LD4-IVT

Large Digit Display
Rate/Total
0-20mA, 4-20mA, ±100mV,
±1V, ±10V or ±100VDC Input

Operation and Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the LD4-IVT rate/total monitor. The LD4 is a general purpose instrument which may be configured to accept inputs of 0 to 20mA, 4 to 20mA, ±100mV, ±1V, ±10V or ±100VDC.

The LD4-IVT offers the choice of linear or square root display or rate/total display.

This manual contains information for the installation and operation of the LD4-IVT Monitor. The LD4 is a general purpose instrument which may be configured to accept an input of 0 to 20mA, 4 to 20mA, ±100mV, ±10V or ±100VDC. The LD4-IVT offers the choice of linear or square root display. Two separate sets of calibration scaling values can be stored, with the display choice being made via a remote input.

The instrument may be calibrated to display the input in engineering units. Two standard inbuilt relays are provided for alarm/control functions, a transmitter supply of 18VDC (unregulated) is also provided on AC powered models. An optional isolated ±12V (24V) transmitter supply is available. Optional isolated analog retransmission or serial communications may also be provided.

Unless otherwise specified at the time of order, your LD4 has been factory set to a standard configuration, see the “Function Table”, Chapter 5, for a list of default settings. Like all other LD4 series instruments the configuration and calibration is easily changed by the user. Initial changes may require dismantling the instrument to alter PCB links, other changes are made via push button functions.

The LD4 series of Large Digit Display Monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels.

Inputs

Programming keypad (on main circuit board)
Power supply 240VAC, 110VAC, 12 to 16VAC, 15 to 24VDC or
optional isolated DC supplies (factory configured)
Signal input ±20mA, 4-20mA, ±100mV, ±1V, ±10V or ±100V (set via internal links)
Remote switch input to perform special functions
such as total reset or display toggle

Standard outputs

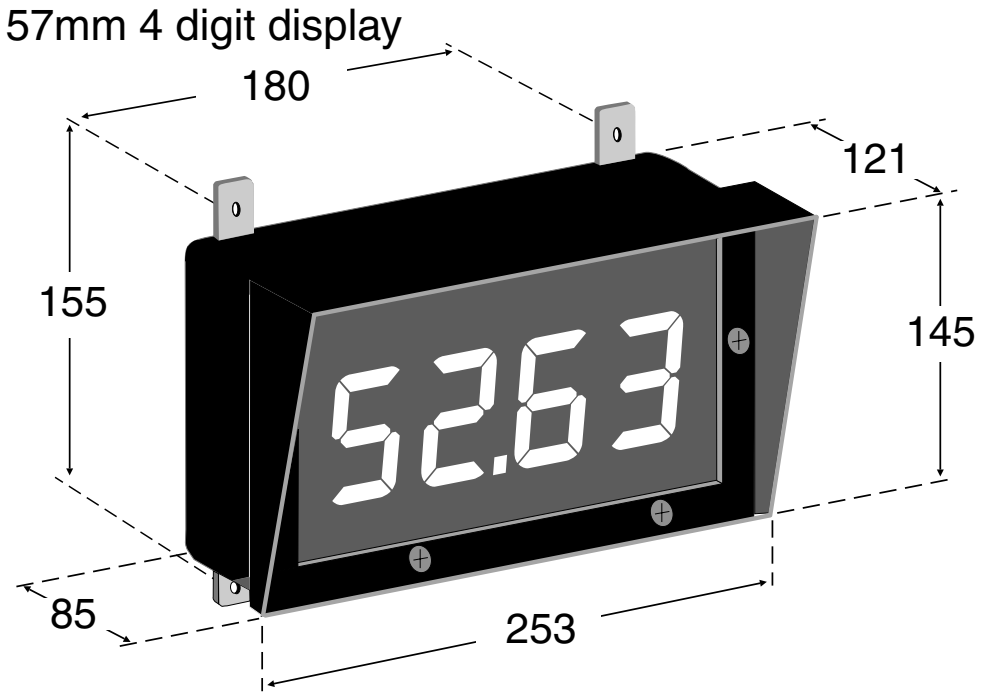
Two alarm relays
Transmitter supply 16VDC unregulated & non isolated (AC powered models only)

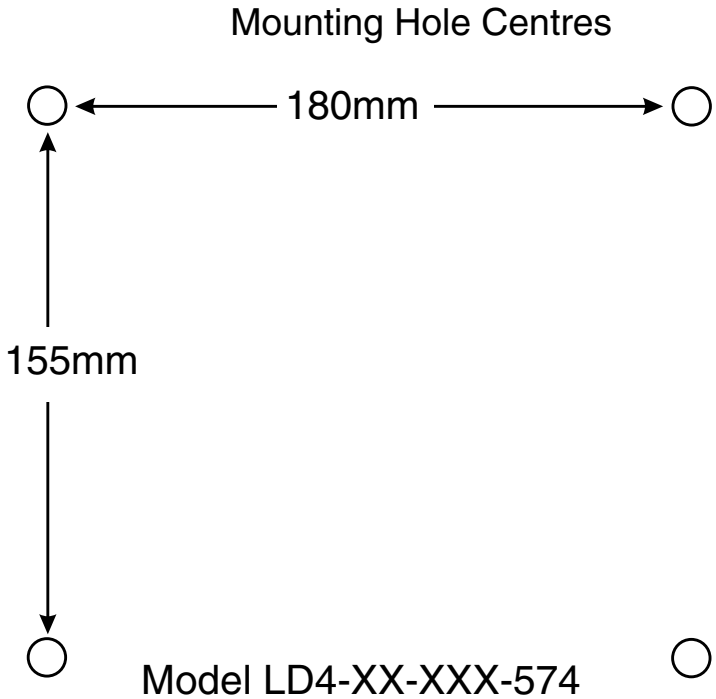
Optional outputs

Two extra alarm relays
Analog retransmission 4-20mA, 0-1V or 0-10V
Serial communications RS232 or RS485 ASCII or Modbus RTU
Isolated & regulated transmitter supply 24VDC (±12V)

2 Mechanical Installation

The instrument is designed be wall mounted. Note which model is to be installed then carefully measure and drill holes, as shown below.
All sizes are in mm. Mounting hole diameters are 6.5mm.





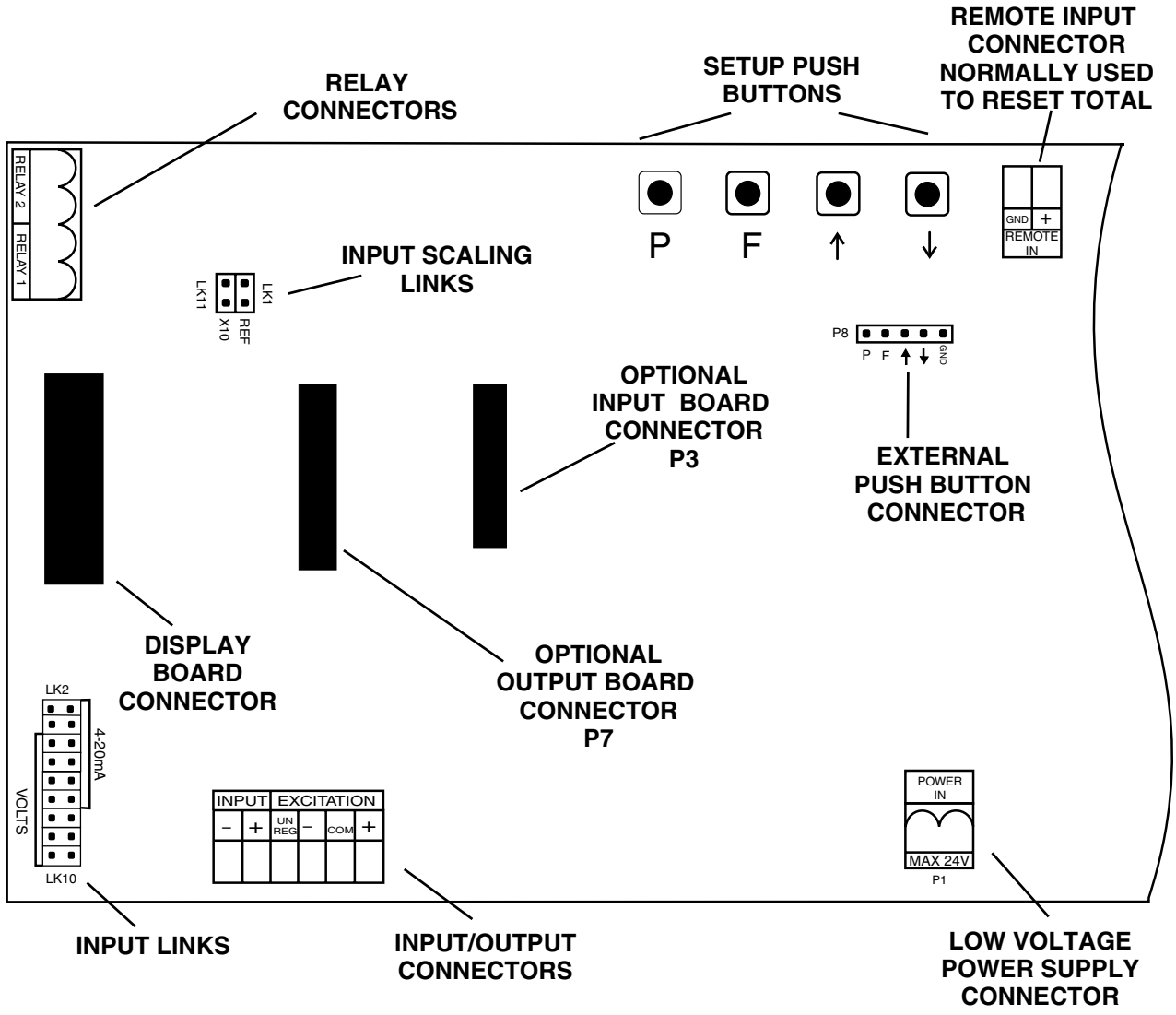
An optional panel mount kit is available for this 57mm type display. Panel cut out size is 240 x 130mm (-0.0mm/+0.5mm)

3 Electrical Installation

The LD4-IVT instrument is designed for continuous operation and no power switch is fitted to the unit. It is recommended that an external switch and fuse be provided to allow the unit to be removed for servicing.

