meter & as a scalable totaliser. In rate mode, the meter needs only one cycle to compute frequency, so is faster than most gated frequency meters. It can accept many different sensor types, such as NPN, PNP and contact closure proximity sensors and differential output proximity sensors, as well as simple contact closures. It provides a 24V excitation supply to power active sensors.

This meter has been designed to be simple to configure. It is easy to use because no menu is used. Look at the front panel below... to change MODE you press the MODE button, to adjust Analogue Output you press the OUTPUT button, to adjust Alarms you press the ALARM button. There is no need to spend time learning a complex menu system.

Peak and valley memories allow you to view the minimum and maximum recorded speed / frequency measurements. The meter can give alarm outputs, scaled and isolated analogue output and isolated serial data retransmission when fitted with suitable option boards.

The front panel has a 6 digit, 7 segment window for displaying the measurement. It allows decimal point and minus sign characters to be included and has 4 alarm annunciators to show the status of each alarm relay.



To change variables when the meter is unlocked, select digits using the DIGIT key, and increase or decrease with UP and DOWN key. When the setting is correct, press OK.

A lockout switch on the rear of the meter protects your configuration settings, which are saved in memory, which has a 10 year guaranteed storage period. If the lockout switch is not set ON, your settings could be accidentally altered.

Getting Started

First, please check that the display will suit all the requirements of your application. Page 2 has some important warnings - please check that all warnings are covered.

If you have analogue output or alarm relay options, you may need to configure their boards before installing the meter in a panel. See the separate sections in this manual for those options.

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. 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 and make sure the sealing gasket is evenly held between the panel and the bezel.

Connect the signal and power cables, to the appropriate screw terminal connectors. Check that you are using the correct terminals or you may cause damage to the meter. Do not connect any output or alarm cabling yet.

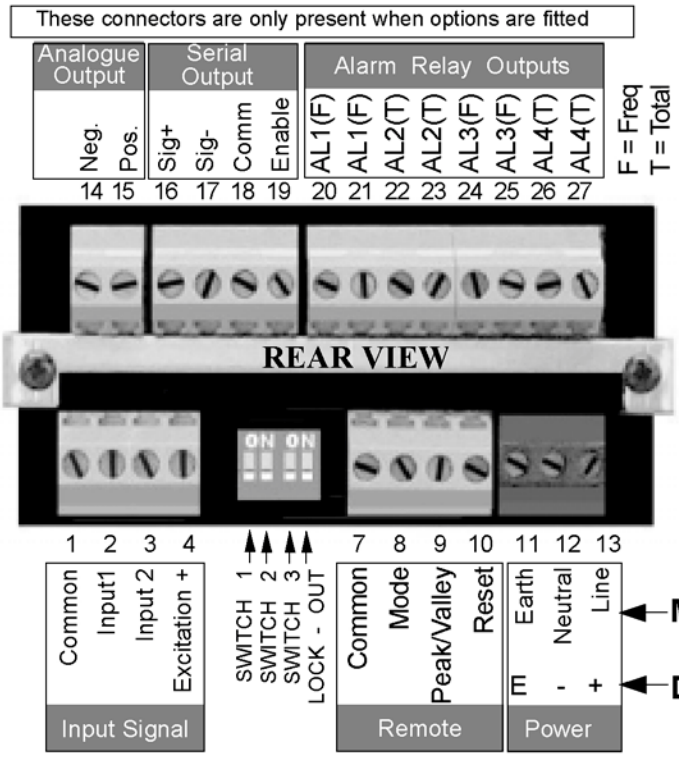
Apply power, and confirm that the meter illuminates all segments for a few seconds and then shows the software version “bAM X.X” briefly
(The X numerals depend on version).

The lockout switch should be OFF to allow you to change the meter’s settings. Set the scaling to suit your system, using one of the scaling methods described in this manual. Check that the meter responds correctly. Now, adjust your analogue output settings, if necessary, and alarm settings. Use a DVM of sufficient precision to check that the analogue output is operating as required, and use a continuity tester to check that the relay contacts operate correctly. Switch the meter off, and check alarm relay contact status. Check that the contact status suits your system, in conditions of power loss to the meter.

When you have verified all settings, you can connect the alarm relay and analogue output cables, to check that your system operation is satisfactory.

Remember to set the lockout switch ON when you have finished , to prevent accidental loss of your settings.

Connections



The ON position is marked on the switch and may differ with different manufacturers.

The LOCKOUT switch *must* be set ON when settings are complete

Serial Output Connection Notes

1) RS232 option type
The RS232 data appears on terminal 16
Data common on terminal 18
RTS on terminal 19
Pullup on terminal 17

To produce a continuous stream of data, connect terminals 17 and 19 together, or, for one-shot transmissions, apply a single pulse of 5V level to terminal 19.

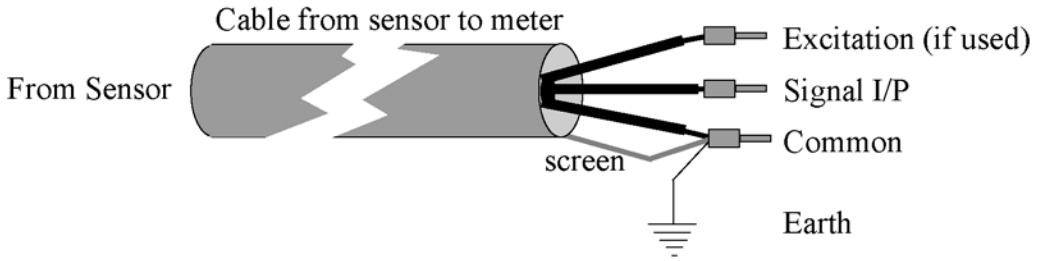
2) RS422 option type
The RS422 data appears on terminals 16 and 17. Common is on terminal 18.

