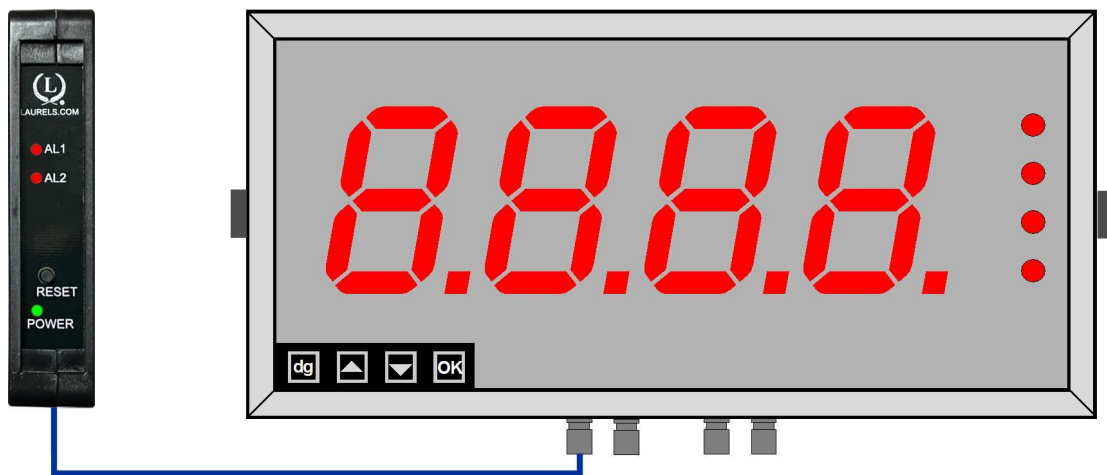


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# MAGNA 4-Digit Large-Digit Temperature Indicator / Controller

## Installation & Operating Manual

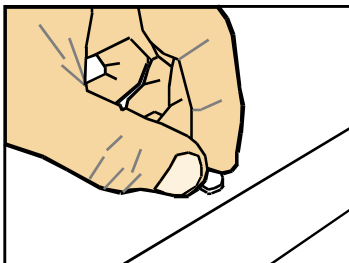
---



**Caution:** Risk of electrical shock if this instrument is not properly installed.



**Caution:** Read the whole manual before you install this display.



### Rear case screws - please note

The rear panel is held in place with finger-screws, which only need to be gently tightened.

**Do not use tools to tighten or loosen the screws, as this could cause damage to the internal threads.**



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# Warranty

We warrant our products against defects in materials or workmanship for a period of one year from the date of purchase.

In the event of a defect during the warranty period, the unit should be returned, freight (and all duties and taxes) prepaid by the Buyer to Laurel or to the authorized distributor from whom the unit was purchased.

Laurel or the distributor, at their option, will repair or replace the defective unit. The unit will be returned to the Buyer with freight charges prepaid by the distributor.

## **LIMITATION OF WARRANTY**

The foregoing warranty shall not apply to defects resulting from:

1. Improper or inadequate maintenance by the buyer.
2. Unauthorized modification or misuse.
3. Operation outside the environmental specification of the product.
4. Mishandling or abuse.

The warranty set forth above is exclusive and no other warranty, whether written or oral is expressed or implied. We specifically disclaim the implied warranties of merchantability and fitness for a particular purpose.

## **EXCLUSIVE REMEDIES**

The remedies provided herein are the buyer's sole and exclusive remedies.

In no event shall we be liable for direct, indirect, incidental or consequential damages (including loss of profits) whether based on contract, tort or any other legal theory.

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\* Need a manual urgently? You can download manuals from our website.  
<https://www.laurels.com/download-manuals.php>

# Warnings

Please carefully read this manual and all warnings. Install the display **ONLY** when you are sure that you've covered all aspects.



Where the product is intended for "UL" installations, removal or addition of option boards is not permitted.



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



Connect the display according to current IEE regulations, IEC61010 & NFPA:70 National Electric Code in USA.



Power supplies to this equipment must have anti-surge (T) fuses rated at 1A for 230V supply, 2A for 110V supply, 5A for 48VAC supply or 10A for 11-30VDC.



Don't touch any circuitry after you have connected the display, because there may be lethal voltages on the circuit board.



Do not apply power to the display if its case is open.



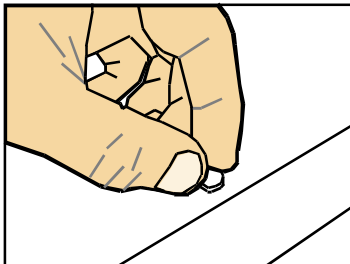
Only adjust on-board switches or connections with the power turned off



Make sure all screw terminals are tight before you switch the meter on.



Only clean the display's case and window with a soft damp cloth. Only lightly dampen with water. Do not use any other solvents.



## Rear case screws - please note

The rear panel is held in place with finger-screws, which only need to be gently tightened.

**Do not use tools to tighten or loosen the screws, as this could cause damage to the internal threads.**

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.

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 1-year warranty. We will put right or replace any display which is faulty because of bad workmanship or materials. This warranty does not cover damage caused by misuse or accident.

If you return a unit for repair, please include a detailed description of the problem, and the name of a contact who we can refer to for any questions. Please mark for the attention of the QA Department.

## **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 during 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 usually returned with a standard courier service.

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

If you do not agree with these conditions, please return this item in unused 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. A spare unit could help to avoid these issues.

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.

## General Description

**MAGNA temperature displays** consists of a MAGNA 4-digit, 4-20 mA process signal input large digit display and an external Laureate LT series RTD or thermocouple transmitter with a 4-20 mA process signal output. Use of a 4-20 mA interface allows long cable runs while kept the thermocouple or RTD leads short. The Laureate transmitter is typically DIN rail mounted inside a cabinet.

**Installation at the user site is easy** when the 4 mA and 20 mA endpoints are specified and the display unit and transmitter are both set up for these same two endpoints. The display unit and transmitter can then simply be joined by a 2-wire 4-20 mA cable, as described in this user manual, and the large temperature display system is ready to run.

The Laureate RTD transmitter can be set up for four RTD types: Pt100 for DIN alpha of 0.00385, Pt100 for ANSI alpha of 0.003902, nickel Ni120, or Copper Cu10. The Laureate thermocouple transmitter can be set up for seven thermocouple types: J, K, T, E, N, R, S. Both transmitters can be set for °C or °F, and 1° or 0.1° resolution. A resolution of 0.1° is normally reserved for RTDs.

Available digit heights are 57 mm (2-1/4"), 102 mm (4.0"), 150 mm (5.9"), and 200 mm (7.9"). For every 10 meters of viewing distance required, use 1" of digit height.

Options include 100-240 Vac or 11-30 Vdc power; normal of daylight viewing display brightness; wall mount, suspension mount or panel mount; and a heater for operation down to -25°C. Heaters can be specified for AC power or 24 Vdc power.

MAGNA displays must be installed fully assembled, and must be installed according to local electrical installation rules.

When properly installed, and provided they have been ordered with cable glands exiting the lower surface of the case, the main display unit provides environmental protection to IP65 / NEMA4X from all sides.

### Safety



**Caution:** There is a risk of electrical shock if this display is not properly installed



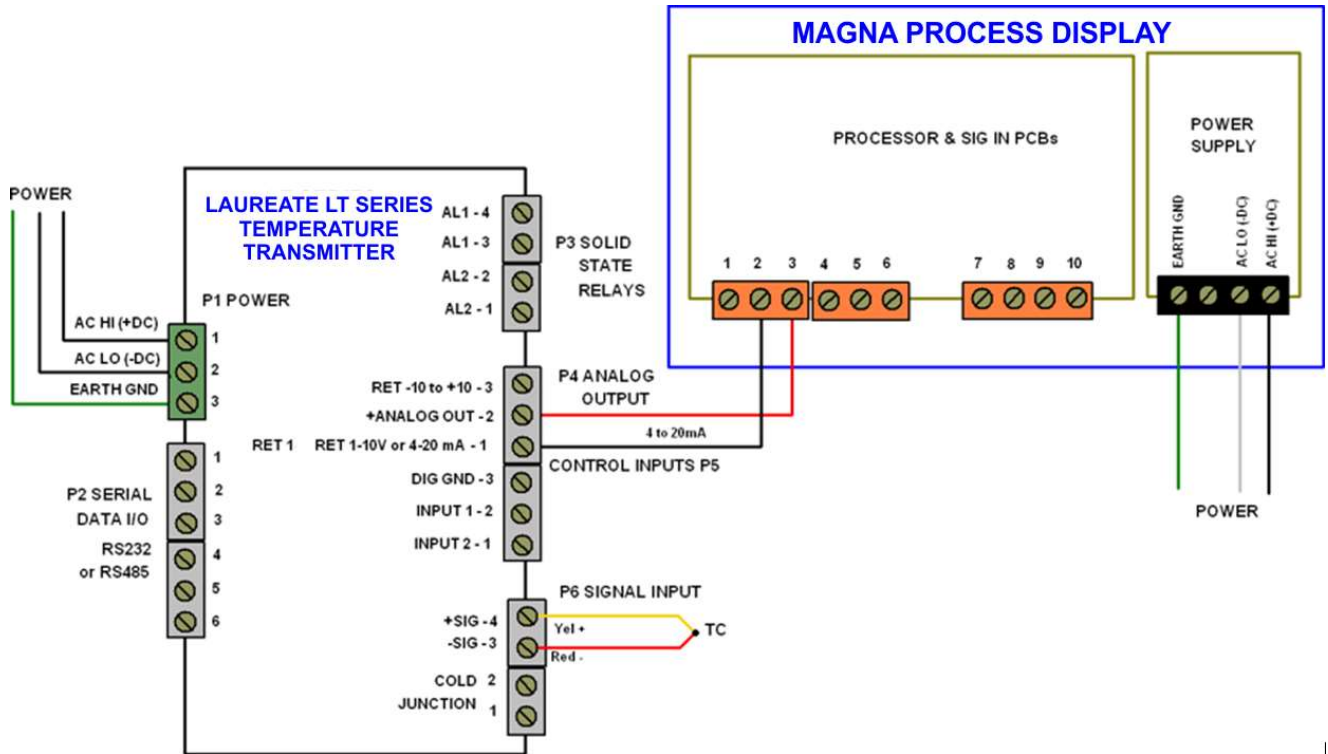
**Caution:** Risk of danger: Read the whole manual before you install this display

Obey all safety warnings in this manual, and install the display according to local wiring and installation regulations. Failure to follow these guidelines may cause damage to the display, connected equipment, or may be harmful to personnel.

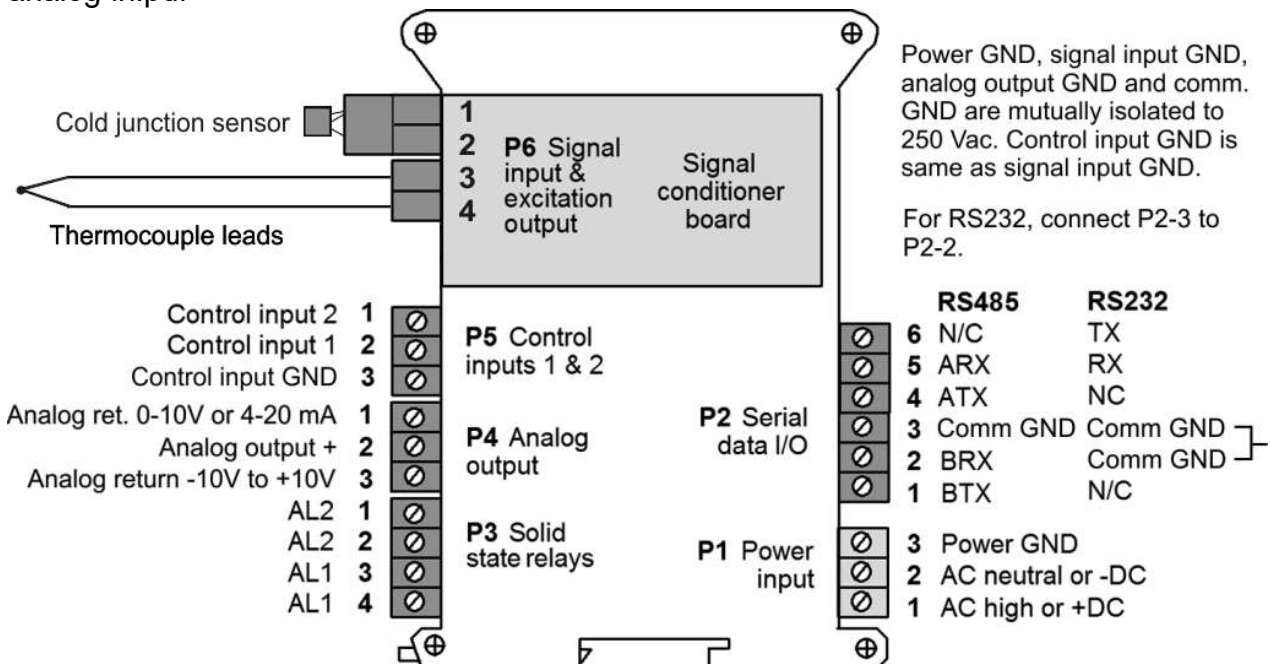
Any moving mechanical device controlled by this equipment must have suitable access guards to prevent injury to personnel if the display should fail.

# Connecting Your Display

To wire the display, insert circular cables through the provided M12 cable compression glands. These are rated for round cables with a diameter of 3.0 to 6.5 mm (1/8" to 1/4"). When the outer nut is tightened by hand, seals inside the gland are compressed against the cable, thereby making a hermetic seal. Connect the power cable to the detachable black power connector inside the display. Connect the 4-20 mA signal cable to the detachable orange signal connector inside the display.