The terminal blocks, which are the plug in type for ease of installation, allow for wires of up to 1.5mm^2 (2.5mm^2 for relay and power connections) to be fitted. Connect the wires to the appropriate terminals as indicated below. Refer to other details provided in this manual to confirm proper selection of voltage, polarity and input type before applying power to the instrument. When power is applied the instrument will cycle through a display sequence, indicating the software version and other status information, this indicates that the instrument is functioning.

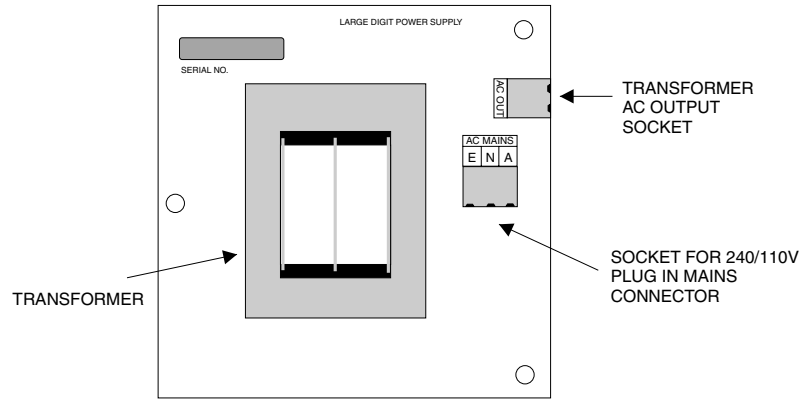
MAIN CIRCUIT BOARD LAYOUT (PARTIAL VIEW)

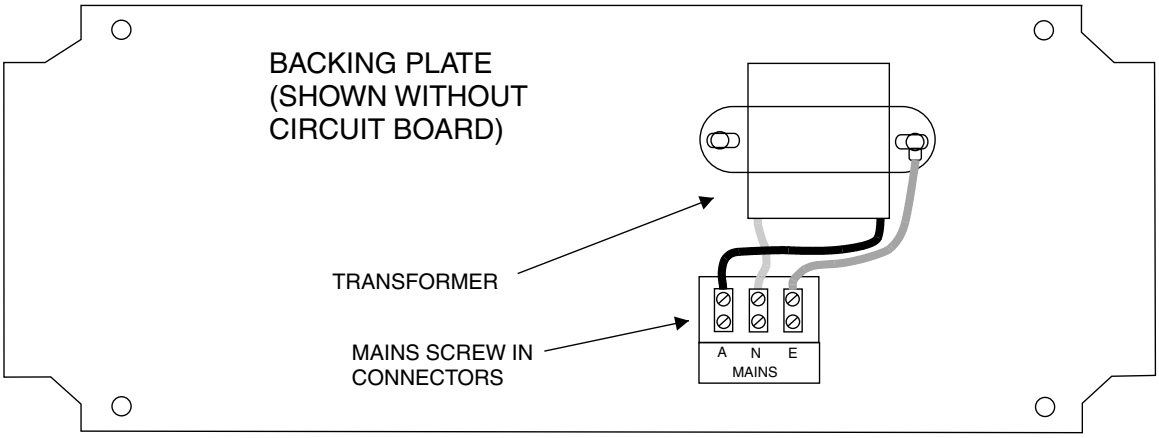


3 .1 Power supply connections

Mains power connections (240VAC or 110VAC)are either via a plug in terminal with screw connections (display type 574) or via screw terminals mounted to the backplane of the instrument.

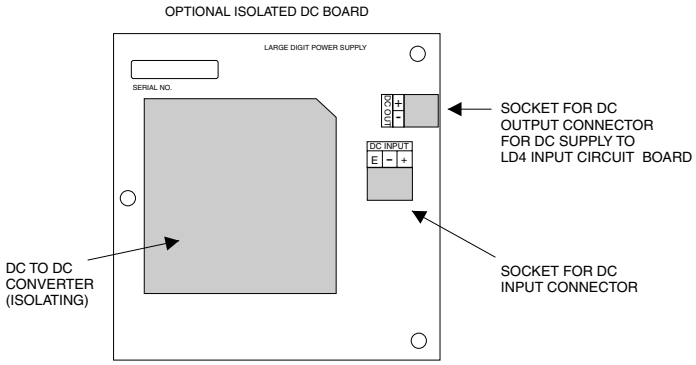
The transformer low voltage AC output goes to the power supply connector P1 on the main circuit board via the lead supplied.





Non isolated DC supplies (15 to 24V) are connected at the main circuit board power supply connector P1 via the plug in connector terminals. The positive and negative supplies may be connected either way around.

Optional isolated DC supplies (if fitted) should be connected to the separate isolated supply board at connector P1 on this board. The required polarity of the connections is marked on this board.



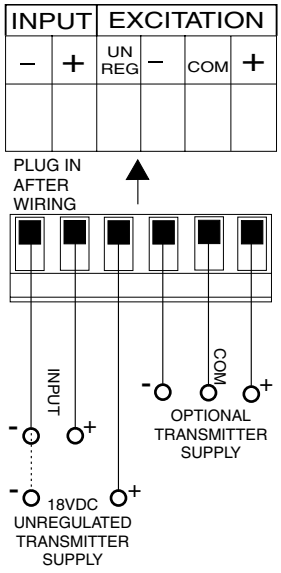
3 .2 Relay connections

The LD4 is supplied with two alarm relays as standard with connections on P6. The relays are single pole, single throw types and are rated at 5A, 240VAC into a resistive load. The relay contact is voltage free and may be programmed for normally open or normally closed operation.

3 .3 Reset input

The remote input connector P5 can be programmed to perform one of a selection of functions. When the LD4-IVT is used as a totaliser the remote input will normally be used to reset the total. This requires the **r.1 nP** function to be set to **CLr.t.** A short circuit across the remote input will reset the total. Alternatively the function **CLr totL** can be used to reset the total.

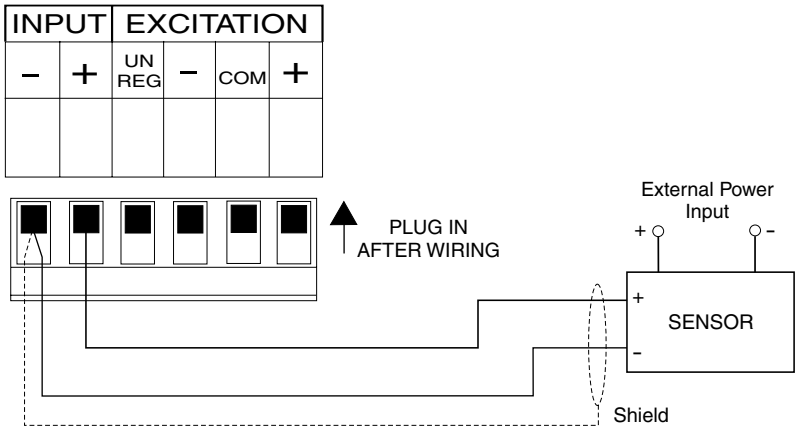
3 .4 Input/output connectors



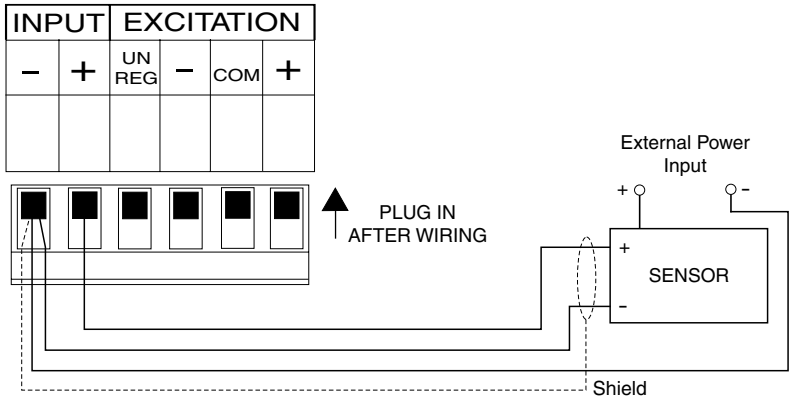
The diagram shows the input/output connectors for the LD4-IVT. The input signal connection is between INPUT + and INPUT -. The standard 18VDC unregulated transmitter supply output is between INPUT - and EXCITATION UN REG. The optional 24VDC (±12V) transmitter supply output is between COM, EXCITATION + and EXCITATION -. Wires of up to 1.5mm diameter can be accepted. The connectors are of the plug in type for ease of installation.

Connection examples

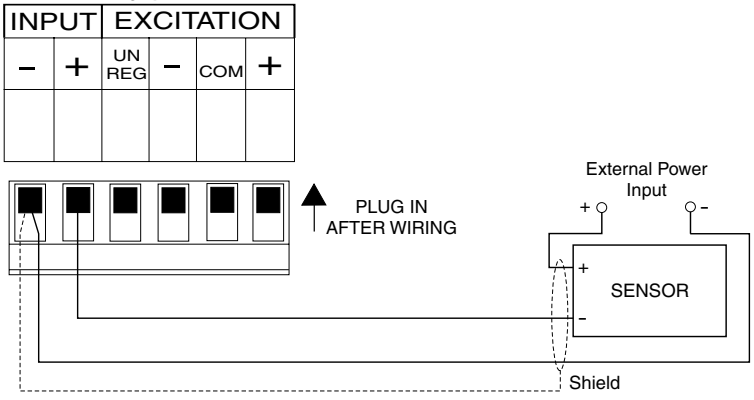
1. 4 wire 4-20mA input - externally powered sensor



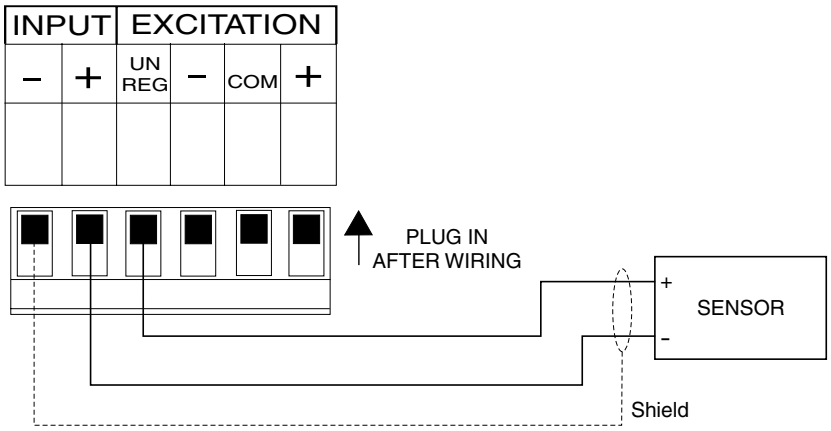
2. 3 wire 4-20mA input - externally powered sensor, common negative