To produce a continuous stream of data, connect terminals 18 and 19 together, or, for one-shot transmissions, apply a single pulse of 0V level to terminal 19

How to install input signal cabling :-

This meter responds to pulse signals. It is important that only wanted pulses are applied to the meter, not noise pulses, or your readings will have errors. Some rules should be followed...

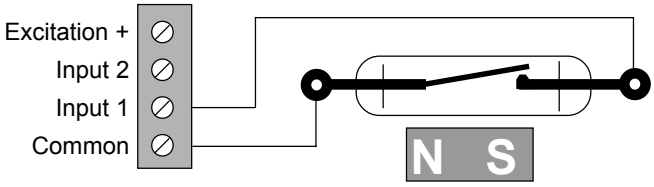
1) Always use screened cable for the input signal.
2) Connect the screen at one end only, preferrable at the meter end.
3) Do not place input cable near power cable or alarm relay cabling.



INPUT Connection & SELECTION Examples

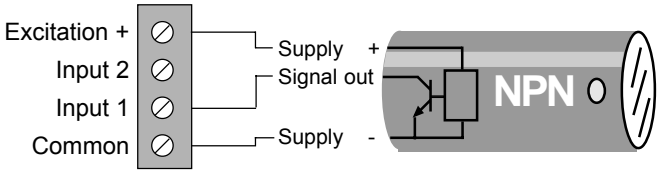
Switch positions

SWITCH 1=ON
SWITCH 2=ON
SWITCH 3=OFF



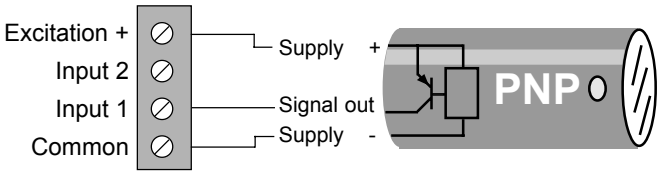
Contact Closure

SWITCH 1=OFF
SWITCH 2=OFF
SWITCH 3=OFF



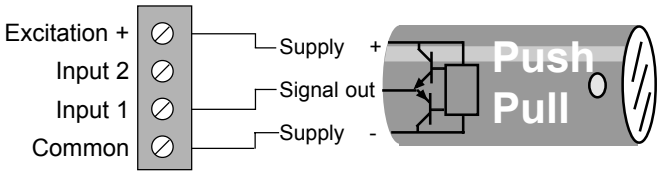
3 wire NPN

SWITCH 1=OFF
SWITCH 2=OFF
SWITCH 3=ON



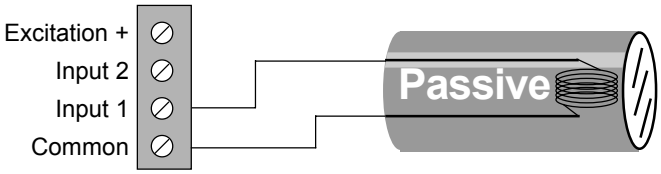
3 wire PNP

SWITCH 1=OFF
SWITCH 2=OFF
SWITCH 3=ON



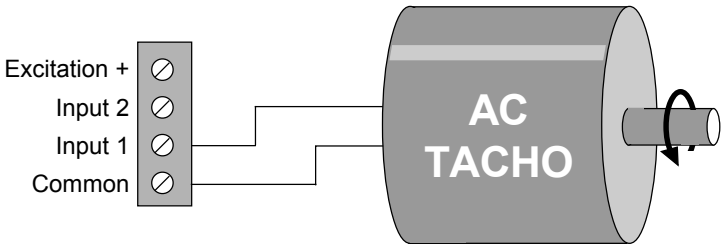
3 wire Push-Pull

SWITCH 1=OFF
SWITCH 2=OFF
SWITCH 3=ON
See note **



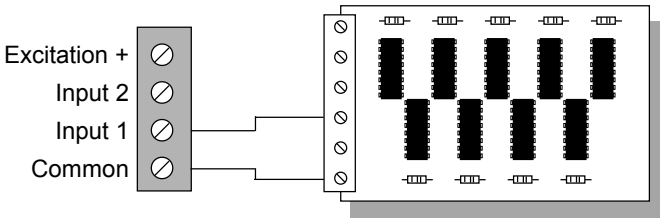
Passive magnetic >100mV <60V

SWITCH 1=OFF
SWITCH 2=OFF
SWITCH 3=ON



Passive AC tacho AC >5V <60V

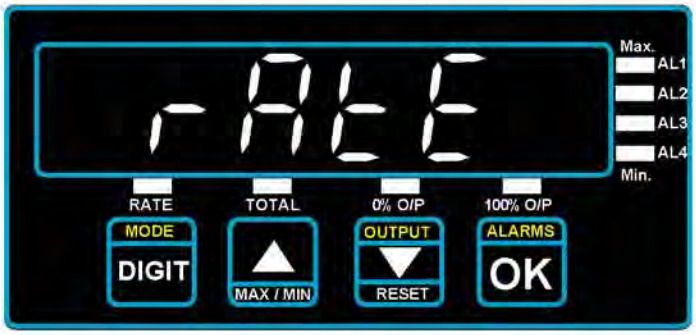
SWITCH 1=OFF
SWITCH 2=OFF
SWITCH 3=ON



CMOS 5-18V

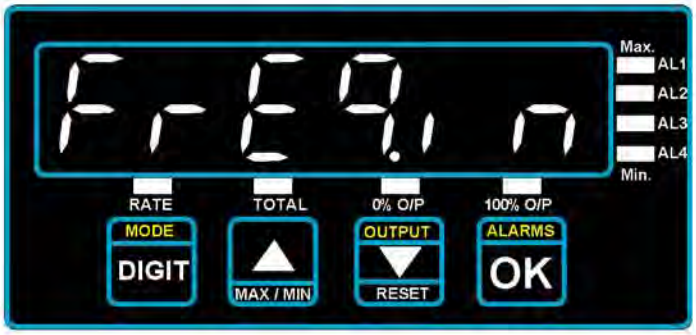
** To activate the internal amplifiers, required for low level signals, it is necessary to fit a pair of jumpers on the gold pins marked S5(for I/P2) and S7 (for I/P 1) . These pins are located inside the meter, 30mm in front of the Input connector. Please see the page 'How to Install Option boards' for advice on opening the case.

1. RATE (Max. Frequency 50Khz. applied to Input 1 only)



Have lockout switch OFF.

Press MODE button for >3 seconds and the display should change to show 'rate'



FREQUENCY IN
This prompt appears for a second or two. Set to the maximum input frequency you will use for your application.

DISPLAY
This prompt appears for a second or two. Set to the display reading you would like to appear, when the maximum frequency is applied to the meter.

AVERAGE NUMBER (seconds)
