LD-LN

Large Digit Display

DC Current / DC Voltage / Slidewire

50 Point Lineariser

Operation and Instruction Manual

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1 Introduction

This manual contains information for the installation and operation of the LD-LN Lineariser Monitor. The LD-LN is a general purpose instrument which may be configured to accept an input of 0 to 20mA, 4 to 20mA, ±100mV, ±1V, ±10V or ±100VDC. The LD-LN offers the choice of linear, square root or linearised display.

In lineariser operation up to 50 points may be entered. These points and any function settings and scaling values are stored in EEPROM memory. The lineariser points are stored in a “lineariser table”. A written copy of the table should be maintained for reference, a table is provided in for this purpose. The lineariser table stores the display values for each point and the input values (scaled or otherwise) associated with these display values.

Prior to entering values into the table the display must be scaled via a 2 point calibration. Functions CAL 1 and CAL2 can be used for live input display scaling for all input types. For 4-20mA inputs only an alternative scaling method is provided via the USEr En4 and USEr En20 functions. The ▲ and ▼ buttons on the main circuit board or on the front of some displays can be used to toggle between then linearised (Li nr) and linear input (i nPt) values. Two separate sets of calibration scaling values can be stored, with the display choice being made via a remote input.

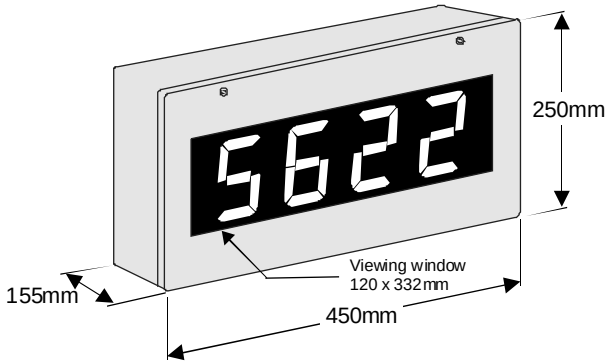
Four standard inbuilt relays are provided for alarm/control functions, a transmitter supply of 10VDC or 24VDC (link selectable) is also provided. Optional isolated dual analog retransmission or serial communications may also be optionally provided.

Unless otherwise specified at the time of order, your display has been factory set to a standard configuration, see the “Function Table” for a list of default settings. Like all other LD 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. See the "Data Logger" chapter for an explanation of the data logger functions available when the optional data logger memory is fitted.

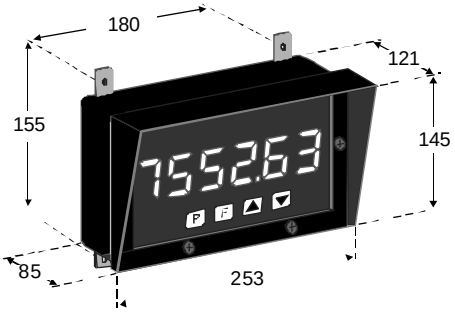
The LD series of Large Digit Display Monitors are designed for high reliability in industrial applications. The high brightness LED display provides good visibility, even in areas with high ambient light levels.

2 Mechanical installation

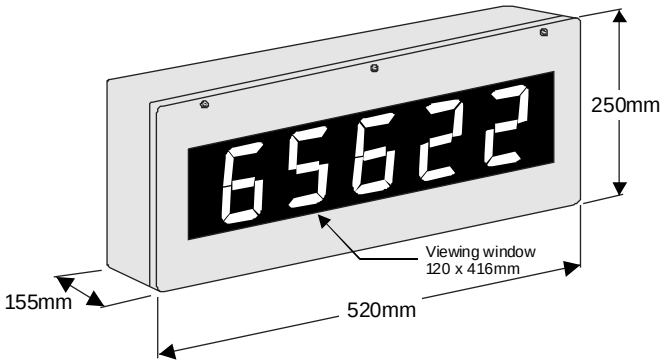
100mm 4 digit LED or Electromagnetic



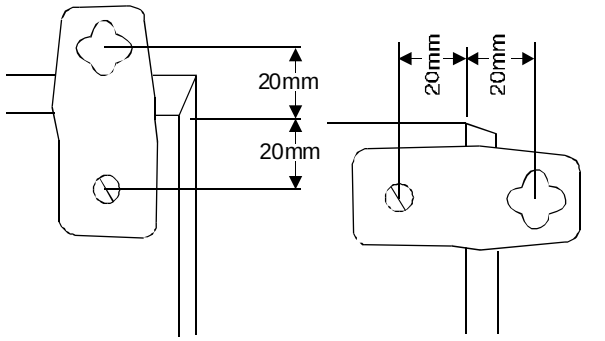
57mm 4 digit or 45mm 5 digit or 38mm 6 digit LED



100mm 5 digit Electromagnetic only

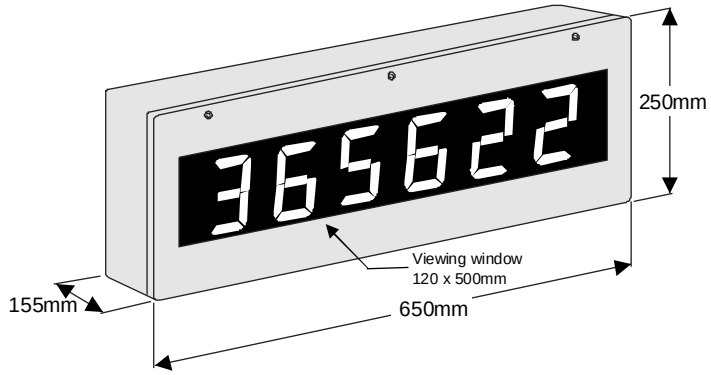


Four mounting kit brackets are supplied for use with 100 & 200mm display models. Diagrams below illustrate vertical and horizontal installation. If mounting without the brackets is preferred then the 9mm dia. case holes provided for the brackets can be used as alternative mounting holes. If the supplied brackets are not used in mounting these holes should be sealed against dust and water.

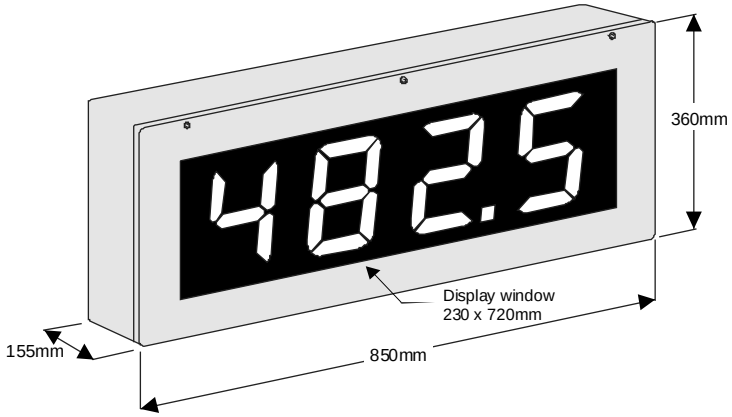


Vertical Orientation Horizontal Orientation

100mm 6 digit LED or Electromagnetic



200mm 4 digit LED

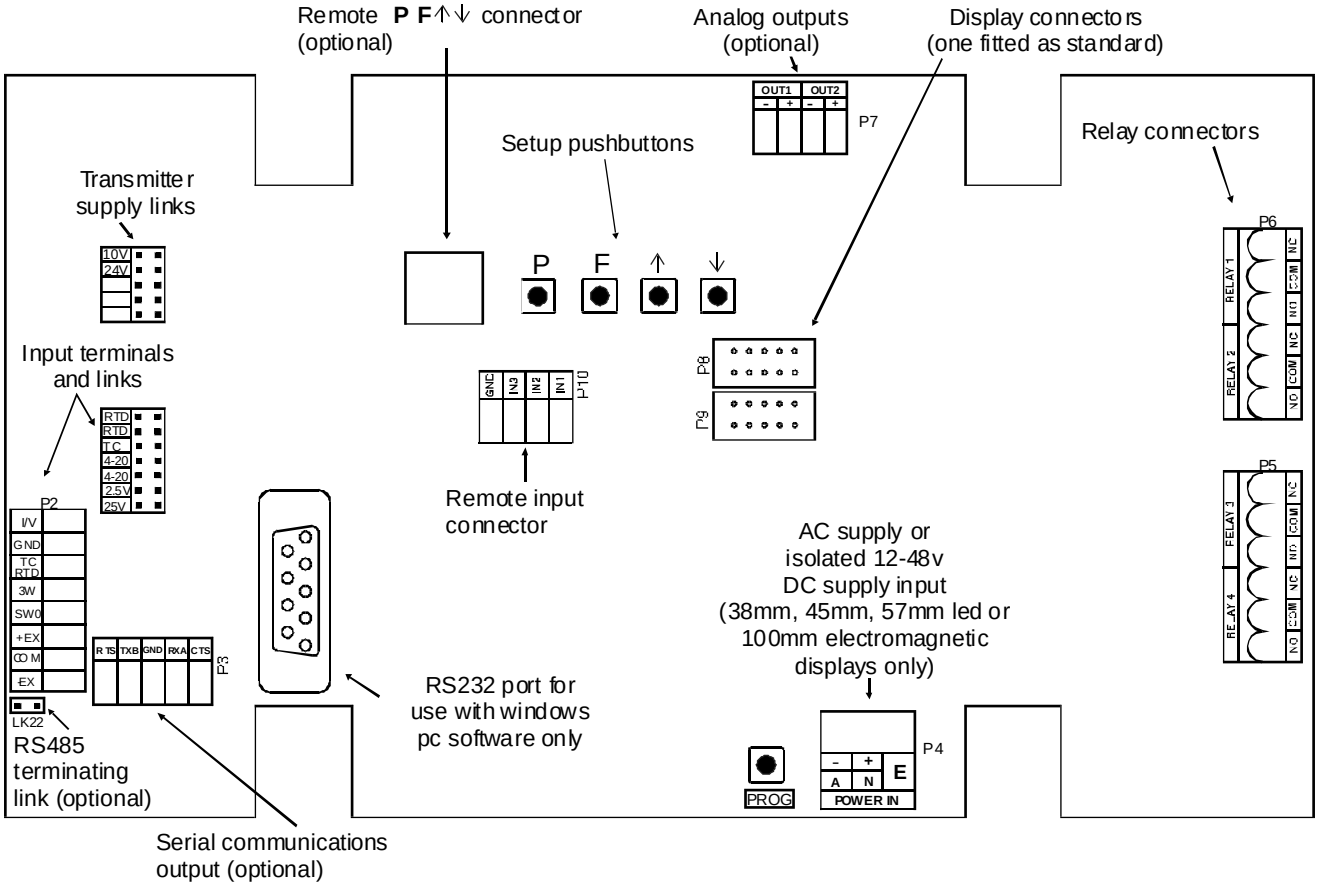


3 Electrical installation

The LD 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 for protection and to allow the unit to be removed for servicing.

The terminal blocks are plug in screw type for ease of installation and allow for wires of up to 1.5mm^2 (2.5mm^2 for relay, AC or isolated DC supply 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.