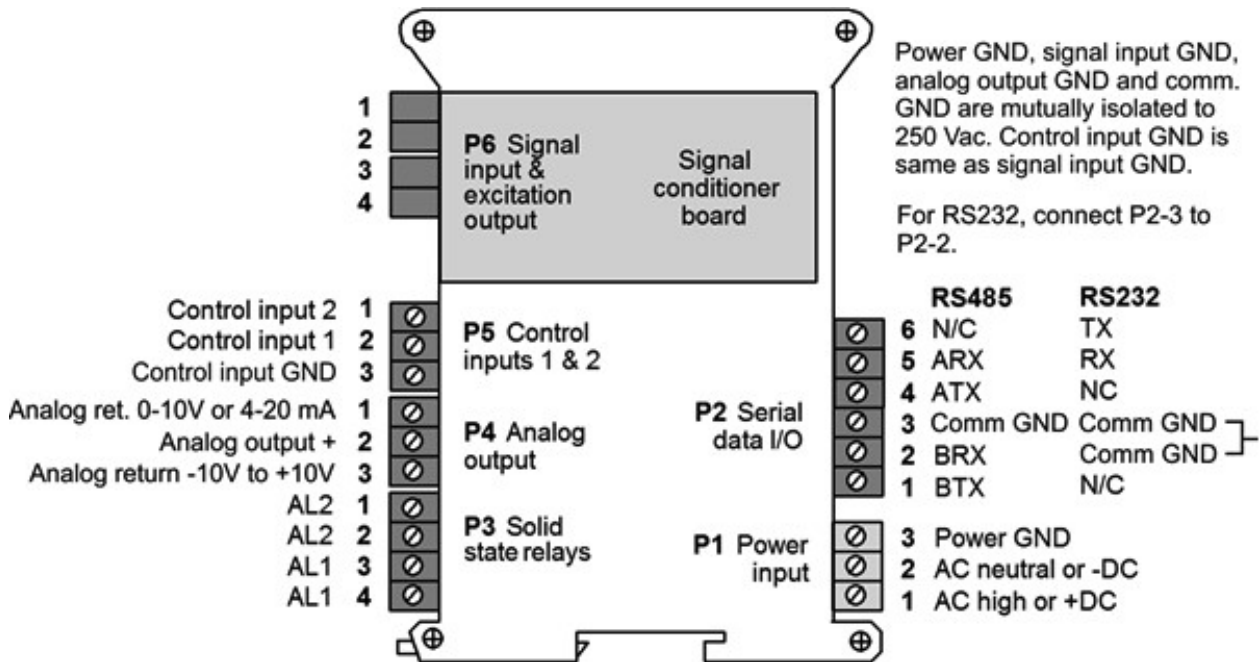


**Connect a thermocouple signal** to the transmitter as illustrated. Run the 4-20 mA output of the transmitter from P4-2 and P4-1 through an available gland of the display unit. Do not remove the cold junction sensor, as it is part of transmitter calibration. For more information on Laureate thermocouple transmitters, see <https://www.laurels.com/transmitter-thermocouple.php> and the user manual at <https://www.laurels.com/downloadfiles/LT-manual-analog-in.pdf>

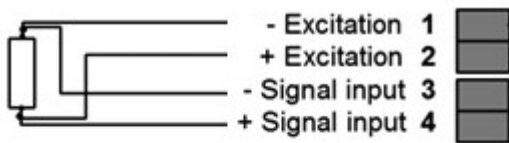


# Connecting Your Display (continued)

Connect an RTD temperature signal to the transmitter as explained below, and run the 4-20 mA output of the transmitter from P4-2 and P4-1 through an available gland.

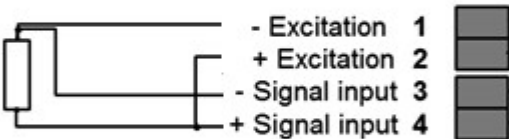


## RTD or Resistance - 2 Wire



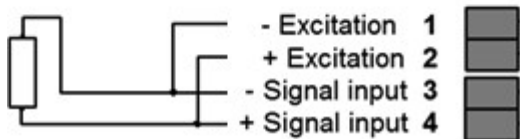
**In 2-wire hookup**, the meter senses the combined voltage drop across the RTD and both lead wires. The voltage drop across the lead wires can be measured by shorting out the RTD during meter setup, and this voltage is then automatically subtracted from the combined total. However, changing resistance of the lead wires due to ambient temperature changes will not be compensated.

## RTD or Resistance - 3 Wire



**In 3-wire hookup**, the meter senses the combined voltage drop across the RTD plus two excitation leads. It also senses the voltage drop across one excitation lead, and then subtracts twice this voltage from the combined total. This technique effectively subtracts all lead resistance and compensates for ambient temperature changes if the two excitation leads are identical.

## RTD or Resistance - 4 Wire

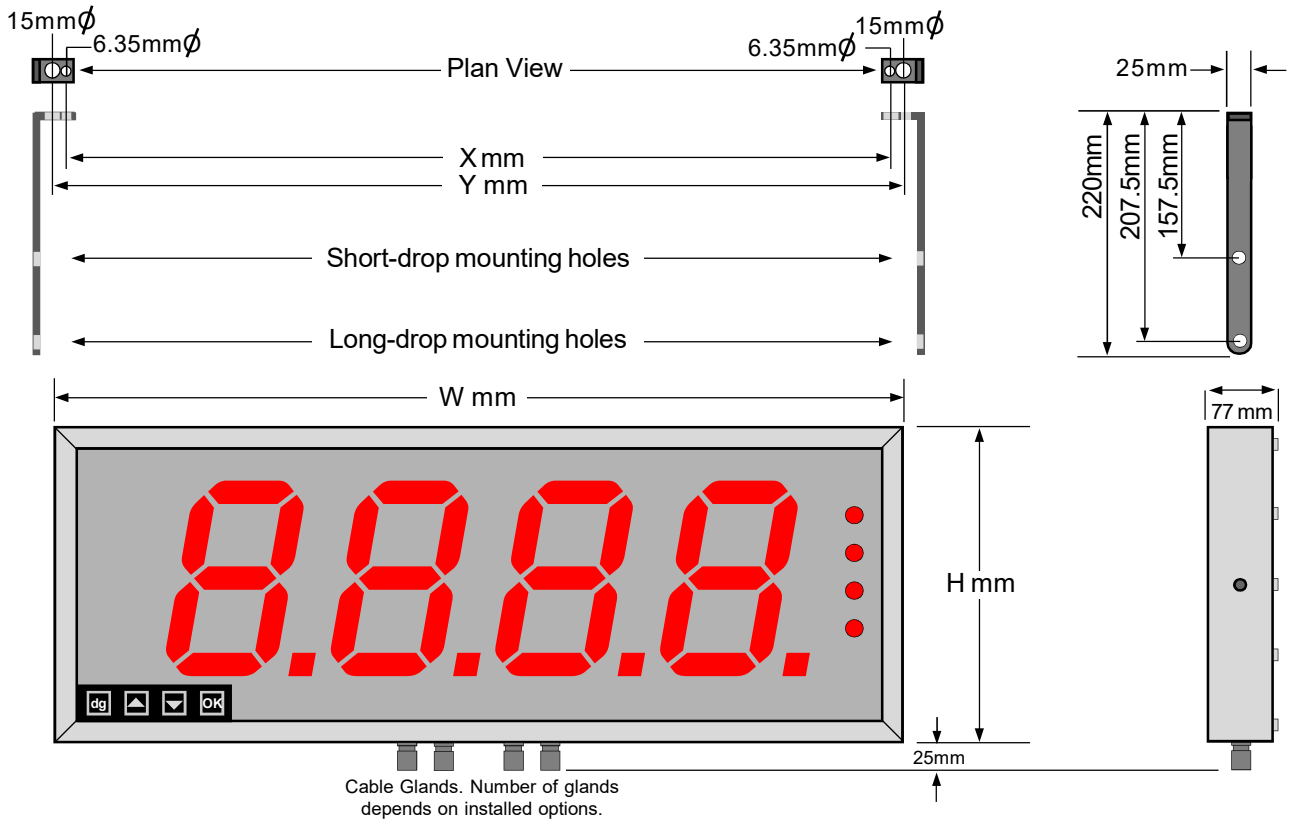


**In 4-wire hookup**, different pairs of leads are used to apply the excitation current and sense the voltage drop across the RTD for ratiometric operation, so that the IR drop across the excitation leads is not a factor.

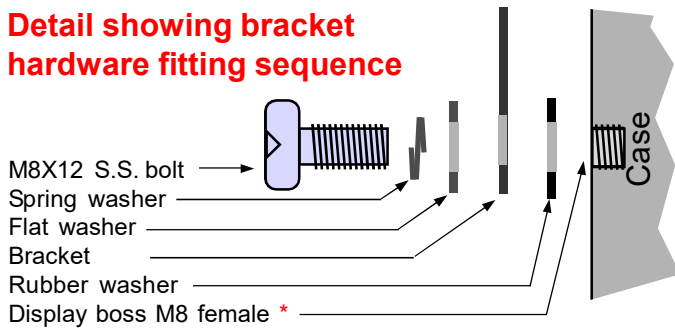
For more information on Laureate RTD transmitters, see <https://www.laurels.com/transmitter-rtd.php> and the user manual at <https://www.laurels.com/downloadfiles/LT-manual-analog-in.pdf>



# Suspension Mounting Dimensions



## Detail showing bracket hardware fitting sequence



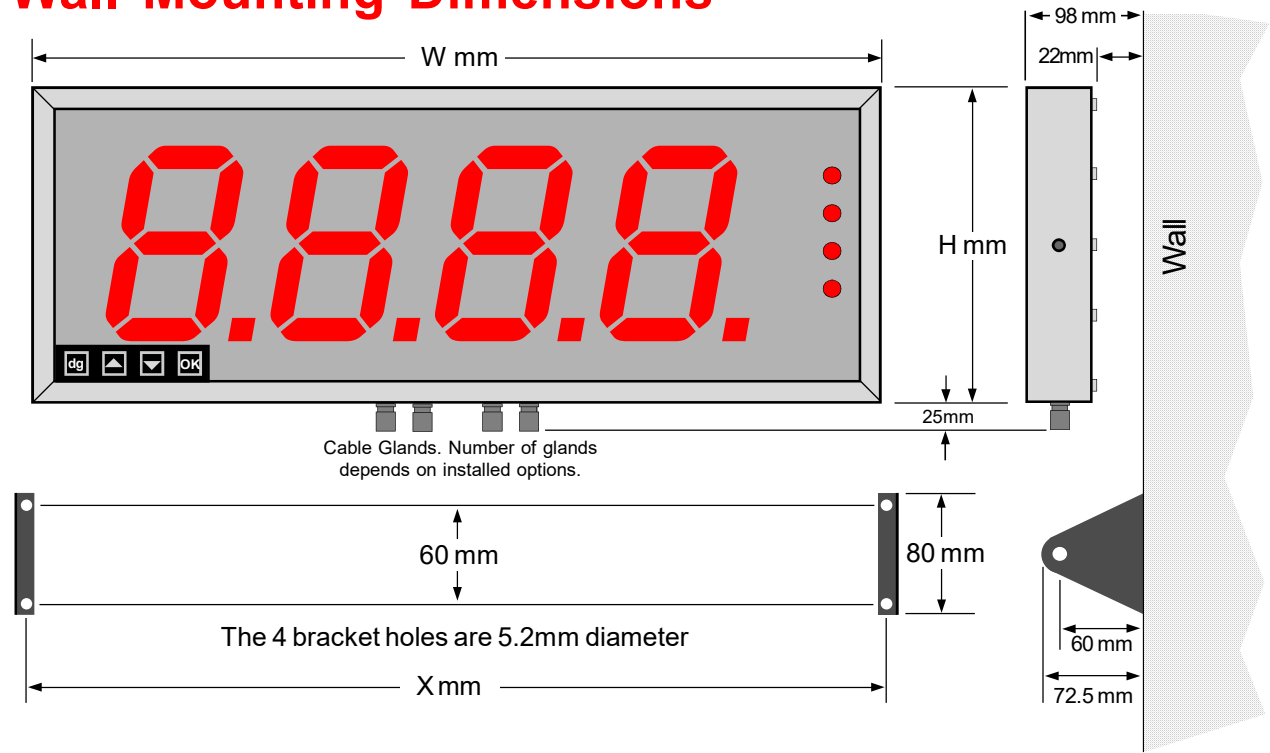
You can order these displays with the cable glands in the bottom surface (as shown) the rear, or top.

Rear glands allow you to mount the display on top of a cubicle, using the brackets shown.