This value can be altered using the UP and DOWN buttons. It selects the number of readings to be averaged. You can choose values from 0 to 31 seconds

DELAY VALUE
When signals stop, you can select how many seconds the display will hold the last reading for, before going to 0. You can select either 3, 10, 30 or 60 seconds

See following page for various common scaling examples.

Rate scaling examples

To measure direct frequency

To read in Hz only	Set Freq.in = 1	Set disp=1
To read in Hz to 1 decimal place	Set Freq.in = 1	Set disp=1.0
To read in Hz to 2 decimal places	Set Freq.in = 1	Set disp=1.00
To read kHz only	Set Freq.in=1000	Set disp=1
To read kHz to 1 decimal place	Set Freq.in=1000	Set disp=1.0
To read kHz to 2 decimal places	Set Freq.in=1000	Set disp=1.00

To measure items per minute, with 1 pulse per item

To read in items/min only	Set Freq.in = 1	Set disp=60
To read in items/min to 1 decimal place	Set Freq.in = 1	Set disp=60.0
To read in items/min to 2 decimal places	Set Freq.in = 1	Set disp=60.00

To measure items per hour, with 1 pulse per item

To read in items/hour only	Set Freq.in = 1	Set disp=3600
To read in items/hour to 1 decimal place	Set Freq.in = 1	Set disp=3600.0

To measure items per 8 hour shift, with 1 pulse per item

To read in items/shift only	Set Freq.in = 1	Set disp=28800

To measure flow rate from a sensor.
First, you need to know how many pulses the sensor produces for each unit of volume. Let's assume you have a sensor giving 400 pulses per litre. Lets's assume that the maximum flow rate is 65 litres per minute, and you want to display in litres per minute. The first task is to convert this to a frequency, so that you can set **freq.in**

F=(400x65) / 60 = 433.33
So, **Freq.in** = 433.33 and **disp** = 65

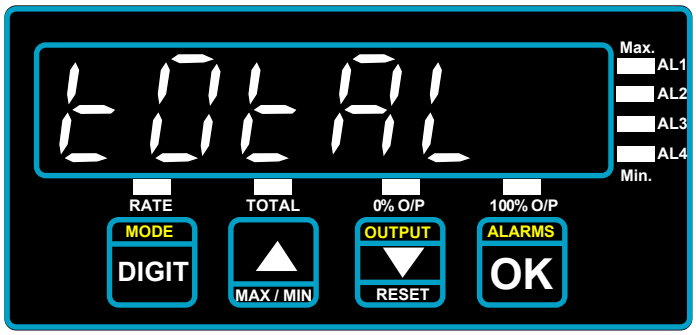
For all scalings, the method is simple:

1. Work out what frequncy (in Hertz) the sensor will be producing at the desired display value.
2. Enter this frequency in **freq.in** and the desired display value in **disp.**

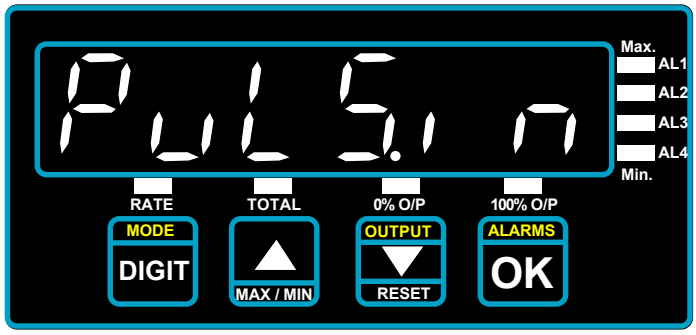
For erratic frequencies, you can improve display stability by increasing the value of Avg (the averaging sample)

2. Totaliser

This is a simple single input fully scalable totaliser.