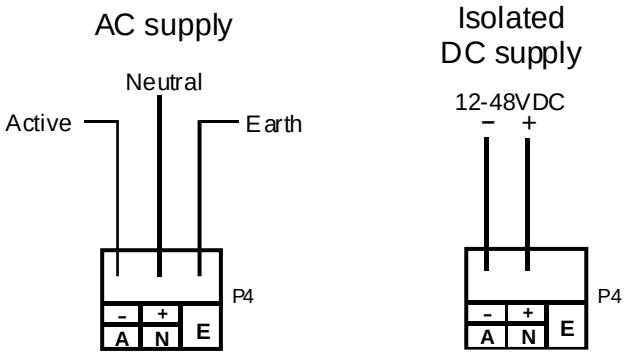
3 .1 Main circuit board layout



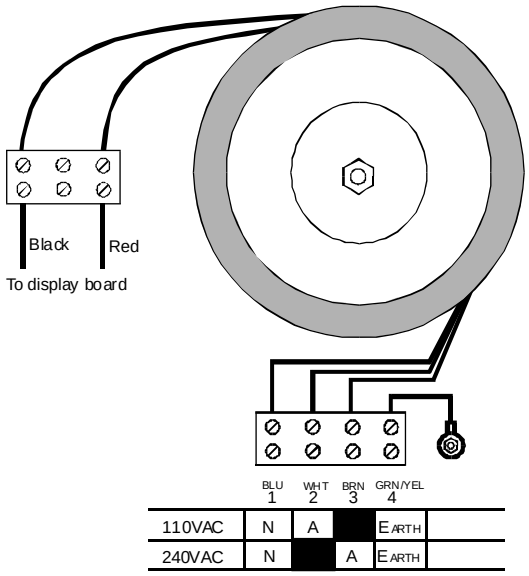
3 .2 Power supply connections

Electromagnetic displays & 38, 45, 57mm LED.
AC power connections for these displays use a plug in connector with screw terminals at P4 (2.5mm^2 max. wire diameter). Isolated DC supplies (12-48VDC) use the same terminals.

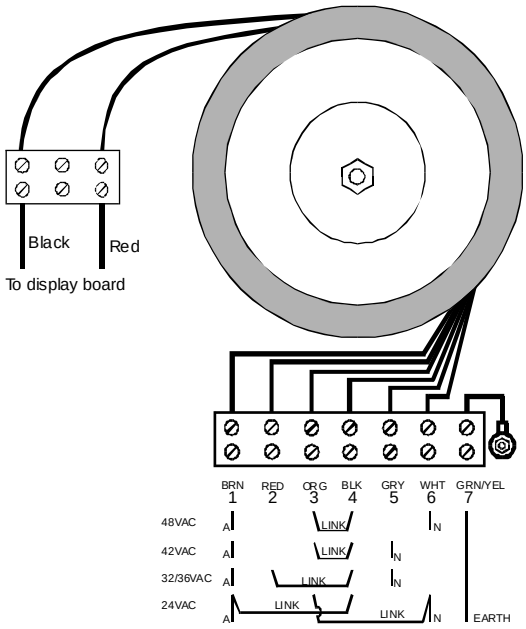
100mm & 200mm LED displays
LED displays receive power directly to the displays from either the mains transformer, low voltage AC transformer or isolated DC supply board. Use the connectors for the AC transformer (terminal block near transformer on AC powered versions) or the input terminals on the DC supply board (DC powered versions) when LED displays are used. See the drawings which follows for high and low voltage AC connections and for isolated DC connections.



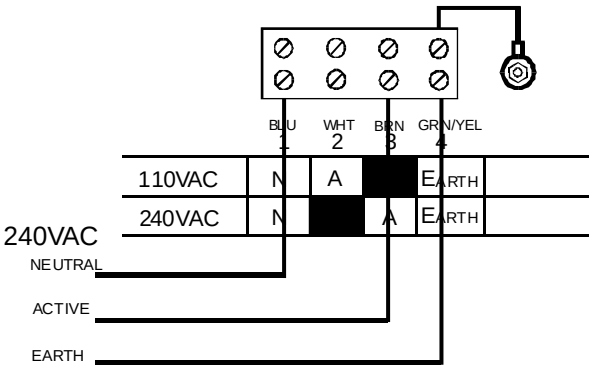
240 & 110VAC supplies.
For 100mm/200mm LED or 100mm electromagnetic display types only.

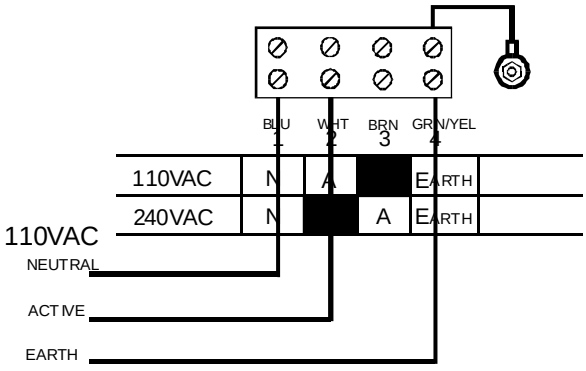


Low voltage AC supplies.
For 100mm/200mm LED or 100mm electromagnetic display types only.



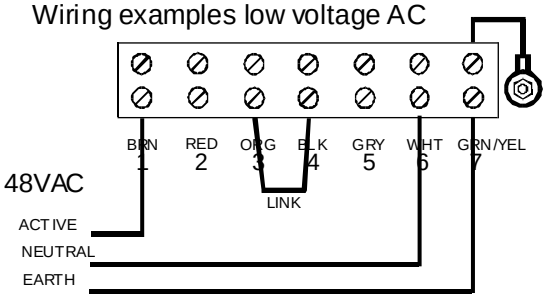
Wiring examples 240VAC & 110VAC

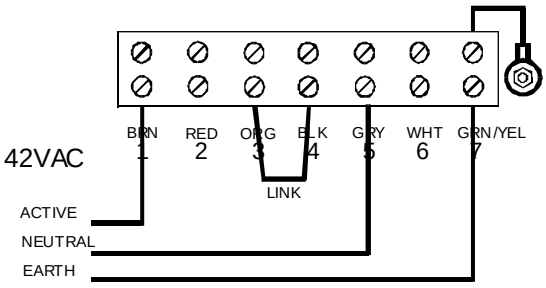


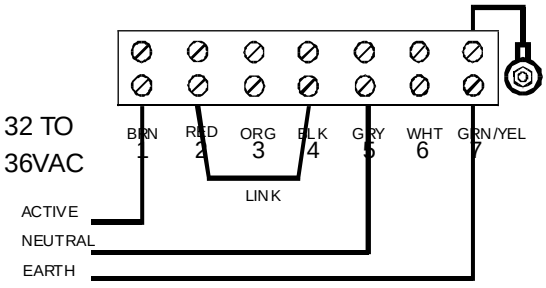


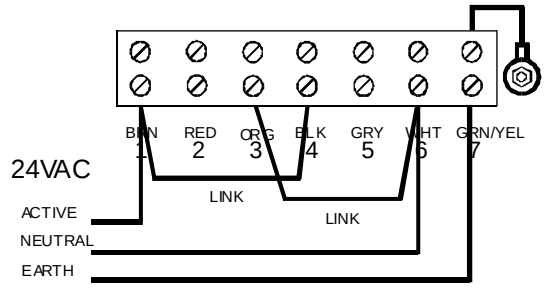
Important note: the 240V & 110V supplies use the same transformer, low voltage instruments use a different transformer. Do not use a low voltage transformer for 240V or 110V or vice versa.

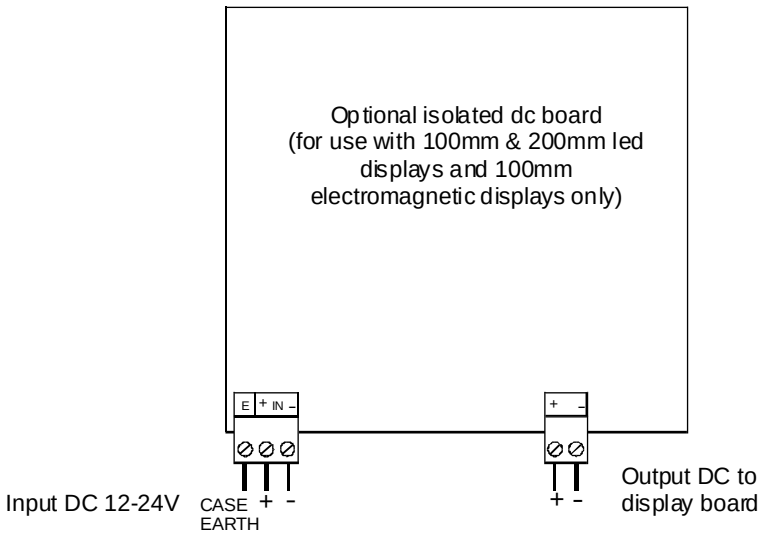
Wiring examples low voltage AC







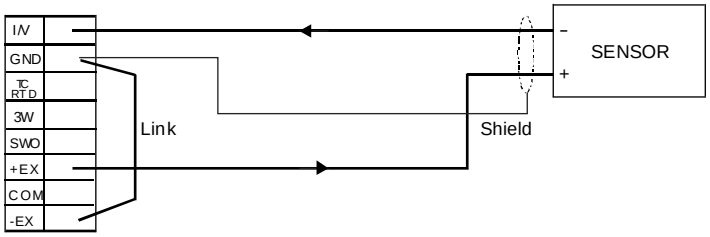




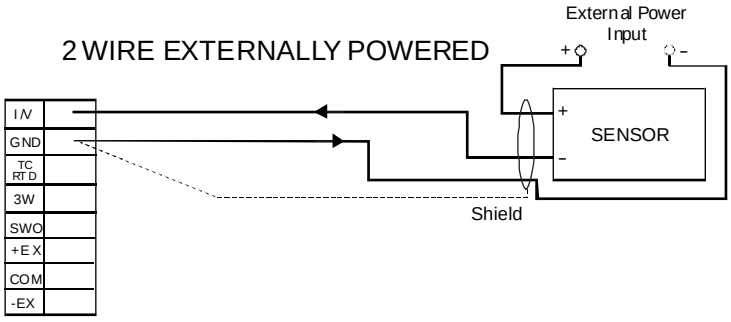
3 .3 Input connections & link settings

WIRING EXAMPLES 4 to 20mA INPUT

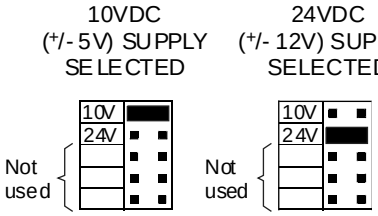
2 WIRE POWERED FROM STANDARD 10V or 24V TRANSMITTER SUPPLY