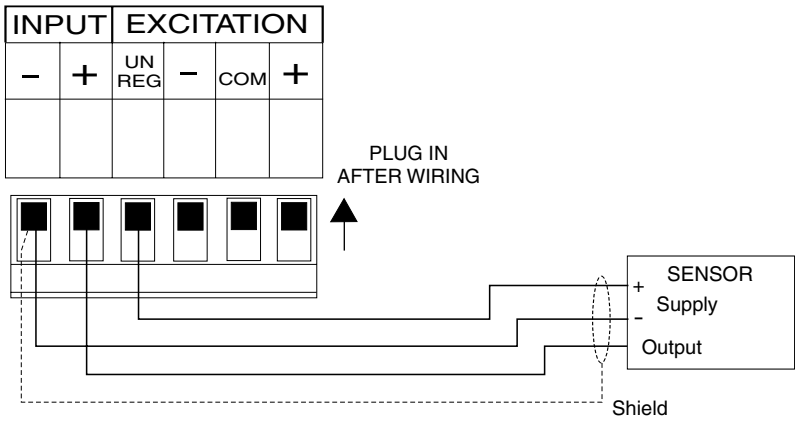
3. 2 wire 4-20mA input - externally powered sensor



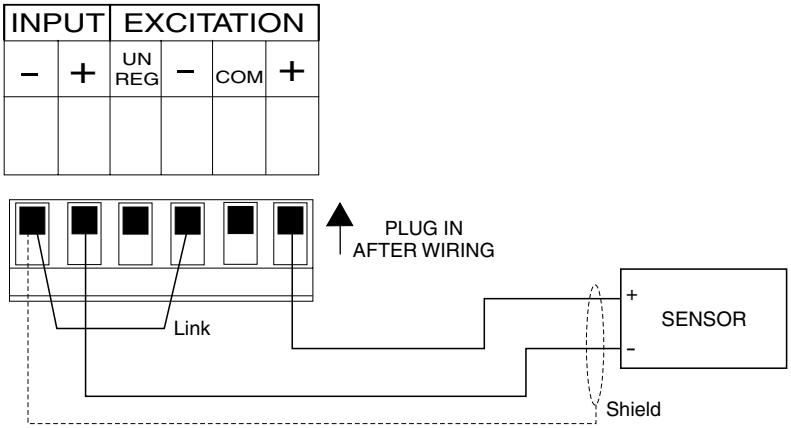
4. 2 wire 4-20mA input - powered from standard 18VDC supply



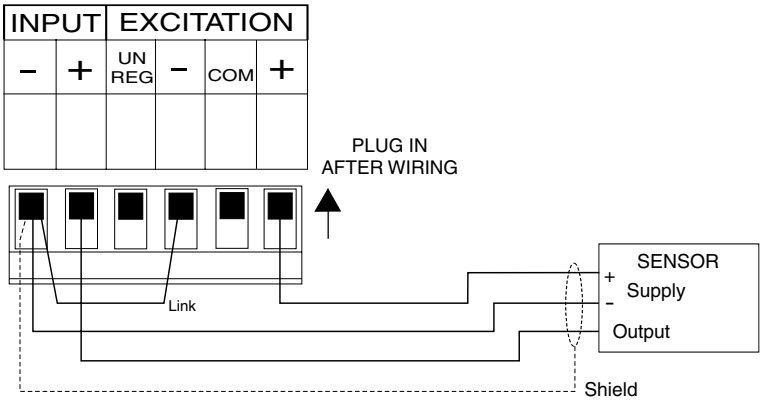
5. 3 wire 4-20mA input - powered from standard 18VDC supply



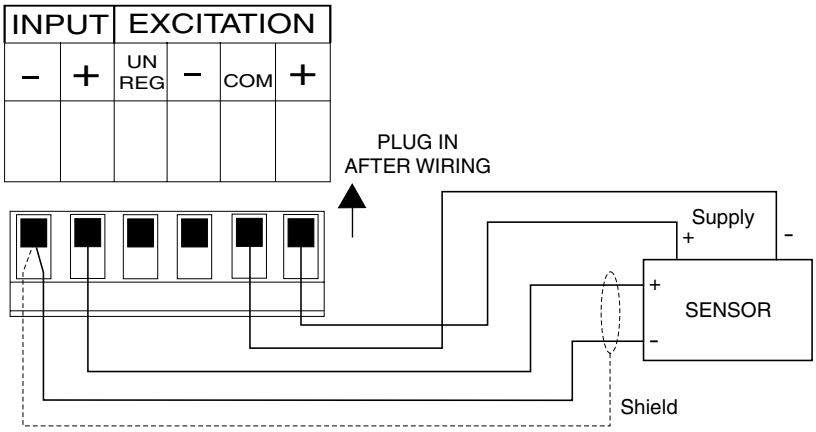
6. 2 wire 4-20mA input - powered from optional 24V (±12V) supply



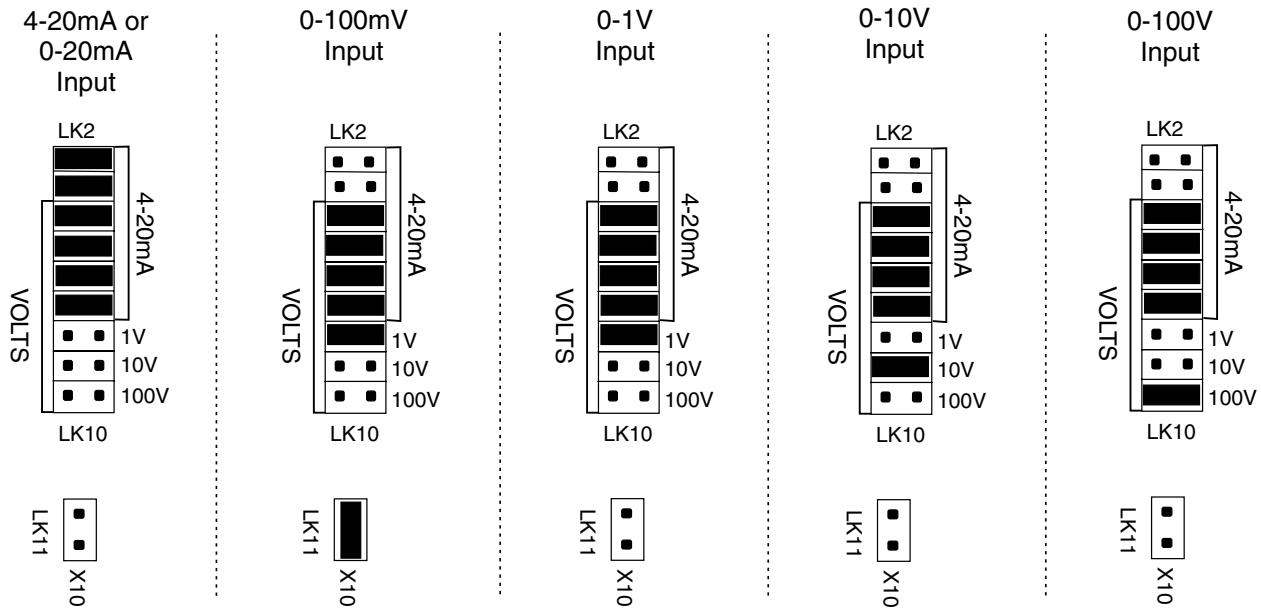
7. 3 wire 4-20mA input - powered from optional 24V (±12V) supply



8. DC voltage input - powered from optional supply using +12V



3 .5 Input type selector links



The input type selector links must be set to suit the input type required. Input links allow selection of 4-20mA, 0-1VDC, 0-10VDC or 0-100VDC input. Note that the x10 link (LK11) is used for the 0-100mVDC input range. The 4-20mA input will allow both 4-20mA and 0-20mA input ranges. Note: Input link LK1 must always be in unless an optional input board is fitted.

4 Explanation of Functions

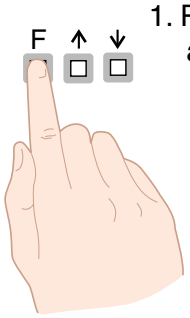
The LD4 setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

FUNC mode (simple push button sequence) allows access to commonly set up functions such as alarm setpoints.

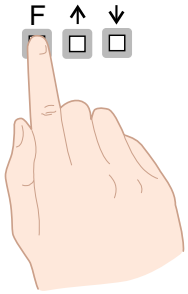
CAL mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

The three push buttons located on the main circuit board are used to alter settings. Once CAL or FUNC mode has been entered you can step through the functions, by pressing and releasing the F push button, until the required function is reached. Changes to functions are made by pressing the ▲ or ▼ push button (in some cases both simultaneously) when the required function is reached.

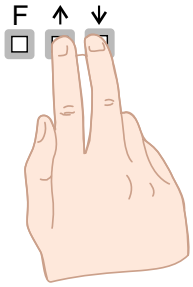
Entering CAL Mode



1. Remove power from the instrument and wait 5 seconds . Hold in the F button and reapply power. The display will indicate CAL as part of the "wake up messages" when the CAL message is seen you can release the button. Move to step 2 below.



2. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the F button. Move to step 3 below.

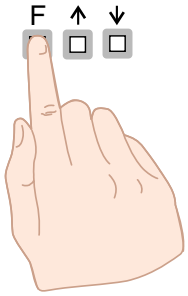


3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

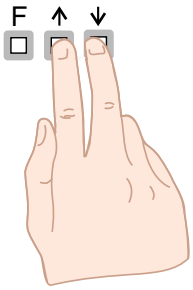
Notes: If step 1 above has been completed then the instrument will remain in this CAL mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed. The instrument should show all 8's on power up e.g. 8.8.8.8. if the instrument does not reset then these numbers will not be seen. Switch off the instrument and allow a longer time delay before powering up again.

Entering FUNC Mode

No special power up procedure is required to enter FUNC mode.



1. When the "wake up" messages have finished and the display has settled down to its normal reading press, then release the F button. Move to step 2 below.



2. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

The alarm and brightness functions below are accessible via FUNC mode.

The LD4-IVT has an easy alarm access facility which allows access to the alarm setpoints simply by pressing the F button. The first setpoint will then appear and changes to this setpoint may be made to this setpoint via the ▲ or ▼ buttons. Press the F button to accept any changes or to move on to the next setpoint.

