LD4-SG
Large Digit Display
Load Cell/Pressure Transducer
Input (mV/V types)
Operation and Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the LD4-SG Monitor. The LD4 is a general purpose instrument which may be configured to accept inputs from 4 wire type (mV/V output) load cell/pressure transducers.

The instrument may be scaled to display the input in engineering units. Use the CAL 1 and CAL2 methods of scaling, as described in Chapter 4 to scale the instrument to the required 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 or two extra relays 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.

LD4-SG inputs & outputs

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 4 wire load cell 0.5mV/V to 20mV/V (set via internal links)
Remote switch input to perform special functions

Standard outputs
Two alarm relays

Optional outputs
Two extra alarm relays
Analog retransmission 4-20mA, 0-1V or 0-10V
Serial communications RS232 or RS485 ASCII or Modbus RTU
Note: only one option can be fitted

1 .1 Alteration of function settings

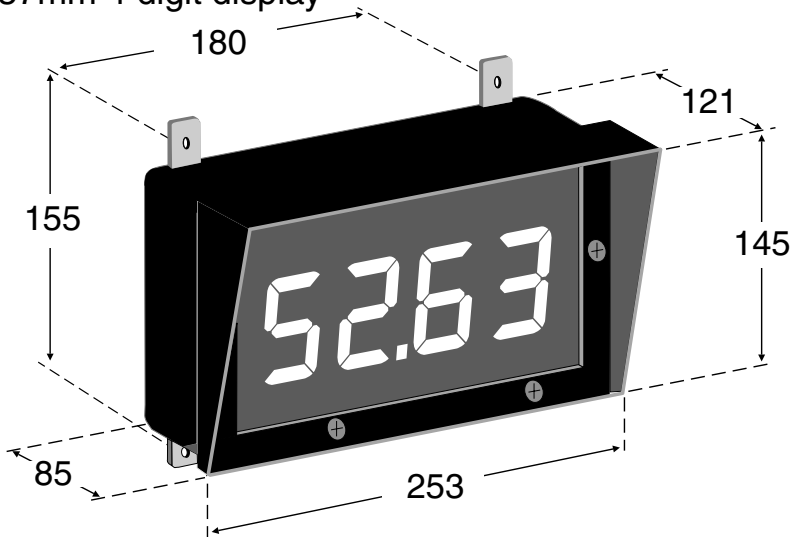
See “Explanation of Functions”, Chapter 4, for details on entering the function and calibration modes.

An improved method of altering the display values when changing certain function settings is now being employed. Some function settings such as alarm trip point settings require numerical changes in their values when initially setting up the instrument or when changes to operational requirements are being made. When in FUNC or CAL mode the ▲ and ▼ buttons on the front panel are used to change values. When these buttons are pressed and held in the display will now change in multiples of 10 (apart from the right most digit). When the button is released the last number to be altered will flash with the bottom digit remaining lit. The digit will continue flashing for approximately 2 second to allow any changes to be made to that digit, the digit to the right hand side of this will now flash and allow changes to be made to it and so on to the right most digit. This new feature has been employed to reduce the time taken to make changes to settings.

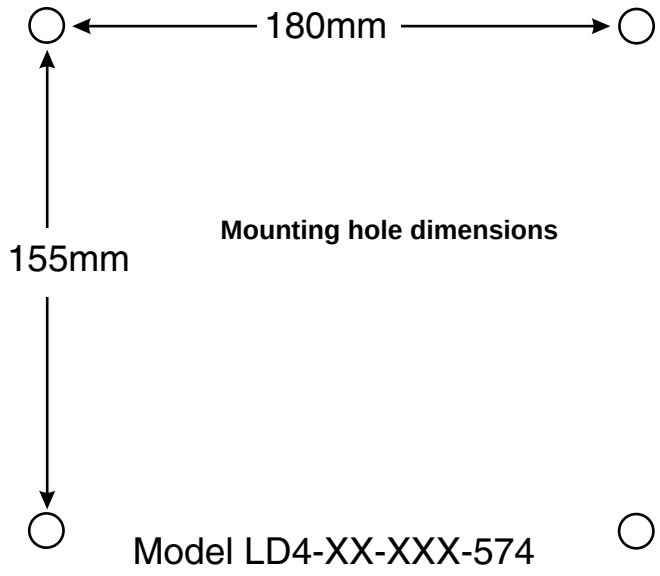
2 Mechanical Installation

The instrument is designed be wall mounted. Carefully measure and drill holes, as shown below. All sizes are in mm. Mounting hole diameters are 6.5mm.

57mm 4 digit display



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



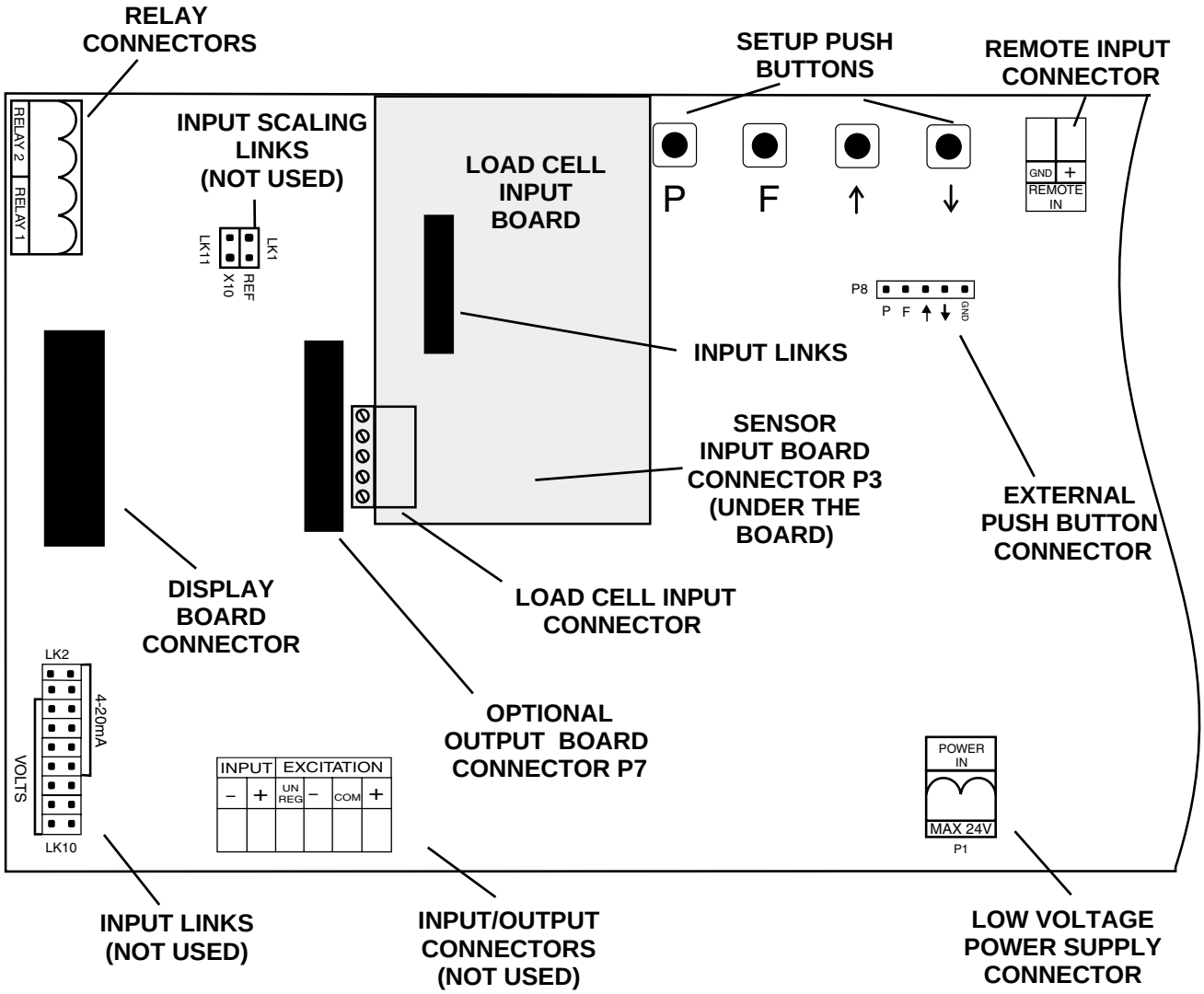
Mounting hole dimensions

3 Electrical Installation

The LD4-SG 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 2.5mm^2 (1.5mm^2 for remote input) 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.