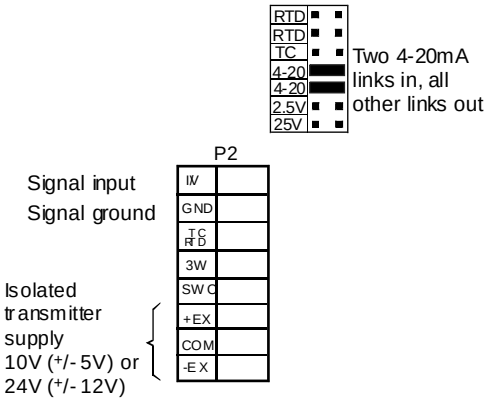
2 WIRE EXTERNALLY POWERED



TRANSMITTER SUPPLY LINKS

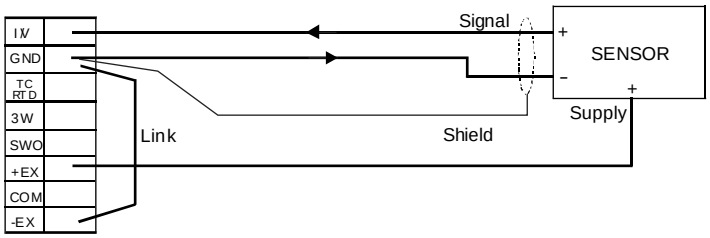


4-20mA INPUT CONNECTOR AND LINKS

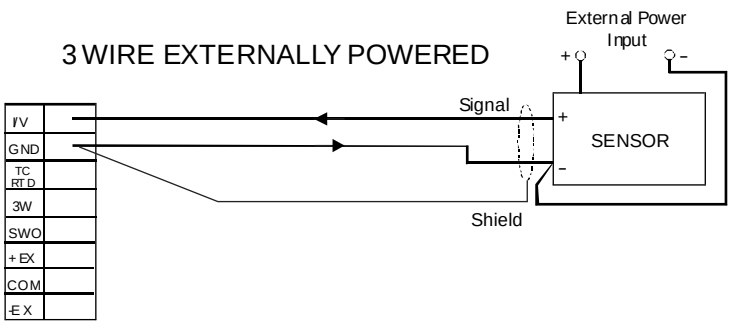


The supplies can be configured as
5, 10, 12 or 24V DC
25mA max. for 5, 12 or 24V
50mA max for 10V

3 WIRE POWERED FROM STANDARD 10V or 24V TRANSMITTER SUPPLY

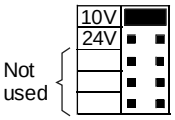


3 WIRE EXTERNALLY POWERED

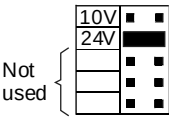


TRANSMITTER SUPPLY LINKS

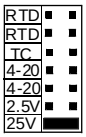
10VDC (+/- 5V) SUPPLY SELECTED



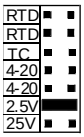
24VDC (+/- 12V) SUPPLY SELECTED



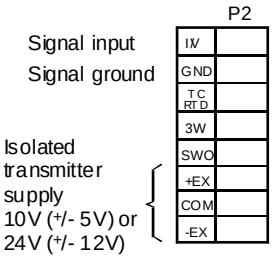
DC VOLTS INPUT CONNECTOR AND LINKS



One input link in to select either 2.5 or 25VDC range. 25V link shown.



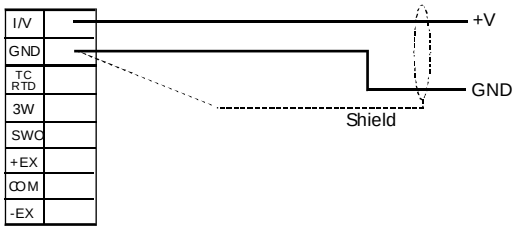
2.5V link shown.



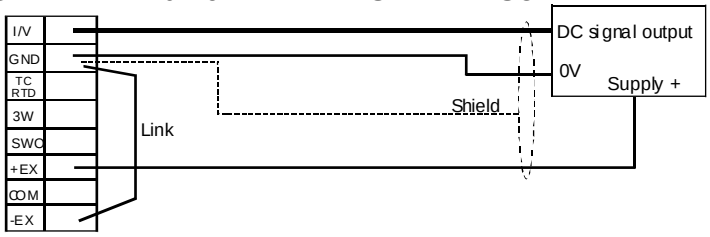
The supplies can be configured as
5, 10, 12 or 24V DC
25mA max. for 5, 12 or 24V
50mA max. for 10V

WIRING EXAMPLES DC VOLTS INPUTS

DIRECT DC VOLTS INPUT

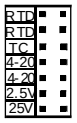


3 WIRE DEVICE POWERED FROM STANDARD 10V or 24V TRANSMITTER SUPPLY

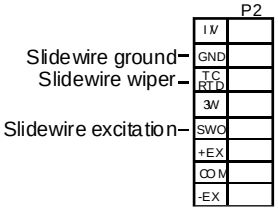


WIRING EXAMPLES SLIDEWIRE INPUT

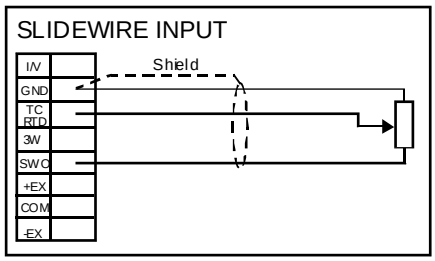
SLIDEWIRE INPUT CONNECTOR AND LINKS



All links should be out for slidewire input

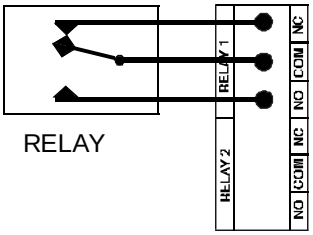


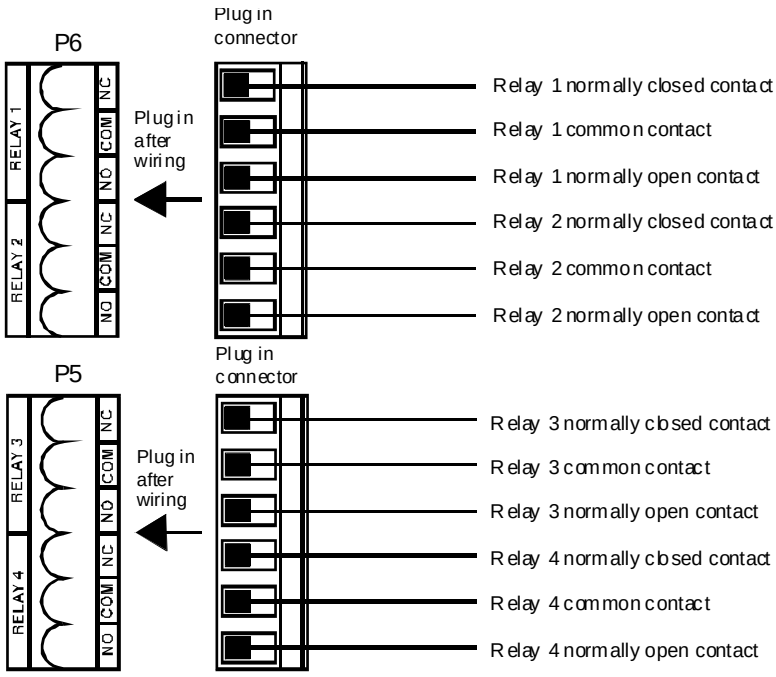
SLIDEWIRE INPUT



3 .4 Relay connections

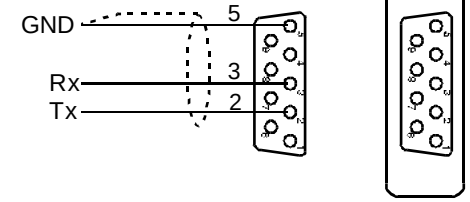
The LD is supplied with four alarm relays as standard with connections on terminals P5 & P6. The relays are changeover types and are rated at 5A, 240VAC into a resistive load. The relay contact is voltage free and may be programmed for normally open or normally closed operation. In normally open operation there will be an open circuit between the COM and NO terminals until an alarm condition is encountered.





3 .5 Standard serial communications connections

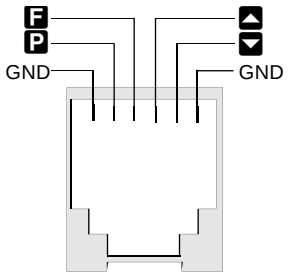
Plug in connector
9 pin male "D" type.
rear terminals shown



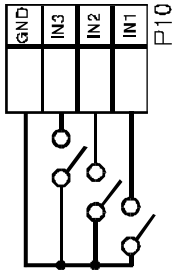
RS232 port for use in **rbus** mode with Windows PC software purchased for use with this instrument or for on site software update only. This port will be disabled if the optional serial communications port fitted. If this port is to be used for **rbus** communcation the **SEr.1tYPE** and **SEr.2tYPE** functions must be set to **nONE**

Note: when connecting using Rs232 the Tx line at the display connects to the Rx line at the device it is communicating with. Likewise the Rx line at the display connects to Tx

3 .6 Optional remote P, F ▲ & ▼ keypad connector



3 .7 Remote input connections



REMOTE INPUT CONNECTOR

IN1, IN2 and IN3 are the remote input switches.
r.1 nP is used to set the IN1 switch function.
r.1 n2 is used to set the IN2 switch function.
r.1 n3 is used ot set the IN3 switch function.
Latching or momentary switches can be used depending on the function selected.

Optional serial output connections - not applicable to this instrument software version.

Optional analog output connections - not applicable to this instrument software version.

4 Explanation of Functions

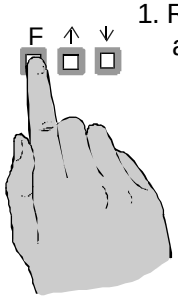
The setup and calibration functions are configured through a push button sequence. Two levels of access are provided for setting up and calibrating:-

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.

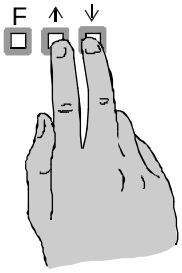
The three push buttons located on the main circuit board are used to alter settings. Once CAL or FUNC mode has been entered you can step through the functions, by pressing and releasing the F push button, until the required function is reached. Changes to functions are made by pressing the ▲ or ▼ push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

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.



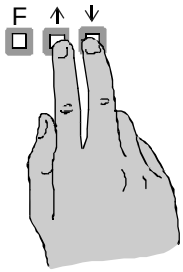
3. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

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.

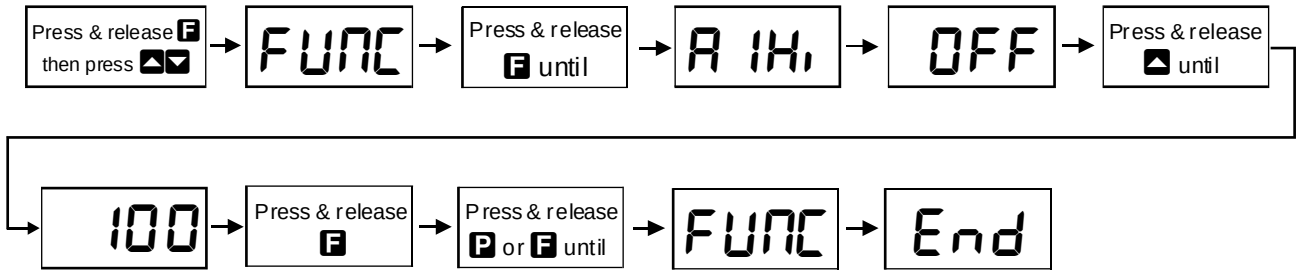


2. Within 2 seconds of releasing the F button press, then release the ▲ and ▼ buttons together. The display will now indicate FUNC followed by the first function.