The instrument must be set in the manner described below to allow the easy access facility to work:

1. The F.1 nP function must be set to SP.AC.

2. At least one alarm must have a setpoint, nothing will happen if all the alarm setpoints are set to OFF.

3. The SP.AC function must be set to allow access to the relays required e.g. if set to A 1-2 then the easy access will work only with alarm relays 1 and 2 even if more relays are fitted.

4. The instrument must be in normal measure mode i.e. if the instrument is powered up so that it is in CAL mode then the easy access will not function. If in doubt then remove power from the instrument, wait for a few seconds then apply power again.

5. If the easy access facility is used then the only way to view or alter any other function settings is to power up via CAL mode i.e. there is not entry to FUNC mode unless the instrument is powered up in CAL mode.

A 1Lo (alarm low setpoint)

Displays and sets the low setpoint value for alarm 1 relay. The low alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Use ▲ or ▼ to adjust the setpoint value if required. The alarm will activate when the displayed value is lower than the A 1Lo setpoint value. Each relay may be configured with both a low and high setpoint if required, if so the relay will be activated when the display reading moves outside the band set between low and high setpoints.

A 1H, (alarm high setpoint)

Displays and sets the high setpoint value for alarm 1 relay. The high alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Use ▲ or ▼ to adjust the setpoint value if required. The alarm will activate when the displayed value is higher than the A 1H, setpoint value. Each relay may be configured with both a low and high setpoint if required, if so the relay will be activated when the display reading moves outside the band set between low and high setpoints.

A2Lo (alarm low setpoint)

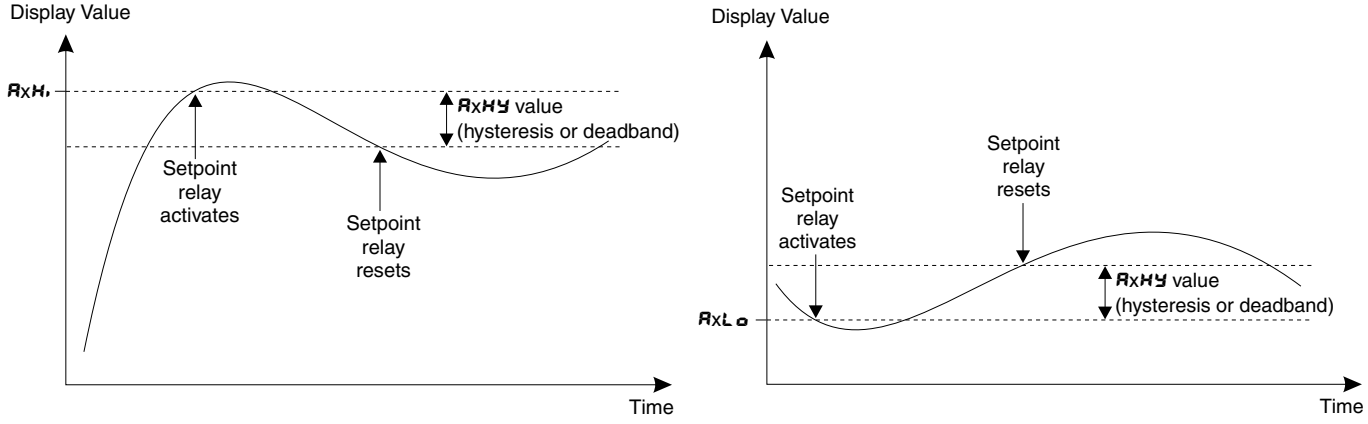
Displays and sets alarm 2 low setpoint, see A 1Lo for further description.

A2H, (alarm high setpoint)

Displays and sets alarm 2 high setpoint, see A 1H, for further description.

A 1HY (alarm hysteresis [deadband])

Displays and sets the alarm hysteresis limit and is common for both high and low setpoint values. The hysteresis value may be used to prevent too frequent operation of the setpoint relay when the measured value stays close to the setpoint. Without a hysteresis setting (A 1HY set to zero) the alarm will activate when the display value goes above the alarm setpoint (for high alarm) and will reset when the display value falls below the setpoint, this can result in repeated on/off switching of the relay at around the setpoint value. The hysteresis setting operates as follows:



In the high alarm mode, once the alarm is activated the input must fall below the setpoint value minus the hysteresis value to reset the alarm.

e.g. if **A 1H** is set to **50.0** and **A 1HY** is set to **3.0** then the setpoint output relay will activate once the display value goes above **50.0** and will reset when the display value goes below **47.0** (50.0 minus 3.0).

In the low alarm mode, once the alarm is activated the input must rise above the setpoint value plus the hysteresis value to reset the alarm.

e.g. if **A 1Lo** is set to **20.0** and **A 1HY** is set to **10.0** then the alarm output relay will activate when the display value falls below **20.0** and will reset when the display value goes above **30.0** (20.0 plus 10.0).

The hysteresis units are expressed in displayed engineering units.

A2HY (alarm hysteresis [deadband])

Displays and sets the alarm hysteresis limit for alarm 2, see **A 1HY** for further description.

A 1tt (alarm trip time)

Displays and sets the alarm trip time and is common for both alarm high and low setpoint values. The trip time is the delay time before the alarm relay will activate, or trip, when an alarm condition is present. The alarm condition must be present continuously for the trip time period before the alarm will trip. This function is useful for preventing an alarm trip due to short non critical deviations from setpoint. The trip time is selectable over **0** to **60** seconds.

A2tt (alarm trip time)

Displays and sets the alarm trip time for alarm 2, see **A 1tt** for further description.

A 1rt (alarm reset time)

Displays and sets the alarm relay reset time. With the alarm condition is removed the alarm relay will stay in its alarm condition for the time selected as the reset time. The reset time is selectable over **0** to **60** seconds.

A2rt (alarm reset time)

Displays and sets the alarm relay reset time for alarm 2, see **A 1rt** for further description.

A 1n.o or **A 1n.c (alarm 1 normally open or normally closed)**

Displays and sets the setpoint alarm relay action to normally open (de-energised) or normally closed (energised), when no alarm condition is present. A normally closed alarm is often used to provide a power failure alarm indication.

A2n.o / A2n.c (alarm x normally open or normally closed)

Displays and sets the setpoint alarm relay action for alarm 2, see **A 1n.o / A 1n.c** for further description.

A2.SP / A2t1 (relay operation independent setpoint or trailing setpoint)

Alarm 2 may be programmed to operate with an independent setpoint setting or may be linked (or trailing) to operate at a fixed difference to alarm relay 1 setpoint. The trailing operation is as follows: Alarm 1 (**A1**) is always independent. Alarm 2 (**A2**) may be independent or may be linked to Alarm 1. For trailing set points the setpoint value is entered as the difference from the setpoint being trailed. If the trailing setpoint is to operate ahead of the prime setpoint then the value is entered as a positive number and if operating behind the prime setpoint then the value is entered as a negative number. For example, with Alarm 2 set to trail alarm 1, if **A 1H** is set to **1000** and **A2H** is set to **50** then Alarm 1 will activate at **1000** and alarm 2 will activate at **1050** (i.e. 1000 + 50). If Alarm 2 had been set at **-50** then alarm 2 would activate at **950** (i.e. 1000 - 50).

brgt (display brightness)

Displays and sets the digital display brightness. The display brightness is selectable from **1** to **15**. where **1** = lowest intensity and **15** = highest intensity. This function is useful for improving the display readability in dark areas or to reduce the power consumption of the instrument.

dULL (remote input controlled display brightness)

This function will not be seen unless the **r.1 nP** function is set to **dULL**. Displays and sets the level for remote input brightness switching, see **r.1 nP** function. When the remote input function is set to **dULL** the

remote input can be used to switch between the display brightness level set by the **brGt** function and the display brightness set by the **duLL** function. The display brightness is selectable from **0** to **15**, where **0** = lowest intensity and **15** = highest intensity. This function is useful in reducing glare when the display needs to be viewed in both light and dark ambient light levels.

The functions which follow are accessible via CAL mode only.

rEC_ (recorder/analog retransmission output low value)

Seen only when analog retransmission option fitted. Displays and sets the analog retransmission (4-20mA, 0-1V or 0-10V, link selectable) output low value (4mA or 0V) in displayed engineering units. e.g. if it is required to retransmit 4mA when the display indicates **0** then select **0** in this function via the ▲ or ▼ button.

rEC¯ (recorder/analog retransmission output high value)

Seen only when analog retransmission option fitted. Displays and sets the analog retransmission (4-20mA, 0-1V or 0-10V, link selectable) output high value (20mA, 1V or 10V) in displayed engineering units. e.g. if it is required to retransmit 20mA when the display indicates **500** then select **500** in this function via the ▲ or ▼ button.

drnd (display rounding)

Displays and sets the display rounding value. This value may be set to 0 - 5000 displayed units. Display rounding is useful for reducing the instrument resolution without loss of accuracy, in applications where it is undesirable to display to a fine tolerance. For example if **drnd** is set to **10** the display indication will change in multiples of 10 only i.e. it will be able to display **0**, **10**, **20**, **30** etc. but not **2**, **4**, **15** etc.

dCPt (decimal point selection)

Displays and sets the decimal point. By pressing the ▲ or ▼ pushbuttons the decimal point position may be set. The display will indicate as follows: **0** (no decimal point), **0.1** (1 decimal place), **0.02** (2 decimal places), **0.003** (3 decimal places) and **0.0004** (4 decimal places) (displays with more than 4 digits only).

FiLtr (digital filter)

Displays and sets the digital filter value. Digital filtering is used for reducing susceptibility to short term interference. The digital filter range is selectable from **0** to **8**, where **0** = none and **8** = most filtering. A typical value for the digital filter would be 3. Use ▲ or ▼ to alter if required. Note that at higher filter values the display update time will be increased.

diSP UNIt (display units)

The display units function allows the user a choice of certain temperature measurement characters which can be displayed on the right hand side of the LED display. Choices are **NONE** (no special characters), **°C**, **°F**, **°**, **C** or **F**. For example if **°C** is chosen then a typical display would be **25°C**. Note that with a 4 digit display this would limit the display range to 0 to 99 if no decimal points are used.

4 .1 Calibration functions.

The **CAL 1** and **CAL 2** functions described below allow the display to be scaled to read in engineering units using “live” inputs. For 4-20mA inputs and alternative method which does not require “live” inputs may be used, see the **USEr En4** and **USEr En20** functions which follow.