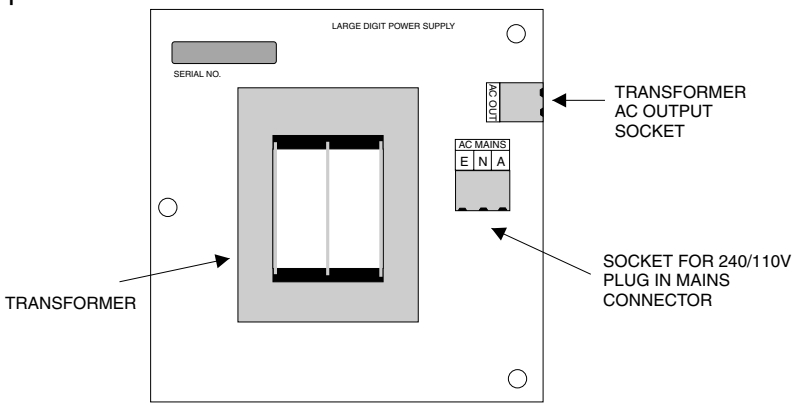
MAIN CIRCUIT BOARD LAYOUT (PARTIAL VIEW)



3 .1 Power supply connections

Mains power connections (240VAC or 110VAC) are mader via a plug in terminal with screw connections.

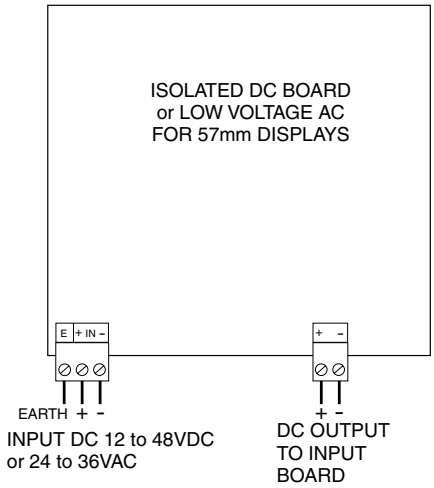
The transformer low voltage AC output goes to the power supply connector P1 on the main circuit board via the lead supplied.



DC supplies may be connected directly to 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.

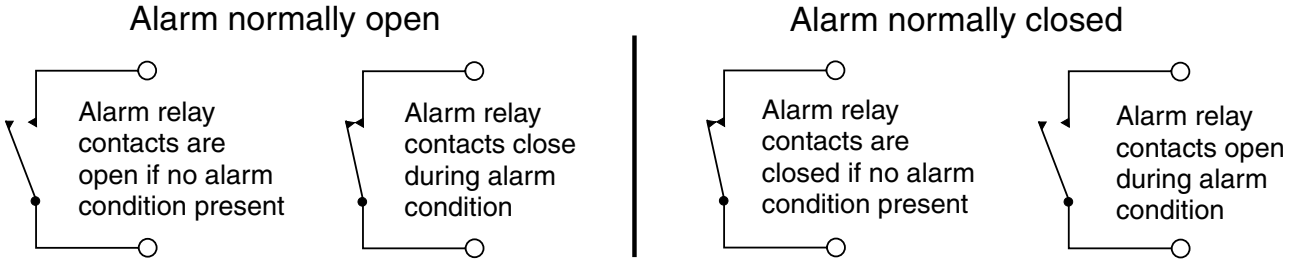
Non isolated DC supplies (15 to 24V) are connected at the main circuit board power supply connector P1 via the plug in connector terminals. The positive and negative supplies may be connected either way around.

Optional isolated DC supplies and low voltage (24 to 36VAC) AC supplies use plug in terminals supplied on the power supply board as shown below. The output from the isolated DC supply board connects directly to the main circuit board power supply connector via the plug in connector (P1) terminals.



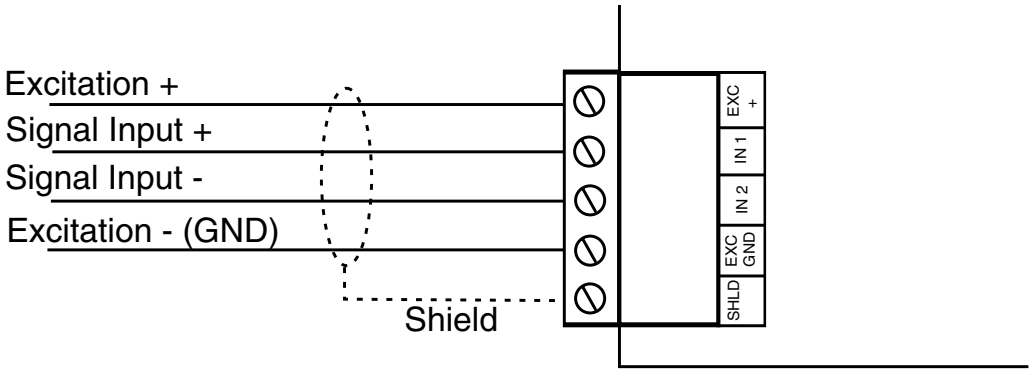
3 .2 Relay connections

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.



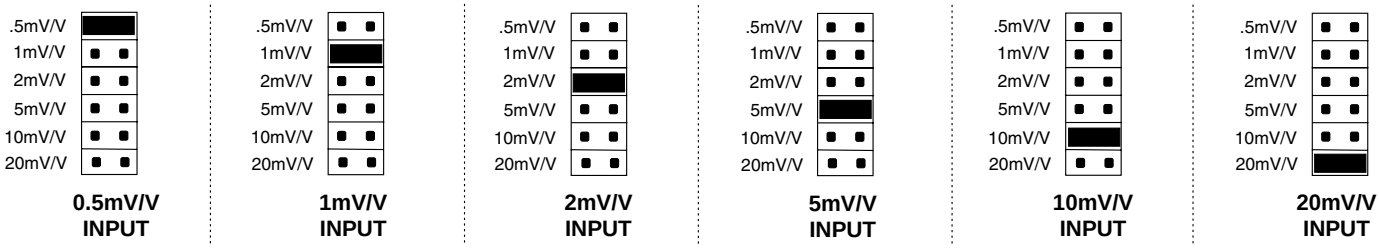
3 .3 Input/output Connectors

The diagram shows the input connector for the LD4-SG. Ensure that the input type selector links are also set correctly (see below). Wires of up to 2.5mm^2 can be accepted. The connector is of the plug in type for ease of installation. Your load cell/pressure transducer connects directly to this input. Remember to set the mV/V input links to suit your sensor.



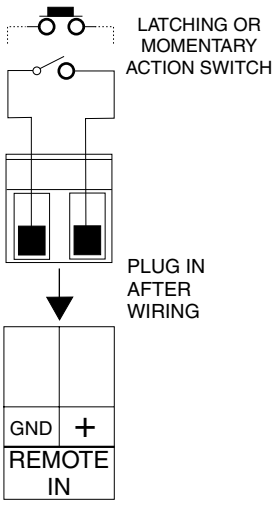
3 .4 Input mV/V and excitation voltage selector links

The input selector links must be set to suit the mV/V of the load cell being used. If your load cell mV/V output does not exactly match the link settings available then use the next highest link setting e.g. for a load cell with a 2.5mV/V output select the 5mV/V link. The excitation voltage selector link (LK7) is located on the underside of load cell input board. With link LK7 in 5V excitation is selected, with link LK7 out 10V excitation is selected. 10V excitation is normally used unless the load cell (or combination of cells) has a resistance of less than 350Ω (nominal). For a resistance of less than 350Ω 5V excitation must be used.