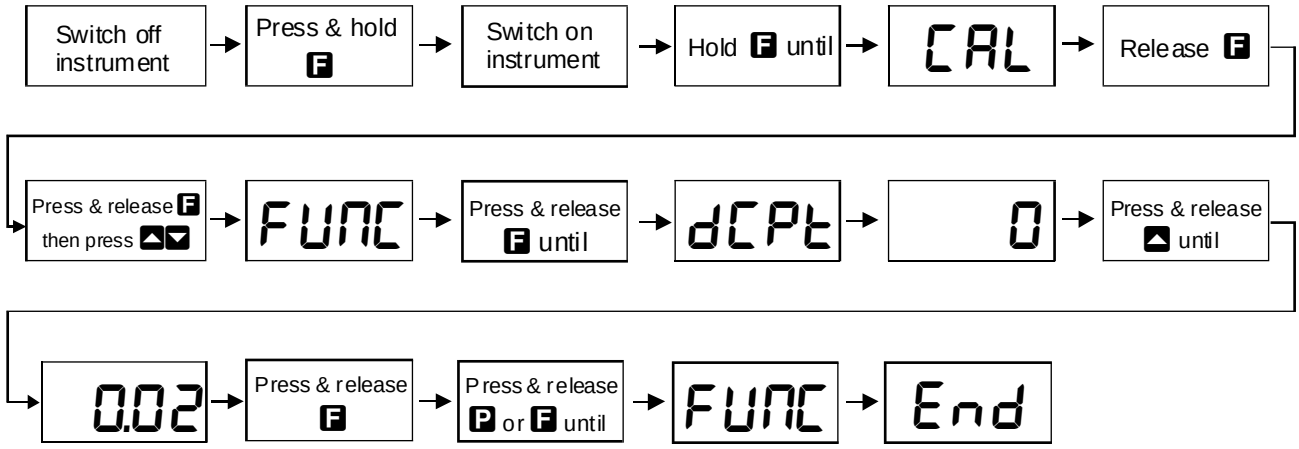
Alternative CAL Mode Entry

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 display will remain in CAL mode for approximately 4 minutes, after this time you will need to repeat this process to enter CAL mode.

Example: Entering FUNC mode to change alarm 1 high function A 1H, from OFF to 100



Example: Entering CAL mode to change decimal point dCPt function from 0 to 0.02



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

The LD-LN 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.

See the "Data Logger" chapter for an explanation of the data logger functions available when the optional data logger memory is fitted.

A 1Lo (alarm low setpoint)

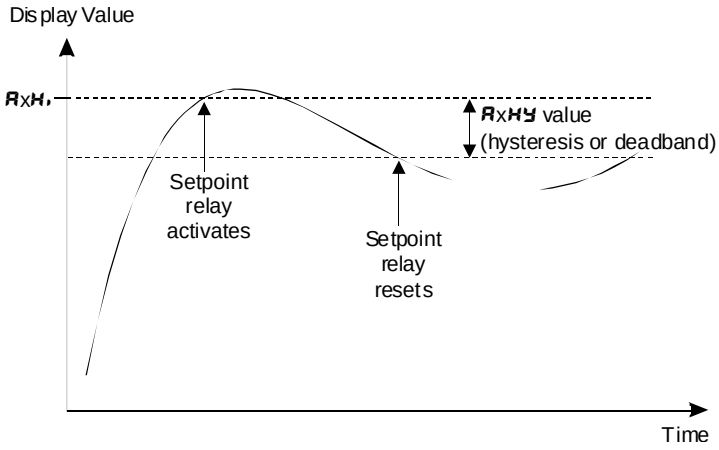
Displays and sets the low setpoint value for alarm 1 relay. The low alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Use ▲ or ▼ to adjust the setpoint value if required. The alarm will activate when the displayed 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)

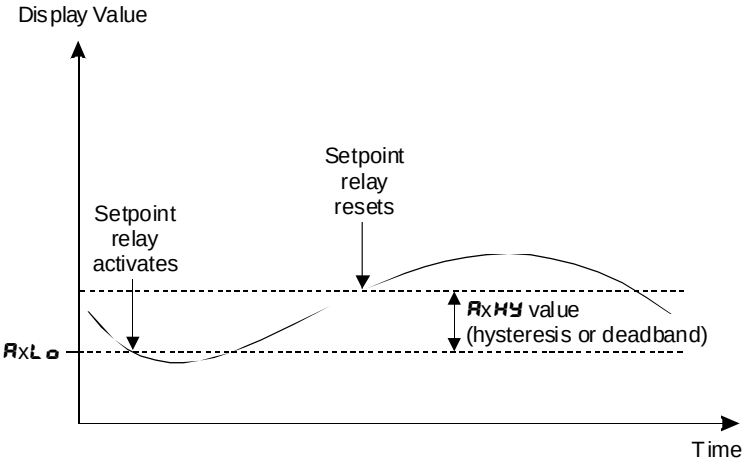
Displays and sets the high setpoint value for alarm 1 relay. The high alarm setpoint may be disabled by pressing the ▲ and ▼ pushbuttons simultaneously. When the alarm is disabled the display will indicate OFF. Use ▲ or ▼ to adjust the setpoint value if required. The alarm will activate when the displayed 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.

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)

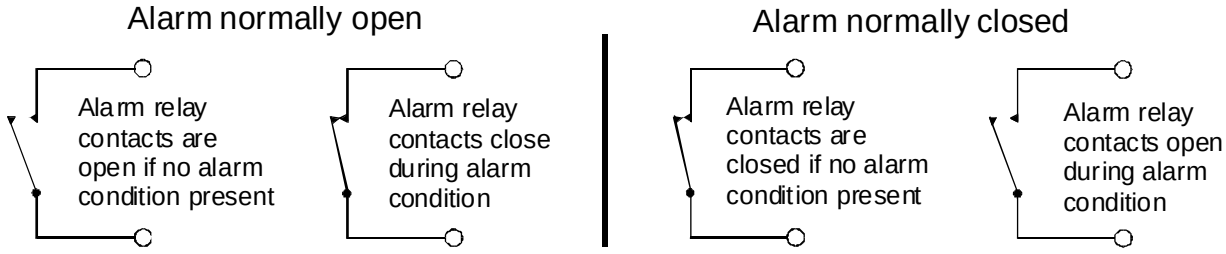
Displays and sets the alarm trip time and is common for both alarm high and low setpoint values. The trip time is the delay time before the alarm relay will activate, or trip, when an alarm condition is present. The alarm condition must be present continuously for the trip time period before the alarm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

A1n.o or A1n.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 A1Lo for further description.

A2Hi , A3Hi & A4Hi (alarm high setpoint)

Displays and sets alarm 2, 3 & 4 high setpoints, see A1Hi for further description.

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

Displays and sets the alarm hysteresis limit for alarm 2, 3 & 4, see A1HY for further description.

A2tt , A3tt & A4tt (alarm trip time)

Displays and sets the alarm trip time for alarm 2, 3 & 4, see A1tt for further description.

A2rt , A3rt & A4rt (alarm reset time)

Displays and sets the alarm relay reset time for alarm 2, see A1rt for further description.

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 A1n.o / A1n.c for further description.

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 A1Hi is set to 1000 and A2Hi 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

P.SEt (Preset)

Preset value - a preset value can be entered at this function. If the remote input (**r.I nP** function) or **P** button (**P.but** function) is programmed to **P.SEt** then operation of the remote input or **P** button will cause the display to change to the preset value. Any change in input from this point will cause a variation above or below the preset value. For example with a display showing a value of 50 at a 12mA input if the **P.SEt** function is set to 70 and the remote function is set to **P.SEt** then once the remote input is operated an input of 12mA will now have a display value of 70.

br9t (display brightness)

Displays and sets the digital display brightness - seen only when **br9t Auto** is set to **OFF**. The display brightness is selectable from **1** to **63**. where **1** = lowest intensity and **63** = highest intensity. This function is useful for improving the display readability in dark areas or to reduce the power consumption of the instrument.

br9t Auto (automatic display brightness)

Automatic display brightness adjustment, may be set to **on** (automatic) or **OFF** (manually set via **br9t** function). The automatic brightness adjustment uses the optional light sensor to gauge the required brightness level for the environment. The high and low brightness limits are set at the **br9t HI 9H** and **br9t Lo** functions described below. If the optional light sensor is not fitted this function should be set to **OFF**.

br9t HI 9H (auto brightness high level)

Automatic brightness high level - seen only when **br9t Auto** is set to **on**. The high brightness level sets the maximum brightness which the automatic brightness control can achieve with **63** being the highest intensity.

br9t Lo (auto brightness low lwvel)

Automatic brightness low level - seen only when **br9t Auto** is set to **on**. The low brightness level sets the minimum brightness which the automatic brightness control can achieve with **63** being the highest intensity.

dull (remote input controlled display brightness)

This function will not be seen unless the **r.I nP** function is set to **dull**. Displays and sets the level for remote input brightness switching, see **r.I 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 **br9t** 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.

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) or **0.003** (3 decimal places).

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.

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, the display will show CAL End and will then move on to the next function.

CAL 2 (second scaling point for 2 point scaling method)

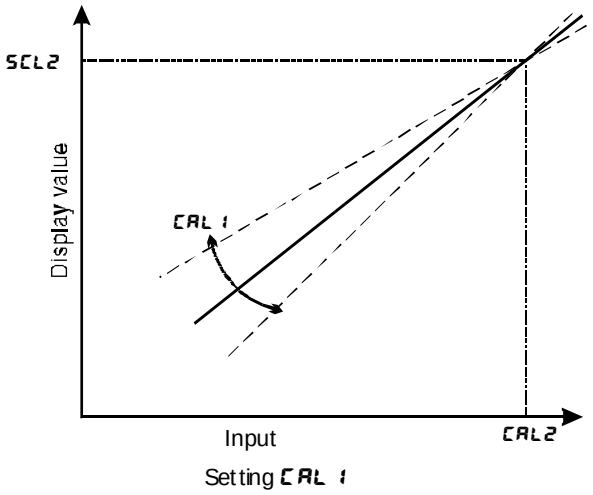
The second point scaling is performed in exactly the same manner as CAL 1 except that SCL 2 will be seen instead of SCL 1. It is essential that the live input is different in value to the CAL 1 input e.g. for a 4-20mA input use 20mA as the CAL 2 live input. Note; it is not essential that exactly 4 and 20mA are used as the live inputs for a 4-20mA scaling but the input values must be significantly different.

The procedure for entering the second scaling point is:

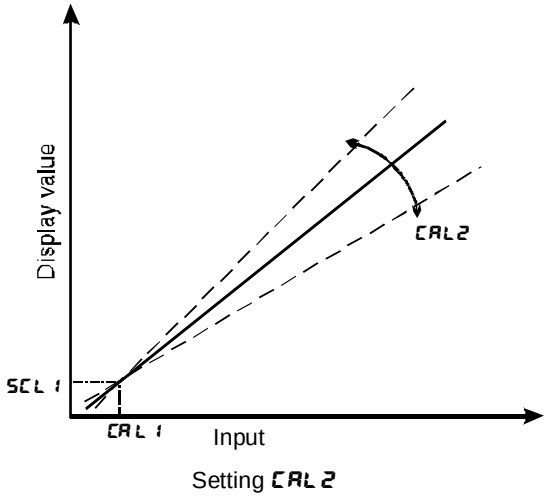
a. Ensure that an input signal (different to the input used at CAL 1) is present at the input terminals, this will normally be at the high end of the signal range e.g. 20mA for a 4-20mA input type.

b. At the CAL 2 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 2 followed by a value. Use the ▲ or ▼ button to change this value to the required display scale value at this input. e.g. if 20mA was input and the required display at 20mA was 500 then ensure 500 is selected at SCL 2. Press the F button to accept changes, the display will show CAL End and will then move on to the next function.