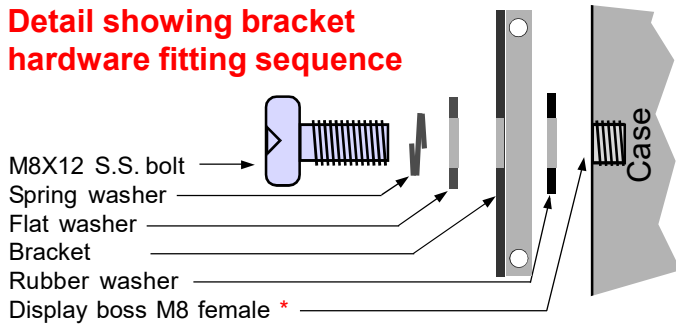
**\* Do not use longer bolt threads than 12mm , or you will fracture the female boss and the case will no longer be sealed.**

Display Format	X mm	H mm	W mm	Y mm
2" 4 digit numeric	219.5	154.5	376	249.5
4" 4 digit numeric	374	195.5	434	404
6" 4 digit numeric	520	246	580	550
8" 4 digit numeric	690	290	750	720

# Wall Mounting Dimensions



## Detail showing bracket hardware fitting sequence



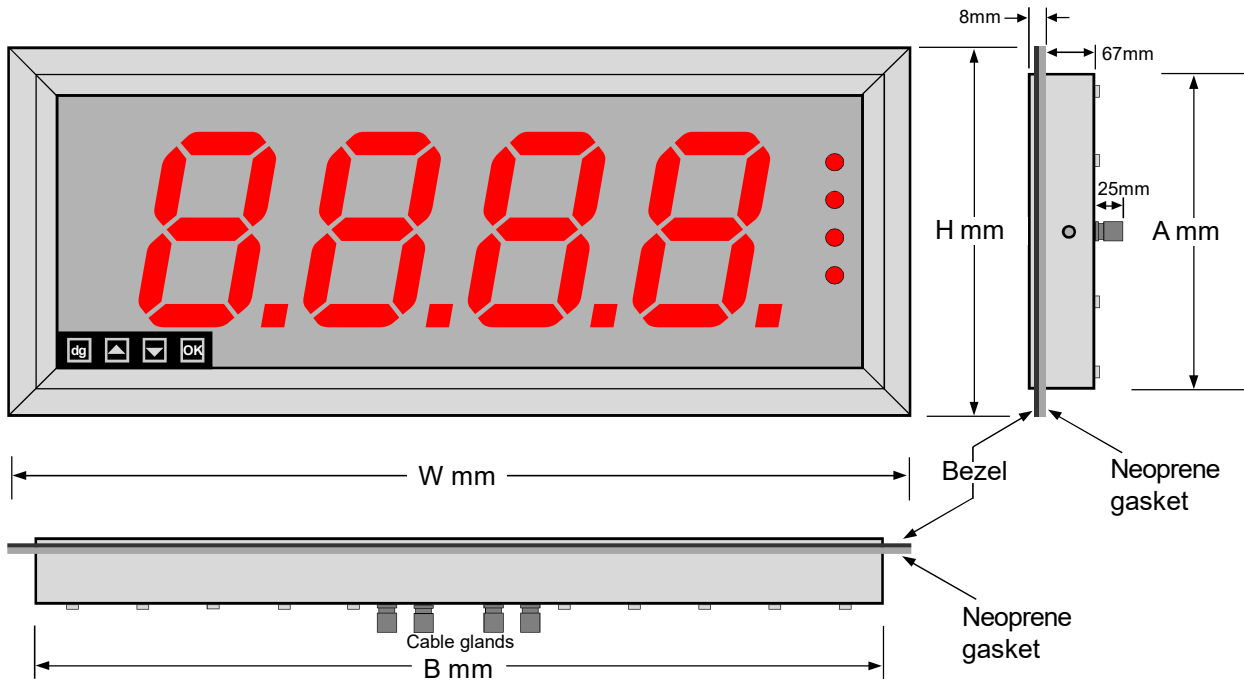
You can order these displays with the cable glands in the bottom surface (as shown) the rear, or top.

Rear glands allow you to mount the display on top of a cubicle, using the brackets shown.

**\* Do not use longer bolt threads than 12mm , or you will fracture the female boss and the case will no longer be sealed.**

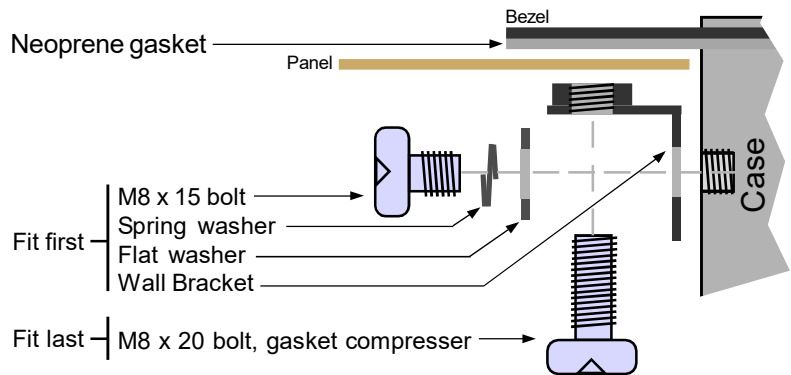
Display Format	X mm	H mm	W mm	Y mm
2" 4 digit numeric	219.5	154.5	376	249.5
4" 4 digit numeric	374	195.5	434	404
6" 4 digit numeric	520	246	580	550
8" 4 digit numeric	690	290	750	720

# Panel Mounting Dimensions



## Detail showing bracket hardware fitting sequence

**Panel cutout dimensions**  
 $A+3\text{mm}(h) \times B+3\text{mm}(w)$



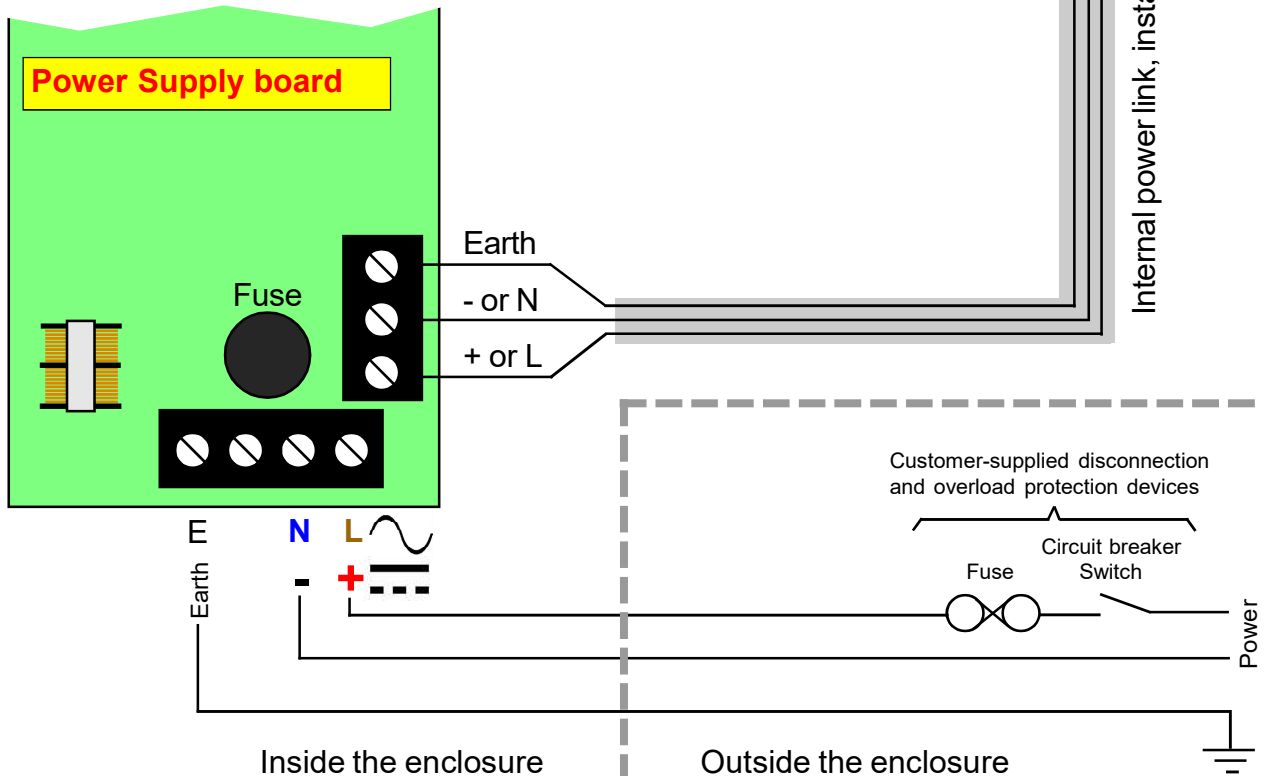
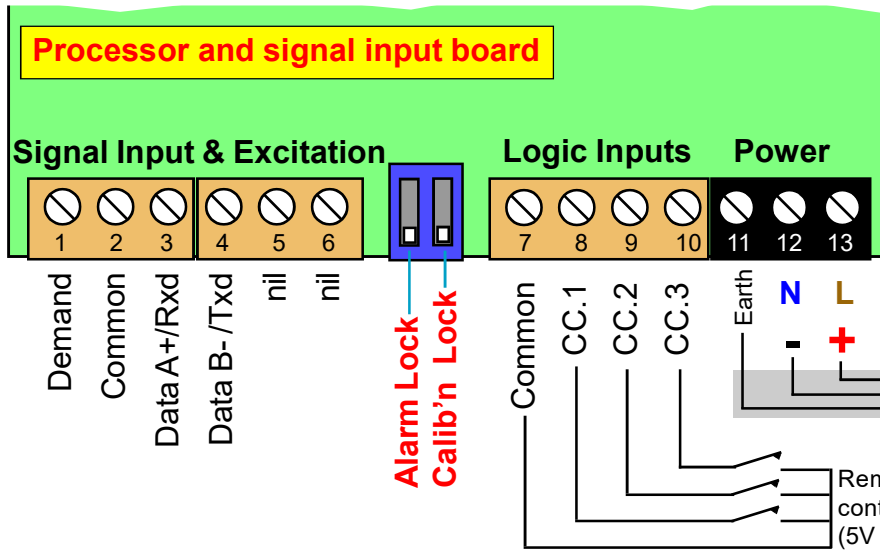
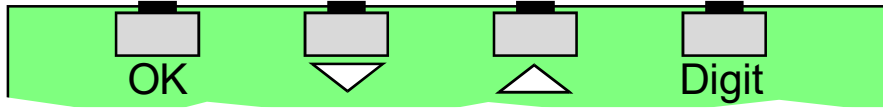
Display Format	X mm	H mm	W mm	Y mm
2" 4 digit numeric	219.5	154.5	376	249.5
4" 4 digit numeric	374	195.5	434	404
6" 4 digit numeric	520	246	580	550
8" 4 digit numeric	690	290	750	720

# MAGNA Connections



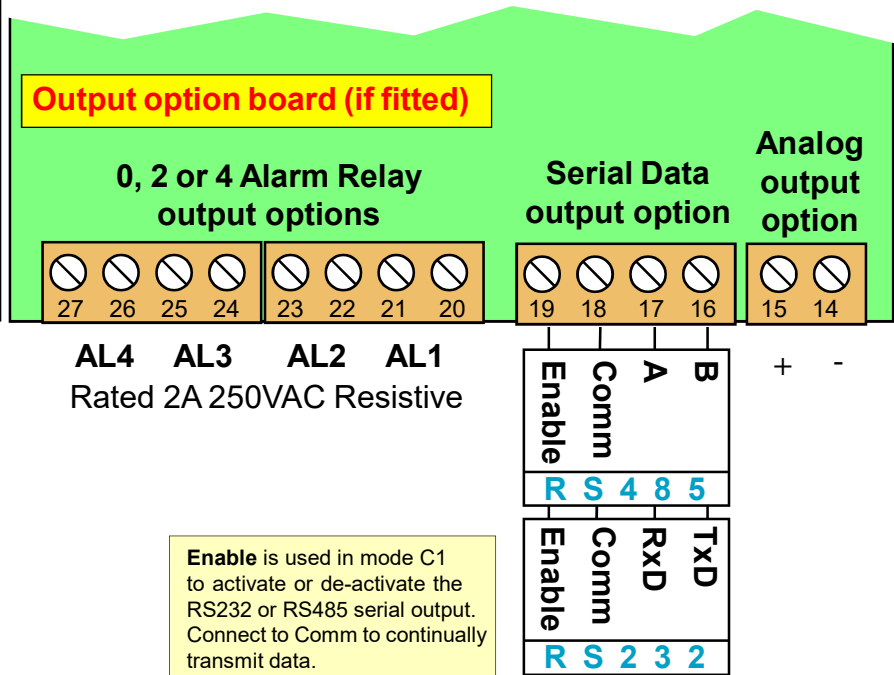
**Warning:**  
Disconnect all power before removing the rear of the display

There is a range of possible locations for the input board, output board and power supply boards. Their locations depend on the height of digits, number of digits, brightness of digits and any installed options. Because the permutation of possible locations is large, we will not describe the location of boards within the display, but simply identify the connectors and their functions on each board, below ...



**Warning:**  
Disconnect all power before removing the rear of the display

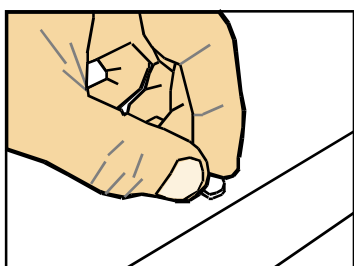
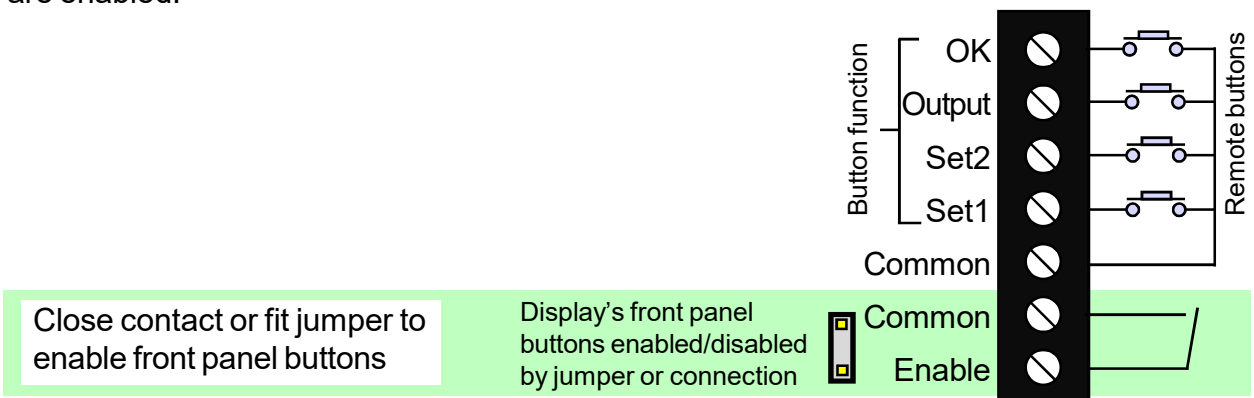
**Connectors and options**  
Connectors may be present even if output options are not installed. Refer to rating label to see installed options.