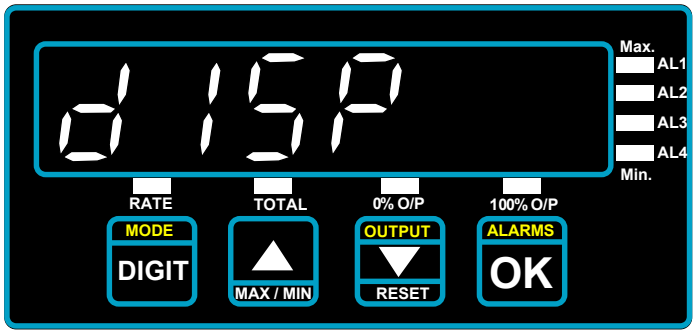


After the RATE setup, the display will enter the TOTALISER setting choices



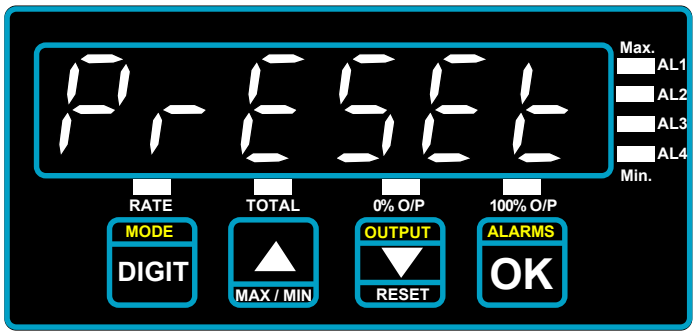
PULSES IN

This prompt appears for a second or two. Set it to a certain number of pulses appropriate to your application.



DISPLAY

This prompt appears for a second or two. Set to the display reading you would like to appear, when the number of pulses you set in the previous step are applied to the meter.



PRESET

Useful if you are replacing a counter which has accumulated a count, and you wish to transfer this value to your new meter. Presets a starting value.

Example:

You have a flow sensor giving 350 pulses per litre and you want to display total litres flowed.

Set **PulS.in** = 350

Set **disp** = 1 (or 1.0 , or 1.00 , etc., depending on required resolution) The decimal point can be set after you have used DIGIT to select left hand digit.

Special Features

Peak and Valley detection (RATE mode only)
The latest frequency measurement is compared to previous maximum and minimum measurements. The meter updates the peak or trough memory, if required with the new value. There are 2 ways of viewing the stored peaks or valleys, either by the front panel pushbuttons or by external contact closure.

Peak is annunciated on the display by the 'MAX' bar flashing (identified as 'AL1' on the front panel)

Valley is annunciated on the display by the 'MIN' bar flashing (identified as 'AL4' on the front panel). The selection of actual reading, peak and valley is sequential.

How to view Peak/Valley using the MIN/MAX button on the front lens
1) The lockout switch must be ON
2) Link terminal 7 to terminal 9
3) Press UP arrow key for peak, valley, normal

How to view Peak/Valley by using a remote contact closure
1) The lockout switch must be ON
2) Connect a normally-open contact closure switch between terminals 7 and 9

Reset Command
The reset command clears any stored peak or valley data, samples of previous rate measurements, being used in the Averaging calculation, and any accumulated total and may be accessed either from the front panel or by external contact closure command.

How to reset the meter by pressing the front panel 'RESET' button
1) The lockout switch must be ON
2) Link terminal 7 to terminal 10
3) Press Down Arrow key to reset display

How to reset the meter with a remote contact closure
1) The lockout switch must be ON
2) Connect a normally-open contact closure switch between terminals 7 and 10

Special Features (cont'd.)

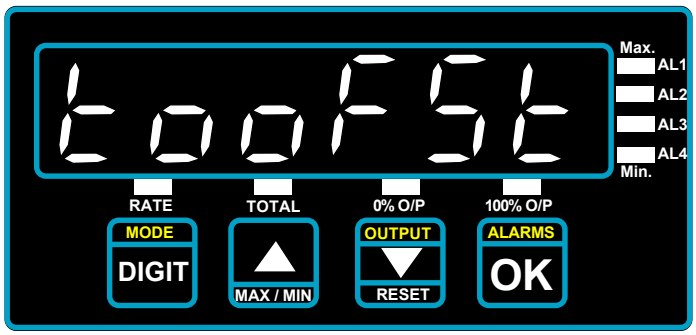
Mode Selection Rate/Total
You can choose to view either the latest total or the latest frequency measurement either by pressing a button on the front facia of the meter, or by making a remote contact closure via a rear connector.

How to view RATE/TOTAL using the MODE button on the front lens
1) The lockout switch must be ON
2) Link terminal 7 to terminal 8
3) Press MODE to change between rate and total. The 'RATE' or 'TOTAL' led will be lit to identify the reading value.

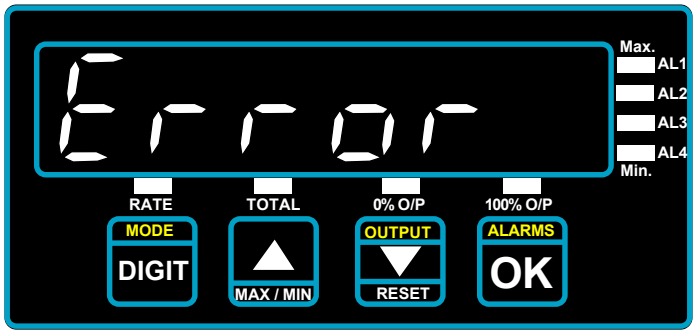
How to view RATE/TOTAL by using a remote contact closure
1) The lockout switch must be ON
2) Connect a normally-open contact closure switch between terminals 7 and 8
Each closure will toggle between Rate and Total. The 'RATE' or 'TOTAL' led will be lit to identify the reading value.