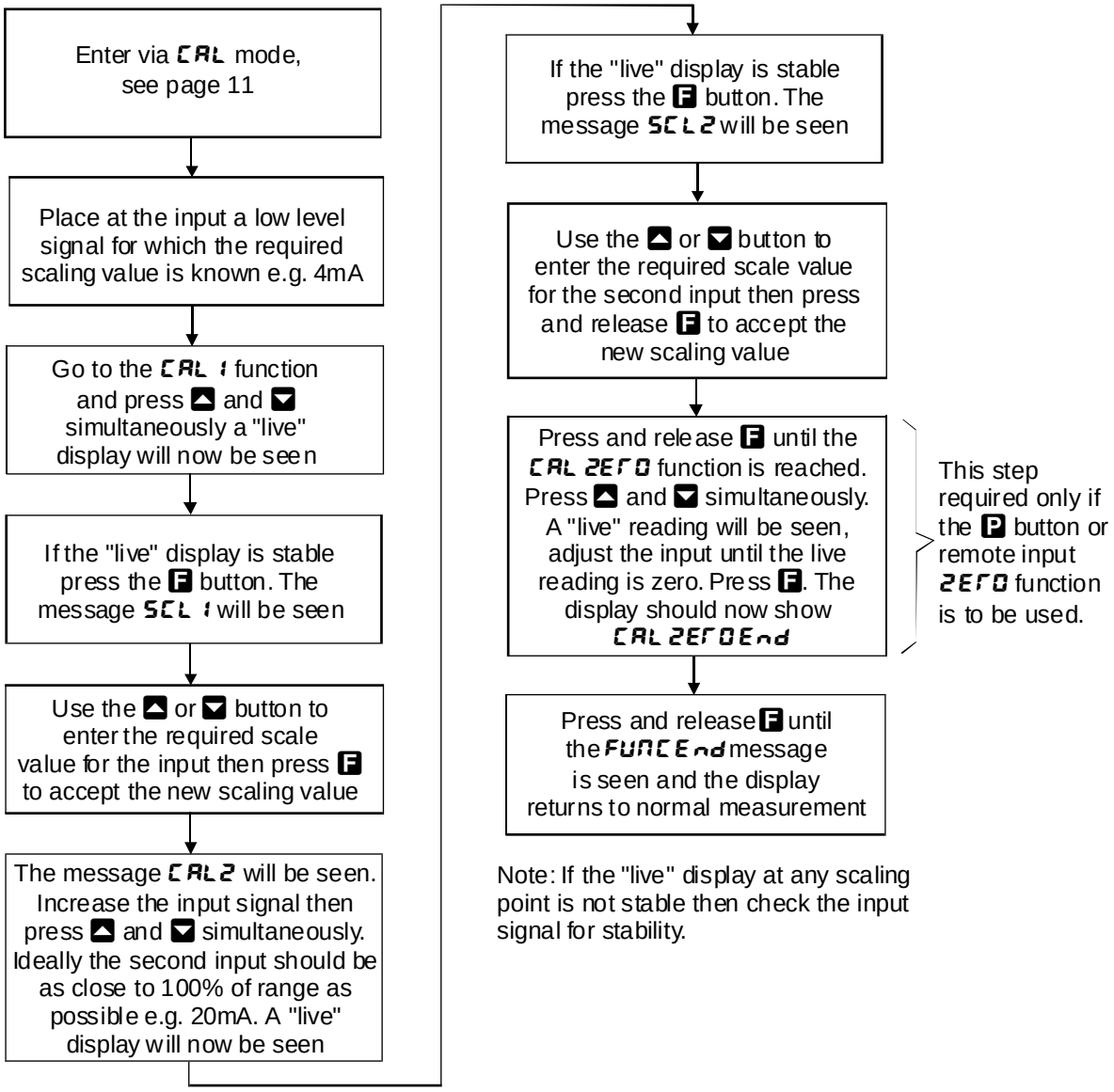


Setting CAL 1



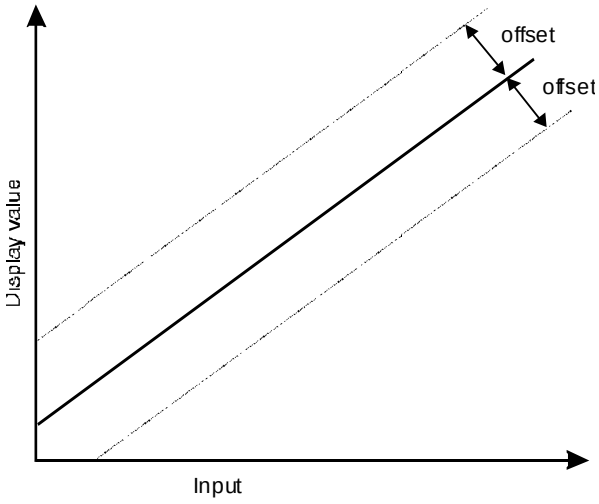
Setting CAL 2

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 function. 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 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 CAL 2 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 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 r.i np below for a description of these functions. 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 r.i np function above with the exception of the P.SEt function.

Functions available are:

NONE, Hi , Lo , Hi Lo, tArE ,2Er0 or P.SEt

Note: To prevent accidental operation of the P button in the tArE or 2Er0 functions it is necessary to hold the button in for 2 seconds to perform the selected operation.

r.i np (remote input function)

See the "Electrical Installation" chapter for the location of the remote input electrical 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.

2Er0 - 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 different sets of two point calibration values, decimal points and display units can be entered in the display, 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 5000 for the 4-20mA range. The remote input can be used to switch between ranges. This function switches the 2 point calibration scaling values only and whilst this can affect the linearised display by providing a separate scaling for the P values it does not provide a second linearisation table.

P.SEt (Preset value) - the display value will start at the value selected in the preset value function P.SEt (this function appears after the alarm functions, see Function Table). This works in a similar manner to the Zero function except that a preset weight/pressure value can be input. If the preset operation were to cause the zero to shift beyond the 2Er0 rnGE function limits the preset will be aborted and a 2Er0 rnGE Err message will be seen.

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.

r.1 n2 and **r.1 n3 (Remote input 2 & 3)**

Remote input 2 and 3 can be set to operate from the same choices as remote input 1 (see **r.1 nP** function above). Note that if more than one remote input is used then each remote input should be set to different operations i.e. You should not set more than one remote input to perform the same function.

nEtt FLSH (nett value display mode)

The nett value is only seen when the remote input or **P** button is set to **tArE**. 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 **A1Lo** 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:

A1 - Allows setpoint access to alarm 1 only.
A1-2 - Allows access to alarms 1 and 2 only.
A1-3 - Allows access to alarms 1, 2 and 3 only
A1-4 - Allows access to alarms 1, 2, 3 and 4

The remote input function (**r.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 **A1Hi** is set to **OFF** then there will be no access to the **A1Hi** 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. $\sqrt{1}$ *x* 1000.
At 16mA (75%) the display will be **866** i.e. $\sqrt{0.75}$ *x* 1000.
At 12mA (50%) the display will be **707** i.e. $\sqrt{0.50}$ *x* 1000 and so on.

4 .2 Lineariser functions

The following five functions are used to set up the lineariser table. The lineariser is of the X,Y type with space for up to 50 points to be programmed and stored. All points are stored in battery backed memory and will be retained when power is removed. Chapter 6 contains a table in which you can make a permanent written record of the points entered.

The X values for each point will actually be indicated as **P** (e.g. **P1**, **P2** etc.) since the seven segment display cannot show an X. The **P** values are normally entered either as a percentage of full scale input or as a direct representation of the input signal e.g. for a 4-20mA input you could either enter 4mA = **0.0** and 20mA = **100.0** or 4mA = **4.0** and 20mA = **20.0**. The value entered into the table must correspond with the initial calibration values (**CAL 1** & **CAL2** or **USEr En4** & **USEr En20**). For example if a 4-20mA input is initially scaled to read from **0.0** to **100.0** then you cannot enter these values as **4.0** to **20.0** in the table

(without causing errors in the reading). The number of decimal points available for entering **P** values is 1 decimal place for 4 digit displays or 2 decimal places for 5 and 6 digit displays. Ideally the decimal point function **dCPt** should be set to match the decimal points of the **P** values.

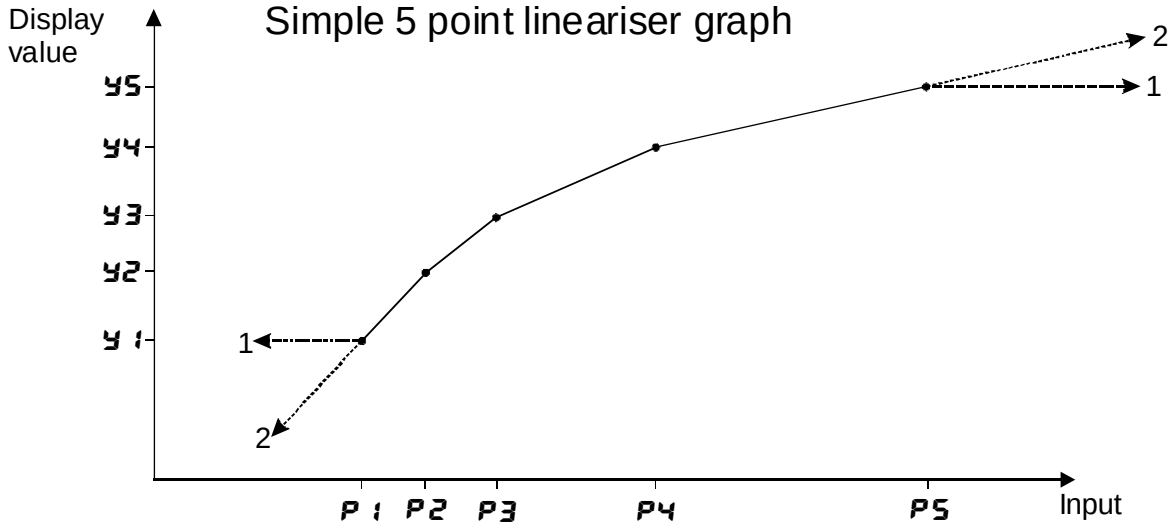
The Y values are indicated as **y** (e.g. **y1**, **y2** etc.) . These **y** values represent the display required for the given **P** value entered. For example if **P3** = **25.0** and **y3** = **1500** then **1500** will be displayed whenever that input is present.

y values to be entered into the lineariser table must be either calculated or measured via a live input. Refer to the "Example" later in this chapter for an example of creating a linearisers table using live inputs.

tAbL (lineariser on or off)

Allows the lineariser to be switched on (**on**) or off (**OFF**). If it is switched off then none of the other linearisers functions will be seen on the display and the instrument will either operate as a linear display using the **CAL 1**&**CAL2** or **USEr En4**&**USEr En20** scaling values or as a square root law display if the **Sqrt** function is set to **on**.

tAbL StOP (mode of operation at points outside the table range)



Arrows labelled "1" show the effect of **tAbL StOP** function = **on**
Arrows labelled "2" show the effect of **tAbL StOP** function = **OFF**

This function sets the mode in which the instrument will behave when a value is input which is higher than the largest value entered in the table or lower than the smallest value entered in the table. Refer to the graph above.