CAL 1 (first scaling point for 2 point scaling method)

CAL 1 and **CAL 2** are used together to scale the instruments display, values for both must be set when using this scaling method.

The **CAL 1** function sets the first calibration point for live input calibration . When using this method a “live” signal input must be present at the input terminals. Note: **CAL 1** and **CAL 2** can be set independently i.e. it is not necessary to perform a **CAL 2** operation directly after a **CAL 1**.

The procedure for entering the first scaling point is:

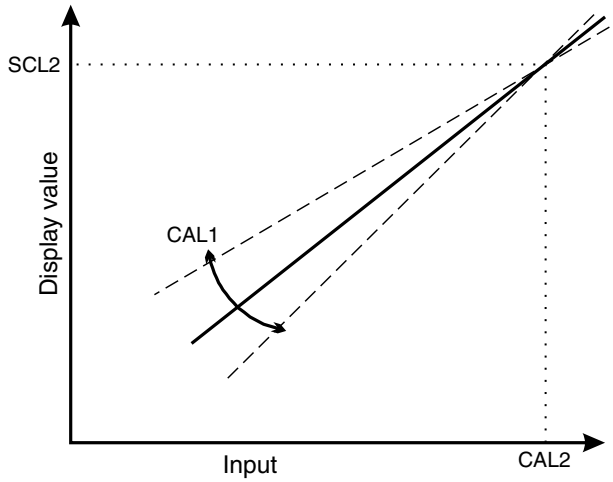
a. Ensure that an input signal is present at the input terminals, this will normally be at the low end of the signal range e.g. 4mA for a 4-20mA input type.

b. At the **CAL 1** function press ▲ and ▼ simultaneously, then release them. The display will indicate the live input value. Do not be concerned at this stage if the live input display value is not what is required. It is important that the live input value seen is a steady value, if not then the input stability needs to be investigated before proceeding with the scaling.

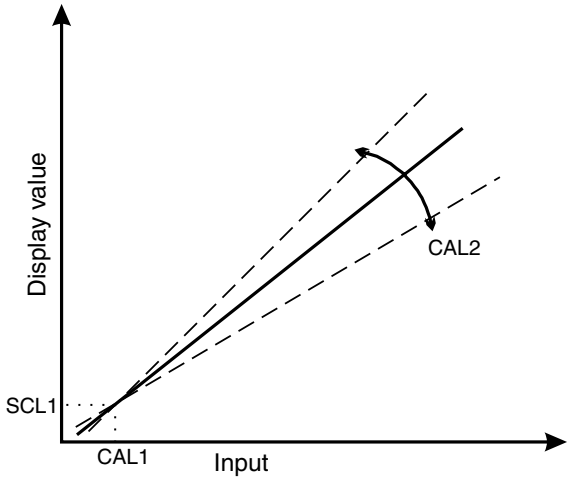
c. Press, then release the F button. The display will indicate SCL 1 followed by a value. Use the ▲ or ▼ button to change this value to the required display scale value at this input. e.g. if 4mA was input and the required display at 4mA was 0 then ensure 0 is selected at SCL 1. Press the F button to accept changes or the P button to abort the scaling.

CAL2 (second scaling point for 2 point scaling method)

The second point scaling is performed in exactly the same manner as CAL 1 except that SCL2 will be seen instead of SCL 1. It is essential that the live input is different in value to the CAL 1 input e.g. for a 4-20mA input use 20mA as the CAL2 live input. Note; it is not essential that exactly 4 and 20mA are used as the live inputs for a 4-20mA scaling but the input values must be significantly different.



Setting CAL1



Setting CAL2

USEr En4 (4mA input scaling without a live input)

This calibration method can be used with 4-20mA inputs only. The instrument can be scaled for a 4-20mA input without a live input i.e. this is an alternative method to the CAL 1 and CAL2 method of scaling. To perform the first point (En4) scaling simply press the ▲ and ▼ buttons simultaneously when the USEr En4 function has been reached. The display will now indicate a value. Use the ▲ or ▼ button to change this value to the scale value required for a 4mA input. Once the USEr En4 scaling has been completed, the USEr En20 function should be completed, see below.

USEr En20 (20mA input scaling without a live input)

This calibration method can be used with 4-20mA inputs only. The same method described in USEr En4 above can be used to scale the instrument for a 20mA input. Again use the ▲ or ▼ button to change the value displayed to the scale value required for a 20mA input.

Example : If the 4-20mA input is to be scaled so that the display reads 0 at 4mA and 5000 at 20mA then USEr En4 should be set to 0 and USEr En20 should be set to 5000.

UCAL (uncalibrate)

Used to set the instrument back to the factory calibration values. This function should only be used when calibration problems exist, and it is necessary to clear the calibration memory. To operate the uncalibration press the ▲ and ▼ buttons simultaneously the display will show the message CAL CLr to indicate that the calibration memory has been cleared.

End of calibration functions.

P.but (P button function)

The P button may be set to operate any one of a selection of special functions, see FUNC below for a description of these functions. With some functions, to prevent accidental operation, the P button must be held pressed for 2-3 seconds before the function will operate. If both the remote input and P button function are operated simultaneously the P button will override the remote input.

Functions available are: NONE, Hi , Lo, Hi Lo, ZERO or CLr.t

r.i nP (remote input function)

See the "Electrical installation" chapter for the location of the remote input terminals. When these are short circuited, via a pushbutton or keyswitch the instrument will perform the remote input function selected from the list below. A message will flash to indicate which function has been selected when the remote input terminals are short circuited. The remote input functions are as follows:

nonE - no remote function required.

P.HLd - peak hold. The display will show the peak value only whilst the remote input terminals are short circuited.

d.HLd - display hold. The display value will be held whilst the remote input terminals are short circuited.

Hi - peak memory. The peak value stored in memory will be displayed if the remote input terminals are short circuited, if the short circuit is momentary then the display will return to normal measurement after 20 seconds. If the short circuit is held for 1 to 2 seconds or the power is removed from the instrument then the memory will be reset.

Lo - valley memory. The minimum value stored in memory will be displayed. Otherwise operates in the same manner as the Hi function.

Hi Lo - toggle between Hi and Lo displays. This function allows the remote input to be used to toggle between peak and valley memory displays. The first operation of the remote input will cause the peak memory value to be displayed, the next operation will give a valley memory display. PHi or PLo will flash before each display to give an indication of display type.

2Er0 - rate display zero. This function will allow the rate display to be zeroed. Note that this zero operation will be retained even when power has been removed. It is therefore necessary to re-calibrate the instrument to restore the original scaling, if required. Also note that since the rate display is used to calculate the total then any future total calculations will be affected by the zero operation.

SP.AC - setpoint access only. This blocks access to any functions except the alarm setpoint functions unless the remote input pins are short circuited or entry is made via CAL mode.

no.AC - no access. This blocks access to all functions unless the remote input pins are short circuited or entry is made via CAL mode.

CAL.S - calibration select. The remote input can be used to select between calibration scaling values. Two sets of calibration values can be entered in the LD4, one set with the remote input open circuit and another set with the remote input short circuit to ground. The remote input can then be used to switch between one set and the other. This feature can be used on all input ranges.
For example: With the remote input open circuit a 4-20mA input can be scaled (using CAL 1&CAL2 or USEr En4 and USEr En20) to read 0 to 100 over the 4-20mA range. With the remote input short circuit to ground the scaling can be repeated using figures of 0 to 500 for the 4-20mA range. The remote input can be used to switch between ranges. In this example the first scaling could represent a % figure and the second scaling could represent the actual process units (litres, kg, volts etc).

dULL - display brightness control. The remote input can be used to change the display brightness. When this mode is selected the display brightness can be switched, via the remote input, between the brightness level set at the br9t function and the brightness level set at the dULL function.

di SP - switch to alternate display i.e. from rate to total or total to rate.

CLr.t - clear total. This function allows the total to be cleared (reset to zero). The message CLrd will appear when this function is operated.

SPAC (setpoint access)

Sets the access to the alarm relay set points. The following choices are available:

A 1 - Allows setpoint access to alarm 1 only.

A 1-2 - Allows access to alarms 1 and 2 only.

The remote input function (r.i nP) must be set to SP.AC for this function to operate . **Note:** Only the setpoints which have been given a value will be accessible e.g. if A 1Hi is set to OFF then there will be no access to the A 1Hi function when SPAC is used.

Sqrt (square root)

Selects the square root scaling to on or OFF. When set to on a square root function is applied to the input. When set to OFF the calibration is a linear function. Note: It is essential that the display is rescaled, using CAL 1 and CAL2 or USEr En4 and USEr En20, whenever the square root function is turned on or off.

When the square root facility is used the scaled displayed value follows the square root of the

percentage of the full scale input value. The upper and lower input limits are set as normal as are the values to be displayed at these limits. For example if, for a 4 - 20mA input, you wish to display **0** at 4mA and **1000** at 20mA the square root function will calculate as follows:

At 20mA (100%) the display will be **1000** *i.e.* $\sqrt{1}x1000$.

At 16mA (75%) the display will be **866** *i.e.* $\sqrt{0.75}x1000$.

At 12mA (50%) the display will be **707** *i.e.* $\sqrt{0.50}x1000$ *and so on.*

tOt dCPt (totaliser decimal point selection)

Displays and sets the decimal point position for the totaliser display. Choices are **0** (no decimal point) . **0.1**, **0.02** etc.

dISP SCLE (display scaling factor)

Displays and sets the display scaling factor. The scaling factor can be set anywhere in the range from 0 to the maximum display value. This factor is used in the formula to calculate the total display (see **E.SCL**). See below for examples.

tOtl SECS (totaliser scaling factor)

Displays and sets the totaliser scaling factor. The scaling factor can be set anywhere in the range from 0 to the maximum display value. This factor is used in the formula to calculate the total display (see **E.**). See below for examples.

E.SCL (exponent scaling factor)

Displays and sets the exponent factor for the display. The scaling factor can be set anywhere in the range from 0 to 9. This factor allows a larger accumulated total by dividing the rate display value down to a smaller number. For example a rate display in grams can be converted to kilograms by setting **E.SCL** to 3.

The formula used to calculate the accumulated total display from the rate display is as follows:

$$Total = Previous\ Total + \left(\frac{Rate\ display \times dISP\ \ SCLE}{tOtl\ \ SECS \times 10^{E.SCL}} \right) \times Ts$$

Where: Ts is the time since the last sample in seconds.