## Remote programming button connector

On one of the display boards, you will find a 7 way connector, to which you can wire remote programming buttons, to allow adjustment of the display's settings when the display is inaccessible.

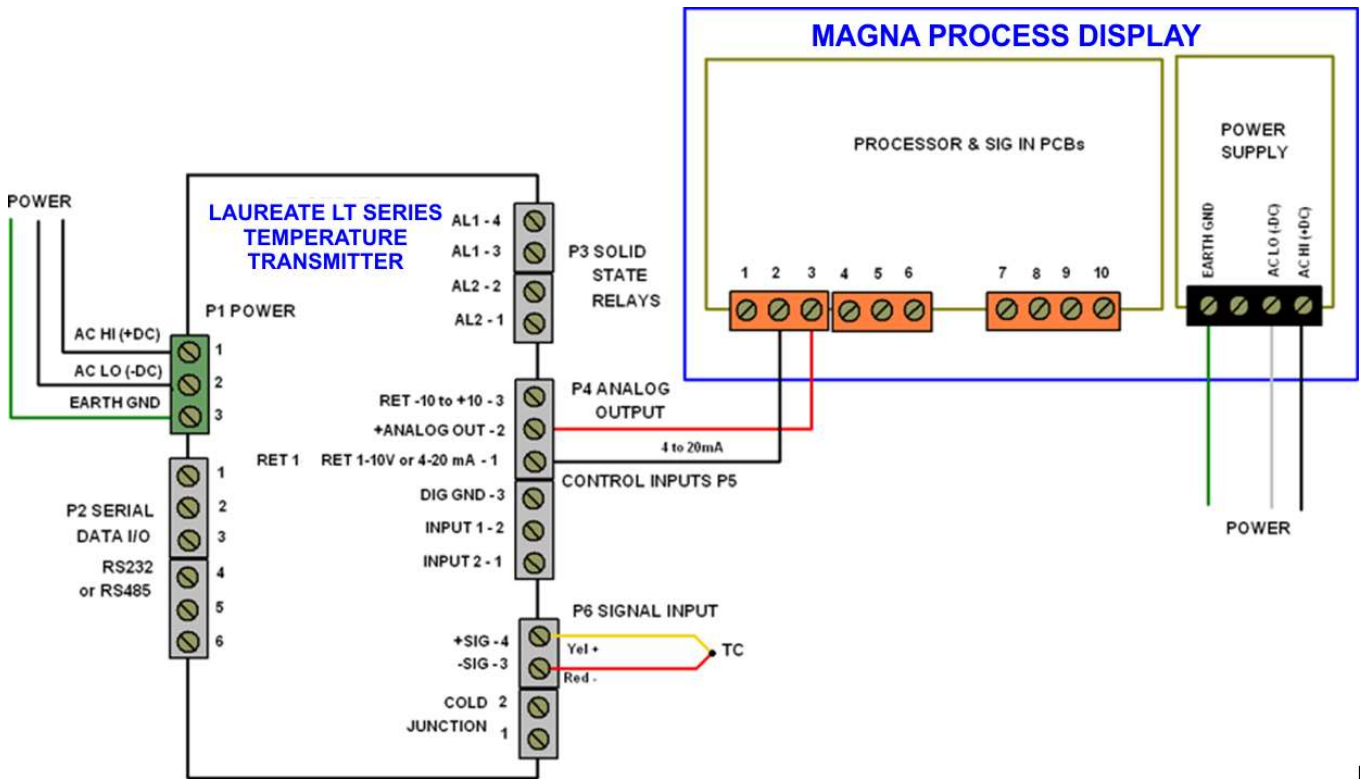
You can also enable or disable the display's front panel buttons, either by a remote contact closure, or by an on-board push-on jumper switch, which is located near to the remote button connector. When the contact is closed, or the push-on switch fitted, the front buttons are enabled.



## Rear case screws - please note

The rear panel is held in place with finger-screws, which only need to be gently tightened.  
**Do not use tools to tighten or loosen the screws, as this could cause damage to the internal threads.**

# Temperature Display Connection Diagram

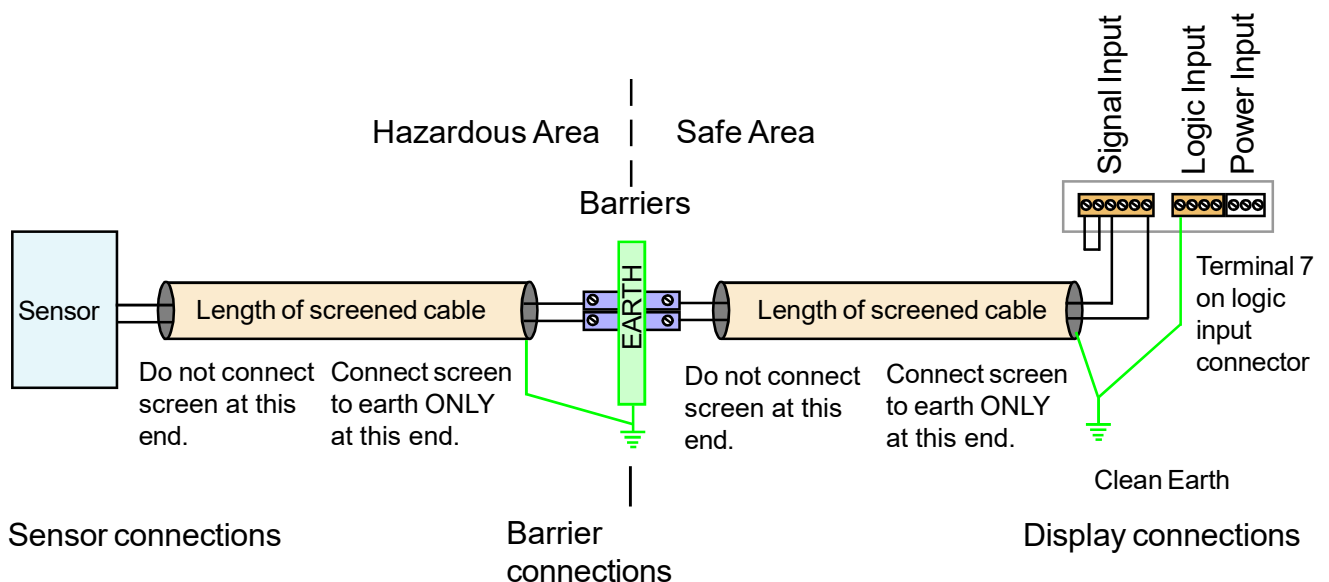


# Installation Hints for Best Performance

This section offers several suggestions which will help you get the best performance from your measurement system.

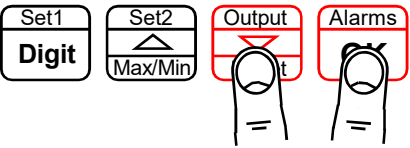
Some sensors generate comparatively small signals which can easily be corrupted by the potentially high level of electrical noise which can be created by electrical machinery such as motors, welding systems, discharge lighting, AC power inverters and solenoids. These steps will ensure you get the best possible performance from your system.

1. Use good quality screened signal cable, with twisted pairs. Belden 8777NH, Belden 9503 and AlphaWire 6010C are good choices, available from many electrical distributors.
2. If you are using multi-pair twisted cable, each pair should be dedicated to a single display as shown opposite, for maximum noise immunity. This will ensure that any electrical noise induced in the cable is properly cancelled. Mixing destinations carelessly amongst the twisted pairs can actually worsen noise performance.
3. Signal and power cables should be routed away from noisy wiring and devices such as power feeds, inverters, discharge-lighting cables, welding cables etc. They should preferably be routed in a dedicated low voltage signalling/instrumentation conduit or cable tray.
4. When using multi-core screened cable to connect several displays to several data sources, use only one twisted pair for each display or sensor. Do not use a wire from one pair for signal positive and a wire from another pair for signal negative, as this would prevent the twisted cables from cancelling induced electrical noise, and could couple noise from one source to another.
4. Screened cable should be earthed at the display end only.
5. All wires and screens coming out of the screened cable should be kept as short as possible to minimise pickup of noise.
6. If you are using barriers, you should earth your screen as shown below, paying particular care that you do not earth both ends of any run of cable.



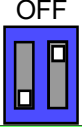
# Language Selection for User Interface

**1**



Set1 Digit Set2 Max/Min Output Alarms

Lockout Switch must be OFF

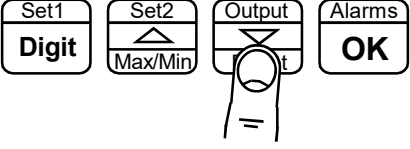


OFF ON

Circuit board ON

Press together, briefly

**2**

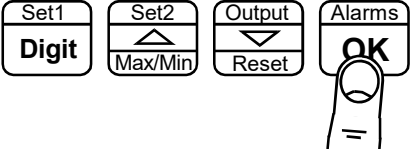


Set1 Digit Set2 Max/Min Output Alarms

For 4 digits: **L.E.n9** for English or **L.F.rA** for French.  
(Default = English)

Press to toggle


**3**



Set1 Digit Set2 Max/Min Output Alarms

Reset OK

Press to accept

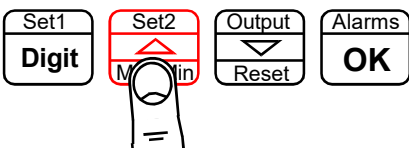


Done!

# Display Brightness Adjustment

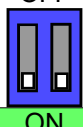
You can adjust the display brightness at any time, provided the display is locked.

**1**



Set1 Digit Set2 Max/Min Output Alarms

Lockout Switch must be ON

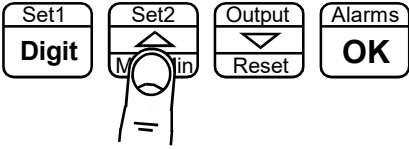


OFF ON

Circuit board ON

Press 3 seconds

**2**



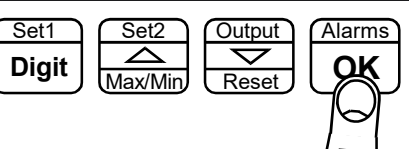
Set1 Digit Set2 Max/Min Output Alarms

Reset OK

For 4 digits, display shows **br .L**  
Each press of the UP button selects a new brightness level. There are 7 brightness levels to choose from.  
(Default = Full brightness)

Press for 3 seconds


**3**



Set1 Digit Set2 Max/Min Output Alarms

Reset OK

Press to accept



Done!



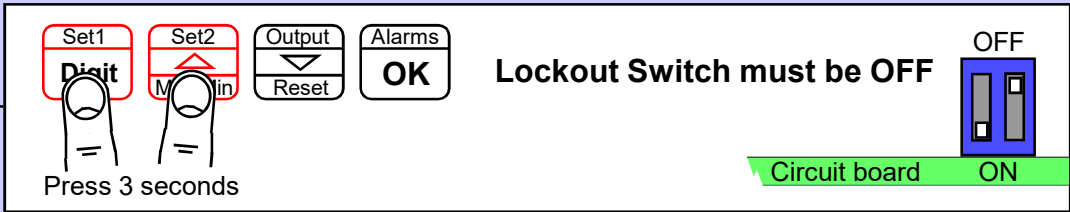
# Meter Calibration Modes

You can choose from two main calibration methods:

1. **Direct Calibration** - this is when you connect the meter to your system and make the meter read what you want it to, at two different points. *This is the preferred calibration method, because it allows you to calibrate the system as a whole.*
2. **Theoretical Calibration** - this is when you type in the sensor's theoretical signal level at the bottom and top of its range and then type in the value the display should show, for each signal level.