3 .5 Remote input connector

The LD4-SG has a software function called **r.inP** or remote input. Closure of the remote input connector via a switch or relay contact will cause the selected remote input function to operate. Choose the switch type to suit the remote input required e.g. for a zero, **ZERO**, function a momentary action switch is most commonly used, for a display hold, **dHLd**, a latching switch may be required.



4 Explanation of Functions

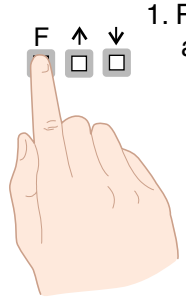
The LD4 setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

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

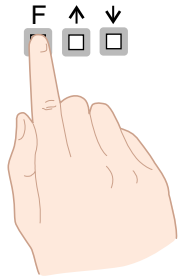
CAL mode (power up sequence plus push button sequence) allows access to all functions including calibration parameters.

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.

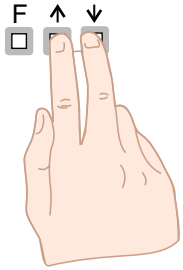
Entering CAL Mode



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.

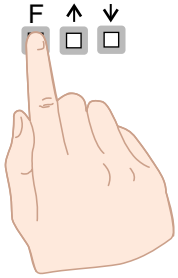


3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

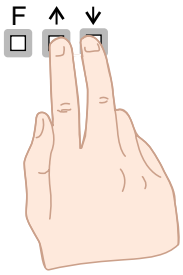
Notes: If step 1 above has been completed then the instrument will remain in this CAL mode state until power is removed. i.e. there is no need to repeat step 1 when accessing function unless power has been removed. The instrument should show all 8's on power up e.g. 8.8.8.8. if the instrument does not 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.

Alternative CAL Mode Entry

This alternative method allows CAL mode entry without the need to remove power:
1. Enter FUNC mode using the 2 steps above
2. When the first function appears press and hold the P button until you see the message FUNC followed by CAL (the P button will have to be held pressed for approximately 2 seconds)
3. You should now return to the function you were in but have full access to CAL mode functions
Note: when you exit back to live reading the PM4 will remain in CAL mode for approximately 4 minutes, after this time you will need to repeat this process to enter CAL mode.

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

The LD4-SG 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 or the ACCS function must be set to EASY.

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.

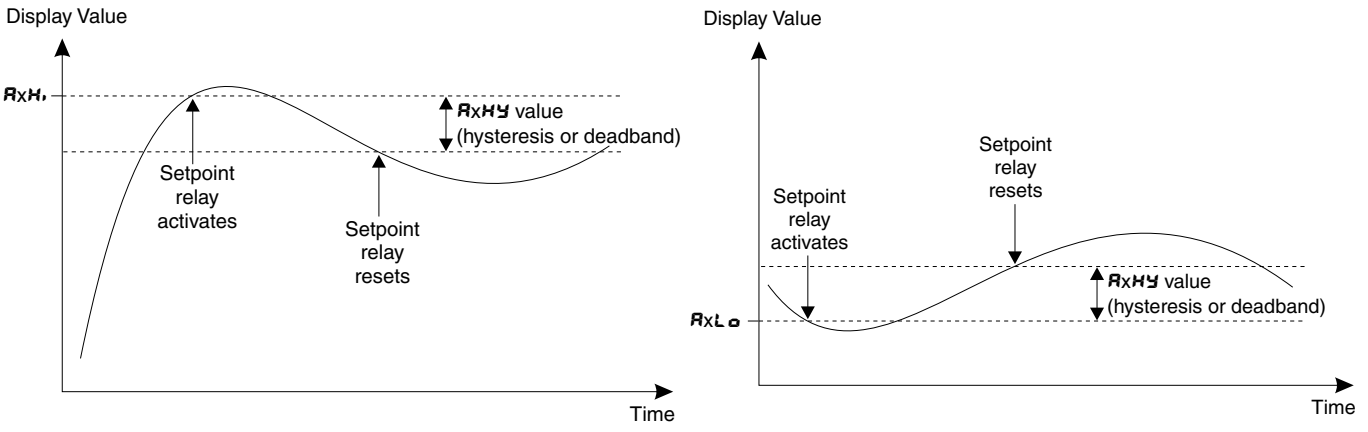
A 1H, (alarm high setpoint)

Displays and sets the high setpoint value 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.

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.

A 1tt (alarm trip time)

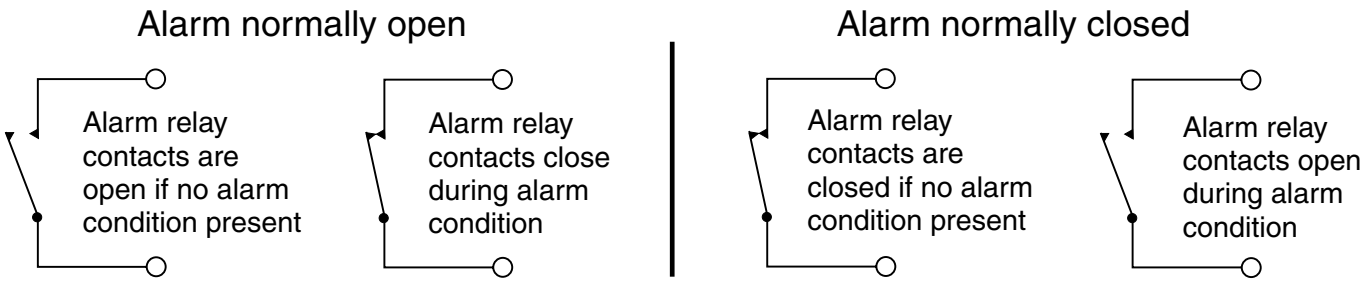
Displays and sets the alarm trip time and is common for both alarm high and low setpoint values. The trip time is the delay time before the alarm relay will activate, or trip, when an alarm condition is present. The alarm condition must be present continuously for the trip time period before the alarm 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 **9999** seconds.

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 **9999** seconds.

A 1n.o or **A 1n.c (alarm x 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.



A2Lo , A3Lo & A4Lo (alarm low setpoint)

Displays and sets alarm 2, 3 & 4 low setpoints, see **A 1Lo** for further description. Note: alarm relays 3 & 4 are only fitted as options.

A2H, , A3H, & A4H, (alarm high setpoint)

Displays and sets alarm 2, 3 & 4 high setpoints, see **A 1H,** for further description. Note: alarm relays 3 & 4 are only fitted as options.

A2HY , A3HY & A4 HY (alarm hysteresis [deadband])

Displays and sets the alarm hysteresis limit for alarm 2, 3 & 4, see **A 1HY** for further description. Note: alarm relays 3 & 4 are only fitted as options.

A2tt , A3tt & A4tt (alarm trip time)

Displays and sets the alarm trip time for alarm 2, 3 & 4, see **A 1tt** for further description. Note: alarm relays 3 & 4 are only fitted as options.

A2rt , A3rt & A4 rt (alarm reset time)

Displays and sets the alarm relay reset time for alarm 2, see **A 1rt** for further description. Note: alarm relays 3 & 4 are only fitted as options.

A2n.o / A2n.c , A3n.o/A3n.c, A4n.o/A4n.c (alarm normally open or normally closed)

Displays and sets the setpoint alarm relay action for alarm 2, 3 & 4, see **A 1n.o / A 1n.c** for further description. Note: alarm relays 3 & 4 are only fitted as options.