If set to **on** then the display value will remain equal to the nearest table entry value. For example if the lowest table entry is made at 8mA and the display indicates **500** at this value then any input lower than 8mA will also cause the display to indicate **500**.

If set to **OFF** then the display value will continue to change when an input outside the table limits in encountered. The instrument will extrapolate the reading using the slope of the previous pair of points.

SCLE tbl E (table rounding value)

This function allows a rounding value to be set for **y** entries. Options provided are 1, 2, 5, 10, 20, 25, 50, 100, 250, 500 or 1000 . For example if the rounding value is set to 25 then the **y** entries will jump in steps of 25 i.e. 0, 25, 50, 75 etc. (or 0.00, 0.25 etc. depending on decimal place setting). This rounding factor is useful in that it allows the speeding up of entries into the table, it does not cause the final display value to jump in steps. Use the **drnd** function if you wish to cause the final display value to also jump in these steps.

tAbL PntS (number of table points)

Displays and sets the number of points in the lineariser table. Select the number you require and enter that number of points. If you wish to increase or decrease the number of points then the **tAbL PntS** value can be changed at a later stage.

SEt tAbL (enter values into the table)

This function allows values to be entered into the lineariser table. With default settings values entered into the table are limited to ± 32,000 (if the number of display digits permits). If this range is too small then the **SCLE tbl E** function can be used to increase the range e.g. with the **SCLE tbl E** function set to **2** the display range will be extended to ± 64,000 the resolution of the values entered into the display will now match the **SCLE tbl E** setting but the final display is not limited to this resolution.

Entries to the table do not need to be in any ascending or descending order since the instrument will automatically arrange the points in order at the end of the entry sequence. The procedure for entering points is:

1. Ensure that the correct number of points required has been set in the **tAbL PntS** function.
2. Complete the lineariser table given in Chapter 6 by calculation or measurement of values.
3. At the **SEt tAbL** function press the ▲ and ▼ buttons simultaneously.
4. The display will show **P 1** indicating the first linearising point followed by the first **P** value in memory, use the ▲ or ▼ button to adjust this to the required first input point value.
5. Press the **F** button, the display will indicate **y 1** followed by the first **y** value in memory, again use the ▲ or ▼ to make any changes to the value required.
6. Press the **F** button, the display will indicate **P2** followed by the second **P** value in memory. Repeat the process described in steps 4 and 5 until all points have been entered.

Example

A pressure transmitter with a 4-20mA output is installed near the base of an irregularly shaped tank, see diagram below, which contains a liquid. The transmitter is connected to a LD-LN and 10 linearising points are required to measure the number of litres in the tank. The output from the transmitter will be linear between P9 and P10 since the sides of the tank are straight. Most of the linearising points are concentrated on the non linear (curved) parts of the tank i.e. the parts of the tank in which the output from the transducer will not be linear.

The procedure used for this examle is as follows, steps a. to n.:

a. All general functions are set as required i.e. display rounding etc.

c. Set the **tAbL** function to **on**. The **SQrt** function should be set to **OFF**.

c. Use **CAL 1** & **CAL 2** or **USEr En4** & **USEr En20** to scale the display to show 4mA= **4.0**, 20mA= **20.0**.

d. The tank is emptied and the transmitter is connected to the display, the tank will need to be gradually filled whilst the lineariser table (Chapter 6) record is completed. Note that the reverse process is equally valid i.e. starting with a full tank and gradually emptying it.

e. The first reading is taken from the display (4.2 in this case) with the tank virtually empty this represents a reading of zero litres. The lineariser table is filled in for the first point, **P 1** = 4.2, **y 1** = 0.

f. The tank is now gradually filled and a flowmeter is used to measure the number of litres entering the tank. The panel meter reading will change as the tank is filled.

g. The second reading is taken from the display (4.7 in this case), at this point 105 litres had been added to the tank. The lineariser table is filled in for the second point, **P2** = 4.7, **y2** = 105.

h. Repeat the filling procedure until all 10 points are recorded, the results in this example are shown in the example diagram and table.

j. The figures from the written table record now need to be transferred to the instruments lineariser table memory. Set the **tAbL** function to **on** and the **tAbL PntS** function to **10**.

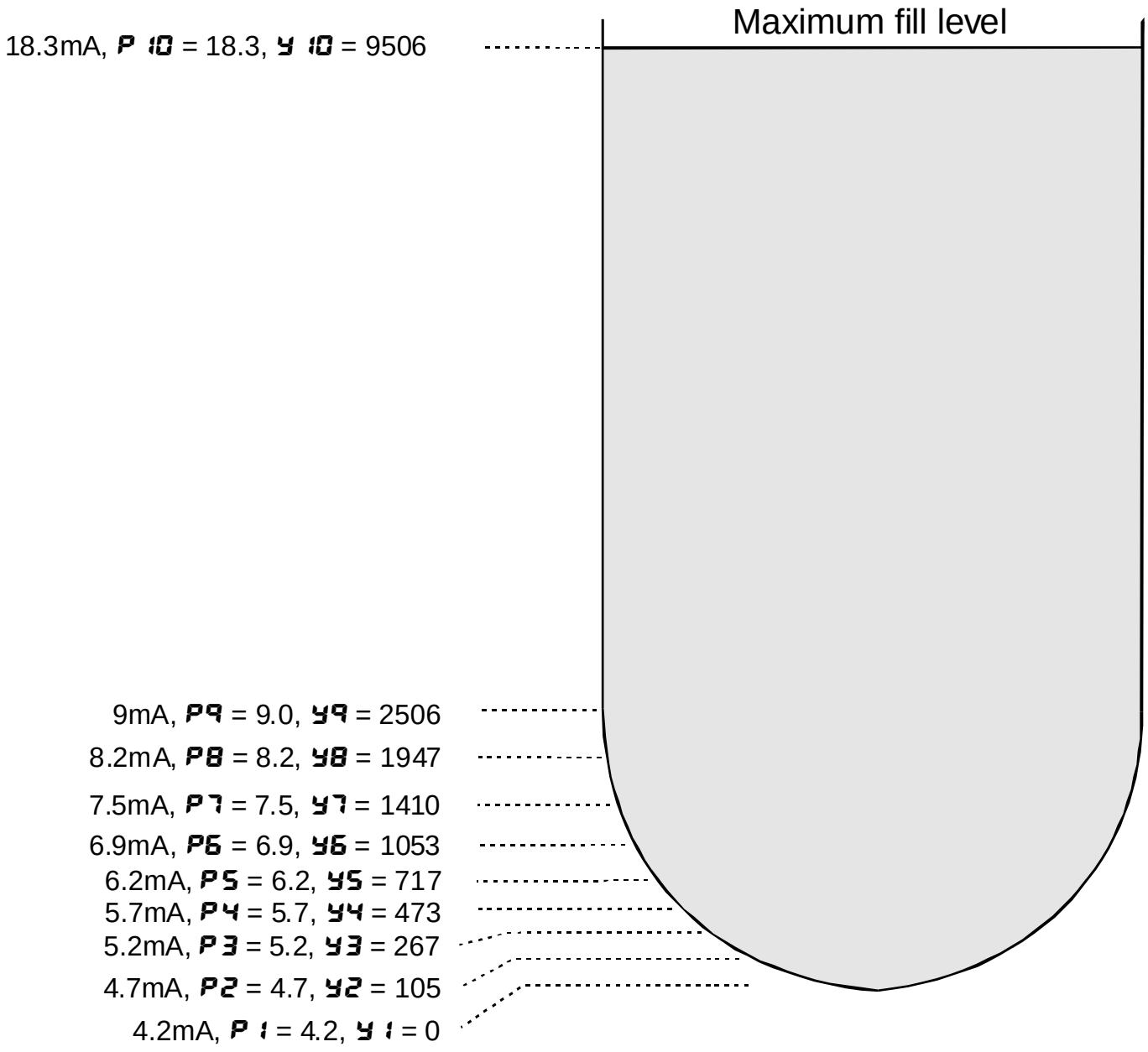
k. At the **SEt tAbL** function press the ▲ and ▼ button simultaneously. The display will show **P 1** followed by a number, use the ▲ or ▼ button to change this number to **4.2**.

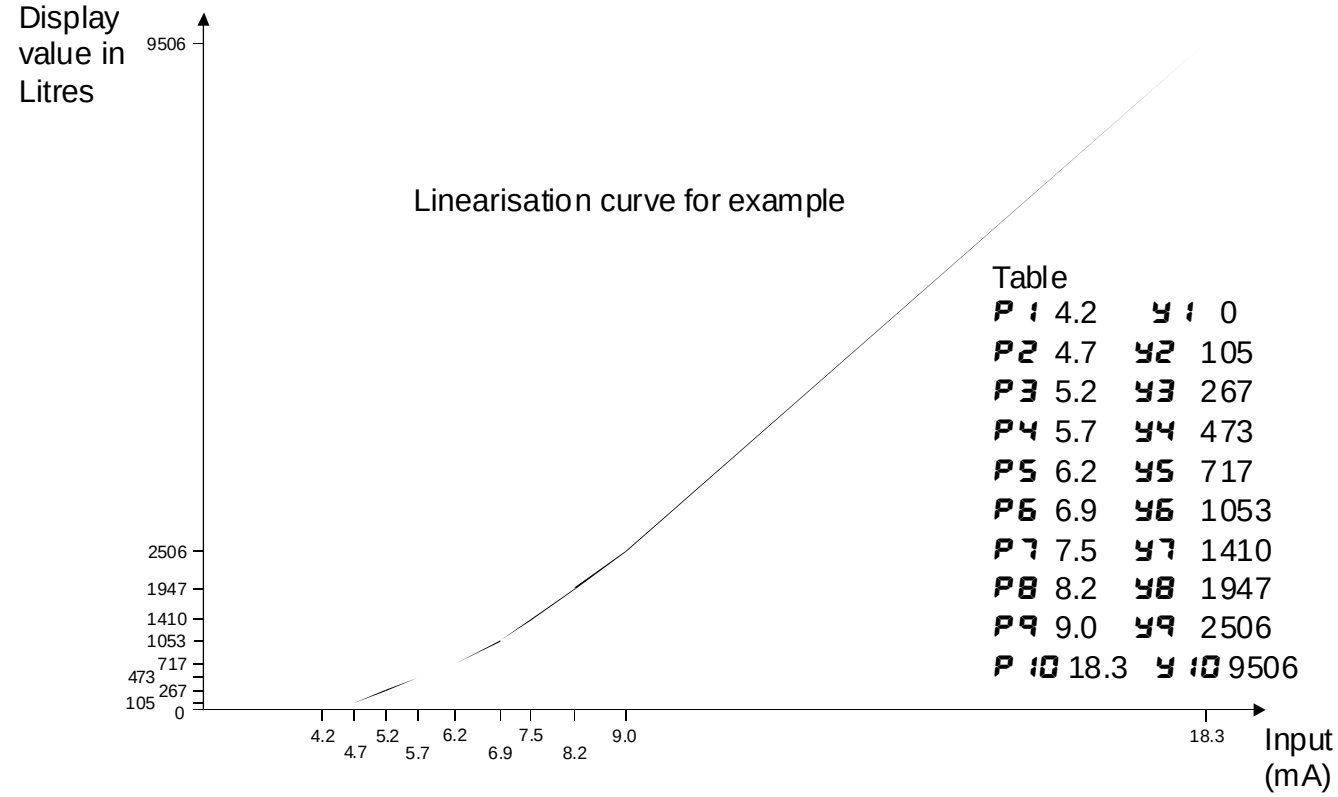
l. Press, then release, the **F** button. The display will indicate **y 1** followed by a number. Use the ▲ or ▼ button to change this to **0**.

m. Press, then release, the F button. The display will indicate P2 followed by a number. Use the ▲ or ▼ button to change this to 4.7.

n. Repeat the process until all the P and y values have been entered.