How to choose a calibration method:

**1**



Set1 Digit Set2 Max/Min Output Reset Alarms OK

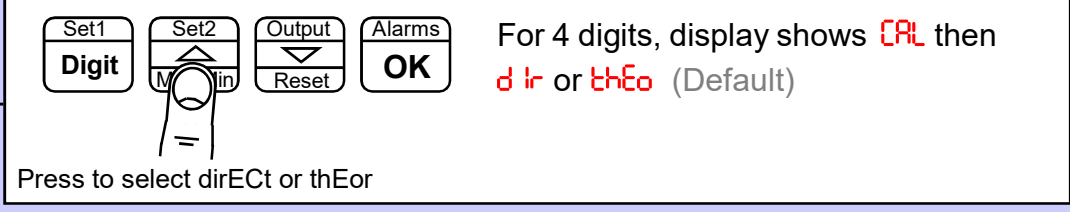
Press 3 seconds

Lockout Switch must be OFF

OFF

Circuit board ON

**2**

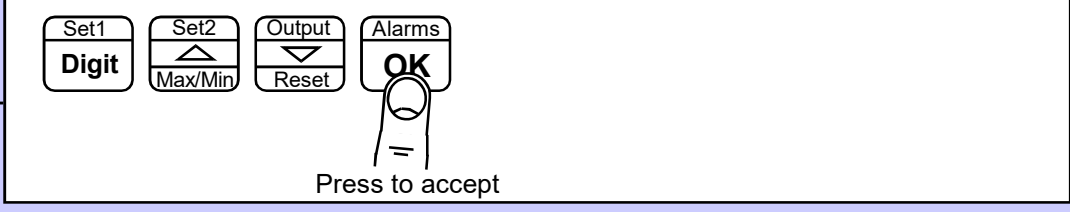


Set1 Digit Set2 Max/Min Output Reset Alarms OK

Press to select dirECt or thEor

For 4 digits, display shows **CAL** then **dIr** or **thEo** (Default)

**3**

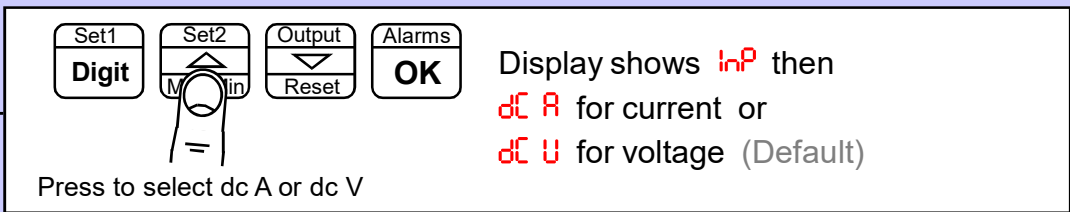


Set1 Digit Set2 Max/Min Output Reset Alarms OK

Press to accept

If you chose Theoretical, you will now be asked whether your input signal will be DC Current or DC voltage ... the display will show **inP** (4 digits) followed by **dC A** or **dC U**

**4**

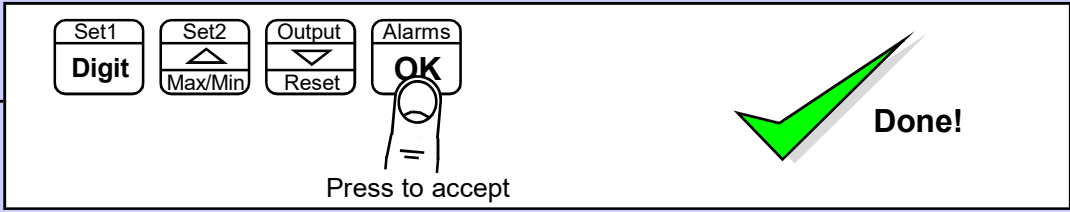


Set1 Digit Set2 Max/Min Output Reset Alarms OK

Press to select dc A or dc V

Display shows **inP** then **dC A** for current or **dC U** for voltage (Default)

**5**



Set1 Digit Set2 Max/Min Output Reset Alarms OK

Press to accept

Done!

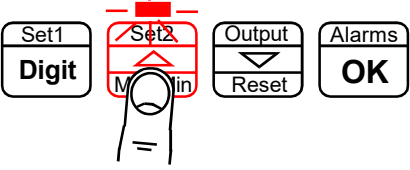
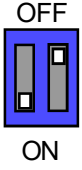
# Direct Calibration - Full Scale Setting

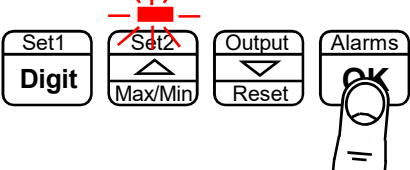
This is when you connect the meter to your system and make the meter read what you want it to, at 2 different points. *This is the preferred calibration method, because it allows you to calibrate the system as a whole.*

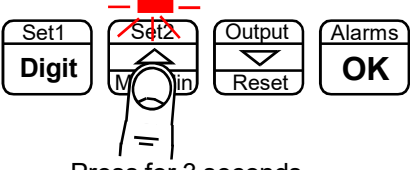
How to do direct calibration:-

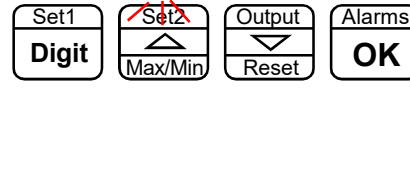
If you have not done so before, please select Direct Calibration mode from the previous page.



First we recommend you set the **FULL SCALE** calibration ...

**1** —  **Lockout Switch must be OFF**  
Display shows **d r** (4 digits)  
followed by **SEt.H**   
Press 3 seconds

**2** —  Apply the highest calibration signal you can achieve, ideally 100% of system capacity. You can use less, but you will get better accuracy with higher signals. Now press OK

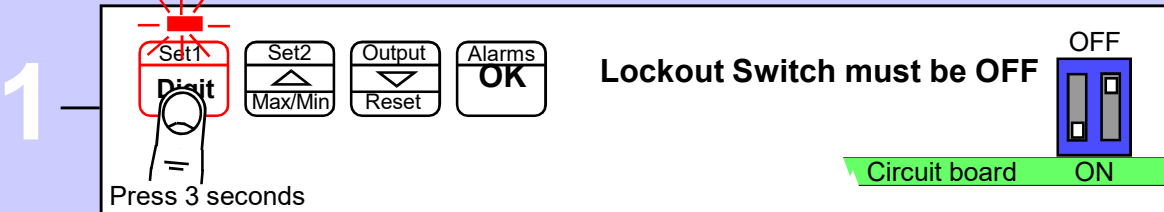
**3** —  Press Set2 for 3 seconds. You can now set your decimal point position using the UP or DOWN buttons. Press OK when done.

**4** —  You can now set the display value you want to see - use DIGIT to select each digit in turn, and the UP or DOWN arrow to increase or decrease each digit's value, as required.

**5** —   **Done!**  
Press to accept

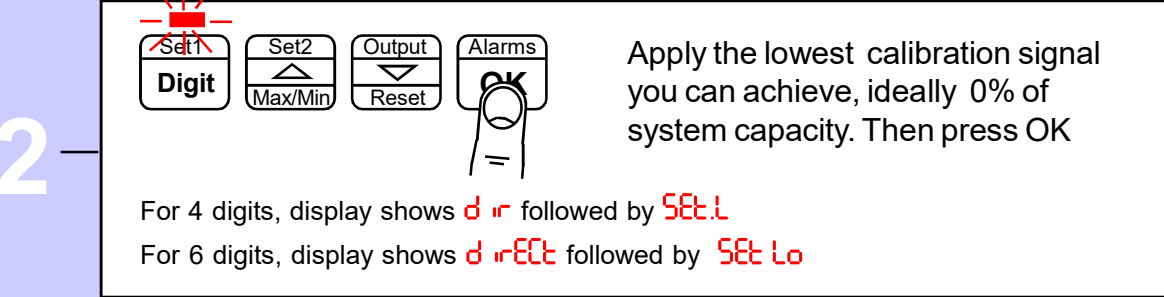
# Direct Calibration - Zero Setting

How to calibrate the **ZERO** point.

- 

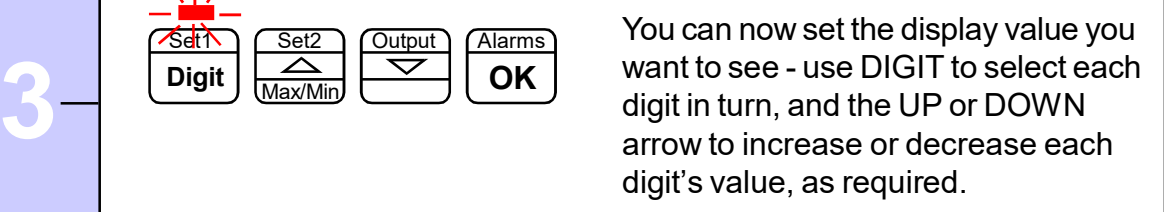
1 Press 3 seconds

Lockout Switch must be OFF

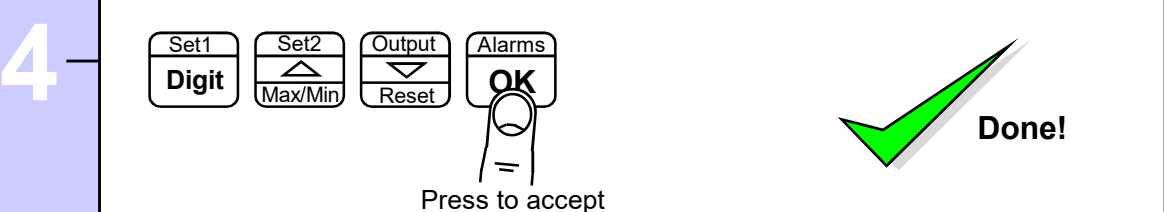
Circuit board ON
- 

2

Apply the lowest calibration signal you can achieve, ideally 0% of system capacity. Then press OK

For 4 digits, display shows **d r** followed by **Set L**  
For 6 digits, display shows **d r E C t** followed by **Set Lo**
- 

3

You can now set the display value you want to see - use DIGIT to select each digit in turn, and the UP or DOWN arrow to increase or decrease each digit's value, as required.
- 

4

Press to accept

Done!

You can set Zero first, if you prefer, but you will not be able to change the decimal point position in the ZERO calibration step.

This will not be an issue if your zero calibration reading is 0, but may become confusing otherwise.

When you have finished your calibration, please remember to put the calibration lockout switch in its ON position, to protect your settings.

# Theoretical Cal. - Decimal Point & Full Scale

This is when you type in the sensor's theoretical signal level at the top and bottom of its range and the value to display, for each signal level.



If you have not done so before, please select Theoretical Calibration mode from the **Meter Calibration** page AND choose whether your input is current or voltage.

First we recommend you set the **FULL SCALE** calibration ...

**1**

Set1 Digit Set2 Max/Min Output Reset Alarms OK

Lockout Switch must be OFF

OFF ON

Circuit board

Press 3 seconds

**2**

Set1 Digit Set2 Max/Min Output Reset Alarms OK

Display shows **thEo** (4 digits) followed by **dC A** or **dC V**, depending on whether you have chosen current or voltage input, then **in H**.

**3**

Set1 Digit Set2 Max/Min Output Reset Alarms OK

You can now specify the maximum input signal. Use DIGIT to select each digit in turn, and the UP or DOWN arrow to increase or decrease each digit's value. Eg., set **20.00** (4 digits) if your input is 4-20 mA.

Press to accept

**4**

Set1 Digit Set2 Max/Min Output Reset Alarms OK

Defaults are  
4-20mA = 0-100.0 for dCA and  
0-10V = 0-100.0 for dC V

Display now shows **rdH**, briefly. You can now specify the maximum reading and decimal point position. Press Set2 button for 3 seconds to set decimal point position. Use up and down arrows to move the decimal point and press OK when done. Then, use DIGIT to select each digit in turn, and the UP or DOWN arrow to increase or decrease each digit's value, as required. eg set 100.0 if your display range is 0 to 100.0

**5**

Set1 Digit Set2 Max/Min Output Reset Alarms OK









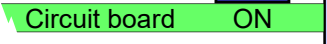
Press to accept









Done!









# Theoretical Calibration - Low End Calibration









This is when you type in the sensor's theoretical signal level at the top and bottom of its range and the value to display, for each signal level.










If you have not done so before, please select Theoretical Calibration mode from the **Meter Calibration** page.

**1** —      **Lockout Switch must be OFF**    
   **OK**   
    
 Press 3 seconds

**2** —      Display shows **thEo** (4 digits) followed by **dC R** or **dC U**, depending on whether you have chosen current or voltage input, then **in Lo**   
      
 Press OK. You can now specify the lowest input signal. Use DIGIT to select each digit in turn, and the UP or DOWN arrow to increase or decrease each digit's value, as required. Eg., set **04.00** (4 digits) if your input is 4-20 mA.

**3** —        
      
 Press to accept

**4** —      Display now shows **rd Lo** briefly. You can now specify the low reading. Use DIGIT to select each digit in turn, and the UP or DOWN arrow to increase or decrease each digit's value, as required. Eg., set **000.0** (4 digits) for 0 to 100.0 or 0 to 100.000   
      
 Press to accept

**5** —        
      
 Press to accept  **Done!**

You can set Zero first, if you prefer, but you will not be able to change the decimal point position in the ZERO calibration step. This will not be an issue if your zero calibration reading is 0, but may become confusing otherwise.

# Sensor Drift Correction

The capability on this page is part of the MAGNA process display, but it is normally not used with temperature.

If your system is normally reading 0, for example as is typical with platform scales or a torque meter, you may find a small amount of sensor drift caused by changes in temperature, ageing etc.

We can automatically correct for slow, long term drift, by comparing your signal to 0 every 30 seconds, and re-calibrating to remove any detected movement.

This does not affect the sensitivity of your system, and is only applied for readings less than 8 least-significant counts.

The corrected value is stored in non-volatile memory, so that any drift trend will be re-applied after you have switched off the meter.

**1** Lockout Switch must be OFF

Set1 Digit Set2 Max/Min Output Alarms

Press together, briefly

Circuit board ON

**2** Press OK button briefly and repeatedly until you see **drf.0** or **drf.1** displayed for 4 digits.

Set1 Digit Set2 Max/Min Output Reset Alarms OK

**3** Press DOWN or UP button to toggle between **drf.0** or **drf.1** (4 digits).

Press briefly to toggle

**drf.0** or **drift.0** = No Correction (Def.)  
**drf.1** or **drift.1** = Correction is active

**4** Press to accept

Done!