Ax.SP, Ax.t 1, Ax.t2 etc. **(relay operation independent setpoint or trailing)** - this function will not be seen if both the high and low setpoints are set to OFF.

Each alarm may be programmed to operate with an independent setpoint setting or may be linked (or trailing) to operate at a fixed difference to another relay setpoint. The operation is as follows: Alarm 1 (A1) is always independent. Alarm 2 (A2) may be independent or may be linked to Alarm 1. Alarm 3 (A3) may be independent or may be linked to Alarm 1 or Alarm 2. Alarm 4 (A4) may be independent or may be linked to Alarm 1, Alarm 2 or Alarm 3. The operation of each alarm is selectable within the Function Setup Mode by selecting, for example, (Alarm 4) A4.SP = Alarm 4 normal setpoint or A4.t 1 = Alarm 4 trailing Alarm 1 or A4.t2 = Alarm 4 trailing Alarm 2 or A4.t3 = Alarm 4 trailing Alarm 3. 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 A1H is set to 1000 and A2H is set to 50 then Alarm 1 will trip at 1000 and alarm 2 will trip at 1050 (i.e. 1000 + 50). If Alarm 2 had been set at -50 then alarm 2 would trip at 950 (i.e. 1000 - 50). See the trailing alarm table which follows.

Trailing Alarm Table
Showing Possible Alarm Assignments

	A2	A3	A4
A1	A2.t 1	A3.t 1	A4.t 1
A2		A3.t2	A4.t2
A3			A4.t3

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)

Displays and sets the level for remote input brightness switching, see rinP 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/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/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. (example if set to 10 the display indication will change in multiples of 10 only).

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 for display with more than 4 digits.

FLtr (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)

This function is not used with load cell/pressure transducer type inputs, the setting for this function should be nonE.

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

CAL 1 and CAL2 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 signal input must be present at the input terminals. Note: CAL 1 and CAL2 can be set independently i.e. it is not necessary to perform a CAL2 operation directly after a CAL 1.

The procedure for entering the first scaling point is:

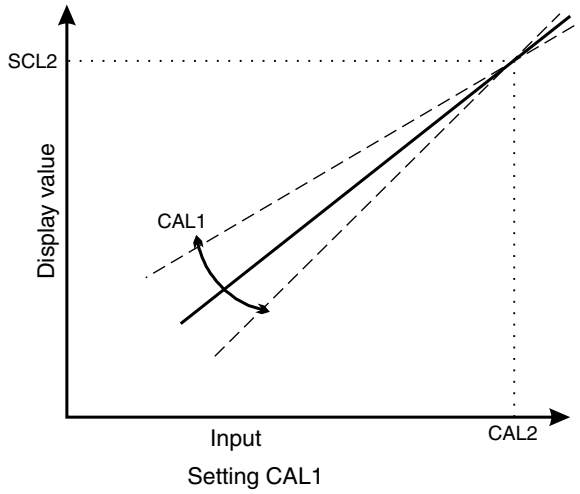
a. Ensure that an input signal is present at the input terminals, this will normally be at the low end of the signal range e.g. no load.

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 needs to be investigated before proceeding with the scaling.

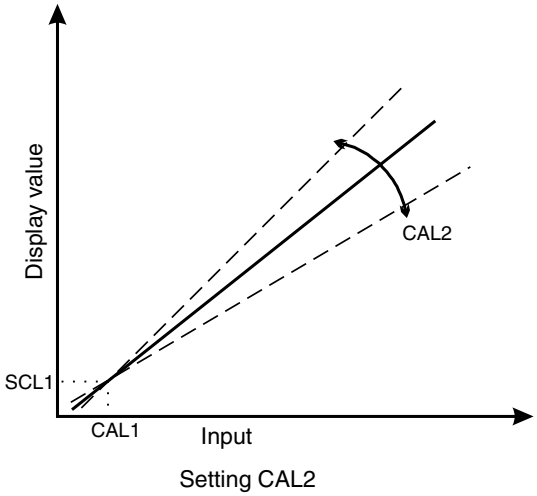
c. Press, then release the F button. The display will indicate SCL 1 followed by a value. Use the ▲ or ▼ button to change this value to the required display value at this input. e.g. if there was no load and the required display at no load was 0 then ensure 0 is selected at SCL 1. Press the F button 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 10kg load cell you could use a 10kg load as the live input. Note; it is not essential that zero and full load are used but the live input values must be significantly different to avoid calibration errors. If the P button 2Er0 or remote input 2Er0 is to be used then once the CAL2 operation has been completed a CAL 2Er0 operation should be undertaken.