Examples:

Example 1 - The instrument is connected to a flow meter and the rate is scaled to show litres per minute (L/m). The total display is required in megga litres (ML). For a flow indication of 500 L/m the total should increase by 500 litres or 0.0005ML in 1 minute.

In the formula the rate display will be 500, there is no display scaling factor (**dISP SCLE**) so enter this as 1, the totaliser scaling factor (**tOtl SECS**) will be 60 (seconds) since we are measuring in litres per minute and Ts will be 60 (seconds) if we wish to see the total after 1 minute. Since we are measuring in megga litres (Litres x 10^6), the **E.SCL** value will be 6.

$$Total = Previous\ Total + \frac{500 \times 1}{60 \times 10^6} \times 60 \quad (ML)$$

$$Total = Previous\ Total + 0.0005 \quad (ML)$$

Example 2 - Rate of fill measured is to be in m^3/hr (cubic metres per hour). It is found that the total fill in one hour equals 1.22 times the rate indication, this will be the **d.SCL** factor. **t.SCL** will be 3600 (seconds i.e. 1hour in seconds), **E.SCL** will be 0 since both rate and total are in cubic metres. For this example we will examine the increase in total after 2 hours (7200 seconds). A rate of 35.8 m^3/hr we would expect an increase in the total of 87.352 m^3 in 2 hours (35.8 x 1.22 x 2).

$$Total = Previous\ total + \frac{35.8 \times 1.22}{3600 \times 10^0} \times 7200 \quad (m^3)$$

$$Total = Previous\ total + 87.352\ \ (m^3)$$

tot NEG (negative total select)

Displays and sets whether negative totals are allowed or not . When set to **OFF** negative totals are not allowed and the total will not increase when the rate input is negative. Set to **on** to allow negative totals.

tot rAP.F (wrap around operation)

Displays and sets the totaliser wrap around operation for displays at full scale. If **StOP** is selected the display will halt at its maximum or minimum display value. If **2Er0** is selected then the display will wrap around to zero i.e. will reset itself and start again at zero.

CLr tot (clear totaliser)

Allows the totaliser value to be cleared via the setup pushbuttons located at the rear of the instrument. To clear the totaliser press ▲ and ▼ simultaneously at this function. The message **CLrd** will be seen to confirm that the totaliser memory has been cleared. The total can also be cleared via a remote switch connected to the remote input terminals P5. If a remote switch is to be used the **r.i nP** function must be set to **CLr.t**.

dFl t di SP (default display)

The default display may be set to total (**tOt**) or rate (**rAtE**). The instrument will automatically revert to its default display. The ▲ or ▼ button can be used to change from the default to the alternate display and the instrument will then return to the default display after a period of around 20 seconds.

A 1rt/A 1tL or A2rt/A2tL (alarm rate or total operation)

Select **A 1rt** (or **A2rt** for relay 2) if the alarm is to operate from the rate value or **A 1tL** (or **A2tL** for relay 2) if the alarm is to operate from the total value.

rEC (analog retransmission mode)

This function is seen only if the analog retramsission option is fitted. The optional analog retransmission output can be set to follow either the rate display (**rAtE** selected) or the total display (**tot** selected).

The following functions will only be seen if the RS232 or RS485 communications option is fitted. See the "Serial communications option" appendix for further details of the **O.Put** function and hardware setup.

bAud (set baud rate, seen only with serial output option)

Select from 9600, 4800, 2400, 1200, 600, 300, 19.2 or 38.4.

PrtY (set parity, seen only with serial output option)

Select parity check to either **nonE**, **EUEn** or **odd**.

O.Put (set RS232/485 interface mode, seen only with serial output option)

Select **di SP**, **Cont** or **POLL**
Allows user to select the RS232/485 interface operation as follows:-

di SP	Sends image data from the display without conversion to ASCII.
Cont	Sends ASCII form of display data every time display is updated.
POLL	Controlled by computer or PLC as host. Host sends command via RS232/485 and instrument responds as required.

Addr (set unit address for polled (POLL) mode (0 to 31, seen only with serial output option)

Allows several units to operate on the same RS485 interface reporting on different areas etc. The host computer or PLC may poll each unit in turn supplying the appropriate address.

The unit address ranges from 0 to 31 (DEC) but is offset by 32 (DEC) to avoid clashing with ASCII special function characters (such as <STX> and <CR>). Therefore 32 (DEC) or 20 (HEX) is address 0, 42 (DEC) or 2A (HEX) addresses unit 10.

SERL (serial communications mode)

The following choices are available for serial communications operation mode:

dI SP - display mode. The serial output value will follow whatever value is on the 7 segment display.

P.HLd - peak hold mode. The 7 segment display and serial output value will indicate the peak value only whilst the peak value function is operated via a contact closure on the remote input i.e. the 7 segment display and serial output value can rise but not fall whilst the remote input switch is closed. When the remote input switch is opened the serial output value will remain fixed i.e. it will not rise or fall, although the 7 segment display value will be free to alter. This peak serial output value can be cleared by closing the remote input switch for another operation or by removing power from the instrument. Note: In this mode the serial output will show a zero reading until the remote input is operated for the first time after switch on.

d.HLd - display hold mode. The 7 segment display and serial output value will be held whilst the remote input display hold switch is closed. When the switch is opened the serial output value will remain fixed at the held value although the 7 segment display value will be free to alter. The held serial output can be cleared by closing the remote input switch for another operation or by removing power from the instrument.

Hi - peak (max.) memory mode. With the peak remote input switch open the serial output will indicate the peak value in memory i.e. the serial output value can rise but not fall. The serial output can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power to the instrument.

Lo - valley (min.) memory mode. With the valley remote input switch open the serial output will indicate the valley (min.) value in memory i.e. the serial output value can fall but not rise. The serial output value can be reset by clearing the memory. The memory may be cleared either by closing the remote input switch for approximately 2 seconds or by removing power to the instrument.

Li uE - live input mode. The serial output will follow the electrical input and will not necessarily follow the 7 segment or bargraph display. For example if the remote input is set for peak hold operation then when the remote input is closed the 7 segment display will only show the peak value but the retransmission will be free to change to follow the electrical input.

Returning to normal measure mode

When the calibration has been completed it is advisable to return the instrument to the normal mode (where calibration functions cannot be tampered with).To return to normal mode, turn off power to the instrument, wait a few seconds and then restore power.

5 Function Table

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
A 1Lo	Alarm 1 low setpoint value	Setpoint value or OFF	OFF	
A 1H,	Alarm 1 high setpoint value	Setpoint value or OFF	OFF	
A2Lo	Alarm 2 low setpoint value	Setpoint value or OFF	OFF	
A2H,	Alarm 2 high setpoint value	Setpoint value or OFF	OFF	
A 1HY	Alarm 1 hysteresis	Hysteresis value in measured units	1	
A2HY	Alarm 2 hysteresis	Hysteresis value in measured units	1	
A 1tt	Alarm 1 trip time	No of seconds before relay trips	0	
A2tt	Alarm 2 trip time	No of seconds before relay trips	0	
A 1rt	Alarm 1 reset time	Reset time in seconds	0	
A2rt	Alarm 2 reset time	Reset time in seconds	0	
A 1n.o or A 1n.c	Alarm 1 action N/O or N/C	A 1n.o or A 1n.c	A 1n.o	
A2n.o or A2n.c	Alarm 2 action N/O or N/C	A2n.o or A2n.c	A 1n.o	
A2.SP or A2.t1	Setpoint or trailing alarm	A2.SP or A2.t1	A2.SP	
brgt	Display brightness	1 to 15	15	
dULL	Remote display brightness switching	0 to 15	1	
Functions which follow are available only via CAL mode				
rEC_	Recorder output low limit	Value in memory	0	
rEC¯	Recorder output high limit	Value in memory	1000	
drnd	Display rounding selects resolution	Value in memory	1	
dCPt	Display decimal point	Decimal point position (e.g. 0 .0. 10.02 or 0.003)	0	
FLtr	Digital filter range 0 to 8	0 to 8 (8=most filtering)	3	
dI SP UNI t	Display units	NONE, °C, °F, °, C or F	NONE	
CAL 1	First scaling point	Live reading	n/a	
CAL2	Second scaling point	Live reading	n/a	
USEr En4	4mA input scaling	Value in memory	n/a	
USEr En20	20mA input scaling	Value in memory	n/a	
UCAL	Uncalibrate	CAL CLr	n/a	
P.but	P button function (5, 6 or 8 digit LED models only)	NONE .H, .Lo.H, Lo. 2Er0 or CLr.t	NONE	
r.I nP	Remote input function	NONE, PHLd, dHLd.H, . Lo.H, Lo.2Er0, SP.Ac, no.AC, CAL.S, dULL, dI SP or CLr.t	NONE	
SPAC	Setpoint access	A 1 or A 1-2	A 1	
Sqrt	Square root operation	OFF or on	OFF	
tOtI dCPt	Total display decimal point	0. 0. 1. 0.02 etc.	0	
dI SP SCLE	Display scale	Value in memory	1	
totI SECS	Total scale	Value in memory	1	
E.SCL	Exponent scale	0 to 9	1	

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
tot NEG	Total display negative	on or OFF	OFF	
tot rAP.F	Total display wrap around	StOP or 2Er0	StOP	
CLr tot	Clear total	CLrd	n/a	
dFl t dl SP	Default display	rAtE or tot	rAtE	
A 1.rt or A 1.tL	Alarm 1 operation from rate or total	A 1.rt or A 1.tL	A 1.rt	
A2.rt or A2.tL	Alarm 1 operation from rate or total	A2.rt or A2.tL	A2.rt	
rEC	Analog retransmissison ouptut mode	rAtE or tot	rAtE	
bAUd rAtE	Baud rate	300 . 600 . 1200 . 2400 . 4800 . 9600 . 19.2 or 38.4	9600	
PrtY	Parity	nONE . EUEN or Odd	nONE	
O.Put	Output mode	POLL . Cont or d. SP	Cont	
Addr	Address	Value in memory	0	
SErL	Serial communications output mode	L. uE . P.HLd . d.HLd . H. . Lo or dl SP	L. uE	

Note: Functions shown shaded on this table will be displayed, only when those particular options are fitted.