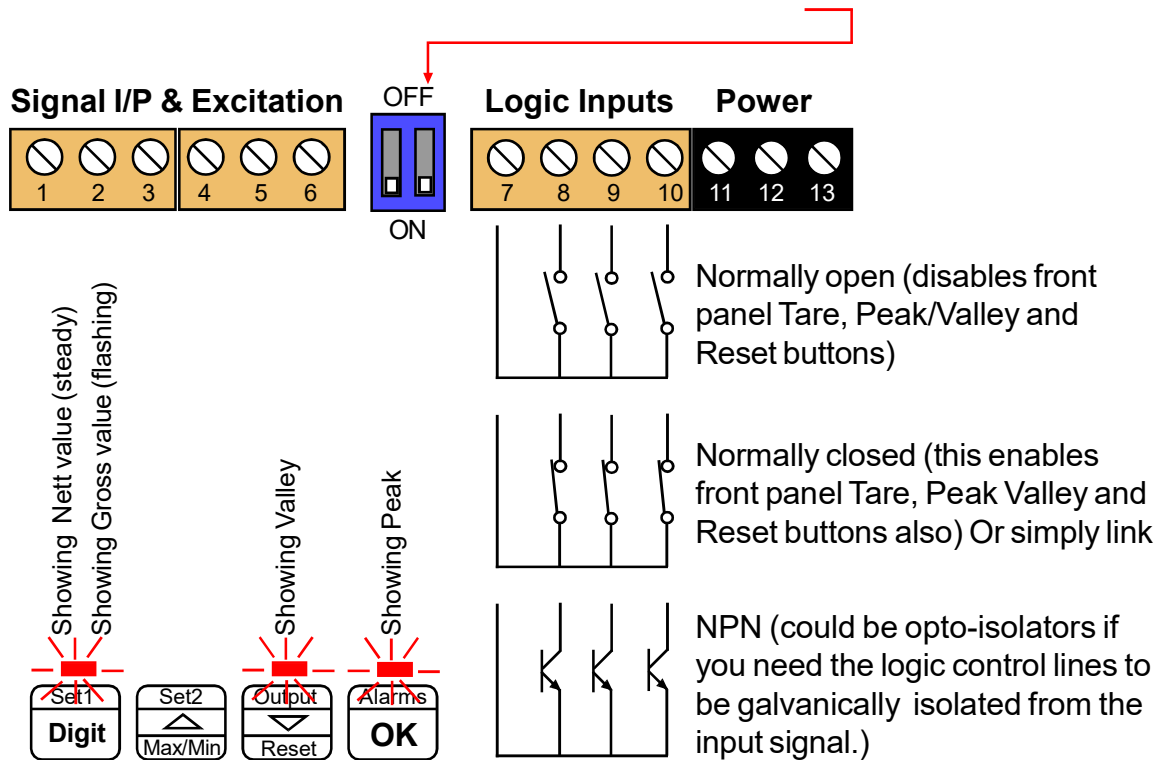
# Logic Input Connections and Front Buttons

The previous pages explained how to select the functions of the 3 logic inputs. You can connect remote contact closures or open NPN collectors to activate these logic inputs.

The logic input provides a 5V DC signal. When you connect this to common, a current of 1mA will flow. Because this is a small signal, we recommend you use switches with gold plated contacts, or self cleaning contacts, for best long term reliability.

The logic inputs are not galvanically isolated from the input signal.

The logic inputs are only activated when the lockout switch is ON

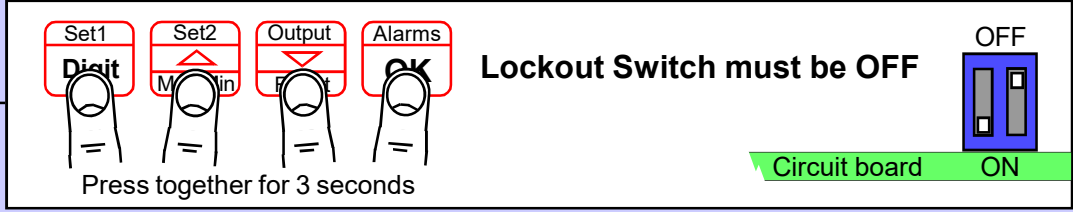


- tArE** = Tares display to 0. Often used in weighing systems to zero a display prior to making a measurement. Net weight is shown once tared. When a display has been tared the small LED above the Set1 button will be illuminated.
- PU** = Peak/Valley toggle. Allows you to view the maximum and minimum values which have been displayed since last reset. 0% LED illuminates when showing valley, 100% LED illuminates when showing peak.
- rSt** = Reset. This clears any tare, peak, valley, alarm latch.
- HoLd** = Freezes the displayed value for as long as the Hold input is closed.
- n.9r** = Toggles between Net and Gross values on the display (4 digits).
- nEt.9ro** = Toggles between Net and Gross values on the display (6 digits).
- PA.1 .. 4** = Page Addresses, if MEM option is installed.

# Factory Defaults

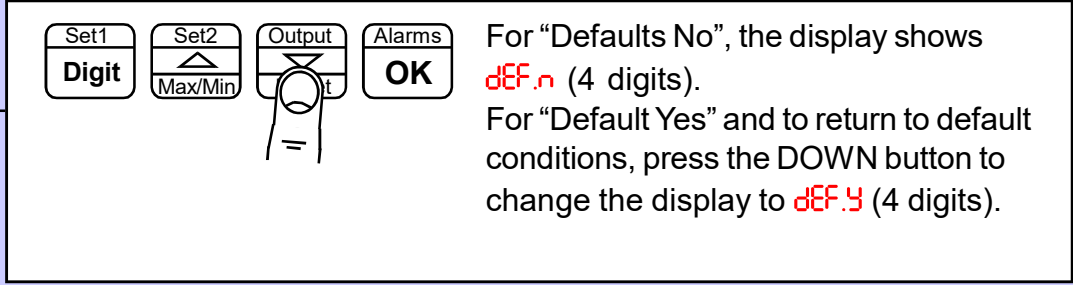
You can return the display to its factory default conditions whenever you wish. If you do so, you will permanently lose all your settings and will need to start from the beginning again.

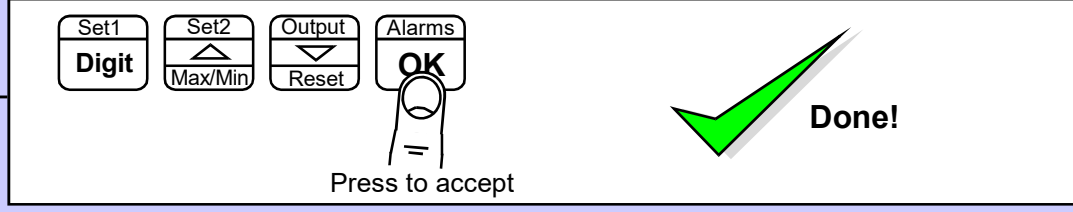
The calibration Audit Counter will NOT be reset, there is no way provided to reset this value, as it is intended as a secure record to indicate whether changes have been made to the display since it was last calibrated..

- 

1 — Press together for 3 seconds

Lockout Switch must be OFF

Circuit board ON
- 

2 — For “Defaults No”, the display shows **dEF.n** (4 digits).  
For “Default Yes” and to return to default conditions, press the DOWN button to change the display to **dEF.y** (4 digits).
- 

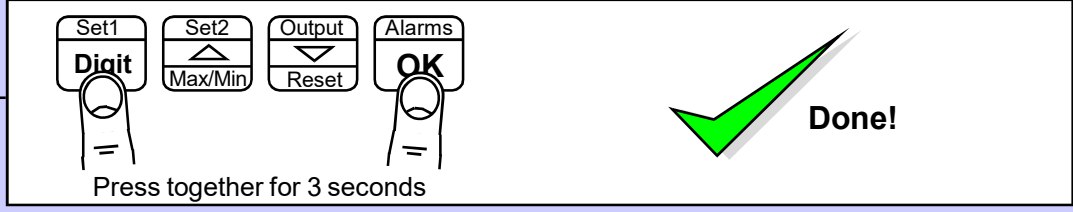
3 — Press to accept

Done!

# Calibration Audit Number

Your display includes a non-resettable counter which increments each time you make a change to the display’s calibration. This is useful if you want to check whether a display has been altered since it was last calibrated.

The calibration audit number ranges from **CL01** to **CLFF** (4 digits), allowing up to 255 alterations to be recorded. Whenever you want to check the calibration audit number, press and hold the 2 outer buttons (Set1 + Alarms) for more than 3 seconds.

- 

1 — Press together for 3 seconds

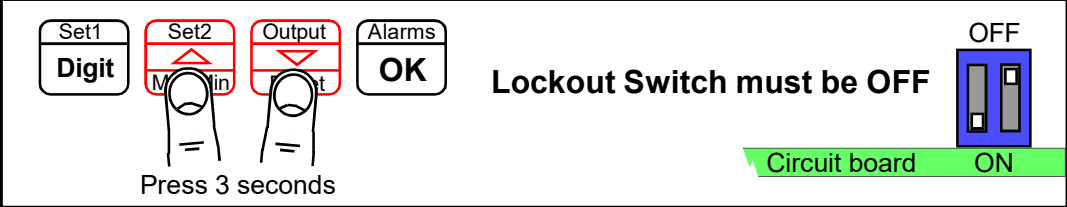
Done!



# Signal Filtering / Averaging

You can adjust the filtering time constant to reduce the effect of noise or instability on your input signal. A larger FIL value will give a more stable display, but the response to signal changes will be slower.

Because your output options, such as analogue output, alarm relays and serial output are all derived from the displayed value, they will respond at the same rate as the filtered display.

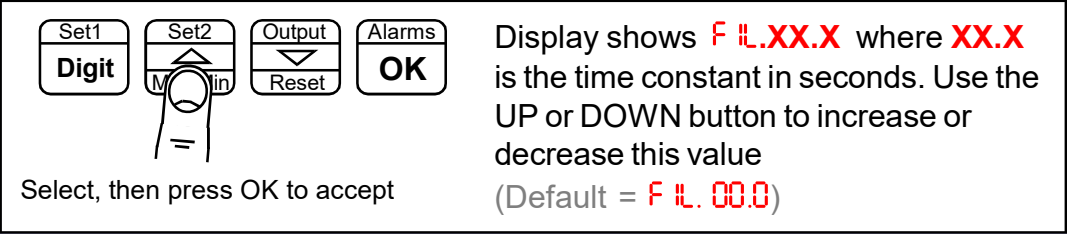
- 

1

Set1 Digit Set2 Max/Min Output Reset Alarms OK

Press 3 seconds

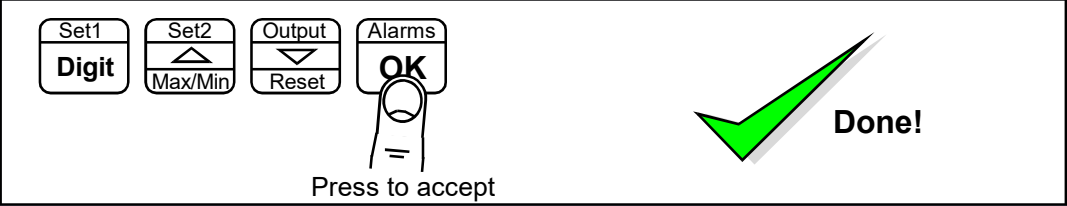
Lockout Switch must be OFF

Circuit board ON
- 

2

Set1 Digit Set2 Max/Min Output Reset Alarms OK

Select, then press OK to accept

Display shows **FIL.XX.X** where **XX.X** is the time constant in seconds. Use the UP or DOWN button to increase or decrease this value  
(Default = **FIL.00.0**)
- 

3

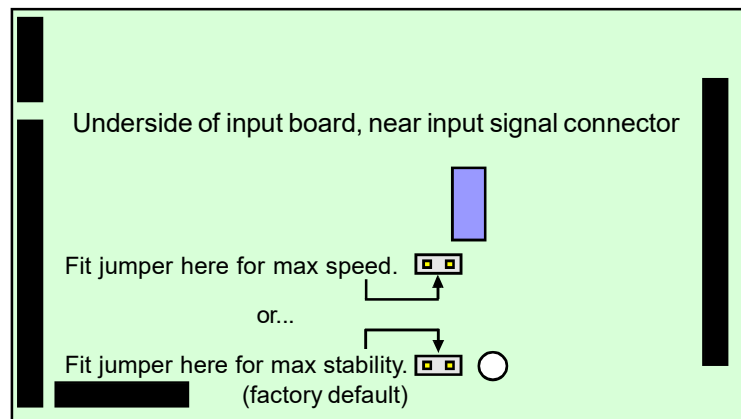
Set1 Digit Set2 Max/Min Output Reset Alarms OK

Press to accept

Done!

See also Filter Jump setting if your signal is particularly noisy and you cannot get sufficient smoothing with this filter.

This meter also includes an active filter for removing the effects of vibration. It is shipped with the filter enabled for maximum stability. You can move a push-on jumper switch to change the filter response to maximum speed if you wish. See below.