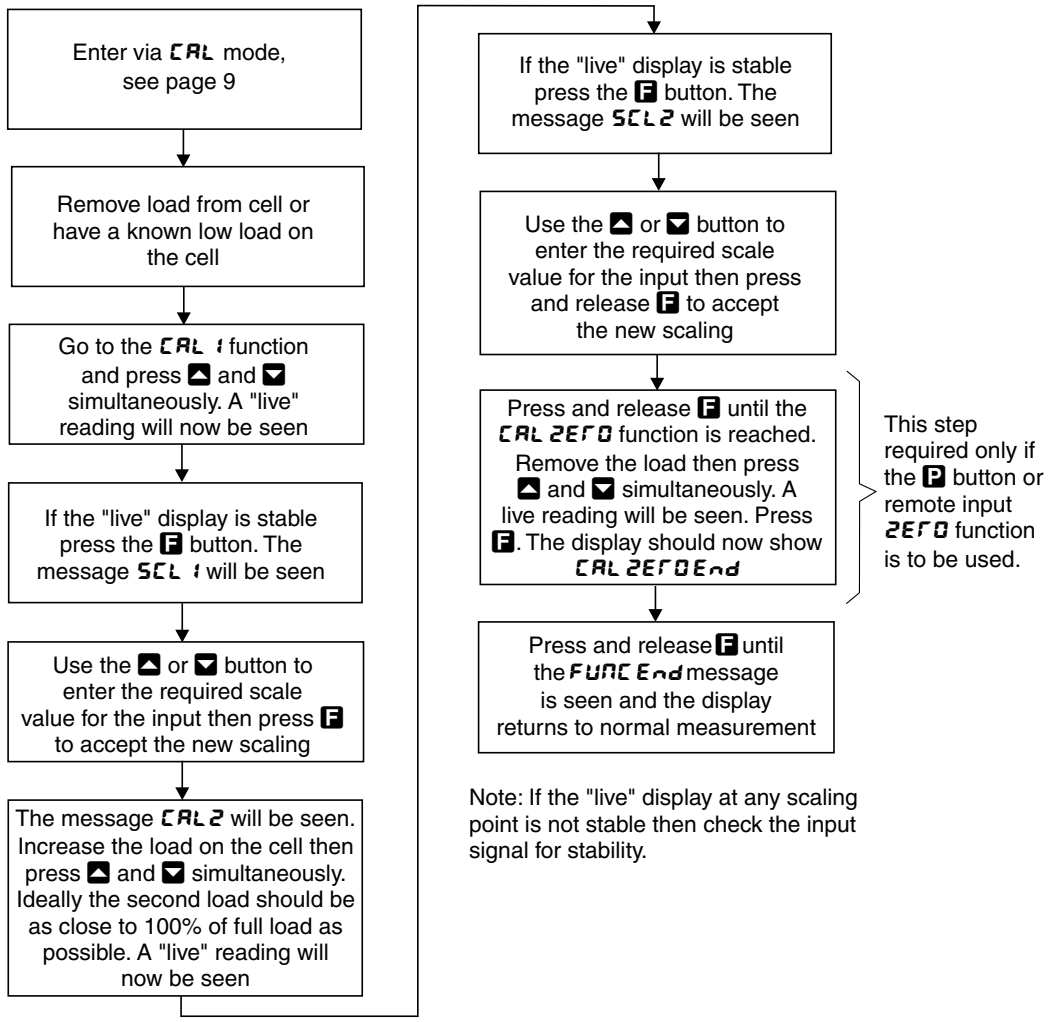


Setting CAL1



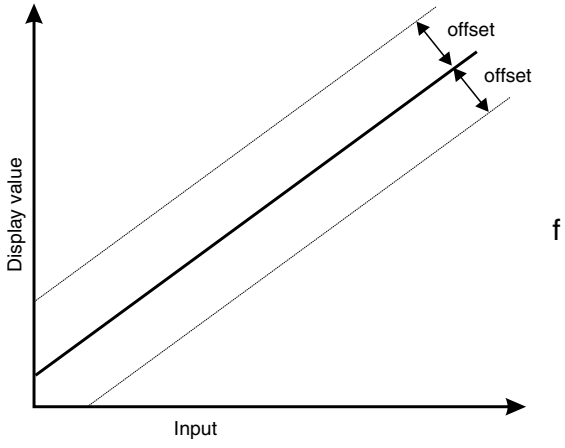
Setting CAL2

Example - Scaling using two live inputs



CAL OFSt (calibration offset)

The calibration offset is a single point adjustment which can be used to alter the calibration scaling values across the entire measuring range without affecting the calibration slope. This method can be used instead of performing a two point calibration when a constant measurement error is found to exist across the entire range. To perform a calibration offset press the ▲ and ▼ buttons simultaneously at the CAL OFSt unction. A "live" reading from the input will be seen, make a note of this reading. Press the F button, the message SCLE will now be seen followed by the last scale value in memory. Use the ▲ or ▼ button to adjust the scale value to the required display value for that input. For example if the "live" input reading was 50 and the required display value for this input was 70 then adjust the SCLE value to 70.



ZERO rnGE (zero range)

The zero range function allows a limit value to be set (in engineering units) above which the display will not zero i.e. if a zero operation is attempted via the P button, remote input or set zero function when the display value is greater than the zero range setting the display will refuse to zero and give a ZERO rnGE Err message (note that the CAL OFSt function is also affected by the ZERO rnGE setting). For example if the zero range setting is 10 the instrument will only respond to a zero operation if the display reading at the time is between -10 and 10. If the zero range function is not required it can be set to OFF by pressing the ▲ and ▼ buttons simultaneously at this function. When switched off the instrument can be zeroed no matter what the display value.

Note that the instrument keeps track of the value being zeroed at each operation, when the total amount zeroed from repeated operations becomes greater than the zero range value the instrument will

reject the zero operation and a ZERO RNGE Err message will be seen. To allow a zero operation beyond this point either the ZERO RNGE function value will need to be raised or a new zero reference point introduced via the CAL ZERO function.

If repeated zero operations are required the ZERO RNGE function should be set to OFF or alternatively the tARE operation could be considered.

CAL ZERO (calibration zero)

The calibration zero function is used following a calibration via CAL 1 and CAL 2. A calibration zero operation at this time ensures that the display zero and the ZERO RNGE reference zero are at the same point after a calibration. After a calibration the calibration zero can also be used to select a zero point other than the display zero as the reference for the ZERO RNGE function. For example if the CAL ZERO operation is carried out with a display reading of 500 and a ZERO RNGE reading of 10 the zero range function will allow the display to zero only if the current display reading is between 490 and 510. To perform a calibration zero press the ▲ and ▼ buttons simultaneously at the CAL ZERO function, a live reading will be seen, press the F button, the message CAL ZERO End should now be seen indicating that the instrument has accepted the zero point. Although the display reading will not change as a result of the calibration zero the input value on the display at the time of the operation will be the new zero reference point for the ZERO RNGE function.

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

This function is not used with load cell/pressure transducer type inputs. By-pass the function by pressing the F button.

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

This function is not used with load cell/pressure transducer type inputs. By-pass the function by pressing the F button.

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 reset the instrument calibration press ▲ and ▼ together at the UCAL function. The message CAL CLr should be seen.

P.but (P button function)

The P button may be set to operate some of the remote input functions, see F.1 NP below for a description of these functions. The P button is located at the front of 5 or 6 digit LED models. 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. The functions below are as described in the F.1 NP function above with the exception of the P.SEt function.

Functions available are: NONE, Hi , Lo , Hi Lo, tARE or ZERO

Note: To prevent accidental operation of the P button in the tARE or ZERO functions it is necessary to hold the button in for 2 seconds to perform the selected operation. If using tARE then also refer to

F.1 NP (remote input function)

See “Electrical Installation” the location of the remote input connector. When these pins are short circuited, via a pushbutton or keyswitch the instrument will perform the selected remote input function. A message will flash to indicate which function has been selected when the remote input pins 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 pins are short circuited.

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

Hi - peak memory. The peak value stored in memory will be displayed if the remote input pins 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.

TARE - display tare. Short circuiting the remote input pins momentarily will allow toggling between nett and gross values (shown as NETT and GROS). If the remote input is short circuited for approx. 2 seconds the display will be tared and will show zero. The tare will be lost if power is removed.

ZERO - display zero. Zeroes the display in same manner as the tare function except that the zero is not lost when power is removed and the display will zero as soon as the remote input is short circuited.

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-SG, 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 load cell input can be scaled (using CAL 1& CAL2 or USER En4 and USER En20) to read 0 to 100 over the full range. With the remote input short circuit to ground the scaling can be repeated using figures of 0 to 500 for the full 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, tonnes 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 brgt function and the brightness level set at the DULL function.

NETT FLSH (nett value display mode)

The nett value is only seen when the remote input or **P** button is used to toggle between the nett and gross values. The NETT FLSH function can be set to on or OFF. If set to on then the message NETT will flash briefly approximately every 6 seconds when the operator toggles to a nett display to remind the operator that a nett value is being viewed. If set to OFF then the message NETT will flash briefly once only when the operator toggles to the nett value.

ACCS (access mode)

The access mode function ACCS has four possible settings namely OFF, EASY, NONE and ALL. If set to OFF the mode function has no effect on alarm relay operation. If set to EASY the easy alarm access mode will be activated, see details at the beginning of this chapter preceding the A 1LO function. If set to NONE there will be no access to any functions via FUNC mode, entry via CAL mode must be made to gain access to alarm and calibration functions. If set to ALL then access to all functions, including calibration functions, can be gained via FUNC mode.

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.

A 1-3 - Allows access to alarms 1, 2 and 3 only.

A 1-4 - Allows access to alarms 1, 2, 3 and 4.

The remote input function (F.1 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)

This function is not used with load cell/pressure transducer type inputs. By-pass the function by pressing the **F** button.

Lo di SP (low overrange limit value)

The display can be set to show an overrange message if the display value falls below the Lo di SP setting. For example if Lo di SP is set to 50 then once the display reading falls below 50 the message -or- or the display value (see di SP function) will flash instead of the normal display units. This message can be used to alert operators to the presence of an input which is below the low limit. If this function is not required it should be set to OFF by pressing the ▲and ▼ buttons simultaneously at this function.

HI 9H di SP (high overrange limit value)

The display can be set to show an overrange message if the display value rises above the HI 9H di SP setting. For example if HI 9H di SP is set to 1000 then once the display reading rises above 1000 the message -or- or the display value (see di SP function) will flash instead of the normal display units. This message can be used to alert operators to the presence of an input which is above the high limit. If this function is not required it should be set to OFF .

di SP (display overrange warning flashing mode)

This function is used in conjunction with the Lo and HI 9H di SP functions. The di SP function can be set to FLSH or -or-. If the value set at the Lo or HI 9H di SP function is exceeded and the di SP function is set to FLSH then the display value will flash on for approximately one second and off for approximately one second as a warning. If the value set at the Lo or HI 9H di SP function is exceeded and the di SP function is set to -or- then the -or- message will flash on for approximately one second and off for approximately one second as a warning. The warning flashes will cease and the normal display value will be seen when the value displayed is higher than the low limit and lower than the high limit.