Continue pressing, then releasing, the F button until the End message is seen and the display returns to measurement mode.





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 by pressing the ▲ and ▼ buttons simultaneously at this function.

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 **d1 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.

Log UPdt (datalogger update time)

Select log update time - seen only with data logger option. Refer to “Data logger” chapter. Displays and sets the time period between each log sample. Available selections are:

0. 10 (10 seconds), **0.20** (20 seconds), **0.30** (30 seconds), **1.00** (1 minute), **2.00** (2 minutes), **3.00** (3 minutes), **4.00** (4 minutes), **5.00** (5 minutes), **6.00** (6 minutes), **10.00** (10 minutes), **15.00** (15 minutes), **20.00** (20 minutes), **30.00** (30 minutes) and **60.00** (60 minutes).

Note: The data log memory (see **Cl r Log** below) must be cleared whenever the log update time is changed or the date and time is changed.

Cl r Log (clear data logger memory) - seen only with data logger option. Refer to “Data logger” chapter.

This function clears the data log memory, to clear the memory press then release ▲ and ▼

simultaneously, the display will show **CLr P** asking if you really want to clear the memory. If you wish to clear memory then press then release ▲ and ▼ simultaneously again. The log memory will then be cleared and the log period reset, the display will indicate **Prog Log** to confirm this. Once the memory is cleared all previously logged records will be lost from the instruments memory, if the **CLr P** message is reached and it is not wished to clear the log memory then pressing and releasing either **F** or **P** will abort the function.

SEt rtc (set time) - seen only with data logger option. Refer to "Data logger" chapter.

Displays and sets the current time in hours and minutes (24 hour format HH.MM) e.g. set as **17.20** for 5:20 pm.

SEt dAtE (set date) - seen only with data logger option. Refer to "Data logger" chapter.

Displays and sets the current date in days and months (DD.MM format). The months will roll over automatically (up at the end of the month, down at the beginning of the month) as the day is scrolled up or down.

SEt YEAr (set year) - seen only with data logger option. Refer to "Data logger" chapter.

Displays and sets the current year (YYYY format). Valid years settings are from 1970 to 2037 (valid Julian time format years).

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**, **EVEN** 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 **A.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 requested.

A.buS is a special mode used when communicating with the optional Windows compatible download software. This optional software also allows remote setting of basic alarm relay functions and calibration via the standard 9 pin D RS232 connector P12 or optional serial communications port.

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**.

The serial retransmission mode function allows the continuous serial retransmission output to follow either the live input value (**Li ve**), the tare function (**tArE**), the peak hold function (**P.HLd**), the display hold (**d.HLd**), the peak memory (**Hi**) 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.

4 .3 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. 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 link settings e.g. a 10V input being used when the link settings are for a 0 to 1V 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	Relay low setpoint value	Setpoint value or OFF	OFF	See following table
AxHi	Relay high setpoint value	Setpoint value or OFF	OFF	See following table
AxHY	Alarm relay hysteresis	Hysteresis value in measured units	10	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
Axn.o or Axn.c	Alarm relay action N/O or N/C	A1n.o or A1n.c	A1n.o	See following table
Ax.SP or Ax.t1	Setpoint or trailing alarm relay	Ax.SP or Ax.t1	Ax.SP	See following table
P.SEt	Preset value	Value in memory	0	
brgt	Display brightness	1 to 63	63	
dULL	Remote display brightness switching	0 to 63	1	
The functions below are only accessible via CAL mode or if ACCS function is set to ALL				
brgt AUt0	Automatic brightness control	on or OFF	on	
brgt Hi gH	Automatic high brightness level	1 to 63	63	
brgt Lo	Automatic low brightness level	1 to 63	10	
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	
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	
2Er0 rn9E	Zero range limit	Limit value or OFF	1000	
CAL 2Er0	Zero point calibration	0	n/a	
USEr En4	4mA input scaling	Value in memory	n/a	
USEr En20	20mA input scaling	Value in memory	n/a	
UCAL	Uncalibrate	CALCLr	n/a	
P.but	P button function	nonE, Hi, Lo, Hi Lo, tArE, 2Er0 or P.SEt	nonE	
r.1 nP	Remote input function	nonE, PHLd, dHLd, Hi, Lo, Hi Lo, tArE, 2Er0, SP.AC, no.AC, CAL.S, P.SEt or dULL	nonE	
r.1 n2	Remote input 2	As per r.1 nP	nonE	

Initial display	Meaning of display	Next display	Default Setting	Record Your Settings
r.I n3	Remote input 2	As per r.I nP	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	
Sqrt	Square root operation	OFF or on	OFF	
tAbL	Lineariser on/off	on or OFF	OFF	
tAbL StOP	Operation mode at table limits	on or OFF	OFF	
SCLE tbl E	Scaling (rounding) factor for lineariser Y values	1, 2, 5, 10, 20, 25, 50, 100, 250, 500 or 1000	1	
tAbL PntS	Number of points for lineariser	2 to 50	2	
SEttAbL	Enter points into lineariser table	P1	n/a	
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	
A1, A2 etc.	Alarm relay operation mode	L, uE, tArE, P.HLd, d.HLd, H, , Lo or dI SP	L, uE	See following table
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	dI SP, cont, nuE, POLL or A.bUS	Cont	
Addr	Unit address	0 to 31	0	
SErL	Serial communication output mode.	L, uE, tArE, P.HLd, d.HLd, H, , Lo, dI SP or H, Lo	L, uE	

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

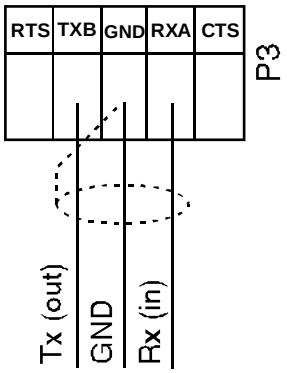
Settings for relays - record settings here				
	A1	A2	A3	A4
AxLo				
AxH,				
AxHY				
Axtt				
Axrt				
Axn.o or Axn.c				
Ax.SP or Ax.t1	n/a			
Ax				

6 Lineariser table

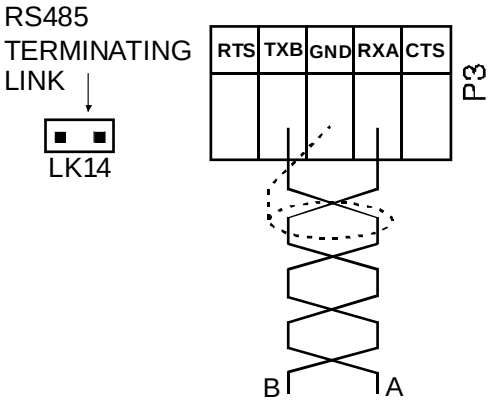
Lineariser Table Complete and retain for reference							
P Value		y Value (Value to be displayed)		P Value		y Value (Value to be displayed)	
P1		Y1		P26		Y26	
P2		Y2		P27		Y27	
P3		Y3		P28		Y28	
P4		Y4		P29		Y29	
P5		Y5		P30		Y30	
P6		Y6		P31		Y31	
P7		Y7		P32		Y32	
P8		Y8		P33		Y33	
P9		Y9		P34		Y34	
P10		Y10		P35		Y35	
P11		Y11		P36		Y36	
P12		Y12		P37		Y37	
P13		Y13		P38		Y38	
P14		Y14		P39		Y39	
P15		Y15		P40		Y40	
P16		Y16		P41		Y41	
P17		Y17		P42		Y42	
P18		Y18		P43		Y43	
P19		Y19		P44		Y44	
P20		Y20		P45		Y45	
P21		Y21		P46		Y46	
P22		Y22		P47		Y47	
P23		Y23		P48		Y48	
P24		Y24		P49		Y49	
P25		Y25		P50		Y50	

7 Serial communications

7 .1 Serial electrical connections



RS232 communications
use 3 core shielded cable



RS485 communications
use twisted pair shielded cable

7 .2 RS232/485 operation and commands

The RS232/485 modes of operation (see **O.Put** function) available are as follows:-

nonE - No serial communications

di SP - Image Display Mode, see further description in this chapter

Cont - Continuous Transmit Mode, see further description in this chapter

POLL - Host Controlled Transmit Mode, see further description in this chapter

r.buS - Special communications mode for use with optional Windows compatible software, refer to the booklet "Download Software Users Guide" supplied with the software

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di 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)
Iis the character 'I' (73 Dec, 49 Hex)
Xis the number of image bytes in ASCII (31 to 38 Hex)
YYYYis 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 LD.

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 selected (**rAtE** function). 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.
YYYYis 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" or "Hyperterminal" is required when using POLL mode. Data is in ASCII format with 8 data bits + 1 stop bit. When polling the LD 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
YYYYis 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 main reading e.g. load or pressure on a LD-WT meter. Format of returned data is:-

<ACK>PAXYYYY<CR>

Where: <ACK> is Acknowledge (6 Dec, 06 Hex)
Pecho command received 'P' (80 Dec, 50 Hex)
A is the responding unit's address
X SPACE for positive and '-' for negative
YYYYis 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
YYYYis 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 remote input 1 function value (if applicable). Will reset the stored value for Peak Hold, Valley High and Valley Low or will operate the selected special function (tare, zero, batch or preset functions only). 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
YYYYis 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
YYYYis 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)
lecho command received 'l' (108 Dec, 6C Hex)
Ais the responding unit's address
Nis the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
Xis SPACE for positive and '-' for negative
YYYYis 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)
hecho command received 'h' (104 Dec, 68 Hex)
Ais the responding unit's address
Nis the setpoint number in ASCII e.g.: 31 Hex would be alarm 1 etc.
Xis SPACE for positive and '-' for negative
YYYYis 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. 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)
Iis echo command received 'I' (73 Dec, 49 Hex)
Ais the responding unit's address
CCa 2 character model identifier (e.g.: TC - thermocouple)
X.Xis the version number (e.g.: '0.1')
<CR>is a Carriage Return (13 Dec, 0D Hex)

9. 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)
Ais 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.

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

8 Data logger

The data logger is an optional addition to the LD. This chapter applies only to instruments fitted with the data logger option. If the data logger is being used with the Windows compatible software provided then refer to the separate “Download Software User Guide” booklet.

Operation of the Data Logger

The data logger memory will store the hours:mins:secs, day:month and year together with the LD display reading at the time of log update. The log update time may be set at the **LoG UPdt** function.

If an input is overranged when logged then the overrange value (**----**) will be logged for that channel for as long as the overrange value is present. Readings taken during power failure will not be logged.

The log memory is set up in a circular format. Once the top of memory is reached the log data will overwrite the start of memory (overwriting the oldest record). The recording time available will vary depending on the memory size fitted and the update time selected. The table below shows maximum recording times.

Data is transmitted in comma separated format making it compatible with many commercially available databases/spreadsheets. Time information is downloaded in Julian time format which is again compatible with many databases/spreadsheets. The internal clock is battery backed. Downloaded log records are in the form of the time followed by the logged record for each channel at that time.