# Filter Jump Value

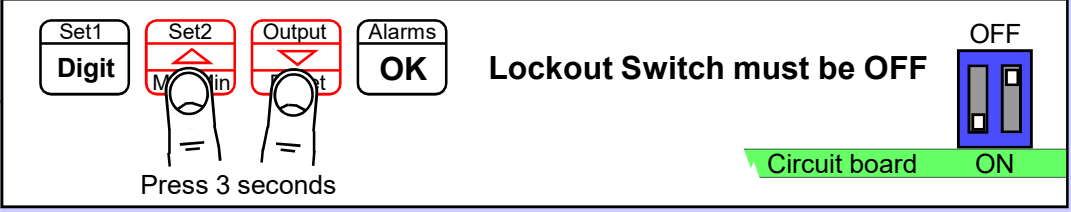
The Filter Jump value allows you to decide how the display will respond to a process step change. It does this by overriding the filtering, if the input signal moves by more than a chosen amount in one conversion. The Filter Jump default value is 10%.

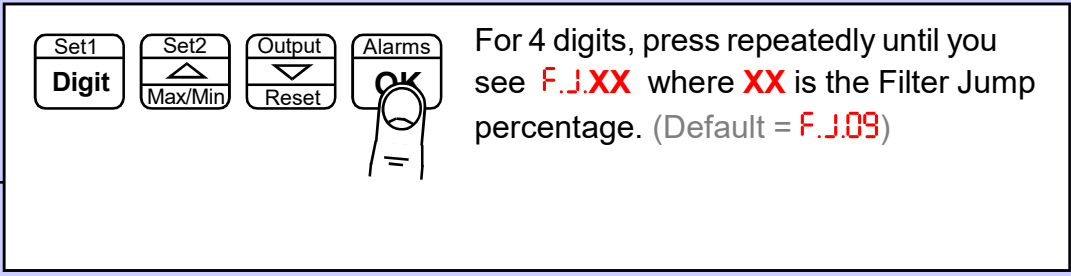
This means that for noise amplitude which has a peak value of less than 10% of the input range, filtering will be applied. Any signal movement greater than 10% of the input range will cause the display to jump immediately to that value, without filtering. After that jump, normal filtering will be re-applied, provided signal movement thereafter is less than 10% per conversion.


## Guidance:

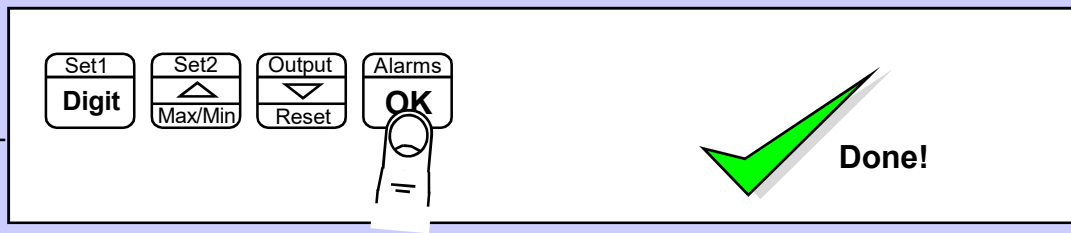
For noisy systems, increase the Filter Jump value up to a maximum of 99. Choose a value which gives a good compromise between filtering and response speed.

For reasonably clean signals, a Filter Jump value of around 10 or less will give a good compromise between filtering and response speed to step change inputs.

**1** —   
Press 3 seconds

**2** —   
For 4 digits, press repeatedly until you see **F.J.XX** where **XX** is the Filter Jump percentage. (Default = **F.J.09**)

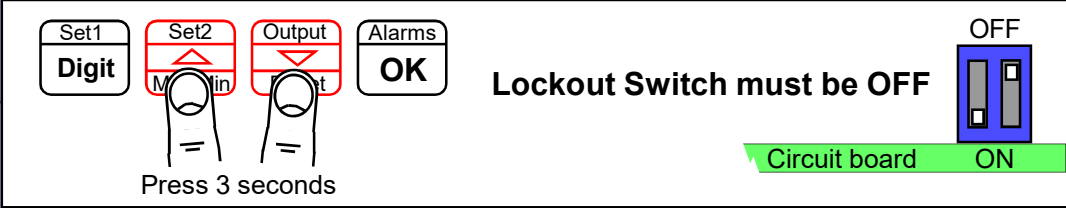
**3** —   
You can set from **00** to **99**. Use the DIGIT and UP or DOWN button to increase or decrease this value.

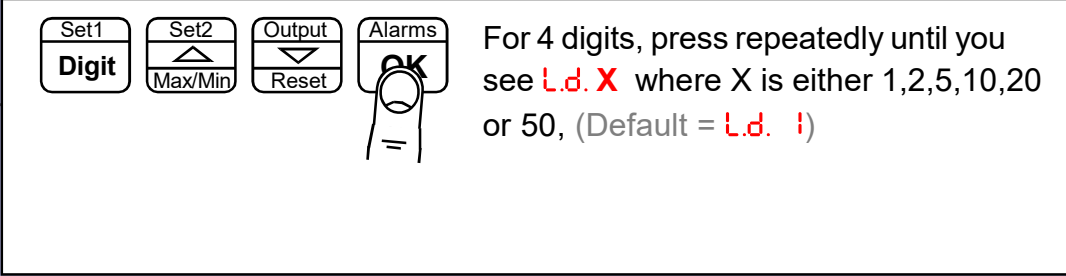
**4** —   
Done!

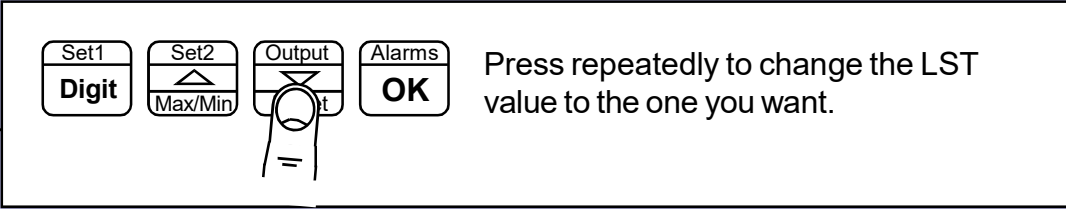
# Last Digit Rounding Up by 1, 2, 5, 10, 20 or 50

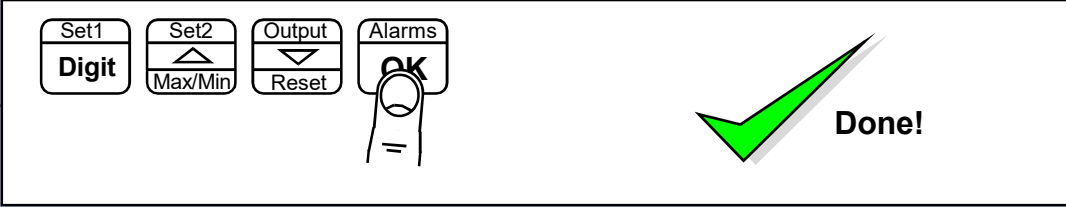
You can adjust the way the display rounds up, which is useful if you want to display a very large number, but do not want jitter on the last digit.

The display can be set to round up to the nearest 1 (no rounding) 2, 5, 10, 20 or 50

**1** —  **Lockout Switch must be OFF**  
Press 3 seconds

**2** —  For 4 digits, press repeatedly until you see **L.d.X** where X is either 1,2,5,10,20 or 50, (Default = **L.d. 1**)

**3** —  Press repeatedly to change the LST value to the one you want.

**4** —  **Done!**

# Scale Factor Adjustment

After you have calibrated your meter, you can use the SCALE feature to make fine adjustments to calibration, without affecting the calibration itself.

## Example

### Changing volume units of measure from litres to Imperial gallons

You could also use the SCALE to convert your readout from litres to imperial gallons, without affecting the calibration. Simply set SCALE = 0.220 and your meter which was calibrated in litres will now read in imperial gallons.

### Changing weight units of measure from kg to pounds

You could also use the SCALE to convert your readout from kg to pounds, without affecting the calibration. Simply set SCALE = 2.205 and your meter which was calibrated in kg will now read in pounds.

**1** — Lockout Switch must be OFF

Press 3 seconds

Circuit board ON

**2** — For 4 digits, press repeatedly until you see **SCAL**, followed by the existing scale factor. (Default = **00 1.0**)

**3** — Use **DIGIT** button to select each digit in turn, **UP** or **DOWN** buttons to increase or decrease each digit's value. Press **OK** when done.

**4** — Press to accept

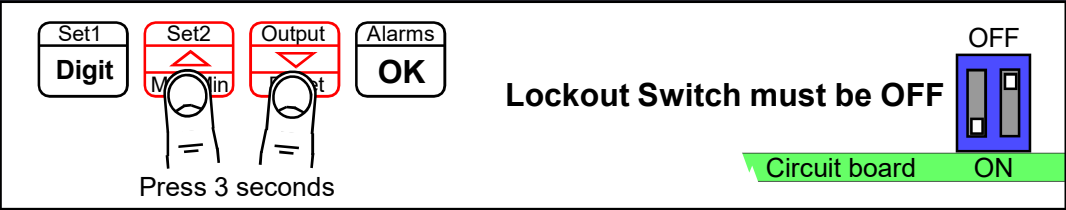
Done!

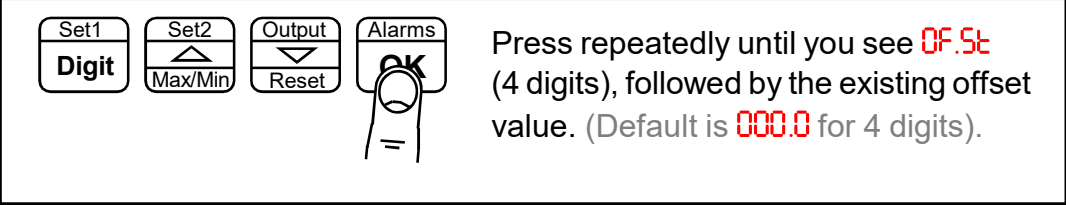
You may want to adjust an offset value also, see separate OFFSET page for this feature.

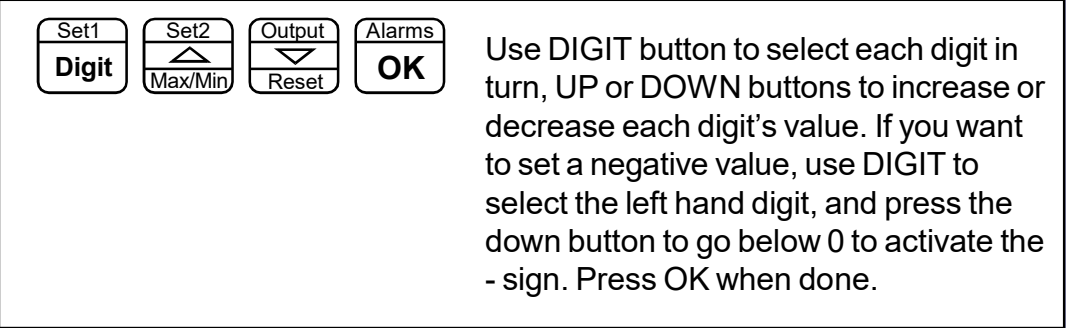
# Offset Adjustment

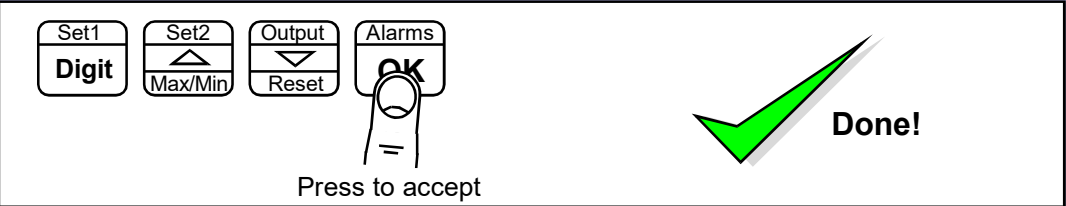

After you have calibrated your meter, you can use the Offset feature to make fine additions or subtractions to the reading, without affecting the calibration itself.

For example if your weighing structure is altered after calibration and you want to subtract the effect of 37kg of extra metalwork which was welded to the hopper, you can easily do this by entering a value of -37 in the offset value.

**1** —  **Lockout Switch must be OFF**  
Circuit board ON

**2** —  Press repeatedly until you see **OF.St** (4 digits), followed by the existing offset value. (Default is **000.0** for 4 digits).

**3** —  Use DIGIT button to select each digit in turn, UP or DOWN buttons to increase or decrease each digit's value. If you want to set a negative value, use DIGIT to select the left hand digit, and press the down button to go below 0 to activate the - sign. Press OK when done.

**4** —   **Done!**  
Press to accept

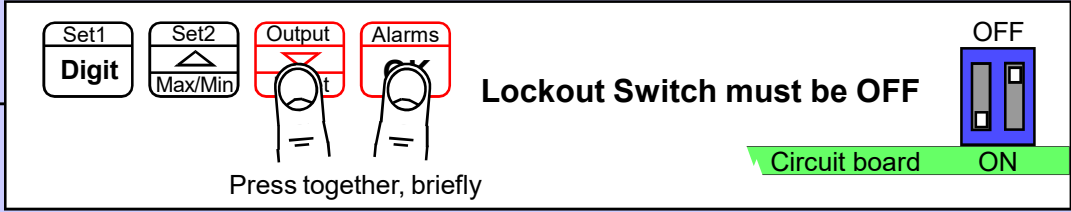
You may want to adjust a SCALE FACTOR value also, without affecting calibration. See the separate SCALE page for this feature.

# Menu Timeout Adjustment

The display has a default timeout of 60 seconds, to allow you sufficient time to refer to the manual between key operations.

You can make this period shorter, if you wish, once you become more familiar with the setup method.