A 1 (alarm 1 operation mode)

The alarm mode function allows the selected alarm relay to follow either the live input value (L, uE), the tare function (tArE), the peak hold function (P.HLd), the display hold (d.HLd), the peak memory (H,) or valley memory (Lo) or the display value (di SP). For settings other than di SP operation a remote input or P button must also be set to the function required.

Example 1- A1 is set to L, uE

With the alarm function set to L, uE the alarm relay operation will follow the live input based on the electrical inputs and scaling values used when the instrument is calibrated. If the value on the display has been altered from the calibration scaling values e.g. via a tare operation then the alarm operation will ignore the display changes caused by the tare operation. For example if A 1H, is set to 100 then alarm relay 1 will activate if the display reading goes to 100 or above. If a tare operation is now carried out when the display value is 20 then the tare will cause the display value for that input to fall to zero. The alarm relay will now activate at display value of 80 or above since the live electrical input for a tared display of 80 is the same as it was for a value of 100 prior to the tare operation.

Example 2 - A 1 is set to tArE and r.1 nP (remote input special function) is set to tArE.

Assume that A 1H, is set to 100 and that the instrument is given a remote tare when the display reads 40. Once the instrument is tared the display will read 0. Alarm relay 1 is set to follow the tare value and will therefore operate when the (nett) display becomes greater than 100.

Example 3 - A 1 is set to P.HLd and r.1 nP is set to P.HLd

If A 1H, is set to 100 then it will operate whenever the display shows a value over 100. If the peak value exceeds 100 when the remote input is closed then alarm 1 will activate and will not reset until the remote input opens **and** the display value falls below 100.

Example 4 - A 1 is set to d.HLd and r.1 nP is set to d.HLd

If A 1Lo is set to 5 then it will operate whenever the display shows a value below 5. If the display hold remote input is operated at a value above 5 then the alarm will not activate whilst the remote input remains closed, no matter what the electrical input. Likewise if the remote input is operated at a value below 5 then alarm will not de activate until the remote input is opened and the display value goes above 5.

Example 5 - A 1 is set to H, and r.1 nP is set to H,

If A 1H, is set to 50 and the peak memory value becomes greater than 50 then alarm relay 1 will be constantly activated at this point and will only become de activated when the memory is reset at a value below 50. The memory can be reset by holding the remote input closed for 2-3 seconds. Note that in this case the alarm can be activated even if the display value is less than the alarm setting, this is because the alarm is activated by the value in peak memory rather than the display

value.

Example 6 - **A 1** is set to **Lo** and **r.1 nP** is set to **Lo**

If **A 1Lo** is set to **280** and the valley memory value becomes less than **280** then alarm 1 will be constantly activated at this point and will only become de activated when the memory is reset at a value above **280**. The memory can be reset by holding the remote input closed for 2-3 seconds. Note that in this case the alarm can be activated even if the display value is greater than the alarm setting, this is because the alarm is activated by the value in valley memory rather than the display value.

Example 7- **A1** is set to **di SP**

With the alarm function set to follow the display value the alarm relay will activate whenever the display shows an alarm condition, irrespective of any alteration to the original scaling values due to a tare, zero, peak memory etc. operation. Thus if **A 1Lo** is set to **50** and **A 1H,** is set to **100** then alarm relay 1 will activate whenever the value shown on the display falls below **50** or goes above **100**. If the **r.1 nP** function is now set to **H,** (peak memory) and the peak memory value is **100** or greater then the alarm relay will be activated whenever the remote input is used to display the **H,** value, irrespective of the live input at the time.

A2, **A3** & **A4** **(alarm 2, 3 & 4 operation mode)**

Operates as per **A 1** above but affects alarm relays 2, 3 & 4.

rEC (analog retransmission output mode) - seen only when analog retransmission option is fitted

The analog retransmission mode function allows the selected retransmission output to follow either the live input value (**L, uE**), the tare function (**tArE**), the peak hold function (**P.HLd**), the display hold (**d.HLd**), the peak memory (**H,**) or valley memory (**Lo**) or the display value (**di SP**). For settings other than **di SP** operation a remote input or **P** button must also be set to the function required. These settings affect the retransmission output in the same manner as the equivalent settings affect the alarm relay operation - see **A 1** function for details.

bAud (Set baud rate) - seen only with serial output option.

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

PrtY (Set parity) - seen only with serial output option.

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

O.Put (Set serial interface mode) - seen only with serial output option. Refer to “Optional Outputs” appendix in this manual for a full description of the **di SP**, **Cont**, **POLL** and **Mod.bUS** modes.

Allows user to select the serial 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.

Mod.bUS Modbus RTU protocol.

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 retransmission mode) - seen only with serial output option - applies only when **O.Put** function set to **Cont**.

Refer to **rEC** function on for function description. The **H, Lo** selection in this functions allows both the peak and valley memories to be transmitted. The peak value will be transmitted followed by a space then the valley value.

4 .1 Error Messages

CAL Err - This indicates that one of the calibration points has caused an overrange error in the analog to digital converter. Check the input link settings against the live input then try calibration again.

SPAN ERR - This indicates that the calibration points entered were too close together. Try calibrate again with the points further apart i.e. with a bigger difference between loads used. The calibration points should be at least 10% of full scale apart, ideally as close to 100% of full scale as possible.

ZERO RNGE Err - This indicates that an attempt to zero or preset a value on the display has failed due to the **ZERO RNGE** function value being exceeded. Check the **ZERO RNGE** function setting, if this is set at the required figure and the display value seems to be within the zero range limits then it could be that previous zero operations have caused the limit to be exceeded.

"**----**" - This display indicates that the actual input is higher than the input mV link settings e.g. a 50mV input being used when the link settings are for a 2mV/V input. Check the link settings and the live input value.

"**-or-**" - This display indicates an overrange reading. This could be due to the instrument not being able to display the number because it is too large e.g. above **9999** on a 4 digit display. Alternatively it could mean that the **Lo** or **HI 9H di SP** limit value has been exceeded and the instrument is showing a warning message.

Value on display flashing - this means that the **Lo** or **HI 9H di SP** limit value has been exceeded and the instrument is showing a warning message.

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
AxLo	Alarm relay low setpoint value	Setpoint value or OFF	OFF	See following table
AxHi	Alarm relay high setpoint value	Setpoint value or OFF	OFF	See following table
AxHY	Alarm relay hysteresis	Hysteresis value in measured units	1	See following table
Axtt	Alarm relay trip time	No of seconds before relay trips	0	See following table
Axrt	Alarm relay reset time	Reset time in seconds	0	See following table
Axno or Axnc	Alarm relay action N/O or N/C	A1no or A1nc	A1no	See following table
Ax.SP or Ax.t1	Setpoint or trailing alarm relay	Ax.SP or Ax.t1	Ax.SP	See following table
brgt	Display brightness	1 to 15	15	
dULL	Remote display brightness switching	0 to 15	1	
Function below are accessible 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 unit	Not used with load cell/pressure transducer type inputs, leave set to NONE.			
CAL 1	First scaling point	Live reading	n/a	
CAL2	Second scaling point	Live reading	n/a	
CAL OFSt	Offset to calibration	Live reading	n/a	
2ERO rNGE	Zero range limit	Limit value or OFF	1000	
CAL 2ERO	Zero point calibration	0	n/a	
USEr En4	Not used with load cell/pressure transducer type inputs.			
USEr En20				
UCAL	Uncalibrate	CAL CLr		
P.but	P button function	NONE, Hi, Lo, Hi Lo, tArE or 2ERO	NONE	
r.i nP	Remote input function	NONE, PHLd, dHLd, Hi, Lo, Hi Lo, tArE, 2ERO, SP.Ac, no.Ac, CAL.S or dULL	NONE	
nEtt FLSH	Nett viewing mode	on or OFF	OFF	
ACCS	Access mode	OFF, EASY, NONE or ALL	OFF	
SPAC	Setpoint access	A1, A1-2 etc.	A1	
SGrt	Not used with load cell/pressure transducer type inputs, leave set to OFF.			