Downloaded information is transmitted via the serial output option board in RS232 or RS485 format, thus a serial output option must be fitted on all instruments with data logging software. Refer to the “RS232/RS485 Output Option” chapter for hardware and software details. Special software details which apply only to data logger option instruments are given at the end of this appendix.

Data Logger Software

Data logger software compatible with Windows 95, 2000, NT & XP is provided for use with the data logger. A separate user manual for the software is also provided. Consult this user manual for details of software setup. The data logger can also communicate using standard serial polling commands, these are listed under the heading “Serial Command Format” in this chapter.

Data Logger Table - Maximum Logging Times

Times are approximate.

Time between logs	32k Memory	128k Memory
	days : hours : min	days : hours : min
10 Sec	0 : 04 : 39	0 : 18 : 37
20 Sec	0 : 09 : 18	1 : 13 : 13
30 Sec	0 : 13 : 57	2 : 07 : 50
1 Minutes	1 : 03 : 54	4 : 15 : 40
2 Minutes	2 : 07 : 48	9 : 08 : 20
3 Minutes	3 : 11 : 42	14 : 00 : 00
4 Minutes	4 : 15 : 36	18 : 16 : 40
5 Minutes	5 : 19 : 30	23 : 08 : 20
6 Minutes	6 : 23 : 24	27 : 01 : 00
10 Minutes	11 : 15 : 00	46 : 16 : 40
15 Minutes	17 : 14 : 30	70 : 01 : 00
20 Minutes	23 : 06 : 00	93 : 09 : 20
30 Minutes	34 : 21 : 00	140 : 02 : 00
60 Minutes	69 : 18 : 00	280 : 04 : 00

Explanation of Functions

Functions which are used when the data logger option is fitted are accessible only via CAL mode. Details of these new functions are given below.

LoG UPdt (select log update time)

Displays and sets the time period between each log sample. Available selections are:
0. 10 (10 seconds), 0.20 (20 seconds), 0.30 (30 seconds), 1.00 (1 minute), 2.00 (2 minutes), 3.00 (3 minutes), 4.00 (4 minutes), 5.00 (5 minutes), 6.00 (6 minutes), 10.00 (10 minutes), 15.00 (15 minutes), 20.00 (20 minutes), 30.00 (30 minutes) or 60.00 (60 minutes).

Note: The data log memory (see CLrLoG below) must be cleared whenever the log update time is changed or the date and time is changed.

CLr LoG (clear data log memory)

This function clears the data log memory, to clear the memory press then release ▲ and ▼ simultaneously, the display will show CLr? asking if you really want to clear the memory. If you wish to clear memory then press then release ▲ and ▼ simultaneously again. The log memory will then be cleared and the log period reset, the display will indicate ProGLoG to confirm this. Once the memory is cleared all previously logged records will be lost from the instruments memory, if the CLr? message is reached and it is not wished to clear the log memory then pressing and releasing either F or P will abort the function.

SEt rtc (set time)

Displays and sets the current time in hours and minutes (24 hour format HH.MM) e.g. set as 17.20 for 5:20 pm.

SEt dAtE (set date)

Displays and sets the current date in days and months (DD.MM format). The months will roll over automatically (up at the end of the month, down at the beginning of the month) as the day is scrolled up or down.

SEt YEAr (set year)

Displays and sets the current year (YYYY format). Valid years settings go up to 2037 (valid Julian time format years).

Serial Command Format

Instruments using the data logger option are provided with extra software functions to the standard instrument. This section describes these extra functions, refer to “RS232/RS485 Output Option” appendix for standard functions.

Initial Setup

Select the baud rate (bAud), parity (PrtY) and address (Addr) as required. The serial output mode function (O.Put) must be set to POLL when using the data logger.

Extra Functions

These functions are seen only in data logger software versions of the TP488.

Transmit Record Block:

<STX>DA<CR>D<CR>TTTTTTTTTT<CR>NNNN<CR>

Where: TTTTTTTTTT is the start time of the block (in Julian time format).
NNNN is the number of records to be sent.

Instructs the unit to send a block of logged data via the serial interface.

The returned data format is:-

<ACK>DAD<CR>

Followed by NNNN records in the format:-

TTTTTTTTTT,S1111,S2222,S3333,S4444,S5555,S6666,S7777,S8888<CR>

Where: TTTTTTTTTT is the start time for each record (in Julian time format). If TTTTTTTTTT (time in "Transmit Record Block" request) is sent as 0 then the records will start at the earliest time in log memory.

S is the sign (<SPACE> for positive values and "-" for negative.)

1111, 2222 etc. are the values for each channel.

Values will only be transmitted for active channels. Invalid readings from any channel will be received as the overrange value (——) for that channel.

If the start time requested is not present in the log then <ACK>DA?<CR> will be returned.

Transmit All Logged Data: <STX>DA<CR>A<CR>

Instructs the unit to transmit the entire data log. All log records since the last log memory reset will be sent to the host.

The unit will respond with <ACK>DAA<CR> followed by all log record sent in the same format as above (Transmit Record Block)

Transmit System Time: <STX>DA<CR>T<CR>

Instructs the instrument to transmit the current time in Julian time format as follows:-

<ACK>DAT TTTTTTTTTT<CR>

Transmit the Log Start Time: <STX>DA<CR>S<CR>

Instructs the instrument to transmit the log start time i.e. the time stamp on the first record in the log. Note that if the memory has "wrapped around", i.e. has started to overwrite existing logged records, that the log start time will not be the original time the log started (since this time stamp and associated log record has been overwritten).

The returned data format is:-

<ACK>DAS TTTTTTTTTT<CR>

Transmit the Log Update Time: <STX>DA<CR>U<CR>

Returns the current log update time as set in the log memory. The returned time may be different to the **dLAY** time if there has been no log reset since the **dLAY** function was changed.

The returned data format is:-

<ACK>DAU NNNN<CR>

Where: NNNN is the update time in seconds.

Transmit the Log Memory Size: <STX>DA<CR>M<CR>

Returns the size of the log memory in records.

The returned data format is:-

<ACK>DAM NNNN<CR>

Where: NNNN is the number of records for that memory size e.g. an 8K memory will return 508.

Set the System Time: <STX>DA<CR>t<CR>TTTTTTTTTT<CR>

Set the instrument system clock to Julian time TTTTTTTTTT. If the command is successful then <ACK>DAt<CR> will be returned. If the Julian time is invalid then <ACK>DA?<CR> will be returned.

Set the Log Update Time: <STX>DA<CR>u<CR>NNNN<CR>

Set the log update time to NNNN seconds. Note that the new time will not apply until a log reset is performed. If the command is successful then <ACK>DAu<CR> will be returned. If the update time is invalid then <ACK>DA?<CR> will be returned. Valid times are as shown in the **dLAY** function explanation.

Reset the Log Memory: <STX>DA<CR>R<CR>RESET<CR>

This command will reset the log memory. This will erase all current records and reset the log update time if it has changed. As this will result in a loss of data the command must be sent exactly as it appears or the memory will not be reset.

If the command is successful then <ACK>DAR<CR> will be returned to indicate that the memory has been reset. If the command is invalid then <ACK>DA?<CR> will be returned.

9 Specifications

9 .1 Technical Specifications

Input Types:	Link selectable ±20mA, 4 to 20mA or DC Volts ±2.5V or ±25V or slidewire 0-1kΩ to 0-1MΩ potentiometer
Input impedance:	64Ω nominal for 4 to 20mA/±20mA range & 1MΩ on DC voltage ranges. 4-20mA/±20mA input uses a self healing 30mA poly fuse for input protection, input impedance quoted includes poly fuse resistance.
Lineariser points:	Up to 50 points can be entered
ADC Resolution:	1 in 32,000
Accuracy:	Better than 0.1% when calibrated
Sample Rate:	5 per sec.
Conversion Method:	Sigma Delta ADC
Microprocessor:	MC68HC11F CMOS
Ambient Temperature:	-10 to 60°C
Humidity:	5 to 95% non condensing
Power Supply:	38, 45 0r 57mm LED displays only 240VAC or 38, 45 0r 57mm LED displays only 110VAC or 38, 45 0r 57mm LED displays only 24 - 48VAC or 38, 45 0r 57mm LED displays only 12-48VDC or 100mm LED displays only AC 240/110V selectable 50/60Hz or 100mm LED displays only AC 48/42/32/24V selectable 50/60Hz or 100mm LED displays only DC 12 to 24V isolated or 100mm Electro magnetic displays only AC 240V or110V 50/60Hz or 100mm Electro magnetic displays only DC 12 to 48V isolated 100mm Electro magnetic displays only DC 24V (±10%) non isolated Supply type is factory configured
Power Consumption:	AC supply 15 VA max, DC supply, consult supplier (depends on display type & options)
Output (standard):	4 x Setpoint relays, form C, rated 5A at 240VAC Transmitter supply 10V (± 5V) or 24V (± 12) link selectable. 25mA max. for 5, 12 or 24V. 50mA max. for 10V
Relay Action:	All relays programmable N.O. or N.C. Relays 1 & 2 can alternatively be set for PI control (frequency or pulse width)

9 .2 Output Options

Serial communications:	Non isolated RS232 or RS485 or isolated RS485 (factory configured)
Analog retransmisison:	Dual isolated analog 4-20mA outputs
Datalogger:	32k or 128k internal datalogger memory.
Remote pushbutton connector:	On board connector for remote P, F, ▲ & ▼ pushbuttons. Circuit board connector only supplied, not keypad

9 .3 Physical Characteristics

Models LD-LN-X-100E4 100mm 4 digit electromagnetic	Case size (mm) = 450 x 250 x 155 Weight: = 8.5 kgs Mounting hole locations - see “Mechanical Installation” chapter
Models LD-LN-X-100E5 100mm 5 digit electromagnetic	Case size (mm) = 520 x 250 x 155 Weight: = 9.5 kgs Mounting hole locations - see “Mechanical Installation” chapter
Models LD-LN-X-100E6 100mm 6 digit electromagnetic	Case size (mm) = 650 x 250 x 155 Weight: = 10.5 kgs Mounting hole locations - see “Mechanical Installation” chapter
Model LD-LN-X-38R6 38mm 6 digit LED	Case size (mm) = 255 x 145 x 125 Weight: = 1.3 kgs Mounting hole locations (mm) - see “Mechanical Installation” chapter
Model LD-LN-X-45R5 45mm 5 digit LED	Case size (mm) = 255 x 145 x 125 Weight: = 1.3 kgs Mounting hole locations (mm) - see “Mechanical Installation” chapter
Model LD-TR-X-57R4 57mm 4 digit LED	Case size (mm) = 255 x 145 x 125 Weight: = 1.3 kgs Mounting hole locations (mm) - see “Mechanical Installation” chapter
Model LD-LN-X-100R4 100mm 4 digit LED	Case size (mm) = 450 x 250 x 155 Weight: = 8.5 kg Mounting hole locations (mm) - see “Mechanical Installation” chapter
Model LD-LN-X-100R6 100mm 6 digit LED	Case size (mm) = 650 x 250 x 155 Weight: = 10.5 kg Mounting hole locations - see “Mechanical Installation” chapter
Model LD-LN-X-200R4 200mm 4 digit LED	Case size (mm) = 850 x 360 x 130 Weight: = 12 kg Mounting hole locations - see “Mechanical Installation” chapter

10 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.

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written consent of the manufacturer.

This product is designed and manufactured in Australia.