Error Messages

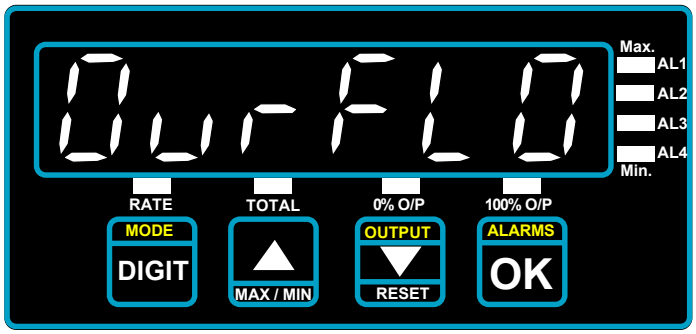
Certain conditions may arise which fall outside the capability of the meter, and these conditions are announced with error messages as follows:-



"Too Fast" = The input signal frequency is higher than the meter can accept. Reduce input frequency or use a signal source (encoder etc.) with lower output rate.



"Error" =Microprocessor error. There may be a fault in the meter, or the meter has been unable to perform a computation. The scale factor may be set to a value beyond the capability of the meter.

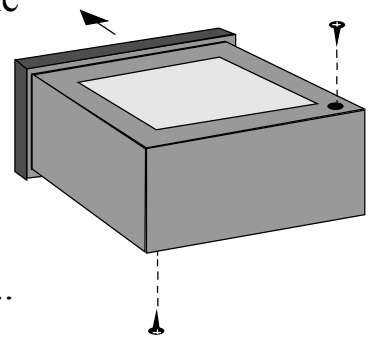


"Overflow" = The counter has reached or exceeded its capacity of 999999. If this occurs earlier than desired, consider dividing the count by 100, or 1000 and use either 2 or 3 decimal places, and label the reading 'X 100' or 'X 1000'

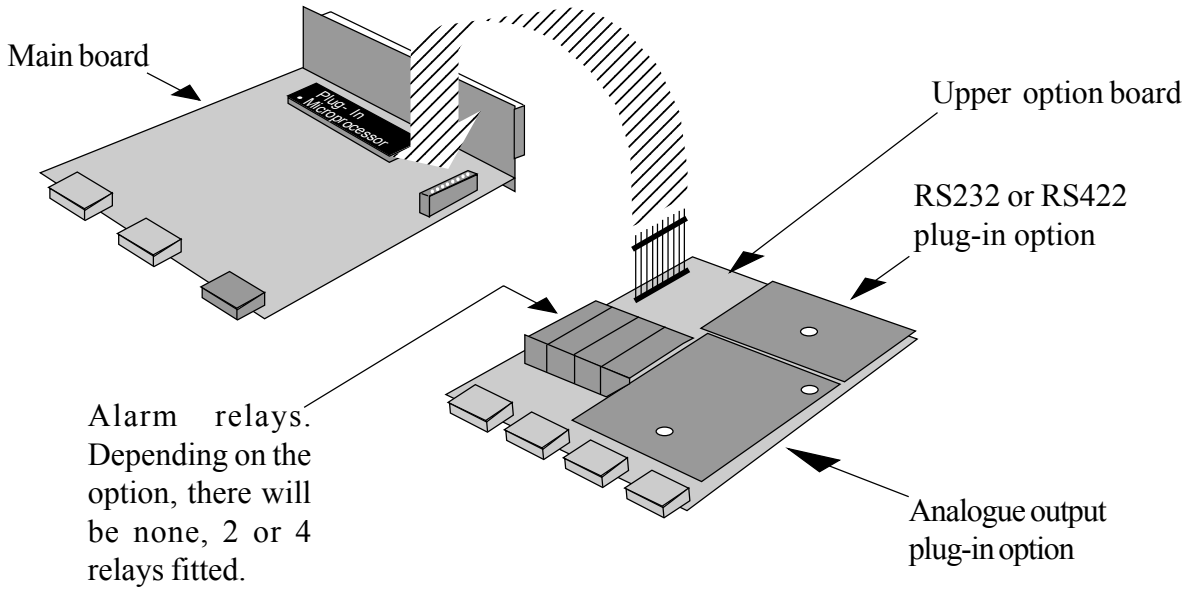
How to install option boards

If you want to open the meter to install or modify option boards, follow these steps...

1) Switch off power to the meter and unplug all connectors.
2) Unclip the front bezel. This is easier if you squeeze the top and bottom of the case, near the front.
3) Remove the small screws shown in the diagram. If the meter doesn't yet have an output option board, the top screw may not yet be fitted.
4) Slide the electronic boards out through the front of the case. You can easily separate the upper option board from the main board. We strongly suggest that you use anti-static precautions to prevent damage to the semiconductors.



The board assemblies will look something like this...



The analogue output and RS232 or RS422 plug-in option boards are fixed to the upper option board with white plastic pillars. You must apply a firm force when fitting or removing these options.

Always be careful to connect the pins to sockets accurately. When reassembling, make sure option boards are firmly fixed to the upper option board. When the boards are replaced in the case, secure them again with the two small black screws.