6 Specifications

6 .1 Technical Specifications

Input types:	Link selectable 0-20mA, 4-20mA, ±100mV, ±1V, ±10V or ±100V
Impedance:	80Ω (4-20mA or 0-20mA) or 1MΩ (DC Volts)
ADC Resolution:	1 in 20,000
Accuracy:	0.1% of full scale when calibrated
Memory retention:	Total retained in memory for 1 week with power removed
Sample rate:	4 per second
Conversion method:	Dual slope ADC
Microprocessor:	MC68HC11 CMOS
Ambient Temperature:	-10 to 60°C,
Humidity:	5 to 95% non condensing
Power Supply:	AC 240V,110V 50/60Hz or DC 15 to 24V non isolated or DC 12V, 24V or 48V isolated Supply type is factory configured
Outputs:	2 x Setpoint relays, form A, rated 5A at 240VAC
Power Consumption:	AC supply 15 VA max, DC supply, consult supplier (depends on display type & options)
Transducer Excitation:	+18V unregulated

6 .2 Options

Analog retransmission:	4-20mA, 0-1V or 0-10V
Serial communication:	RS232 or RS485
Transducer Excitation:	24V (±12V) regulated & isolated

6 .3 Physical characteristics

Model LD4-X-X-574	Case size (mm) = 255 x 145 x 125 Weight: = 1.3 kgs Mounting hole locations (mm) = 180(w) x 155(h)

7 Guarantee and Service

The product supplied with this manual is guaranteed against faulty workmanship for a period of 2 years from the date of dispatch.

Our obligation assumed under this guarantee is limited to the replacement of parts which, by our examination, are proved to be defective and have not been misused, carelessly handled, defaced or damaged due to incorrect installation. This guarantee is VOID where the unit has been opened, tampered with or if repairs have been made or attempted by anyone except an authorised representative of t he manufacturing company.

Products for attention under guarantee (unless otherwise agreed) **must be returned to the manufacturer freight paid** and, if accepted for free repair, will be returned to the customers address in Australia free of charge.

When returning the product for service or repair a full description of the fault and the mode of operation used when the product failed must be given.

In any event the manufacturer has no other obligation or liability beyond replacement or repair of this product.

Modifications may be made to any existing or future models of the unit as it may deem necessary without incurring any obligation to incorporate such modifications in units previously sold or to which this guarantee may relate.

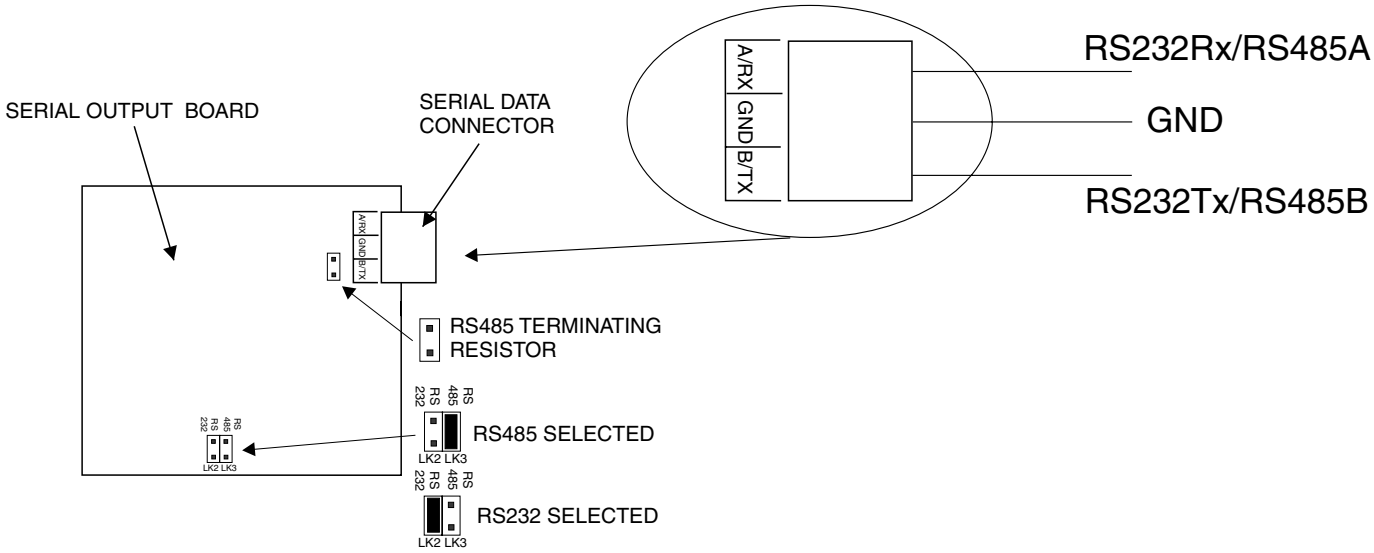
This product is designed and manufactured in Australia.

Addendum - Serial communications option

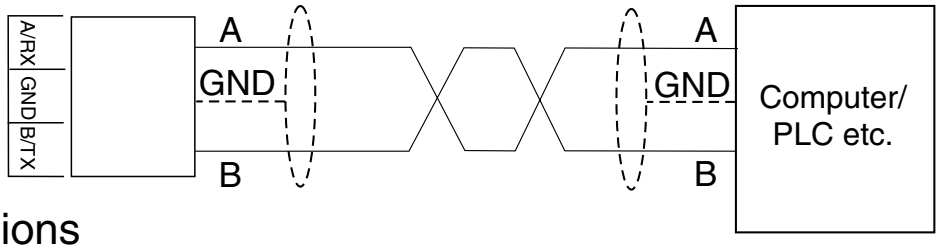
Electrical connections and output board links

See diagram below. Refer to “Electrical Installation” chapter for general information on electrical connections. External connections to the board are via plug in connectors with screw terminals these terminals allow for wires up to 1.5mm^2 to be fitted. Use twisted pair overall screened cable for RS485 and 3 core overall screened cable for RS232.

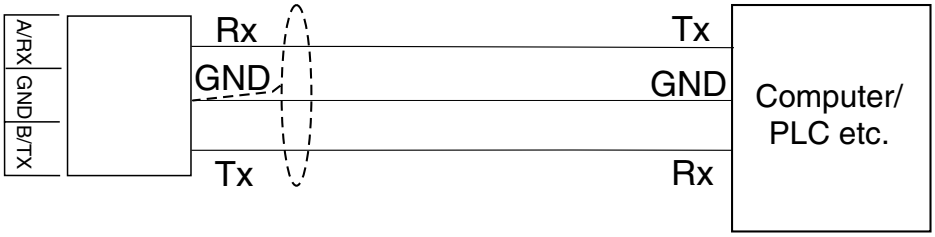
Ensure that the appropriate link is selected for RS232 or RS485. If RS232 is selected chip U1 should be in and chip U2 should be out. If RS485 is selected chip U1 should be out and chip U2 should be in. The RS485 terminating resistor link should be in if the LD4 is the first or last unit in a RS485 chain.



RS485 connections



RS232 connections



RS232/485 Operation and Commands

The RS232/485 interface is user selectable. The modes of operation available are as follows:-

diSP - Image Display Mode:

In image display mode the display value is sent via RS232/RS485 as raw data in the following format:

<ESC> IXYYYY

Where:

<ESC>is the ESCAPE character (27 Dec, 1B Hex)

I is the character 'I' (73 Dec, 49 Hex)

X is the number of image bytes in ASCII (31 to 38 Hex)

YYYY is the raw, 8 bit display data.

This information is output every display update (approx. 4 times per second - depending upon baud rate). The number of image bytes sent depends on the number of display digits present. This mode is suitable only when the receiving unit is produced by the same manufacturer as the PM4.

The most common usage would be to provide a large digit display for wide area viewing which just mimics the smaller display on the measuring instrument. The large digit displays automatically detect the image mode data and display the correct value accordingly. The data is in seven segment display image i.e. Bit 0 is segment A, Bit 1 is segment B etc.

Cont - Continuous Transmit Mode:

In this mode the display value is continually sent via the RS232/485 interface in ASCII format with 8 data bits + 1 stop bit. Data will be updated at approximately the same rate as the sample rate (approx. 4 times per second - depending upon baud rate). Refer to the **SERL** function for choices of operation mode in continuous transmit mode. The format for this is as follows:-

<STX> XYYYY<CR>

Where:

<STX> is start of text character (2 Dec, 02 Hex)

X SPACE (32 Dec, 20 Hex) for a positive value.

X'-' (45 Dec, 2D Hex) for a negative value.

YYYY is the display value in ASCII.

<CR> is a Carriage Return (13 Dec, 0D Hex)

e.g.: If the display is showing 123456 then the instrument will send '02 31 32 33 34 35 36 0D' (HEX) to the host.

POLL - Host Controlled Transmit Mode:

This mode requires a host computer or PLC to poll the instrument to obtain display or other information or reset various setpoint parameters. Special communications software such as "Telix" is required when using POLL mode. Data is in ASCII format with 8 data bits + 1 stop bit. When polling the PM4 it is essential that the command characters are sent with less than a 10mS delay between them. This normally means that each command line must be sent as a whole string e.g. <STX>PA<CR> is sent as one string rather than <STX> on one line followed by P etc. If testing using "Telix" or other software this is normally achieved by allocating a command string to a function key. Whenever the function key is operated the whole string is sent. The format used is ASCII (8 data bits + 1 stop bit) so, for instance, if address 1 is used then the string <STX>PA<CR> must be put into "Telix", or similar program as:

^BP!^M

Where:

^B is the ASCII character for STX

P is the command line to transmit the primary display value

! is the ASCII character for address 1 (33 Dec of 21 Hex)

^M is the ASCII character for CR

A typical format for the host command is as follows:-

<STX>CA<CR> (Standard read etc.)

<STX>CA<CR>N<CR>XYYYY (Set Value Command)

Where:

<STX> is Start of Text Character (2 Dec, 02 Hex, ^B ASCII)

C is the command character (see following commands)

A is the unit address (Range: 32 to 63 Dec, 20 to 3F Hex, “SPACE” to ? ASCII the address is offset by 32 Dec, 20 Hex)

<CR> is Carriage Return (13 Dec, 0D Hex, ^M ASCII)

N is the setpoint number in ASCII e.g.: 1 for alarm 1 etc.

X SPACE for positive and ‘-’ for negative

YYYY is the setpoint value in ASCII

The **POLL** commands available and instrument responses are as follows:

1. Transmit Primary Display Value: <STX>PA<CR>

e.g. ^BP!^M using Telix or similar (address 1).