**1**



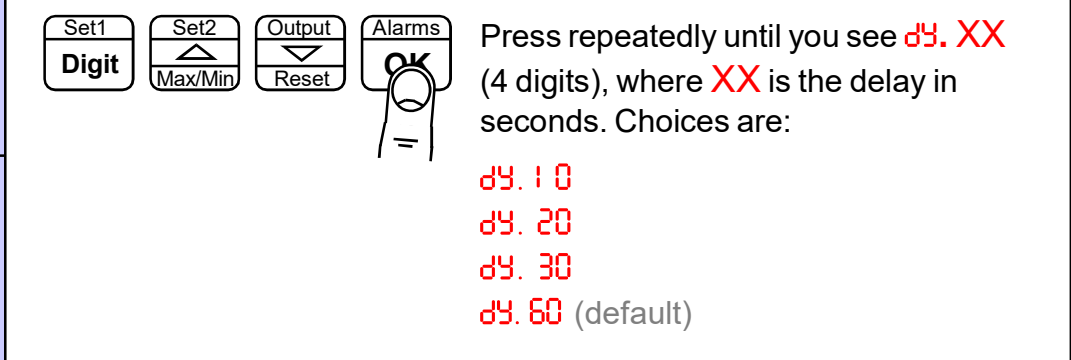
Set1 Digit   Set2 Max/Min   Output   Alarms

Lockout Switch must be OFF

Circuit board ON

Press together, briefly

**2**

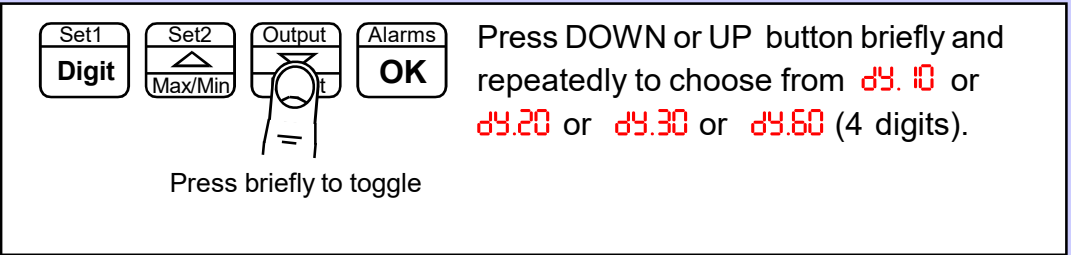


Set1 Digit   Set2 Max/Min   Output Reset   Alarms OK

Press repeatedly until you see **dy. XX** (4 digits), where **XX** is the delay in seconds. Choices are:

- dy. 10
- dy. 20
- dy. 30
- dy. 60 (default)

**3**

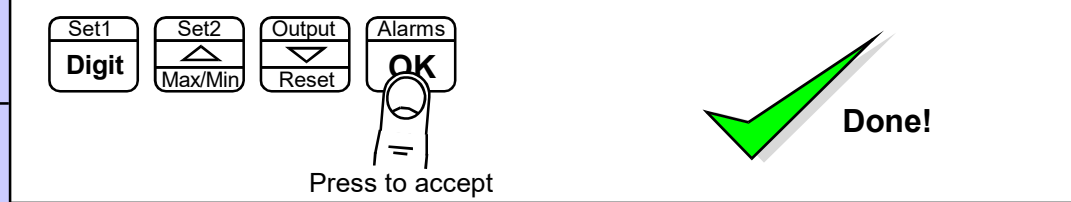


Set1 Digit   Set2 Max/Min   Output   Alarms OK

Press DOWN or UP button briefly and repeatedly to choose from **dy. 10** or **dy. 20** or **dy. 30** or **dy. 60** (4 digits).

Press briefly to toggle

**4**



Set1 Digit   Set2 Max/Min   Output Reset   Alarms OK

Press to accept

Done!

# Reverse Display Function (Mirror Image)

If you need to be able to see a reflection of the display in a mirror or other reflective surface, for example in a simple heads-up system, or for drivers reversing into a bay, using mirrors only, you can set the display to show as a mirror image.

**1**

Set1 Digit    Set2 Max/Min    Output    Alarms

Press together, briefly

Lockout Switch must be OFF

Circuit board ON

**2**

Set1 Digit    Set2 Max/Min    Output Reset    Alarms OK

Press OK button briefly and repeatedly until you see:

rEV.0 (Default) or rEV.1 (4 digits)

**3**

Set1 Digit    Set2 Max/Min    Output    Alarms OK

Press DOWN or UP button briefly and repeatedly to choose from

rEV.0 or rEV.d 0 (normal display) or  
rEV.1 or rEV.d 1 (mirror image display)

Press to accept

Done!

rEV.d 0



Example of normal display displaying the number 876543

rEV.d 1



Example of Mirror Reverse display displaying the number 876543

# Bootup Routine and Tare Save Choices

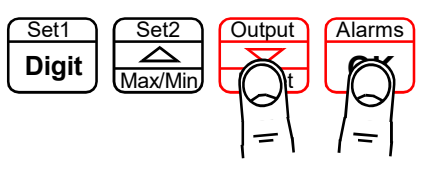

When you switch on your meter, it can be set to power up with 3 possible summary message combinations. The choices are:-

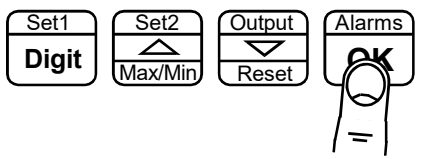
**bt 0** (4 digits) = Segment test, followed by a full summary of software revision, calibration audit number, model number, installed options.

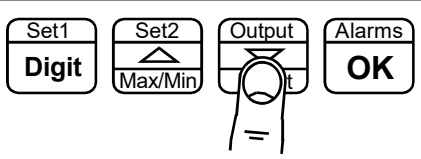
**bt 1** (4 digits) = Segment test followed by model number (Default)

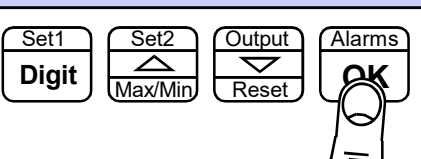
**bt 2** (4 digits) = No summary, meter displays the measurement value immediately when power is applied.

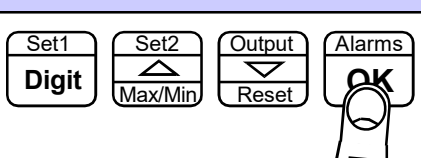
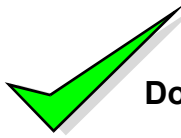
**bt 3** (4 digits) = All segments illuminate permanently, until a button is pressed.

**1** —  **Lockout Switch must be OFF**   
Circuit board ON

**2** —  Press OK button briefly and repeatedly until you see **bt 0**, **bt 1**, **bt 2** or **bt 3** displayed (4 digits).

**3** —  Press DOWN or UP button briefly and repeatedly to choose from **bt 0** to **bt 3** (4 digits).  
Press briefly to toggle

**4** —  Press to accept

**5** —  Press to accept  **Done!**



# Error Codes and Fault Finding



1. Under Range. The meter is being asked to display a value which is more negative than its limit of -1999



2. Over Range. The meter is being asked to display a value which is higher than its limit of 9999

These fault codes could be displayed because the signal is too negative, too positive, or because there is a wiring error, or because the display's scaling has been adjusted to give excessive sensitivity, or because there is a fault in the display.

a. If you are connecting a 4-20 mA signal to the display, please measure the DC millivolt signal between terminals 2(-) and 3(+). Ideally, you will measure 132 mV at 4 mA and 660 mV at 20 mA.

If the voltage is much higher, there may be a problem with the 33 Ohm input shunt resistor.

You can verify this as follows...

Remove the input signal and power connectors to the meter, and measure the resistance between terminals 2 and 3. This should be 33 Ohms. If it is more than this, the resistor has probably been overloaded and burned by having a voltage connected across it. Please check your field wiring to ensure that no more than 30 mA or 1V can be applied to the current input terminals.

Sometimes excessive current can feed to the current input of the display if your 2-wire 4-20 mA transmitter is faulty or is wired incorrectly, because we rely on the transmitter to regulate the loop current between 4 and 20 mA. The excitation power supply for the loop may have a much higher capacity than 20 mA.

b. If the measurements above were satisfactory, the problem may be caused by the scaling being too sensitive.

If you are happy to do so, it is a simple matter to reset the display's scaling to the factory default conditions. Put the lockout switch off and press all 4 buttons together for around 3 seconds until the display shows "dEFS n". Then press the UP button once so the display shows "dEFS Y". Now press the OK button and the display will be reset to factory defaults.

If still no success, please return the display to us for the attention of our QA Manager, with a report of what you found, for repair.

# Main Display Specifications

<b>Case Material</b>	Heavy duty welded uPVC.
<b>Connectors</b>	Internal detachable Screw Terminal connectors accessed via compression glands.
<b>Environmental</b>	Storage Temperature range -20 to +70°C, non condensing. Operating temperature range 0 to 50C. Internal heater option available for use in conditions down to -25°C.
<b>Power</b>	100-240 VAC, 48 VAC, 45 to 60Hz or 11-30 VDC optional.
<b>Burden</b>	40VA maximum.
<b>Sealing</b>	IP65 all round (NEMA-4) provided the display is mounted vertically and that all cable glands and rear case-closure screws are properly secured.
<b>Input Signals (bipolar)</b>	0-10V, 0-5V, 1-5V, 0-10mA, 0-20mA, 4-20mA
<b>Input Resistance</b>	1 Megohm for voltage, 33 Ohms for current inputs
<b>Accuracy</b>	+/-0.05% of range
<b>Span tempco</b>	25 ppm/°C
<b>Zero Tempco</b>	30 ppm/°C
<b>24V Excitation voltage</b>	24 VDC nominal rated at 60mA
<b>10V Excitation voltage</b>	10 VDC nominal rated at 20mA
<b>Filtering / smoothing</b>	Selectable time constants of 0 to 25 seconds.
<b>A/D conversion</b>	Sigma-Delta 10 conversions per second, 50/60Hz rejection Resolution 1 in 400 000 max. over full range
<b>Display update rate</b>	10 readings per second.
<b>Display Range (max)</b>	-199999 to +199999, depending on available signal level.

## Plug-In Output Options

<b>Analog Output</b>	See analog output manual for details. Available from our website.
<b>Alarm Relay Output</b>	See alarm output manual for details. Available from our website.
<b>ASCII Data Output</b>	See Serial output manual for details. Available from our website.
<b>Calendar/Clock option</b>	See serial output manual for details. Available from our website.

# RTD Input Specifications

Calibration, Pt 100 DIN	Per IEC 751 (ITS-90)
Calibration, Pt 100 ANSI	NIST Monograph 126
Calibration, Ni 120	43760
Max error at 25°C, Pt100	±0.04°C (±0.07°F) ±0.01% of reading
Span tempco	±0.003% of reading/°C
Zero tempco	±0.03 deg/deg
Provision for user calibration	Multiplier of RTD resistance plus offset in degrees
Connection	2, 3 or 4-wire
Overvoltage protection	125 Vac
Open sensor indication	0 mA or > 20mA output, user selectable
Sensor lead resistance	2-wire, 10 mdeg/ohm/deg up to 10 ohms
Tempco per conductor	3 & 4-wire, 10 mdeg/O/deg up to 100 ohms

RTD Metal	Alpha	R at 0°C	R at top of range	Excitation Current	Range	Conformity Error
Platinum	0.003850 (DIN)	100Ω	390.48Ω at 850°C	196 μA	-202°C to +850°C -331°F to +1562°F	±0.03°C ±0.05°F
Platinum	0.003902 (ANSI)	100Ω	394.36Ω at 850°C	196 μA	-202°C to +631°C -331°F to +1168°F	±0.04°C ±0.07°F
Nickel	0.00672	120Ω	380.31Ω at 260°C	196 μA	-80°C to +260°C -112°F to +500°F	±0.05°C ±0.09°F
Copper	0.00427	9.035Ω	19.116Ω at 260°C	5.0 mA	-100°C to +260°C -148°F to +500°F	±0.05°C ±0.09°F

# Thermocouple Input Specifications

Calibration	NIST Monograph 125 (IPTS-68)
Overall error at 25°C	±0.01% of full span ± conformity error
Span tempco	±0.003% of reading/°C
Reference junct. accuracy	0.5°C, 10°C to 40°C
Input resistance	1 Gohm
Input current	100 pA
Max lead resistance	1 kohm max for rated accuracy
Overvoltage protection	125 Vac
NMR at 50/60 Hz	80 dB plus selectable digital filter
CMR, DC-60 Hz	120 dB with 500 ohm imbalance
CMV, DC-60 Hz	250 Vac from power and earth grounds

TC Type	Range	Conformity Error
J	-210°C to +760°C (-347°F to +1400°F)	±0.09°C (±0.16°F)
K	-244°C to +1372°C (-408°F to +2501°F)	±0.1°C (±0.17°F)
T	0°C to +400°C (32°F to 752°F) -257°C to 0°C (-430°F to +32°F)	±0.03°C (±0.05°F) ±0.2°C (±0.36°F)
E	-240°C to +1000°C (-400°F to +1830°F)	±0.18°C (±0.32°F)
N	-245°C to +1300°C (-410°F to +2370°F)	±0.10°C (±0.17°F)
R	-45°C to +1768°C (-49°F to +3214°F)	±0.17°C (±0.31°F)
S	-46°C to +1768°C (-51°F to +3214°F)	±0.12°C (±0.22°F)

# Declaration of CE Conformity

Declaration Reference : INs  
Title : DOC-INTUITIVE2

This is to confirm that the Product covered by this declaration has 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 at the meter end of the cable.

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