Alarm Board Configuration & Adjustment

The alarm relays are assigned as follows:

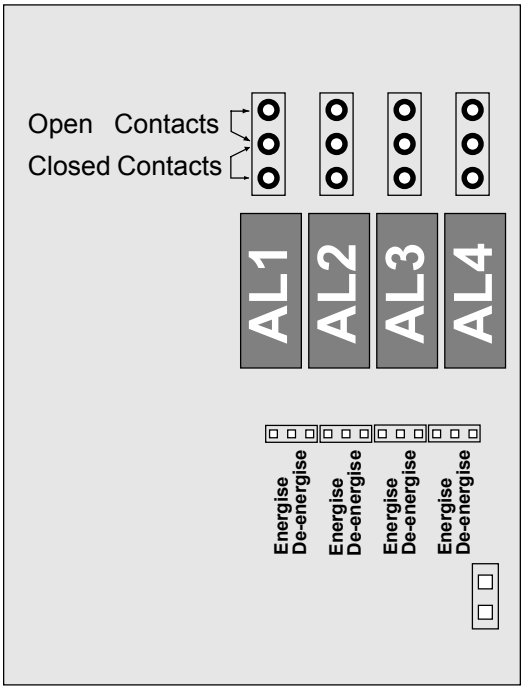
AL1-Frequ/Rate AL2-Total AL3-Frequ/Rate AL4-Total

For failsafe operation (where contacts open on alarm or when power is lost to the meter) set the jumpers for OPEN CONTACTS and DE-ENERGISE on alarm. This is the factory default setting.

To access the alarm board, first remove power from meter, including any power which might be on the alarm output circuitry.

Look on the top and bottom surfaces of the case, near the rear. You will see two small screws, one on each surface. Remove both screws. Now, clip off the front bezel and slide the meter assembly carefully out via the front of the case.

The relay board plugs into the main board. Gently separate the two boards.



Select relay output contact status, when relays are de-energised (power removed from meter) by placing these jumpers...

and set these jumper to make the alarms energise or de-energise on trip. De-energise means you will get an alarm if power is lost to the meter.

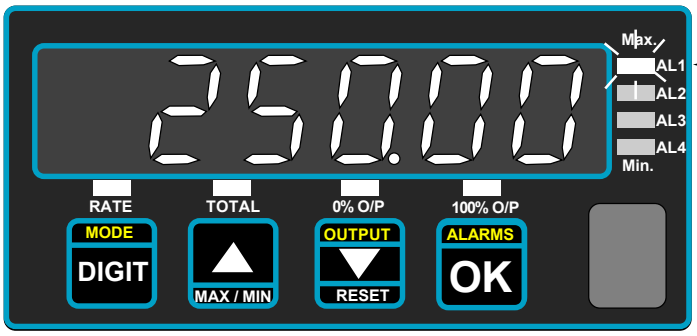
When you have set the jumpers, refit the board to the meter and carefully slide the assembly back into the case.

Fit the two small board screws to the top and bottom surfaces.

Alarm settings (AL1 & AL3 - Rate || AL2 & AL4 - Total)

NOTE : totalisation stops during alarm adjustment

If you press the ALARMS button momentarily, you can view each of the 4 alarm settings (each press will illuminate in turn AL1, AL2, AL3 and AL4 LEDs). alarm settings are not locked out by the lockout switch.



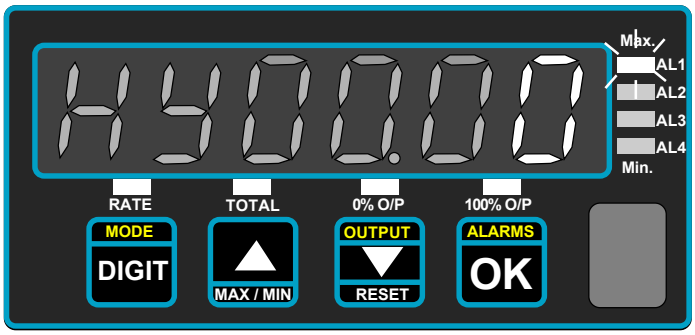
Alarm channel LED will flash.

Here, we see that Alarm 1 has its setpoint at 250.00

To change alarm settings, select the alarm you wish to change as shown above until its LED is flashing, then press the ALARM key for more than 3 seconds. You will see one digit is brighter than the others. You can change its value using the UP/DOWN buttons, and then select other digits with the DIGIT SELECT pushbutton. When the value has been set, press OK.

The alarm action is now displayed. This will show 'HI' for HIGH alarm action, 'LO' for LOW alarm action, or 'off' for NO alarm action. You can change this with the UP/DOWN buttons. Press OK when set.

The HYSTERESIS value is identified with a 'HY' prompt, and you can change this to suit your requirements.



The hysteresis value is directly related to your measurements, so, for example, if you have a high alarm, set to 500 , and set the hysteresis value to 7, the alarm will occur when the meter reading rises above 500, and will reset when the meter reading falls to 493 .