Instructs unit to return the primary display value. The primary value is the live input reading. Format of returned data is:-

<ACK>PAXYYYY<CR>

Where:

<ACK> is Acknowledge (6 Dec, 06 Hex)

P echo command received ‘P’ (80 Dec, 50 Hex)

A is the responding unit’s address

X SPACE for positive and ‘-’ for negative

YYYY is the display value in ASCII

<CR> is a Carriage Return (13 Dec, 0D Hex)

The number of display characters returned depends on the number of display digits present. If the decimal point is non zero then it will be sent in the appropriate place as ‘.’ (46 Dec, 2E Hex).

2. Transmit Secondary Display Value: <STX>SA<CR>

e.g. ^BS!^M using Telix or similar (address 1).

Instructs the unit to send the secondary display value. The value will equal the primary display value if the **F.1 NP** function is set to **NONE**. If the **F.1 NP** function is set to **Hi**, **Lo**, **Hi Lo**, **P.HLd** or **d.HLd** the value for the selected operation will be returned (note: For **Hi Lo** the Hi value followed by the Lo value will be sent separated by a comma). Format of returned data is:

<ACK>SAYYYY<CR> or
<ACK>SAYYYY,YYYY<CR> in the case of **Hi Lo**

Where:

<ACK> is Acknowledge (6 Dec, 06 Hex)

S echo command received ‘S’ (83 Dec, 53 Hex)

A is the responding unit’s address

YYYY is the secondary display value in ASCII

<CR> is a Carriage Return (13 Dec, 0D Hex)

3. Reset Special Function Value: <STX>RA<CR>

e.g. ^BR#^M using Telix or similar (address 3).

Instructs the unit to reset the special function value (if applicable). Will reset the stored value for Peak Hold, Valley High and Valley Low or will operate the tare or zero function if selected. Format of returned data is:-

<ACK>RA<CR>

Where:

<ACK> is Acknowledge (6 Dec, 06 Hex)

R echo command received ‘R’ (82 Dec, 52 Hex)

A is the responding unit’s address

<CR> is a Carriage Return (13 Dec, 0D Hex)

If special functions are not active then the invalid command message will be returned (refer Invalid Command later).

4. Read Low Alarm Setpoint: <STX>LA<CR>N<CR>

e.g. ^BL%^M2^M to read alarm 2 low setpoint value using Telix or similar (address 5).

Instructs unit to return value of low alarm setpoint.

Format of returned data is:

<ACK>LANXYYYY<CR>

Where:

<ACK> is Acknowledge (6 Dec, 06 Hex)

L echo command received 'L' (76 Dec, 4C Hex)

A is the responding unit's address

N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.

X is SPACE for positive and '-' for negative

YYYY is the setpoint value in ASCII

<CR> is a Carriage Return (13 Dec, 0D Hex)

If setpoint number specified is not present the return string will have the setpoint number set to zero (i.e.: <ACK>LA0).

5. Read High Alarm Setpoint: <STX>HA<CR>N<CR>

e.g. ^BH*^M1^M to read alarm 1 high setpoint value using Telix or similar (address 10).

Instructs unit to return value of high alarm setpoint.

Format of returned data is:

<ACK>HANXYYYY<CR>

Where:

<ACK> is Acknowledge (6 Dec, 06 Hex)

H echo command received 'H' (72 Dec, 48 Hex)

A is the responding unit's address

N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.

X is SPACE for positive and '-' for negative

YYYY is the setpoint value in ASCII

<CR> is a Carriage Return (13 Dec, 0D Hex)

If setpoint number specified is not present the return string will have the setpoint number set to zero (i.e.: <ACK>HA0).

6. Set Low Alarm Setpoint: <STX>lA<CR>N<CR>XYYYY<CR>

e.g. ^Bl!^M1^M500^M to set alarm 1 low setpoint to 500 using Telix or similar (address 1)

Instructs unit to change value of low alarm setpoint.

Format of returned data is:-

<ACK>lANXYYYY<CR>

Where:

<ACK> is Acknowledge (6 Dec, 06 Hex)

l echo command received 'l' (108 Dec, 6C Hex)

A is the responding unit's address

N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.

X is SPACE for positive and '-' for negative

YYYY is the setpoint value in ASCII

<CR> is a Carriage Return (13 Dec, 0D Hex)

If setpoint number specified is not present the return string will have the setpoint number set to zero (i.e.: <ACK>lA0XYYYY).

7. Set High Alarm Setpoint: <STX>hA<CR>N<CR>XYYYY<CR>

e.g. ^Bh!^M1^M1000^M to set alarm 1 high setpoint to 1000 using Telix or similar (address 1)

Instructs unit to change value of high alarm setpoint. Format of returned data is:-

<ACK>hANXYYYY<CR>

Where:
<ACK> is Acknowledge (6 Dec, 06 Hex)
h echo command received 'h' (104 Dec, 68 Hex)
A is the responding unit's address
N is the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
X is SPACE for positive and '-' for negative
YYYY is the setpoint value in ASCII
<CR> is a Carriage Return (13 Dec, 0D Hex)

If setpoint number specified is not present the return string will have the setpoint number set to zero (i.e.: <ACK>hA0XYYYY).

8. Tare Using Current Display Value: <STX>TA<CR>

e.g. ^BT$^M using Telix or similar (address 4).

Instructs the unit to tare the instrument using the current display value (if tare has been selected in special functions mode). Format of returned data is:-

<ACK>TA<CR>

Where:
<ACK> is Acknowledge (6 Dec, 06 Hex)
T is echo command received 'T' (84 Dec, 54 Hex)
A is the responding unit's address
<CR> is a Carriage Return (13 Dec, 0D Hex)

If tare is not valid then the invalid command message will be returned (refer Invalid Command later).

9. Transmit Instrument Model and Version: <STX>IA<CR>

e.g. ^BI!^M using Telix or similar (address 1)

Instructs unit to return the model and version number of the instrument. Format of returned data is:-

<ACK>IACCX.X<CR>

Where:
<ACK> is Acknowledge (6 Dec, 06 Hex)
I is echo command received 'I' (73 Dec, 49 Hex)
A is the responding unit's address
CC is a one or two character model identifier (e.g.: 'E')
X.X is the version number (e.g.: '0.1')
<CR> is a Carriage Return (13 Dec, 0D Hex)

10. Invalid Command

If the command received from the host is not valid then the unit will return the following:-

<ACK>?A<CR>

Where:
<ACK> is Acknowledge (6 Dec, 06 Hex)
? is the character '?' (63 Dec, 3F Hex)
A is the responding unit's address
<CR> is a Carriage Return (13 Dec, 0D Hex)

If the address received from the host does not match the units address then the unit will not respond at all.

Other commands may be added to suit the particular configuration of each instrument. Value read commands will have the same format as the Transmit Primary Value command. Set Value commands will have the same format as the Set Low Alarm Setpoint command etc.

Host Timing Requirements for RS485 Operation

RS485 operation requires the host to switch the RS485 transceiver to transmit before a command is sent. The instrument is capable or replying after 1 to 2 milliseconds. Therefore the host should switch the RS485 transceiver back to receive mode within 0.5 milliseconds after the last character of the command has been sent to ensure correct operation.

ASCII Code Conversion Listing

ASCII for control characters is shown in brackets. e.g. STX is entered as ^B if typing into a communications package for computer communication .

ASCII Char.	Dec	Hex	ASCII Char.	Dec	Hex
NUL (^@)	000	00	SP ( )	032	20
SOH (^A)	001	01	!	033	21
STX (^B)	002	02	“	034	22
ETX (^C)	003	03	#	035	23
EOT (^D)	004	04	$	036	24
ENQ (^E)	005	05	%	037	25
ACK (^F)	006	06	&	038	26
BEL (^G)	007	07	‘	039	27
BS (^H)	008	08	(	040	28
HT (^I)	009	09	)	041	29
LF (^J)	010	0A	*	042	2A
VT (^K)	011	0B	+	043	2B
FF (^L)	012	0C	,	044	2C
CR (^M)	013	0D	-	045	2D
SO (^N)	014	0E	.	046	2E
SI (^O)	015	OF	/	047	2F
DLE (^P)	016	10	0	048	30
DC1 (^Q)	017	11	1	049	31
DC2 (^R)	018	12	2	050	32
DC3 (^S)	019	13	3	051	33
DC4 (^T)	020	14	4	052	34
NAK (^U)	021	15	5	053	35
SYN (^V)	022	16	6	054	36
ETB (^W)	023	17	7	055	37
CAN (^X)	024	18	8	056	38
EM (^Y)	025	19	9	057	39
SUB (^Z)	026	1A	:	058	3A
ESC (^[)	027	1B	;	059	3B
FS (^\)	028	1C	<	060	3C
GS (^^)	029	1D	=	061	3D
RS (^)	030	1E	>	062	3E
US (^_)	031	1F	?	063	3F

@	064	40	‘	096	60
A	065	41	a	097	61
B	066	42	b	098	62
C	067	43	c	099	63
D	068	44	d	100	64
E	069	45	e	101	65
F	070	46	f	102	66
G	071	47	g	103	67
H	072	48	h	104	68
I	073	49	i	105	69
J	074	4A	j	106	6A
K	075	4B	k	107	6B
L	076	4C	l	108	6C
M	077	4D	m	109	6D
N	078	4E	n	110	6E
O	079	4F	o	111	6F
P	080	50	p	112	70
Q	081	51	q	113	71
R	082	52	r	114	72
S	083	53	s	115	73
T	084	54	t	116	74
U	085	55	u	117	75
V	086	56	v	118	76
W	087	57	w	119	77
X	088	58	x	120	78
Y	089	59	y	121	79
Z	090	5A	z	122	7A
[	091	5B	{	123	7B
\	092	5C	|	124	7C
]	093	5D	}	125	7D
^^	094	5E	~	126	7E
_	095	5F	DEL	127	7F

Addendum - Analog retransmission option

This addendum covers instruments with the analog retransmission board. This board allows retransmission of 4 - 20mA, 0-1V or 0-10V selectable via two sets of links. Refer to the main "Explanation of Functions" chapter for details of the functions (rEC_, rEC2 and rEC) associated with these outputs and to the Function table for function listing.

Electrical Connections

See diagram below. Refer to "Electrical Installation" chapter for general information on electrical connections. External connections to the board are via plug in connectors with screw terminals these terminals allow for wires up to 1.5mm^2 to be fitted.

Configuring the output board

The output board has facilities for 4-20mA, 0-1V and 0-10V retransmission and is factory supplied with all the necessary components for the output options required.

Two sets of PCB links are fitted to the circuit board to connect the electronic components for the correct output types, ensure that both sets of links have the required output selected. It may be necessary to alter the PCB links to change the output type (see link settings below).