Lo dI SP	Display low overrange	Limit value or OFF	OFF	
HI 9H dI SP	Display high overrange	Limit value or OFF	OFF	
dI SP	Overrange display warning flashing mode	FLSH or -or-	FLSH	
Ax	Alarm 1 operation mode	L, uE.tArE.P.HLd. d.HLd.H, .Lo or dI SP	dI SP	See following table
rEC	Analog retransmission output mode. Seen only when this option is fitted.	L, uE.tArE.P.HLd. d.HLd.H, .Lo or dI SP	dI SP	
bAUd	Baud rate	300.600. 1200. 2400.4800.9600. 19.2 or 38.4	9600	
PrtY	Parity	nONE.EUEn or odd	nONE	
O.Put	Communication mode	d, SP.Cont.POLL or ñ.buS	Cont	
Addr	Unit address	0 to 3 1	0	
SErL	Serial communication output mode.	L, uE.tArE.P.HLd. d.HLd.H, .Lo.d, SP or H, Lo	L, uE	

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

Settings for relays - record settings here				
	A1	A2	A3 (optionally fitted)	A4 (optionally fitted)
AxLo				
AxH,				
AxHY				
Axtt				
Axrt				
Axn.o or Axn.c				
Ax.SP or Ax.t 1				
Ax				

6 Specifications

6 .1 Technical Specifications

Input types:	Load cell/pressure transducer 4 wire type. mV/V selectable ranges up to 20mV/V
Excitation:	10VDC or 5VDC, link selectable. Use 5V if load cell resistance is less than 350Ω
ADC Resolution:	1 in 20,000
Accuracy:	0.1% of full scale when calibrated
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 AC 24 to 36VAC 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)

6 .2 Options

Relays 3 & 4	Same specifications as standard relays 1 & 2
Analog retransmission:	4-20mA, 0-1V or 0-10V
Serial communication:	RS232 or RS485

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 55(h)

8 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.

Appendix - Optional outputs

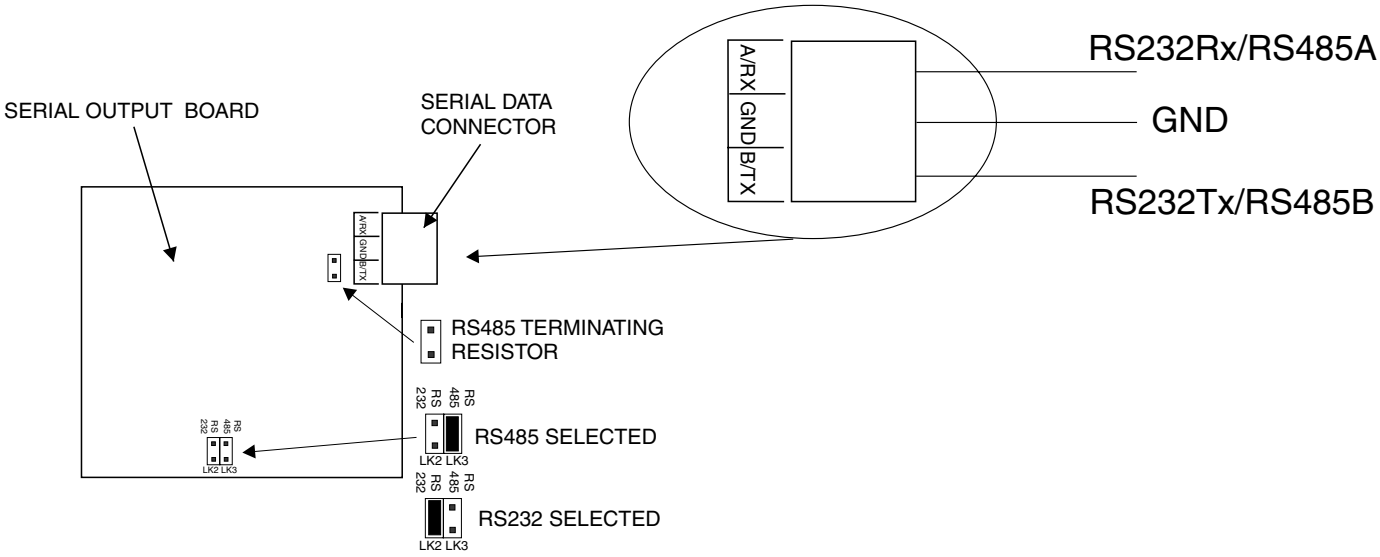
This appendix provides information required when an optional output is fitted to the LD4. The three optional outputs are serial communications, analog retransmission or two extra setpoint relays. Note that only one of these options can be fitted at any time.

Serial communications option

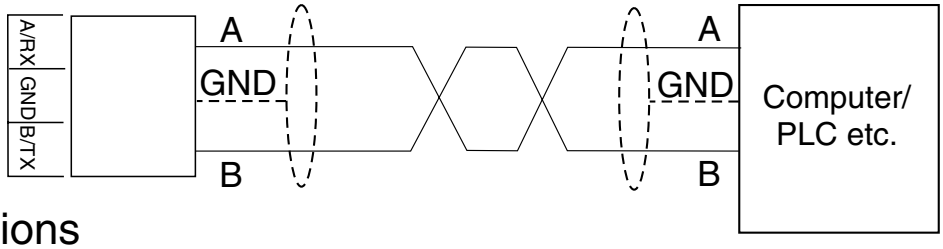
Electrical connections and output board links

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.

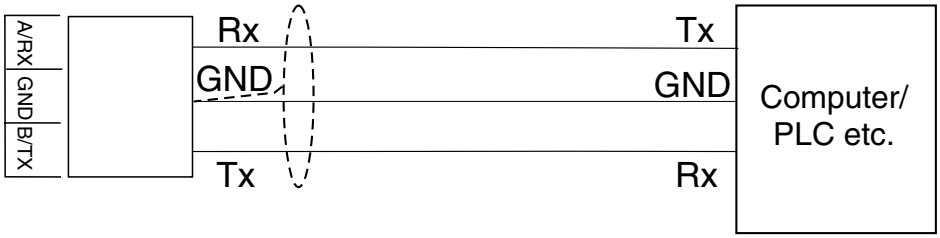
Ensure that the appropriate link is selected for RS232 or RS485. If RS232 is selected chip U1 should be in and chip U2 should be out. If RS485 is selected chip U1 should be out and chip U2 should be in. The RS485 terminating resistor link should be in if the LD4 is the first or last unit in a RS485 chain.



RS485 connections



RS232 connections



RS232/485 Operation and Commands

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

d, SP - 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 **SETL** 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	l	124	7C
]	093	5D	}	125	7D
^^	094	5E	~	126	7E
_	095	5F	DEL	127	7F

Modbus communications

This addendum covers the use of Modbus RTU communications when using the LD4 monitor.

When using Modbus communications the instrument must be set up electrically for RS232 or RS485 communications and the **O.Put** function must be set to **rS.buS**.

Modbus commands

Note: the maximum recommended baud rate is 9600.

The following commands are available:

Function 1 Read coil status

Reads the ON/OFF status of the relay coils. Broadcast is not supported. Relays 1 to 4 are addressed as 0 to 3. Logic 1 = ON, Logic 0 = OFF.