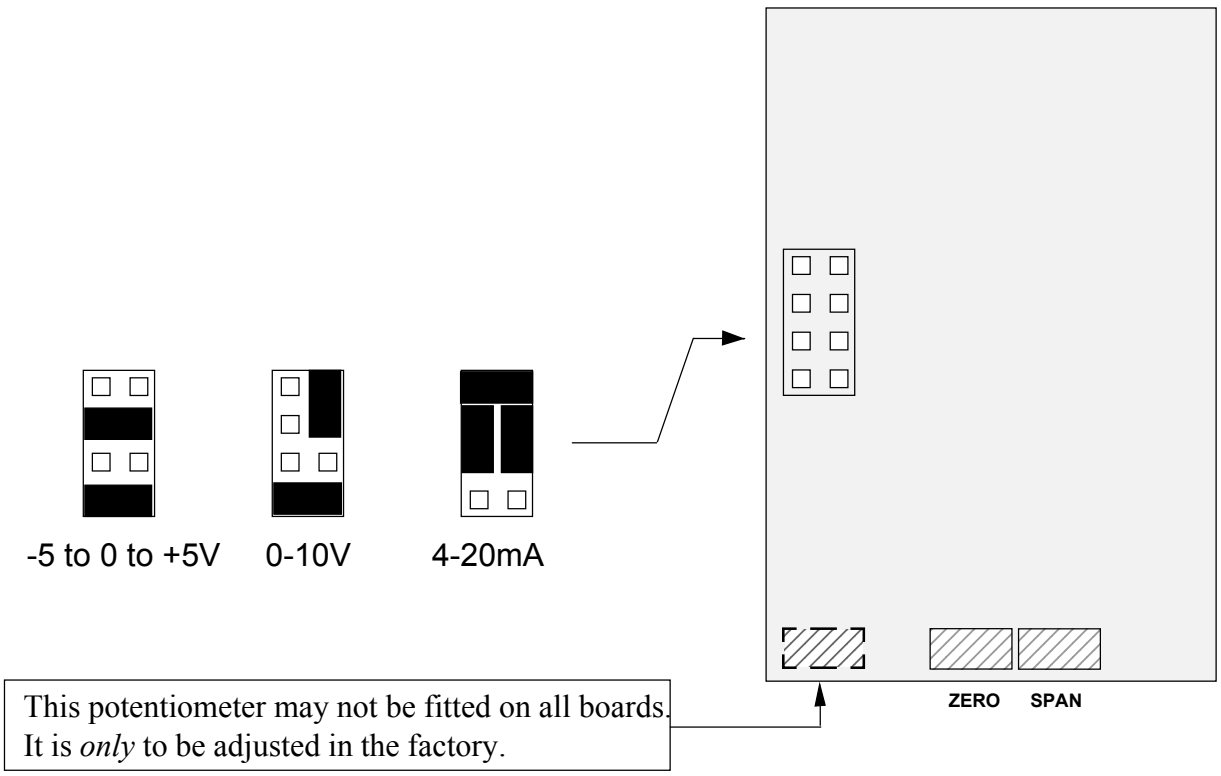
Analogue Output Configuration

We always set the meters to suit any requests on your order, so you should not need to adjust the analogue board. If you didn't specify ranges, but ordered option 'ANI', the meter will be set for 4-20mA output. If you ordered 'ANV' it will be set for 0-10V.

If you want to change a range, for example from 0-10V to 4-20mA, the zero and span potentiometers must be adjusted to get best accuracy at 0% and 100%.

You will need to remove the analogue board from the case to change the position of jumpers and to adjust the fine trim potentiometers. See the page headed " How to fit Option Boards" for details of how to expose this board. The analogue board, if fitted, can be seen plugged into the upper board, and can be easily identified because it has either 2 or 3 blue potentiometers, depending on version.

You will need to carefully unplug the analogue output board from the upper board and change the jumper positions to suit your new range, as shown below.



Re assemble the meter, apply power and follow the Analogue Output Settings procedure on the next page. Measure the analogue output and trim, if needed, using the ZERO and SPAN potentiometers, for best accuracy.

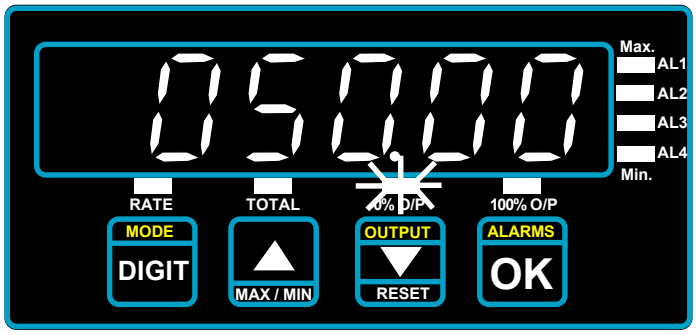
How to adjust your Analogue Output

NOTE : totalisation stops during analogue output adjustment

The lockout switch should be set 'OFF' to change the analogue output calibration. You can set the analogue output range to suit your display range.

The analogue output can be directly proportional or inversely proportional to the display range, for example you can have 4-20mA output for display 0 to100 or for display 100 to 0.

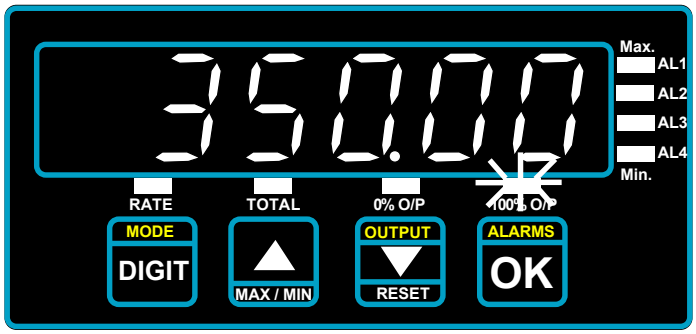
1) Press 'OUTPUT' button for 3 seconds and you will see either 'An.rAt' or 'An.tOt' meaning the analogue output is derived either from the Rate or Total value. Use the Up and Down buttons to select your preference, then press OK.
2) 0% O/P LED should flash
3) Set the display for the reading value where you want 0% Output, by using DIGIT and UP/DOWN buttons



Jumpers on Analogue Board	0% gives
4-20mA	4mA
0-10V	0 V
-5 to +5V	-5V

So in this example, if you set the jumpers for 4-20mA, you will get 4mA output when the display is 50.00

4) When set, press the OK button.
5) Now the 100% O/P LED should flash
6) Set the display to the reading value where you want 100% Output, by using DIGIT and UP/DOWN buttons



Jumpers on Analogue Board	100% gives
4-20mA	20mA
0-10V	10 V
-5 to +5V	+5V

So in this example, if you set the jumpers for 4-20mA you will get 20mA output when the display is 350.00

7) When set, press OK, to complete your adjustment of the analogue output scaling
8) Next, 'SER.rAt' or 'SER.tOt' will show, and you can use the up or down arrow to select either, to choose whether the serial output is related to rate or total measurement, then press OK to save your choice.

Please remeber to set the lockout switch 'ON' to save your settings.

Serial Communications Output Option

You can have either an RS232 or an RS422 ASCII output at 1200 baud representing the meter's rate or total value (See step 8 on the previous page). You can have a continuous transmission of readings, or a single transmission on demand.

RS232 O/P on terminal 16 (data+) and terminal 18(common)
RS422 O/P on terminals 16 & 17(Data + and -) and 18 (common)

String Format:
ASCII coded numerals, with embedded decimal point position if one has been set on the display, with a preceding - sign if the display is negative, with leading zero blanking, followed by a Carriage Return and a Line Feed. 9 characters will be sent if the meter is in RATE mode, 10 characters if it is in TOTAL mode.

So, for a displayed value of....

12345 string is <space><space><1><2><3><4><5><CR><LF> for rate ... or <space><space><space><1><2><3><4><5><CR><LF> for total.

-15.0 string is <space><space><-><1><5><.><0><CR><LF> for rate ... or <space><space><space><-><1><5><.><0><CR><LF> for total.

Commands:
The data output port is activated by connecting to the ENABLE terminal.

For RS232, the ENABLE port must be held high at a 5V level for as long as serial data output is required, or, if only one string of data is needed, the ENABLE line must be held high until the transmission starts, after which it may be taken low again. The Sig- connection on terminal 17 may be used to provide the 5V level if an external source is not available. For RS422, the ENABLE port operates in reverse, so must be held low to enable transmission.

If you need a remote mimic display, the Model INTUITIVE-S is an ideal choice, being a 1/8 DIN meter directly compatible with this output format. Also, we manufacture a range of Large Format remote displays having digit heights of 57mm, 102mm, 144mm, 200mm and 280mm. Ask us about the 1700 Series and the Grand Intuitive Series.

Equipment Specifications

Bezel size	48mm high by 96 mm wide (1/8 DIN)
Panel Cutout	45 mm high by 92 mm wide
Case Depth	125 mm including connectors
Weight	300 grammes
Case Material	Black polycarbonate
Connectors	Detachable Screw Terminal connectors
Storage temperature	-10 to +70 degrees C
Operating temperature	0 to 50 degrees C
Display	6 digit LED 14.2mm high red or green
Sealing	IP65 from front. Can be upgraded to IP67
Power	95-265 VAC or 11-30 VDC optional, 8VA maximum
Signal Types	NPN, PNP, Dry Contact, AC voltage, CMOS
Minimum Amplitude	100 mV RMS @1kHz. with amplifier activated
Maximum Amplitude	60 V P-P
Minimum frequency	0.03 Hz for rate, no lower limit for totalisation
Maximum frequency	50 KHz
Accuracy	Rate +/- 0.01% of input @25°C. +/- 100ppm/^{o}C
Pullup/down	22 Kilohms
Excitation voltage	24 VDC typ.100mA max.@23 Deg. C, 60mA max. at 50 deg. C. Noise<100mV<100Khz.
Debounce action	Enabled by rear switches. 30 Hz. Cutoff.
Totalisation memory	10 years EEPROM. Note: When switching meter off, the power must drop to 0 in <200 mSeconds for data to be saved properly.

ANALOGUE O/P	0-10VDC	4-20mA	+/-5VDC
Drive capacity	>1K Ohms	<500 Ohms	>1 K Ohms
Isolation	250 VAC Optically isolated		
Accuracy	+/-0.1% range, +/-10mV for ANV, +/-10uA for ANI		
Linearity	+/-0.02% of range		
Resolution	12 bits		
Scaling	Fully adjustable, direct or inverse		
Update rate	1 conversion every 570mS for ratemeter, if F_{in}>1.5Hz. 10 conversions/sec for totaliser		

ALARM O/P	4 alarms SPST rated 5 Amperes at 250 VAC resistive May be set as HI or LO , with variable hysteresis.
ASCII O/P	RS232 or RS422 transmission of reading. 1200 baud
Isolation	250 VAC optically isolated

Record of Revisions/Changes

Declaration of Conformity

Declaration Reference	: INTUITIVE
Issue Date	: 9 October 1998
Products Covered	: INTUITIVE series
Title	: DOC-INTUITIVE

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

EN50081-1:1992
EN50082-1:1992

and have been designed to the applicable sections of the following safety standard:

EN61010-1:1995

and comply with the requirements of Council Directive 89/336/EEC relating to Electro-Magnetic Compatibility, & are designed to meet 73/23/EEC Low VoltageDirective.

Conditions

The meters are permitted a worst case error of 1% of analogue signal range during electro-magnetic disturbance, and must recover automatically when disturbance ceases without the need for human intervention, such as resetting, power-down etc. No digital errors are permitted.

The meters covered by this declaration 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.