To read the coil status a query is sent to the LD4, the LD4 then responds to the query.

An example of a query to read coils 1 to 4 from the LD4 at address 2 is given below.

Field Name	Example (Hex)
Unit address	02
Function	01
Starting address Hi	00
Starting address Lo	00
Number of points Hi	00
Number of points Lo	04
Error check (LRC or CRC)	–

An example of a response is given below:

Field Name	Example (Hex)
Unit address	02
Function	01
Byte count	01
Data (coils 7 to 1)	04
Error check (LRC or CRC)	–

The status of the relay coils is shown in the Data 04 (hex) or binary 0100. Relay 1 is indicated by the LSB. The status of the relays is therefore:

Relay 1 - OFF, Relay 2 - ON, Relay 3 - OFF, Relay 4 - OFF

Function 3 Read holding registers

This function reads the binary contents of the holding registers in the PM4 being addressed. The value for this function is stored as a 32 but two's compliment number, 2 registers per channel are used. Note; a value of 1,000,000 represents a positive overrange and -200,000 a negative overrange. Registers 1 to 2 hold the display value, registers 3 to 4 the valley memory (lowest reading in memory), registers 5 to 6 the peak memory (highest reading in memory), registers 7 to 8 the display hold value. Registers 9 to 16 hold the alarm high values for relays 1 to 4. Note a value of 0X8000 means that the relay is set to OFF and has no high value. Registers 17 to 24 hold the alarm low values for relays 1 to 4. Note a value of 0X8000 means that the relay is set to OFF and has no low value. Register 25 represents the decimal point settings for the display.

An example of a query to read holding registers 1 to 3 from the TP488 at address 5 is given below.

Field Name	Example (Hex)
Unit address	05
Function	03
Starting address Hi	00
Starting address Lo	00
Number of points Hi	00
Number of points Lo	03
Error check (LRC or CRC)	–

An example of a response is given below:

Field Name	Example (Hex)
Unit address	05
Function	03
Byte count	06
Data Hi (register 1)	00
Data Lo (register 1)	33
Data Hi (register 2)	00
Data Lo (register 2)	25
Data Hi (register 3)	00
Data Lo (register 3)	17
Error check (LRC or CRC)	–

The contents of register 1 is 33 (hex) or 51 (decimal), register 2 is 25 (hex) or 37 (decimal) and register 3 is 17 (hex) or 23 decimal.

Register table

Address	Register	Description
0X00	1	Display value high word
0X01	2	Display value low word
0X02	3	Valley memory high word
0X03	4	Valley memory low word
0X04	5	Peak memory high word
0X05	6	Peak memory low word
0X06	7	Display hold high word
0X07	8	Display hold low word
0X08	9	Alarm 1 high setpoint high word
0X09	10	Alarm 1 high setpoint low word
0X0A	11	Alarm 2 high setpoint high word
0X0B	12	Alarm 2 high setpoint low word
0X0C	13	Alarm 3 high setpoint high word
0X0D	14	Alarm 3 high setpoint low word
0X0E	15	Alarm 4 high setpoint high word
0X0F	16	Alarm 4 high setpoint low word
0X10	17	Alarm 1 low setpoint high word
0X11	18	Alarm 1 low setpoint low word
0X12	19	Alarm 2 low setpoint high word
0X13	20	Alarm 2 low setpoint low word
0X14	21	Alarm 3 low setpoint high word
0X15	22	Alarm 3 low setpoint low word
0X16	23	Alarm 4 low setpoint high word
0X17	24	Alarm 4 low setpoint low word
0X18	25	Display decimal point

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_ and rEC~) associated with these outputs and to the Function table for function listing. See separate manual addendum for PI control output operation functions (rECctrl set to on).

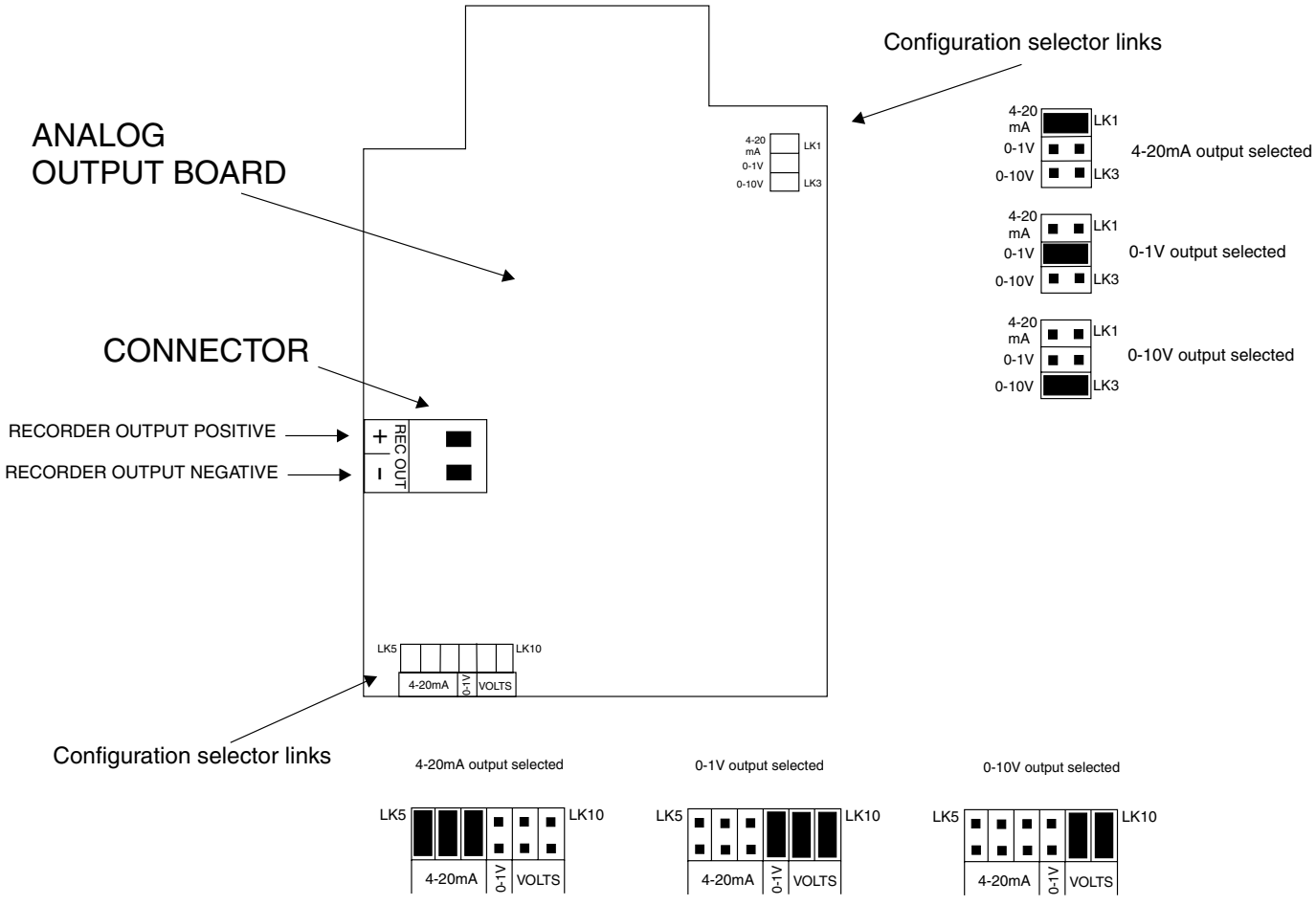
Electrical Connections

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).



Relay 3 and 4 option

When the relay 3 and 4 option is fitted two extra relays will be fitted as shown below. These relays have the same specification and setup functions as the standard relays 1 and 2.